CHAPTER ③

Installation

The information in this chapter will enable you to:

- ❑ Ensure that the complete system is installed correctly
- ❑ Mount all system components properly

Environmental Considerations

You must consider the environment in which your system will be operating. Proper mounting, wiring, and grounding will ensure trouble-free operation.

WARNING *The Dynaserv motor is not dust-proof, water-proof, or oil-proof and measures must be taken if the system will be operating in such environments.*

Compumotor recommends that you operate and store the Dynaserv in the following conditions:

- ❑ ***Storage Temperature*: -4°F to 185°F (-20°C to 85°C)**
- ❑ ***Operating Temperature*: 32°F to 122°F (0°C to 50°C)**

Complete System Configuration

Safety is the primary concern when installing any motion control system. This chapter provides guidelines that you should use to ensure the safety of the operator and equipment. Install all Compumotor hardware in conformity with local and national electrical and safety codes.

Once the system has been properly installed and adjustments are made, minimal adjustment should be required to maintain normal operation. Each Dynaserv motor/drive system is adjusted as a pair. ***Do not change the motor/driver combination*. Serial numbers on the motor and drive must match. Unpredictable motion can result with unmatched motors/drives causing personal injury or system damage.** Consult the Compumotor Applications Department before interchanging systems.

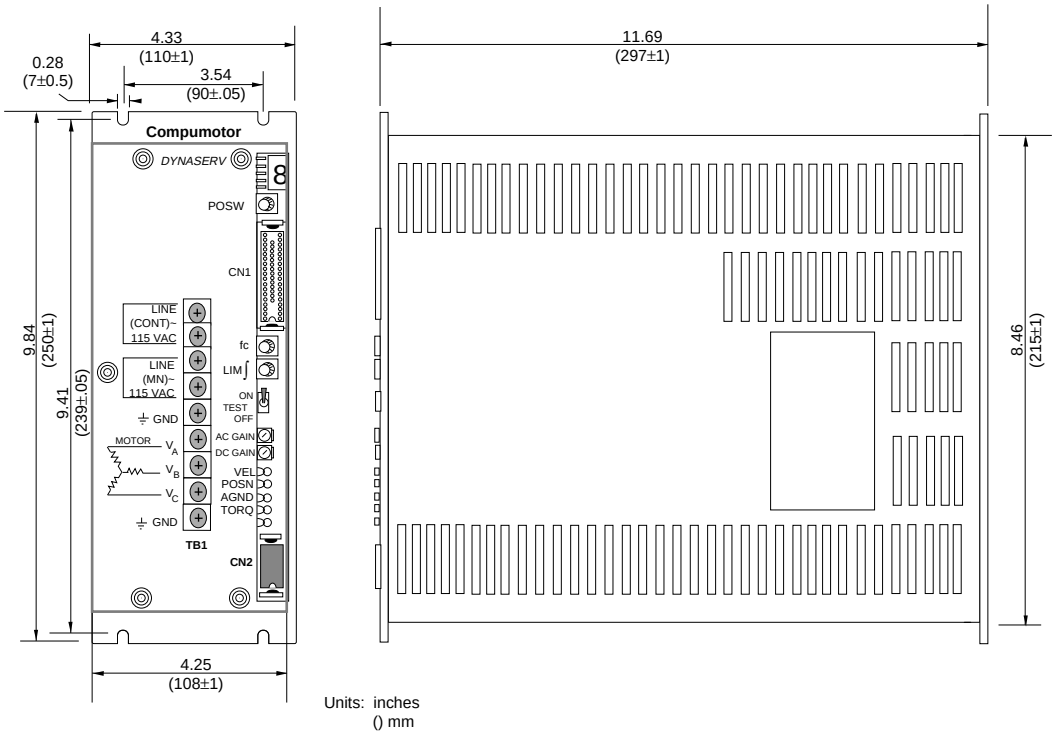
Drive Mounting

The Dynaserv should be installed in an enclosure that will protect it from atmospheric contaminants (oil, metal flakes, moisture, and dirt). The National Electrical Manufacturers Association (NEMA) has established standards that define the

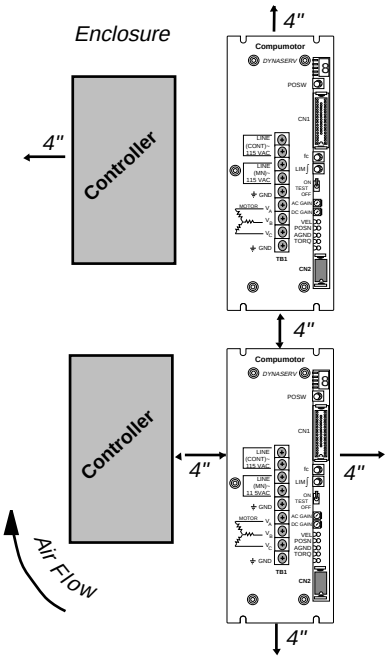
degree of protection that electrical enclosures provide. Industrial environments may contain airborne contaminants. The enclosure should conform to an enclosure *NEMA TYPE 12 standard* (minimum).

You can mount the Dynaserv drive in a panel or rack configuration. For ***panel mounting***, the Dynaserv has open-end slots for flat panel mounting. Refer to the figure below for dimensions and slot locations. You should use 10-32 or 1/4 x 20 screws into captured nuts to mount the Dynaserv in a panel mount configuration. Use locking type fasteners to prevent the drive from coming loose due to vibration. *When there is a vibration source near the drive, mount the drive to the panel with vibration insulators.*

The Dynaserv has open-end slots for ***rack mounting***. Refer to the figure below for dimensions and slot locations. To simplify rack mounting, the panel mount tabs at the rear of the Dynaserv are removable. Use 10-32 or 1/4 x 20 screws into captured nuts to mount the Dynaserv in a rack mount configuration. Use locking type fasteners to prevent the drive from coming loose due to vibration.



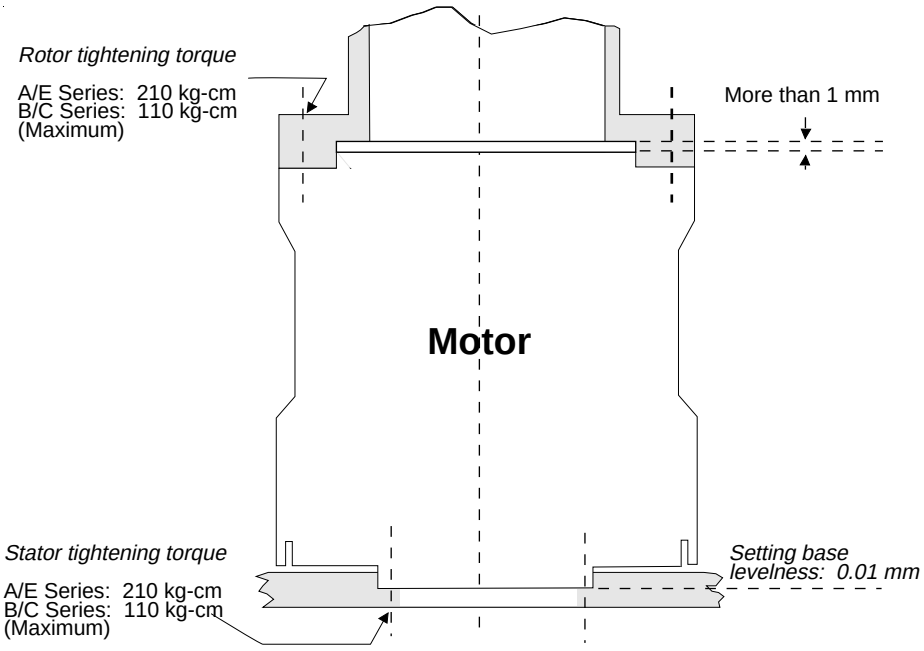
Panel Layout



Proper panel layout prevents equipment in the enclosure from overheating. Each drive must have an unrestricted air flow. The figure below shows the recommended panel layout configuration. *Mount the drive **vertically**. If it is mounted **horizontally**, heat will not be vented adequately and the drive will overheat.*

DR/DM Motor Mounting

The motor can be mounted vertically or horizontally. Incorrect mounting or an unsuitable mounting location may shorten the motor's life.



Mechanical Coupling

To couple a load with the motor rotor section, use the following guidelines.

- ❑ When coupling the load to the motor rotor, keep a clearance of more than 1 mm between the load and the motor's upper surface to maintain surface accuracy.
- ❑ Base levelness should be less than 0.01 mm.

- ❑ When tightening the screws, always apply LOCKTITE 601 or its equivalent to these screws to lock them.

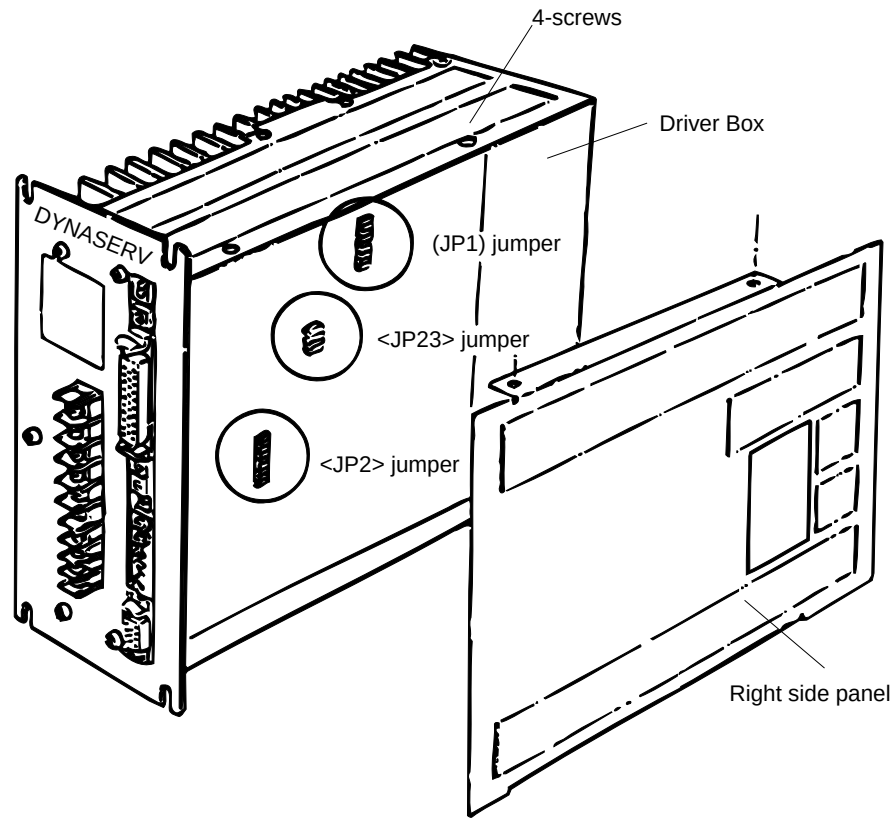
Operation Cautions

- ❑ The driver is adjusted with the matched motor. Do not change the motor/driver combination.
- ❑ This motor rotates at high speed and high torque. ***To prevent accidents, do not touch the rotating radius when operating with a load connected to the motor***.
- ❑ The motor is not dust-proof, water-proof, or oil-proof. Care must be taken to shield the motor from these contaminants.
- ❑ The magnetic resolver is built into the motor. Do not apply a strong force, shock, or magnetic field to the motor (***applicable to DR Motors only***).
- ❑ Since the motor surface is magnetically charged, do not put any magnetized objects or substances near the surface.
- ❑ Never disassemble or modify the motor or driver. If they need to be modified, contact Compumotor. ***Compumotor is not responsible for the products' operation after they have been disassembled or modified without our permission***.

Preparation for Operation

You may need to reset some jumpers, switches, and variable resistors within the driver box to meet your application's requirements. The jumpers, variable resistors, and switches are on a board inside the Dynaserv. The factory settings (*how they are set when you receive the Dynaserv*) are set as shown in subsequent figures and tables.

Prior to opening the drive, always turn power **OFF**. Remove the side plate of the driver box. *Never touch the high-voltage generation section, even with power turned* ***OFF***. *Never touch switches and variable resistors other than those specified.*



<JP1> Jumper

MODE	:See following table
CALIB	:See following table
RATE#1	:Position command pulse multiplying factor setting
RATE#2	:Position command pulse multiplying factor setting
UD/AB	:With jumper/A/B-phase, Without jumper/Up/Down pulse
VFFH	:Velocity feed forward amount setting (Note 1)
VFFM	:Velocity feed forward amount setting (Note 1)
VFFL	:Velocity feed forward amount setting (Note 1)
GAIN H	:DC gain magnification setting (Note 2)

<JP2> Jumper

I	:Velocity I type control
P	:Velocity P type control
100	:Velocity detection filter (Hz) selection (Open when a mechanical resonance filter is installed)
200	:Velocity detection filter (Hz) selection (Open when a mechanical resonance filter is installed)
PV	:Mode selection
VEL	:Velocity input
TORQ	:Torque input
TLIM	:Open for standard models

Indicates setting prior to shipment.

Note (1)

VFFH	VFFM	VFFL	Velocity feed forward amount (1%)
Shorted	Shorted	Shorted	100
Shorted	Shorted	Open	95
Shorted	Open	Shorted	90
Shorted	Open	Open	85
Open	Shorted	Shorted	80
Open	Shorted	Open	75
Open	Open	Shorted	70
Open	Open	Open	65

Note (2)

Type	Gain Magnification
With Jumper	DC Gain X13
Without Jumper	DC Gain X1

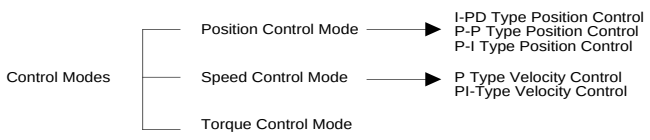
Switch, Volume Settings Done Prior to Shipment

The table below shows the default values of the rotary switches and variable resistors. For safety, they are set to their minimum values.

Switch Name/Volume	Setting Status
DC Gain	Minimum position
AC Gain	Minimum position
POSW	8
fc	0
I.LIM	0
TEST	OFF

Control Mode Jumper settings

The following 6 control modes are available for the Dynaserv DR/SR Series.



The following table shows the validity or invalidity of the switches and variable resistors related to the control mode and the jumper pin settings for each control mode.

	Jumper Name	Position Control			Velocity Control		Torque Mode
Section	Switch Name	I-PD Mode	P-P Mode	P-I Mode	P Mode	PI Mode	Control Mode
JP1	MODE	Shorted	Shorted	Shorted	Open	Open	Open
	CALIB	Open	Open	Open	Open	Open	Open
	RATE #1	①	①	①	①	①	①
	RATE #2	①	①	①	①	①	①
	UD/AB	①	①	①	①	①	①
	VFFH	①	①	①	②	②	②
	VFFM	①	①	①	②	②	②
	VFFL	①	①	①	②	②	②
	GAIN H	①	①	①	①	①	②
JP2	I	Open	Open	Shorted	Open	Shorted	Open
	P	Shorted	Shorted	Open	Shorted	Open	Open
	100	①	①	①	①	①	①
	200	①	①	①	①	①	①
	PV	Shorted	Shorted	Shorted	Shorted	Shorted	Open
	VE;	Open	Open	Open	Shorted	Shorted	Open
	TPRQ	Open	Open	Open	Open	Open	Shorted
V1	DC GAIN	①	①	①	①	①	②
	AC GAIN	②	②	①	②	①	②
S1	POSW	①	①	①	②	②	②
S2	fc	①	①	①	②	②	②
	I.LIM	①	②	②	②	②	②
	TEST	①	①	①	①	①	②

① VALID: Affects motor performance

② INVALID: Does not affect motor performance

Velocity Signal Filter Setting/JP1

In addition to changing operating modes, you can use the **JP1** jumpers from the Control Board to select velocity signal filter cut-off frequency. The cut-off frequency is set to 100 Hz with 100 shorted, and it is set to 200 Hz with 200 shorted. For initial set-up, leave the jumper at the default 200 Hz. Leave three jumpers open, when using the low-pass filters and the notch filters. ***Chapter ⑥ Maintenance & Troubleshooting*** contains instructions on using the low-pass filter and the notch filter.

Feedback & Position Pulse Resolution Settings/JP1

The servo driver receives a signal from the feedback integral to the motor, then outputs an A/B phase or UP/DOWN pulse signal to a higher-level controller. Jumper pins related to the feedback pulse signal are **RATE#1**, **RATE#2**, and **UD/AB**. The position command pulse signal multiplication factor is determined by setting jumpers **RATE#1** and **RATE#2** on **JP1**. Adjusting these jumpers changes the position command pulse signal by 1 to 1/8 times (table below). However, changes in the multiplication factor also change the resolution. *When operating the Dynaserv with lower pulse frequency controllers, it may be necessary to reduce the resolution to realize full motor speed.*

Motor Type	Rate #1	*Rate #2*	*Multiplication Factor*	*Resolution*
DR-B	Shorted	Shorted	1	507,904
	Open	Shorted	1/2	253,952
	Shorted	Open	1/4	126,976
	Open	Open	1/8	63,488
DR-E	Shorted	Shorted	1	614,400
	❍	S	1/2	307,200
	S	❍	1/4	153,600
	❍	❍	1/8	76,800

DR-A	Shorted	Shorted	1	819,200
	❍	S	1/2	409,600
	S	❍	1/4	204,800
	❍	❍	1/8	102,400
DR5000B	Shorted	Shorted	1	278,528
Series	❍	S	1/2	139,264
	S	❍	1/4	69,632
	❍	❍	1/8	34,814
DR5000A	Shorted	Shorted	1	425,984
Series	❍	S	1/2	212,992
	S	❍	1/4	106,496
	❍	❍	1/8	53,248
DR5000C	Shorted	Shorted	1	212,992
Series	❍	S	1/2	106,496
	S	❍	1/4	53,248
	❍	❍	1/8	26,624
DM-B	Shorted	Shorted	1	655,360
Series	❍	S	1/2	327,680
	S	❍	1/4	163,840
	❍	❍	1/8	81,920

UD/AB Jumpers

The **UD/AB** jumpers allow you to select the A/B and UP/DOWN phases. The *shorted jumper* activates the A/B phase. The *open jumper* activates the UP/DOWN phase.

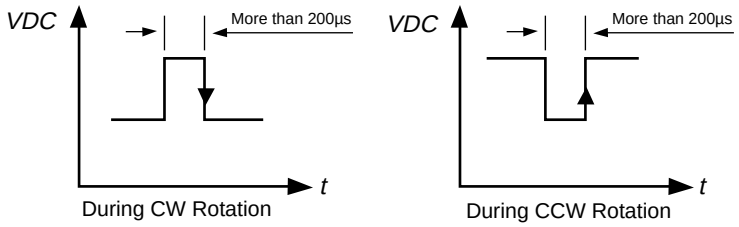
Velocity Loop Gain

The **AC GAIN** and **DC GAIN** rotary switches, allow you to adjust the servo parameters and are accessible from the front panel of the drive.

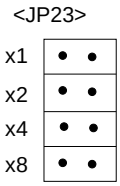
Origin (2-Channel) Pulse Output Signal Setting/JP23

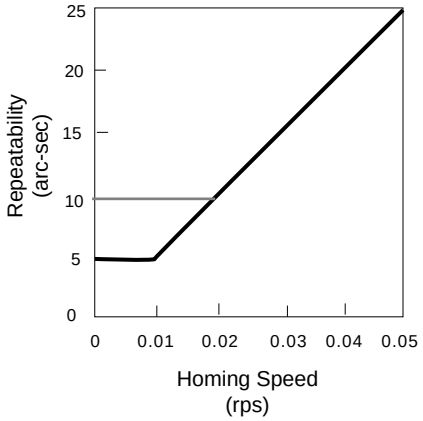
The point at which H changes to L (CW direction), or L changes to H (CCW direction), corresponds to the original position. (The CW and CCW directions are direction of movement when the motor is viewed from the load side.)

Origin (2-channel) repeatability depends on the homing speed (RPS). The following figure shows the characteristics. The number of origins per revolution can be selected by setting jumper <JP23>.



	A Type	B Type	E Type	A Type	B Type	C Type
x1 shorted with others open	200	124	150	104	68	52
x2 shorted with others open	400	248	300	208	136	104
x4 shorted with others open	800	496	600	416	272	208
x8 shorted with others open	1600	992	1200	832	544	416





This function is only available in the DR series. In the DM series, the number of Z channels is not selectable. The number of Z channels is as follows:

- ❏ A Type: 100
- ❏ B Type: 60

Positioning Completion Width Setting/S1

When positioning in the Position Control mode is completed, the CN1 connector COIN signal is set to ON. This positioning completion width can be selected by the POSW switch on the front panel.

The following table shows the relationship between POSW switches with <POSW 0, 1> signal of the CN1 connector set to H and the positioning completion width.

At the same time, when setting the position completion width using <POSW 0,1> signal, set the POSW switch in 4 steps as shown in the following table. With a combination of H and L of the <POSW> signals, the same selection as the POSW switch can be obtained.

POSW Set Value	Position Completion Width (Unit: Pulse)*	POSW 1	POSW 0	POSW Switch
0	1	H	H	
1	5	H	L	0
2	20	L	H	
3	100	L	L	
4	2	H	H	
5	10	H	L	4
6	40	L	H	
7	200	L	L	
8	4	H	H	
9	20	H	L	8
A	80	L	H	
B	400	L	L	
C	8	H	H	
D	40	H	L	C
E	160	L	H	
F	800	L	L	

*:1 pulse =1/max. resolution

Notch Filter Board

Each Dynaserv comes with a Notch Filter Board to help combat mechanical resonance in the system. For more information on the Notch Filter Board refer to ***Chapter ⑥ Maintenance & Troubleshooting***.

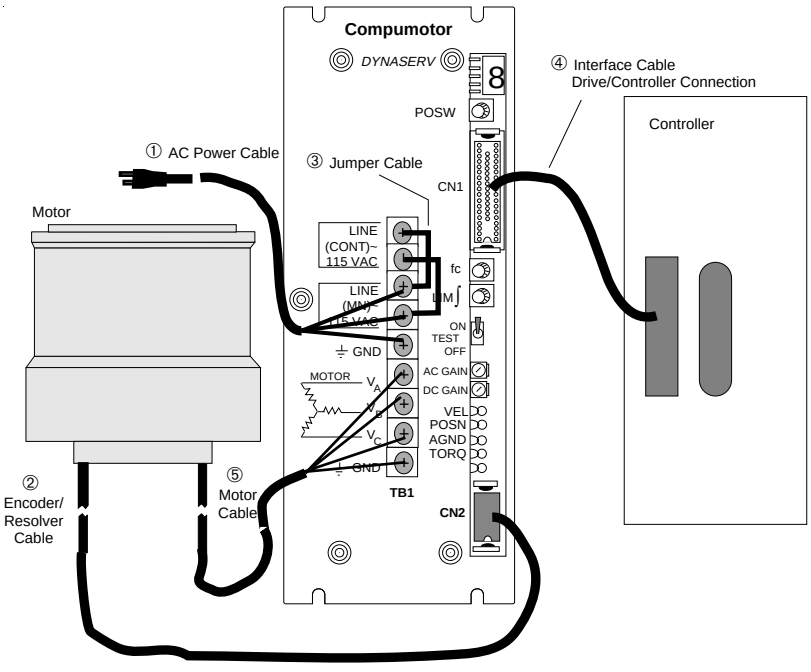
Wiring Cables

This table contains the Dynaserv cable sizes and their rated currents. The cables are cross-referenced in the subsequent figure.

			A Type	B Type	E Type
Input	① AC Power Cable	Current (A)	20	15	20
		Conductor Size	HIV*: More than 2.0 mm^2 cross sectional area (14AWG) Length: Within 30mm		
	② Feedback Cable	Current (A)	150mA DC•Maximum		
		Conductor Size	HIV*: More than 0.2 mm^2 cross sectional area (24AWG) Twisted pair collectively shielded wire length: within 30m		
	③ Jumper Cable	Current (A)	20	15	20
		Conductor Size	HIV*: More than 2.0 mm^2 cross sectional area (14AWG)		
Output	④ Interface Cable	Current (A)	100 mA DC•Maximum		
		Conductor Size	HIV*: More than 0.2 mm^2 cross sectional area (24AWG) Twisted pair collectively shielded wire length: within 30m		
	③ Jumper Cable	Current (A)	20	15	20
		Conductor Size	HIV*: More than 2.0 mm^2 cross sectional area (14AWG)		

** HIV: Special heat-insulation wire*

- Current values: rms of rated currents
- Outer sizes of **CN1** and **CN2** cables: Less than 14 mm or 9 mm, respectively
- Cable size is obtained under the condition that ambient temperature is 40°C and the rated current flows through three bundled leadwires
- HIV: Special heat-insulation wire—allowable conductor temperature of 75°C



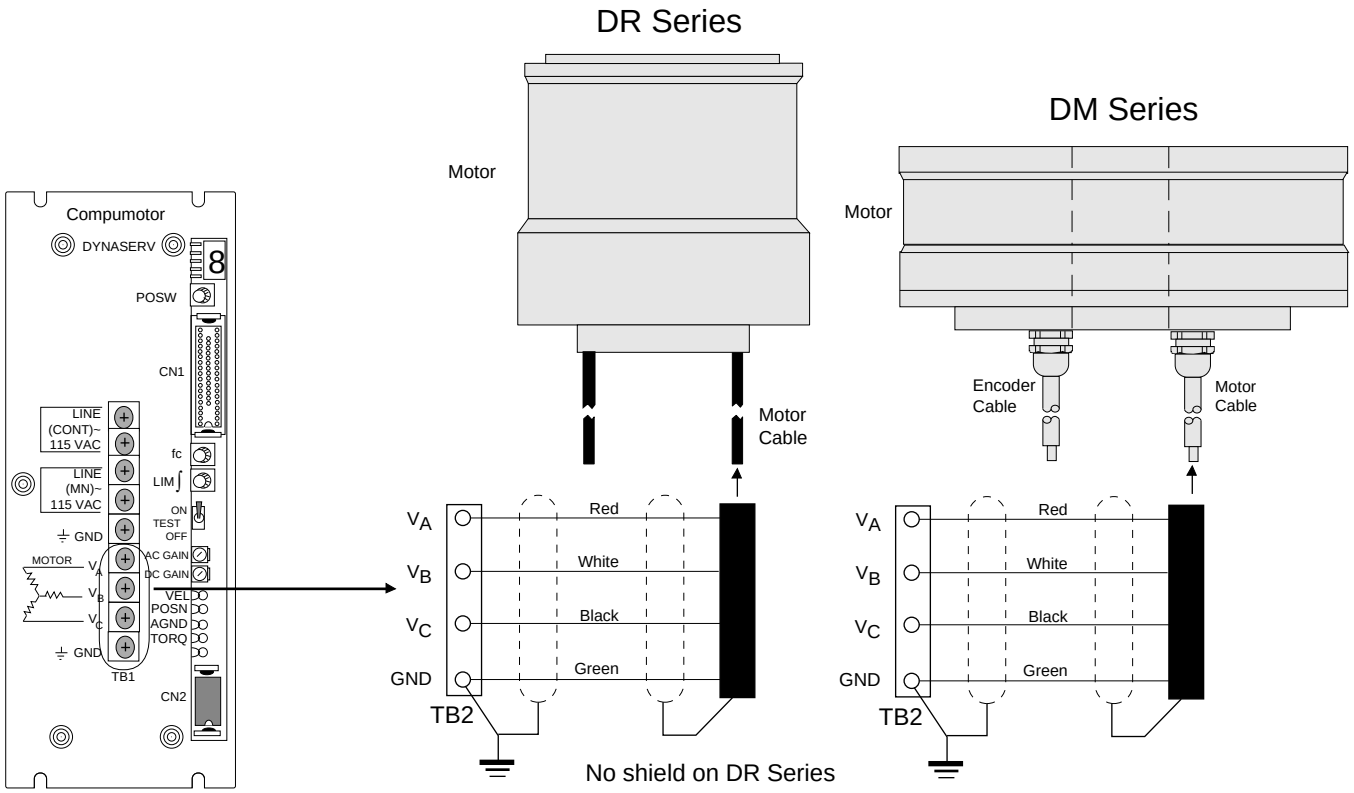
Wiring Cautions

- ❑ Use specified multi-core twisted pair cables with collective shielding for interface and feedback cables. Conduct shield end treatment correctly.
- ❑ Use thick conductors as grounding cables. Ground the Dynaserv through a resistance of less than 100Ω.
- ❑ Since high-voltage current flows through motor and AC power cables, make sure that their wirings are correct.

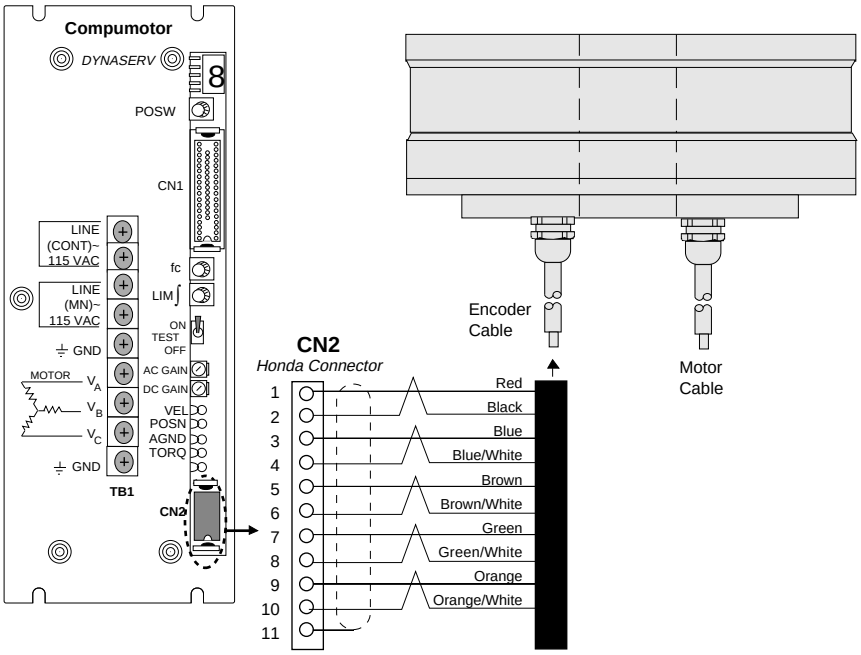
Motor/Drive Connection

The motor and encoder cables provided with the Dynaserv are pre-wired. If you need to re-wire these cables, use the following color codes and function descriptions.

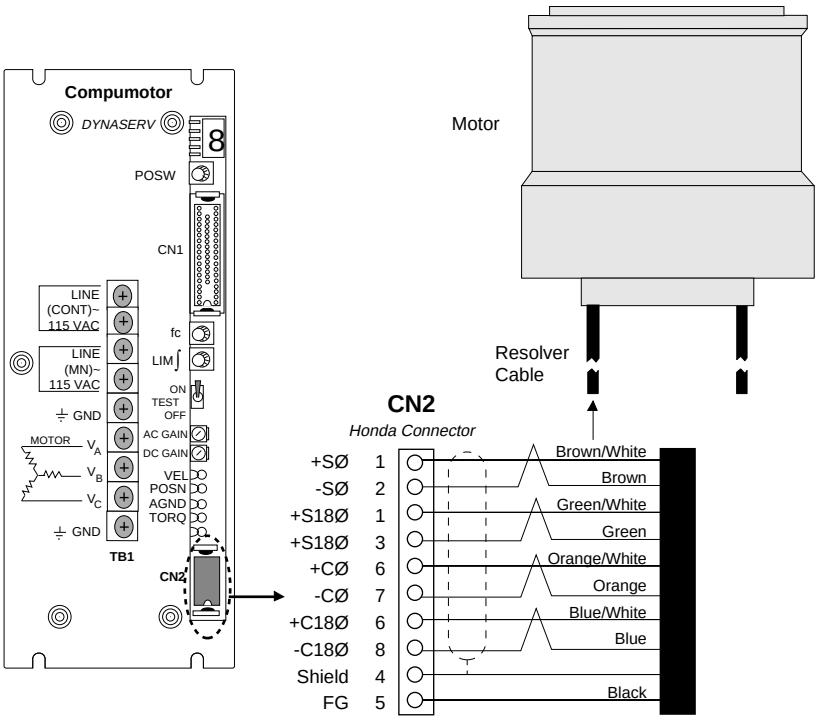
Motor Cable Codes (DM & DR Series)

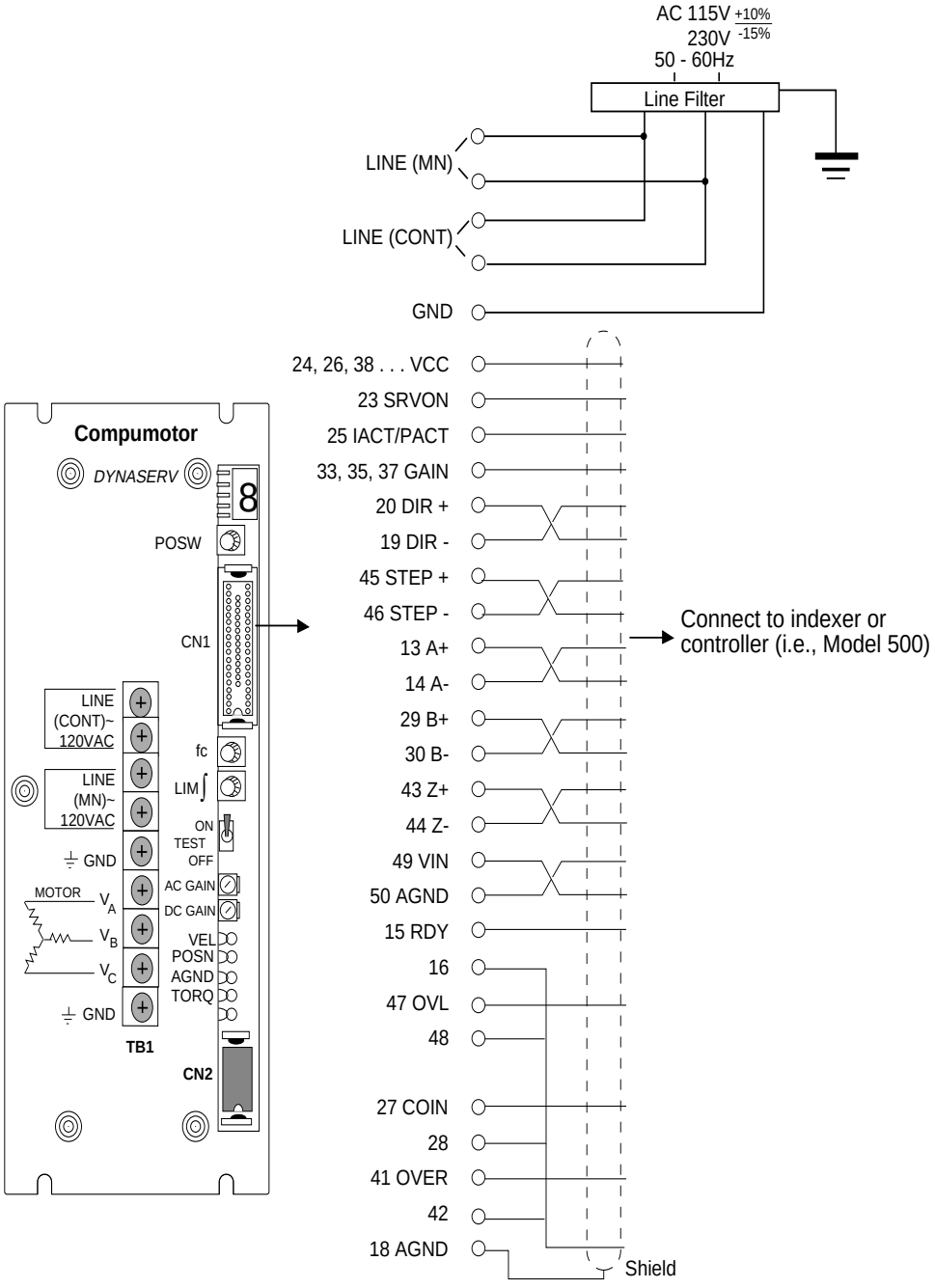


Encoder Cable Codes (DM Series)

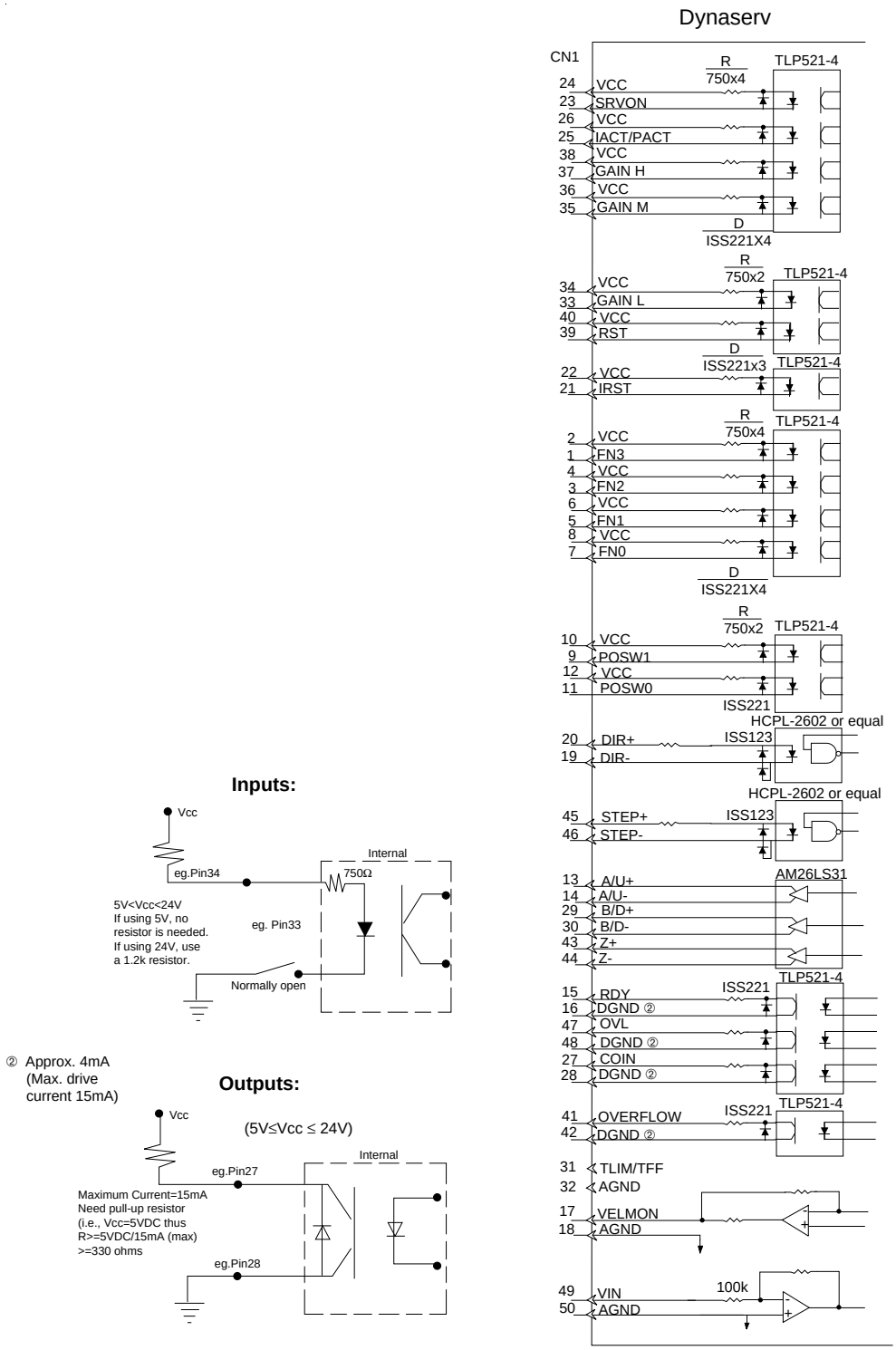


Resolver Cable Codes (DR Series)




AC 115V +10% -15%
230V
50 - 60Hz
Line Filter
LINE (MN)
LINE (CONT)
GND
24, 26, 38 . . . VCC
23 SRVON
25 IACT/PACT
33, 35, 37 GAIN
20 DIR +
19 DIR -
45 STEP +
46 STEP -
13 A+
14 A-
29 B+
30 B-
43 Z+
44 Z-
49 VIN
50 AGND
15 RDY
16
47 OVL
48
27 COIN
28
41 OVER
42
18 AGND
Shield
Connect to indexer or controller (i.e., Model 500)
Compumotor
DYNASERV
POSW
CN1
fc
LIM
ON
TEST
OFF
AC GAIN
DC GAIN
VEL
POSN
AGND
TORQ
CN2
LINE (CONT)~ 120VAC
LINE (MN)~ 120VAC
GND
MOTOR
V_A
V_B
V_C
GND
TB1

Indexer/Drive Connection



The following table describes CN1 inputs' functions and characteristics.

Signal Name	Pin No.*	Function	Description
FN3FN2FN1FNØ	1 (2)3 (4)5 (6)7 (8)	Compliance Setting	The signal for setting the fc switch on an interface is a 4-bit (Servo Stiffness Setting) positive logic binary number that can be set in 16 steps of fc = 1 to 16 Hz.
POSW 1POSW Ø	9 (10)11 (12)	Positioning Completion	This signal sets a deviation counting value to output Pulse-Width End positioning completion pulses. A four-step setting can be made in ranges of 1 to 100, 2 to 200, 4 to 400, or 8 to 800 together with POSW switch setting.
DIR+DIR-	2019	Rotating Direction Command	The motor rotates CW with this signal set to H and CCW with it set to L (When viewed from the load side, it is the same hereafter).
IRST	21 (22)	Integral Capacitor Reset	The integral capacitor in the velocity loop is shorted.
SRVON	23 (24)	Servo On	The motor is set to the servo ON status 0.2 seconds after this signal is set to L to set the driver to the command wait status.
IACT/PACT	25 (26)	Integral/Proportional Action Selection	Integral action is selected when this signal is set to H and proportional action selection is selected when this signal is set to L in Position Control mode.
GAIN H GAIN M GAIN L	37 (38)35 (36)33 (34)	Gain Selection	Signal to select the variable DC gain range. DC gain can be varied in the range of 0.5 to 110 times. Set by the variable resistor.
RST	39 (40)	CPU Reset	The driver control section is initialized when this signal is set to L for more than 50 seconds.
STEP+STEP-	45 46	Position Command Pulse	Driver position command pulse signal pulse
VIN	49	Velocity Command Input Torque Command Input	Use the following voltages to perform various functions. • Set to maximum number of revolutions input: +10V • CW: +10V • CCW: -10V • Torque command: ±8V
AGND	50	Analog Input GND	Velocity/Torque input analog GND

* ( ) Indicates Vcc signal power input.

FN Ø to 3 and POSW Ø to 1 are wired-ORed with the rotary switch on the interface card.

The following table describes the **CN1** outputs' functions and characteristics.

Signal Name	Pin No.*	Function	Description
A+/U+ A-/U- B+/D+ D-/D-30	13 14 29	Position Feedback Pulse Signal	Pulse signal to indicate the motor rotatin position. Either A/B or UP/DOWN phase pulse can be selected by the jumper on the board
RDY	(15) 16	Servo Ready	This signal is set to the H level about 3 seconds after driver power is ON
VELMON	(17) 18	Velocity Monitoring	Signal for monitoring the motor revolutions to output positive voltage for CW rotation and negative voltage for CCW rotation. Velocity detection sensitivity is not guaranteed for motor revolutions exceeding ±7.5V
COIN	(27) 28	Positioning Completion Signal	This signal is set to L when the deviation counter value is the POSW switch set-value.
OVERFLOW	(41) 42	Deviation Counter Overflow or Overspeed (Excess Position Error)	Deviation counter overflow signal is output only in Position Control mode. This signal is set to L when the deviation counter value is 32767. The overspeed signal is set to L when feedback pulse output frequency is 3 MHz. It is set to L if the number of motor revolutions exceeds ±7.5V in the Position Control or Velocity Control modes.
Z+ Z-	43	Origin Pulse	Signal for detecting the original positions obtained by equally dividing motor 1 revolution (200 for the A series, 150 for the E series, and 124 for the B series), and changes from H to L (CW) and from L to H (CCW).
OVL	47	Overload	Set to H during overload, it simultaneously reduces motor current automatically to 1/3.

* ( ) Indicates Vcc signal power output.

Input and Output Signals

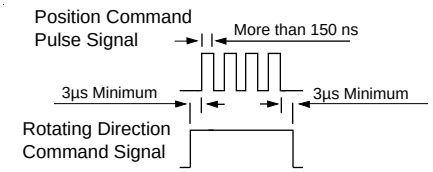
The step, direction, and velocity inputs and the velocity monitoring, and pulse output signals employ a different circuit design than the inputs and outputs previously defined.

Step Input Signal

The step input is a drive position command pulse signal. The pulse signal is in positive logic and its minimum pulse width is 150 ns.

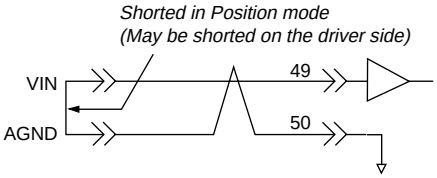
Direction Input Signal

This direction input signal sets the direction that the motor rotates. The motor rotates CW when this signal is set to **H** and CCW with it is set to **L**.



Velocity Command Input (VIN)

This analog input signal gives the motor rotating velocity command value. The maximum rated CW velocity is +10V. The maximum rated CCW velocity is -10V (in the ±10V input range, input impedance is 100 kΩ). This input is only valid in Torque mode or Velocity mode.

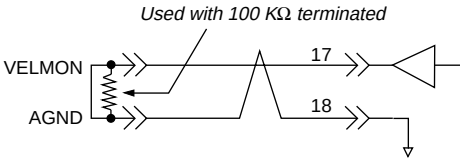


Velocity Monitoring Output (VELMON)

Motor analog velocity monitoring output voltage:

- ❑ At maximum velocity +5 V (CW)
- ❑ At maximum velocity -5 V (CCW)
- ❑ (Output impedance: 1 kΩ)

The analog velocity monitoring output circuit is shown below.



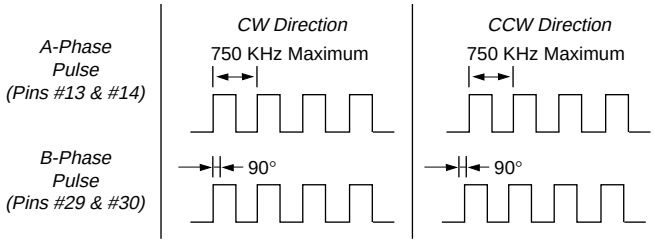
The table below describes Dynaserv's velocity detection capabilities.

Model	Model Velocity Detection Sensitivity (V/rps)	# of Detection Limit Revs (rps)
DR1015B - DR1060B, DR1070E, DR1100E	5.0/2.0	3.0
DR1050A	5.0/1.5	2.3
DR1130E - DR1250E, DR1100A - DR1400A	5.0/1.5	1.5
DM-B	5.0/2.0	2.4
DM-A	5.0/1.0	1.2
DR5015C - DR5030B - DR5070B	5.0/4.0	5.0
DR5300A - DR5500A	5.0/2.0	3.0

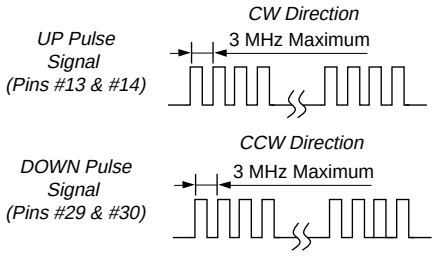
A/B Phase, UP/DOWN Pulse Output Signals (A/U, B/D)

Pulse signals indicate the motor's position. You can select the states of two pulse outputs with Control Board jumpers (see JP11H3).

- **A/B Phase Output Pulse**: The following pulse signal is output with the jumper UD/AB on the controller board shorted. This output is very similar to a standard incremental encoder.



- **UP/DOWN Phase Output Pulse**: The following pulse signal is output with the jumper UD/AB on the controller board opened. This output is appropriate for use with a simple counter.



Compliance Control Gain Setting

You can set fc or corner frequency with the front panel rotary switch or with input signals FNØ - FN3. The following table shows the corner frequency values and corresponding switch positions.

FN3	FN2	FN1	FNØ	fc Switch Position	fc (Hz)
H	H	H	H	Ø	1
H	H	H	L	1	2
H	H	L	H	2	3
H	H	L	L	3	4
H	L	H	H	4	5
H	L	H	L	5	6
H	L	L	H	6	7
H	L	L	L	7	8
L	H	H	H	8	9
L	H	H	L	9	1Ø
L	H	L	H	A	11
L	H	L	L	B	12
L	L	H	H	C	13
L	L	H	L	D	14
L	L	L	H	E	15
L	L	L	L	F	16

DC Gain Scaling Setting

The following table shows **DC GAIN** scaling settings.

GH	GM	GL	Gain*
H	H	H	1
H	H	L	4
H	L	H	7
H	L	L	10
L	H	H	13
L	H	L	16
L	L	H	19
L	L	L	22

*The product of the gain scale factor and **DC GAIN** variable resistor setting is the total gain.

Power ON/OFF

Note the following conditions when power is ON.

① When turning ON the main and control circuit power supplies, turn them ON simultaneously or turn ON the control circuit power first.

② When turning them OFF, turn them OFF simultaneously (including after instantaneous power failure), or turn OFF the main circuit power first.

③ Rush current in both the main and control power circuits is about 25A (peak).

④ The motor is enabled (servo on) about 200 ms after SRVON is set to L.

⑤ When the main power circuit is active, RDY = H indicates driver trouble. Use a sequence circuit to turn OFF the main power circuit when RDY = H. However, after the control and main circuit power supplies are turned ON, the RDY = H condition is maintained for up to 3 seconds. Therefore, hold the power-ON signal for more than 3 seconds.