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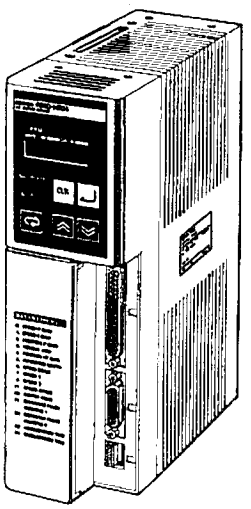
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Find the *OMRON R88M-H50030-B* at our website: *Click HERE*

OMRON

Cat. No. I508-E1-2

USER'S MANUAL



OMNUC H SERIES

MODEL: R88D-HT04/-HT10
(POWER UNIT BUILT-IN TYPE)
MODEL: R88D-HS04/-HS10/-HS22
(POWER UNIT SEPARATED TYPE)

AC SERVO DRIVER

<Version 3>

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Thank you for choosing OMNUC H series products. But please note: improper use and handling will adversely affect product performance and may cause unanticipated accidents or shorten the product's life.
We ask you to read this manual thoroughly and handle and operate the unit carefully.

Notes About Using This Manual

(1) This manual describes in as much detail as possible the functions of the unit and relations with other units. Items not described in this manual should be understood as "unavailable."

(2) Though we have tried to create the manual optimum, do not hesitate to contact our agent if you find anything difficult to understand.

(3) Inside the cover, there are potentially dangerous parts. If you open the cover, serious problems may arise. Never repair or disassemble the unit.

(4) We recommend adding the following precautions to your instruction manuals for unit-installed systems.
- High voltage equipment is dangerous.
- Do not touch terminals of the unit after power is switched OFF as voltage remains.

(5) Specifications and functions may change without notice in order to improve performance.

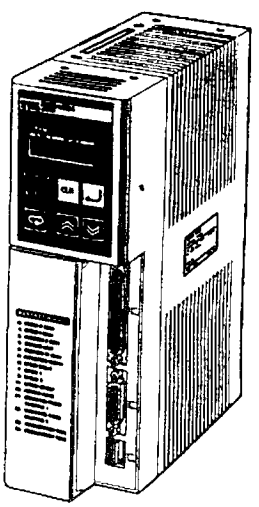
Check items before unpacking

- Check following points before removing package:
  - Delivered unit is exactly as ordered.
  - No damage caused during transportation.
  - No looseness of any screw or bolt.
  - Accessories are correctly delivered together with or attached to unit.
- Check that below accessories are delivered:
  2 pcs of fitting metals
  4 pcs. of fixing screws
  1 set of connectors (VH): 1 pc. of housing VHR-4N, 4 pcs. of contact SVH-21T-P1.1
  1 volume of Instruction Book

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OMRON

USER'S MANUAL



OMNUC H SERIES

MODEL: R88D-HT04/-HT10
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AC SERVO DRIVER

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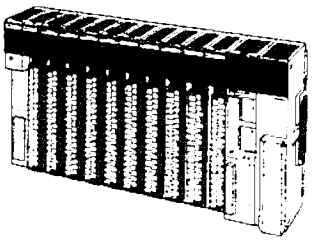
VISUAL INDEX

For users who wish to operate soon.

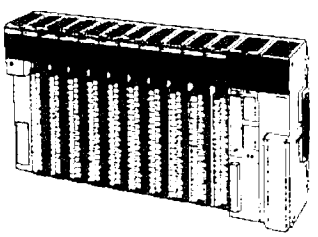
☐ Read Chapter 2: Planning, and Items 3-1, 3-2, 3-3, as well as 3-4 in Chapter 3: Operation.

You can get minimum required contents to operate.

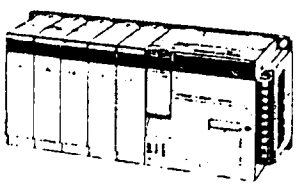
■ Programmable controller
SYSMAC CV/C series
C500–NC103/–NC222



Analog input
Pulse train input

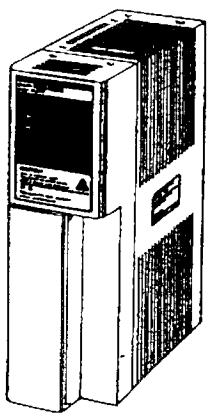


■ Programmable controller
SYSMAC CV/C series
C500–NC111–V1



■ Programmable controller
SYSMAC C200H/C200HS
C200H–NC112/–NC211

Power unit for
OMNUC H series



DC power

DIGITAL INNOVATION

This series is a fully software controlled AC servo driver benefitting from advanced Omron software servo technology. It secures high performance, a sensitive man-machine interface, and economy.

User's Manuals for OMNUC H series

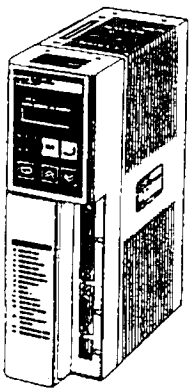
☐ User's Manual for OMNUC H series AC Servo Driver.

☐ User's Manual for OMNUC H series Power Unit.

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OMNUC H series

OMNUC H series
AC Servo Driver



Power unit
built-in type

• Display control section
Chapter 2, 2-2
Chapter 3, 3-1
Chapter 4, 4-1

Encoder signal

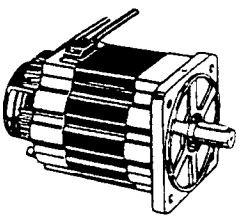
Power signal

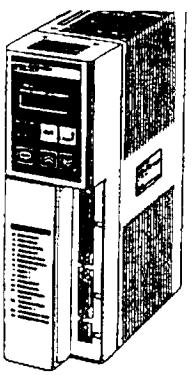
• CN1
Chapter 2, 2-3-3
Chapter 5, 5-1

• CN2
Chapter 2, 2-3-4
Chapter 5, 5-1

• CN3
Chapter 2, 2-3-5
Chapter 5, 5-1

OMNUC H series
AC servo motor

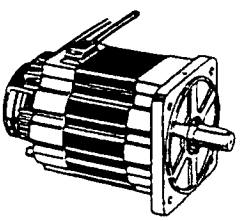




Power unit
separated type

Encoder signal

Power signal



• Installation, wiring
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Chapter 2, 2-3

Function setting	
☐ Soft start.....	Chapter 3, 3-4-2
☐ Electronic gear.....	Chapter 3, 3-4-3
☐ Servo brake/dynamic brake.....	Chapter 3, 3-4-4

Treatment at abnormality	
☐ Adjustment.....	Chapter 3, 3-5
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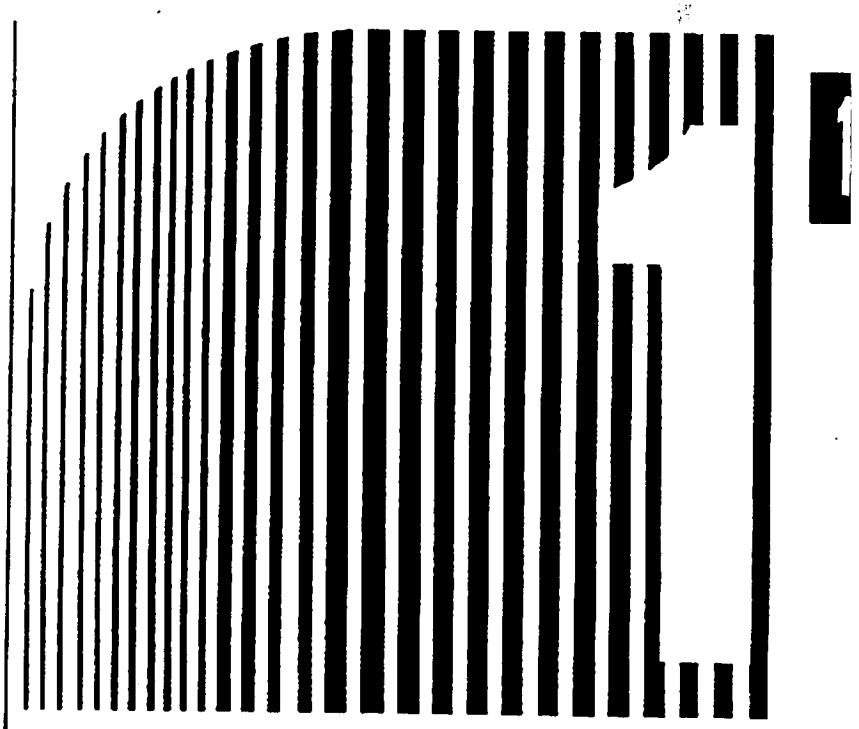
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Chapter 1

• Outline •

1-1. Features

1-2. System Configuration

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Chapter 1. Outline

1-1 Feature

This unit is an AC servo driver for controlling supply of power to an AC servo motor in accordance with analog input signal or pulse train input signal. It facilitates high precision speed control and/or position control.
This series consists of AC servo motors from 50 W to 1100 W and AC servo drivers for control of these motors.

Main features

■ AC servo motor

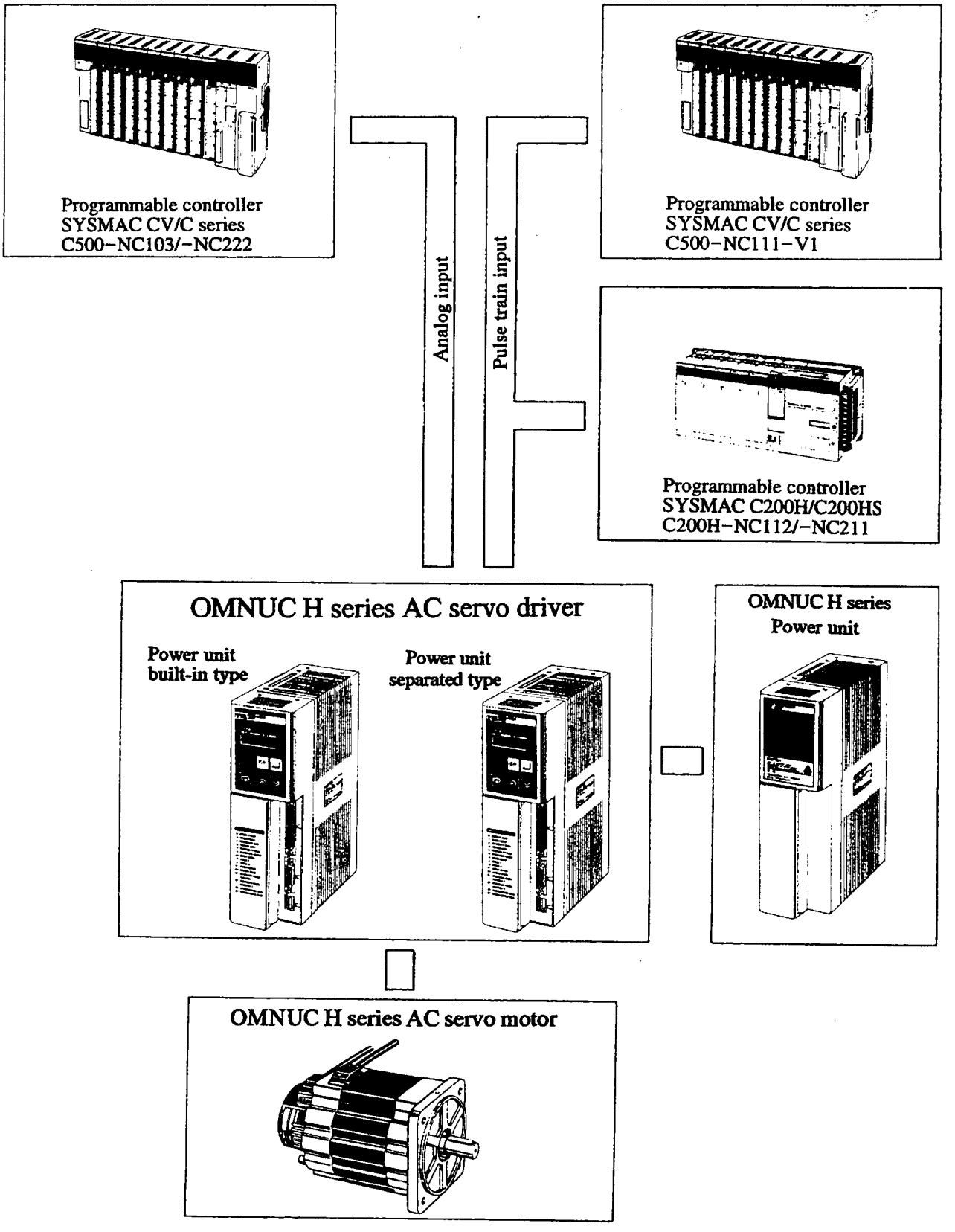
- Compact, light weight
  By adopting new material rare earth for magnetics, employing a newly designed magnetic circuit, compact and light weight motors are made possible.
- High resolution
  High resolution magnetic encoder of 2000 ppr (pulse per revolution) is integrated. As this encoder is a magnetic system, it is durable against any environmental conditions.
- Wide variation
  Seven models are provided from 50 W to 1100 W output capacities so that an optimum model for each application is selectable.
- No need of periodical maintenance
  As AC servo motors have no brush, there is no need to replace them. Therefore, your machines or plants can improve on reliability by having these motors installed.

■ AC servo driver

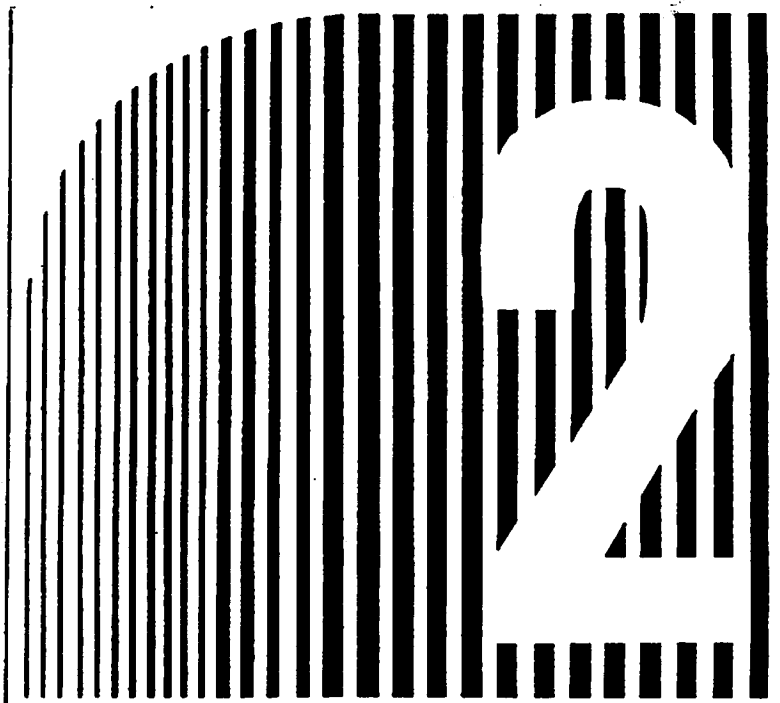
- Full software servo
  By employing one-chip CPU, all control systems, including position loop, speed loop, and current loop, are administrated by software. There is none of the deterioration with time that plagues analog type servo drivers.
- Common use for analog input and pulse train input
  Both analog voltage speed command and pulse train position command are acceptable so that a system can be modified easily, and maintenance items decreased.
- Easy-to-set **HMI(Human Machine Interface)**
  Variable settings available by keys on a front panel. No need to open covers and set dip switches.
- Semi-automatic tuning function
  Control system gain is automatically adjusted by merely setting load inertia. No need for cumbersome tuning.
- Various monitor functions
  Operation conditions, including current speed, peak torque, actual torque, input/output information, are displayed on 7 segment LED. Useful for checking the system during construction and maintenance.
- Convenient additional functions
  Additional functions, such as soft start function to easily construct simple positioning and electronic gear function to set pulse rate at any ratio, are provided as standard. Effective for simplifying system.
- Two types, power unit built-in type and power unit separated type, are provided.
  A power unit built-in type for single axis systems, a power unit separated type for multi-axis systems are both suitable respectively.
- Simple wiring
  Various types of exclusive connection cables for connecting positioners and extension cables for connecting motors with drivers are provided for easy connection.

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1-2 System Configuration



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Chapter 2

• Planning •

2-1. Installation

2-2. Instruction of Front Panel

2-3. Wiring and Connection

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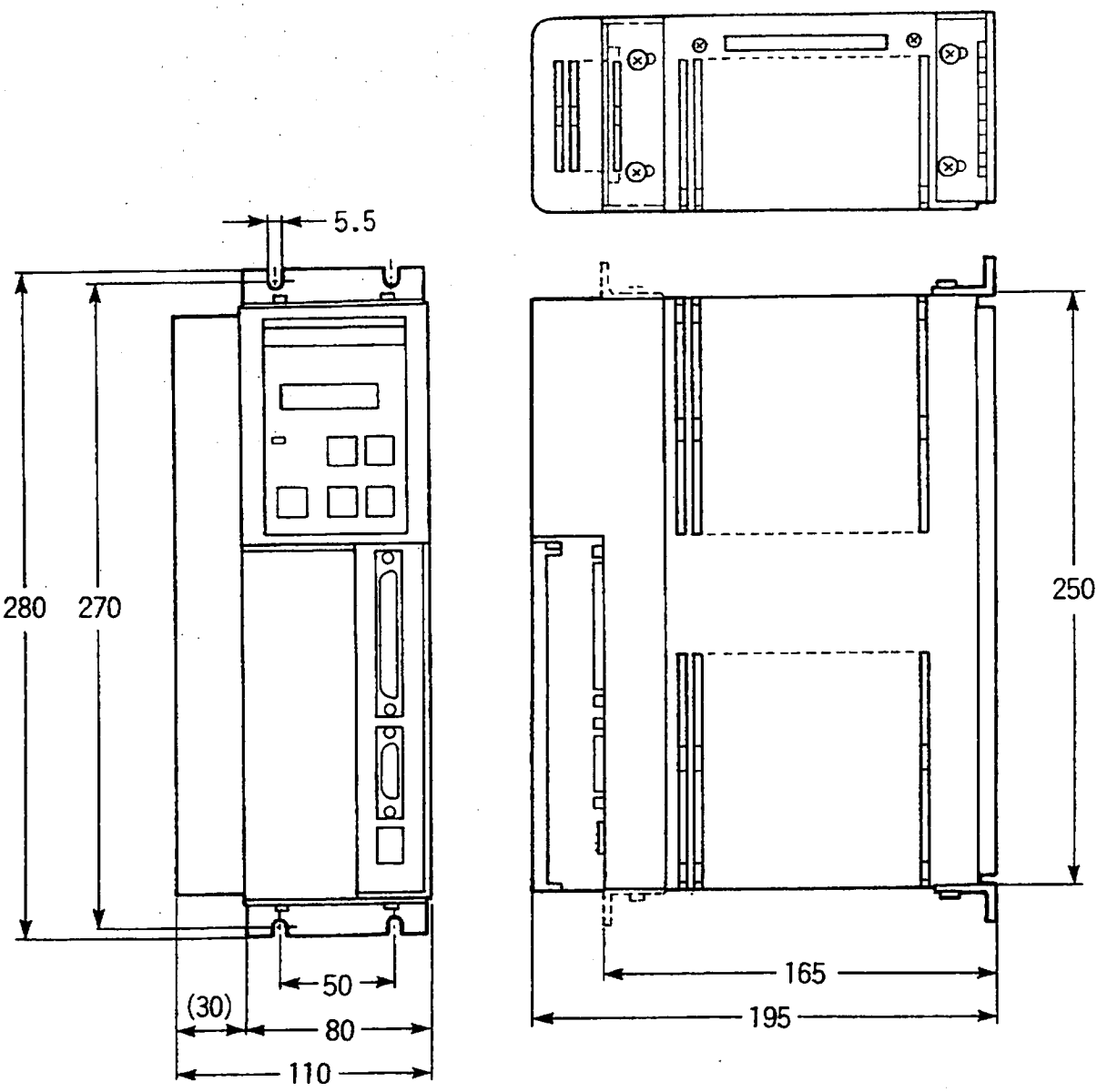
Chapter 2. Planning

2-1. Installation

2-1-1 Outside Dimensions

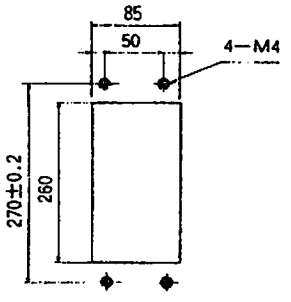
■ AC servo driver (Power unit built-in type: R88D-HT04/-HT10, Power unit separated type: R88D-HS04/-HS10)

• Outside dimensions

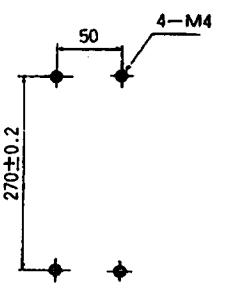


• Installation dimensions

(Installation into a panel)



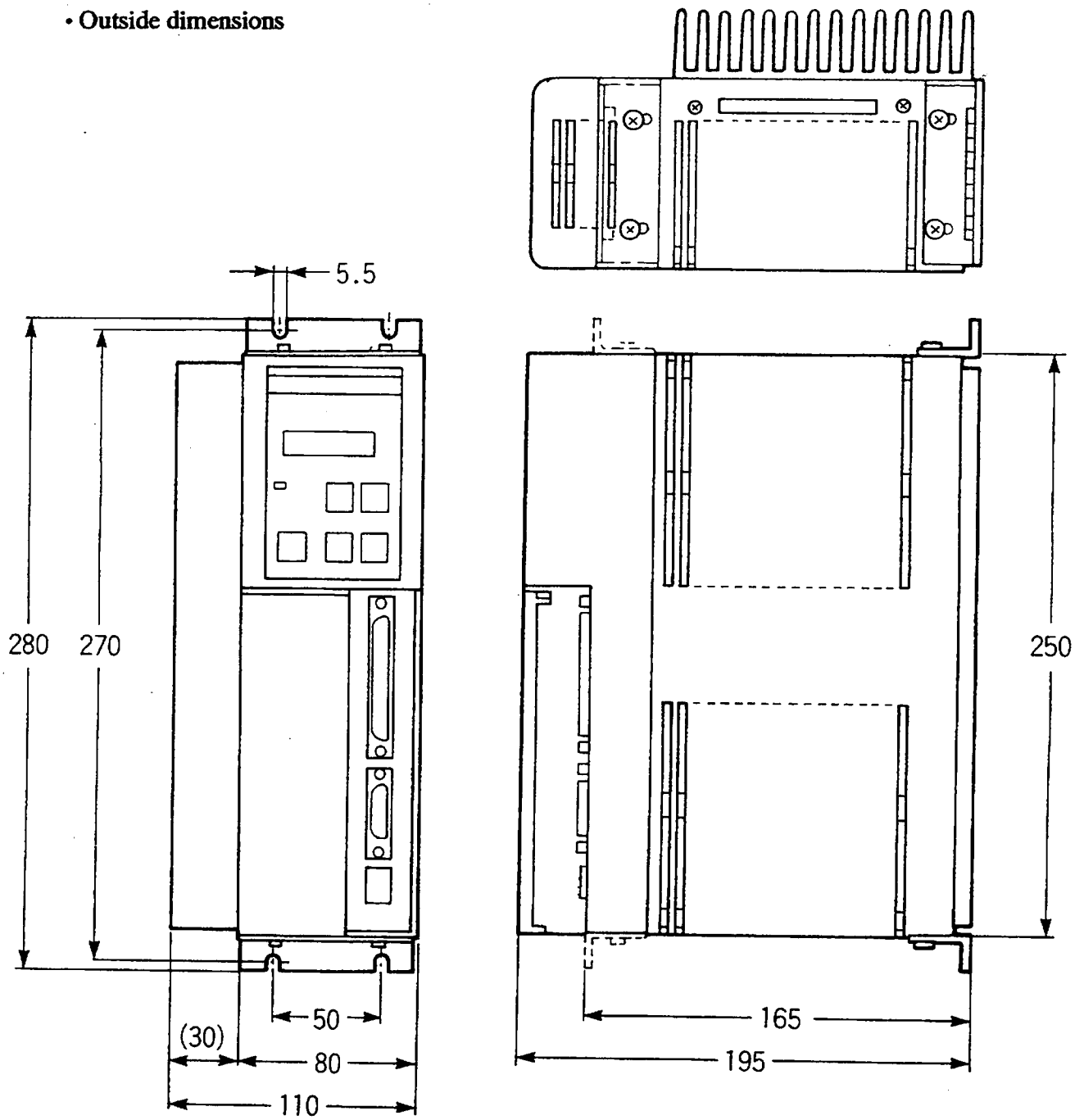
(Installation on a wall)

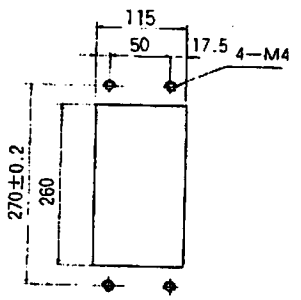


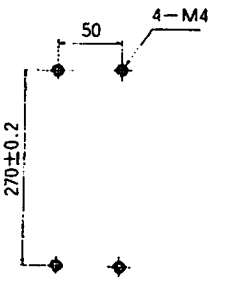
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■ AC servo driver (Power unit separated type: R88D-HS22)

• Outside dimensions



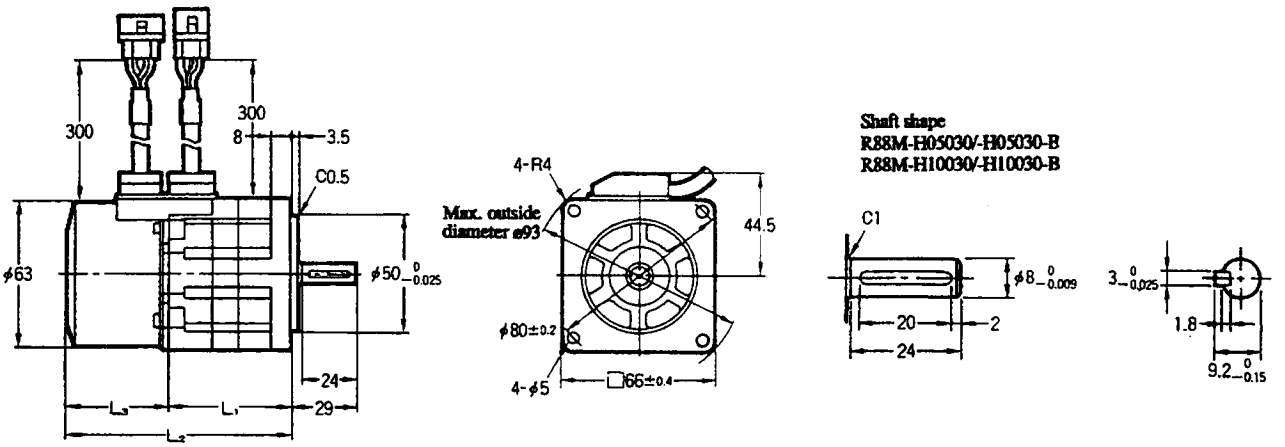




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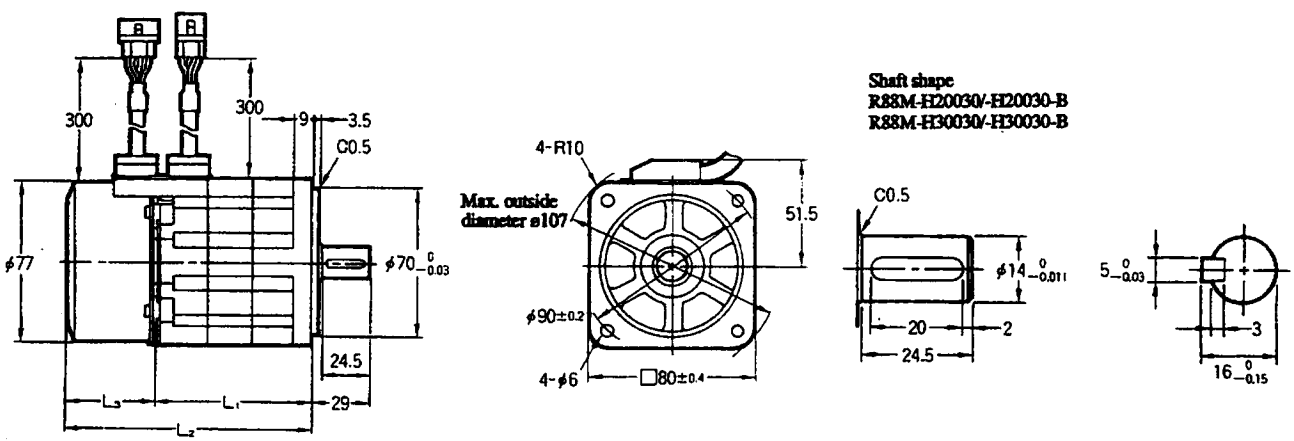
■ AC servo motor

• 50W/100W Standard type: R88M-H05030, R88M-H10030
Brake built-in type: R88M-H05030-B, R88M-H10030-B



Model / Dimensions (mm)	Standard type L1	L2	L3	Model / Dimensions (mm)	Brake built-in type L1	L2	L3
R88M-H05030 (50W)	53.5	99	45.5	R88M-H05030-B (50W)	84.5	130	45.5
R88M-H10030 (100W)	63.5	109	45.5	R88M-H10030-B (100W)	94.5	140	45.5

• 200W/300W Standard type: R88M-H20030, R88M-H30030
Brake built-in type: R88M-H20030-B, R88M-H30030-B



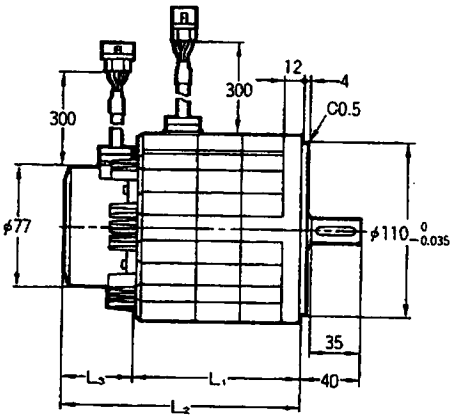
Model / Dimensions (mm)	Standard type L1	L2	L3	Model / Dimensions (mm)	Brake built-in type L1	L2	L3
R88M-H20030 (200W)	77	123.5	46.5	R88M-H20030-B (200W)	107.5	154	46.5
R88M-H30030 (300W)	89	135.5	46.5	R88M-H30030-B (300W)	119.5	166	46.5

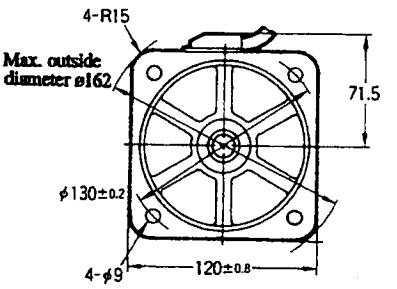
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- **500W to 1100W**

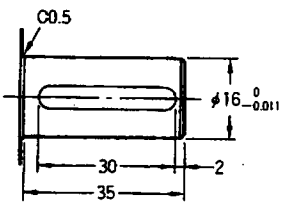
Standard type: R88M-H50030, R88M-H75030, R88M-H1K130

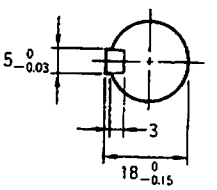
Brake built-in type: R88M-H50030-B, R88M-H75030-B, R88M-H1K130-B



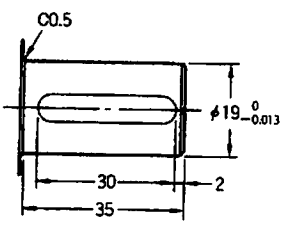


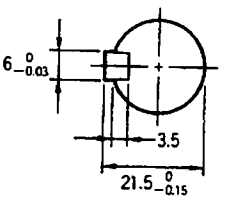
Shaft shape
R88M-H50030/-H50030-B
R88M-H75030/-H75030-B





R88M-H1K130/-H1K130-B





Model Dimensions (mm)	Standard type			Model Dimensions (mm)	Brake built-in type		
	L1	L2	L3		L1	L2	L3
R88M-H50030 (500W)	107.5	154.0	46.5	R88M-H50030-B (500W)	148.5	195.0	46.5
R88M-H75030 (750W)	126.0	172.5	46.5	R88M-H75030-B (750W)	167.0	213.5	46.5
R88M-H1K130 (1100W)	144.5	191.0	46.5	R88M-H1K130-B(1100W)	185.5	232.0	46.5

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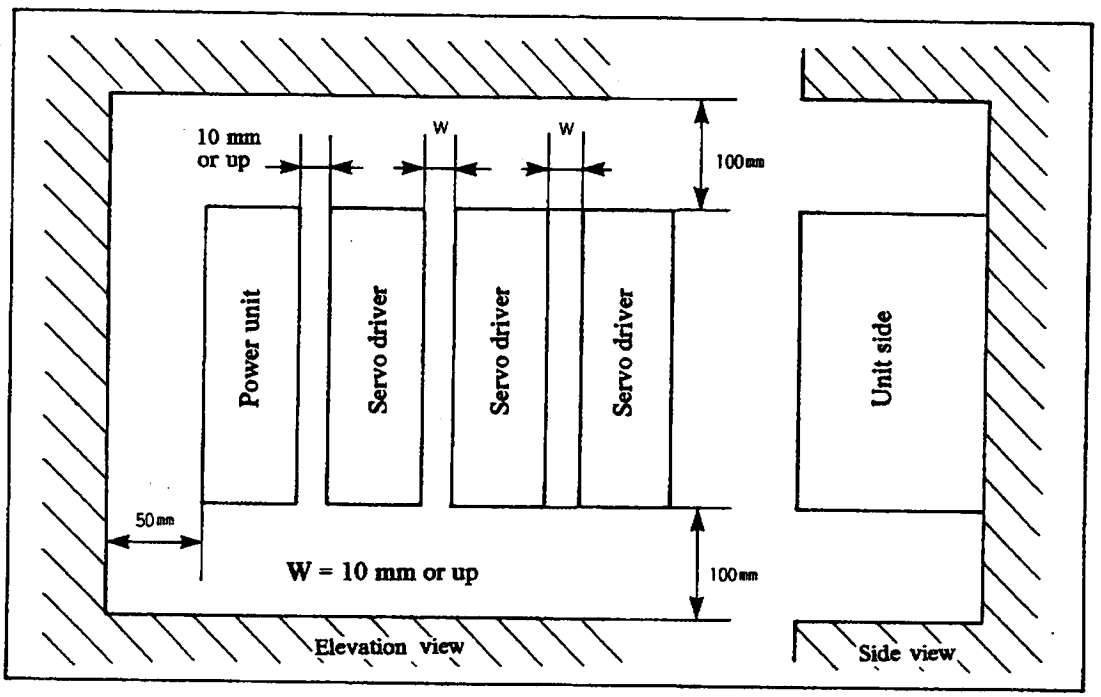
2-1-2 Installation Condition

■ AC servo driver

(power unit built-in type: R88D-HT04/-HT10, power unit separated type: R88D-HS04/-HS10/-HS22)

(1) Space around the drivers

- When you install the AC servo drivers, note the dimensions below considering heat radiation from drivers inside.
- Install the AC servo drivers in a direction that their model names are readable (vertical direction).



(2) Operation environmental conditions

Operation environmental temperature:	0 to + 55°C
Operation environmental humidity:	35 to 85%RH (without dew condensation)
Storage environmental temperature:	-10 to +75°C
Storage environmental humidity:	35 to 85%RH (without dew condensation)

(3) Environmental temperature control

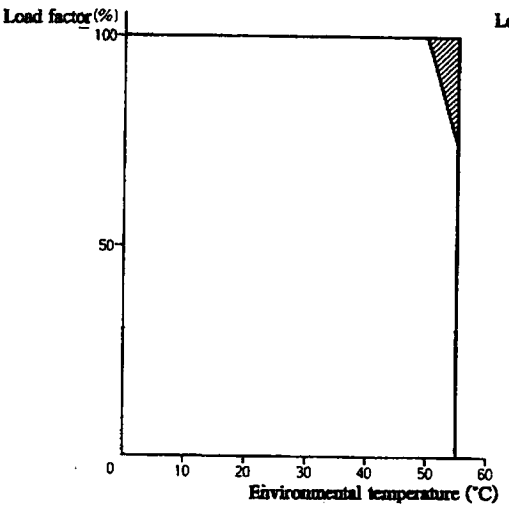
- In order to enhance reliability of the drivers, we recommend that you use them where temperature does not rise.
- When the drivers are installed in an enclosure such as control box, provide a cooling fan or air conditioner to ensure that environmental temperature of each driver does not exceed +55°C.
- Surface of the drivers may raise temperature 30° higher compared with environmental temperature. Devices and wirings to be affected by thermal attack should be installed separate from the drivers.

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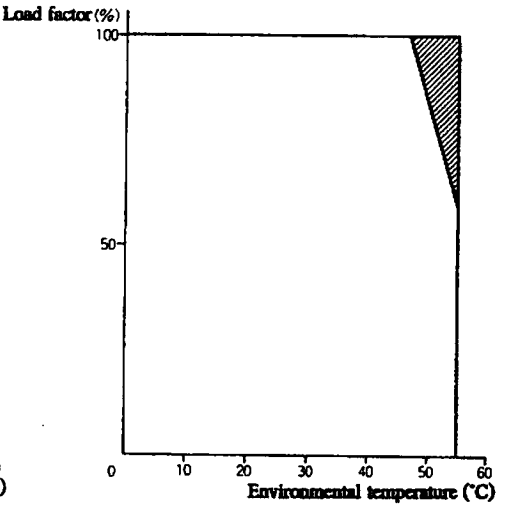
(4) Forced cooling

- When an AC servo driver: R88D-HS22 for 500W/750W/1100W motors, is used in slanting zone shown in the illustration below, a fan or air conditioner is required to force cooling.

• Using 750W motor



• Using 1100W motor



Note: Calculate load factor using the equation below:

$$\text{Load factor} = \frac{\text{Effective torque}}{\text{Rated torque}} \times 100\ (\%)$$

(5) Prohibition of obstacle intrusion

- Take a measure such as cover the driver unit so that metal chips do not enter into the driver by drilling while installation work. (Be sure to take out these covers after works for thermal radiation.)
- Take care during installation and operation that metal powders, oil, water, etc. do not enter into the inside of the AC servo drivers.

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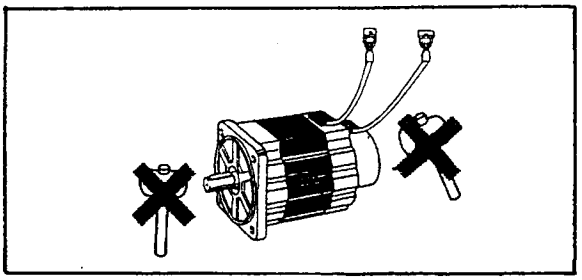
■ AC servo motor

(1) Operation environmental conditions

Operation environmental temperature: 0 to + 40°C
Operation environmental humidity: 35 to 85%RH (without dew condensation)
Storage environmental temperature: -10 to +75°C
Storage environmental humidity: 35 to 85%RH (without dew condensation)

(2) Cautions at handling (As for thrust load, see item 5-2-4.)

- Do not give large shock to the motor while transporting, installing, and removing it.
- Use a pulley remover to pull out a coupling from the motor shaft.



(3) Connection with mechanical system

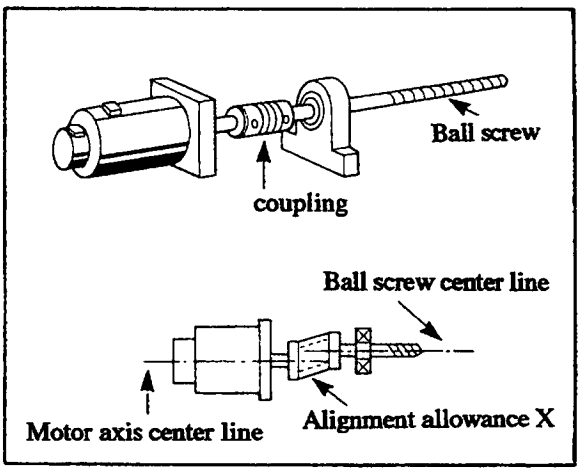
- Connection with a ball screw

① Apply a coupling to joint the motor shaft and a ball screw.

② Align a motor shaft center with a ball screw center within allowable range of the applied coupling.

Recommended coupling

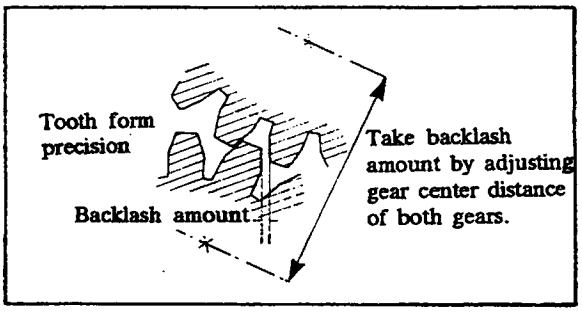
Name	Mfg.
Oldham coupling	Myghty Co., Ltd.



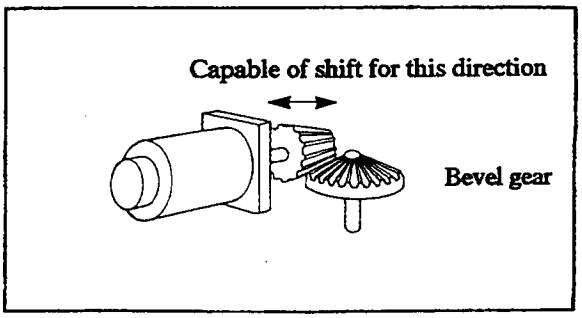
- Joint with a gear

① Use gear of its tooth form is equivalent to JIS B 1702 item 2 or up.

② In case of low precision gears, secure enough backlash.

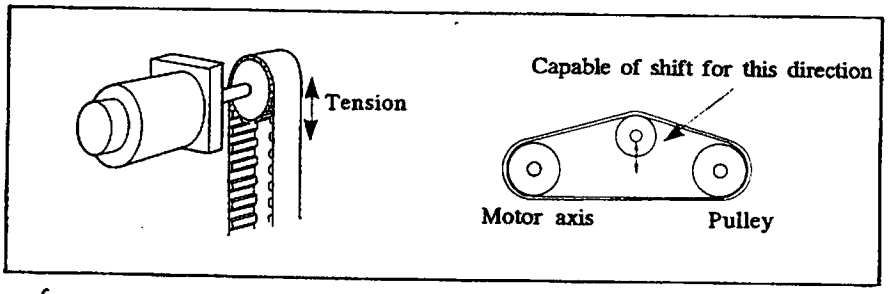


③ When using bevel gears, thrust load is charged by assembly precision level, gear finished precision level, and ambient temperature variation. Be sure to take care not to charge heavier thrust load than the rated specifications.



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• For selection of timing belt type and tension level, contact each belt manufacturer. Take care that the motor shaft does not receive excessive radial load from belt tension. Excessive radial load may cause damage to the motor shaft. For radial load, see item 5-2-4.



(4) Drip-proof

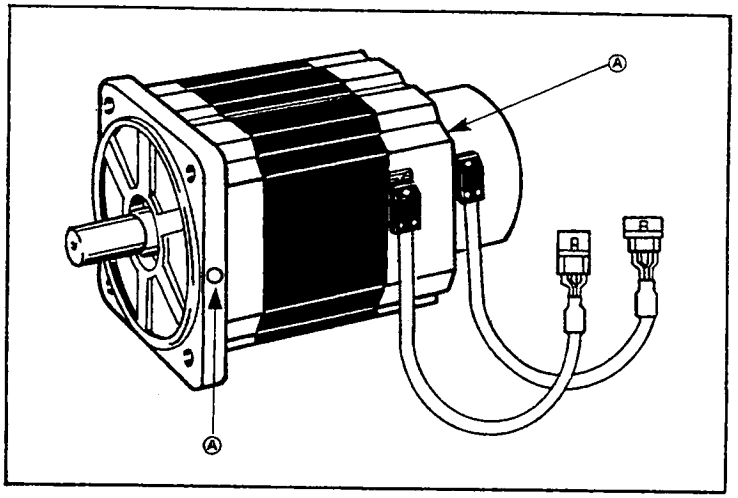
• As the servo motor, including its connectors, is not water-proof, be careful not to drip water or oil on it , this will help to prevent insulation failure and short circuits. (IP52 item is applied for the motor.)

• This motor, including its connectors, cannot be used in a location where dripping water and/or oil conditions exist, or in a misty atmosphere.

(5) Motor installation direction

• Follow the direction shown in illustration right for motor installation direction.

• To treat cables or to change installation direction, use M4×8 tapped hole Ⓐ and a fixed bundle belt supplied with the motor.



Fixed type bundle belt

Models	Mfg.	Remarks
SKB-145F (M4)	SK Tool Machine	Accessory
PLC1.51-S8	Panwitt	Recom-mended
T30MR	Titon Co., Ltd	

(6) Oil seal

• When oil or grease pours on the motor output shaft, provide the oil seal integrated servo motor. Ex.: Install a harmonic drive or etc. on the motor.

•Exchange the oil seal regularly ,as the life of the oil seal is about 5000 hours at lubricated condition.

Rated output power of motor	Models	Mfg.
50W , 100W	AC0279AO	NOK
200W , 300W	AC0598AO	
500W , 750W , 1100W	AC1013AO	

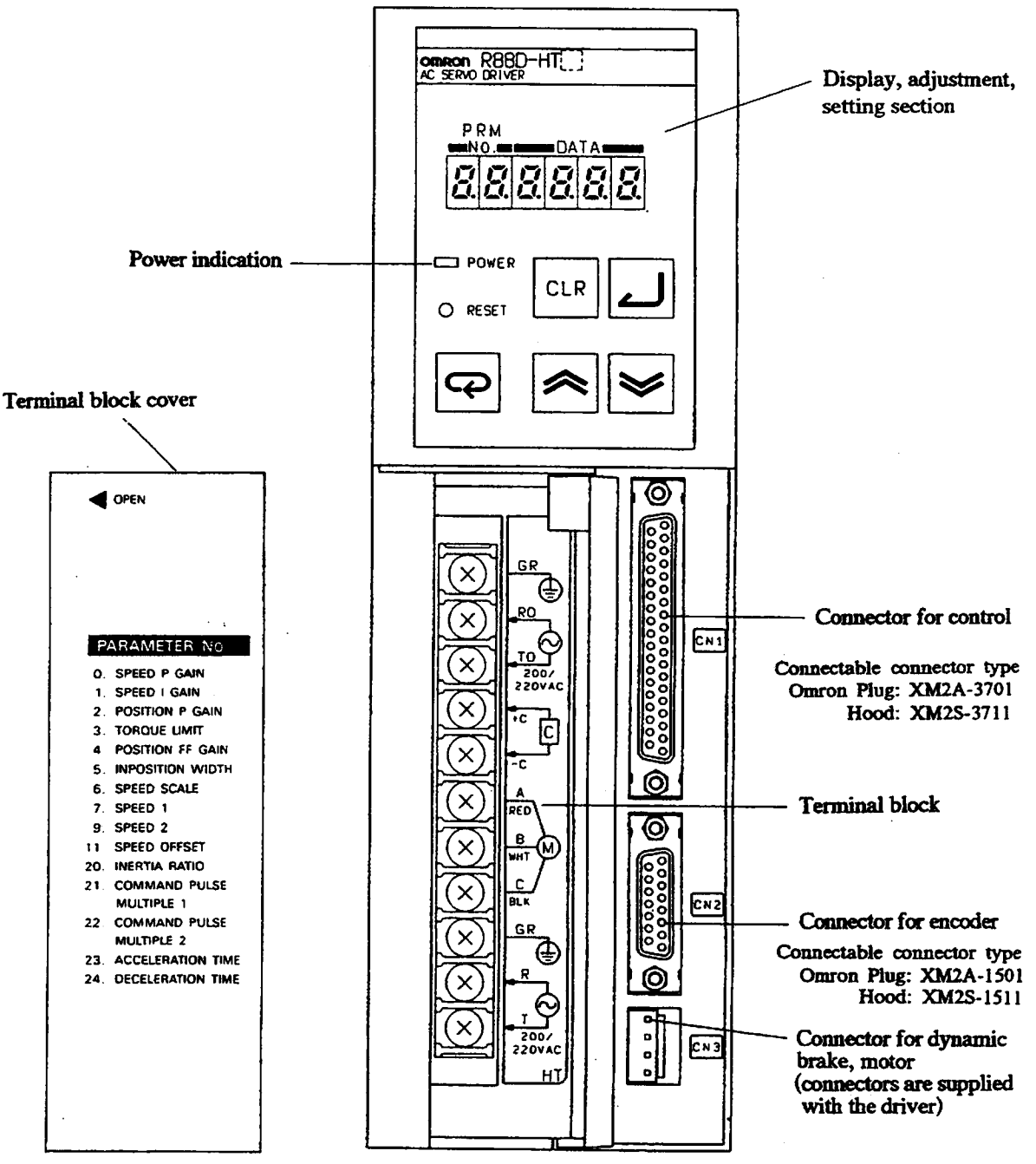
(7) Miscellaneous

• The motor does not rotate when supplied by commercial 3 phase power. Never supply commercial power to the AC motor as it may burn out its coil.

• Never remove an encoder cover nor disassemble the AC servo motor itself.

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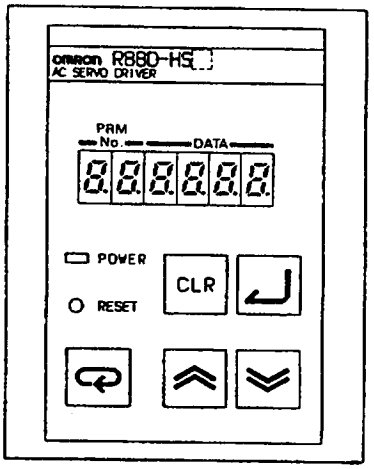
2-2 Instruction of Front Panel



(Terminal names on the terminal block means an example of a power unit built-in type driver)

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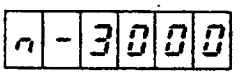
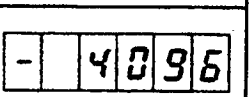
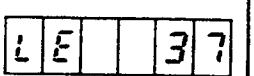
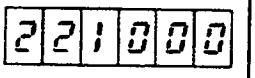
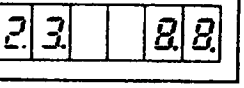
■ Arrangement of display and control section



■ Operation keys

Sign	Name	Main function
	Mode key	Mode change
	Enter key	Register parameter
	Increment key	Data change (increase)
	Decrement key	Data change (decrease)
	Clear key	Return to initial display. Release parameter setting error.
RESET	Reset button	Reset alarm

■ Display contents, display pattern

Display mode	Displayed contents		Display symbol	Display pattern (example)
RUN	Speed (rpm)	Speed display at operation.	[n] 	
	Accumulated pulse (number of pulses)	Display at resolution of 8000 pulse per revolution.	(None)	
	Peak torque (%)	Display max. torque from power ON to reset.	[LP] 	
	Effective torque (%)	Display current generated torque taking the rated torque as 100 %.	[LE] 	
	Control signal input/output monitor	Monitor 12 signal ON/OFF condition with 12 lines.	(None)	
	Error code	Display error code at abnormality.	[E] 	
Parameter	Parameter number, parameter display	Display two digits of parameter number and four digits of data.	(None)	
	Protected parameter data		(None) (with decimal)	

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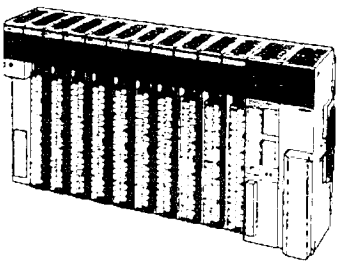
2-3 Wiring and Connection

2-3-1 Outline of Wirings

For wiring H series AC servo drivers and motors, you can easily execute wiring work using specially prepared optional connection cables.

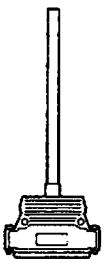
■Connection with Position Control Unit for SYSMAC C Series

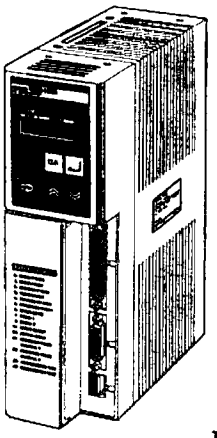
SYSMAC CV/C series



Position Control Unit
for Programmable Controller
(SYSMAC CV/C series)
C500-NC103
C500-NC111-V1
C500-NC112
C500-NC222
C200H-NC112
C200H-NC211

Controller connection cable
for general control
R88A-CPH□□□S



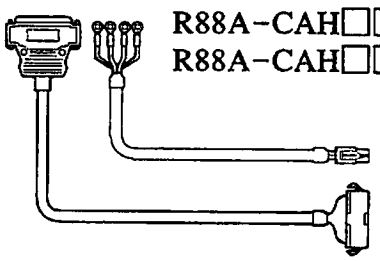


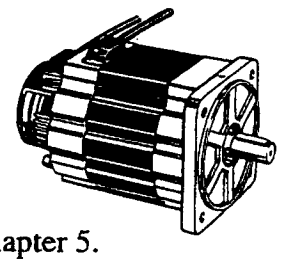
OMNUC H series
AC servo driver

Power cable
R88A-CAH□□□S
R88A-CAH□□□B

OMNUC H series
AC servo motor

Encoder cable
R88A-CRH□□□C

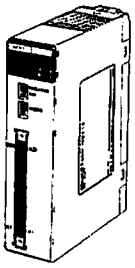




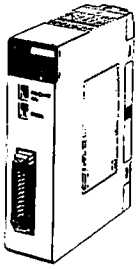
*Connnector specifications and cable specifications are mentioned in Chapter 5.

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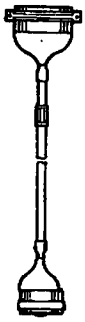
■Connection with Position Control Unit for SYSMAC C200H



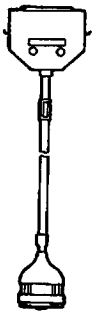
Position Control Unit
for SYSMAC C200H
(Single-axis)
C200H-NC112



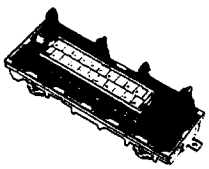
Position Control Unit
for SYSMAC C200H
(Double-axis)
C200H-NC211



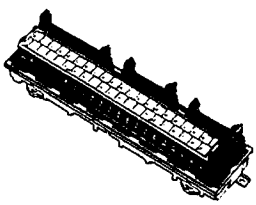
Cable for position control unit side
(for C200H-NC112)
XW2Z-050J-A1 (0.5m)
XW2Z-100J-A1 (1m)



Cable for position control unit side
(for C200H-NC211)
XW2Z-050J-A2 (0.5m)
XW2Z-100J-A2 (1m)



Terminal connection unit
(for C200H-NC112)
XW2B-20J6-1

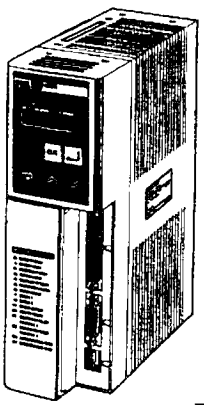


Terminal connection unit
(for C200H-NC211)
XW2B-40J6-2

*1.Example of connection to terminal block of relay unit is mentioned in Chapter 6.
*2.Relay unit for CQM1-CPU43 (with pulse input/output) is prepared also.

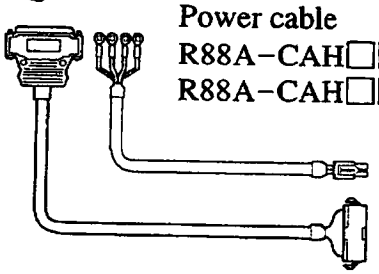


Cable for driver side
XW2Z-100J-B3 (1m)
XW2Z-200J-B3 (2m)



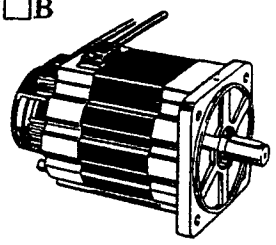
OMNUC H series
AC servo driver

Power cable
R88A-CAH□□□S
R88A-CAH□□□B



Encoder cable
R88A-CRH□□□C

OMNUC H series
AC servo motor

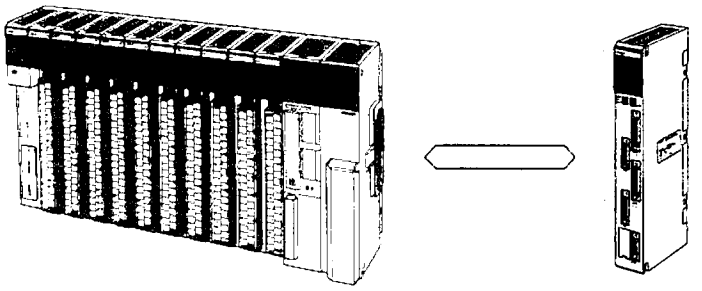


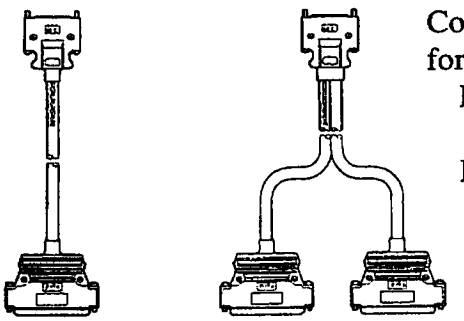
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■Connection with Motion Control Unit for SYSMAC CVM1/CV

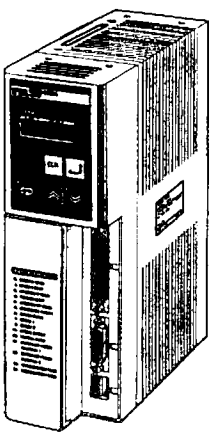
Programmable Controller
SYSMAC CVM1/CV series

Motion Control Unit
CV500-MC221/421





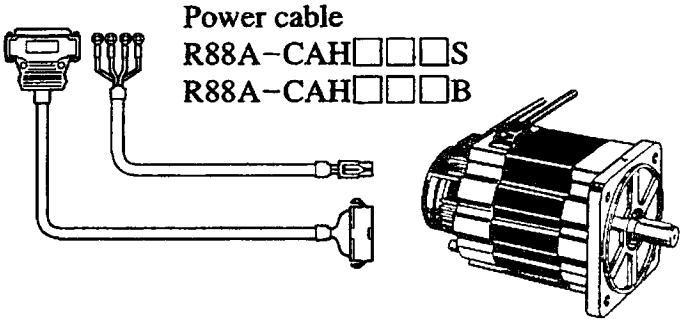
Controller connection cable
for exclusive control
R88A-CPH□□□M1
(for single-axis)
R88A-CPH□□□M2
(for double-axis)



OMNUC H series
AC servo driver

Power cable
R88A-CAH□□□S
R88A-CAH□□□B

Encoder cable
R88A-CRH□□□C



OMNUC H series
AC servo motor

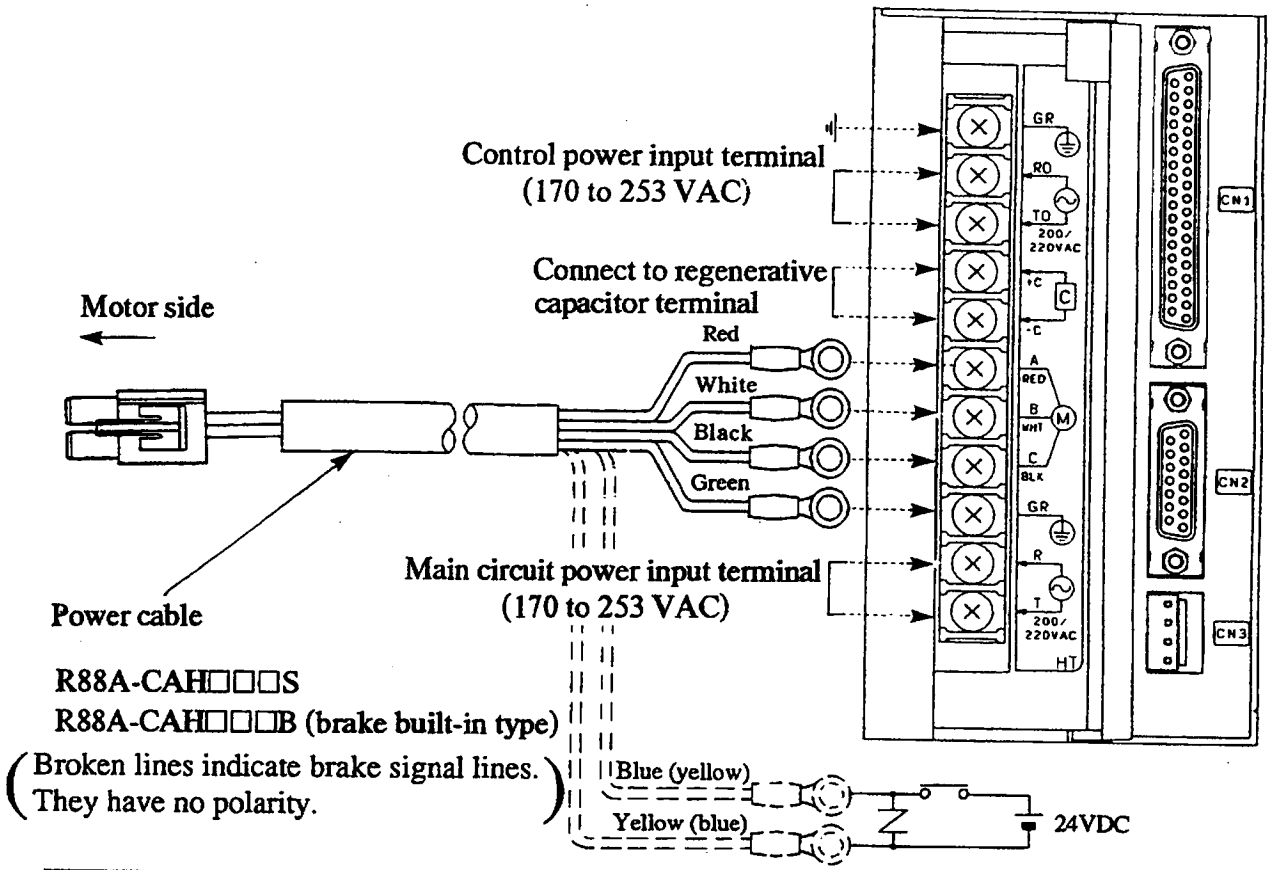
*Connnector specifications and cable specifications are mentioned in Chapter 5.

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2-3-2 Wiring of Terminal Block

Take note of cable sizes, grounding lines, noise-proof conditions when wiring the terminal block of the servo driver.

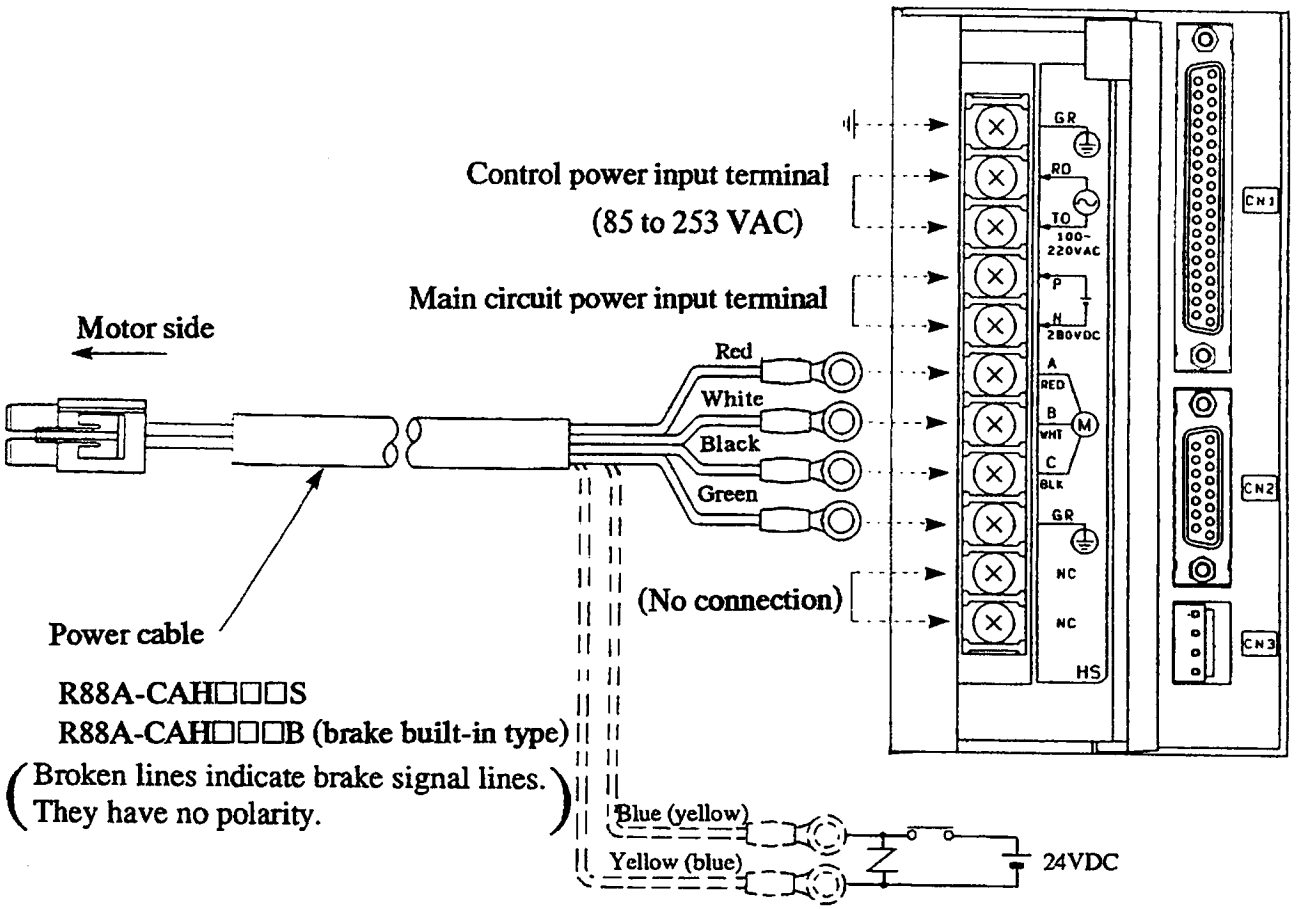
■ Power unit built-in type R88D-HT04/-HT10



Sign	Name	Function		Wire size
GR	Ground	Case ground of servo driver.Connect Class 3 or up grounding in order to improve noize-proof and to prevent from electric shock or fire.		2 mm^2
R0 T0	Power input for control	Input between 170 to 253 VAC		0.75 mm^2
+ C - C	Connection to regenerative capacitor	Terminals to connect the regenerative energy absorbing capacitor. In case of more than one capacitor, do not connect them in parallel. (See item 3-6: Connection of regenerative capacitor)		2 mm^2
A B C GR	Terminal for motor connection (GR: ground)	Terminals to connector motor armature lines. Be careful not to mis-wire them. Connect GR to motor's GR terminal.	A: red B: white C: black GR: green	(Exclusive cable)
R T	Main circuit power input	Use same power line as control power		1.25 mm^2

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■ Power unit separated type R88D-HS04/-HS10/-HS22



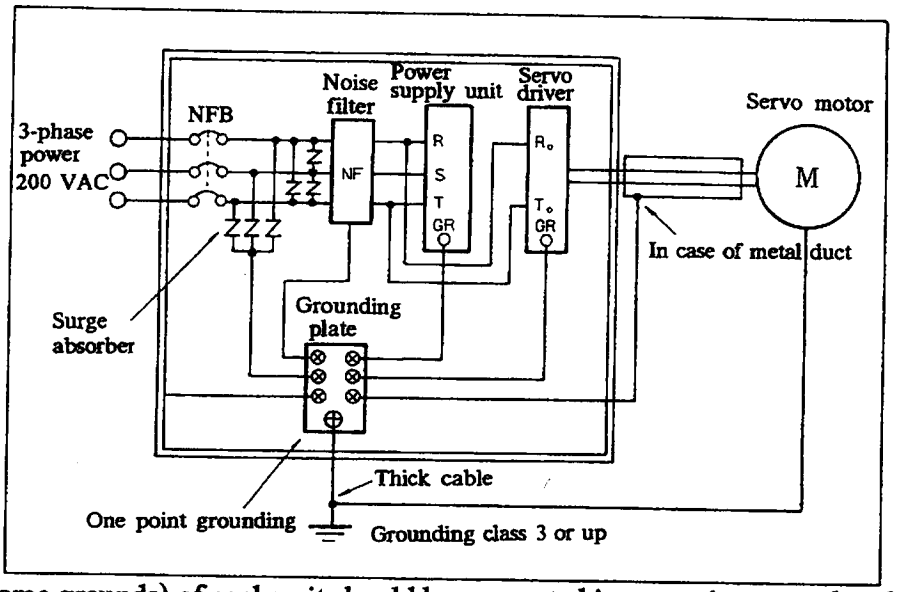
Sign	Name	Function		Wire size
GR	Ground	Case ground of servo driver.Connect Class 3 or up grounding in order to improve noize-proof and to prevent from electric shock or fire.		2 mm^2
R0 T0	Power input for control	Input between 85 to 253 VAC		0.75 mm^2
P N	Power input for main circuit	Supply main circuit DC voltage from a power unit within 240 to 350 VDC.		2 mm^2
A B C GR	Terminal for motor connection (GR: ground)	Terminals to connector motor armature lines. Be careful not to mis-wire them. Connect GR to motor's GR terminal.	A: red B: white C: black GR: green	(Exclusive cable)
NC NC	No connection	Do not connect.		-

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■ Wiring method to improve noise-proof characteristic

Noise-proof characteristic is influenced by wiring and arrangement. Wire following guide lines below.

① Wiring method

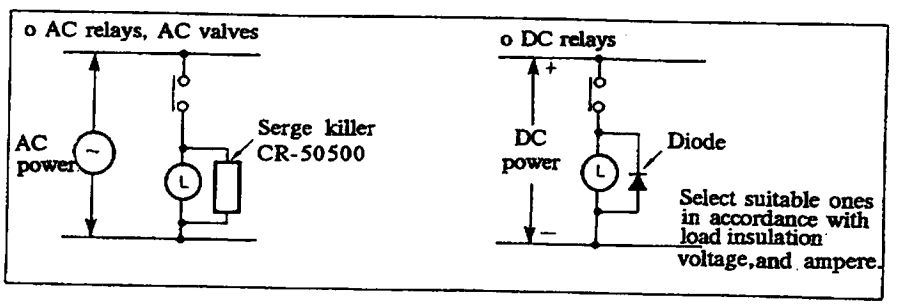


- GRs (frame grounds) of each unit should be connected in one point ground gathering in a grounding plate shown above.
- When the motor is installed in a movable table,connect the motor frange with the machine frame.
- Don not run grounding lines in the same duct with motor power lines, encoder signal lines nor bundle them together.
- In case of wiring in a metal conduit or metal duct, connect metal part with the one-point grounding.

② Use of surge absorber, noise filter

- In AC power input line, connect surge absorbers or noise filters as shown above.
- When electrical noise generating relays, solenoid valves, magnetic brakes and alike are used near by the driver, follow the cautions below.

1) Install these noise generating devices and parts or their wirings separate as far as possible from the driver.
2) Separate power lines of the driver from these devices.
3) Provide separate grounding lines from these devices.
4) Install noise filters, surge killers etc. to these noise generating devices and parts. Example of these measures shown below.



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■ Selection of connecting parts

We recommend use of the parts below or equivalent.

(1) No fuse beaker (NFB)

Use a breaker having applicable current value for your system. Never use one for semiconductor and one having characteristics for immediate response.

Use one with delay characteristics 62 (2.2 to 20s at 200% load).

(2) Noise filter

Phase	Model	Rated	Mfg.
Single phase	GT-205U GT-210U GT-2150R GT-2200R	5A 10A 15A 20A	TOKIN
	ZAC2206-11 ZAC2210-11 ZAG2220-11-P	6A 10A 20A	TDK
	NFB2302H	30A	FDK
	SUP-E3H-EP SUP-E5H-EP	3A 5A	OKAYA ELECTRIC IND.
Three phase	LF-315K LF-325K LF-305 LF-310 LF-315 LF-320	15A 25A 5A 10A 15A 20A	TOKIN
	ZCW2205-01 ZCW2210-01 ZCW2220-01	5A 10A 15A	TDK
	3SUP-A5J-E 3SUP-A10J-E 3SUP-A15J-E	5A 10A 15A	OKAYA ELECTRIC IND.

(3) Magnet relay

Model	Current	Mfg.
LC1-D173A60 LC1-D253A60 J7AN-E3	18A 26A 15A	OMRON

(4) Surge absorber (ZNR)

Model	Surge immunity	Mfg.
ERZC20EK471 ERZC25EK471 ERZC32EK471	5kA 10kA 20kA	MATSUSHITA ELECTRIC PARTS

(5) Surge killer

Model	CR value	Mfg.
CR-50500 S2-A-0 CRE-50500	50Ω-0.5μF 200Ω-0.1μF 50Ω-0.5μF	OKAYA ELECTRIC IND.

(6) Leakage breakers

- Select leakage breakers designed for inverters.
- Since switching operations take place inside the Servo Driver, high-frequency current leaks from the armature of the Servomotor. With inverter leakage breakers, high-frequency current is not detected, preventing the breaker from operating due to leakage current.
- When selecting leakage breakers, also remember to add the leakage current from devices other than the Servomotor, such as machines using a switching power supply, noise filters, and so on.
- For detailed information about the selection methods of leakage breakers, refer to catalogs provided by manufacturers.

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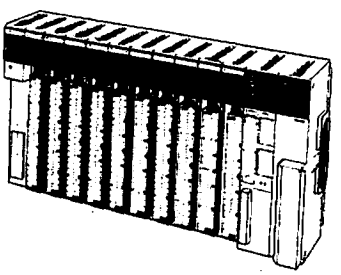
2-3-3 Wiring of CN1 (as for cable specifications, see item 5-3)

The connector CN1 of the servo driver connects with a programmable controller. To connect with OMNUC series programmable controllers, exclusive connection cables are provided for your easy connection.

■ Connection with other programmable controllers

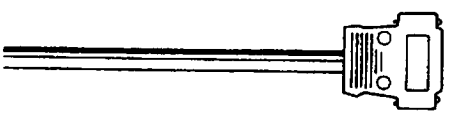
To connect with PC(SYSMAC) position control units and general controllers, use general use controller cable:R88A-CPH□□□S sold separately. Prepare cable referring connection example in item 6-1.

SYSMAC CV/C series

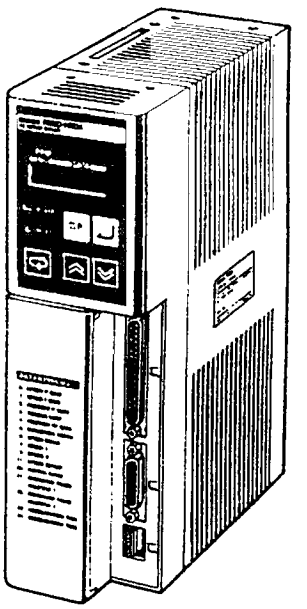


Position Control Unit
for Programmable Controller
(SYSMAC CV/C series)
C500-NC103
C500-NC111-V1
C500-NC112
C500-NC222
C200H-NC112
C200H-NC211

CN1



General use control cable
R88A-CPH□□□S

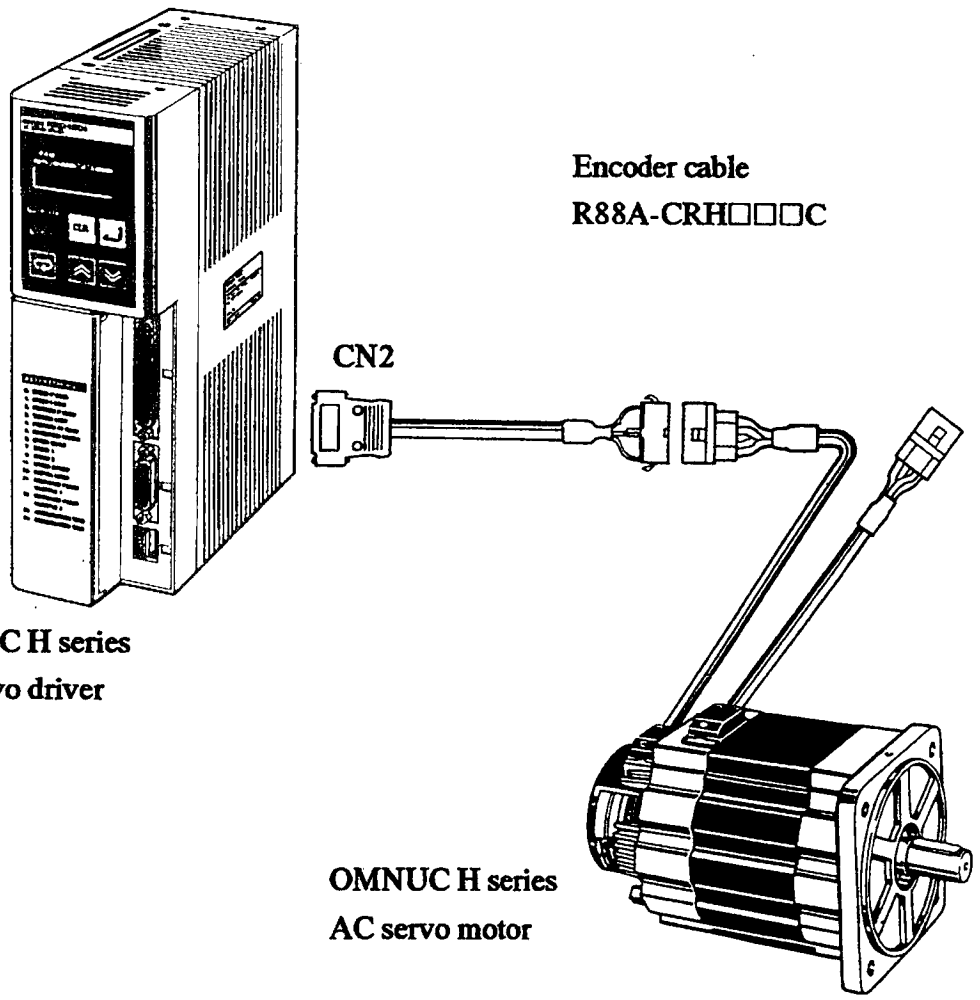


OMNUC H series
AC servo driver

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2-3-4 Wiring of CN2 (as for cable specifications, see item 5-3)

The connector CN2 of the servo driver is for connection with an encoder on the servo motor. Connect with the motor lead wire connector using separately sold connection cables.



2-3-5 Wiring of CN3

The connector CN3 of the servo driver is connected when using dynamic brake signal output, speed, or current monitor output.

■ CN3 connector terminal

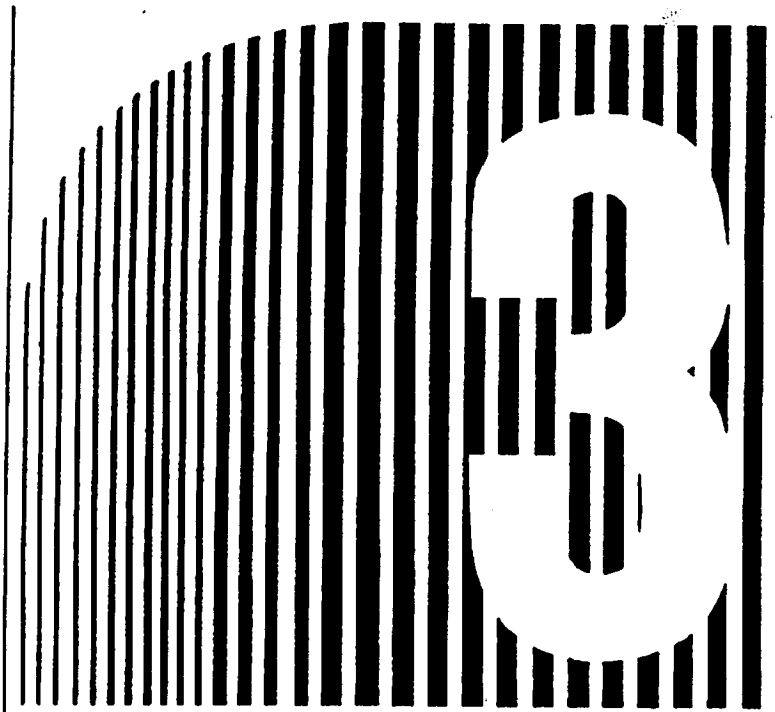
Pin	Symbol	Function
1	DB	Output of dynamic brake signal
2	NM	Output of speed monitor
3	AM	Output of current monitor
4	GND	Ground for DB, NM, and AM

Note: For dynamic brake, see item 3-4-4.

■ Connector (accessory)

Mfg	Japan Solderless Terminal
Housing	VHR-4N
Contact	SVH-21 T-P1.1

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Chapter 3

• Operation •

3-1. Start Operation

3-2. Initial Settings

3-3. Setting of Inertial Ratio

3-4. Zero Position Search

3-5. Function Settings

3-6. Adjustment

3-7. Connection of Regenerative Capacitor

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Chapter 3. Operation

3-1 Start Operation

3-1-1 Operation Procedure

Be sure to execute initial settings of servo drivers before operation. Set functions in accordance with operation condition of servo motors, if required.

■ Flow chart before operation

Item	Contents	Reference
Installation, mounting	Install drivers, and motors following installation conditions.	Chapter 2, item 2-1
Wiring, connections	Connections and wirings with power supply and other devices.	Chapter 2, item 2-3
Supply power	After executing check items before switching ON power, input commercial power source as trial in order to set initial settings.	Chapter 3, item 3-1-2
Check display conditions	Check abnormalities inside the driver with indications.	Chapter 3, item 3-1-2
Initial settings	Set parameter to fix operation conditions.	Chapter 3, item 3-2-2
Set inertia ratio	Set ratio between load inertial and rotor inertia with parameter. Each loop gain is automatically adjusted by this setting.	Chapter 3, item 3-3
Function settings	Set functions required for each condition of use by user parameter.	Chapter 3, item 3-4
Operation	Now you can start operation. * Adjust drivers in request. For problems, see Chapter 4.	Chapter 3, item 3-5

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3-1-2 Power Input and Display Check

(1) Check items before power ON

① Check power supply voltage

Driver type	For control	For main circuit
Power unit built-in type	170 to 253 VAC	
Power unit separated type	85 to 253 VAC	(Check connection of P, N)

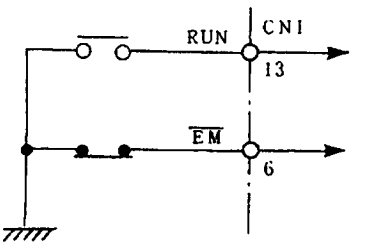
② Check that motor is not connected with any load. (Do not connect the motor shaft with a mechanical system.)

③ Check that operation command (RUN) on No. 13 pin of the connector CN1.

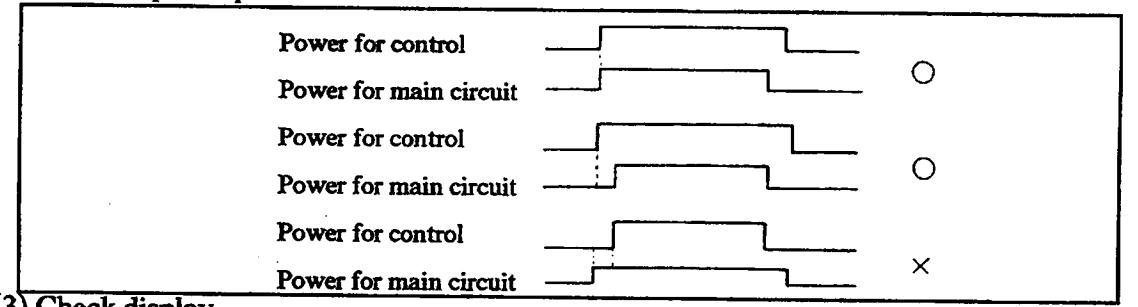
④ Check that emergency stop ($\overline{EM}$) on No. 6 pin of the connector CN1.
$\overline{EM}$ signal applies reverse logic against other signals so that this connection should be closed (contacted).

⑤ Check that motor power lines: A, B, C, and GR, are properly connected.

Normal condition at power input



(2) Power input sequence

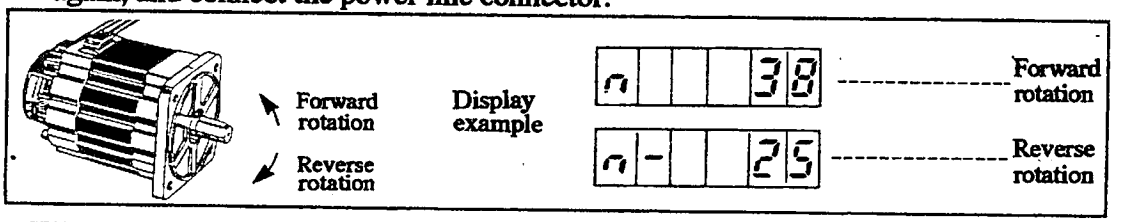


(3) Check display

• Data display at power ON becomes one of the below.

Normal (speed display)	Abnormal (error code display)
n 0	E 5

• When the above normal display appears, check the following:
Remove the power line connector and turn the motor shaft in forward and reverse directions and check the speed indication properly displays as positive for forward turn and negative as reverse turn. If this display is not correct, mis-wiring of the encoder signal lines may be a cause. Correct wiring and after checking display again, and connect the power line connector.



• When at abnormal conditions, the following will be a case.

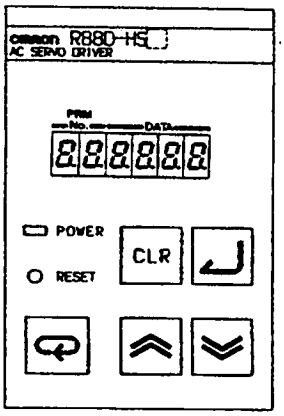
Display	Cause of abnormality
E 5	Input emergency stop signal ($\overline{EM}$)
E 1	Encoder lines are not connected, or disconnected.
E 23	Main circuit power is not connected or power input sequence is other than required.

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Chapter 3. Operation

3-1-3 Mode Change

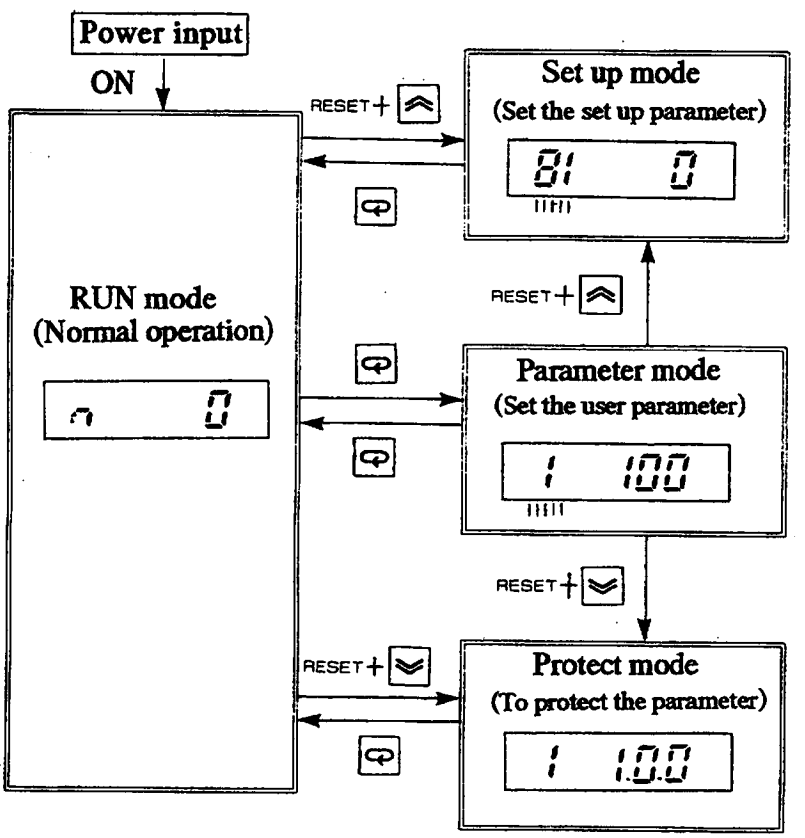
■ Arrangement of display and control section



■ Operation keys

Sign	Name	Main function
	Mode key	Mode change
	Enter key	Register parameter
	Increment key	Data change (increase)
	Decrement key	Data change (decrease)
CLR	Clear key	Return to initial display. Release parameter setting error.
RESET	Reset button	Reset alarm

■ Types of modes and their change method



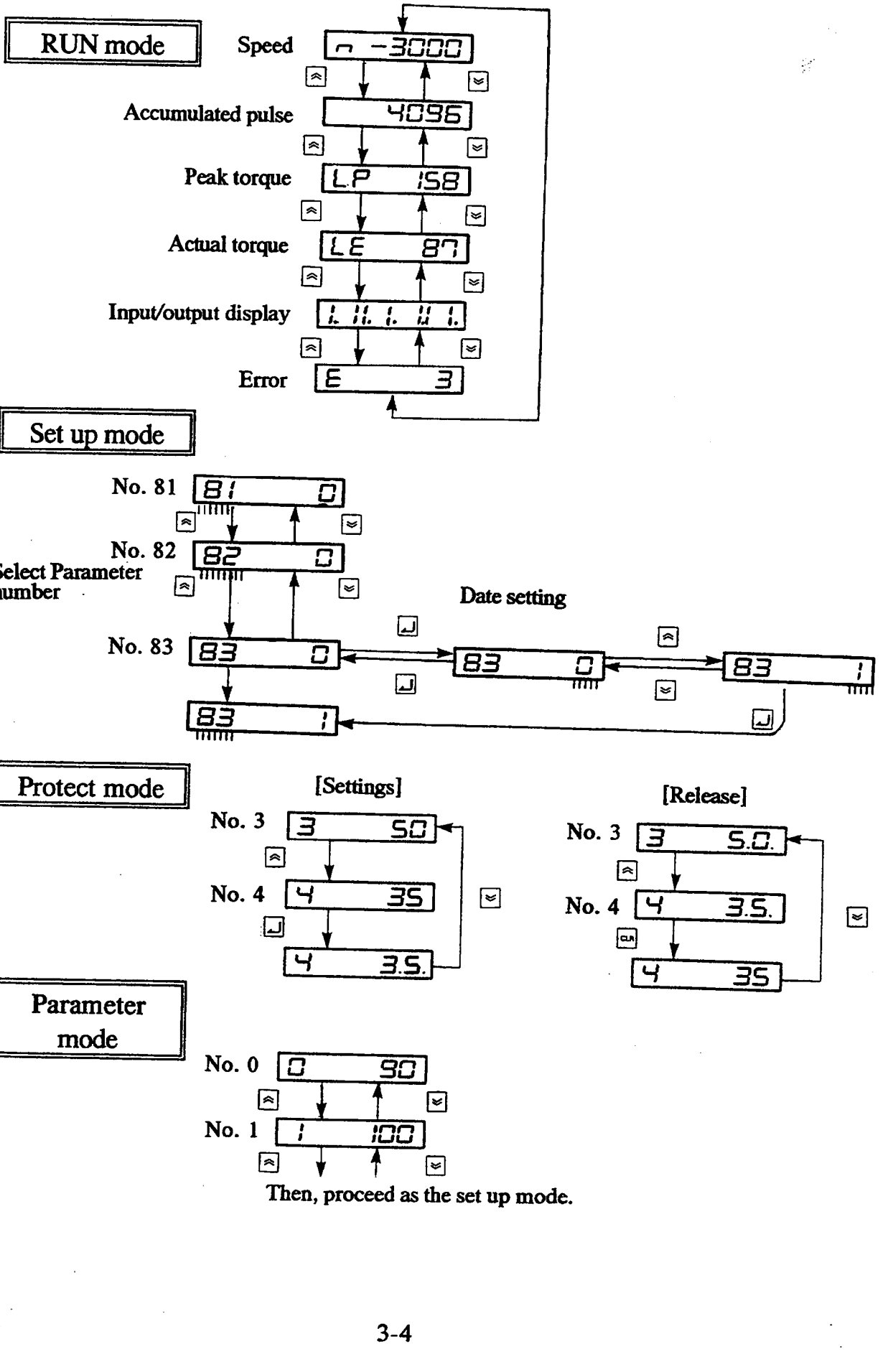
Note: 1. "RESET + " means to depress both RESET and keys at the same time and release RESET first.

Note 2. means that display is flickering.

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Chapter 3. Operation

■ Operation methods in each mode



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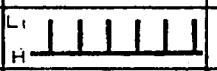
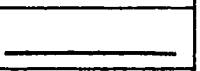
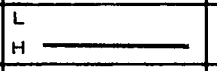
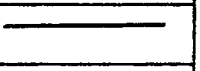
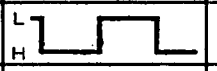
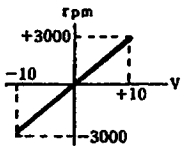
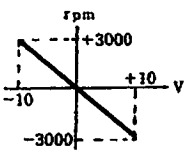
Chapter 3. Operation

3-2 Initial Settings

3-2-1 Types of Set Up Parameters

Set up (initial setting) parameter is required to be set only at start up to meet user's system configuration, and normally no further system setting at operation is required.

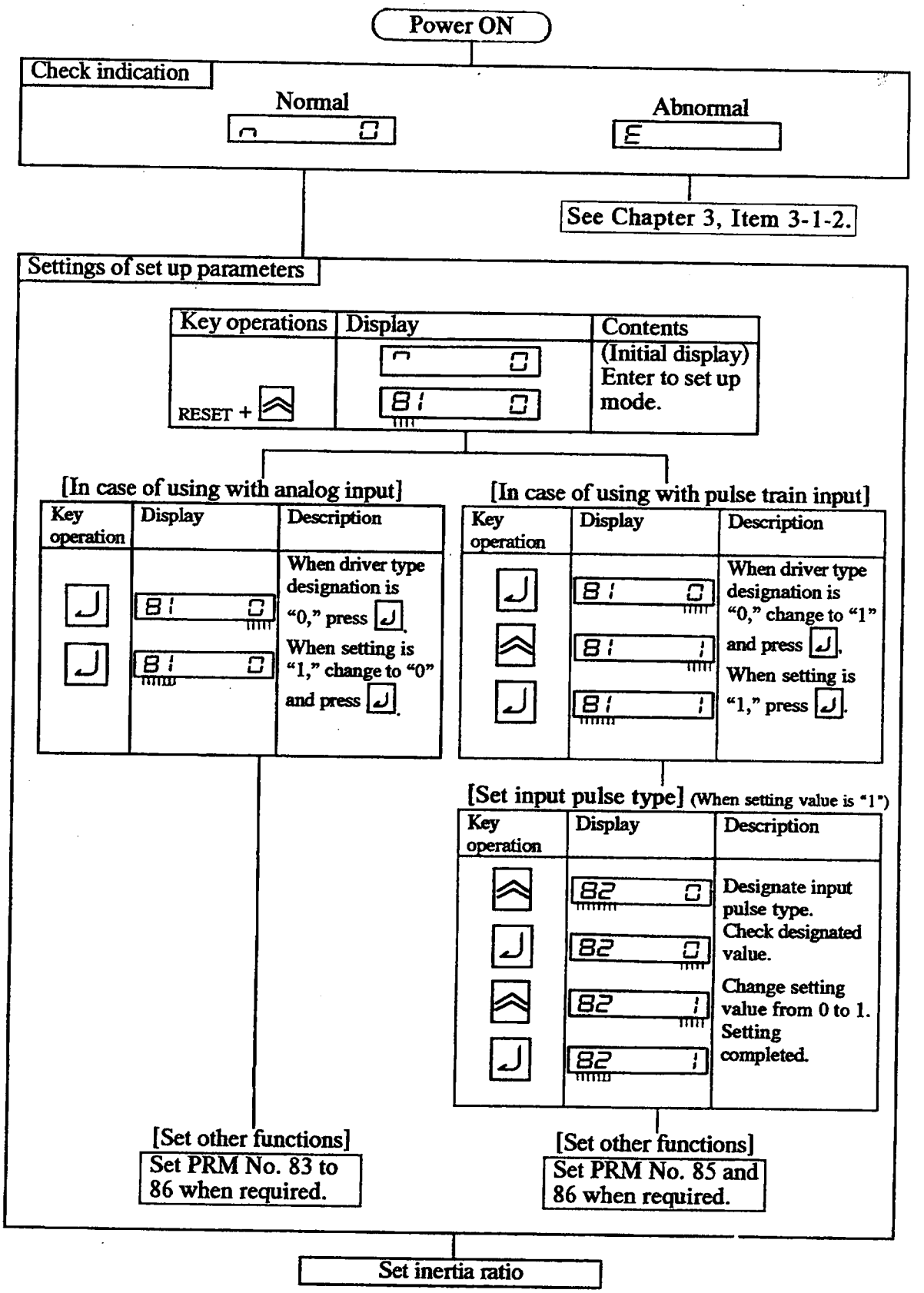
• Table of set up parameters

<table>
<tr><th>PRM No.</th><th>Driver type</th><th>Parameter name</th><th>Descriptions</th><th>Default value</th></tr>
<tr><td>81</td><td>A, P</td><td>Designate driver type</td><td>Select input command between analog speed and pulse train input. Set in accordance with host controller type.
0: A; analog input 1: P; Pulse train input</td><td>0</td></tr>
<tr><td>82</td><td>P</td><td>Designation of input pulse type</td><td>Select type of input pulse from the three shown below:
<table>
<tr><th>Setting value</th><th>Use</th><th>Pin No.</th><th>Signal</th><th>Forward rotation</th><th>Reverse rotation</th></tr>
<tr><td rowspan="2">0*</td><td rowspan="2">Forward pulse /reverse pulse</td><td>CN1-14
CN1-33</td><td>+ CCW
- CCW</td><td rowspan="2"></td><td rowspan="2"></td></tr>
<tr><td>CN1-15
CN1-34</td><td>+ CW
- CW</td></tr>
<tr><td rowspan="2">1</td><td rowspan="2">Feed pulse /for and back signal</td><td>CN1-14
CN1-33</td><td>Reverse
Forward</td><td rowspan="2"></td><td rowspan="2"></td></tr>
<tr><td>CN1-15
CN1-34</td><td>+ feed pulse
- feed pulse</td></tr>
<tr><td rowspan="2">2</td><td rowspan="2">90° phase difference signal</td><td>CN1-14
CN1-33</td><td>+ A phase
- A phase</td><td rowspan="2"></td><td rowspan="2"></td></tr>
<tr><td>CN1-15
CN1-34</td><td>+ B phase
- B phase</td></tr>
</table>
* When forward pulse/reverse pulse is used, a signal where pulse is not input turns at signal open (H) condition. It does not rotate at close (L) condition.</td><td>0</td></tr>
<tr><td>83</td><td>A</td><td>Designate rotation direction</td><td>This parameter is used for changing rotation direction against same speed command voltage.
<table>
<tr><th>0: Forward rotation with + voltage</th><th>1: Reverse rotation with + voltage.</th></tr>
<tr><td>
</td><td>
</td></tr>
</table></td><td>0</td></tr>
<tr><td>84</td><td>A</td><td>Designate soft start input</td><td>When soft start is selected, set "1" or "2." (see item 3-4-2: Soft start function.)
0: Operation in accordance with speed command (REF). No execution of soft start.
1: Soft start operation in accordance with speed command (REF).
2: Soft start operation in accordance with inside setting speed.</td><td>0</td></tr>
<tr><td>85</td><td>A, P</td><td>Designation of treatment at error.</td><td>0: Dynamic brake ON, servo brake OFF.
1: Dynamic brake ON, servo brake ON.
Servo brake charges brake by input speed command "0" volt for 0.5 sec. at releasing RUN command.</td><td>0</td></tr>
<tr><td>86</td><td>A, P</td><td>Designation of encoder output</td><td>Set number of feed back pulses from the driver to a positioner.
0: 2000 ppr 1: 1000 ppr</td><td>0</td></tr>
<tr><td>87</td><td>A, P</td><td>Initialize parameter</td><td>99: Set all parameters to default value (set condition at delivery). Even protected parameters are released and enters initial values.</td><td>0</td></tr>
</table>

Note: "A" as available for analog input type driver, "P" as available for pulse train input type driver.

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3-2-2 Settings of Set Up Parameters



Note: 81 means that this display is flickering.

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Chapter 3. Operation

3-3 Settings Inertia Ratio

Set the load inertia to motor's rotor inertia ratio using the ratio parameter. Speed loop gain is adjusted automatically according to the inertia ratio setting.
If the semi-auto tuning feature is unable to obtain the optimum speed loop gain setting, follow the steps described in Subsection 3-6-3.

■ Inertia ratio setting parameter (parameter mode, parameter No. 20)

PRM No.	Driver type	Parameter name	Default value	Unit	Setting range	Descriptions
20	A, P	Inertia ratio	3	Times	0 to 10	Automatic change to center value in accordance with inertia ratio.

■ Setting method

Setting of inertia ratio

Ex.: Set inertia ration to 5.

Key operation	Display	Description
	0	(Initial display)
Q	0 100	Enter parameter mode.
≪	1 100	
≪	20 3	Enter PRM No. 20.
J	20 3	
≪	20 4	
≪	20 5	Change to setting value 5.
J	20 5	Completion of setting.

End

Note: 0 means that this display is flickering.

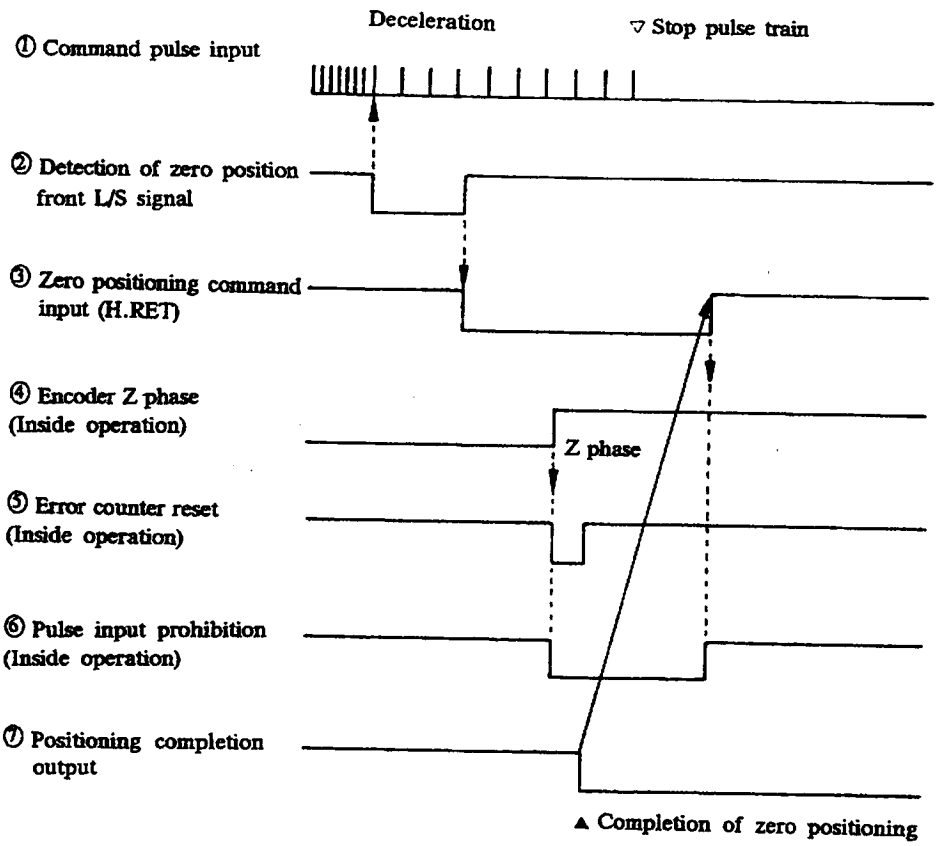
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Chapter 3. Operation

3-4 Zero Position Search

In case of using H series driver with pulse train input, be sure to use zero positioning signal (HRET signal) for zero positioning.
Note that if error counter reset signal (ECRST signal) is used for zero positioning, zero position may be deviate.

■ Sequence of zero positioning



Above dotted lines means inside operation.

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Chapter 3. Operation

3-5 Function Settings

3-5-1 Outline of Function Setting

The H series servo driver is designed to meet various usages such as soft start, electronic gear function, etc. The items below instruct how to set these functions.

■ Table of user parameter

PRM No.	Driver type	Parameter name	Default value	Unit	Setting range	Description
0	A, P	Speed loop proportional gain	100		0 to 254	Fine adjustment taking 100 as center value.
1	A, P	Speed loop integer gain	100		0 to 254	
2	A, P	Position loop proportional gain	100		0 to 254	
3	A, P	Torque limit value	50		0 to 100	100 as instantaneous max. torque.
4	P	Position loop FF gain	0	%	0 to 100	FF amount ratio against speed command.
5	P	Positioning completion range	3	± pulse	0 to 127	Set number of pulses at 8000 pulse/rev.
6	A	Speed command scale	100	%	83 to 167	Set rpm at 10 V input with ratio against 3000 rpm.
7	A	Inside 1st speed	0	10 rpm	- 300 to + 300	- 3000 to + 3000 rpm (Setting value × 10 rpm)
9	A	Inside 2nd speed	0	10 rpm	- 300 to + 300	
11	A	Speed command offset	0		- 63 to + 63	Adjust command voltage between ± 0.2V. (divide ± 0.2 V into ± 63.)
20	A, P	Inertia ratio	3	times	0 to 10	Automatically set each gain to its center value.
21	P	Electronic gear multiplier (G1)	1000	times	1 to 9999	Setting range: $\frac{1}{50} \leqq \frac{G1}{G2} \leqq 50$
22	P	Electronic gear multiplier (G2)	1000	times	1 to 9999	
23	A	Soft start acceleration time	10	0.1 sec.	0 to 99	Acceleration time from 0 to ± 3000 rpm.
24	A	Soft start deceleration time	10	0.1 sec.	0 to 99	Deceleration time from ± 3000 to 0 rpm.

Note 1: User parameters No. 0 to 24 are available protection.
Note 2: No. 0 to 11 parameters are settable regardless of servo ON and OFF conditions.
Note 3: No. 20 to 24 parameters are settable only at servo OFF (RUN signal is OFF).
Note 4: No. 6 (speed command scale) can adjust between ± 2490 to ± 5010 rpm at ± 10 V speed command input. However, the driver detects over speed at more than ± 4000 rpm and stops rotation.
Note 5: Meaningless parameters will be skipped automatically.
(Eg.: When analog input type is selected, electronic gear ratio parameter will be automatically skipped.)
Note 6: Sign of driver type: "A" as analogue input type, "P" as pulse train input type.

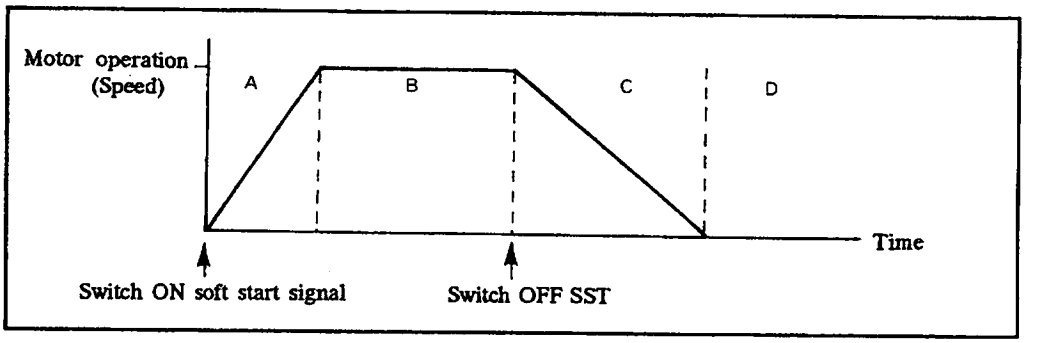
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3-5-2 Soft Start Function

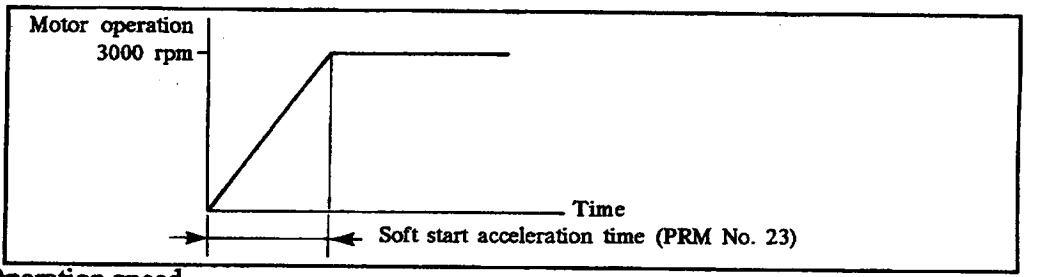
(1) Function

- Soft start function starts and stops the motor at preset acceleration speed. This function can construct a simple positioning system without positioners and host controllers.
- Acceleration speed at start and stop can be set in parameters respectively. Set operation speed by inside speed setting (parameter) or speed command input (analog voltage).

(2) Operation

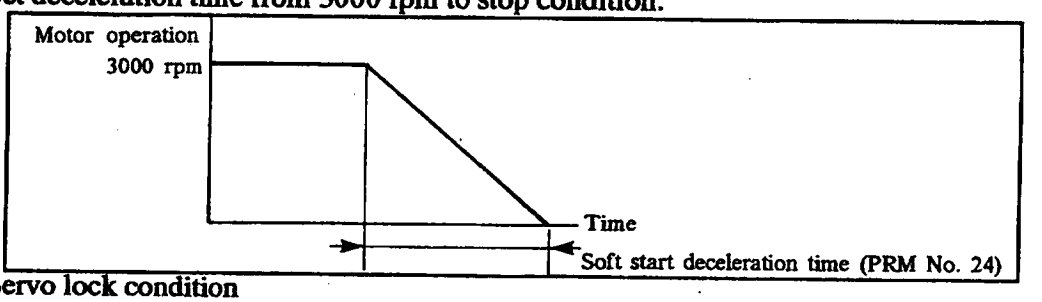


A: Acceleration operation
When soft start signal (SST) is input during inputting run command signal (RUN), the motor starts rotation with the set acceleration speed.
Set acceleration time between start and reaching 3000 rpm.



B: Operation speed
Set operation speed ether inside speed setting (PRM No. 7, 9) or speed command input (REF).

C: Deceleration operation
When SST signal is OFF, the motor starts deceleration with the set acceleration speed.
Set deceleration time from 3000 rpm to stop condition.



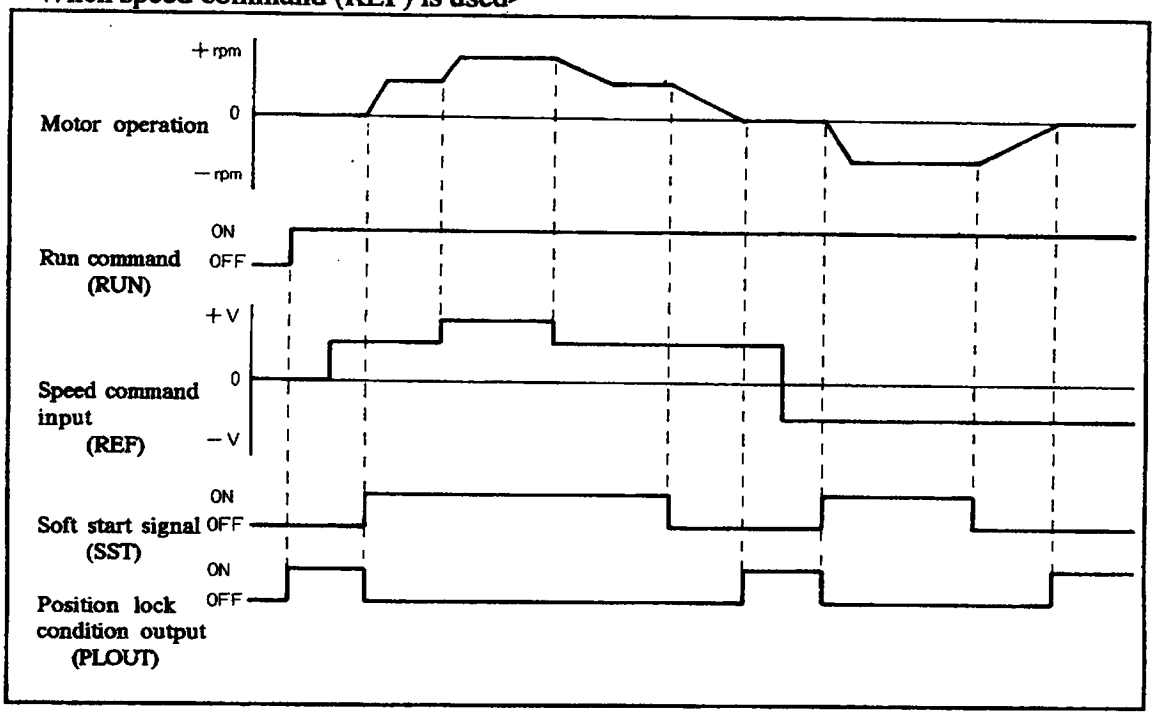
D: Servo lock condition
When the motor stops by switching OFF SST signal, it automatically enters servo lock condition and outputs position lock output (PLOUT). With this PLOUT signal, the driver acknowledges completion of positioning to other devices.

Note: When speed command input (REF) is "0," while SST signal is ON, position lock does not function when the motor stops.

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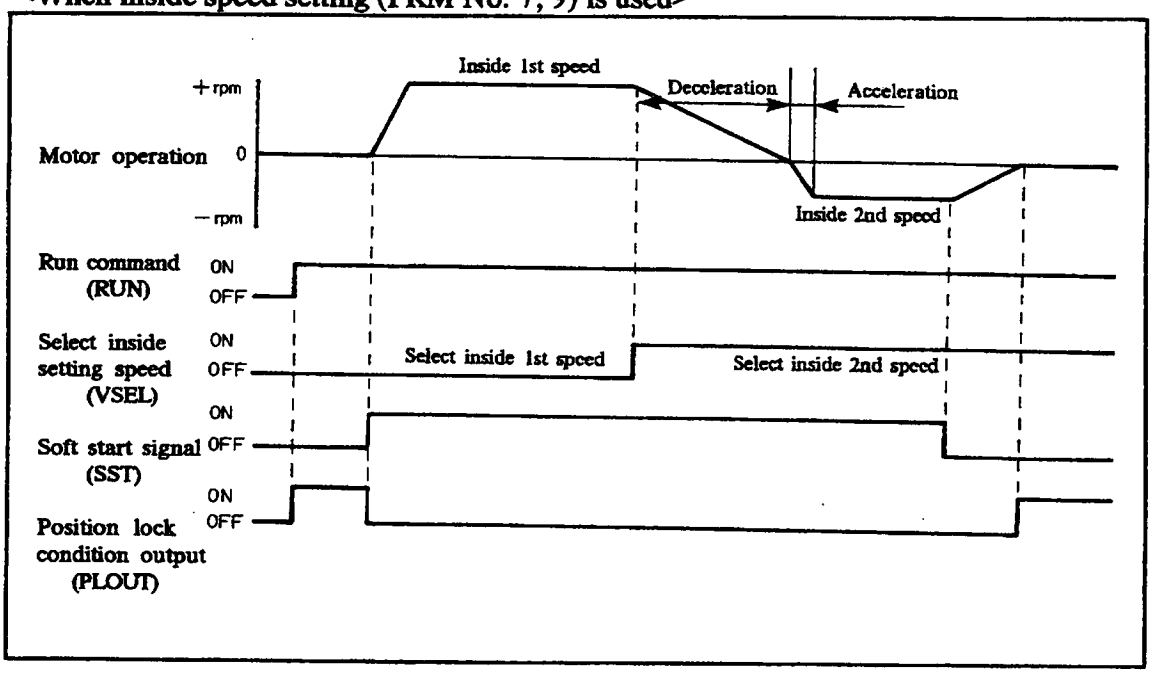
■ Time chart

<When speed command (REF) is used>



Note: When speed command (REF) is changed while switching ON soft start signal, the motor rotates in accordance with REF signal and the set acceleration speed.

<When inside speed setting (PRM No. 7, 9) is used>



Note: Inside speed setting parameters (PRM No. 7, 9) can be changed with pressing  keys while the motor is rotating. The motor rotates in accordance with changed inside speed setting.

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(3) Parameter setting of soft start function

■ Parameter to set

PRM No.	Parameter name	Setting range	Description
81	Designation of driver type	0, 1	0: Analog input, 1: Pulse train input
84	Designation of soft start input	0, 1, 2	0: REF, 1: Soft start + REF, 2: Soft start + inside speed
7	Inside 1st speed	-300 to + 300	- 3000 to 3000 rpm (setting value × 10 rpm)
9	Inside 2nd speed	-300 to + 300	- 3000 to 3000 rpm (setting value × 10 rpm)
23	Soft start acceleration time	0 to 99	× 0.1 sec., Time to reach from 0 to ± 3000 rpm
24	Soft start deceleration time	0 to 99	× 0.1 sec., Time to reach from ± 3000 rpm to 0.

■ Soft start in accordance with speed command (REF)

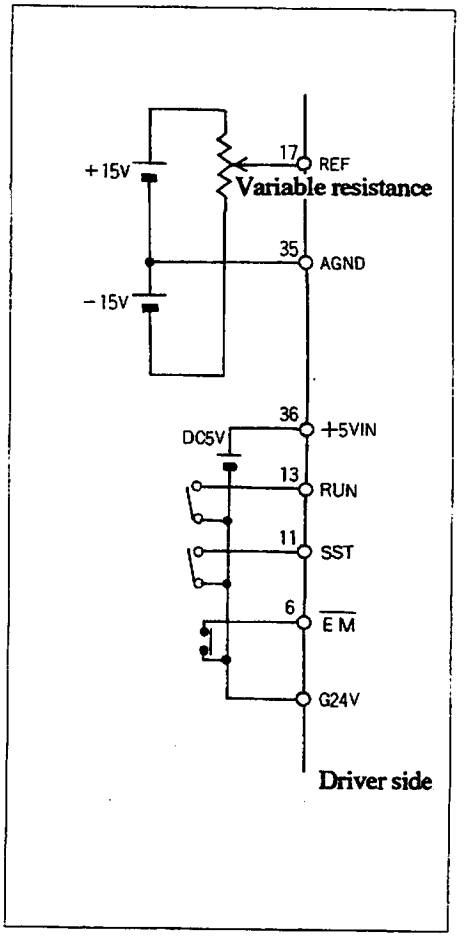
① Designation of soft start input
Set the set up parameter No. 84 to "1."

Key operation	Display	Description
	0	(Initial display)
RESET +	81 0	Enter set up mode. (Check that PRM No. 81 is "0.")
	82 0	
	84 0	Enter PRM No. 84.
	84 0	
	84 1	Change setting value to "1."
	84 1	Setting completed.

② Designation of soft start acceleration/ deceleration times.
Set acceleration and deceleration times on parameter No. 23 and 24.

Key operation	Display	Description
	84 1	(Set up mode)
	0	Enter RUN mode.
	0 100	Enter parameter mode.
	1 0	
	23 10	Select PRM No. 23. (Set acceleration time)
	23 10	Change setting value.
	23 9	
	23 5	Set "5" to designate acceleration time 0.5 sec.
	23 5	Setting completed.
	24 10	Select PRM No. 24. (Set deceleration time)
	24 10	Change setting value.
	24 7	Set "7" to designate acceleration time 0.7 sec.
	24 7	Setting completed.

• Wiring
Wire the control connector CN1 as follows:



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■ Soft start in accordance with inside speed setting

① Designation of soft start input
Set the set up parameter No. 84 to "2."

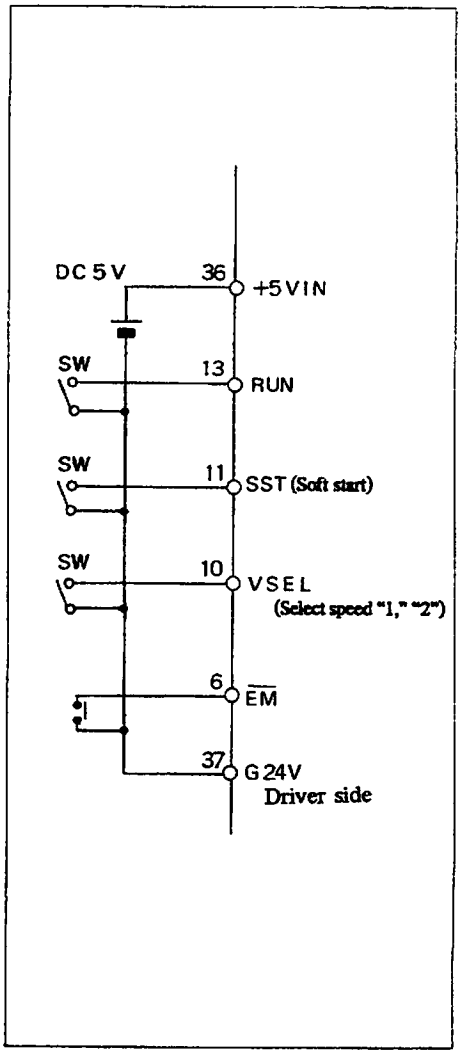
Key operation	Display	Description
	0	(Initial display)
RESET +	81 0	Enter set up mode. (Check that PRM No. 81 is "0.")
	82 0	
	84 0	Enter PRM No. 84.
	84 0	
	84 1	
	84 2	Change setting value to "2."
	84 2	Setting completed.

② Setting of inside 1st speed and 2nd speed.
Set inside speeds in parameter No. 7 and No. 9.

Key operation	Display	Description
	84 2	(Set up mode)
	0	Enter RUN mode.
	0 100	Enter parameter mode.
	1 100	
	7 0	Select PRM No. 7. (Set 1st speed)
	7 0	
	7 1	Change setting value.
	7 30	
	7 30	Set "30" to designate rotation speed 300 rpm.
		Setting completed.
	9 0	Select PRM No. 9. (Set 2nd speed)
	9 0	Change setting value.
	9 -1	
	9 -5	Set "-5" to designate rotation speed -50 rpm.
	9 -5	Setting completed.

③ Setting of soft start acceleration/deceleration times.
Set acceleration and deceleration times in parameter No. 23 and No. 24.
[Setting procedure is same as previous page.]

• Wiring
Wire the control connector CN1 as follows:



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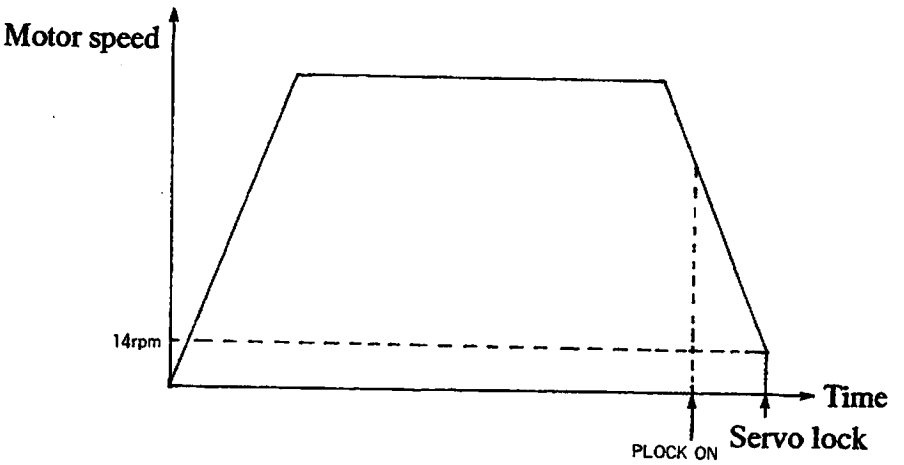
3-5-3 Position lock function

(1) Function

- Select driver type as "analog input type, " and without using the soft start function, input the position lock signal "PLOCK." Then, the motor enters into servo lock mode.
- This function can stop slight rotation along with drifting which is characteristic of analog input.
- This function is effective when the motor rotation speed is 14 rpm or less.

(2) Operation

- Turning ON the position lock signal "PLOCK" creates a position loop inside the driver when the motor rotation speed becomes less than 14 rpm. The motor shaft functions servo lock.
- While in servo lock condition, and position lock signal "PLOCK" is ON, the motor does not rotate even inputting speed reference signal "REF."



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3-5-4 Functions of Electronic Gear

(1) Functions

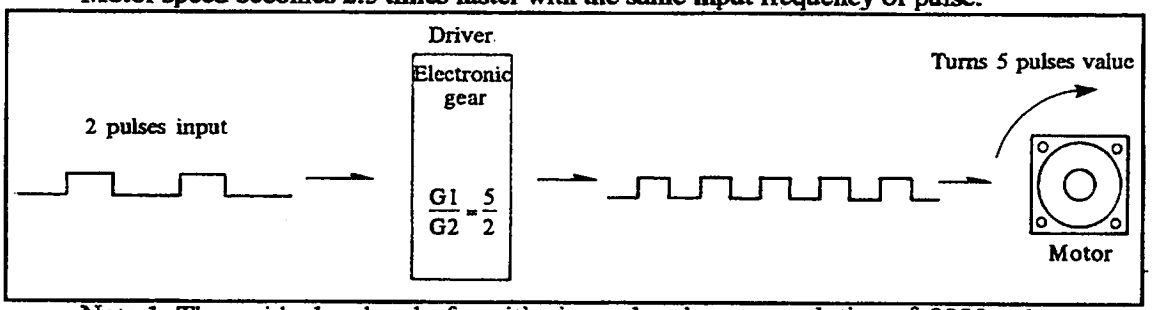
- Rotate motor by pulse frequency which is multiplied with number of command pulse by electronic gear multiplier.
- Set electronic gear multiplier by a parameter.
- Used to fine-adjust two feed lines to synchronize or to correct slower frequency of command pulse.

(2) Operation

- Electronic gear uses G1 and G2 of parameters No.21 and 22, set by $\frac{G1}{G2}$.

  Number of command pulse × $\frac{G1}{G2}$ = required number of pulses

- When $\frac{G1}{G2} = 1$, motor rotates one rotation with command pulse 2000.
- When $\frac{G1}{G2} = \frac{5}{2}(\frac{10}{4})$ is set, motor rotates (or feeds) 2.5 times of the command pulse. Motor speed becomes 2.5 times faster with the same input frequency of pulse.



Note 1: The residual and end-of-positioning pulses have a resolution of 8000 pulses per revolution.

Note 2: E25 (deviation counter over) may occur when electronic gear multiplier: $\frac{G1}{G2}$ is larger than 1. In this case, adjust position loop FF gain of parameter No. 4.

(3) Settings of electronic gear function parameters

■ Parameter to set

PRM No.	Parameter name	Setting range	Description
21	Electronic gear multiplier (G1)	1 to 9999	Setting value should be
22	Electronic gear multiplier (G2)	1 to 9999	$\frac{1}{50} \leqq \frac{G1}{G2} \leqq 50$

■ In case of operating electronic gear multiplier by $\frac{5}{2}$.

- Settings of electronic gear multiplier G1 and G2.
  Set electronic gear multiplier G1 and G2 in parameter No.21 and No.22.

Key operation	Display	Description
	0	(Initial display)
	100	Enter parameter mode.
	21 1000	Select PRM No.21. (Set electronic gear multiplier G1.)
	21 1000	Change setting value.
	21 999	
	21 5	Set "5."
	21 5	Setting is completed. Set "2" to PRM No.22 following the same procedures.

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3-5-5 Treatment Function at Abnormalities

(1) Treatment method at abnormalities
Select from three below to treat driver against motor at abnormalities (when an error occurs). Setting parameter is No. 85 (designation of treatment method at abnormality).

Treatment method	Dynamic brake circuit	Parameter value
① At abnormality, motor axis becomes free without any action.	No connection	0
② The driver outputs a signal at abnormality to an external dynamic brake to stop motor axis.	Connection	0
③ Effect servo brake at overload, overspeed, or counter over errors. Other errors than these three, motor axis becomes free.	No connection	1

Note: Dynamic brake: This brake uses motor regenerative energy and generates brake torque by short circuit motor armatures.
Servo brake: This function tries to stop motor shaft by making speed command to "0" while releasing run command.

(2) Parameter setting to designate treatment method at abnormalities

- Output only dynamic brake triggering signal at abnormality listed in ① and ② above.
  Set setting value of set up parameter No. 85 to "0."
  Initial value (at delivery) is "0." When setting value of No. 85 is "1," operate as follows.

Key operation	Display	Description
	0	(Initial display)
RESET + ≪	81 0	Enter set up mode.
≪	82 0	
≪	85 1	Enter PRM No.85.
J	85 1	
≫	85 0	Change setting value to "0."
J	85 0	Setting completed.

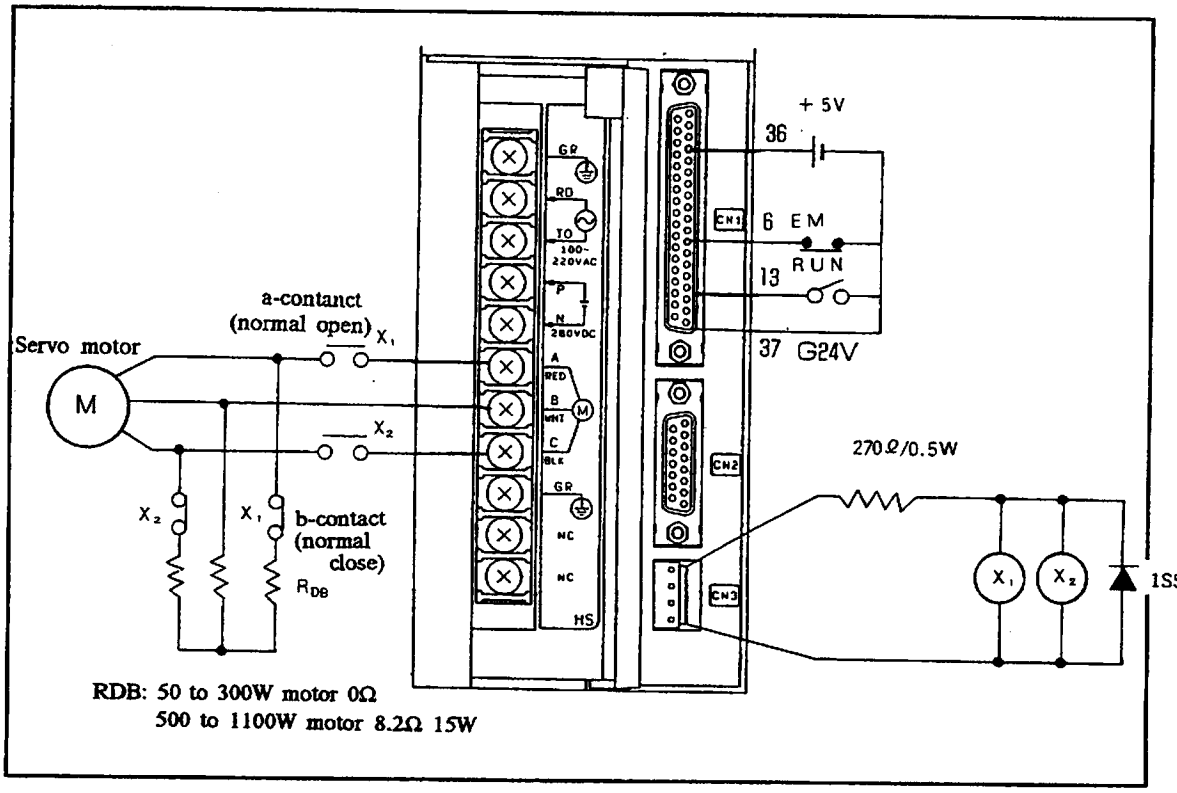
Note: As for dynamic brake circuit, see the next page.

- Setting of applying servo brake at abnormality listed in ③ above.
  Set value of set up parameter No. 85 to "1."
  [For key operation, refer to above example.]

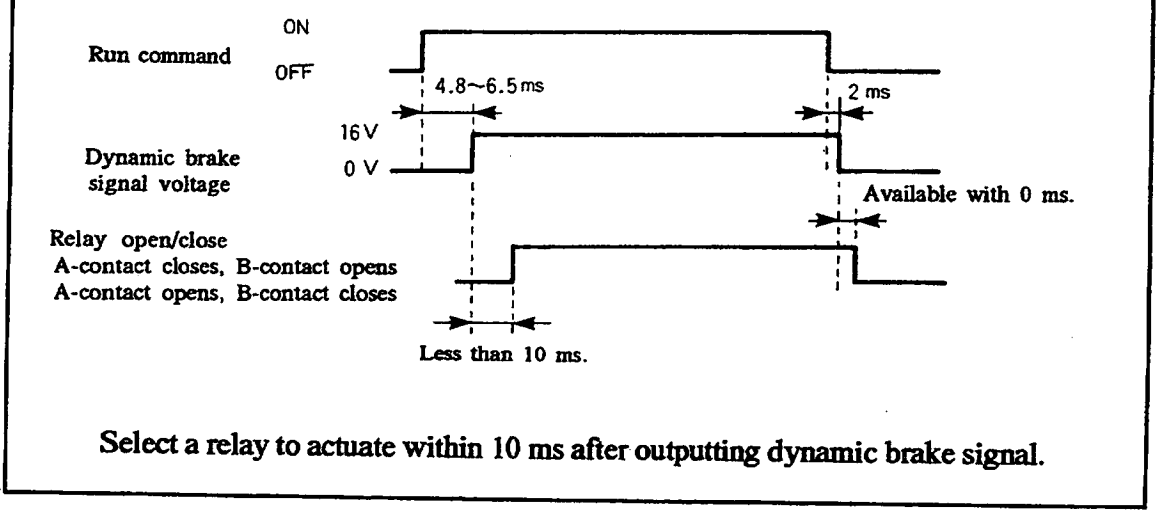
Note: Error types to be able to stop motor using servo brake are follows.
- Overload — Error code E22
- Overspeed — Error code E24
- Deflection counter over — Error code E25

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(3) Connection of dynamic brake
In case of using dynamic brake, connect as follows using CN3 dynamic brake signal



Note 1: Use OMRON model G6C-2117P (12 VDC specifications, 1a, 1b contacts) for relays X1 and X2.
Note 2: Specifications of dynamic brake output signal are 16V, 30 mA at max. When the signal exceeds this value, control circuit will be damaged so that take care for relay selection.
Note 3: Relay ON/OFF timing is as follows.



Select a relay to actuate within 10 ms after outputting dynamic brake signal.

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3-5-6 Protect Function

When you want to protect already set parameter, use following method.
Protectable parameters are No.0 to No.24.

Protect settings

Key operation	Display	Description
		(Initial display)
RESET +		Enter protect mode.
		Change parameter number pressing and keys.
		For example, protect PRM No.2.
		Lights ON dot on the lower right of data, and protect is completed.

End

Release protect

Key operation	Display	Description
		(Initial display)
RESET +		Enter protect mode.
		Change parameter number pressing and keys.
		For example, release protect of PRM No.2.
CLR		Light OFF dot by pressing CLR key, protect release is completed.

End

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Chapter 3. Operation

3-6 Adjustment

3-6-1 Adjusting Parameters

There are 8 type of parameters for adjustment. Set required adjustment.
These adjusting parameters can be set during motor operation, displayed data is valid as latest setting value.

■ Types of adjusting parameter

PRM No.	Driver type	Parameter name	Default value	Unit	Setting range	Description
0	A, P	Speed loop proportional gain	100		0 to 254	Fine adjustment taking 100 as center value.
1	A, P	Speed loop integer gain	100		0 to 254	
2	A, P	Position loop proportional gain	100		0 to 254	
3	A, P	Torque limit value	50	%	0 to 100	100 as instantaneous max. torque.
4	P	Position loop FF gain	0	%	0 to 100	FF amount ratio against speed command.
5	P	Positioning completion range	3	± pulse	0 to 127	Set number of pulses at 8000 pulse/rev.
6	A	Speed command scale	100	%	83 to 167	Set rpm at 10 V input with ratio against 3000 rpm.
11	A	Speed command offset	0		- 63 to + 63	Adjust command voltage between ± 0.2V. (divided ± 0.2 V into ± 63.)

Note 1: Sign of driver type: A: Analog input type
P: Pulse input type

Note 2: Though parameter No.6 (speed command scale) can adjust speed between ± 2490 to 5010 rpm at ± 10 V input, setting exceeding ± 4000 rpm becomes overspeed error and the motor cannot rotate.

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3-6-2 Settings for Adjusting Parameter

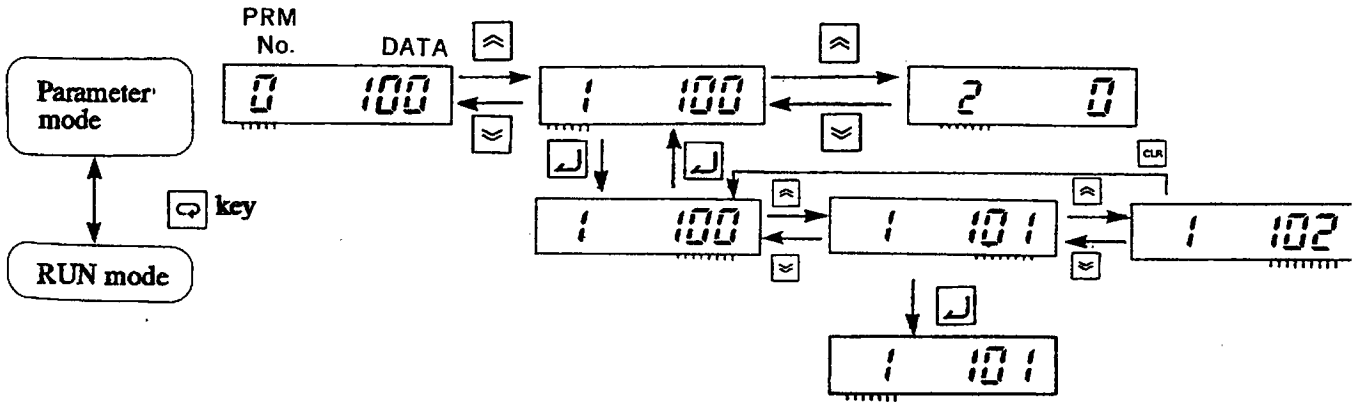
■ Effect on parameter

PRM No.	Parameter name	Setting and effect on parameter value
0	Speed loop proportional gain	When this setting value is increased, overshoot and speed ripple become smaller.
1	Speed loop integer gain	When this value is increased, allowance against speed command becomes smaller. This is effective to counteract a large amount of friction in mechanical system.
2	Position loop proportional gain	When this value is increased, positioning allowance becomes smaller. This is effective when positioning completion signal (INP) does not output soon.
3	Torque limit value	This parameter is used to limit motor generating torque when torque limit (CLIM) signal is input. When this value is decreased taking instantaneous max. torque as 100%, generating torque also becomes smaller.
4	Position loop FF gain	When this value is increased, delay of motor operation at acceleration/deceleration becomes shorter.
5	Positioning completion range	This is used to match timing with a host controller. Increase of this value hastens detection of positioning and is effective to shorten tact time.
6	Speed command scale	This parameter is used to change rotation speed against speed command voltage. Setting to "167" generates 3000 rpm with 6 V speed command, "83" generates 3000 rpm with 12V.
11	Speed command offset	Set this value not to rotate motor with 0 V speed command voltage. When motor rotates forward set negative (-) side, and vice-versa.

Note 1: Too enlarge settings of PRM No. 0, 1, 2, and 4 will vibrate motor and E22 (overload) error occurs. Too small value settings for each gain will decrease servo lock power and decrease response characteristic.

Note 2: Though parameter No.6 (speed command scale) can adjust speed between ± 2490 to 5010 rpm at ± 10 V input, setting exceeding ± 4000 rpm becomes overspeed and the motor cannot rotate.

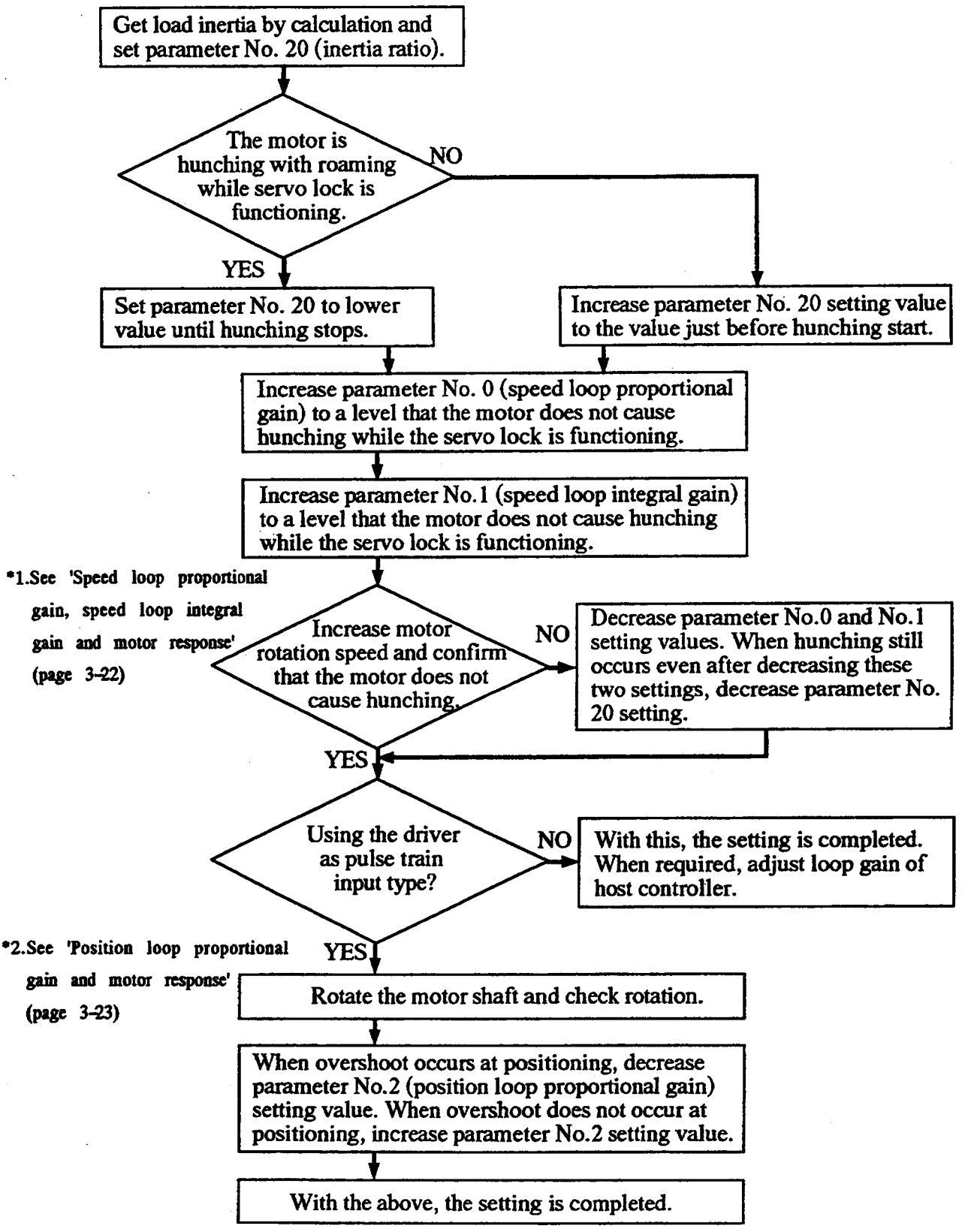
■ Operation of parameter



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3-6-3 Adjustment of the driver

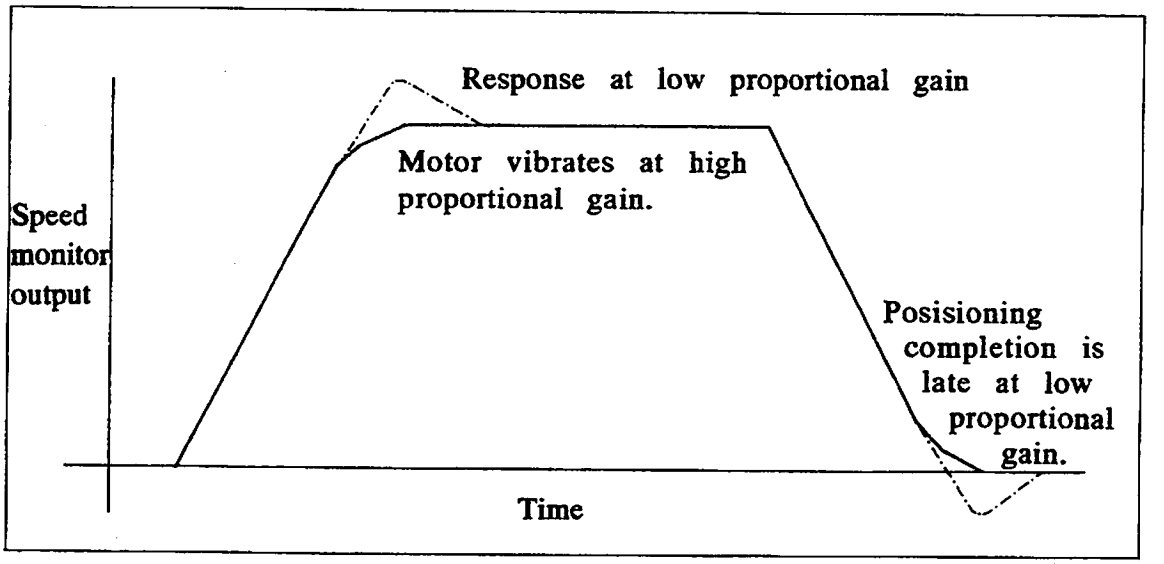
For normal driver adjustment, see 3-3: Setting inertia ratio (semi-automatic tuning function)
When the driver cannot be adjusted to required level with the semi-automatic tuning function, adjust it following the flow chart below.



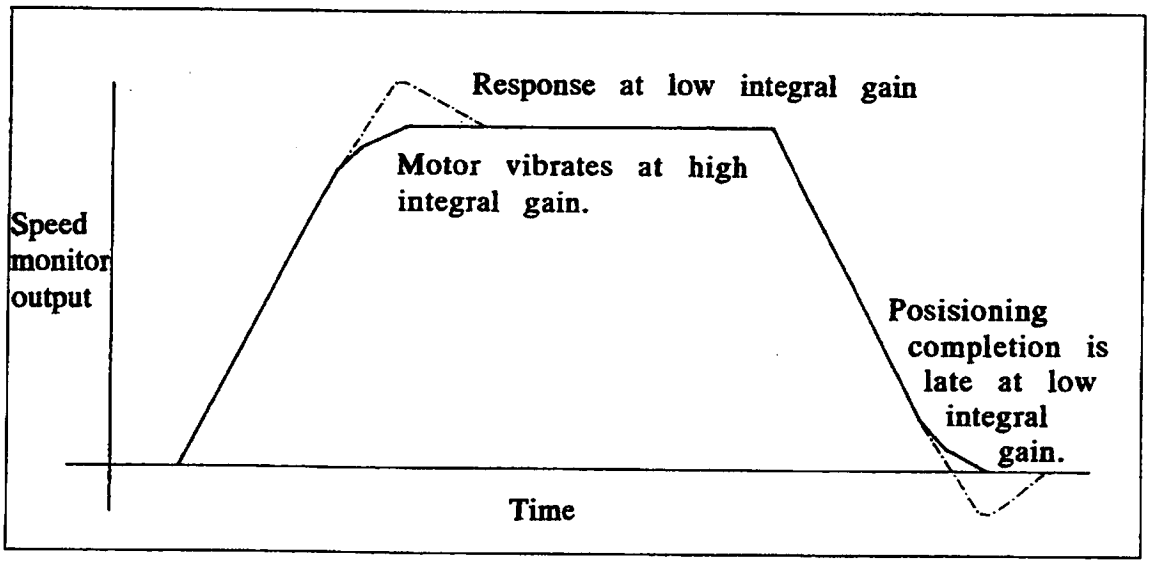
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*1.Speed loop proportional gain, speed loop integral gain and motor response

•Speed loop proportional gain and motor response

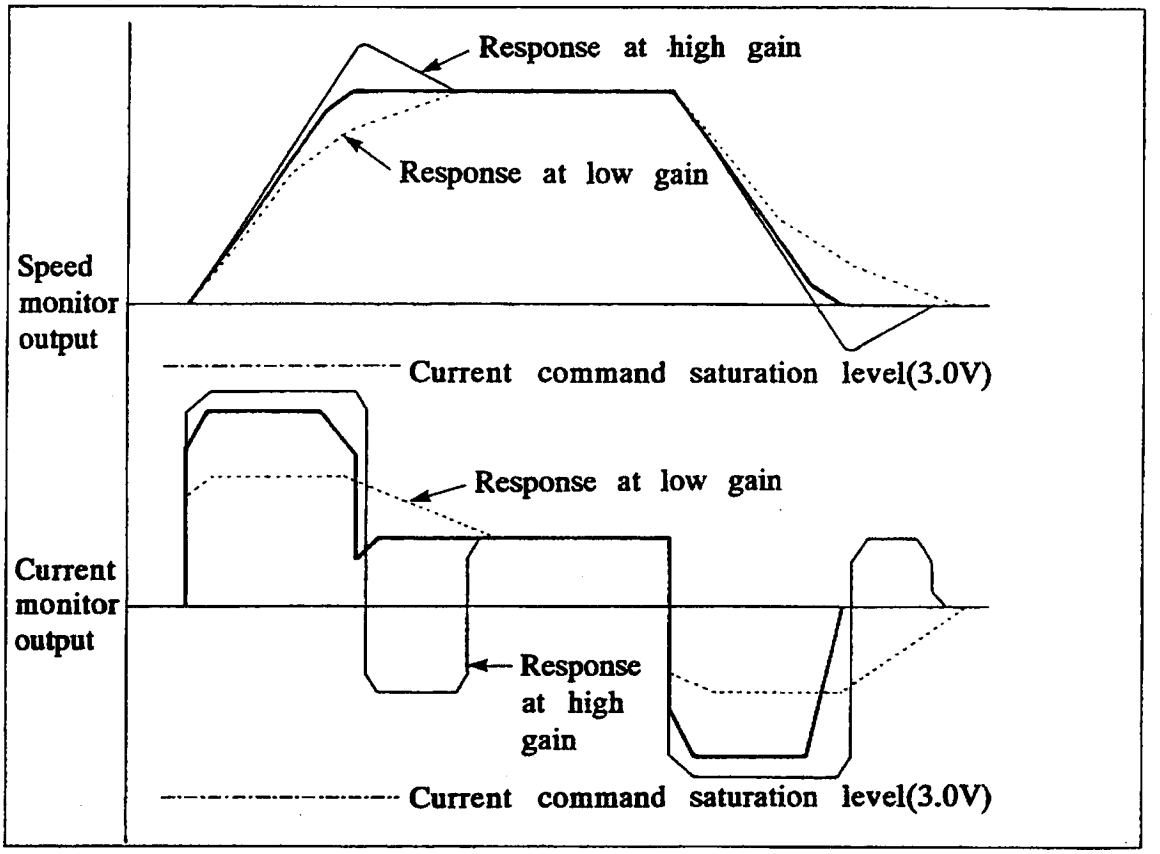


•Speed loop integral gain and motor response



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*2.Position loop proportional gain and motor response



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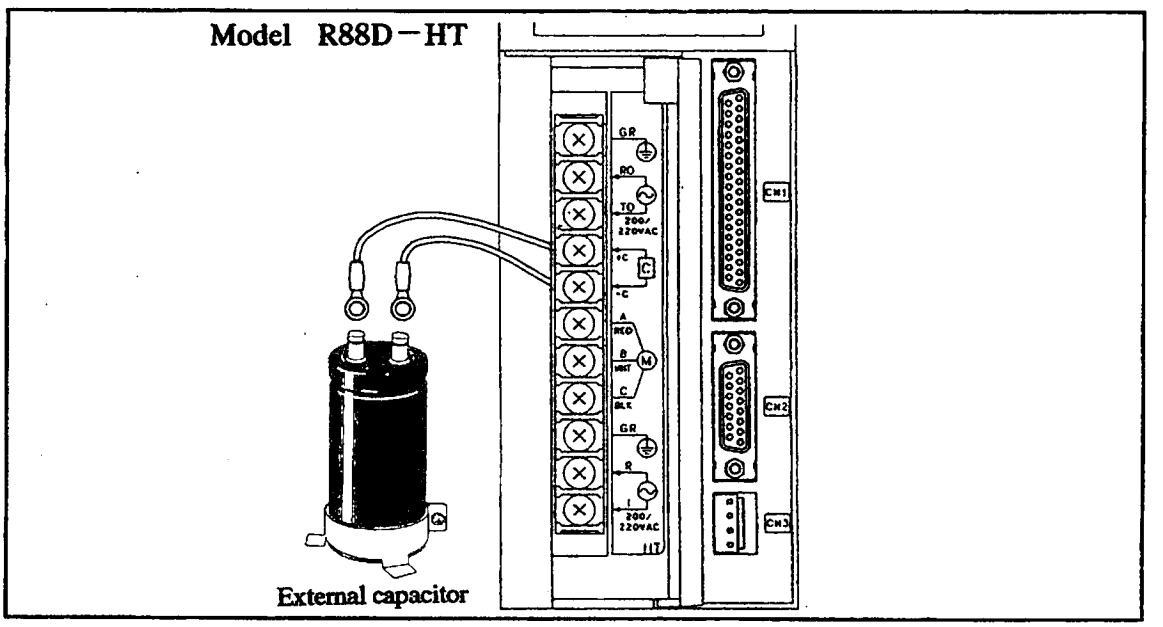
Chapter 3. Operation

3-7 Connection of Regenerative Capacitor

Power unit built-in type servo drivers have terminals in order to connect capacitors externally for absorbing motor regenerative energy. Connect a capacitor when regenerative energy is too large.

(1) Necessity of connection

- When error code E3 (main circuit overvoltage) lights ON by motor regenerative energy, connect regenerative capacitor between + C and - C terminals on the terminal block.
- Select a capacitor of 1000μF at max. capacity, and resist 400 V (surge resistance: 450 V).
- In case of lighting ON E3 (main circuit overvoltage) though installing a capacitor of 1000μF, make deceleration time longer.
- In case of using more than 2 sets of drivers, do not connect regenerative capacitors on terminals + C and - C in parallel.



(2) External installation parts

1) Capacitor

Model	Regenerative resistance absorption capacity at 200 VAC input	Mfg.
KME400LGSN560TA	51J	Nippon Chemi-con Co., Ltd.
KME400LGSN1000TC	64J	
KME400LGSN1200TC	70J	
LNT2G471MSM	48J	Nichicon Corporation
LNT2G102MSM	64J	

* Capacity of external installation capacitor is 1,000 μF for HT.

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(2)Regeneration from the servo driver

Model	Mean regeneration	Regeneration/cycle
R88D-HS	Depends on power unit	Depends on power unit
R88D-HT	10W	33J for a 200VAC input

(3)Calculating regeneration absorption

The regeneration per cycle of the integrated power unit can be controlled with an external capacitor. The relationship is given by

$$\frac{1}{2}(C_1+C_2)\{(375)^2-(\sqrt{2}\times Vin)^2\}$$

C_1 is the driver's internal capacitor HT $\fallingdotseq$ 1120(μF)

C_2 is the external capacitor

Vin is the input voltage (RMS)

Example:

The regeneration per cycle for an HT with a 1000 uF external capacitor and an input voltage of 200VAC is given by

$$\frac{1}{2}(1120\times 10^{-6}+1000\times 10^{-6})\{(375)^2-(\sqrt{2}\times 200)^2\}$$

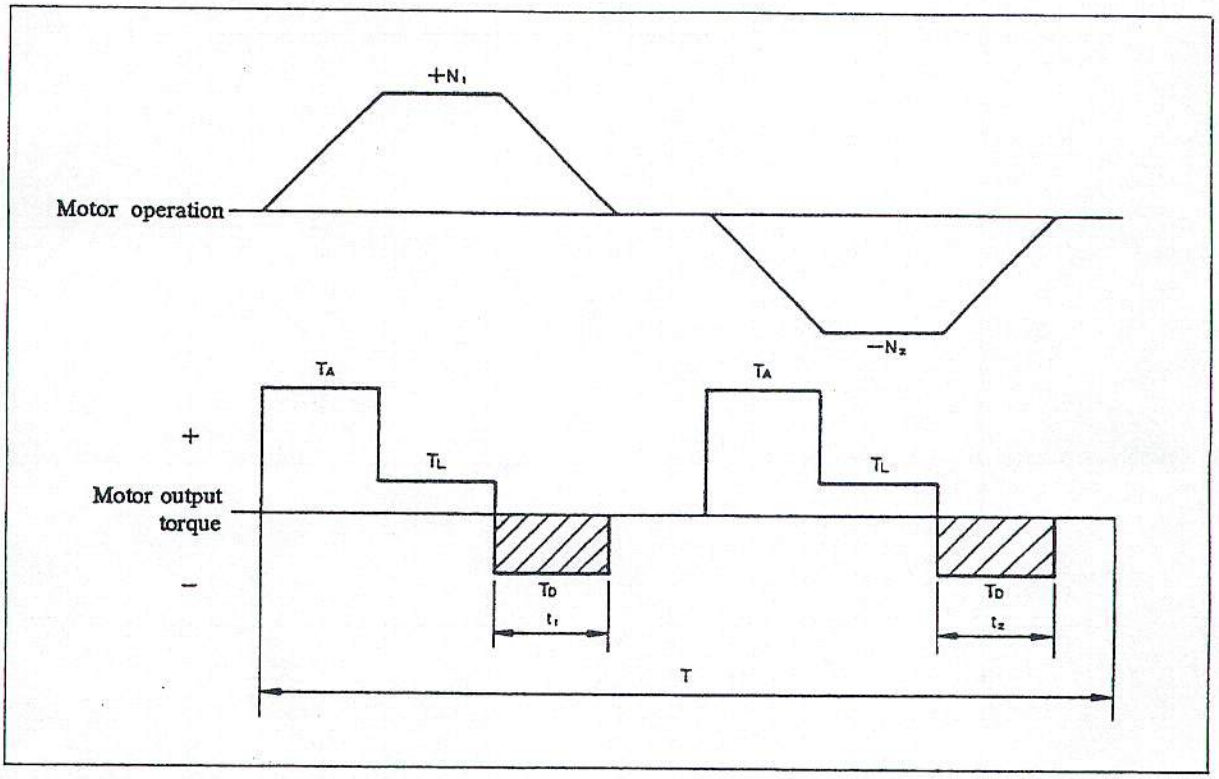
$$=64.2(J)$$

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3-8 Regenerative Energy

Calculation of Regenerative Energy

(1) In case of horizontal axis



As shown above, regenerative energy occurs when motor output torque becomes negative. Regenerative energy in each section is given in the formula below:

$$Eg_1 \fallingdotseq \frac{1}{2} N_1 \cdot T_D \cdot t_1 \times 1.027 \times 10^{-2} \ [J]$$

$$Eg_2 \fallingdotseq \frac{1}{2} N_2 \cdot T_D \cdot t_2 \times 1.027 \times 10^{-2} \ [J]$$

N_1, N_2 : Number of motor revolutions at triggering deceleration [rpm]

T_D : Required deceleration torque [kgf·cm]

t_1, t_2 : Deceleration interval [sec.]

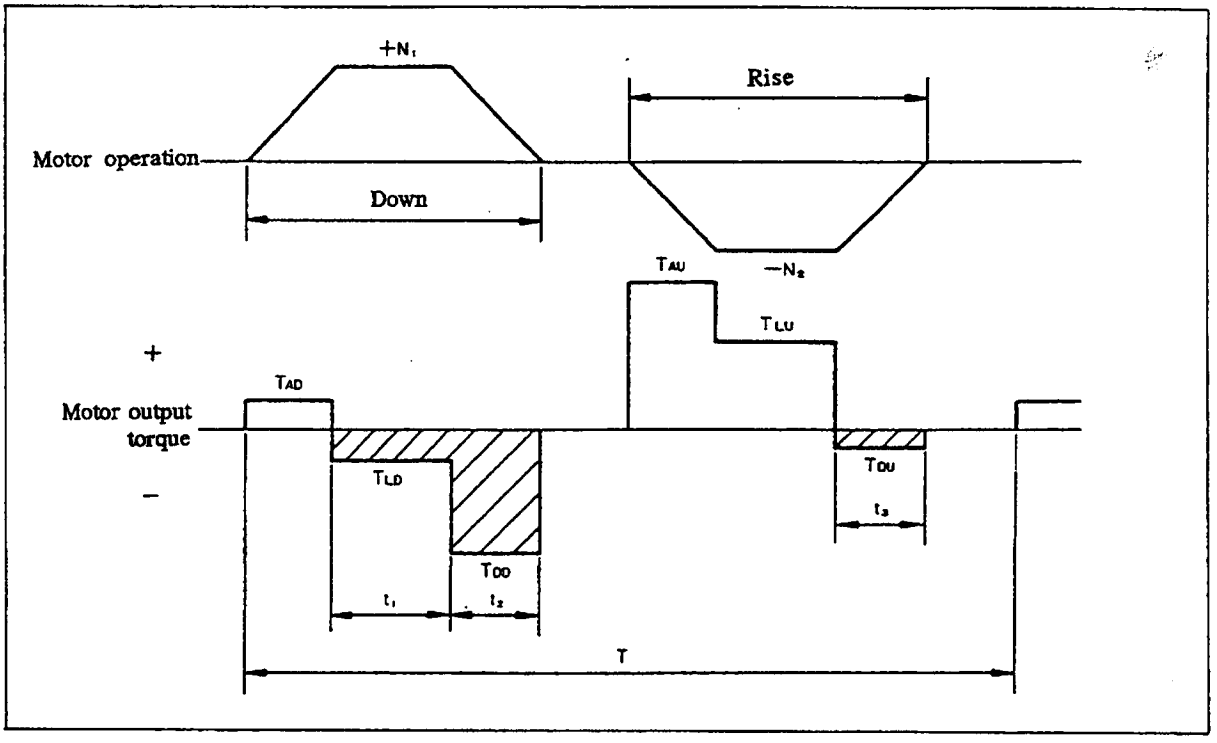
Average regenerative power is given in the formula below:

$$Eg = \frac{Eg_1 + Eg_2}{T} \ [W]$$ T: operation cycle [sec.]

Generally, there is energy loss by motor coiling resistance and actual value is approx. 90% of above figure.

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(2) In case of vertical axis



In the above movement, regenerative energy occurs while motor output torque becomes negative. Regenerative energies in each section is given by the formula below:

$$Eg_1 \fallingdotseq N_1 \cdot T_{LD} \cdot t_1 \times 1.027 \times 10^{-2} \ [J]$$

$$Eg_2 \fallingdotseq \frac{1}{2} N_1 \cdot T_{DD} \cdot t_2 \times 1.027 \times 10^{-2} \ [J]$$

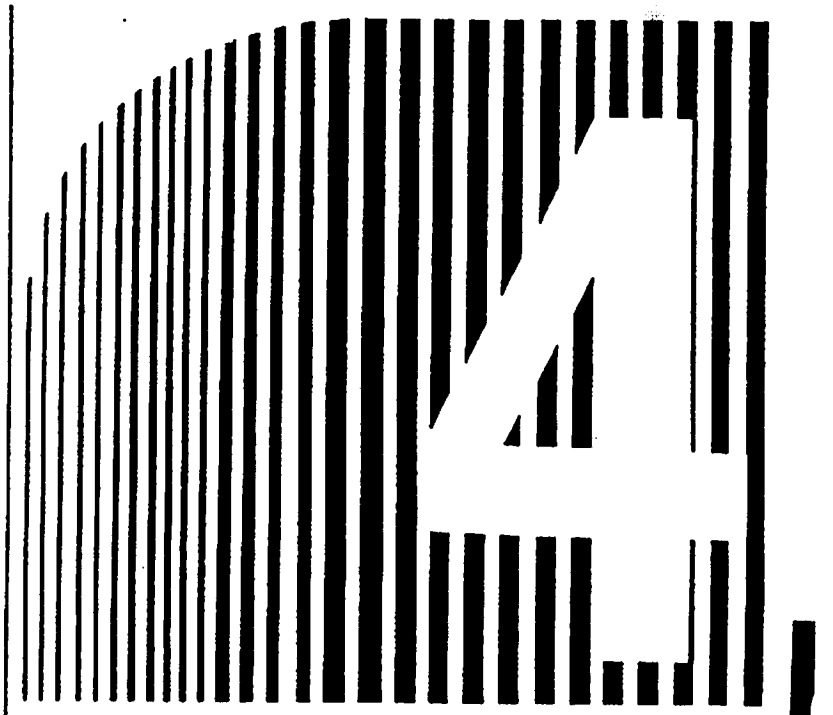
$$Eg_3 \fallingdotseq \frac{1}{2} N_2 \cdot T_{DU} \cdot t_3 \times 1.027 \times 10^{-2} \ [J]$$

Average regenerative power is given in the formula below:

$$Eg = \frac{Eg_1 + Eg_2 + Eg_3}{T} \ [W] \qquad T: \text{operation cycle [sec.]}$$

Generally, there is energy loss by motor coiling resistance and actual value is approx. 90% of above figure.

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Chapter 4

• Maintenance •

4-1. Use of Display

4-2. Protective and Diagnosis Functions

4-3. Troubleshooting

4-4. Regularly Check

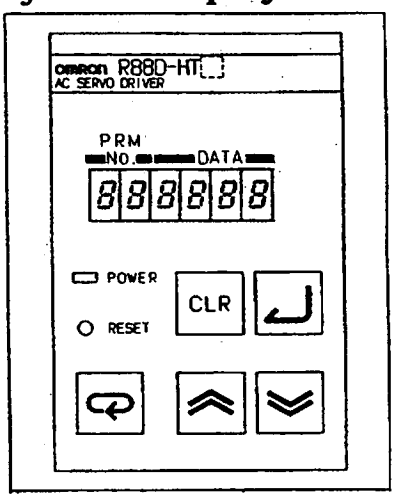
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Chapter 4. Maintenance

4-1 Use of Display

OMNUC H series AC servo driver has the unique feature of monitoring various characters' variation with real time and in a quantative way, which is exclusively available for software servo drivers. Use these displays for checking each character and operation condition.

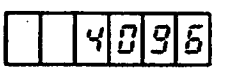
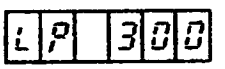
■ Layout of display section



• Green LED

Sign	POWER
Function	Power indication
Lighting condition	Control power is input normally

■ Display contents and display patterns

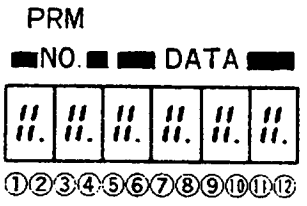
Display item (unit)	Display contents	Display pattern	Descriptions
Speed (rpm)	Current speed during operation		Check command speed versus actual speed. Check for cross connections between encoder phases A and B.
Accumulated pulse (pulse)	Accumulated pulse of deviation counter (difference between command pulse and feedback pulse)		Check positioning precision. Check adjustment of position loop FF gain.
Peak torque (%)	Display max. torque between power ON and reset taking the rated torque as 100%.		Trouble prediction such as gear burnout, etc. Trouble prediction of motor.
Actual torque (%)	Display current generating actual torque taking the rated torque as 100 %.		Check age-deterioration such as mechanical friction load.
Control signal input/output monitor	Display ON/OFF conditions such as operation command, etc. (For detail, see the next page.)		Check input/output signal of a host controller. Check mis-wiring of CN1.
Error code	Display an error code at error detection. (See item 4-2-1.)		Shows the error point. Guide to troubleshooting
Parameter display	Display set up parameter (item 3-2-1), user parameter (item 3-4-1). (Parameter No. and data)		Set and check parameter.

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Chapter 4. Maintenance

■ Control signal input/output monitor

- To check input/output signals (CN1) with a host controller (positioner), use this monitor function.
- Display contents vary between analog input and pulse train input.



• Analog input type

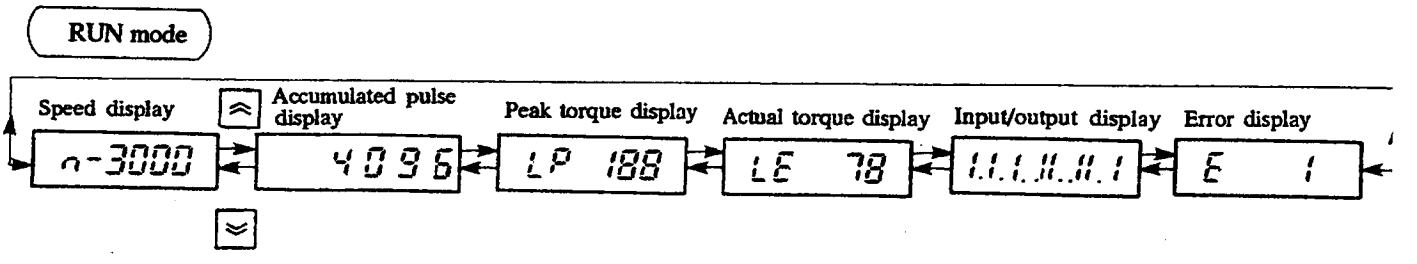
No.	Signal name	CN1 PIN	Lighting condition
①	RUN: Operation command	13	At inputting RUN signal
②	PLOCK: Position lock	12	At inputting PLOCK signal
③	SST: Soft start input	11	At inputting SST signal.
④	VSEL: Inside setting speed selection	10	At inputting VSEL signal.
⑤	$\overline{EM}$: Emergency stop	6	When emergency stop is not input.
⑥⑦		-	(Not used)
⑧	Rotation direction	-	At motor rotation is CCW.
⑨	A-phase	-	A-phase feedback comes from encoder.
⑩	B-phase	-	B-phase feedback comes from encoder.
⑪	Z-phase	-	Z-phase feedback comes from encoder.
⑫	PLOUT: Position lock condition output	28	At outputting position lock condition.

• Pulse train input type

No.	Signal name	CN1 PIN	Lighting condition
①	RUN: Operation command	13	At inputting RUN signal
②	IPG: Pulse prohibition	12	At inputting IPG signal
③	HRET: Positioning match	11	At inputting HRET signal.
④	ECRST: Counter reset	10	At inputting ECRST signal.
⑤	$\overline{EM}$: Emergency stop	6	When emergency stop does not input.
⑥	CCW: Forward command pulse	14, 33	At inputting CCW command.
⑦	CW: Reverse command pulse	15, 34	At inputting CW command.
⑧	Rotation direction	-	At motor rotating forward (CCW).
⑨	A-phase	-	A-phase feedback comes from encoder.
⑩	B-phase	-	B-phase feedback comes from encoder.
⑪	Z-phase *	-	Z-phase feedback comes from encoder.
⑫	INP: Completion of positioning	28	At outputting INP signal.

* Rotates the motor shaft slowly as Z-phase pulse width is extremely short.

■ Display changeover operation



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Chapter 4. Maintenance

4-2 Protective and Diagnosis Functions

4-2-1 Error Types and Diagnosis Functions

About diagnosis against error and protection, the following are provided.

Error code	Error contents	Diagnosis method	Protective function	Output
E 0	Current loop CPU run away	Watchdog timer	Prevents occurrence of abnormal operation.	Alarm
E 1	Encoder disconnection/motor overheat	Detection at voltage level (hardware detection)	Prevents run away, motor burn out.	Alarm
E 3	Main circuit overvoltage	Voltage detection circuit (hardware detection)	Protects driver main circuit.	Alarm
E 4	Main circuit overcurrent	Current detection circuit (hardware detection)	Protects driver main circuit.	Alarm
E 5	Notice external error	Input emergency stop	Protects on system	Alarm
E 21	Overheat of radiation plate	Driver heat radiation plate thermal sensor	Protects driver main circuit.	Alarm
E 22 Remaining time table	Alarm hold for 3 min. after occurrence of overload.	Motor current feedback value (software detection)	Prevents burn out of motor coil.	Alarm
E 23	Main circuit voltage drop below the rated.	Voltage detection circuit (hardware detection)	Secures motor output torque.	Alarm
E 24	Overspeed	Motor speed feedback value (software detection)	Protects motor shaft, bearing etc.	Alarm
E 25	Deviation counter over	Software deviation counter value (software detection)	Detects improper adjustment of motor gain	Alarm
EE ##	EEPROM trouble	Software detection	Prevents occurrence of abnormal operation	Alarm
EP ##	Parameter setting error	Software detection	Prevents mis-setting of parameter	-

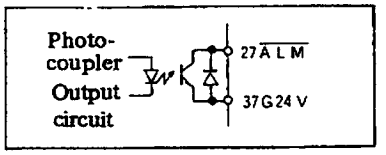
Note 1: Signal of error code #: numeral (parameter number)
Note 2: "Alarm" of above output column indicates alarm output signal in the next page.

Note 3: To release parameter setting error (EP), press CLR key, and reset parameter.
Note 4: If error displays other than above, contact our local agent.

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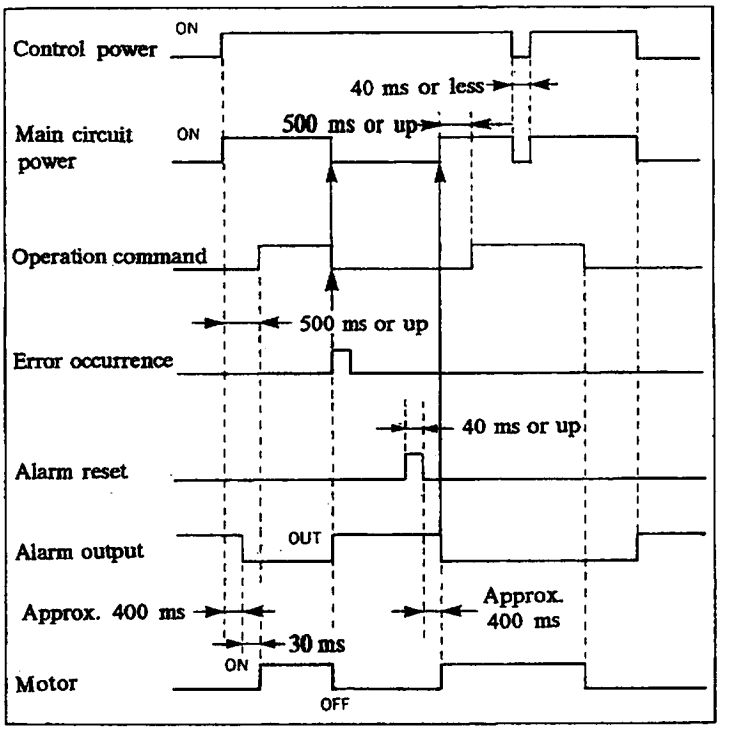
4-2-2 Alarm Output

■ Output circuit



Output specifications : 30V, 80mA or less
At normal : Output transistor switches "ON"
At abnormal : Output transistor switches "OFF" (Alarm output)

■ Time chart (At power ON, power failure, error occurrence)



- Operation command invalid time (recover time)
  Invalid time is 400 to 500 ms. After power "ON," the driver does not receive operation command until each power reaches normal value.
- Power failure detection
  When power failure interval is more than 40 ms, the driver detects power failure and refuses run command. To recover, 400 to 500 ms is required.
- Operation command input
  We recommend turning "ON" operation command after 500 ms of main circuit power "ON."
  (In case of simultaneous ON, first CPU of control circuit executes initial processing, then the driver accepts run command.)

■ Cautions

1) Check cause of error
- The driver outputs alarm at the same time as error detection. The driver outputs alarm even if control power is OFF. After approx. 400 ms of inputting control power, the driver releases alarm output.
- When alarm is output, keep control power ON. Then, switch OFF main circuit power and run command. Investigate error contents, and check the cause.
- When overload (E22) occurs, abnormal of mechanical system may possibly be a cause. Check mechanical system. When overload occurs, the driver repeats display of alarm indication and remaining time of reset invalid (unit: sec.) alternatively for 3 minutes, and does not accept reset during this interval.

2) Alarm releasing method
- Alarm can be released by pressing reset switch, inputting reset signal, re-input control power. In case of overload (E22), however, release is invalid until reset invalid remaining time display becomes "0."
- Be sure to switch OFF run command as reset or reinput power while inputting run command signal may start rotation of motor after approx. 400 ms.

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4-3 Troubleshooting

(1) Diagnosis by error codes and treatment

Error code display	Error contents	Operation	Causes	Measures
E 0	Current loop CPU malfunction	Shut off motor output by time-up of watchdog timer	• Trouble with hardware	• Contact our service center.
E 1	Disconnection of line	Shut off motor output by encoder signal cable disconnection.	• Disconnection of encoder signal cables, faulty connection of connector.	• Check conductivity of each encoder signal line alone in encoder cable assembly. • Check contact resistance of connector.
			• Misconnection of encoder cable.	• Check wirings of encoder cable lines.
	Motor overheat	When encoder inside temperature is more than 85°C, shut off motor output.	• Load torque is too large.	• Recalculate actual torque using NM and AM monitors and select proper motor type.
			• Motor temperature rises.	• Check whether surface temperature of encoder exceeds 70°C. If so, improve radiation performance.
E 3	Main circuit overvoltage	Detect abnormal increase of DC main circuit voltage, shut off motor output.	• Too large regenerative energy at deceleration.	• When power unit built-in type driver is applied, recalculate volume of regenerative energy. When regenerative energy exceeds the rated value, newly install a regenerative resistance absorption capacitor. • When power unit separated type driver is applied: ① Check wiring of the power unit, especially short bar connection for setting internal regenerative resistance. ② When an internal regenerative resistance is not used, check whether an external regenerative resistance is properly connected. ③ Check whether regenerative energy LED flickers at turning OFF supply power. When this LED does not flicker, faulty internal regenerative resistance may be a cause. Install an external regenerative resistance, in this case. • Recalculate required motor capacity and select motor type. • Make the deceleration time longer.
			• Main circuit input voltage exceeds 385 VDC.	• When model: R88D-HL□□ is applied, check that main circuit power input does not exceed 127 VAC. • When model: R88D-HT□□ is applied, check that main circuit power input does not exceed 253 VAC. • When model: R88D-HS□□ is applied, check that main circuit power input does not exceed 350 VDC.
			• Miswiring of A, B, C phases, and GR.	• Check whether any one of A, B, or C phases of motor armature lines is not connected with GR.

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Error code display	Error contents	Operation	Causes	Measures
E 4	Main circuit overcurrent	When overcurrent flows on DC main circuit, fuse blows and the circuit is shut off. Detect overcurrent in main circuit and shut off motor power.	• Short circuit, or leakage to ground of motor power lines.	• Measure insulation resistance between each phase armature line alone using a 500 V (250 V) megger tester. (It is normal at 5 M ohm).
			• Misconnection of A, B, or C phases, or GR	• Check whether any one of A, B, or C phases of motor armature lines is not connected with GR.
			• Regenerative resistance terminal is shorted or connected with GR.	• Check wirings of main circuit power terminals.
			• Burnout of motor coil.	• Check motor coil resistance. (See 5-2: Motor specifications)
E 5	Indication of outside error	Shut off motor output by inputting emergency stop.	• Emergency stop signal is input to the driver.	• No. 6 pin on control connector (CN1) is disconnected. Check connection of control signal lines. • 5 VDC does not input. • 5 VDC is input after control power was input. Make a sequence to input 5 VDC input prior to control power input.
E 21	Heat radiation plate overheat	Detect abnormal increase of heat radiation plate temperature, shut off motor output.	• Too high driver ambient temperature.	• Make arrangement that driver ambient temperature maintains itself below 55°C.
			• Too large load torque.	• Calculate actual torque using NM and AM monitors and select proper motor type.
E 22	Overload (alarm hold for 3 minutes)	When current flows exceeding the rated value and interval, the driver shuts off motor power.	• Lower main circuit voltage.	• Check main circuit power voltage • Check main circuit wiring connections.
			• Lock of motor shaft.	• Release the brake in case of brake-integrated motor. • Check that motor shaft is not mechanically locked.
			• Miswiring, disconnection of A, B, C phases.	• Check wirings of motor armature lines.
			• Improper adjustment of each gain. • Vibration of motor.	• Measure NM and AM monitors using an oscilloscope and adjust gain.
			• Count out of E22 does not complete.	• Wait three minutes after inputting control power. Reset it after three minutes.
			• Too large load torque or acceleration/deceleration torque.	• Calculate actual torque using NM and AM monitors and select proper motor type.
E 23	Main circuit disconnection	Main circuit is disconnected.	• Main circuit power does not input. • Open a phase of main circuit.	• Check wirings of main circuit power.

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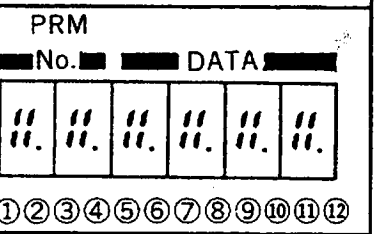
Error code display	Error contents	Operation	Causes	Measures
E 24	Overspeed	Shut off motor power when motor speed exceeds the rated value.	• Motor speed exceeds 4000 rpm.	• Decrease max. speed of the speed command. • Adjust gain when overshoot may be caused by excess motor rotation speed.
			• Other than twisted pair shield cable is applied.	• Use appropriate twisted pair shield cable.
			• Miswiring of encoder signal lines.	• Check wirings of encoder signal cables.
E 25	Deviation counter over	Value of positioning deviation exceeds upper limit, reset counter,and shut off motor output.	• Too high frequency of command pulse.	• Decrease command pulse frequency
			• Lock of motor shaft.	• Release the brake in case of brake-integrated motor • Check whether motor output shaft is not mechanically locked.
			• Too low gain setting. • Short of position loop FF gain.	• Adjust gain.
			• Too short acceleration/ deceleration time.	• Make longer acceleration/deceleration time.
			• Torque limit signal is input.	• Check wirings of control signal lines. • Increase torque limit value setting • Make longer acceleration/deceleration time.
			• Miswiring of encoder signal lines.	• Check wirings of encoder signal lines.
			• Main circuit voltage is not input.	• Check wirings of main circuit power.
			• Miswiring or disconnection of A, B, or C phases	• Check wirings of motor armature lines.
			• Too high electronic gear setting.	• Lower electronic gear setting value. • Make longer acceleration/deceleration time.
E P	Parameter setting error	Error indication only	• Outside the electronic gear multiplier setting range (Release by pressing CLR key.)	• Set electronic gear multiplying factor setting within the proper range (see 3-5-4: electronic gear function).

* About other errors, contact our local agent.

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Chapter 4. Maintenance

(2) Diagnosis by operation condition and treatment

<table>
<tr><th>Conditions</th><th>Diagnosis and treatment</th></tr>
<tr><td>Motor does not rotate without alarm output.</td><td>
The following will be possible causes. Check signals, etc. To check ON/OFF signals, use numerical displays of indicator. (Control signal input/output monitor.)


● Analog input type

• Command voltage of speed command (REF) is 0 V.

• Position lock (PLOCK) is input.

• Run command does not input.

• Soft start input (SST) does not input while using soft start function.

• Torque limit is set at too low value.
<table>
<tr><th>Signal name</th><th>LED No.</th><th>Normal condition</th></tr>
<tr><td>RUN</td><td>①</td><td>lights ON</td></tr>
<tr><td>PLOCK</td><td>②</td><td>lights OFF</td></tr>
<tr><td>SST</td><td>③</td><td>lights ON</td></tr>
</table>

● Pulse train input type

• CW or CCW command input does not input.

• Pulse prohibition (IPG) is input.

• Deviation counter reset (ECRST) is input.

• Zero match command (HRET) is input.

• Run command (RUN) is not input.

• Torque limit is set at too low value.

• While forward/reverse pulse mode, other side of pulse input is close (L) signal level.
<table>
<tr><th>Signal name</th><th>LED No.</th><th>Normal condition</th></tr>
<tr><td>CW</td><td>⑦</td><td>lights ON</td></tr>
<tr><td>CCW</td><td>⑥</td><td>lights ON</td></tr>
<tr><td>RUN</td><td>①</td><td>lights ON</td></tr>
<tr><td>IPG</td><td>②</td><td>lights OFF</td></tr>
<tr><td>HRET</td><td>③</td><td>lights OFF</td></tr>
<tr><td>ECRST</td><td>④</td><td>lights OFF</td></tr>
<tr><td>$\overline{EM}$</td><td>⑤</td><td>lights ON</td></tr>
</table>
</td></tr>
<tr><td>Unstable rotation</td><td>• Deviation of mechanical system coupling center and motor shaft center, load torque variation by looseness, pulley or gear friction will be possible causes.</td></tr>
<tr><td>Large noise</td><td>• Check that inertia ratio is appropriate.
• Decrease speed loop or position loop gain.
• Check that excessive pressure is not loaded to motor shaft for thrust direction.
• Check that no abnormal sound of bearings.</td></tr>
<tr><td>Heat generation</td><td>• Check that actual load torque does not exceed the rated torque with current monitor (AM)
• When E22 (overload) is displayed, the driver does not accept reset for three minutes. Keep the driver at charging condition, and release alarm after reset invalid remaining time display becomes “0.”</td></tr>
<tr><td>Vibration</td><td>• Check that inertia ration is appropriate.
• Decrease speed look proportional gain, integer gain, or position look proportional gain.</td></tr>
</table>

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Chapter 4. Maintenance

4-4 Regularly Check

■ Daily check

Check the following items prior to operating the system.

No abnormal sound from motor.
No looseness of fixing screws.
No abnormal heat generation.
Ambient temperature is not so high.
Actual torque display (LE) or peak torque display (LP) does not increase compared with normal values.

■ Periodical check

Check the following items during user's periodical check.

• Servo driver

No looseness on the terminal block, connectors, and fixing screws.
No dust at ventilation hole.
Actual torque display (LE) and peak torque display (LP) do not increase compared with normal values.

• Servo motor

No abnormal sound from motor.
No looseness of motor installation section.
No abnormality in appearance.

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Chapter 4. Maintenance

■Periodic Maintenance for Parts

The servo motor and its driver consist of many parts.
Some mechanical and electronic parts require periodic maintenance or replacement depending on operating conditions (from "Recommendation for periodic maintenance of general-purpose inverters" by JEMA).

The periodic maintenance interval depends on the operating environment and conditions in which the servo motor and driver are used. The maintenance intervals for the servo motor and driver are shown below. Use them as a guideline for periodic maintenance.

• Servo motor

Periodic maintenance intervals are as follows:
Oil seals : 2000 hours
Bearings : 30000 hours
Operating conditions should not exceed ambient temperature range, permissible shaft load, rated rotation rate, torque, and mounting conditions specified in this Manual.
In general, the radial load to the timing pulley or other pulleys (driven by belts) is doubled during operation as compared to that in the stationary state.
The belt and pulley should be designed not to exceed the motor's permissible shaft load during operation.
Consult the manufacturers of the belt and pulley as required.
If permissible motor shaft load is exceeded, the shaft may be damaged or the bearing may seize.

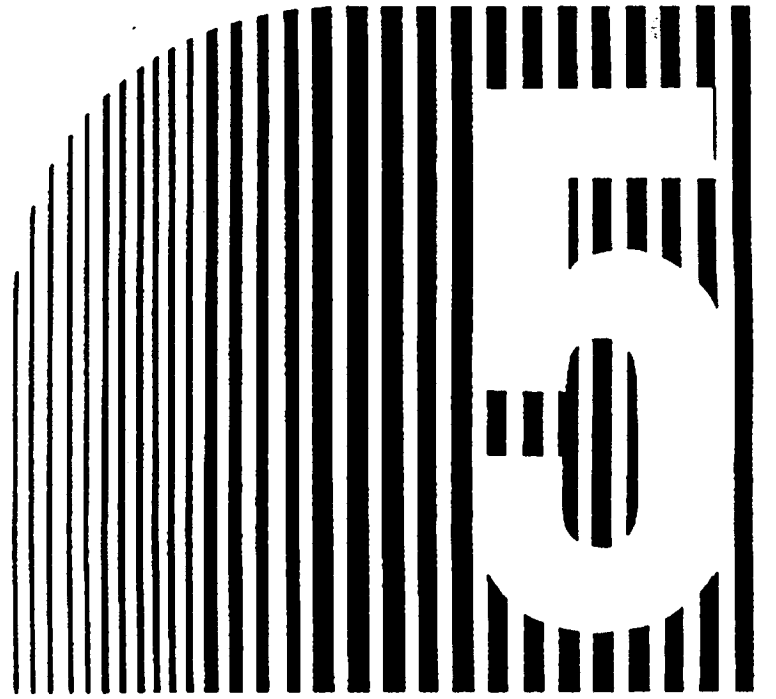
• Servo driver

Periodic maintenance intervals are as follows:
Electrolytic capacitors: 50000 hours
Operating conditions should not exceed an ambient temperature of 35 ℃, or the rated torque and mounting conditions specified in this Manual.
To extend the periodic maintenance interval, it is recommended that ambient temperature and operating duration be reduced as much as possible.

- The service life of the alminum electrolytic capacitor varies dependeing on the ambient operating temperature. Generally, an increase of 10 ℃ in the ambient tenperature will reduce its life to approximately half its original life.
- It is suggested that periodical inspections be carried out every five years if the servo driver is not used for a long period of time or if it is used under more severe conditions then described above. Please contact us for any assistance. We are ready to carry out inspections and judge whether parts need to be replaced or not.

For detailed maintenance methods, consult our sales engineer.

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Chapter 5

• Specifications •

5-1. Specifications of Driver

5-2. Specifications of Motor

5-3. Specifications of Cable

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Chapter 5. Specifications

5-1 Specifications of Driver

5-1-1 General Specifications and Performance Specifications

(1) General specifications

Item	Specifications		
Ambient operating temperature	0 to +55 °C		
Ambient operating humidity	35 to 85%RH (without dew condensation)		
Ambient storage temperature	-10 to +75 °C		
Ambient storage humidity	35 to 85%RH (without dew condensation)		
Atmosphere	Without corrosive gases		
Vibration proof	One of lower level between 2G or 10 - 150 Hz with half amplitude of 0.15 mm.		
Shock proof	Less than 10G at peak acceleration (each tested 3 times in X, Y, Z directions).		
Insulating resistance	More than 5MΩ at 1000 VDC, between P, N, AC terminals and case (heat radiation plate)		
Voltage proof capacity	1 minute at 1500 VAC 50/60 Hz, between P, N, AC terminals and case (heat radiation plate)		
Structure	Installation inside an enclosure type		
Weight	Power unit built-in type	R88D-HT04/-HT10	Approx. 2.3 kg
	Power unit separated type	R88D-HS04/-HS10	Approx. 2.1 kg
		R88D-HS22	Approx. 2.9 kg

(2) Performance specifications

■ **Common specifications**

Type / Item / Model	Power unit separated type			Power unit built-in type	
	R88D-HS04	R88D-HS10	R88D-HS22	R88D-HT04	R88D-HT10
Constant output current	1 A	2.5 A	8 A	1 A	2.5 A
Instantaneous max. output current	4 A	9.5 A	22 A	4 A	9.5 A
Main circuit power	240 to 350 VDC			200 VAC single-phase (170 to 253 VAC) 50/60 Hz	
Control power	85 to 253 VAC, 50/60 Hz			Same as main circuit	
Speed feedback	Magnetic encoder 2,000 ppr				
Protection functions	Detection of overcurrent, overload, overvoltage, and abnormal speed, abnormal encoder etc.				
Applicable load inertia	10 times or less of load inertia of motor				

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Chapter 5. Specifications

■ Analog input type

Item		Specifications
Speed control range		1 by 1,000 (generate rated torque at 7.5 mV)
Load characteristic		Less than ± 0.2% at 0 to 100 % load
Voltage characteristic		Less than ± 0.5% at 170 to 253 VAC voltage
Temperature characteristic		Less than ± 1% at 25°C ±25°C
Frequency characteristic		Less than 50 Hz with 100 % inertia of the motor rotor
Speed command voltage		± 3,000 rpm at ± 10 VDC (adjustable by parameter)
Input impedance		Approx. 22 KΩ
Circuit time constant		Approx. 400 μS
Input signal	Auxiliary speed command	± 3,000 rpm at ± 10 VDC (adjustable by parameter)
	Soft start input	+ 5V 10mA, isolated by photo coupler (set acceleration/deceleration time by parameter)
	Inside setting speed selection	+5V 10mA, isolated by photo coupler
	Position lock signal	+5V 10mA, isolated by photo coupler
	Torque limit	+5V 10mA, isolated by photo coupler (set limit value by parameter)
	Other input signal	+5V 10mA, isolated by photo coupler
Output signal	Alarm output	Open collector output, max. 30V 80 mA
	Position lock condition output	Open collector output, max. 30V 80 mA

■ Pulse train input

Item		Specifications
Max. response pulse frequency		200 kpps
Max. capacity of deviation counter		15 bits
Electronic gear function		Electronic gear multiplier G1/G2 times, G1, G2: 1 to 9999 1/50 ≦ G1/G2 ≦ 50
Setting of in-position range		0 to ± 127 pulse
Feed forward control		Set by parameter, between 0 to 100% against speed command. Feed forward control OFF by setting "0."
Input signal	Position feedback	Magnetic encoder, 2000 ppr
	Command pulse	TTL, line driver input, isolated by photo coupler
	Operation command	+5V 10mA, isolated by photo coupler
	Zero position matching command	+5V 10mA, isolated by photo coupler
	Pulse prohibition	+5V 10mA, isolated by photo coupler
	Deviation counter reset	+5V 10mA, isolated by photo coupler
	Torque limit	+5V 10mA, isolated by photo coupler
	Other input signal	+5V 10mA, isolated by photo coupler
Output signal	Alarm output	Open collector output, max. 30V 80mA
	Positioning completion	Open collector output, max. 30V 80mA

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Chapter 5. Specifications

5-1-2 Connector Terminal Signal Names

■ Connector for control: CN1

Send command to the driver through connectors of control: CN1. Be careful that pin position of input command differs from settings of analog input and pulse train input. Encoder signal outputs are also included in CN1.

• At setting analog input

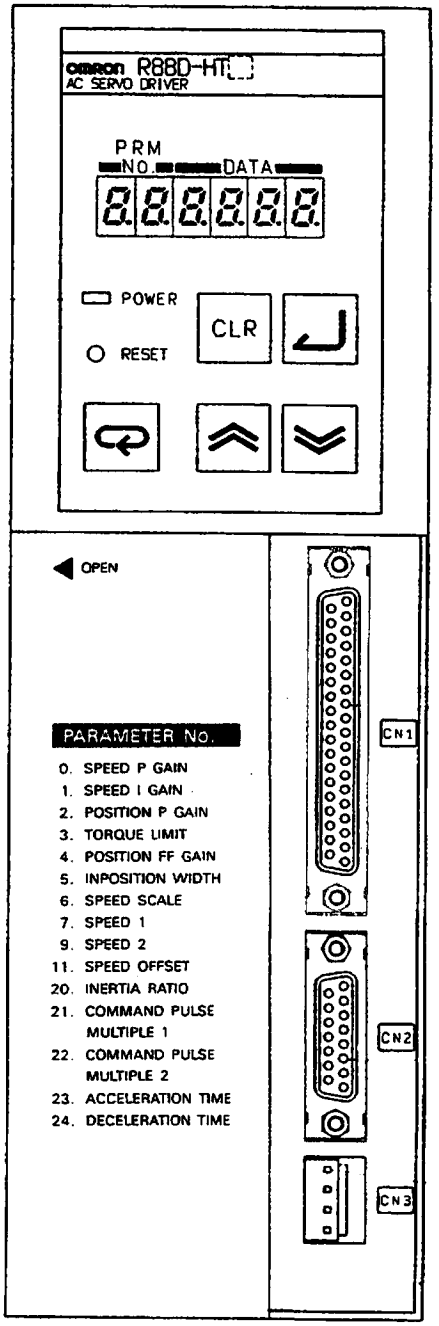
No.	Sign	Function
1	EGND	Ground for encoder
2	+Z	Encoder Z-phase + output
3	-B	Encoder B-phase - output
4	+A	Encoder A-phase + output
5	NC	
6	$\overline{EM}$	Emergency stop signal input
7	NC	
8	NC	
9	NC	
10	VSEL	Inside setting speed selection
11	SST	Soft start signal input
12	PLOCK	Position lock signal input
13	RUN	Run command input
14	NC	
15	NC	
16	SREF	Auxiliary speed command input
17	REF	Speed command input
18	+5VOUT	Control power 5 VDC output
19	+24VIN	Control power 24 VDC input
20	-Z	Encoder Z-phase - output
21	+B	Encoder B-phase + output
22	-A	Encoder A-phase - output
23	NC	
24	NC	
25	NC	
26	FG	Frame ground
27	$\overline{ALM}$	Alarm output
28	PLOUT	Position lock condition output
29	NC	
30	RESET	Alarm reset input
31	MING	Gain minimizing input
32	CLIM	Torque limit input
33	NC	
34	NC	
35	AGND	Analog ground
36	+5V IN	Control power 5 VDC input
37	G24V	Ground for control power 24 VDC

• At setting pulse train input

No.	Sign	function
1	EGND	Ground for encoder
2	+Z	Encoder Z-phase + output
3	-B	Encoder B-phase - output
4	+A	Encoder A-phase + output
5	NC	
6	$\overline{EM}$	Emergency stop signal input
7	NC	
8	NC	
9	NC	
10	ECRST	Deviation counter reset input
11	HRET	Zero match command input
12	IPG	Pulse prohibition input
13	RUN	Run command input
14	+CCW	Forward command pulse (+) input
15	+CW	Reverse command pulse (+) input
16	NC	
17	NC	
18	+5VOUT	Control power 5 VDC output
19	+24VIN	Control power 24 VDC input
20	-Z	Encoder Z-phase - output
21	+B	Encoder B-phase + output
22	-A	Encoder A-phase - output
23	NC	
24	NC	
25	NC	
26	FG	Frame ground
27	$\overline{ALM}$	Alarm output
28	INP	Positioning completion output
29	NC	
30	RESET	Alarm reset input
31	MING	Gain minimizing input
32	CLIM	Torque limit input
33	-CCW	Forward command pulse (-) input
34	-CW	Reverse command pulse (-) input
35	NC	
36	+5V IN	Control power 5 VDC input
37	G24V	Ground for control power 24 VDC

Note: Do not connect with NC pins except pin 29.

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■ Connector for motor signal: CN2

CN2 is terminal to input encoder and pole sensor signal from motor.

No.	Sign	Function
1		NC
2		NC
3	S -	Encoder S-phase -
4	S+	Encoder S-phase +
5	B -	Encoder B phase -
6	B+	Encoder B-phase +
7	A -	Encoder A-phase -
8	A+	Encoder A-phase +
9	E5V	+5 VDC output
10		NC
11		NC
12		NC
13	E0V	+5 VDC ground
14	RG	Return ground
15	SG	Shield ground

■ Connector for dynamic brake and monitor output: CN3

No.	Sign	Function
1	DB	Dynamic brake signal output
2	NM	Speed monitor output
3	AM	Current monitor output
4	GND	Ground for DB, NM, AM

■ Cable side connector models

• CN1

Mfg.	OMRON
Hood	XM2S-3711
Plug	XM2A-3701

• CN2

Mfg.	OMRON
Hood	XM2S-1511
Plug	XM2A-1501

• CN3

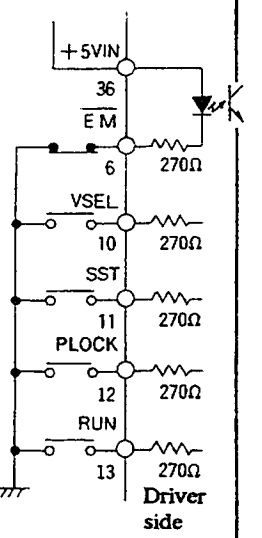
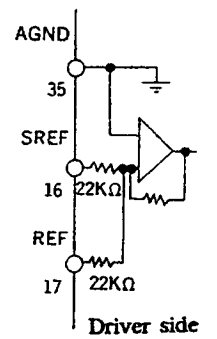
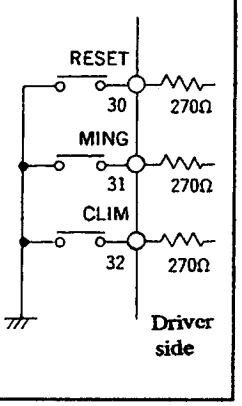
Mfg.	Japan Solderless Terminal
Housing	VHR-4N
Contact	SVH-21 T-P1.1

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Chapter 5. Specifications

5-1-3 Specifications of Control Input Interface

■ Control input interface (analog input type): CN1

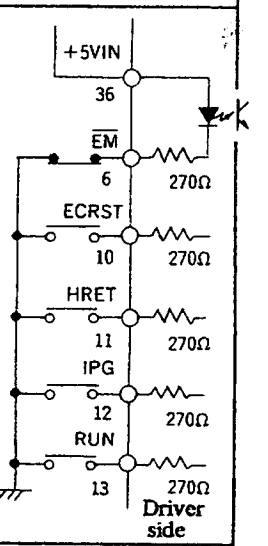
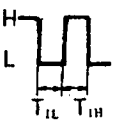
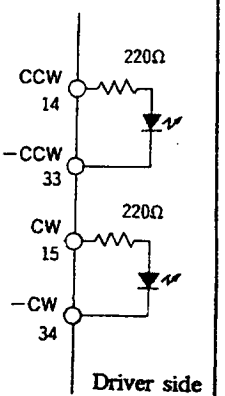
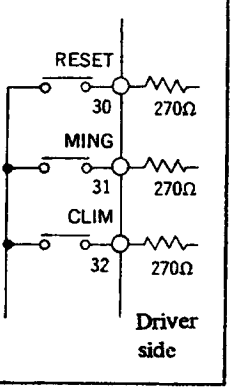
Pin No.	Signal name	Function	Specifications	Interface
6	Emergency stop ($\overline{EM}$)	Emergency stop input. Connect normal close contact. OFF: Emergency stop input ON: Normal operation condition	10mA at 5V power input	
10	Inside setting speed selection (VSEL)	Changeover between 1st speed and 2nd speed set by parameter. OFF: 1st speed ON: 2nd speed	10 mA at 5V power input	
11	Soft start signal (SST)	Start/stop by set acceleration/ deceleration time OFF→ON: Soft start ON→OFF: Soft stop	10 mA at 5V power input	
12	Position lock signal (PLOCK)	ON: Effect servo lock below a rated speed.	10 mA at 5V power input	
13	Operation command (RUN)	ON: Servo ON command	10 mA at 5V power input	
16	Auxiliary speed command (SREF)	Motor rotates in proportion to voltage of auxiliary speed command input. Use to adjust speed command input (REF) for synchronous control, etc.	±3,000 rpm at command voltage ±10V (Adjustable by parameter)	
17	Speed command (REF)	Motor rotates in proportion to voltage of speed command input. Forward rotation with + voltage (CCW) Reverse rotation with - voltage (CW) Changeable rotation direction by set up parameter.	±3,000 rpm at command voltage ±10V (Adjustable from ±2490 to 5010 rpm by user parameter). See note below.	
30	Alarm reset (RESET)	ON: Release alarm condition When error detection functions, the driver enters alarm condition and shuts off output to motor. Alarm reset signal releases this alarm condition.	10 mA at 5V power input	
31	Gain minimizing (MING)	ON: Prevent motor vibration during stop rotation by decreasing gain. The servo lock force is decreased.	10 mA at 5V power input	
32	Torque limit (CLIM)	ON: Decrease supply current to motor to a set value by parameter.	10 mA at 5V power input	

Note: When "167" is set by parameter, motor speed at command voltage ±10 V is ± 5010 rpm. However, the driver detects an overspeed error at more than 4000 rpm motor rotation speed.

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Chapter 5. Specifications

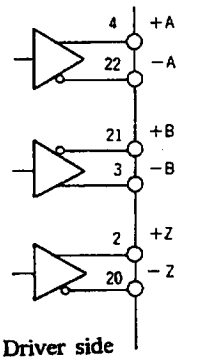
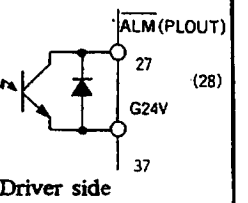
■ Control input interface (pulse train input type): CN1

Pin No.	Signal name	Function	Specifications	Interface
6	Emergency stop ($\overline{EM}$)	Emergency stop input. Connect normal close contact. OFF: Emergency stop input. ON: Normal operation condition.	10 mA at 5V power input	
10	Deviation counter reset (ECRST)	ON: Resets deviation counter and prohibits input command pulse.	10 mA at 5V power input	
11	Zero position matching command (HRET)	ON: Resets deviation counter when first Z-phase is input and simultaneously prohibits input command pulse.	10 mA at 5V power input	
12	Pulse prohibition (IPG)	ON: Prohibits input of command pulse.	10 mA at 5V power input	
13	Operation command (RUN)	ON: Servo ON command.	10 mA at 5V power input	
14	Forward command pulse (CCW)	Forward (CCW) command pulse input. By setting set up parameter No. 82, this pulse becomes feed command, 90° phase difference (A-phase) input.	Input pulse width  T_{IL}, $T_{IH} \geqq 2.5\ \mu S$ 16 mA at input voltage 5V. 8 mA at input voltage 3V. After 25 ms of inputting RUN signal, the driver receives pulses.	
33	(-CCW)			
15	Reverse command pulse (CW)	Reverse (CW) command pulse input. By setting set up parameter No. 82, this pulse becomes feed command, 90° phase difference (B-phase) input.		
34	(-CW)			
30	Alarm reset (RESET)	ON: Release alarm condition. When alarm detection functions, the driver enters alarm condition and shuts off output to motor. Alarm reset signal releases this alarm condition.	10 mA at 5V power input	
31	Gain minimizing (MING)	ON: Prevent motor vibration during stop rotation by decreasing gain. The servo lock force is decreased.	10 mA at 5V power input	
32	Torque limit (CLIM)	ON: Decrease supply current to motor to the set value by parameter.	10 mA at 5V power input	

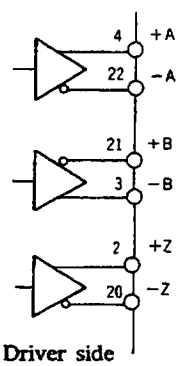
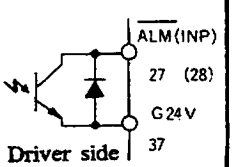
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5-1-4 Specifications of Control Output Interface

■ Control output interface (analog input type): CN1

Pin No.	Signal name	Function	Specifications	Interface
2 3 4 20 21 22	Encoder Z-phase + Encoder B-phase - Encoder A-phase + Encoder Z-phase - Encoder B-phase + Encoder A-phase -	Change servo motor encoder signals to line driver output.	EIA-RS-422A or equivalent	
27	Alarm (ALM)	OFF: At abnormal, emergency stop input. ON: At normal operation.	Max. 30V 80mA	
28	Position lock condition output (PLOUT)	ON: Servo lock condition When the motor stops and enters servo lock condition after inputting position lock ON signal or soft start OFF signal.	Max. 30V 80mA	

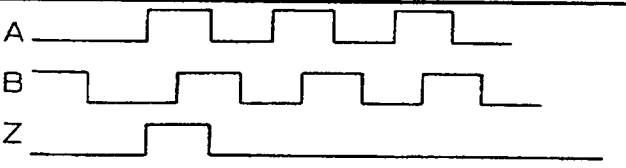
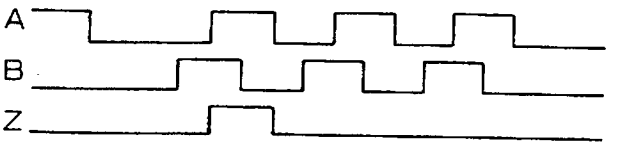
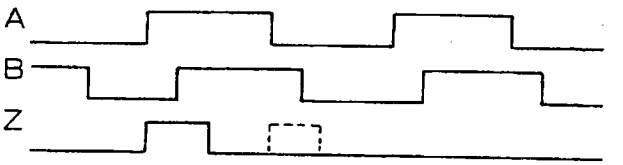
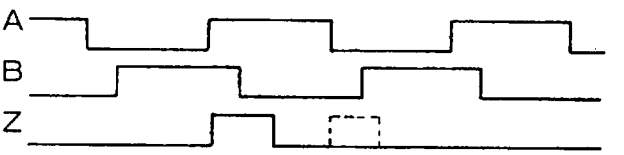
■ Control output interface (pulse train input type): CN1

Pin No.	Signal name	Function	Specifications	Interface
2 3 4 20 21 22	Encoder Z-phase + Encoder B-phase - Encoder A-phase + Encoder Z-phase - Encoder B-phase + Encoder A-phase -	Change servo motor encoder signals to line driver output.	EIA-RS-422A or equivalent	
27	Alarm (ALM)	ON: At abnormal, emergency stop input. ON: At normal operation.	Max. 30V 80mA	
28	Positioning completion (INP)	ON: When amount of accumulated pulses in deviation counter becomes less than in-position range designated in parameter No. 5.	Max. 30V 80mA	

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Chapter 5. Specifications

■ Specifications of driver encoder output pulse

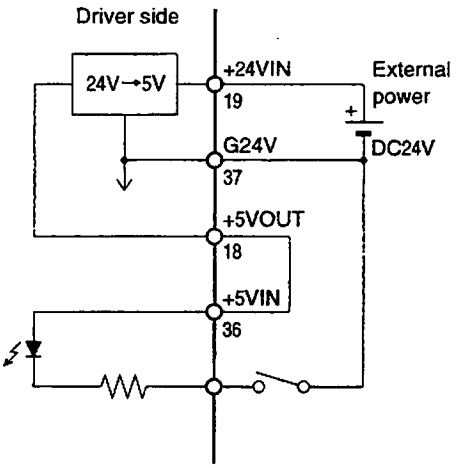
Item	Specifications
Output pulse	A, B phase 2,000 ppr or 1,000 ppr Z phase 1 ppr
Output phase (2,000 ppr mode)	At forward rotation  At reverse rotation 
(1,000 ppr mode)	At forward rotation  At reverse rotation 
	Note 1: Z-phase has serial transfer delay of 28 to 56 µs. Note 2: To changeover output pulse, use setting parameter. Note 3: Z-phase does not properly output more than 500 rpm. Note 4: When using in 1,000 ppr mode, note the following points. ① Detect zero position matching only with Z-phase. The driver cannot detect zero position with "AND" logic of Z-phase with A-phase or with B-phase. ② Z-phase may output with one of both "full line (solid line)" and "dot line" patterns against A-phase and B-phase. Therefore, the first pulse after detection of zero position has allowance of 1/2000 rev.
Output pattern	Output with AM26LS31C or equivalent. (Use 270 Ω or up for termination resistance.)
Insulating resistance	5MΩ or more.
Sensor proof voltage	One minute for 50 VDC, between cases.

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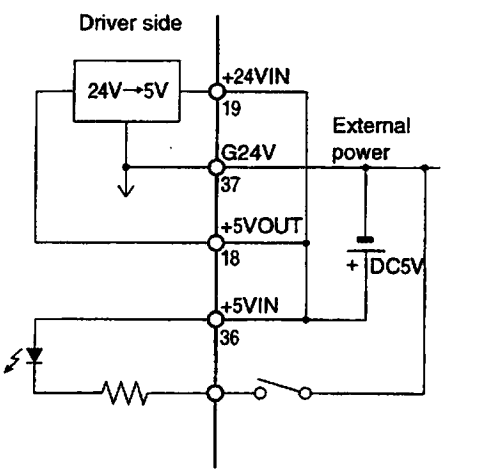
5-1-5 Specifications of Power Interface for Control Input/Output Signal

24 VDC or 5 VDC external power is required as control power. Keep in mind that there is difference in wiring methods between 24 VDC and 5 VDC external power.

■ In case of using 24 VDC power as control power.

Pin No.	Signal name	Functions	Interface
18	5 VDC output (+5V OUT)	Control power 5 VDC output • To supply 24 VDC with 24V IN (pin No.19), 5 VDC is output to this terminal. Connect this terminal with +5V IN (pin No.36).	
19	24 VDC input (+24V IN)	Control power 24 VDC input • Connect 24 VDC external power.	
36	5 VDC input (+5V IN)	Control power 5 VDC input • Connect with +5V OUT (pin No.18).	
37	24 VDC ground (G24V)	Ground for control power 24 VDC • Connect ground of external power 24 VDC • Use as common terminal of control output (ex. alarm).	

■ In case of using 5 VDC power as control power

Pin No.	Signal name	Functions	Interface
18	5 VDC output (+5V OUT)	Control power 5 VDC output · Connect with pin No.19 and No.36 in order to improve noize-proof.	
19	24 VDC input (+24V IN)	Control power 24 VDC input · Connect with pin No.18 and No.36 in order to improve noize-proof.	
36	5 VDC input (+5V IN)	Control power 5 VDC input • Connect external power 5 VDC.	
37	24 VDC ground (G24V)	Ground for control power 24 VDC • Use as common terminal of control output (ex. alarm).	

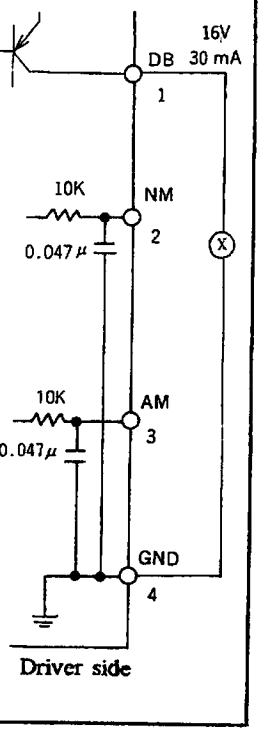
Note 1: Do not supply this 5 VDC to any external equipment as it may cause damage of internal element(s).

Note 2: Be sure to connect 24 VDC ground (G24V).

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5-1-6 Specifications of Dynamic Brake Signal and Monitor Output

■ Specifications of interface

Pin No.	Signal name	Functions	Interface
1	Dynamic brake signal output (DB)	Timing signal to actuate dynamic brake. At normal operation, this terminal outputs 16 V (allowance current 30 mA) voltage.	
2	Speed monitor output (NM)	Current speed is output by analog in real time. At 0 rpm, this terminal outputs 2.5 V and 0.5 V output is equivalent to 1000 rpm. (resolution = 40 rpm) [Ex.] When number of rotation is 3000 rpm: +3000 rpm (CCW) ... 4.0 V - 3000 rpm (CW) ... 1.0 V	
3	Current monitor output (AM)	Motor current is output by analog in real time. At 0 A of motor current, the terminal outputs 2.5 V and 0.5 V output is equivalent to the motor rated current. [Ex.] When rated torque (rated current) is generated: + rated torque ... 3.0 V - rated torque ... 2.0 V	
4	Ground (GND)	Ground for DB, NM, and AM.	

Note: There is allowance of approx. ±10% in NM.
AM, peak torque display (LP), and actual torque display (LE) monitor command current value. Therefore, these values have allowance of approx. ±20% against actual output torque and this amount should be considered only for reference.

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5-1-7 Parameter Table

■ User parameter table

PRM No.	Driver type	Parameter name	Default value	Unit	Setting range	Description
0	A, P	Speed loop proportional gain	100		0 to 254	Fine adjustment taking 100 as center value.
1	A, P	Speed loop integer gain	100		0 to 254	
2	A, P	Position loop proportional gain	100		0 to 254	
3	A, P	Torque limit value	50		0 to 100	"100" as instantaneous max. torque.
4	P	Position loop FF gain	0	%	0 to 100	FF amount ratio against speed command value.
5	P	Positioning completion range	3	± pulse	0 to 127	Set number of pulses at 8000 pulse/rev.
6	A	Speed command scale	100	%	83 to 167	Set rpm at 10 V input with a ratio against 3000 rpm.
7	A	Inside 1st speed	0	10 rpm	- 300 to + 300	- 3000 to + 3000 rpm (Setting value × 10 rpm)
9	A	Inside 2nd speed	0	10 rpm	- 300 to + 300	
11	A	Speed command offset	0		- 63 to + 63	Adjust command voltage between ± 0.2V. (divide ± 0.2 V into ± 63.)
20	A, P	Inertia ratio	3	times	0 to 10	Automatically set each gain to its center value.
21	P	Electronic gear multiplier (G1)	1000	times	1 to 9999	Setting range: $\frac{1}{50} \leq \frac{G1}{G2} \leq 50$
22	P	Electronic gear multiplier (G2)	1000	times	1 to 9999	
23	A	Soft start acceleration time	10	0.1 sec.	0 to 99	Acceleration time from 0 to + 3000 rpm.
24	A	Soft start deceleration time	10	0.1 sec.	0 to 99	Deceleration time from + 3000 to 0 rpm.

Note 1: Driver type: "A" as analog input type, "P" as pulse train input type (changeable by PRM No.81)
Note 2: No. 0 to 11 parameters are settable regardless of servo ON and OFF conditions.
Note 3: No. 20 to 24 parameters are settable only at servo OFF (RUN signal is OFF).
Note 4: No. 6 (speed command scale) can be adjusted between ± 2490 to ± 5010 rpm at ± 10 V speed command input. However, the driver detects over speed at more than ± 4000 rpm and stops rotation.
Note 5: Meaningless parameters will be skipped automatically.
(Eg.: When analog input type is selected, electronic gear ratio parameter will be automatically skipped.)
Note 6: User parameters No. 0 to 24 are protect available.

■ Set up parameter table

PRM No.	Driver type	Parameter name	Default value	Description
81	A, P	Designate driver type	0	0: A; Analog input type 1: P; Pulse train input type
82	P	Designate input type	0	0: Forward pulse/reverse pulse 1: Feed pulse/back-and-force signal 2: 90° pulse signal
83	A	Designate rotation direction	0	0: Forward rotation with + voltage 1: Reverse rotation with + voltage
84	A	Designate soft start input	0	0: Operation in accordance with speed command (REF). 1: Soft start operation in accordance with speed command (REF). 2: Soft start operation in accordance with inside setting speed.
85	A, P	Designation of treatment at error.	0	0: Dynamic brake ON, servo brake OFF. 1: Dynamic brake ON, servo brake ON. Note 2
86	A, P	Designation of encoder output	0	0: 2000 ppr 1: 1000 ppr
87	A, P	Initialize parameter	0	0 to 98, 100 to 255: Invalid 99: Set all parameters to default value (set condition at delivery). Even protected parameters are released and enter initial values. After initializing, display returns to 0 from 99.

Note 1: No.81 to 87 set up parameters do not effect protect function.
Note 2: Servo brake effects brake with supply speed command value "0" for 0.5 sec. at switch OFF RUN signal.

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Chapter 5. Specifications

5-2 Specifications of Motor

5-2-1 Specifications of Servo Motor

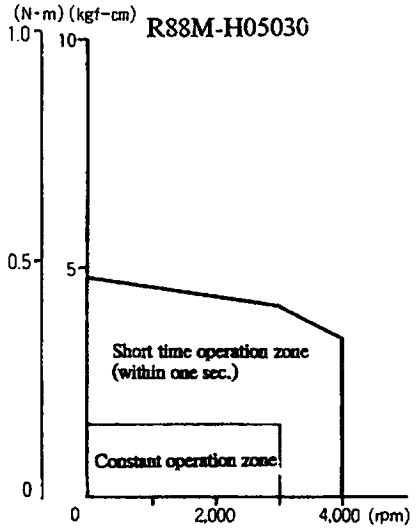
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Rated output power	W	50	100	200	300	500	750	1100
Rated torque	kgf•cm	1.62	3.25	6.50	9.74	16.2	24.4	35.7
	N • m	0.16	0.32	0.64	0.95	1.59	2.39	3.50
Rated speed	rpm	3000	3000	3000	3000	3000	3000	3000
Instantaneous max. speed	rpm	4000	4000	4000	4000	4000	4000	4000
Instantaneous max. torque	kgf • cm	4.86	9.74	19.5	29.2	48.6	73.2	88
	N • m	0.48	0.95	1.91	2.86	4.76	7.17	8.62
Rotor inertia	kgf•cm•S^2	1.4×10^{-4}	2.2×10^{-4}	4.5×10^{-4}	6.6×10^{-4}	26×10^{-4}	42×10^{-4}	58×10^{-4}
	kg•m^2 ($\frac{GD^2}{4}$)	0.14×10^{-4}	0.22×10^{-4}	0.44×10^{-4}	0.65×10^{-4}	2.5×10^{-4}	4.1×10^{-4}	5.7×10^{-4}
Torque constant	kgf•cm/A	2.2	3.6	4.4	5.0	4.4	4.8	6.0
	N•m/A	0.22	0.35	0.43	0.49	0.43	0.47	0.59
Induction voltage constant	V/rps	1.4	2.2	2.7	3.1	2.7	3.0	3.7
Power rate	kW/s	1.8	4.7	9.1	14	9.7	14	21
Mechanical time constant	ms	6.9	2.7	2.3	1.7	2.2	1.4	1.3
Coil resistance	Ω	24	16	10	6.1	1.6	0.74	0.80
Coil inductance	mH	51	43	38	28	10	6.6	6.9
Electrical time constant	ms	2.1	2.7	3.8	4.5	6.5	9.0	8.6
Weight	kg	0.9	1.1	1.8	2.2	4.3	5.6	6.8
Ambient operating condition	°C %RH	Temperature: 0 to 40°C Humidity: 35 to 85%RH (without dew condensation)						
Storage condition	°C %RH	Temperature: - 10 to +75°C Humidity: 35 to 85%RH (without dew condensation)						
Operating atmosphere		Without corrosive gases						
Installation direction		Each direction						
Insulation class		Item B						
Structure		Totally-closed, self-cooling						
Dustproof structure		IP-52 (IP-54 is available as option. However, it is not available at water soluble coolant.)						
Vibration class		V-15						

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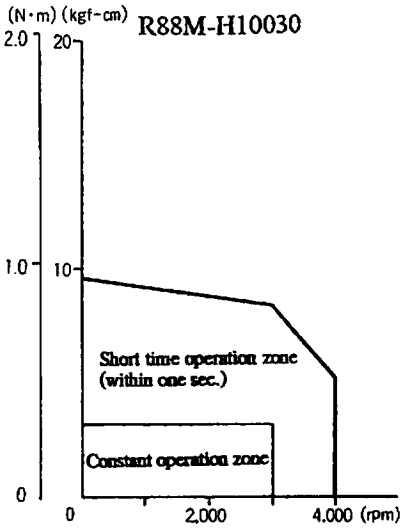
5-2-2 Servo Motor Torque/Speed Characteristic

■ Characteristic curve (tested with the standard cable 3m)

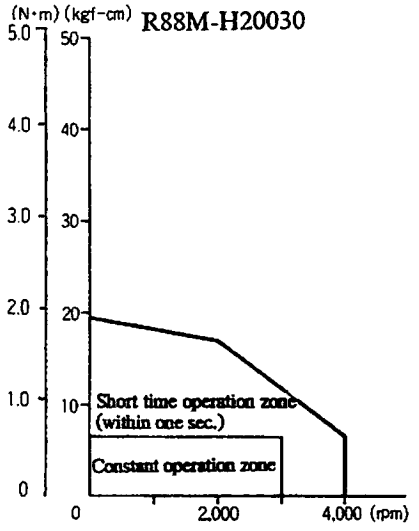
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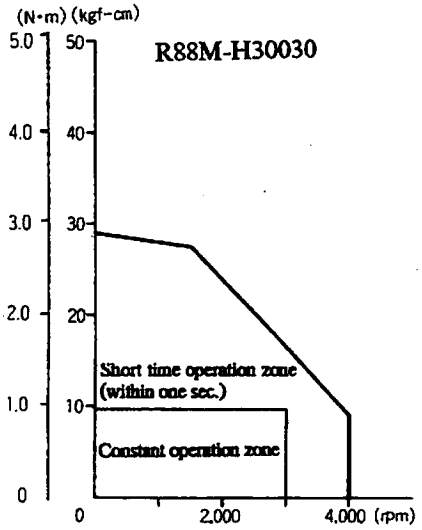
R88M-H10030



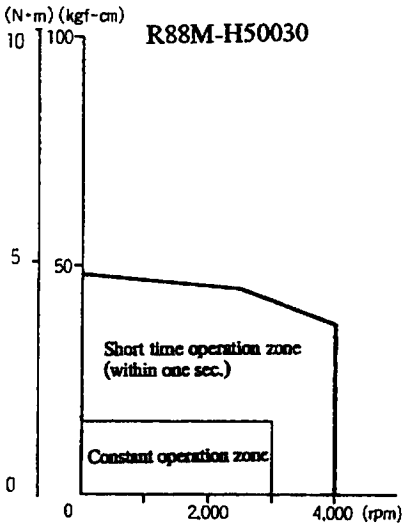
R88M-H20030



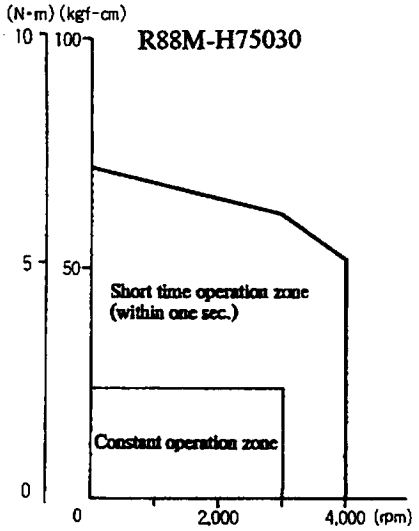
R88M-H30030



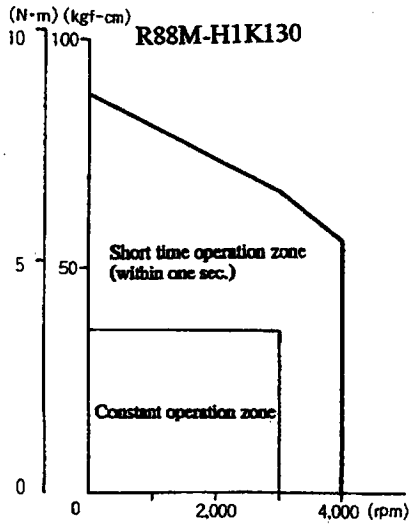
R88M-H50030



R88M-H75030



R88M-H1K130



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5-2-3 Servo Motor Environmental Characteristic

■ Radiation condition of AC servo motor

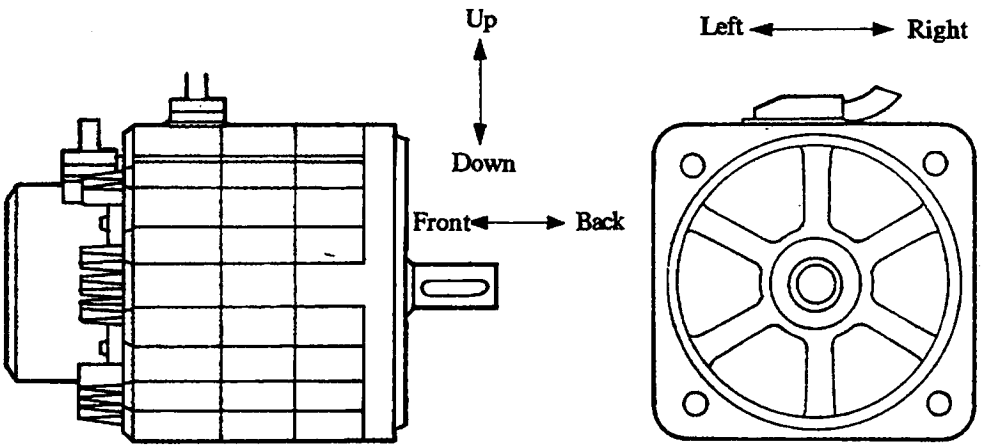
In case of continuous operation at the rated torque, the following radiation fins - or larger - are necessary on the motor flange.

R88M-H05030	Thickness: 6 (6) mm, area: 150 (250) mm^2 aluminum plate or equivalent
R88M-H10030	Thickness: 6 (6) mm, area: 150 (250) mm^2 aluminum plate or equivalent
R88M-H20030	Thickness: 6 (6) mm, area: 250 (350) mm^2 aluminum plate or equivalent
R88M-H30030	Thickness: 6 (6) mm, area: 250 (350) mm^2 aluminum plate or equivalent
R88M-H50030	Thickness: 12 (12) mm, area: 250 (350) mm^2 aluminum plate or equivalent
R88M-H75030	Thickness: 12 (12) mm, area: 250 (350) mm^2 aluminum plate or equivalent
R88M-H1K130	Thickness: 12 (12) mm, area: 250 (350) mm^2 aluminum plate or equivalent

[Note] Above recommendations are at condition of horizontal installation without blockage obstacles around the motor.
( ) is radiation condition of brake built-in motor.

■ Vibration proof characteristic

OMNUC H series AC servo motor is durable against 2G every directions while installing the motor as its shaft directing in horizontal direction.



■ Shockproof characteristic

OMNUC H series AC servo motor can withstand a 10G vertical shock three times when it is installed directing its shaft in horizontal direction.

[Caution] Do not remove the encoder cover or disassemble the AC servo motor.

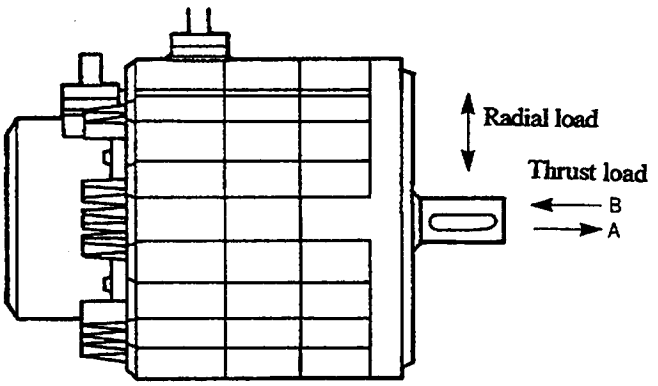
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5-2-4 Allowable Load to Servo Motor Axis

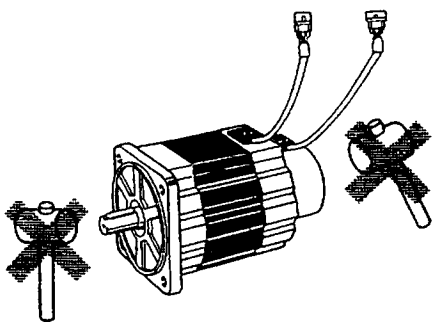
Allowable radial and thrust load to motor axis are as follows:

Motor model	Instantaneous max. radial load (Static pressure)		Instantaneous max. thrust load (Static pressure)				Allowable radial load		Allowable thrust load			
			A		B				A		B	
	(kgf)	(N)	(kgf)	(N)	(kgf)	(N)	(kgf)	(N)	(kgf)	(N)	(kgf)	(N)
R88M-H05030	15	147	20	196	20	196	10.5	103	3.0	29	3.0	29
R88M-H10030	15	147	20	196	20	196	11.5	113	3.0	29	3.0	29
R88M-H20030	35	343	28	275	28	275	19.0	186	8.0	78	7.5	74
R88M-H30030	35	343	28	275	28	275	20.0	196	8.0	78	7.5	74
R88M-H50030	65	637	50	490	50	490	36.0	353	12.0	118	11.0	108
R88M-H75030	65	637	50	490	50	490	38.0	373	12.0	118	11.0	108
R88M-H1K130	85	834	50	490	50	490	45.0	441	15.0	147	13.0	127

(1) Above allowable radial load are values at the center of the axis (one second of shaft length).
(2) Thrust load value varies with load directions.
(3) The above allowable load values are defined according to the target life of 30,000 hours.



[Caution] Never give mechanical stress to a motor body and its output shaft by hammer, etc. as bearing for motor shaft may be damaged.



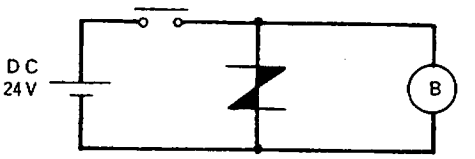
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Chapter 5. Specifications

5-2-5 Specifications of Electromagnetic Brake

Brake release voltage is 24VDC without polarity.
The electromagnetic brake releases when 24VDC is applied to the line.
The purpose for this brake is to hold axis at stop condition, not to stop the axis. Thus, release the brake with the release voltage ON while in operation of the motor. Note that the brake inertia should be added to the load inertia.

• Electromagnetic brake circuit
In order to protect the circuit from surge noise at electromagnetic brake excitation OFF, be sure to insert a surge killer. To select surge killer, see the table below:



Type	Model	Mfg.	Application
Thyrister	C-5A3	ISHIZUKA ELECTRONICS CORP.	24 VDC
Thyrister	V-3		24 VDC
Varistor	Z15L470		24 VDC
Varistor	ERZ-C14DK470	MATSUSHITA ELECTRONICS COMPONENTS CO., LTD.	24 VDC
Surge killer	CR50500	OKAYA ELECTRIC INDUSTRIES.CO., LTD.	Compatible AC and DC

• Specifications of build-in brake motor

[Motor specifications]

Item	Unit	R88M-H05030-B	R88M-H10030-B	R88M-H20030-B	R88M-H30030-B	R88M-H50030-B	R88M-H75030-B	R88M-H1K130-B
Rotor inertia	kgf•cm•S^2	1.4×10^{-4}	2.2×10^{-4}	4.5×10^{-4}	6.6×10^{-4}	26×10^{-4}	42×10^{-4}	58×10^{-4}
	kg•m^2($\frac{GD^2}{4}$)	0.14×10^{-4}	0.22×10^{-4}	0.44×10^{-4}	0.65×10^{-4}	2.5×10^{-4}	4.1×10^{-4}	5.7×10^{-4}
Weight (with brake)	kg	1.4	1.6	2.6	3.0	6.5	7.8	9.0

[Brake specifications]

Item	Unit	R88M-H05030-B	R88M-H10030-B	R88M-H20030-B	R88M-H30030-B	R88M-H50030-B	R88M-H75030-B	R88M-H1K130-B
Inertia	kgf•cm•S^2	0.2×10^{-4}		0.5×10^{-4}		5×10^{-4}		
	kg•m^2($\frac{GD^2}{4}$)	0.02×10^{-4}		0.05×10^{-4}		0.5×10^{-4}		
Excitation voltage	V	24 VDC ± 10%						
Power consumption (at 20°C)	W	10		11		22		
Static friction torque	kgf•cm	5 or up		15 or up		55 or up		
	N•m	0.5 or up		1.5 or up		5.4 or up		
Braking time constant	msec	(50)		(50)		(50)		
Release time constant	msec	(30)		(50)		(50)		
Allowable work (1)	kgf•m/time	15		20		60		
Allowable work (2)	kgf•m/life	1×10^4		1×10^4		6×10^4		
Backlash	deg	(± 1.2°)		(± 0.9°)		(± 0.7°)		
Rated	-	Continuous rating						
Insulation class	-	Item F						

Note: Values indicated in parentheses are not guaranteed.

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Chapter 5. Specifications

5-3 Specifications of Cable

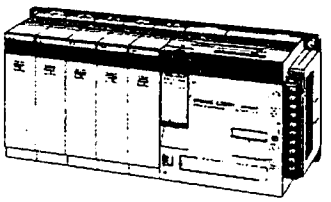
5-3-1 Positioner Connection Cable (Connect to driver CN1)

(1) General use control cable

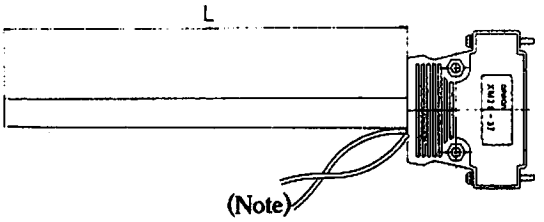
■ Cable type

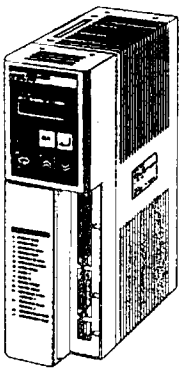
Model	Length (L)	Sheath outside diameter
R88A-CPH001S	1 m	ø10.5
R88A-CPH002S	2 m	

■ Connection configuration



SYSMAC C200H/C200HS
Position control unit





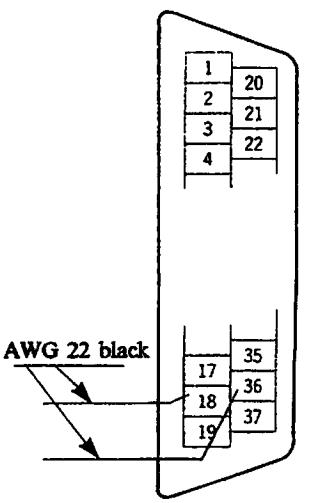
OMNUC H series
AC servo driver

■ Wiring

Pin No.	Insulator color	Marker color	Signal name	
			Analog	Pulse
1	Black	White	EGND	EGND
2	Green		+Z	+Z
3	Yellow	Black	-B	-B
4	Blue		+A	+A
5				
6	Amber		$\overline{EM}$	$\overline{EM}$
7				
8				
9				
10	D. green	Black	VSEL	ECRST
11	Sky blue		SST	HRET
12	Pink	Black	PLOCK	IPG
13	Pink		RUN	RUN
14	Purple *			+CCW
15	Brown			+CW
16	White	Black	SREF	
17	White		REF	
18			+5VOUT	+5VOUT
19	Red		+24VIN	+24VIN
20	Green	Black	-Z	-Z
21	Yellow		+B	+B
22	Blue	Black	-A	-A
23				
24				
25				
26	(Shield)		FG	FG
27	D. green		$\overline{ALM}$	$\overline{ALM}$
28	Amber	Black	PLOUT	INP
29				
30	Purple *		RESET	RESET
31	Gray	Black	MING	MING
32	Sky blue	Black	CLIM	CLIM
33	Purple	Black		-CCW
34	Brown	Black		-CW
35	Gray		AGND	
36	Red	Black	+5V IN	+5V IN
37	Black		GND24V	GND24V

Cable: AWG24 × 5P + AWG24 × 17C

Arrangement of connector pin



Connector plug: **XM2A-3701** (OMRON)
Connector housing: XM2S-3711 (OMRON)

Note 1: In case of using the driver with 24 V power, short circuit AWG22 (black wire).
Note 2: Both pin No.14 and No.30 are purple colored. However, No.14 is twisted lines. No. 30 is single line. Be sure to distinguish between them as these have different functions.
Note 3: This cable has two lines of black colored wire for buffering.

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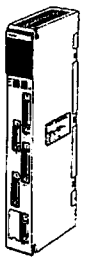
(2) Cable for CV500-MC221/421

■Cable type

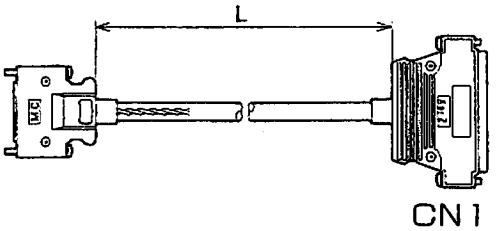
	Model	Length(L)	Sheath outside diameter
single-axis	R88A-CPH001M1	1m	ϕ8.3
	R88A-CPH002M1	2m	

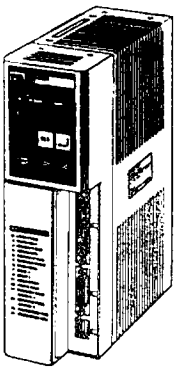
	Model	Length(L)	Sheath outside diameter
double-axis	R88A-CPH001M2	1m	ϕ8.3
	R88A-CPH002M2	2m	

■Connection configuration (for single-axis)



CV500-MC221/421





OMNUC H series
AC servo driver

■Wiring (for single-axis)

CV500-MC221/421

Sign	Insulator color /Marker color	No.
+24V		1
DCGND		2
XALM	Black/White	3
XRUN	Gray	4
XALMRS	Purple	5
X-GND	White/Green	10
X-A	Blue	11
X-$\overline{A}$	Amber	12
X-B	Pink	13
X-$\overline{B}$	Sky blue	14
X-Z	Yellow	15
X-$\overline{Z}$	Brown	16
XOUT	White/Red	17
XAGND	White/Blue	18
+F24V	Red	19
FDC GND	Black	20
YALM	Black/White	21
YRUN	Gray	22
YALMRS	Purple	23
Y-GND	White/Green	28
Y-A	Blue	29
Y-$\overline{A}$	Amber	30
Y-B	Pink	31
Y-$\overline{B}$	Sky blue	32
Y-Z	Yellow	33
Y-$\overline{Z}$	Brown	34
YOUT	White/Red	35
YAGND	White/Blue	36

Connector plug:
10136-3000VE (SUMITOMO 3M)
Connector housing:
10336-52A0-008 (SUMITOMO 3M)

AWG20 red
AWG20 black
(plug frame)

Cable:
AWG24×6C+AWG24×5P

OMNUC H series
AC servo driver

No.	Sign
18	+5VOUT
36	+5VIN
27	$\overline{ALM}$
13	RUN
30	RESET
1	EGND
4	+A
22	-A
21	+B
3	-B
2	+Z
20	-Z
17	REF
35	AGND
19	+24VIN
37	G24V
6	$\overline{EM}$

Connector plug:
XM2A-3701 (OMRON)
Connector housing:
XM2S-3711 (OMRON)

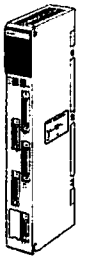
*1. Sign of controller side connector is described as "DRVX·Y" connector.
In case of "DRVZ·U" connector, the sign like as "X~" and "Y~" is altered "Z~" and "U~".

*2. Supply 24VDC to two cables (red ,black) drawed out from controller side connector.
(red:+24VDC , black:ground)

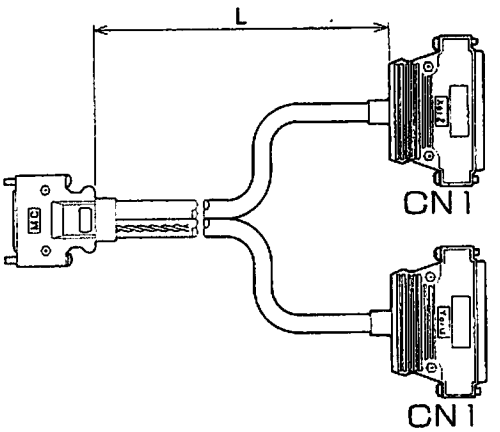
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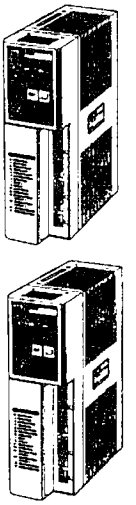
Chapter 5. Specifications

■Connection configuration (for double-axis)



CV500−MC221/421





OMNUC H series
AC servo driver

■Wiring (for double-axis)

CV500−MC221/421

Sign	Insulator color / Marker color	No.
+24V		1
DCGND		2
XALM	Black / White	3
XRUN	Gray	4
XALMRS	Purple	5
X−GND	White / Green	10
X−A	Blue	11
X−$\overline{A}$	Amber	12
X−B	Pink	13
X−$\overline{B}$	Sky blue	14
X−Z	Yellow	15
X−$\overline{Z}$	Brown	16
XOUT	White / Red	17
XAGND	White / Blue	18
+F24V	Red	19
FDC GND	Black	20
YALM	Black / White	21
YRUN	Gray	22
YALMRS	Purple	23
Y−GND	White / Green	28
Y−A	Blue	29
Y−$\overline{A}$	Amber	30
Y−B	Pink	31
Y−$\overline{B}$	Sky blue	32
Y−Z	Yellow	33
Y−$\overline{Z}$	Brown	34
YOUT	White / Red	35
YAGND	White / Blue	36

AWG20 red
AWG20 black

(plug frame)

(plug frame)

OMNUC H series
AC servo driver

No.	Sign
18	+5VOUT
36	+5VIN
27	$\overline{ALM}$
13	RUN
30	RESET
1	EGND
4	+A
22	−A
21	+B
3	−B
2	+Z
20	−Z
17	REF
35	AGND
19	+24VIN
37	G24V
6	$\overline{EM}$

No.	Sign
37	G24V
6	$\overline{EM}$
19	+24VIN
18	+5VOUT
36	+5VIN
27	$\overline{ALM}$
13	RUN
30	RESET
1	EGND
4	+A
22	−A
21	+B
3	−B
2	+Z
20	−Z
17	REF
35	AGND

*1. Sign of controller side connector is described as "DRVX · Y" connector.
In case of "DRVZ · U" connector, the sign like as "X～" and "Y～" is altered "Z～" and "U～".

*2. Supply 24VDC to two cables (red ,black) drawed out from controller side connector. (red:+24VDC , black:ground)

Connector plug:
10136−3000VE (SUMITOMO 3M)
Connector housing:
10336−52A0−008 (SUMITOMO 3M)

Cable:
AWG24×6C+AWG24×5P

Connector plug:
XM2A−3701 (OMRON)
Connector housing:
XM2S−3711 (OMRON)

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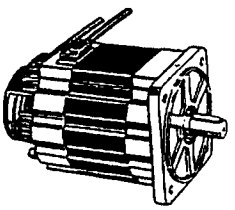
5-3-2 Encoder cable (Connect to driver CN2)

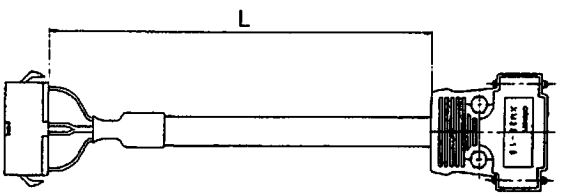
[Encoder connection cable for H series AC servo motor]

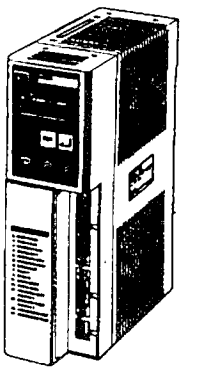
■ Cable type

Model	Length(L)	Sheath outside diameter
R88A-CRH001C	1m	φ 8.0
R88A-CRH003C	3m	
R88A-CRH005C	5m	
R88A-CRH010C	10m	
R88A-CRH015C	15m	
R88A-CRH020C	20m	
R88A-CRH030C	30m	

■ Connection configuration







OMNUC H series
AC servo motor encoder connector

CN2

OMNUC H series
AC servo driver

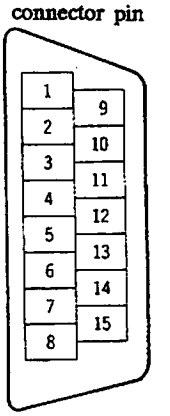
■ Wiring

No.	Sign
1	E5V
2	E0V
3	R G
4	S G
5	A +
6	A −
7	B +
8	B −
9	S +
10	S −

Red
Black
Gray
Green
Blue
Amber
Pink
Light blue
Yellow
Brown

No.	Sign
9	E5V
13	E0V
14	R G
15	S G
8	A +
7	A −
6	B +
5	B −
4	S +
3	S −

Arrangement of connector pin



Connector
(made by Japan Solderless Terminal)
SMP-10V-NC (Plug housing)
BHF-001GI-0.8BS (Contact socket)
Crimping tool: YC-12
Pull out tool: SMJ-06

Cable: AWG22 × 3P + 3C

Connector plug: XM2A-1501
(OMRON)
Connector housing: XM2S-1511
(OMRON)

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5-3-3 Power Cable (Connect to driver terminal block)

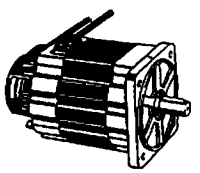
(1) Servo motor power line connection cable (without brake)

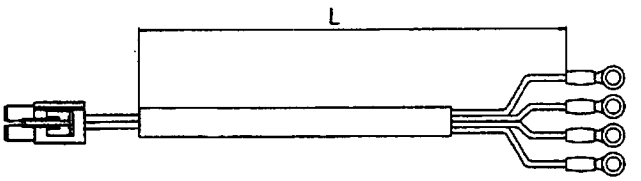
[Connection cable for H series AC servo motor]

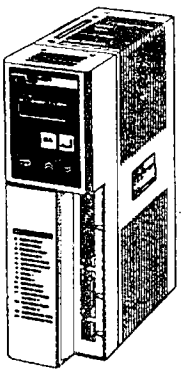
■ Cable type

Model	Length(L)	Line type	Sheath outside diameter
R88A-CAH001S	1m	AWG18	ϕ 7.0
R88A-CAH003S	3m		
R88A-CAH005S	5m		
R88A-CAH010S	10m		
R88A-CAH015S	15m	AWG16	ϕ 11.3
R88A-CAH020S	20m		
R88A-CAH030S	30m		

■ Connection configuration







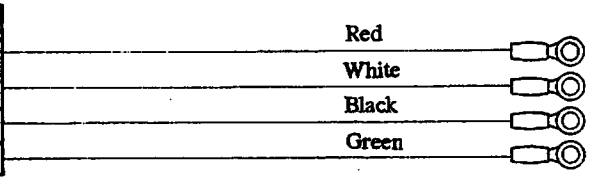
OMNUC H series
AC servo motor

Power connector

OMNUC H series
AC servo driver

■ Wiring

No.	Sign
1	A-phase
2	B-phase
3	C-phase
4	GR



Connector
(made by Japan Solderless Terminal)
LP-04-1 (Plug housing)
LLF-61T-2.0 (Contact socket)
Crimping tool: YC-9
Pull out tool: LEJ-20
Insertion tool: LIT-2013

Cable: AWG18 × 4
AWG16 × 4

Crimp-style terminal

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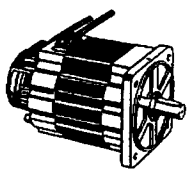
(2) Servo motor power line connection cable (with brake)

[Connection cable for H series AC servo motor]

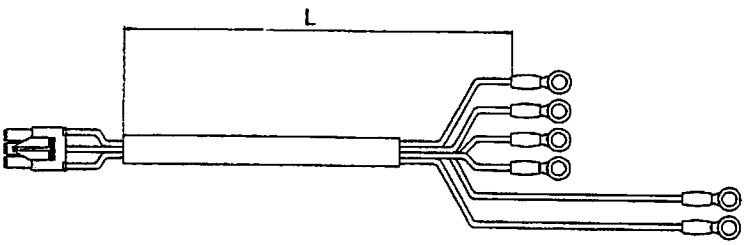
■ Cable type

Model	Length(L)	Line type	Sheath outside diameter
R88A-CAH001B	1m	AWG18	φ 8.3
R88A-CAH003B	3m		
R88A-CAH005B	5m		
R88A-CAH010B	10m		
R88A-CAH015B	15m	AWG16	φ 11.3
R88A-CAH020B	20m		
R88A-CAH030B	30m		

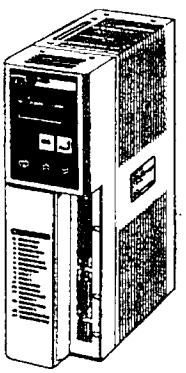
■ Connection configuration



OMNUC H series
AC servo motor
(with brake)



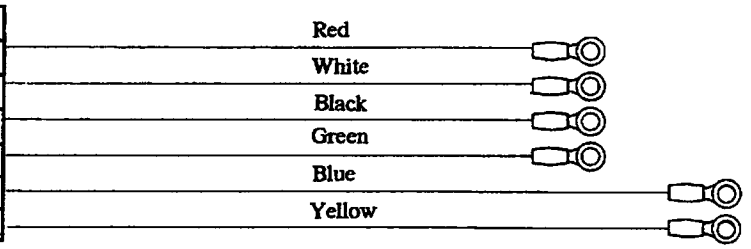
Power connector



OMNUC H series
AC servo driver

■ Wiring

No.	Sign
1	A-phase
2	B-phase
3	C-phase
4	GR
5	Brake
6	Brake

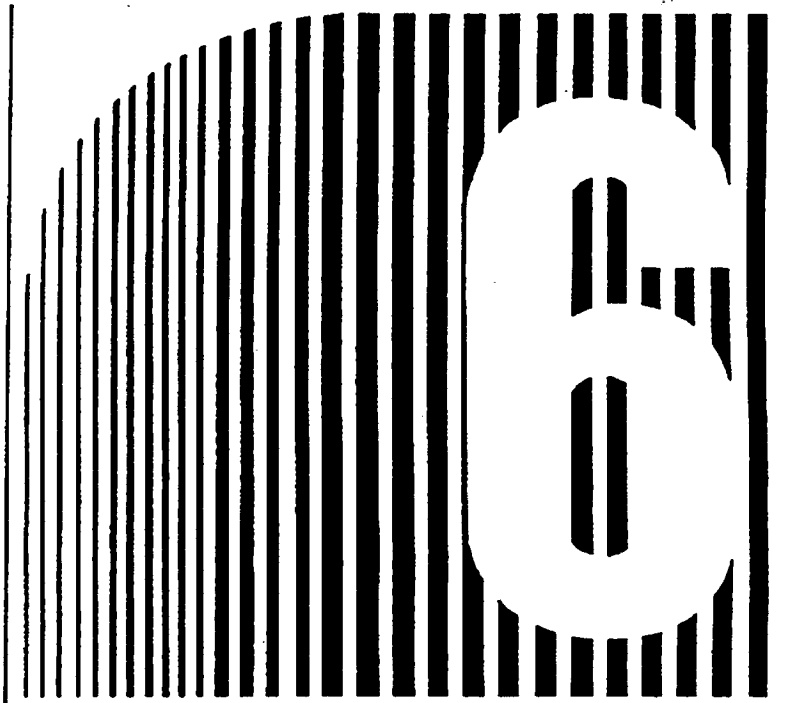


Connector
(made by Japan Solderless Terminal)
LP-06-1 (Plug housing)
LLF-61T-2.0 (Contact socket)
Crimping tool: YC-9
Pull out tool: LEJ-20
Insertion tool: LIT-2013

Cable: AWG18 × 6 or
AWG16 × 4 + AWG20 × 2

Crimp-style terminal

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Chapter 6

• Appendix •

6-1. Example of Connection

6-2. OMNUC H Series Article Model Table

6-3. OMNUC H Series Parameters Setting Table

6-4. Servo Connector Terminal Connection Unit

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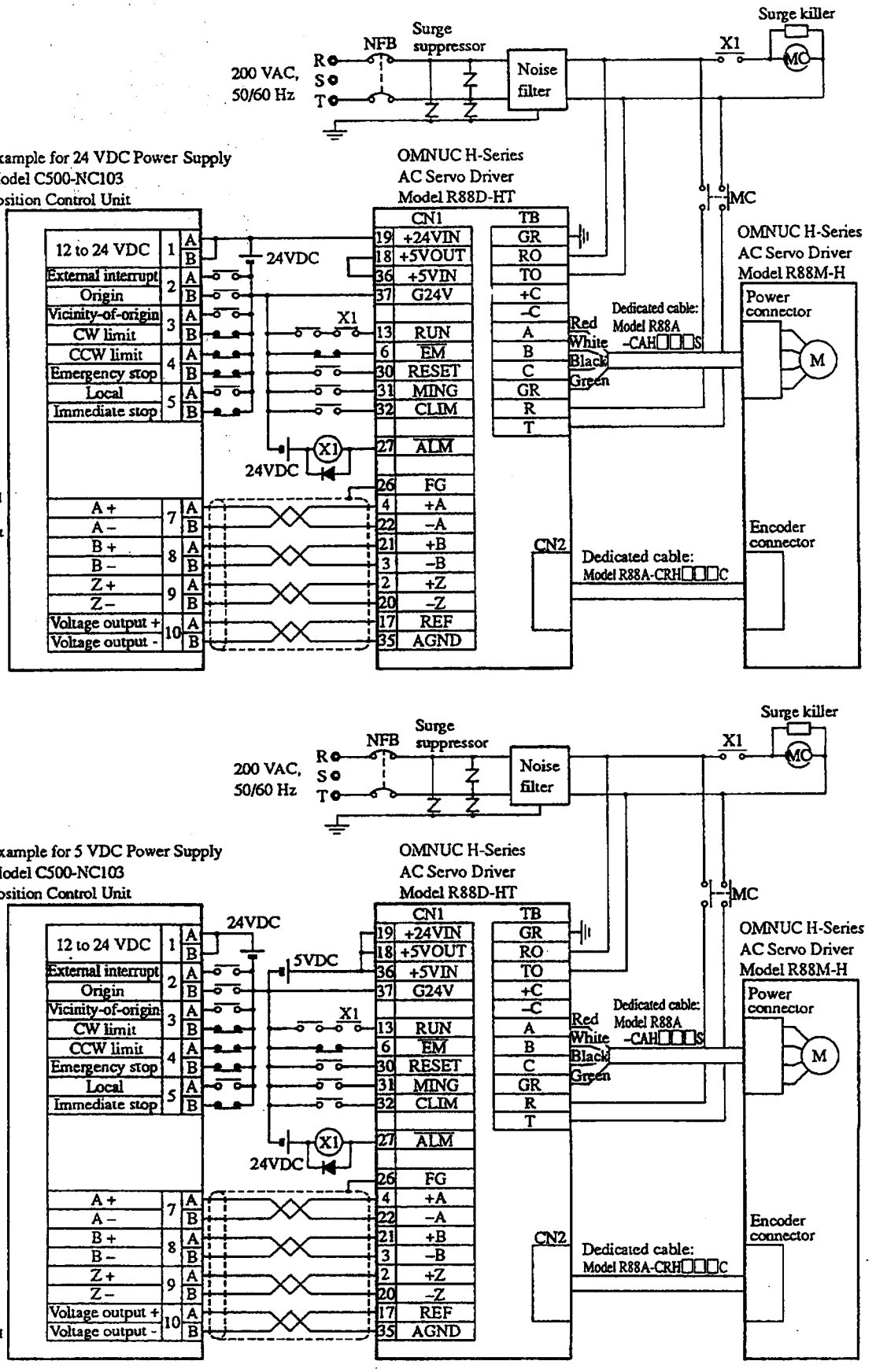
6-1 Example of Connection

■ Application Example 1

SYSMAC C500
NC Unit Model NC103

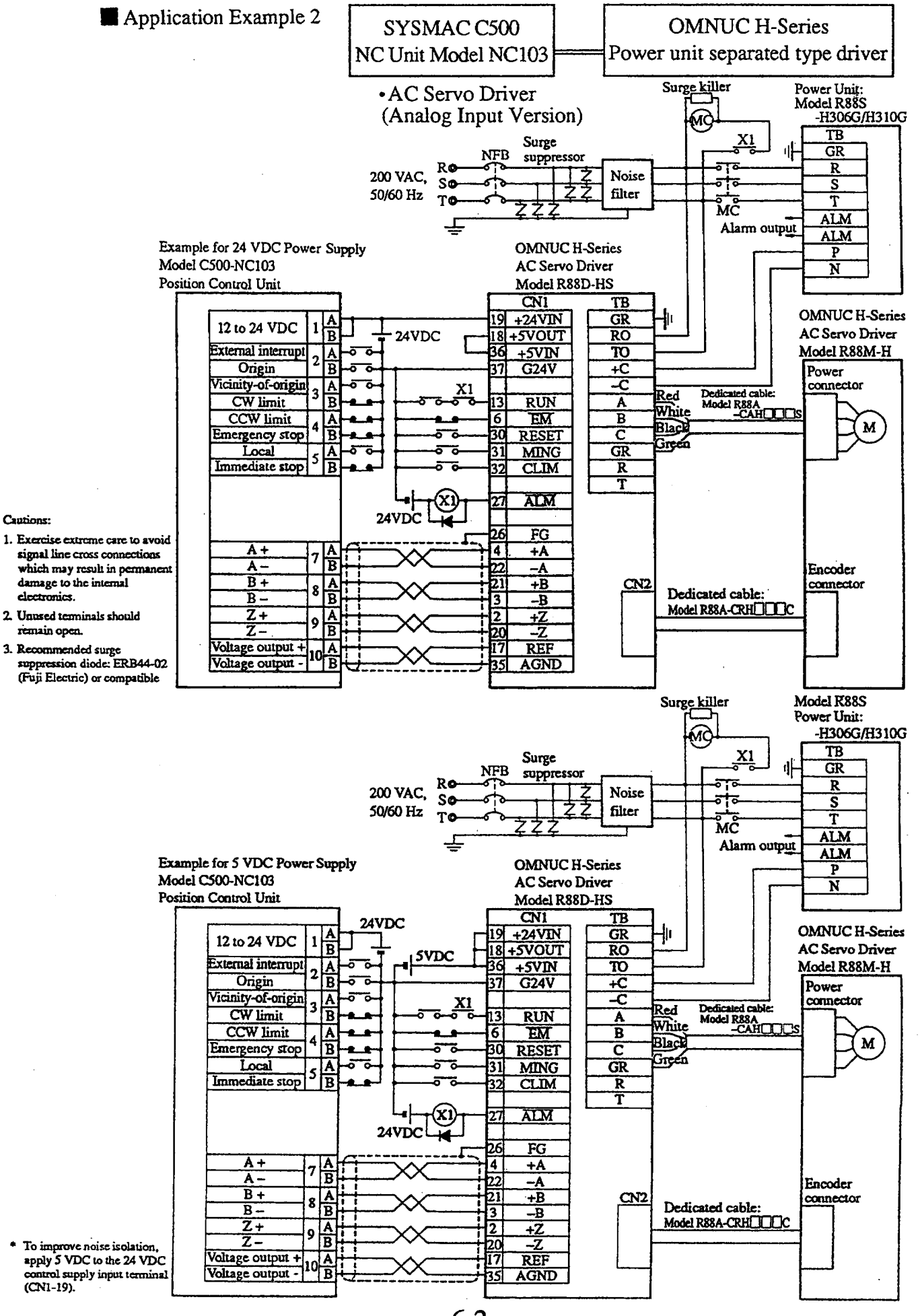
OMNUC H-Series
Power unit built-in driver

• AC Servo Driver (Analog Input Version)



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■ Application Example 2



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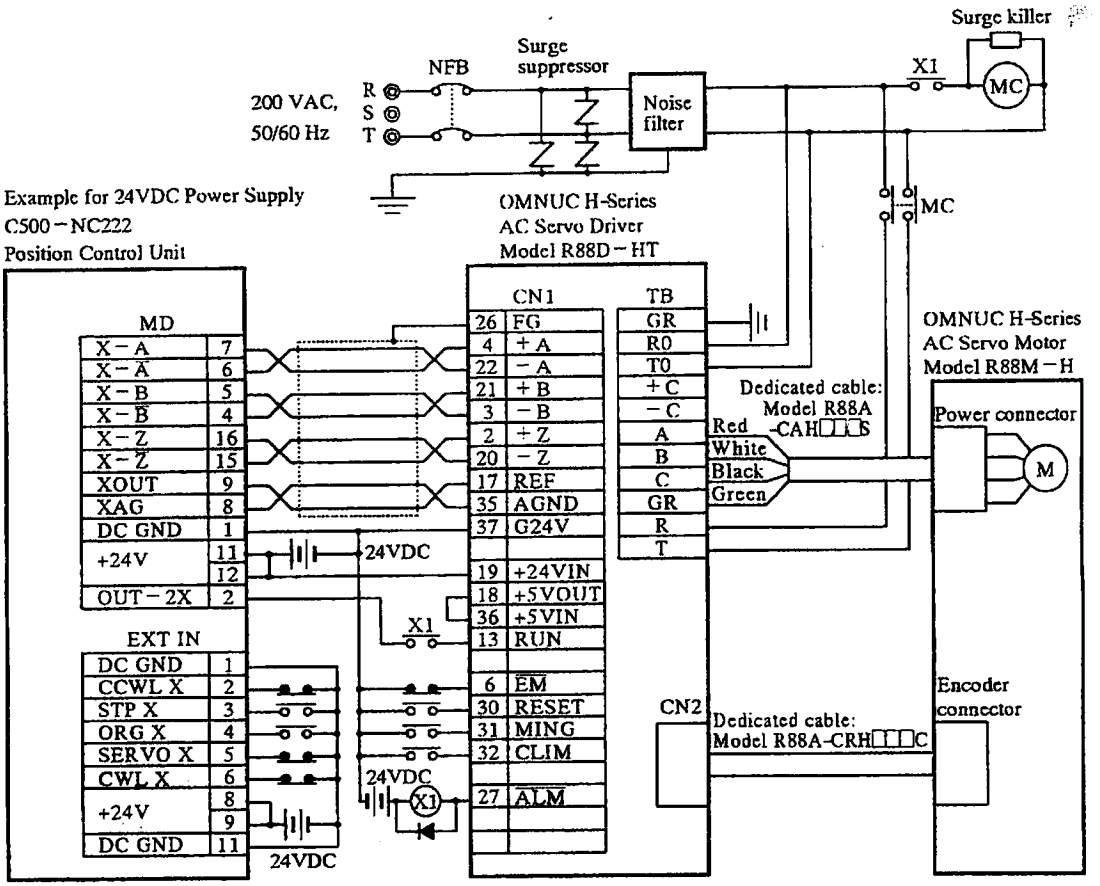
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■Application Example 3

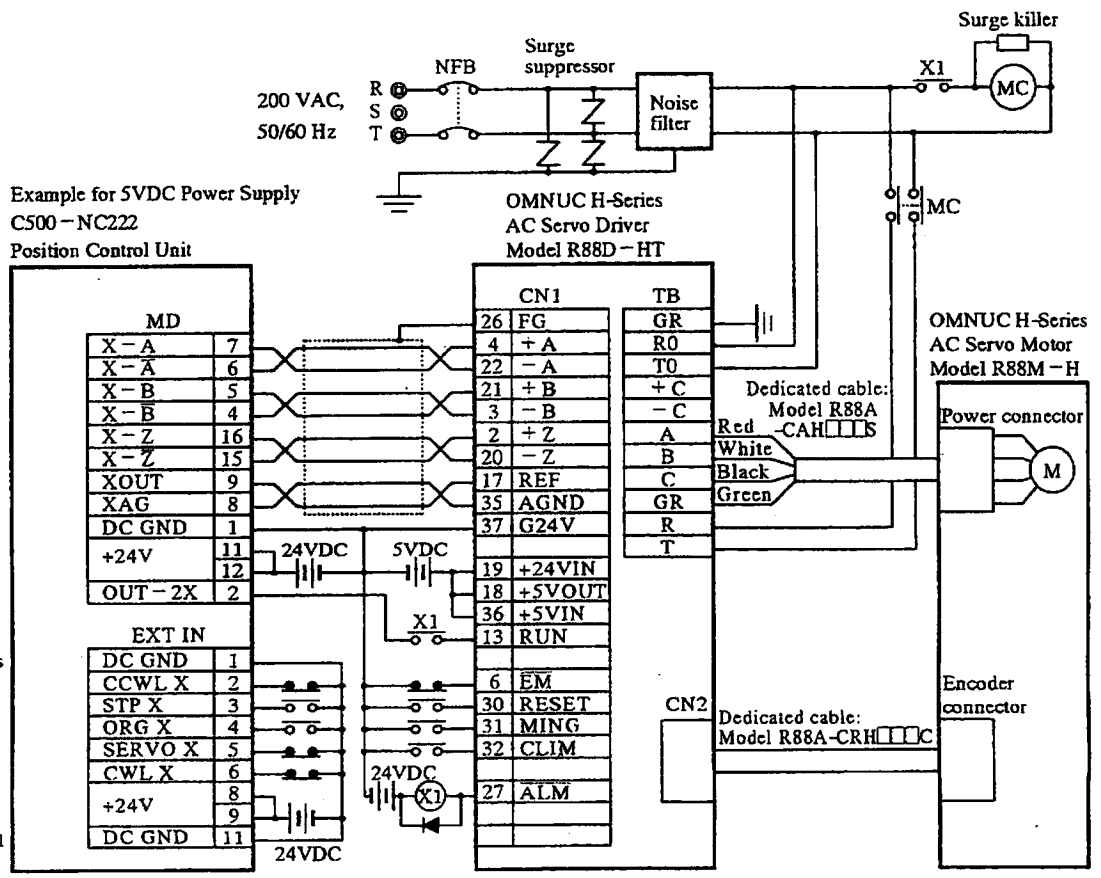
SYSMAC C500
NC Unit Model NC222
═══
OMNUC H-Series
Power unit built-in driver

•AC Servo Driver (Analog Input Version)

Cautions:
1. Exercise extreme care to avoid signal line cross connections which may result in permanent damage to the internal electronics.
2. Unused terminals should remain open.
3. Recommended surge suppression diode: ERB44-02(Fuji Electric) or compatible.
4. This example shows the connections for the X-axis control only. Two-axis control requires another driver and external input for the Y-axis.
5. External output 2(OUT-2X) is turned on and off with the external servo free input. The external output 2 at address No.420 (X axis) and 820 (Y axis) for the C500-NC222 should be set to "1" (OFF when servo free).
6. When the C500-NC222 is used in NC221 mode, the external servo free input acts as the emergency stop input. In this case, therefore, external output 2 is not usable as the RUN signal output. Apply the RUN signal through other I/O.



Cautions:
1. Exercise extreme care to avoid signal line cross connections which may result in permanent damage to the internal electronics.
2. Unused terminals should remain open.
3. Recommended surge suppression diode: ERB44-02(Fuji Electric) or compatible.
4. This example shows the connections for the X-axis control only. Two-axis control requires another driver and external input for the Y-axis.
5. External output 2(OUT-2X) is turned on and off with the external servo free input. The external output 2 at address No.420 (X axis) and 820 (Y axis) for the C500-NC222 should be set to "1" (OFF when servo free).
6. When the C500-NC222 is used in NC221 mode, the external servo free input acts as the emergency stop input. In this case, therefore, external output 2 is not usable as the RUN signal output. Apply the RUN signal through other I/O.
7. To improve noise isolation, aplly 5VDC to the 24VIN control supply input terminal (CN1-19).



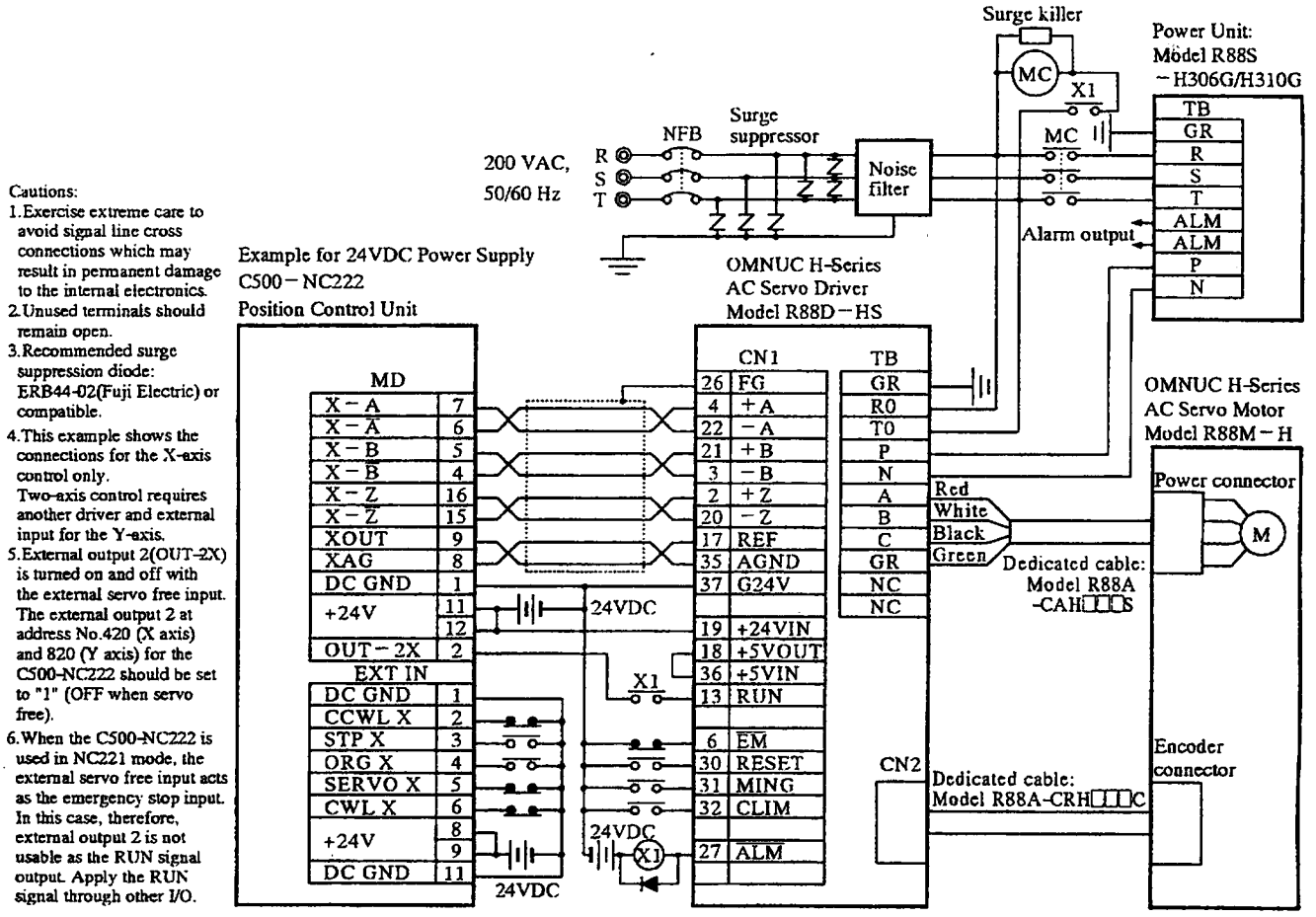
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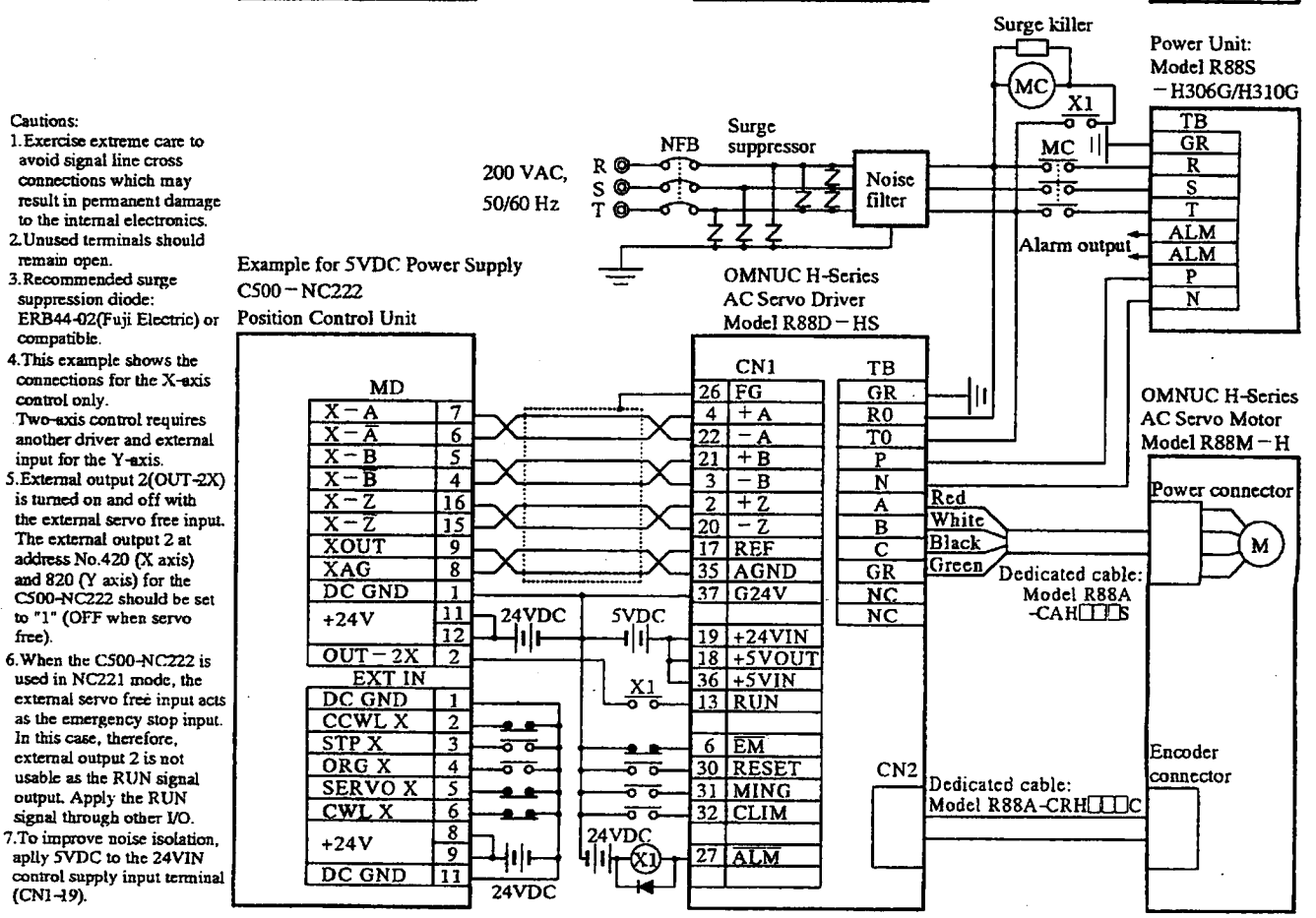
■Application Example 4

SYSMAC C500 NC Unit Model NC222 — OMNUC H-Series Power unit separated type driver

•AC Servo Driver (Analog Input Version)



Cautions:
1. Exercise extreme care to avoid signal line cross connections which may result in permanent damage to the internal electronics.
2. Unused terminals should remain open.
3. Recommended surge suppression diode: ERB44-02(Fuji Electric) or compatible.
4. This example shows the connections for the X-axis control only. Two-axis control requires another driver and external input for the Y-axis.
5. External output 2(OUT-2X) is turned on and off with the external servo free input. The external output 2 at address No.420 (X axis) and 820 (Y axis) for the C500-NC222 should be set to "1" (OFF when servo free).
6. When the C500-NC222 is used in NC221 mode, the external servo free input acts as the emergency stop input. In this case, therefore, external output 2 is not usable as the RUN signal output. Apply the RUN signal through other I/O.



Cautions:
1. Exercise extreme care to avoid signal line cross connections which may result in permanent damage to the internal electronics.
2. Unused terminals should remain open.
3. Recommended surge suppression diode: ERB44-02(Fuji Electric) or compatible.
4. This example shows the connections for the X-axis control only. Two-axis control requires another driver and external input for the Y-axis.
5. External output 2(OUT-2X) is turned on and off with the external servo free input. The external output 2 at address No.420 (X axis) and 820 (Y axis) for the C500-NC222 should be set to "1" (OFF when servo free).
6. When the C500-NC222 is used in NC221 mode, the external servo free input acts as the emergency stop input. In this case, therefore, external output 2 is not usable as the RUN signal output. Apply the RUN signal through other I/O.
7. To improve noise isolation, aplly 5VDC to the 24VIN control supply input terminal (CN1-19).

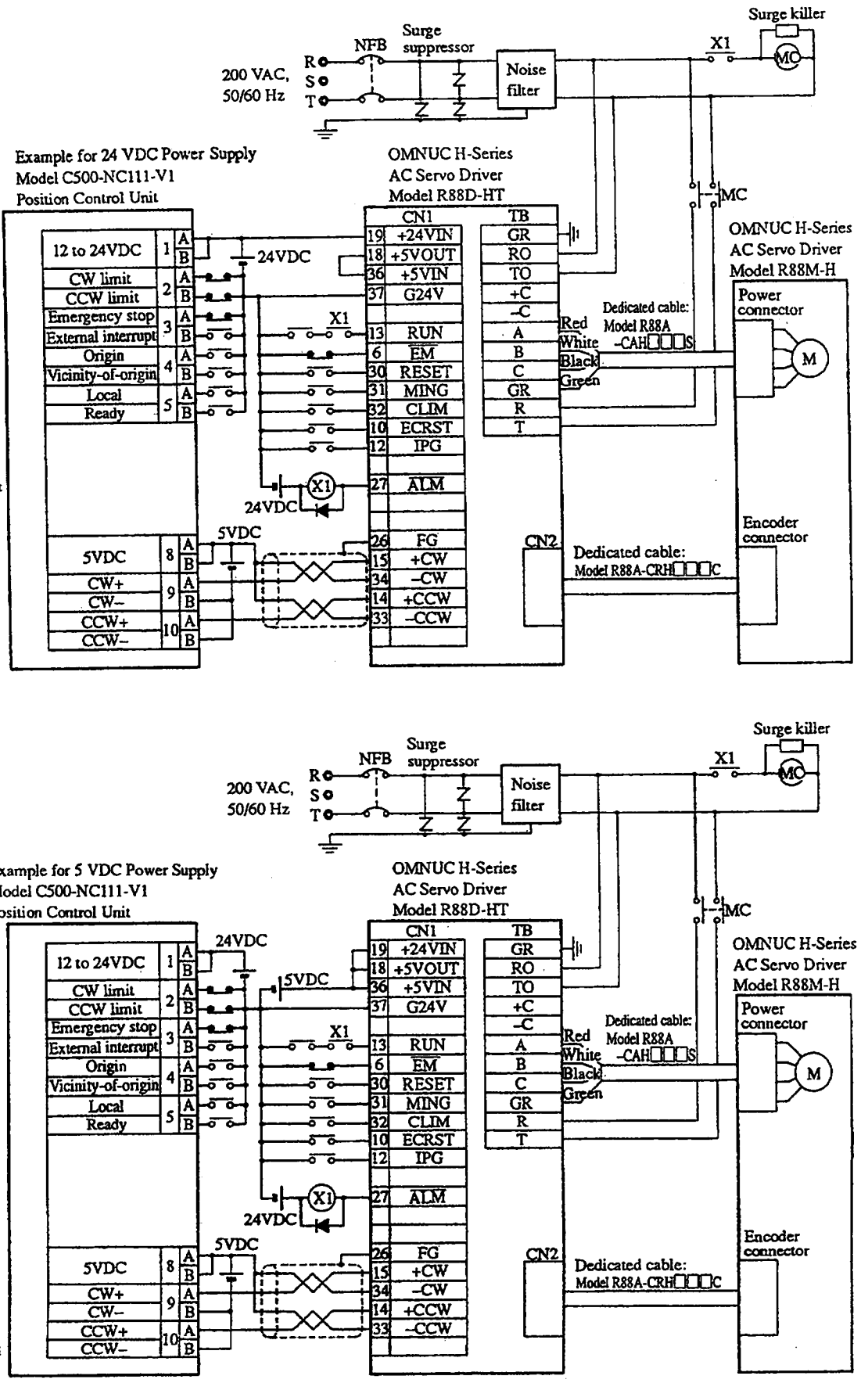
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■ Application Example 5

SYSMAC C500 NC Unit Model NC111-V1 — OMNUC H-Series Power unit built-in driver

• AC Servo Driver (Pulse Array Input Version)



Note:
The C500-NC111-V1 searches for the origin according to origin and vicinity-of-origin data. So it is necessary to define the origin and vicinity-of-origin in the mechanism system.
After the C500-NC111-V1 completes the origin search and stops the pulse output, a pulse array will still remain in the driver's internal deviation counter. The motor will continue until the entire residual pulse array is shifted out, causing a deviation from origin. To minimize this deviation, set the lower speed of origin search as low as possible.

Cautions:

1. Exercise extreme care to avoid signal line cross connections which may result in permanent damage to the internal electronics.
2. Unused terminals should remain open.
3. Recommended surge suppression diode: ERB44-02 (Fuji Electric) or compatible
4. Use an exclusive 24 VDC (5 VDC) power supply for command pulse input.

* To improve noise isolation, apply 5 VDC to the 24 VDC control supply input terminal (CN1-19).

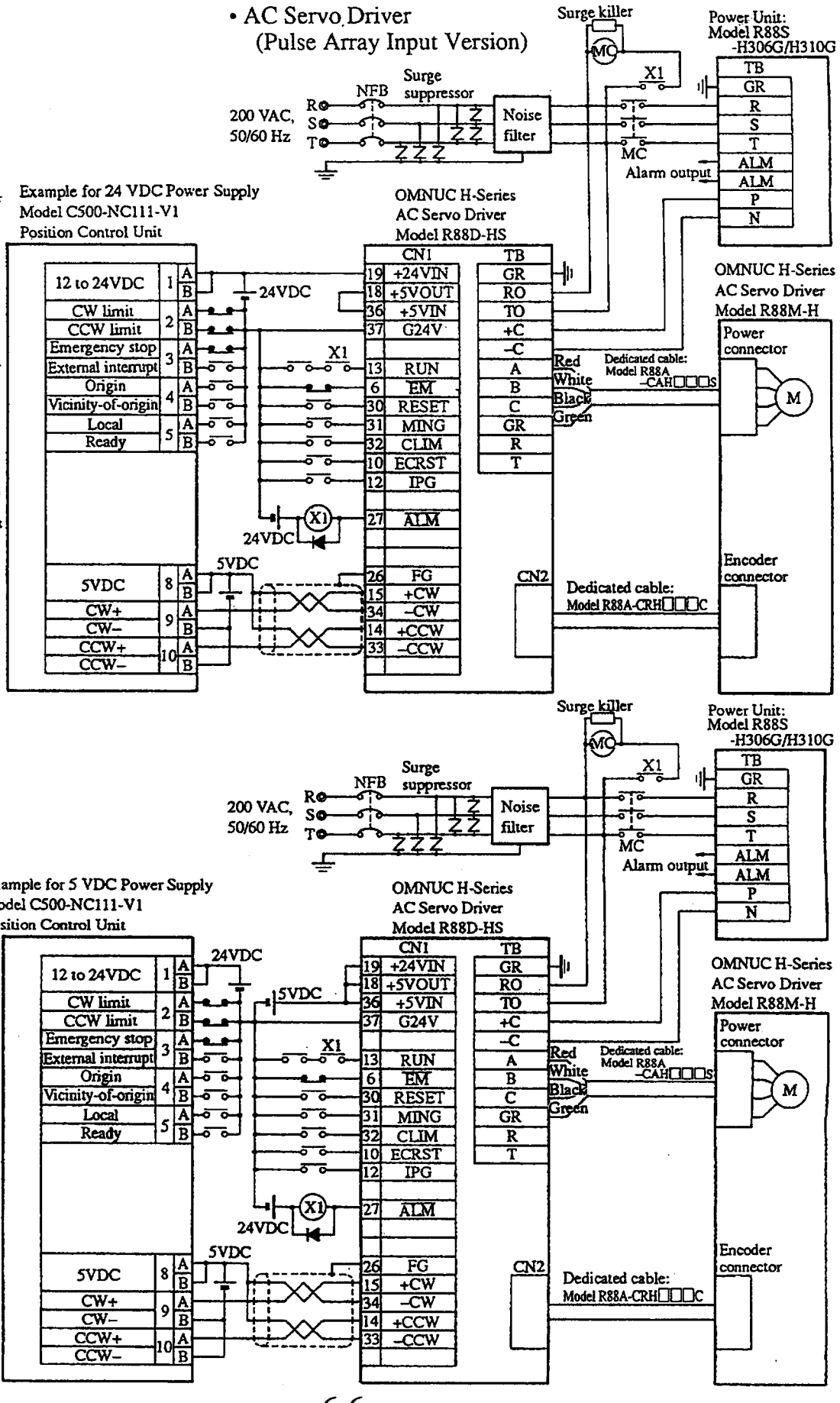
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■ Application Example 6

SYSMAC C500
NC Unit
Model NC111-V1

OMNUC H-Series
Power unit separated type driver

• AC Servo Driver
(Pulse Array Input Version)



Note:
The C500-NC111-V1 searches for the origin according to origin and vicinity-of-origin data. So it is necessary to define the origin and vicinity-of-origin in the mechanism system.
After the C500-NC111-V1 completes the origin search and stops the pulse output, a pulse array will still remain in the driver's internal deviation counter. The motor will continue until the entire residual pulse array is shifted out, causing a deviation from origin. To minimize this deviation, set the lower speed of origin search as low as possible.
Cautions:

1. Exercise extreme care to avoid signal line cross connections which may result in permanent damage to the internal electronics.
2. Unused terminals should remain open.
3. Recommended surge suppression diode: ERB44-02 (Fuji Electric) or compatible
4. Use an exclusive 24 VDC (5 VDC) power supply for command pulse input.

• To improve noise isolation, apply 5 VDC to the 24 VDC control supply input terminal (CN1-19).

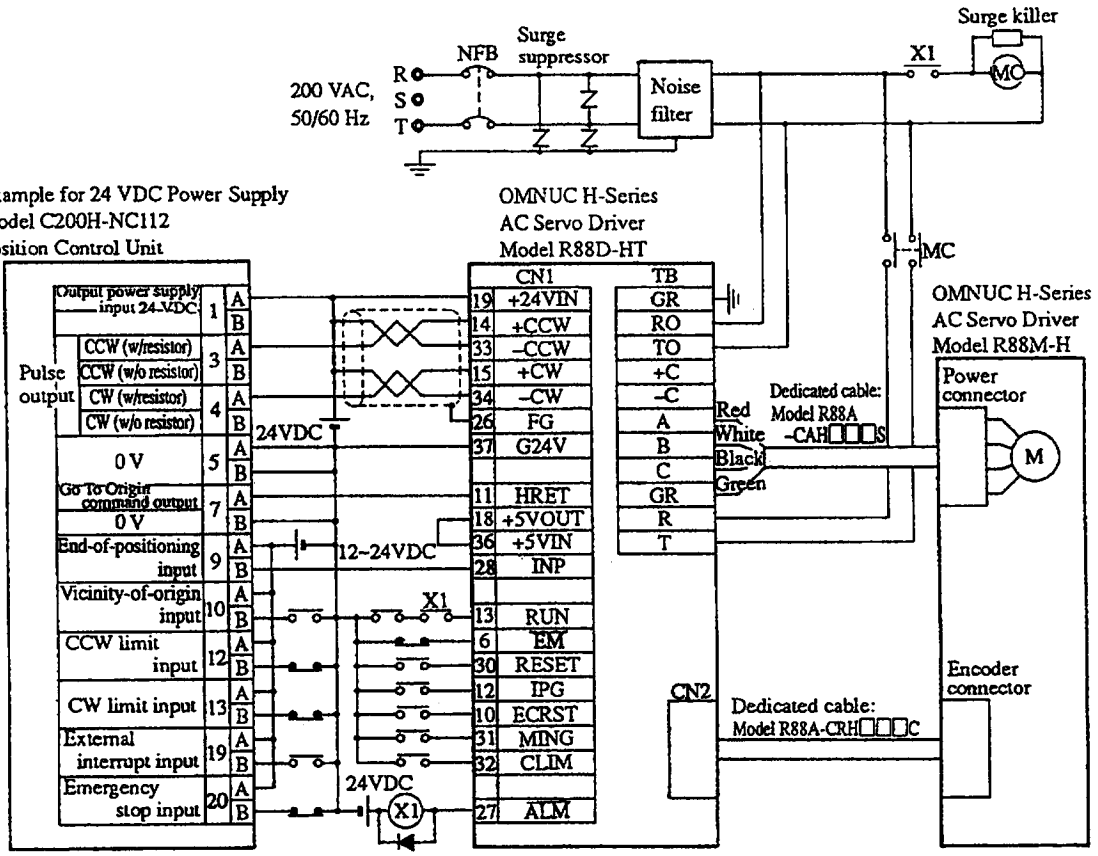
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■ Application Example 7

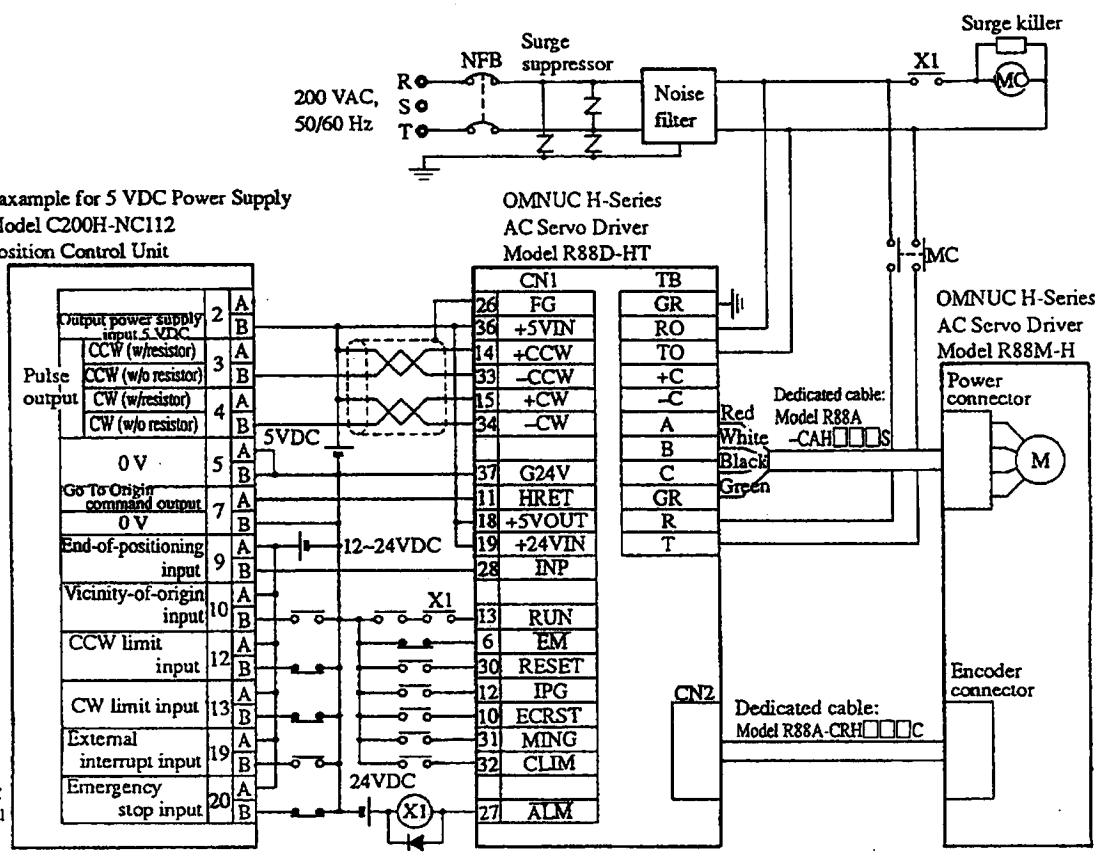
SYSMAC C200H NC Unit Model NC112 — OMNUC H-Series Power unit built-in driver

• AC Servo Driver (Pulse Array Input Version)



Cautions:

1. Exercise extreme care to avoid signal line cross connections which may result in permanent damage to the internal electronics.
2. Unused terminals should remain open.
3. Use Mode 3 for origin search.
4. Recommended surge suppression diode: ERB44-02 (Fuji Electric) or compatible
5. Use an exclusive 24 VDC (5 VDC) power supply for command pulse input.



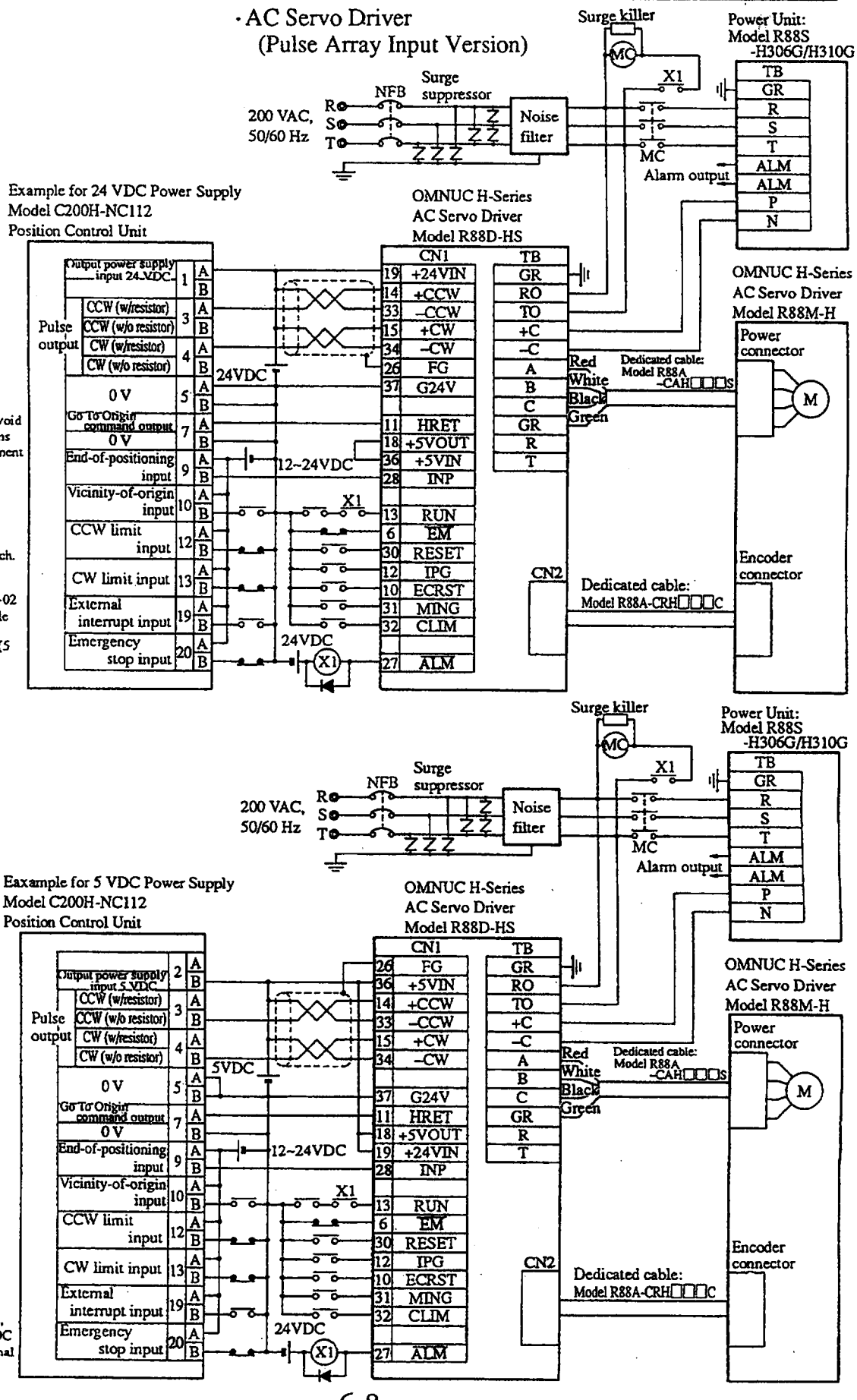
* To improve noise isolation, apply 5 VDC to the 24 VDC control supply input terminal (CN1-19).

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■ Application Example 8

SYSMAC C200H NC Unit Model NC112 — OMNUC H-Series Power unit separated type driver

· AC Servo Driver (Pulse Array Input Version)



Cautions:

1. Exercise extreme care to avoid signal line cross connections which may result in permanent damage to the internal electronics.
2. Unused terminals should remain open.
3. Use Mode 3 for origin search.
4. Recommended surge suppression diode: ERB44-02 (Fuji Electric) or compatible
5. Use an exclusive 24 VDC (5 VDC) power supply for command pulse input.

* To improve noise isolation, apply 5 VDC to the 24 VDC control supply input terminal (CN1-19).

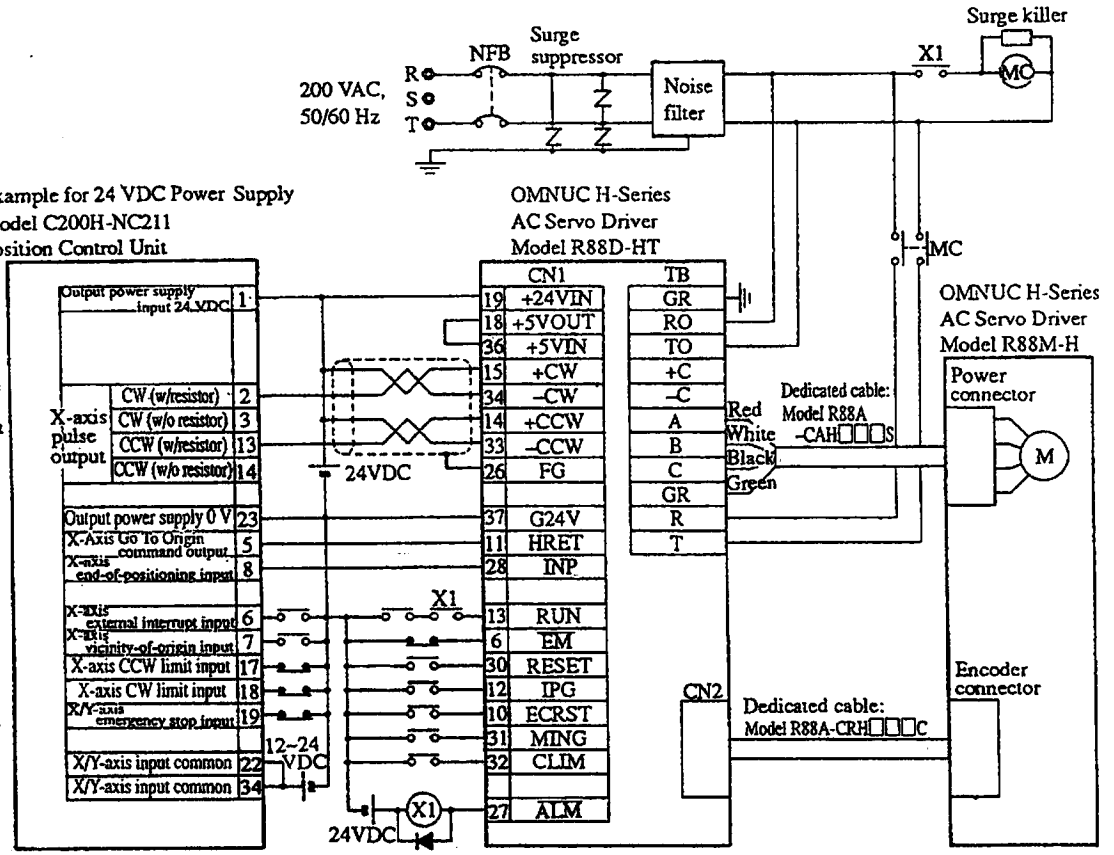
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■ Application Example 9

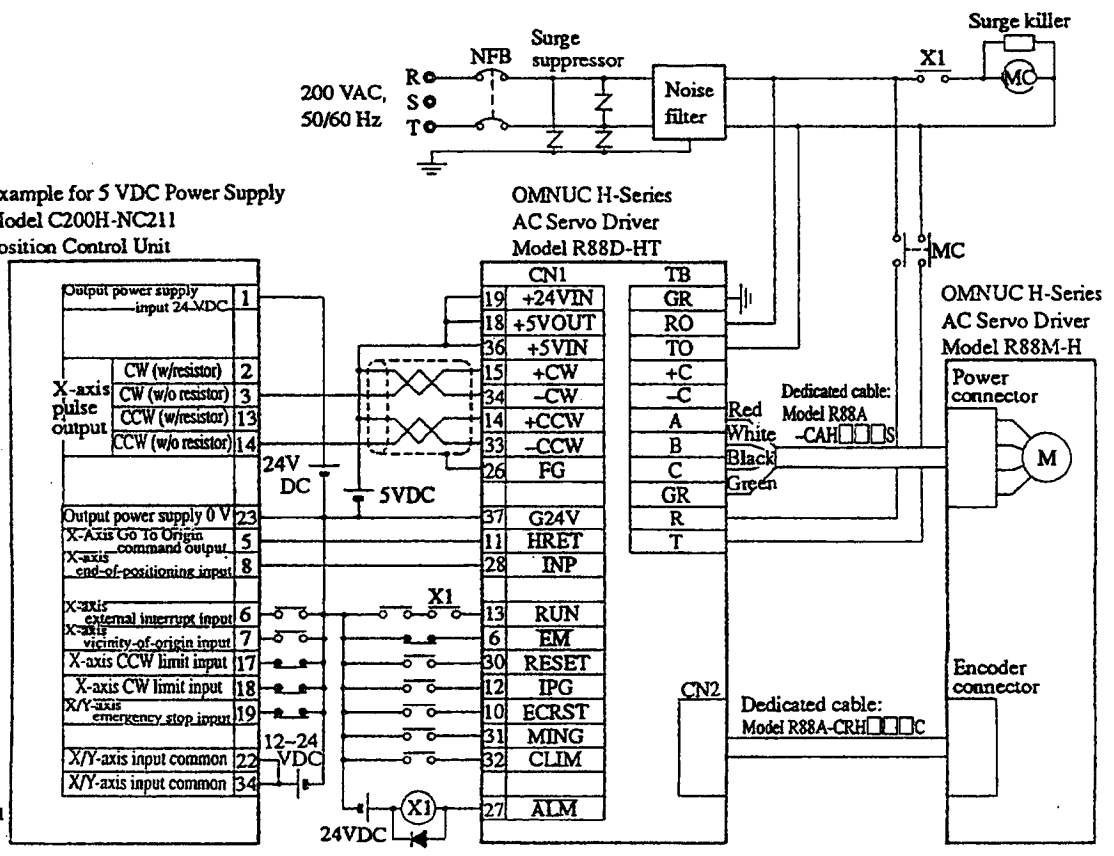
SYSMAC C200H NC Unit Model NC211 — OMNUC H-Series Power unit built-in driver

• AC Servo Driver (Pulse Array Input Version)



Cautions:

1. Exercise extreme care to avoid signal line cross connections which may result in permanent damage to the internal electronics.
2. Unused terminals should remain open.
3. Use Mode 3 for origin search.
4. Recommended surge suppression diode: ERB44-02 (Fuji Electric) or compatible
5. This example shows the connections for the X-axis control only. Two-axis control requires another driver and external input for the Y-axis.
6. Use an exclusive 24 VDC (5 VDC) power supply for command pulse input.



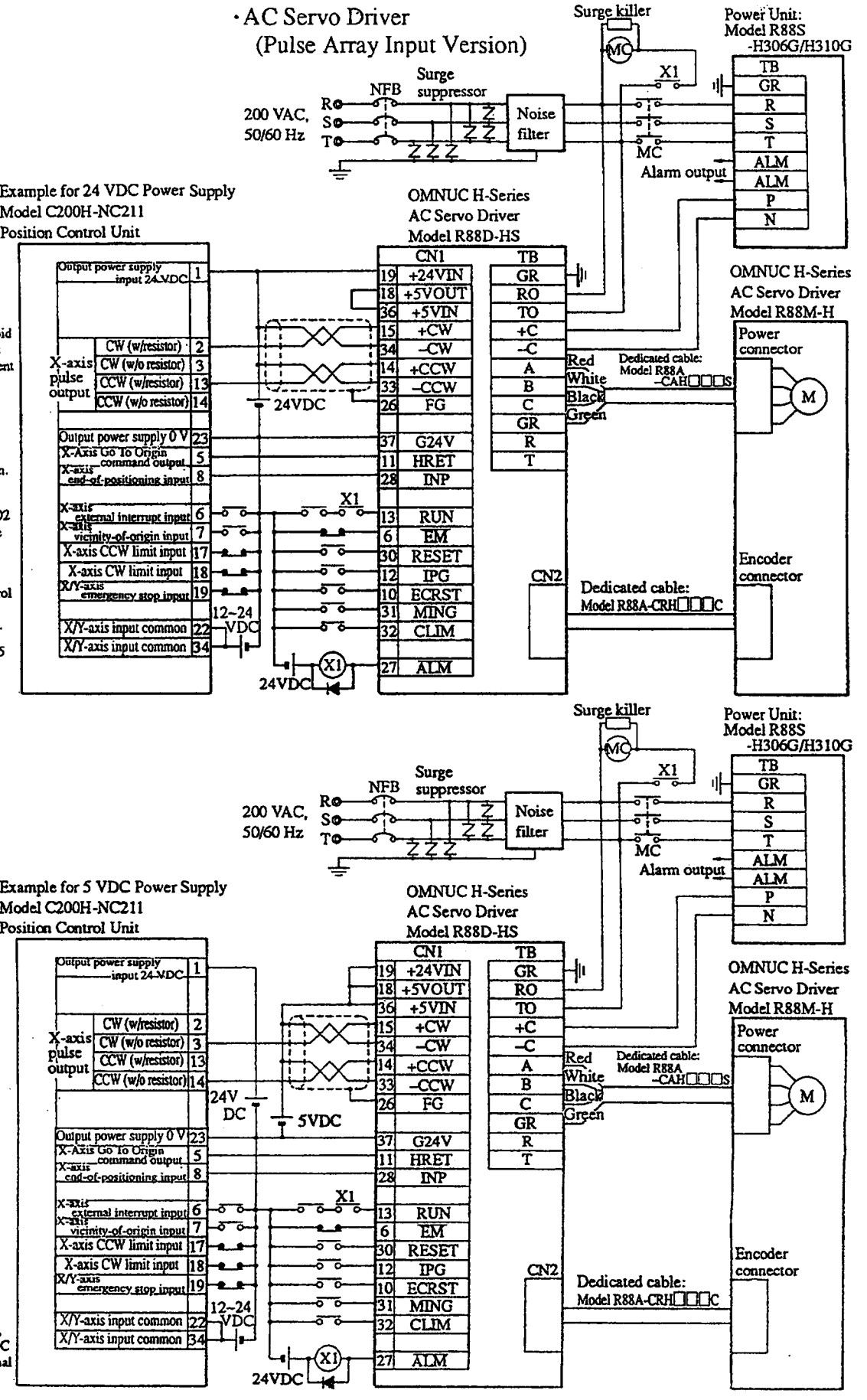
* To improve noise isolation, apply 5 VDC to the 24 VDC control supply input terminal (CN1-19).

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■ Application Example 10

SYSMAC C200H
NC Unit Model NC211

OMNUC H-Series
Power unit separated type driver



Cautions:

1. Exercise extreme care to avoid signal line cross connections which may result in permanent damage to the internal electronics.
2. Unused terminals should remain open.
3. Use Mode 3 for origin search.
4. Recommended surge suppression diode: ERB44-02 (Fuji Electric) or compatible
5. This example shows the connections for the X-axis control only. Two-axis control requires another driver and external input for the Y-axis.
6. Use an exclusive 24 VDC (5 VDC) power supply for command pulse input.

* To improve noise isolation, apply 5 VDC to the 24 VDC control supply input terminal (CN1-19).

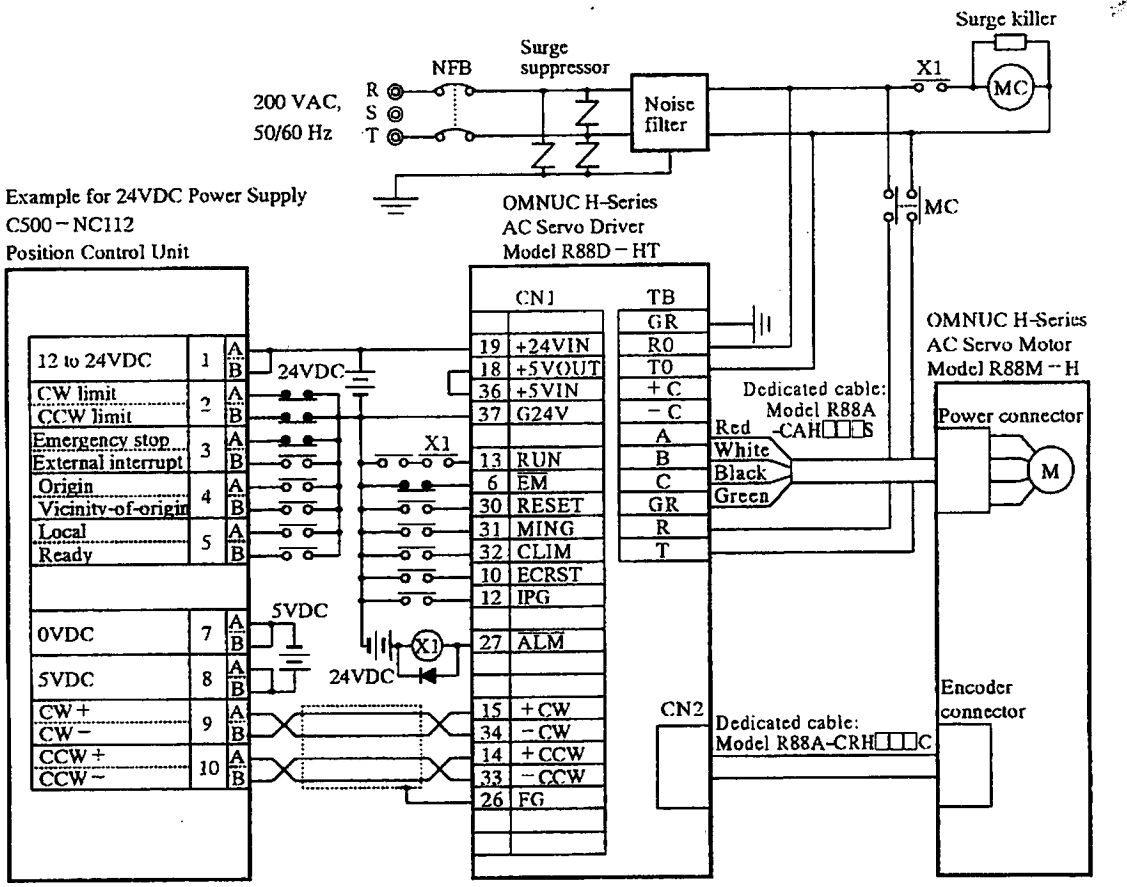
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■Application Example 11

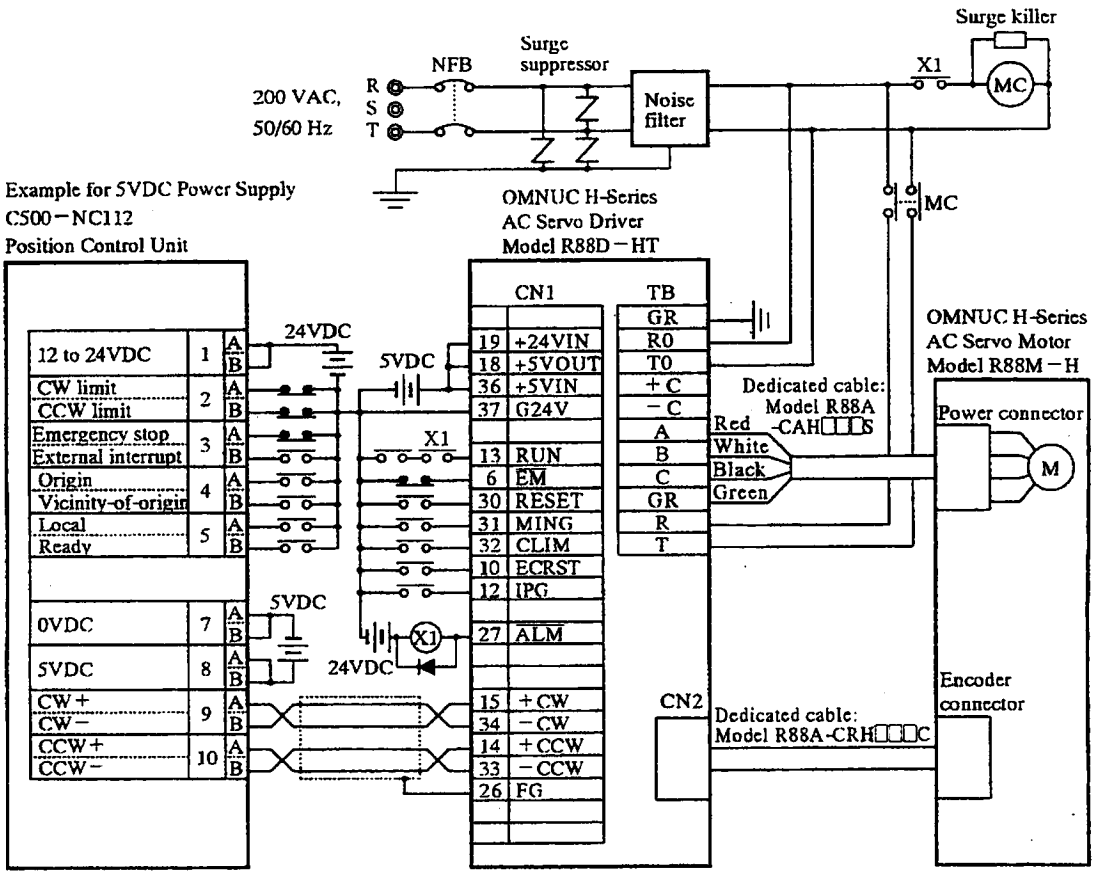
SYSMAC C500 NC Unit Model NC112 — OMNUC H-Series Power unit built-in driver

•AC Servo Driver (Pulse Array Input Version)



Cautions:

1. Exercise extreme care to avoid signal line cross connections which may result in permanent damage to the internal electronics.
2. Unused terminals should remain open.
3. Recommended surge suppression diode: ERB44-02(Fuji Electric) or compatible.
4. Use anexclusive 5VDC power supply for command pulse input.



Cautions:

1. Exercise extreme care to avoid signal line cross connections which may result in permanent damage to the internal electronics.
2. Unused terminals should remain open.
3. Recommended surge suppression diode: ERB44-02(Fuji Electric) or compatible.
4. Use anexclusive 5VDC power supply for command pulse input.
5. To improve noise isolation, apply 5VDC to the 24VIN control supply input terminal (CN1-19).

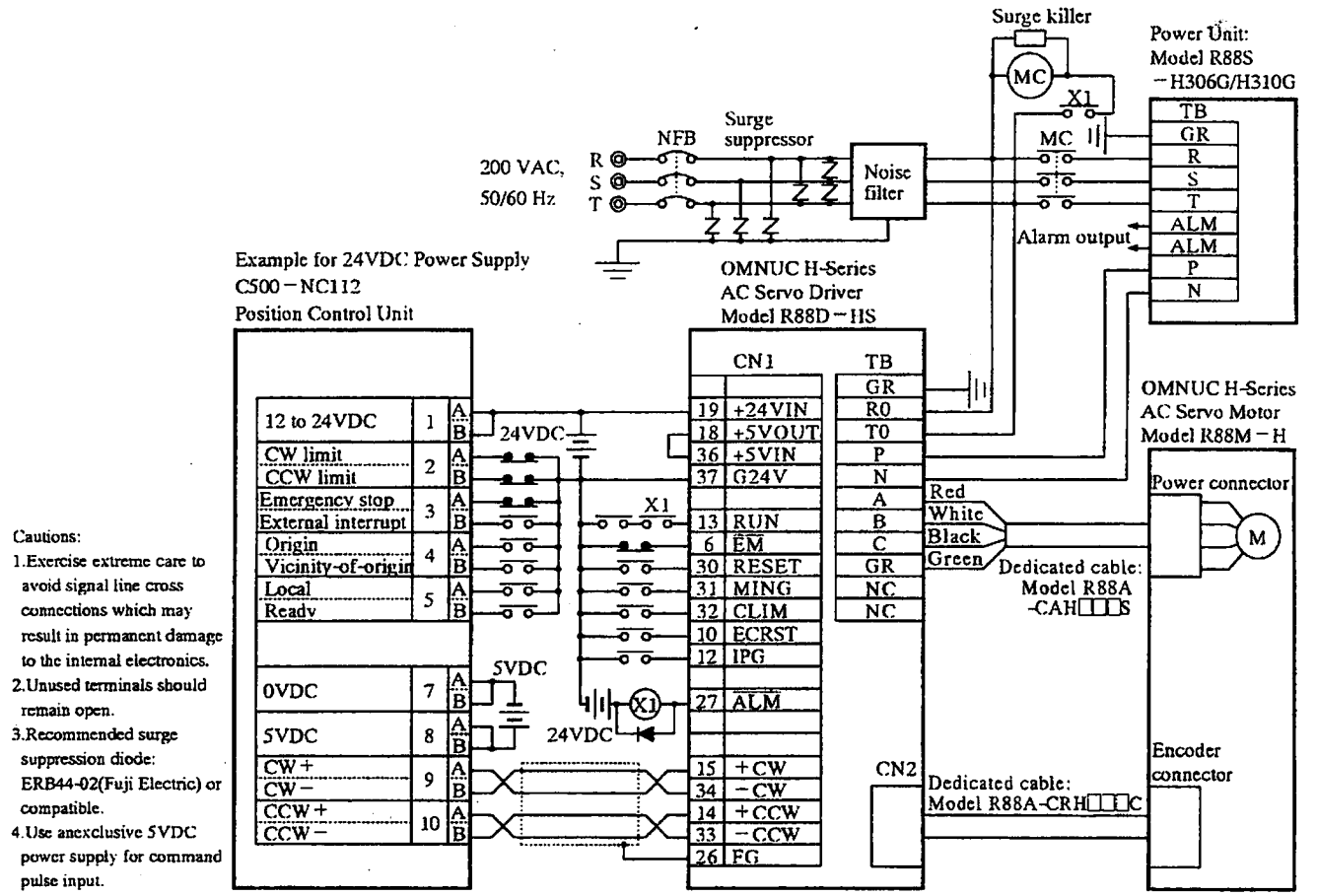
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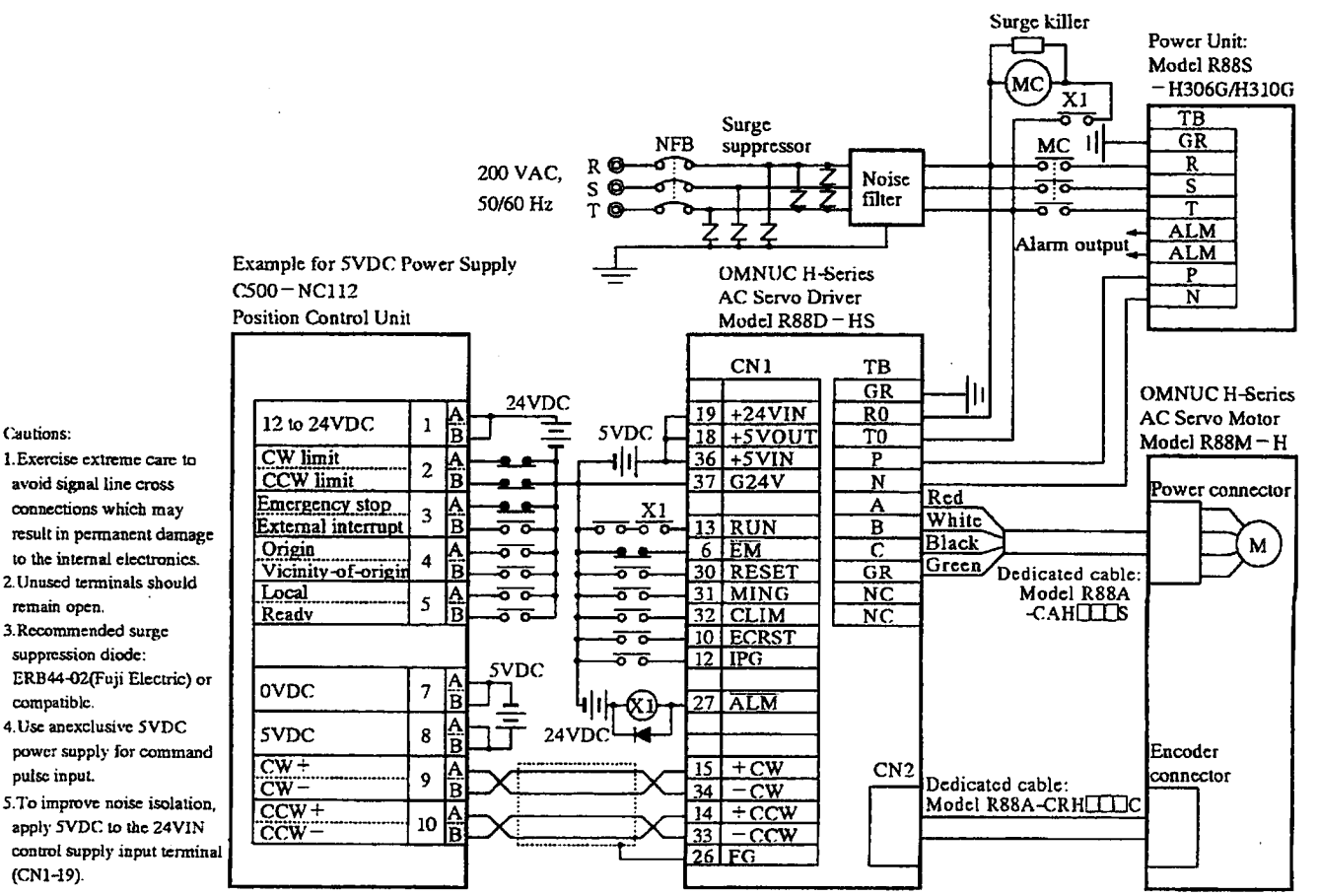
■Application Example 12

SYSMAC C500 NC Unit Model NC112 — OMNUC H-Series Power unit separated type driver

•AC Servo Driver (Analog Input Version)



Cautions:
1. Exercise extreme care to avoid signal line cross connections which may result in permanent damage to the internal electronics.
2. Unused terminals should remain open.
3. Recommended surge suppression diode: ERB44-02(Fuji Electric) or compatible.
4. Use anexclusive 5VDC power supply for command pulse input.



Cautions:
1. Exercise extreme care to avoid signal line cross connections which may result in permanent damage to the internal electronics.
2. Unused terminals should remain open.
3. Recommended surge suppression diode: ERB44-02(Fuji Electric) or compatible.
4. Use anexclusive 5VDC power supply for command pulse input.
5. To improve noise isolation, apply 5VDC to the 24VIN control supply input terminal (CN1-19).

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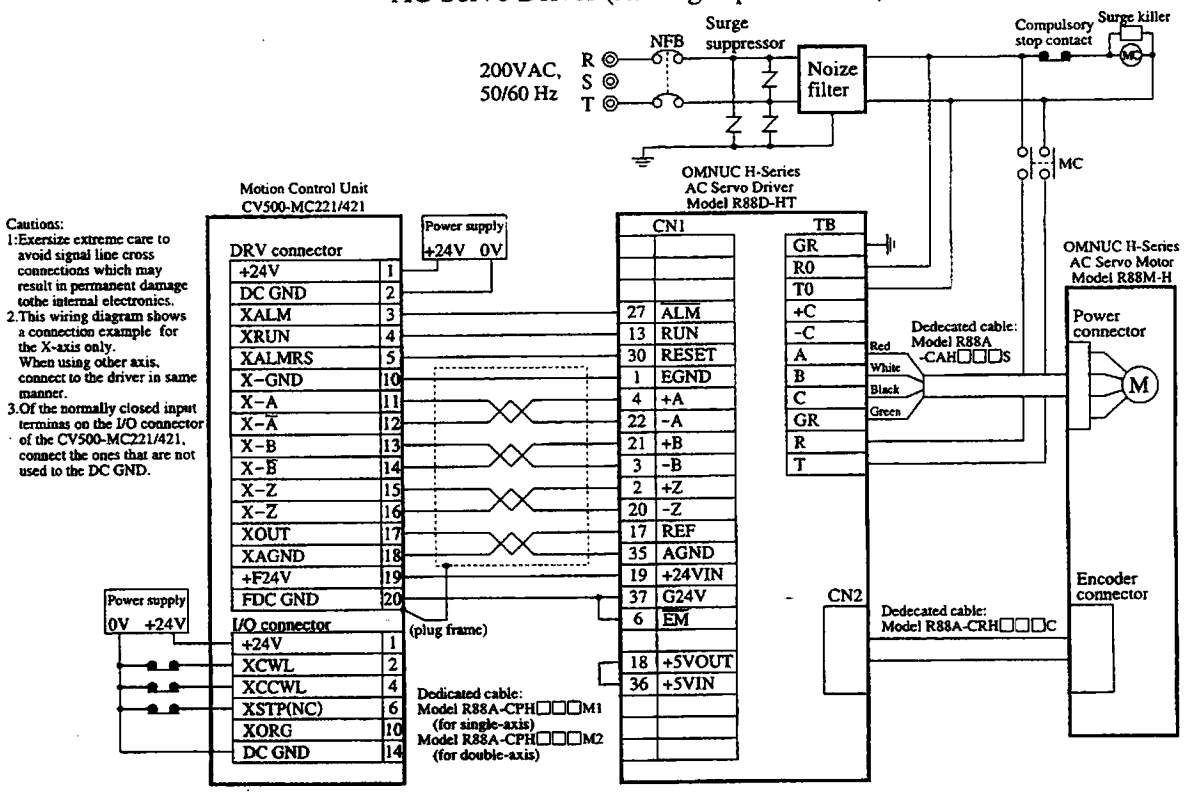
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■Aplication Example 13

SYSMAC CV500
MC Unit Model MC221/421

OMNUC H-Series
Power unit built-in driver

· AC Servo Driver (Analog Input Version)

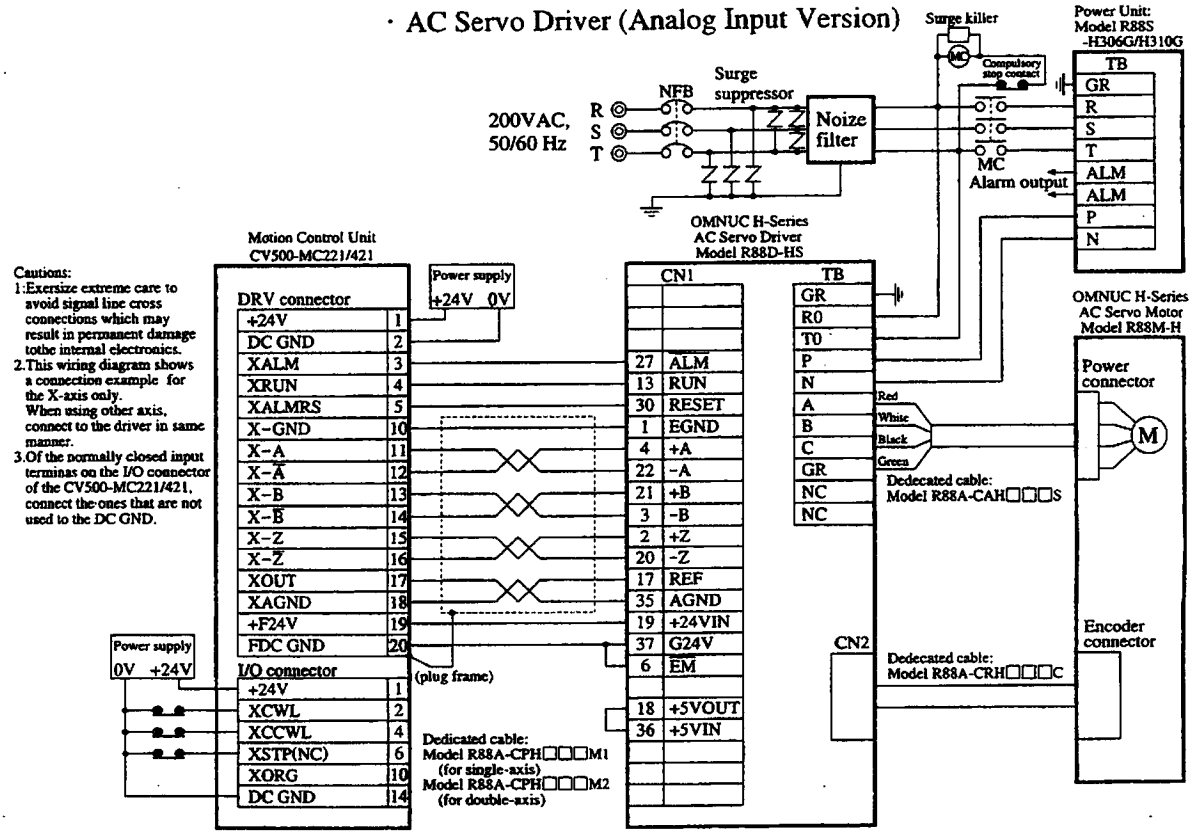


■Aplication Example 14

SYSMAC CV500
MC Unit Model MC221/421

OMNUC H-Series
Power unit separated typedriver

· AC Servo Driver (Analog Input Version)



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Chapter 6. Appendix

6-2 OMNUC H Series Article Model Table

Article name	Specifications		Model
AC servo motor	50W	3000 rpm	R88M-H05030
	with 50W brake	3000 rpm	R88M-H05030-B
	100W	3000 rpm	R88M-H10030
	with 100W brake	3000 rpm	R88M-H10030-B
	200W	3000 rpm	R88M-H20030
	with 200W brake	3000 rpm	R88M-H20030-B
	300W	3000 rpm	R88M-H30030
	with 300W brake	3000 rpm	R88M-H30030-B
	500W	3000 rpm	R88M-H50030
	with 500W brake	3000 rpm	R88M-H50030-B
	750W	3000 rpm	R88M-H75030
	with 750W brake	3000 rpm	R88M-H75030-B
	1100W	3000 rpm	R88M-H1K130
	with 1100W brake	3000 rpm	R88M-H1K130-B
AC servo driver	Power unit built-in type	for 50, 100W	R88D-HT04
		for 200, 300W	R88D-HT10
	Power unit separated type	for 50, 100W	R88D-HS04
		for 200, 300W	R88D-HS10
		for 500, 750, 1100W	R88D-HS22
Power unit	200 VAC with 200 VAC regenerative circuit		R88S-H306G
	200 VAC with 200 VAC regenerative circuit		R88S-H310G
	100 VAC with 100 VAC regenerative circuit		R88S-H205G
Encoder cable	1m,3m,5m,10m,15m,20m,30m		R88A-CRH□□□C
Power cable	1m,3m,5m,10m,15m,20m,30m		R88A-CAH□□□S
	1m,3m,5m,10m,15m,20m,30m (with brake)		R88A-CAH□□□B
Positioner connection cable	for general control (for SYMAC) 1m, 2m		R88A-CPH□□□S
	for CV500 -MC221/421	for single-axis 1m, 2m	R88A-CPH□□□M1
		for double-axis 1m, 2m	R88A-CPH□□□M2

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Chapter 6. Appendix

6-3 OMNUC H Series Parameters Setting Table

1.Set up parameters

PRM No.	Parameter name	Descriptions	Default value	Setting value
81	Designate driver type	0: A; analog input type 1: P; Pulse train input type	0	
82	Designation of input pulse type	0: Forward pulse/reverse pulse 1: Feed pulse/for and back signal 2: 90° phase difference signal	0	
83	Designate rotation direction	0: Forward rotation with + voltage 1: Reverse rotation with + voltage.	0	
84	Designate soft start input	0: Operation in accordance with speed command. 1: Soft start operation in accordance with speed command. 2: Soft start operation in accordance with inside setting speed.	0	
85	Designation of treatment at error	0: Dynamic brake ON, servo brake OFF. 1: Dynamic brake ON, servo brake ON.	0	
86	Designation of encoder output	0: 2000 ppr 1: 1000 ppr	0	
87	Initialize parameter	99: Set all parameters to default value (set condition at delivery).	0	

2. User parameter

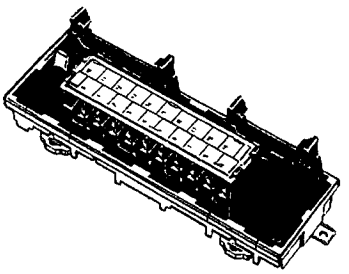
PRM No.	Parameter name	Description	Setting range	Unit	Default value	Setting value
0	Speed loop proportional gain	Fine adjustment taking 100 as center value.	0 to 254		100	
1	Speed loop integer gain	Fine adjustment taking 100 as center value.	0 to 254		100	
2	Position loop proportional gain	Fine adjustment taking 100 as center value.	0 to 254		100	
3	Torque limit value	100 as instantaneous max. torque.	0 to 100		50	
4	Position loop FF gain	FF amount ratio against speed command.	0 to 100	%	0	
5	Positioning completion range	Set number of pulses at 8000 pulse/rev.	0 to 127	± pulse	3	
6	Speed command scale	Set rpm at 10 V input with ratio against 3000 rpm.	83 to 167	%	100	
7	Inside 1st speed	- 3000 to + 3000 rpm (Setting value × 10 rpm)	- 300 to + 300	10 rpm	0	
9	Inside 2nd speed	- 3000 to + 3000 rpm (Setting value × 10 rpm)	- 300 to + 300	10 rpm	0	
11	Speed command offset	Adjust command voltage between ± 0.2V (divide ± 0.2 V into ± 63.)	- 63 to + 63		0	
20	Inertia ratio	Automatically set each gain to its center value.	0 to 10	times	3	
21	Electronic gear multiplier (G1)	Setting range: $\frac{1}{50} \leq \frac{G1}{G2} \leq 50$	1 to 9999	times	1000	
22	Electronic gear multiplier (G2)		1 to 9999	times	1000	
23	Soft start acceleration time	Acceleration time from 0 to ± 3000 rpm.	0 to 99	0.1 sec.	10	
24	Soft start deceleration time	Deceleration time from ± 3000 to 0 rpm.	0 to 99	0.1 sec.	10	

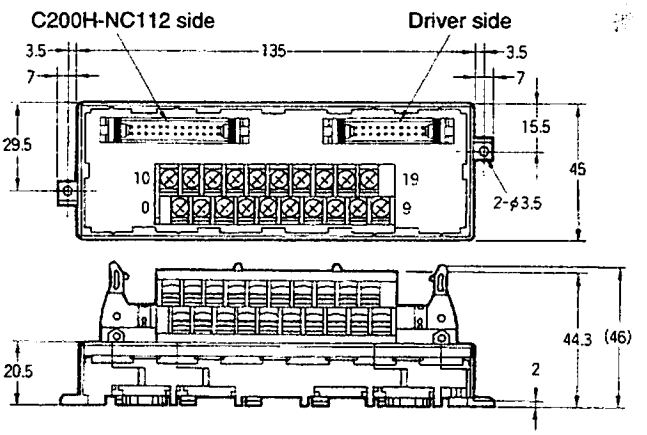
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6-4 Servo Connector Terminal Connection Unit

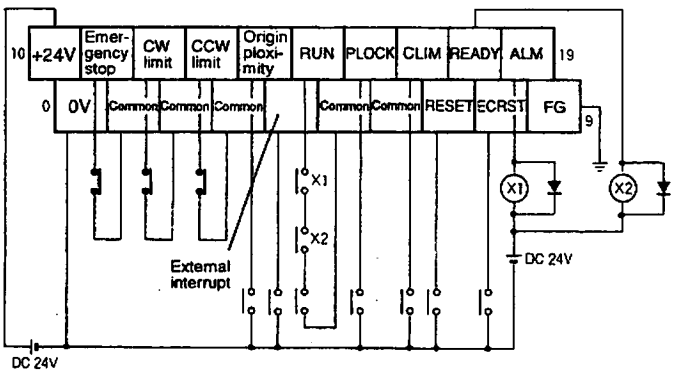
■Terminal Connection Unit for C200H-NC112

Model:XW2B-20J6-1





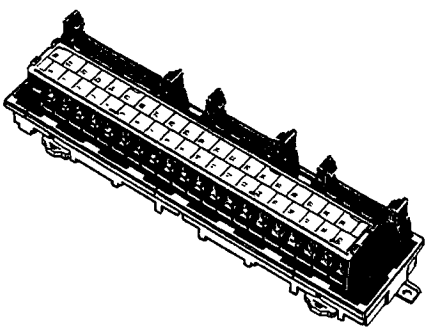
*The terminal block pitch is 7.62mm.

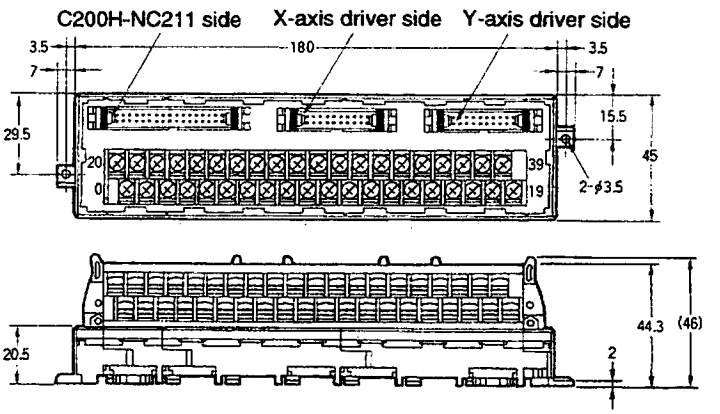


Notes:
1. Do not connect open terminals.
2. The 0V terminal and the common terminal are internally connected.
3. Applicable crimp terminals:
   R1.25-3 (round type, open-end type)

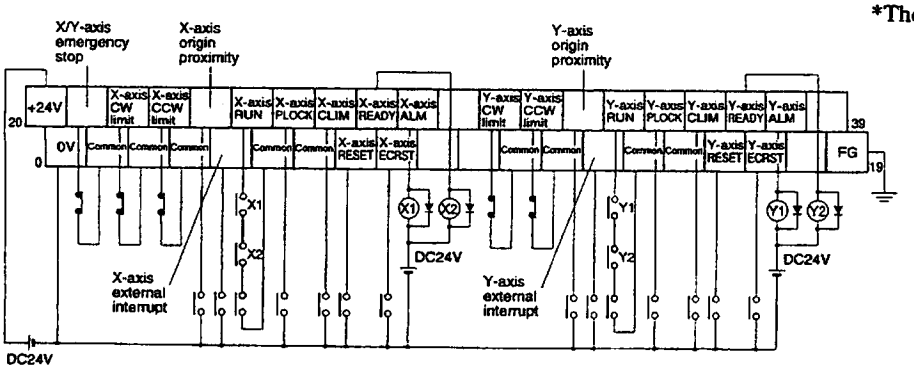
■Terminal Connection Unit for C200H-NC211

Model:XW2B-40J6-2





*The terminal block pitch is 7.62mm.

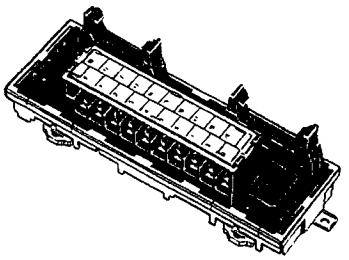


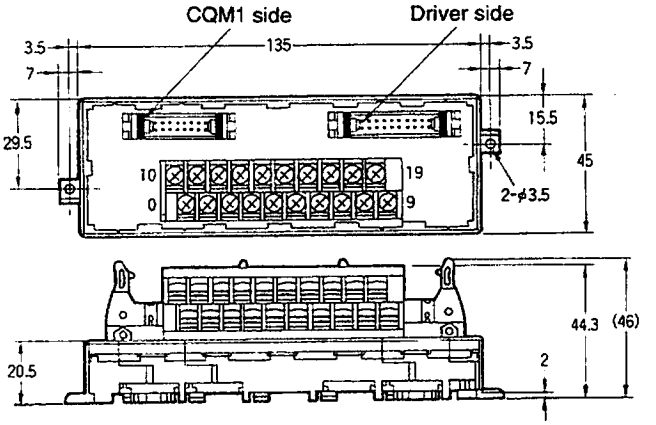
Notes:
1. When using only one axis, short circuit to the common terminal the CW limit and CCW limit of the axes not used.
2. Do not connect open terminals.
3. The 0V terminal and the common terminal are internally connected.
4. Applicable crimp terminals:
   R1.25-3 (round type, open-end type)

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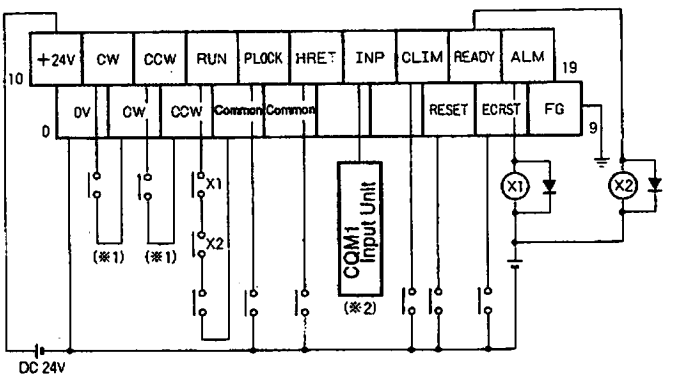
■Terminal Connection Unit for CQM1-CPU43

Model:XW2B-20J6-3





*The terminal block pitch is 7.62mm.



Notes:
1. When this signal is input, the output pulse from the CQM1 can be input back to the high-speed counter.
2. Input this output signal to the Input Unit of the CQM1.
3. Do not connect open terminals.
4. The 0V terminal and the common terminal are internally connected.
5. Applicable crimp terminals: R1.25-3 (round type, open-end type)

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