efesotomasyon.com

DELTA ELECTRONICS, INC.

www.delta.com.tw/industrialautomation

ASIA

Delta Electronics, Inc.
Taoyuan1
31-1, Xingbang Road, Guishan Industrial Zone,
Taoyuan County 33370, Taiwan, R.O.C.
TEL: 886-3-362-6301 / FAX: 886-3-362-7267

Delta Electronics (Jiang Su) Ltd.
Wujiang Plant3
1688 Jiangxing East Road,
Wujiang Economy Development Zone,
Wujiang City, Jiang Su Province,
People's Republic of China (Post code: 215200)
TEL: 86-512-6340-3008 / FAX: 86-512-6340-7290

Delta Electronics (Japan), Inc.
Tokyo Office
Delta Shibadaimon Building, 2-1-14 Shibadaimon,
Minato-Ku, Tokyo, 105-0012, Japan
TEL: 81-3-5733-1111 / FAX: 81-3-5733-1211

Delta Electronics (Korea), Inc.
234-9, Duck Soo BD 7F, Nonhyun-dong,
Kangnam-ku, Seoul, Korea
Post code : 135-010
TEL: 82-2-515-5305 / FAX: 82-2-515-5302

Delta Electronics (Singapore) Pte. Ltd.
8 Kaki Bukit Road 2, #04-18 Ruby Warehouse Complex,
Singapore 417841
TEL: 65-747-5155 / FAX: 65-744-9228

Delta Energy Systems (India) Pvt. Ltd.
Plot No. 27 & 31, Sector-34, EHTP,
Gurgaon-122001 Haryana, India
TEL: 91-124-4169040 / FAX: 91-124-4036045

AMERICA

Delta Products Corporation (USA)
Raleigh Office
P.O. Box 12173,5101 Davis Drive,
Research Triangle Park, NC 27709, U.S.A.
TEL: 1-919-767-3813 / FAX: 1-919-767-3939

EUROPE

Deltronics (The Netherlands) B.V.
Eindhoven Office
De Witbogt 15, 5652 AG Eindhoven, The Netherlands
TEL: 31-40-2592850 / FAX: 31-40-2592851

*We reserve the right to change the information in this manual without prior notice

20090628

DELTA ASDA-B Series User Manual

efesotomasyon.com

DELTA ELECTRONICS, INC.

ASDA-B Series

User Manual

Standard AC Servo Drive for General Purpose Applications



www.delta.com.tw/industrialautomation

efesotomasyon.com

Thank you very much for purchasing DELTA's AC servo products.

This manual will be helpful in the installation, wiring, inspection, and operation of Delta AC servo drive and motor. Before using the product, please read this user manual to ensure correct use.

You should thoroughly understand all safety precautions (DANGERS, WARNINGS and STOPS) before proceeding with the installation, wiring and operation. If you do not understand please contact your local Delta sales representative. Place this user manual in a safe location for future reference.

🕮 Using This Manual

■ Contents of this manual

This manual is a user guide that provides the information on how to install, operate and maintain ASDA-B series AC servo drives and ECMA series AC servo motors. The contents of this manual are including the following topics:

- Installation of AC servo drives and motors
- Configuration and wiring
- Trial run steps
- Control functions and adjusting methods of AC servo drives
- Parameter settings
- Communication protocol
- Inspection and maintenance
- Troubleshooting
- Application examples

■ Who should use this manual

This user manual is intended for the following users:

- Those who are responsible for designing.
- Those who are responsible for installing or wiring.
- Those who are responsible for operating or programming.
- Those who are responsible for maintaining or troubleshooting.

■ Important precautions

Before using the product, please read this user manual thoroughly to ensure correct use and store this manual in a safe and handy place for quick reference whenever necessary. Besides, please observe the following precautions:

- Do not use the product in a potentially explosive environment.
- Install the product in a clean and dry location free from corrosive and inflammable gases or liquids.

- Do not connect a commercial power supply to the U, V, W terminals of motor. Failure to observe this precaution will damage either the Servo motor or drive.
- Ensure that the motor and drive are correctly connected to a ground. The grounding method must comply with the electrical standard of the country (Please refer to NFPA 70: National Electrical Code, 2005 Ed.).
- Do not disconnect the AC servo drive and motor while the power is ON.
- Do not attach, modify and remove wiring when power is applied to the AC servo drive and motor.
- Before starting the operation with a mechanical system connected, make sure the emergency stop equipment can be energized and work at any time.
- Do not touch the drive heat sink or the servo motor during operation. Otherwise, it may result in serious personnel injury.

PLEASE READ PRIOR TO INSTALLATION FOR SAFETY.

ASDA-B series drives are open type servo drives and must be installed in an NEMA enclosure such as a protection control panel during operation to comply with the requirements of the international safety standards. They are provided with precise feedback control and high-speed calculation function incorporating DSP (Digital Signal Processor) technology, and intended to drive three-phase permanent magnet synchronous motors (PMSM) to achieve precise positioning by means of accurate current output generated by IGBT (Insulated Gate Bipolar Transistor).

ASDA-B series drives can be used in industrial applications and for installation in an end-use enclosure that do not exceed the specifications defined in the ASDA-B series user manual (Drives, cables and motors are for use in a suitable enclosure with a minimum of a UL50 type 1 or NEMA 250 Type 1 rating).

Carefully notice and observe the following safety precautions when receiving, inspecting, installing, operating, maintaining and troubleshooting. The following words, DANGER, WARNING and STOP are used to mark safety precautions when using the Delta's servo product. Failure to observe these precautions may void the warranty!

The words, DANGER, WARNING and STOP, have the following meaning:

	Indicates a potentially hazardous situation and if not avoided, may result in serious injury or death.
	Indicates a potentially hazardous situation and if not avoided, may result in minor to moderate injury or serious damage to the product.
	Indicates an improper action that it is not recommended to do and if doing it may cause damage, malfunction and inability.

Unpacking Check



- *Please ensure that both the servo drive and motor are correctly matched for size (power rating). Failure to observe this precaution may cause fire, seriously damage the drive / motor or cause personal injury.*

Installation



- *Do not install the product in a location that is outside the stated specification for the drive and motor. Failure to observe this caution may result in electric shock, fire, or personal injury.*

Wiring



- *Connect the ground terminals to a class-3 ground (Ground resistance should not exceed 100Ω). Improper grounding may result in electric shock or fire.*
- *Do not connect any power supplies to the U, V, W terminals. Failure to observe this precaution may result in serious injury, damage to the drive or fire.*
- *Ensure that all screws, connectors and wire terminations are secure on the power supply, servo drive and motor. Failure to observe this caution may result in damage, fire or personal injury.*

Operation



- *Before starting the operation with a mechanical system connected, change the drive parameters to match the user-defined parameters of the mechanical system. Starting the operation without matching the correct parameters may result in servo drive or motor damage, or damage to the mechanical system.*
- *Ensure that the emergency stop equipment or device is connected and working correctly before operating the motor that is connected to a mechanical system.*



- *Do not approach or touch any rotating parts (e.g. shaft) while the motor is running. Failure to observe this precaution may cause serious personal injury.*



- *In order to prevent accidents, the initial trial run for servo motor should be conducted under no load conditions (separate the motor from its couplings and belts).*
- *For the initial trial run, do not operate the servo motor while it is connected to its mechanical system. Connecting the motor to its mechanical system may cause damage or result in personal injury during the trail run. Connect the servo motor once it has successfully completed a trail run.*
- *Caution: Please perform trial run without load first and then perform trial run with load connected. After the servo motor is running normally and regularly without load, then run servo motor with load connected. Ensure to perform trial run in this order to prevent unnecessary danger.*
- *Do not touch either the drive heat sink or the motor during operation as they may become hot and personal injury may result.*

Maintenance and Inspection



- *Do not touch any internal or exposed parts of servo drive and servo motor as electrical shock may result.*
- *Do not remove the operation panel while the drive is connected to an electrical power source otherwise electrical shock may result.*
- *Wait at least 10 minutes after power has been removed before touching any drive or motor terminals or performing any wiring and/or inspection as an electrical charge may still remain in the servo drive and servo motor with hazardous voltages even after power has been removed.*
- *Do not disassemble the servo drive or motor as electric shock may result.*
- *Do not connect or disconnect wires or connectors while power is applied to the drive and motor.*
- *Only qualified personnel who have electrical knowledge should conduct maintenance and inspection.*

Main Circuit Wiring



- *Install the encoder cables in a separate conduit from the motor power cables to avoid signal noise. Separate the conduits by 30cm (11.8inches) above.*
- *Use multi-stranded twisted-pair wires or multi-core shielded-pair wires for signal, encoder (PG) feedback cables. The maximum length of command input cable is 3m (9.84ft.) and the maximum length of encoder (PG) feedback cables is 20m (65.62ft.).*
- *As a charge may still remain in the drive with hazardous voltages even after power has been removed, be sure to wait at least 10 minutes after power has been removed before performing any wiring and/or inspection.*



- *It is not recommended to frequently power the drive on and off. Do not turn the drive off and on more than once per minute as high charging currents within the internal capacitors may cause damage.*

Main Circuit Terminal Wiring



- *Insert only one wire into one terminal on the terminal block.*
- *When inserting wires, please ensure that the conductors are not shorted to adjacent terminals or wires.*
- *Please use Y-type terminals to tighten the ends of wires.*
- *Ensure to double check the wiring before applying power to the drive.*



1) In this manual, actual measured values are in metric units. Dimensions in (imperial units) are for reference only. Please use metric for precise measurements.
2) The content of this manual may be revised without prior notice. Please consult our distributors or download the most updated version at http://www.delta.com.tw/industrialautomation.

efesotomasyon.com

Table of Contents

Chapter 1 Unpacking Check and Model Explanation 1-1

1.1 Unpacking Check 1-1

1.2 Model Explanation 1-3

1.2.1 Nameplate Information 1-3

1.2.2 Model Name Explanation 1-4

1.3 Servo Drive and Servo Motor Combinations 1-6

1.4 Servo Drive Features 1-7

1.5 Control Modes of Servo Drive 1-8

Chapter 2 Installation and Storage 2-1

2.1 Installation Notes 2-1

2.2 Storage Conditions 2-1

2.3 Installation Conditions 2-2

2.4 Installation Procedure and Minimum Clearances 2-3

Chapter 3 Connections and Wiring 3-1

3.1 Connections 3-1

3.1.1 Connecting to Peripheral Devices 3-1

3.1.2 Servo Drive Connectors and Terminals 3-2

3.1.3 Wiring Methods 3-4

3.1.4 Motor Power Cable Connector Specifications 3-5

3.1.5 Encoder Connector Specifications 3-7

3.1.6 Cable Specifications for Servo Drive and Servo Motor 3-8

3.2 Basic Wiring 3-9

3.3 Input / Output Interface Connector -CN1 3-12

3.3.1 CN1 Terminal Identification 3-12

3.3.2 Signals Explanation of Connector CN1 3-13

3.3.3 User-defined DI and DO signals 3-18

3.3.4 Wiring Diagrams of I/O Signals (CN1) 3-20

3.4 Encoder Connector CN2 3-25

3.5 Serial Communication Connector CN3 3-26

3.5.1 CN3 Terminal Layout and Identification 3-26

3.5.2 Connection between PC/Keypad and Connector CN3 3-27

3.6 Standard Connection Example 3-28

3.6.1 Position Control Mode 3-28

3.6.2 Speed Control Mode 3-29

3.6.3 Torque Control Mode 3-30

Chapter 4 Display and Operation 4-1

4.1 ASD-PU-01A 4-1

4.1.1 Description of Digital Keypad ASD-PU-01A 4-1

4.1.2 Display Flowchart 4-3

4.1.3 Status Display 4-8

4.1.4 Fault Code Display Operation 4-11

4.1.5 JOG Operation 4-12

4.1.6 DO Force Output Diagnosis Operation 4-14

4.1.7 DI Diagnosis Operation 4-15

4.1.8 DO Diagnosis Operation 4-15

4.1.9 Parameters Read and Write 4-16

4.2 ASD-PU-01B 4-18

4.2.1 Description of Digital Keypad ASD-PU-01B 4-18

4.2.2 Display Flowchart 4-19

4.2.3 Status Display 4-28

4.2.4 Fault Code Display Operation 4-31

4.2.5 JOG Operation 4-31

4.2.6 DO Force Output Diagnosis Operation 4-33

4.2.7 DI Diagnosis Operation 4-34

4.2.8 DO Diagnosis Operation 4-35

4.2.9 Parameters Read and Write 4-36

Chapter 5 Trial Run and Tuning Procedure 5-1

5.1 Inspection without Load 5-1

5.2 Applying Power to the Drive 5-3

5.3 JOG Trial Run without Load 5-7

5.3.1 ASD-PU-01A Tuning Flowchart 5-7

5.3.2 ASD-PU-01B Tuning Flowchart 5-8

5.4 Speed Trial Run without Load 5-9

5.5 Tuning Procedure 5-11

5.5.1 Tuning Flowchart 5-13

5.5.2 Load Inertia Estimation Flowchart 5-14

5.5.3 AutoMode (PI) Tuning Flowchart 5-15

5.5.4 AutoMode (PDFF) Tuning Flowchart 5-17

5.5.5 Limit of Load Inertia Estimation 5-18

5.5.6 Relationship between Tuning Modes and Parameters 5-19

5.5.7 Gain Adjustment in Manual Mode 5-20

Chapter 6 Control Modes of Operation 6-1

6.1 Control Modes of Operation 6-1

6.2 Position Control Mode 6-2

6.2.1 Command Source of Position Control Mode 6-2

6.2.2 Structure of Position Control Mode 6-3

6.2.3 Pulse Inhibit Input Function (INHIBIT) 6-4

6.2.4 Electronic Gear Ratio 6-4

6.2.5 Low-pass Filter 6-6

6.2.6 Position Loop Gain Adjustment 6-6

6.3 Speed Control Mode 6-9

6.3.1 Command Source of Speed Control Mode 6-9

6.3.2 Structure of Speed Control Mode 6-10

6.3.3 Smoothing Strategy of Speed Control Mode 6-11

6.3.4 Analog Speed Input Scaling 6-14

6.3.5 Timing Chart of Speed Control Mode 6-15

6.3.6 Speed Loop Gain Adjustment 6-15

6.3.7 Resonance Suppression 6-23

6.4 Torque Control Mode 6-25

6.4.1 Command Source of Torque Control Mode 6-25

6.4.2 Structure of Torque Control Mode 6-26

6.4.3 Smoothing Strategy of Torque Control Mode 6-27

6.4.4 Analog Torque Input Scaling 6-27

6.4.5 Timing Chart of Speed Control Mode 6-28

6.5 Control Modes Selection 6-29

6.5.1 Speed / Position Control Mode Selection 6-29

6.5.2 Speed / Torque Control Mode Selection 6-30

6.5.3 Torque / Position Control Mode Selection 6-30

6.6 Others 6-31

6.6.1 Speed Limit 6-31

6.6.2 Torque Limit 6-31

6.6.3 Regenerative Resistor 6-32

6.6.4 Electromagnetic Brake 6-36

Chapter 7 Servo Parameters 7-1

7.1 Definition 7-1

7.2 Parameter Summary 7-2

7.2.1 Parameters List by Group 7-2

7.2.2 Parameters List by Function 7-10

7.3 Detailed Parameter Listings 7-19

Chapter 8 MODBUS Communications 8-1

8.1 Communication Hardware Interface 8-1

8.2 Communication Parameter Settings 8-4

8.3 MODBUS Communication Protocol 8-8

Chapter 9 Maintenance and Inspection 9-1

9.1 Basic Inspection 9-1

9.2 Maintenance 9-2

9.3 Life of Replacement Components 9-2

Chapter 10 Troubleshooting 10-1

10.1 Fault Messages Table 10-1

10.2 Potential Cause and Corrective Actions 10-3

10.3 Clearing Faults 10-12

Chapter 11 Specifications 11-1

11.1 Specifications of Servo Drive (ASDA-B Series) 11-1

11.2 Specifications of Servo Motor (ECMA Series) 11-4

11.3 Dimensions of Servo Drive 11-7

11.4 Servo Motor Speed-Torque Curves (T-N Curve) 11-10

11.5 Overload Characteristics 11-11

11.6 Dimensions of Servo Motor 11-18

11.7 EMI Filters Selection 11-22

Chapter 12 Application Examples 12-1

12.1 Connecting to DVP-EH PLC and DOP-A HMI 12-1

12.2 Connecting to DVP-EH PLC and Delta TP04 Series 12-12

12.3 External Controller Connection Examples 12-15

Appendix A Accessories A-1

About this Manual…

User Information

Be sure to store this manual in a safe place.

Due to constantly growing product range, technical improvement and alteration or changed texts, figures and diagrams, we reserve the right of this manual contained information change without prior notice.

Coping or reproducing any part of this manual, without written consent of Delta Electronics Inc. is prohibited.

Technical Support and Service

Welcome to contact us or visit our web site (http://www.delta.com.tw/industrialautomation/) if you need any technical support, service and information, or, if you have any question in using the product. We are looking forward to serve you needs and willing to offer our best support and service to you. Reach us by the following ways.

ASIA
DELTA ELECTRONICS, INC.
Taoyuan Plant 1
31-1, XINGBANG ROAD,
GUISHAN INDUSTRIAL ZONE,
TAOYUAN COUNTY 33370, TAIWAN, R.O.C.
TEL: 886-3-362-6301
FAX: 886-3-362-7267

JAPAN
DELTA ELECTRONICS (JAPAN), INC.
Tokyo Office
DELTA SHIBADAIMON BUILDING
2-1-14 SHIBADAIMON, MINATO-KU,
TOKYO, 105-0012, JAPAN
TEL: 81-3-5733-1111
FAX: 81-3-5733-1211

NORTH/SOUTH AMERICA
DELTA PRODUCTS CORPORATION (USA)
Raleigh Office
P.O. BOX 12173
5101 DAVIS DRIVE,
RESEARCH TRIANGLE PARK, NC 27709, U.S.A.
TEL: 1-919-767-3813
FAX: 1-919-767-3969

EUROPE
DELTRONICS (THE NETHERLANDS) B.V.
Eindhoven Office
DE WITBOGT 15, 5652 AG EINDHOVEN,
THE NETHERLANDS
TEL: 31-40-259-2850
FAX: 31-40-259-2851

Revision June, 2009

This page intentionally left blank

efesotomasyon.com

Chapter 1 Unpacking Check and Model Explanation

1.1 Unpacking Check

After receiving the AC servo drive, please check for the following:

- **Ensure that the product is what you have ordered.**

  Verify the part number indicated on the nameplate corresponds with the part number of your order (Please refer to Section 1.2 for details about the model explanation).

- **Ensure that the servo motor shaft rotates freely.**

  Rotate the motor shaft by hand; a smooth rotation will indicate a good motor. However, a servo motor with an electromagnetic brake can not be rotated manually.

- **Check for damage.**

  Inspect the unit to insure it was not damaged during shipment.

- **Check for loose screws.**

  Ensure that all necessary screws are tight and secure.

If any items are damaged or incorrect, please inform the distributor whom you purchased the product from or your local Delta sales representative.

A complete and workable AC servo system should be including the following parts:

Part I : Delta standard supplied parts

(1) Servo drive

(2) Servo motor

(3) Quick Start

Part II : Optional parts, not Delta standard supplied part (Refer to Appendix A)

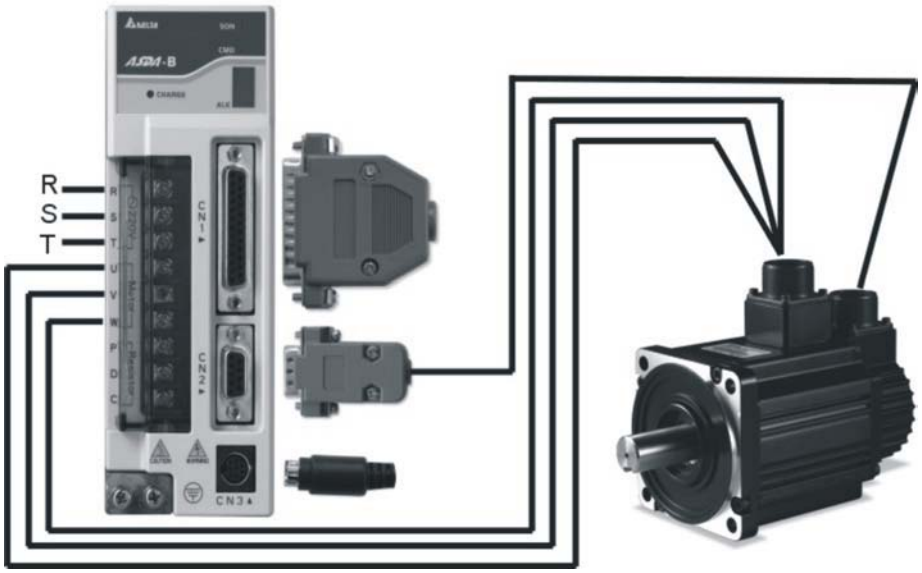
(1) One power cable, which is used to connect servo motor and U, V, W terminals of servo drive. This power cable is with one green grounding cable. Please connect the green grounding cable to the ground terminal of the servo drive.

(2) One encoder cable, which is used to connect the encoder of servo motor and CN2 terminal of servo drive.

(3) CN1 Connector: 25 PIN Connector (D-sub Connector)

(4) CN2 Connector: 9 PIN Connector (D-sub Connector)

(5) CN3 Connector: 8 PIN Connector (DIN Cable Mount Male)



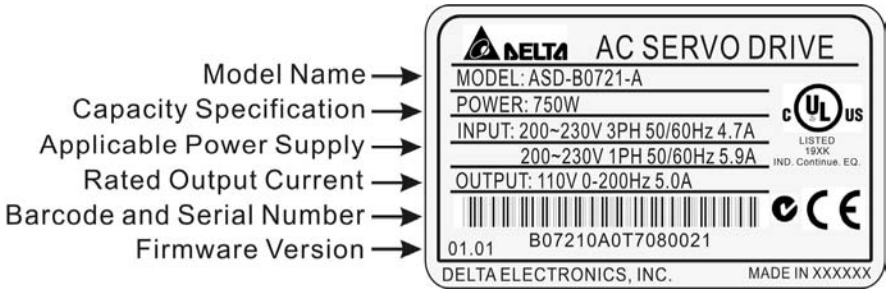
Delta AC Servo Drive and Motor

1.2 Model Explanation

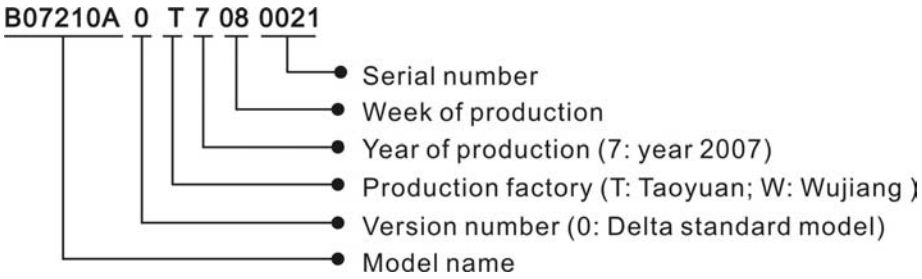
1.2.1 Nameplate Information

ASDA-B Series Servo Drive

- Nameplate Explanation

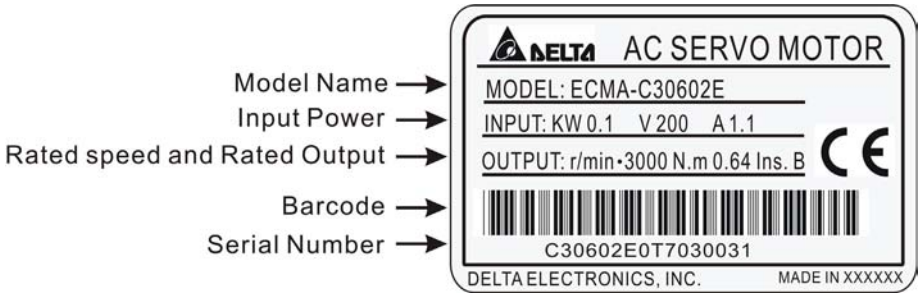


- Serial Number Explanation

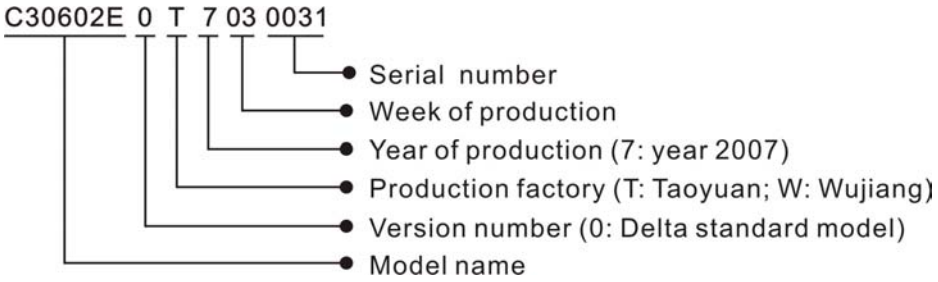


ECMA Series Servo Motor

- Nameplate Explanation

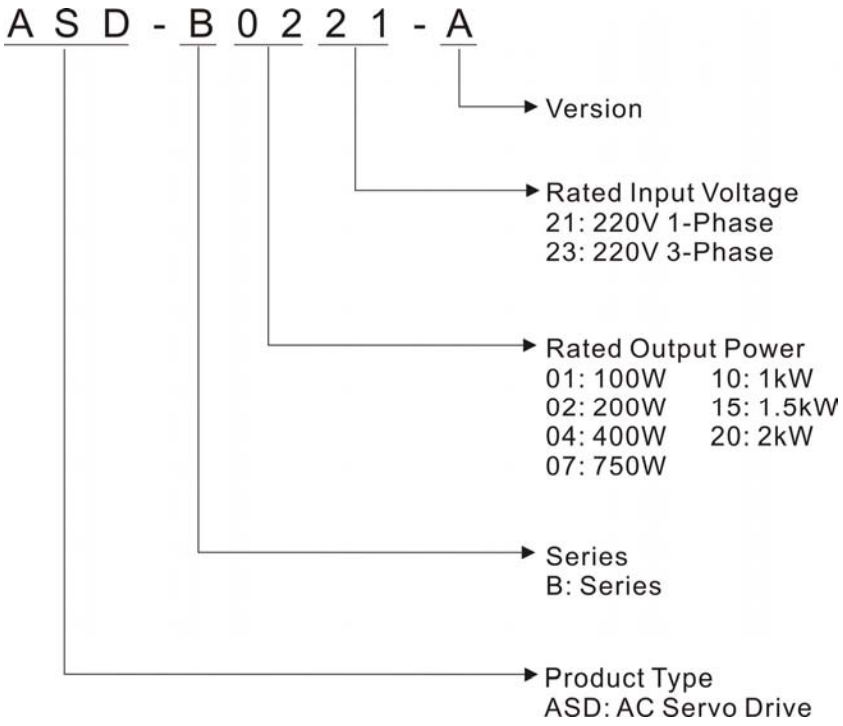


- Serial Number Explanation

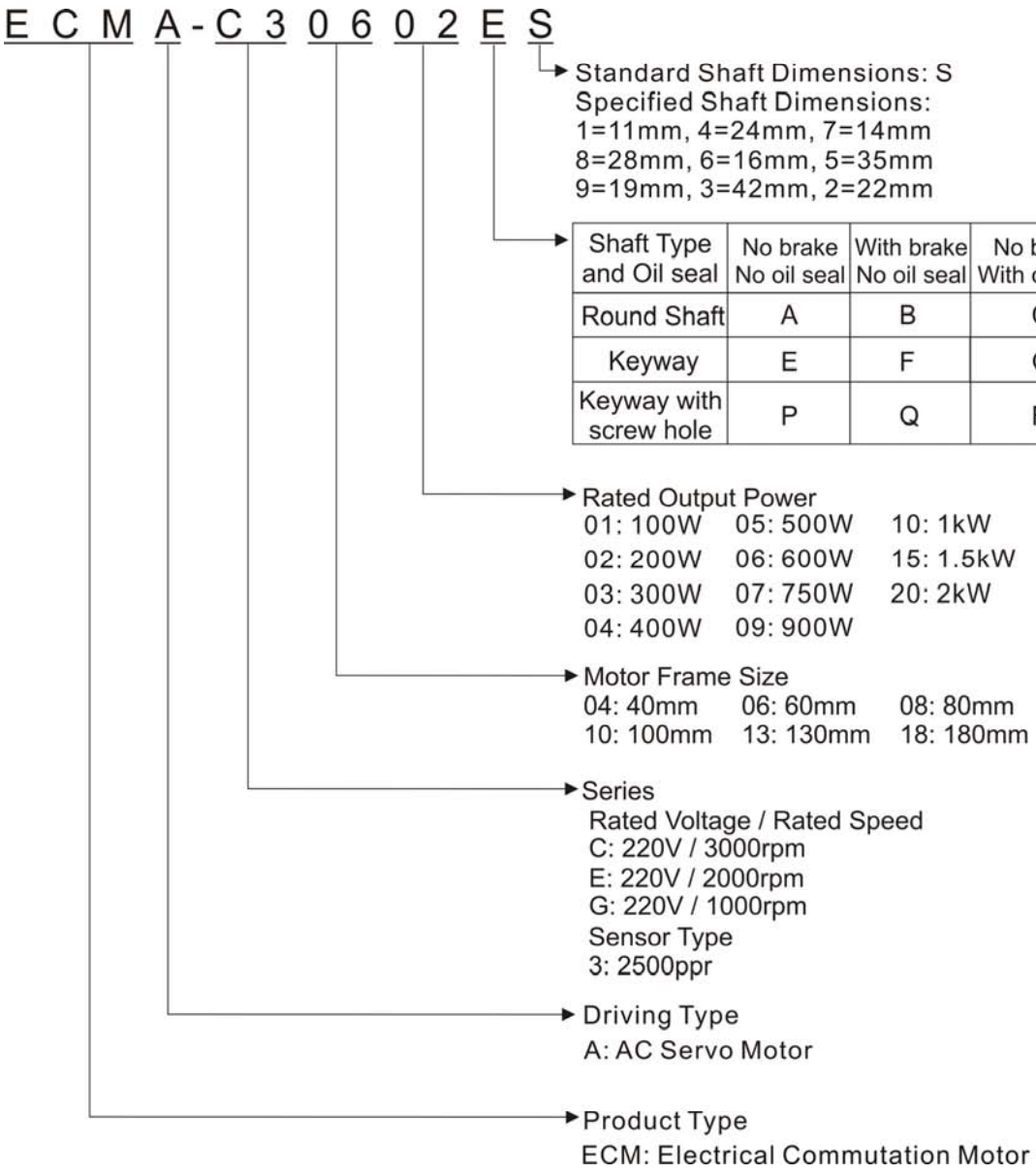


1.2.2 Model Name Explanation

ASDA-B Series Servo Drive



ECMA Series Servo Motor



Shaft Type and Oil seal	No brake No oil seal	With brake No oil seal	No brake With oil seal	With brake With oil seal
Round Shaft	A	B	C	D
Keyway	E	F	G	H
Keyway with screw hole	P	Q	R	S

1.3 Servo Drive and Servo Motor Combinations

The table below shows the possible combination of Delta ASDA-B series servo drives and ECMA series servo motors. The boxes (□) in the model names are for optional configurations. (Please refer to Section 1.2 for model explanation)

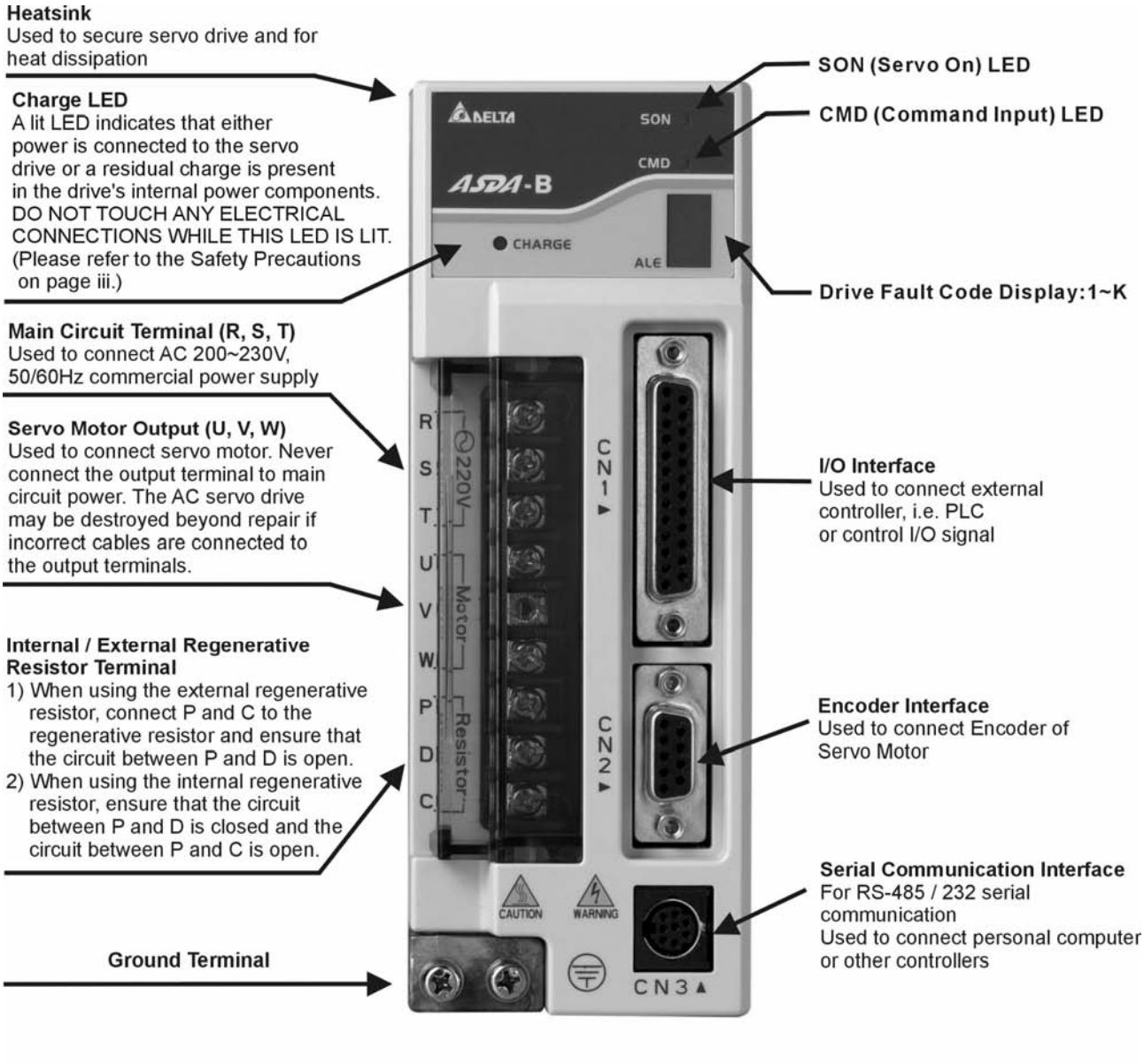
Servo Drive		Servo Motor
100W	ASD-B0121-A	ECMA-C30401□S (S=8mm)
200W	ASD-B0221-A	ECMA-C30602□S (S=14mm)
400W	ASD-B0421-A	ECMA-C30604□S (S=14mm) ECMA-C30804□7 (7=14mm) ECMA-E31305□S (S=22mm) ECMA-G31303□S (S=22mm)
750W	ASD-B0721-A	ECMA-C30807□S (S=19mm) ECMA-G31306□S (S=22mm)
1000W	ASD-B1021-A	ECMA-C31010□S (S=22mm) ECMA-E31310□S (S=22mm) ECMA-G31309□S (S=22mm)
1500W	ASD-B1521-A	ECMA-E31315□S (S=22mm)
2000W	ASD-B2023-A	ECMA-C31020□S (S=22mm) ECMA-E31320□S (S=22mm) ECMA-E31820□S (S=35mm)

The drives shown in the above table are designed for use in combination with the specific servo motors. Check the specifications of the drives and motors you want to use.

Also, please ensure that both the servo drive and motor are correctly matched for size (power rating). If the power of motor and drive is not within the specifications, the drive and motor may overheat and servo alarm would be activated. For the detail specifications of servo drives and motors, please refer to Chapter 11 “Specifications”.

The drives shown in the above table are designed according to the three multiple of rated current of motors shown in the above table. If the drives which are designed according to the six multiple of rated current of motors are needed, please contact our distributors or your local Delta sales representative.

1.4 Servo Drive Features



NOTE

1) Only 750W and above servo drives are provided with built-in regenerative resistors. The servo drives below 400W are not.

2) CMD LED: A lit CMD LED indicates that the servo drive is ON (Servo On) or the motor speed is equal to or higher than the setting value of P1-38 (>=P1-38 (ZSPD)).

1.5 Control Modes of Servo Drive

The Delta Servo can be programmed to provide five single and three dual modes of operation.

Their operation and description is listed in the following table.

Mode		Code	Description
Single Mode	External Position Control	P	Position control for the servo motor is achieved via an external pulse command.
	Speed Control	S	Speed control for the servo motor can be achieved via parameters set within the servo drive or from an external analog -10 ~ +10 Vdc command. Control of the internal speed parameters is via the Digital Inputs (DI). (A maximum of three speeds can be stored internally).
	Internal Speed Control	Sz	Speed control for the servo motor is only achieved via parameters set within the servo drive. Control of the internal speed parameters is via the Digital Inputs (DI). (A maximum of three speeds can be stored internally).
	Torque Control	T	Torque control for the servo motor can be achieved via parameters set within the servo drive or from an external analog -10 ~ +10 Vdc command. Control of the internal torque parameters is via the Digital Inputs (DI). (A maximum of three torque levels can be stored internally).
	Internal Torque Control	Tz	Torque control for the servo motor is only achieved via parameters set within the servo drive. Control of the internal torque parameters is via the Digital Inputs (DI). (A maximum of three torque levels can be stored internally).
Dual Mode		S-P	Either S or P control mode can be selected via the Digital Inputs (DI). (Please refer to Chapter 7 for more detailed DI setting.)
		T-P	Either T or P control mode can be selected via the Digital Inputs (DI). (Please refer to Chapter 7 for more detailed DI setting.)
		S-T	Either S or T control mode can be selected via the Digital Inputs (DI). (Please refer to Chapter 7 for more detailed DI setting.)

The above control modes can be accessed and changed via by parameter P1-01. If the control mode is changed, switch the drive off and on after the new control mode has been entered. The new control mode will only be valid after drive off/on action. Please see safety precautions on page iii (switching drive off/on multiple times).

efesotomasyon.com

Chapter 2 Installation and Storage

2.1 Installation Notes

Pay close attention on the following installation notes:

- Do not bend or strain the connection cables between servo drive and motor.
- When mounting servo drive, make sure to tighten screws to secure the drive in place.
- If the servo motor shaft is coupled directly to a rotating device ensure that the alignment specifications of the servo motor, coupling, and device are followed. Failure to do so may cause unnecessary loads or premature failure to the servo motor.
- If the length of cable connected between servo drive and motor is more than 20m (65.62ft.), please increase the wire gauge of the encoder cable and motor connection cable (connected to U, V, W terminals).
- Make sure to tighten the screws for securing motor.

2.2 Storage Conditions

The product should be kept in the shipping carton before installation. In order to retain the warranty coverage, the AC servo drive should be stored properly when it is not to be used for an extended period of time. Some storage suggestions are:

- Store in a clean and dry location free from direct sunlight.
- Store within an ambient temperature range of -20°C to +65°C (-4°F to 149°F).
- Store within a relative humidity range of 0% to 90% and non-condensing.
- Do not store in a place subjected to corrosive gases and liquids.
- Correctly packaged and placed on a solid surface.

2.3 Installation Conditions

Operating Temperature

ASDA-B Series Servo Drive : 0°C to 45°C (32°F to 113°F)

ECMA Series Servo Motor : 0°C to 40°C (32°F to 104°F)

The ambient temperature of servo drive for long-term reliability should be under 45°C (113°F).

If the ambient temperature of servo drive is greater than 45°C (113°F), please install the drive in a well-ventilated location and do not obstruct the airflow for the cooling fan.

Caution

The servo drive and motor will generate heat. If they are installed in a control panel, please ensure sufficient space around the units for heat dissipation.

Pay particular attention to vibration of the units and check if the vibration has impacted the electric devices in the control panel. Please observe the following precautions when selecting a mounting location. ***Failure to observe the following precautions may void the warranty!***

- Do not mount the servo drive or motor adjacent to heat-radiating elements or in direct sunlight.
- Do not mount the servo drive or motor in a location subjected to corrosive gases, liquids, or airborne dust or metallic particles.
- Do not mount the servo drive or motor in a location where temperatures and humidity will exceed specification.
- Do not mount the servo drive or motor in a location where vibration and shock will exceed specification.
- Do not mount the servo drive or motor in a location where it will be subjected to high levels of electromagnetic radiation.

2.4 Installation Procedure and Minimum Clearances

Installation Procedure

Incorrect installation may result in a drive malfunction or premature failure of the drive and or motor. Please follow the guidelines in this manual when installing the servo drive and motor.

The ASDA-B servo drive should be mounted perpendicular to the wall or in the control panel. In order to ensure the drive is well ventilated, ensure that the all ventilation holes are not obstructed and sufficient free space is given to the servo drive. Do not install the drive in a horizontal position or malfunction and damage will occur.



Correct



Incorrect

Drive Mounting

The ASDA-B Servo drives must be back mounted vertically on a dry and solid surface such as a NEMA enclosure. A minimum spacing of two inches must be maintained above and below the drive for ventilation and heat dissipation. Additional space may be necessary for wiring and cable connections. Also, as the drive conducts heat away via the mounting, the mounting plane or surface should be conductor away and not conduct heat into the drive from external sources

Motor Mounting

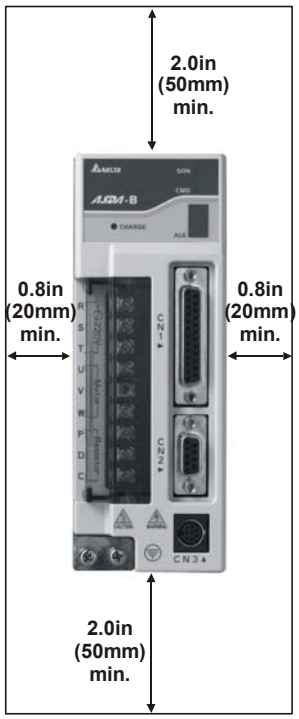
The ECMA Servo motors should be mounted firmly to a dry and solid mounting surface to ensure maximum heat transfer for maximum power output and to provide a good ground.

For the dimensions and weights specifications of servo drive or motor, please refer to Chapter 11 “Specifications".

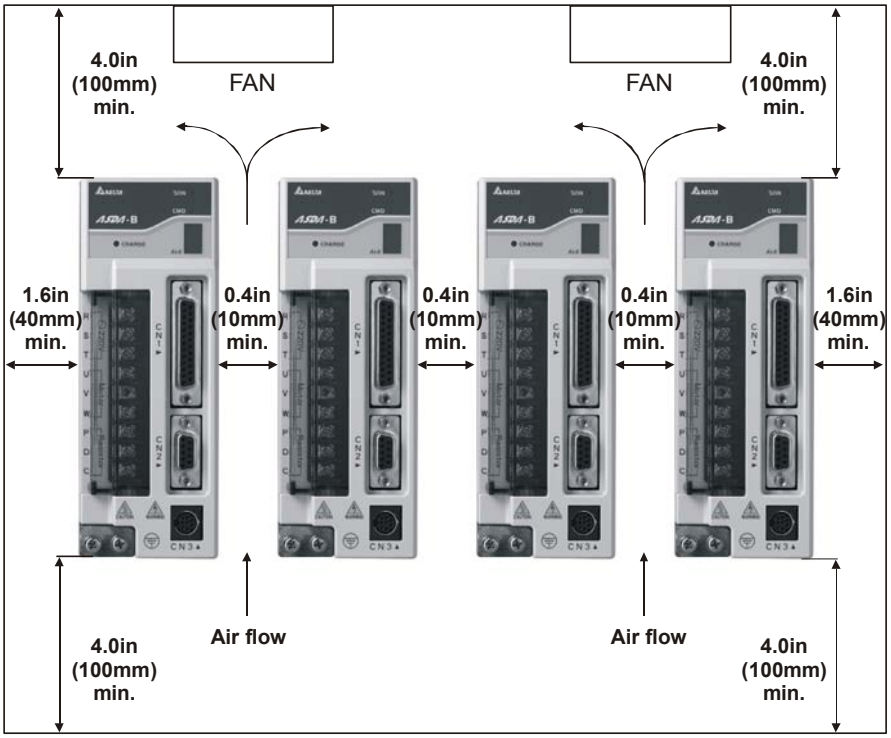
Minimum Clearances

Install a fan to increase ventilation to avoid ambient temperatures that exceed the specification. When installing two or more drive adjacent to each other please follow the clearances as shown in the following diagram.

■ Minimum Clearances



■ Side by Side Installation



efesotomasyon.com

Chapter 3 Connections and Wiring

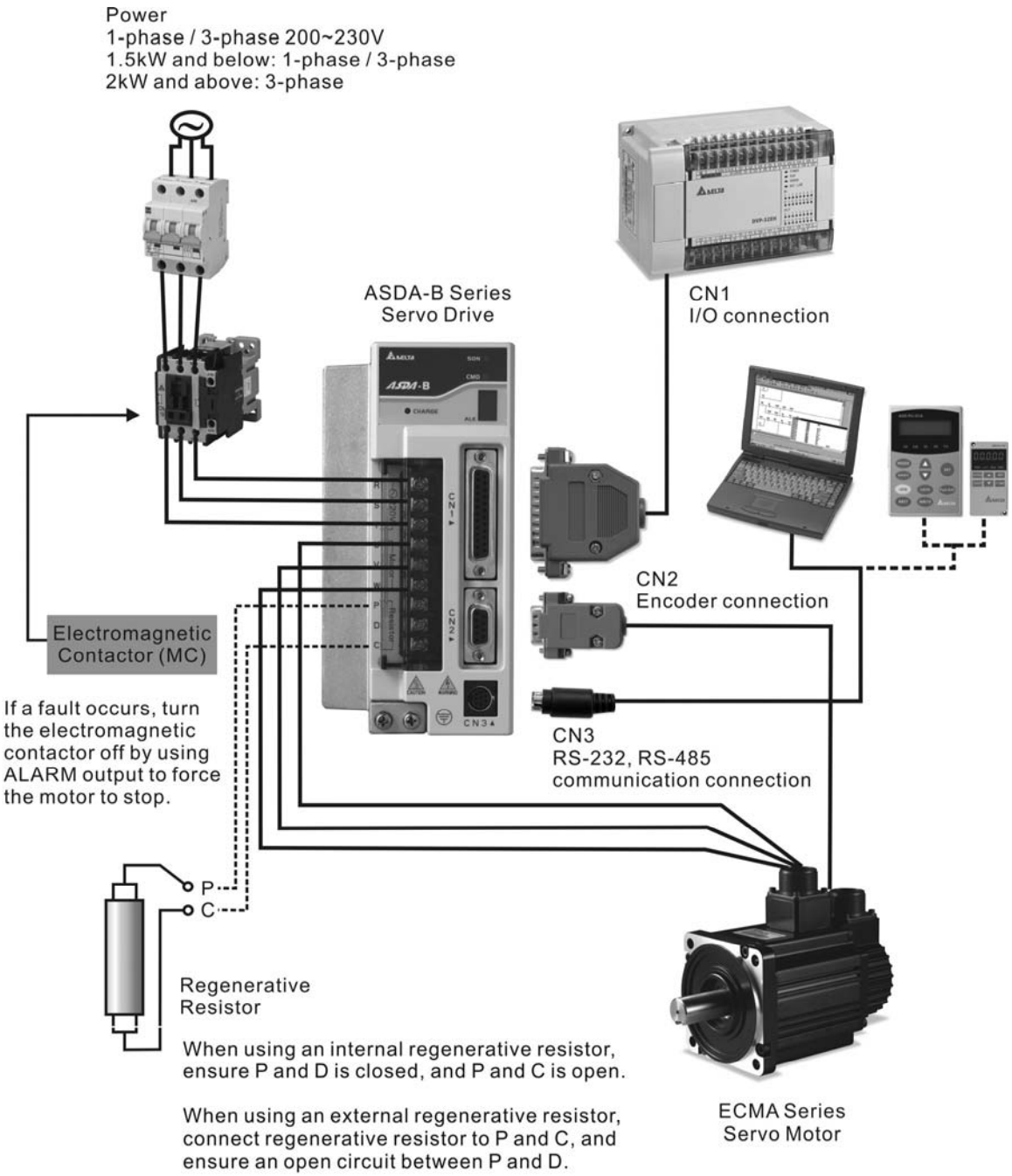
This chapter provides information on wiring ASDA-B series products, the descriptions of I/O signals and gives typical examples of wiring diagrams.

3.1 Connections

3.1.1 Connecting to Peripheral Devices

In Figure 3.1, it briefly explains how to connect each peripheral device.

Figure 3.1



3.1.2 Servo Drive Connectors and Terminals

<table>
<tr><th>Terminal Identification</th><th>Terminal Description</th><th colspan="3">Notes</th></tr>
<tr><td>R, S, T</td><td>Main circuit terminal</td><td colspan="3">The Main Circuit Terminal is used to supply the servo with line power. If a single-phase supply, is used connect the R and S terminals to power. If 3-phase, connect all three R, S, & T terminals.</td></tr>
<tr><td rowspan="6">U, V, W
FG</td><td rowspan="6">Servo motor output</td><td colspan="3">Used to connect servo motor</td></tr>
<tr><td>Terminal Symbol</td><td>Wire Color</td><td></td></tr>
<tr><td>U</td><td>Red</td><td></td></tr>
<tr><td>V</td><td>White</td><td></td></tr>
<tr><td>W</td><td>Black</td><td></td></tr>
<tr><td>FG</td><td>Green</td><td></td></tr>
<tr><td rowspan="3">P, D, C</td><td rowspan="3">Regenerative resistor terminal</td><td>Internal resistor</td><td colspan="2">Ensure the circuit is closed between P and D, and the circuit is open between P and C.</td></tr>
<tr><td>External resistor</td><td colspan="2">Connect regenerative resistor to P and C, and ensure an open circuit between P and D.</td></tr>
<tr><td colspan="3">Only 750W and above servo drives are provided with built-in regenerative resistors. Ensure to leave the circuit closed between P and D when using a built-in (internal) regenerative resistor.</td></tr>
<tr><td>⏚ two places</td><td>Ground terminal</td><td colspan="3">Used to connect grounding wire of power supply and servo motor.</td></tr>
<tr><td>CN1</td><td>I/O connector</td><td colspan="3">Used to connect external controllers. Please refer to section 3.3 for details.</td></tr>
<tr><td rowspan="11">CN2</td><td rowspan="11">Encoder connector</td><td colspan="3">Used to connect encoder of servo motor. Please refer to section 3.4 for details.</td></tr>
<tr><td>Terminal Symbol</td><td>Wire Color</td><td></td></tr>
<tr><td>A</td><td>Black</td><td></td></tr>
<tr><td>/A</td><td>Black/Red</td><td></td></tr>
<tr><td>B</td><td>White</td><td></td></tr>
<tr><td>/B</td><td>White/Red</td><td></td></tr>
<tr><td>Z</td><td>Orange</td><td></td></tr>
<tr><td>/Z</td><td>Orange/Red</td><td></td></tr>
<tr><td>+5V</td><td>Brown & Brown/White</td><td></td></tr>
<tr><td>GND</td><td>Blue & Blue/White</td><td></td></tr>
<tr><td>CN3</td><td>Communication connector</td><td colspan="3">Used to connect PC or keypad. Please refer to section 3.5 for details.</td></tr>
</table>

NOTE

1) U, V ,W , CN1, CN2, CN3 terminals provide short circuit protection.

Wiring Notes

Please observe the following wiring notes while performing wiring and touching any electrical connections on the servo drive or servo motor.

1. Ensure to check if the power supply and wiring of the "power" terminals (R, S, T, U, V, & W) is correct.
2. Please use shielded twisted-pair cables for wiring to prevent voltage coupling and eliminate electrical noise and interference.
3. As a residual hazardous voltage may remain inside the drive, please do not immediately touch any of the "power" terminals (R, S, T, U, V, & W) and/or the cables connected to them after the power has been turned off and the charge LED is lit. (Please refer to the Safety Precautions on page iii).
4. The cables connected to R, S, T and U, V, W terminals should be placed in separate conduits from the encoder or other signal cables. Separate them by at least 30cm (11.8inches).
5. If the encoder cable is too short, please use a twisted-shield signal wire with grounding conductor. The wire length should be 20m (65.62ft.) or less. For lengths greater than 20m (65.62ft.), the wire gauge should be doubled in order to lessen any signal attenuation.
6. As for motor cable selection, please use the 600V PTFE wire and the wire length should be less than 30m (98.4ft.). If the wiring distance is longer than 30m (98.4ft.), please choose the adequate wire size according to the voltage.
7. The shield of shielded twisted-pair cables should be connected to the SHIELD end (terminal marked ⏚) of the servo drive.
8. For the connectors and cables specifications, please refer to section 3.1.6 for details.
9. In this manual, actual measured values are in metric units. The recommended wire lengths in (imperial units) are for reference only. Please use metric for precise measurements.

3.1.3 Wiring Methods

For servo drives 1.5kW and below the input power can be either single or three-phase. For drives 2kW and above only three-phase connections are available.

In the wiring diagram figures 3.2 & 3.3:

Power ON : contact “a” (normally open)

Power OFF or Alarm Processing : contact “b” (normally closed)

1MC/x : coil of electromagnetic contactor

1MC/a : self-holding power

1MC : contact of main circuit power

Figure 3.2 Single-Phase Power Supply Connection

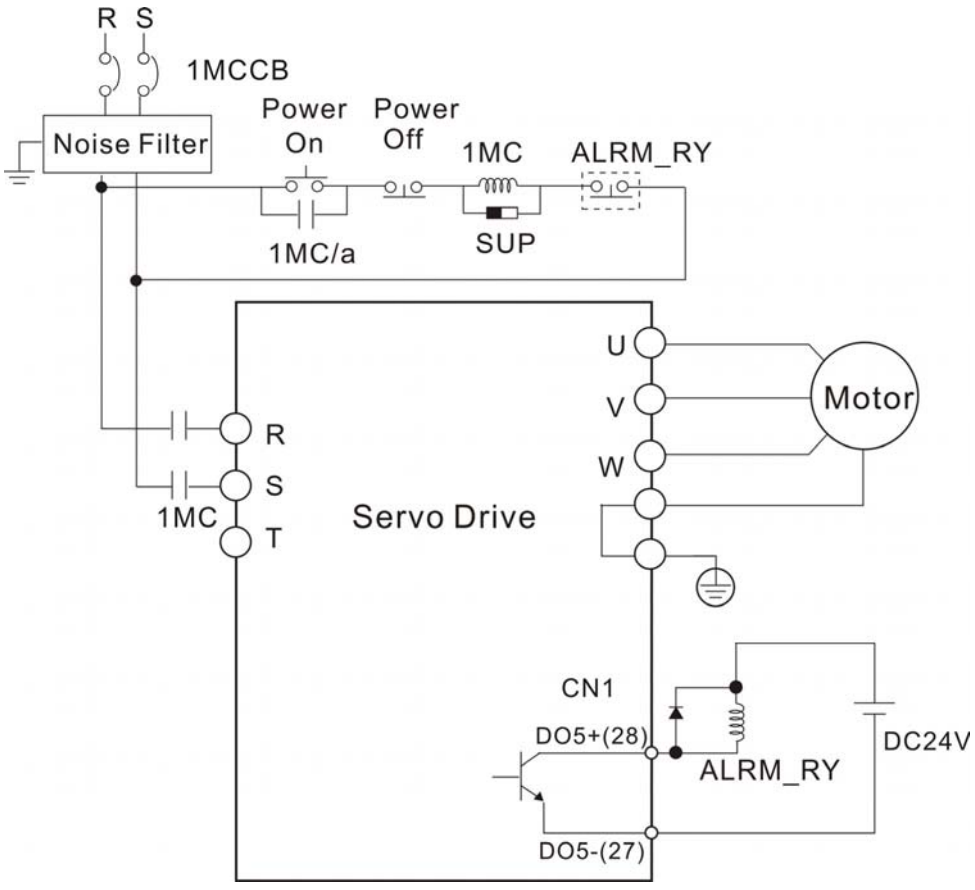
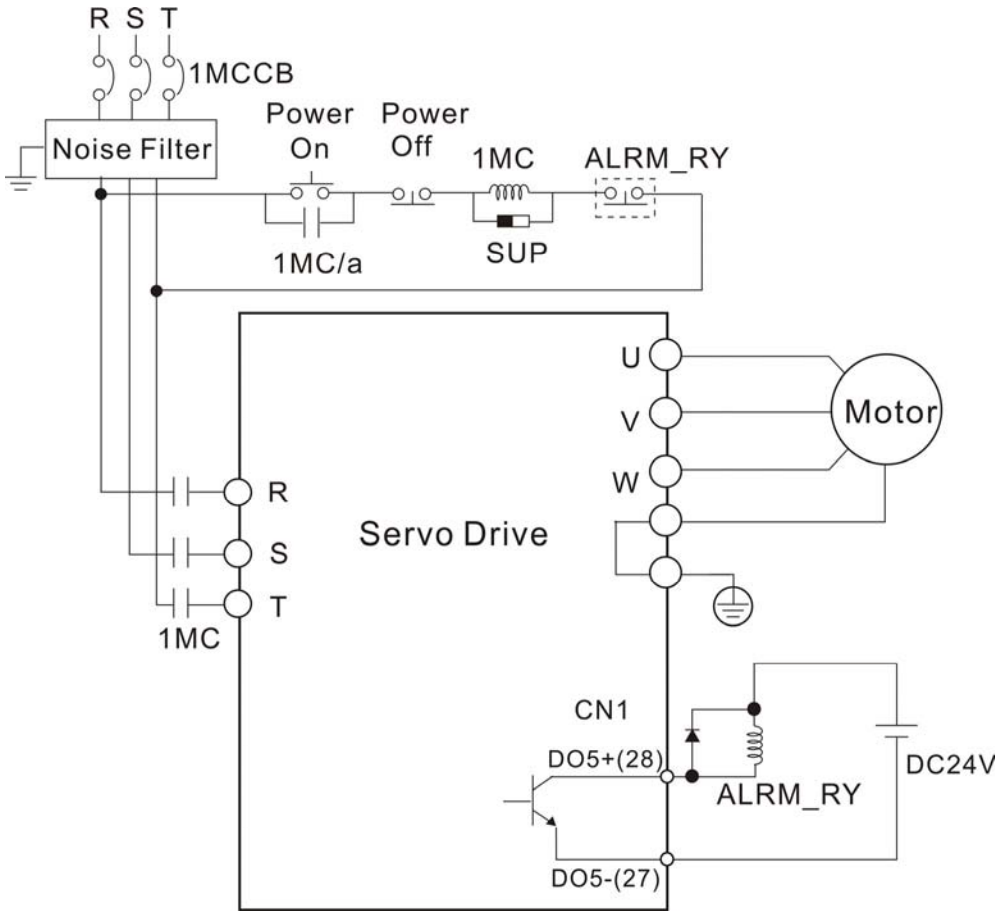
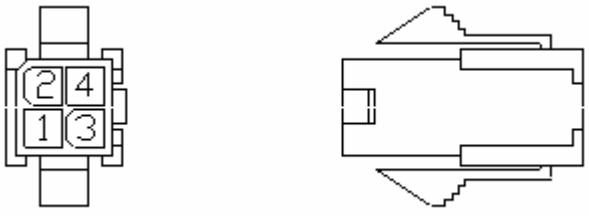
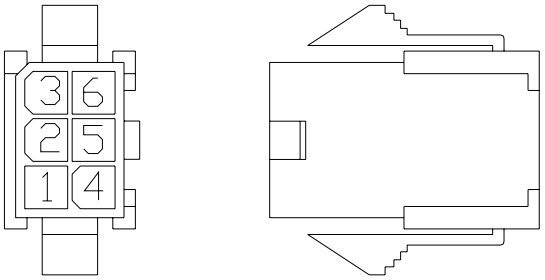


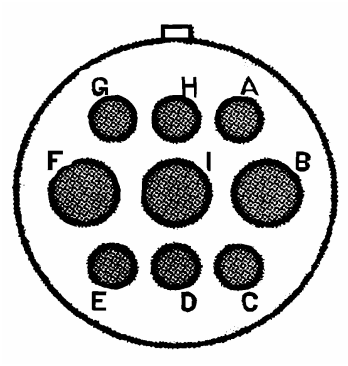
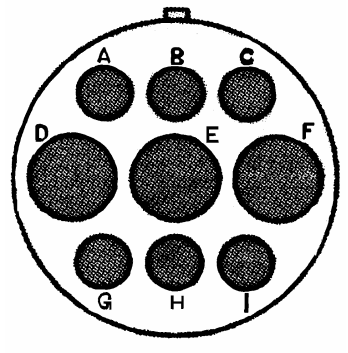
Figure 3.3 Three-Phase Power Supply Connection



3.1.4 Motor Power Cable Connector Specifications

The boxes (☐) in the model names are for optional configurations. (Please refer to section 1.2 for model explanation.)

Motor Model Name	U, V, W / Electromagnetic Brake Connector	Terminal Identification
ECMA-C30401☐S (100W) ECMA-C30602☐S (200W) ECMA-C30604☐S (400W) ECMA-C30804☐7 (400W) ECMA-C30807☐S (750W)	 HOUSING: JOWLE (C4201H00-2*2PA)	A
ECMA-C30602☐S (200W) ECMA-C30604☐S (400W) ECMA-C30804☐7 (400W) ECMA-C30807☐S (750W)	 HOUSING: JOWLE (C4201H00-2*3PA)	B

Motor Model Name	U, V, W / Electromagnetic Brake Connector	Terminal Identification
ECMA-G31303□S (300W) ECMA-E31305□S (500W) ECMA-G31306□S (600W) ECMA-G31309□S (900W) ECMA-C31010□S (1000W) ECMA-E31310□S (1000W) ECMA-E31315□S (1500W) ECMA-C31020□S (2000W) ECMA-E31320□S (2000W)	 3106A-20-18S	C
ECMA-E31820□S (2000W)	 3106A-24-11S	D

Terminal Identification	U (Red)	V (White)	W (Black)	CASE GROUND (Green)	BRAKE1	BRAKE2
A	1	2	3	4	-	-
B	1	2	4	5	3	6
C	F	I	B	E	G	H
D	D	E	F	G	A	B

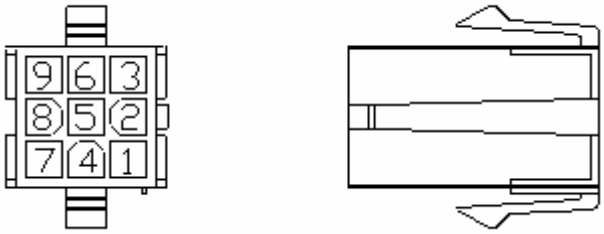
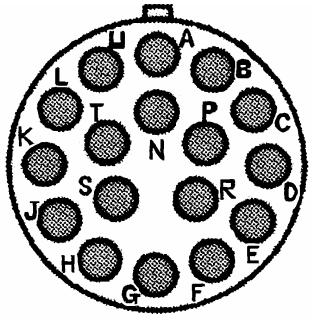
NOTE

1) The coil of brake has no polarity. The names of terminal identification are BRAKE1 and BRAKE2.

2) The power supply for brake is DC24V. Never use it for VDD, the +24V source voltage.

3.1.5 Encoder Connector Specifications

The boxes (☐) in the model names are for optional configurations. (Please refer to section 1.2 for model explanation.)

Motor Model Name	Encoder Connector	Terminal Identification
ECMA-C30401☐S (100W) ECMA-C30602☐S (200W) ECMA-C30604☐S (400W) ECMA-C30804☐7 (400W) ECMA-C30807☐S (750W)	 HOUSING: AMP (1-172161-9)	A
ECMA-G31303☐S (300W) ECMA-E31305☐S (500W) ECMA-G31306☐S (600W) ECMA-G31309☐S (900W) ECMA-C31010☐S (1000W) ECMA-E31310☐S (1000W) ECMA-E31315☐S (1500W) ECMA-C31020☐S (2000W) ECMA-E31320☐S (2000W) ECMA-E31820☐S (2000W)	 3106A-20-29S	B

Terminal Identification AMP (1-172161-9)	A (Black)	/A (Black /Red)	B (White)	/B (White /Red)	Z (Orange)	/Z (Orange /Red)	+5V (Brown & Brown/White)	GND (Blue & Blue/White)	BRAID SHELD
A	1	4	2	5	3	6	7	8	9
Terminal Identification 3106A-20-29S	A (Blue)	/A (Blue /Black)	B (Green)	/B (Green /Black)	Z (Yellow)	/Z (Yellow /Black)	+5V (Red & Red /White)	GND (Black & Black /White)	BRAID SHELD
B	A	B	C	D	F	G	S	R	L

3.1.6 Cable Specifications for Servo Drive and Servo Motor

Servo Drive and Servo Motor		Power Cable - Wire Gauge mm^2 (AWG)		
		R,S,T	U,V,W	P,C
ASD-B0121-A	ECMA-C30401□S	2.1 (AWG14)	0.82 (AWG18)	2.1 (AWG14)
ASD-B0221-A	ECMA-C30602□S	2.1 (AWG14)	0.82 (AWG18)	2.1 (AWG14)
ASD-B0421-A	ECMA-C30604□S	2.1 (AWG14)	0.82 (AWG18)	2.1 (AWG14)
	ECMA-C30804□7	2.1 (AWG14)	0.82 (AWG18)	2.1 (AWG14)
	ECMA-E31305□S	2.1 (AWG14)	0.82 (AWG18)	2.1 (AWG14)
	ECMA-G31303□S	2.1 (AWG14)	0.82 (AWG18)	2.1 (AWG14)
ASD-B0721-A	ECMA-C30807□S	2.1 (AWG14)	0.82 (AWG18)	2.1 (AWG14)
	ECMA-G31306□S	2.1 (AWG14)	0.82 (AWG18)	2.1 (AWG14)
ASD-B1021-A	ECMA-C31010□S	2.1 (AWG14)	1.3 (AWG16)	2.1 (AWG14)
	ECMA-E31310□S	2.1 (AWG14)	1.3 (AWG16)	2.1 (AWG14)
	ECMA-G31309□S	2.1 (AWG14)	1.3 (AWG16)	2.1 (AWG14)
ASD-B1521-A	ECMA-E31315□S	2.1 (AWG14)	1.3 (AWG16)	2.1 (AWG14)
ASD-B2023-A	ECMA-C31020□S	2.1 (AWG14)	2.1 (AWG14)	2.1 (AWG14)
	ECMA-E31320□S	2.1 (AWG14)	2.1 (AWG14)	2.1 (AWG14)
	ECMA-E31820□S	2.1 (AWG14)	3.3 (AWG12)	2.1 (AWG14)

Servo Drive and Servo Motor		Encoder Cable - Wire Gauge mm^2 (AWG)			
		Wire Size	Core Number	UL Rating	Standard Wire Length
ASD-B0121-A	ECMA-C30401□S	0.13 (AWG26)	10 core (4 pair)	UL2464	3m (9.84ft.)
ASD-B0221-A	ECMA-C30602□S	0.13 (AWG26)	10 core (4 pair)	UL2464	3m (9.84ft.)
ASD-B0421-A	ECMA-C30604□S	0.13 (AWG26)	10 core (4 pair)	UL2464	3m (9.84ft.)
	ECMA-C30804□7	0.13 (AWG26)	10 core (4 pair)	UL2464	3m (9.84ft.)
	ECMA-E31305□S	0.13 (AWG26)	10 core (4 pair)	UL2464	3m (9.84ft.)
	ECMA-G31303□S	0.13 (AWG26)	10 core (4 pair)	UL2464	3m (9.84ft.)
ASD-B0721-A	ECMA-C30807□S	0.13 (AWG26)	10 core (4 pair)	UL2464	3m (9.84ft.)
	ECMA-G31306□S	0.13 (AWG26)	10 core (4 pair)	UL2464	3m (9.84ft.)
ASD-B1021-A	ECMA-C31010□S	0.13 (AWG26)	10 core (4 pair)	UL2464	3m (9.84ft.)
	ECMA-E31310□S	0.13 (AWG26)	10 core (4 pair)	UL2464	3m (9.84ft.)
ASD-B1021-A	ECMA-G31309□S	0.13 (AWG26)	10 core (4 pair)	UL2464	3m (9.84ft.)
ASD-B1521-A	ECMA-E31315□S	0.13 (AWG26)	10 core (4 pair)	UL2464	3m (9.84ft.)
ASD-B2023-A	ECMA-C31020□S	0.13 (AWG26)	10 core (4 pair)	UL2464	3m (9.84ft.)
	ECMA-E31320□S	0.13 (AWG26)	10 core (4 pair)	UL2464	3m (9.84ft.)
	ECMA-E31820□S	0.13 (AWG26)	10 core (4 pair)	UL2464	3m (9.84ft.)

(Please refer to Section 1.2 for model explanation)



1) Please use shielded twisted-pair cables for wiring to prevent voltage coupling and eliminate electrical noise and interference.
2) The shield of shielded twisted-pair cables should be connected to the SHIELD end (terminal marked ⏚) of the servo drive.

3.2 Basic Wiring

Figure 3.4 Basic Wiring Schematic of 400W and below models

For 400W and below models (without built-in regenerative resistor)

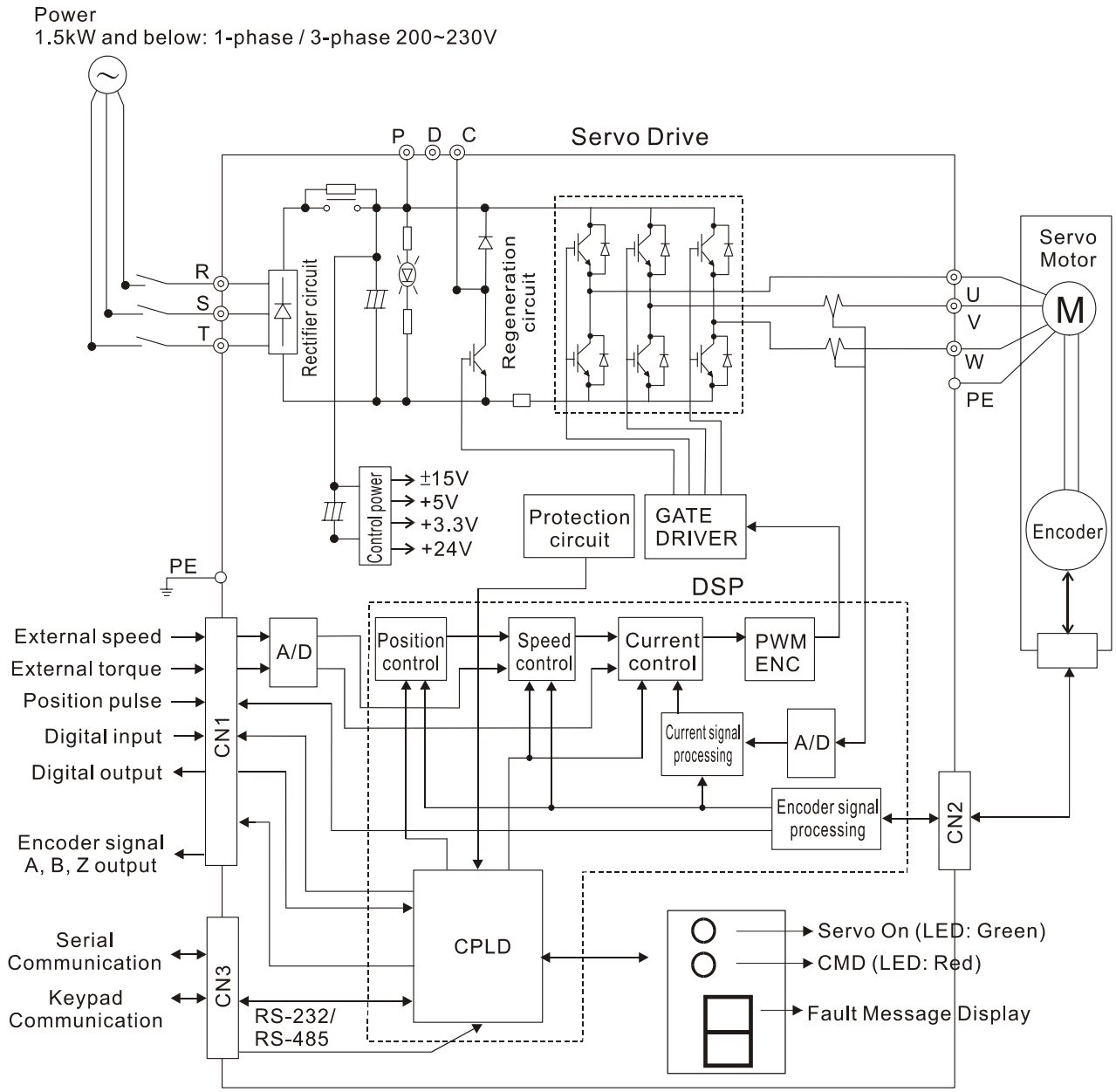


Figure 3.5 Basic Wiring Schematic of 750W models

For 750W and above models (with built-in regenerative resistor)

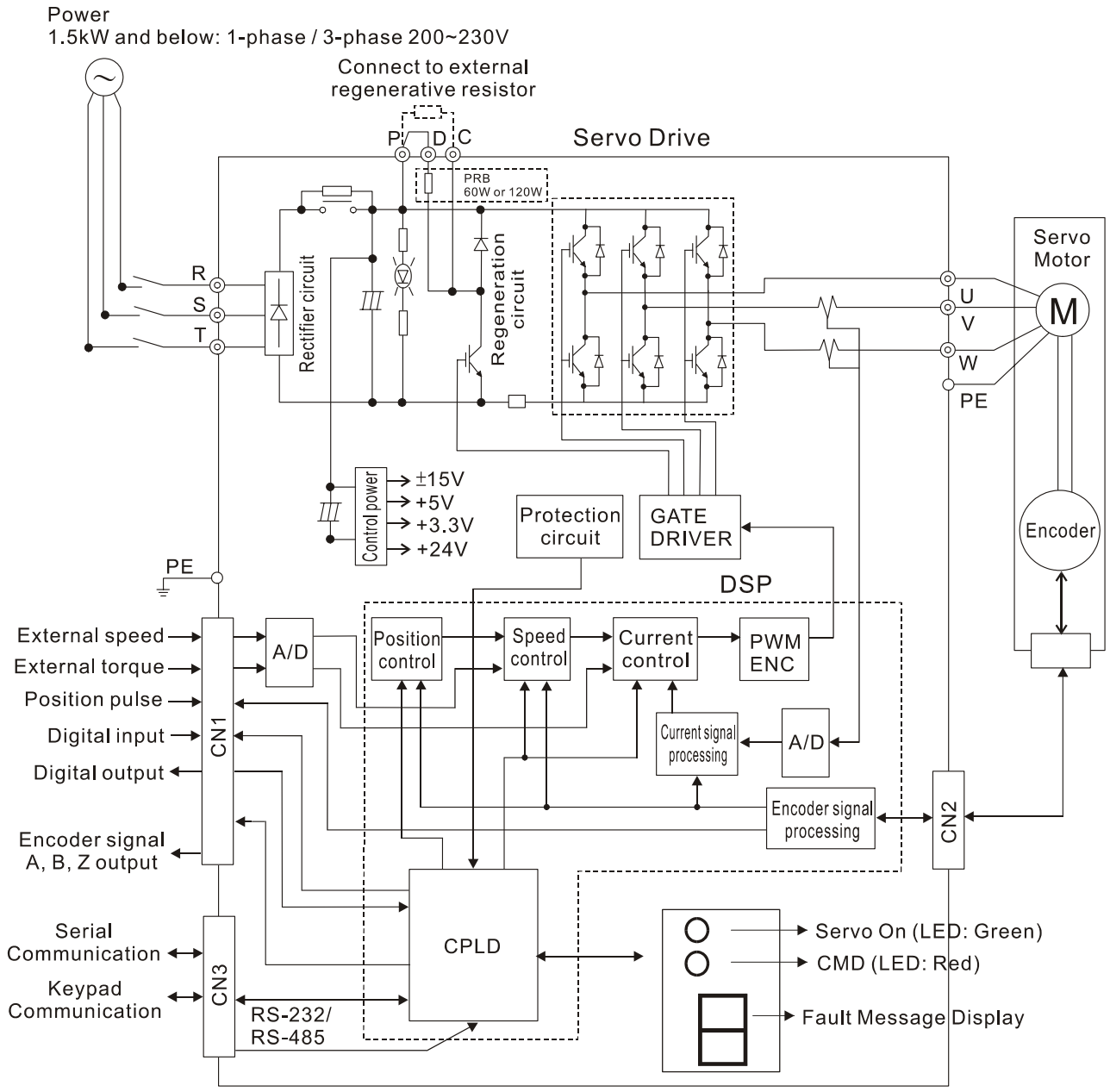
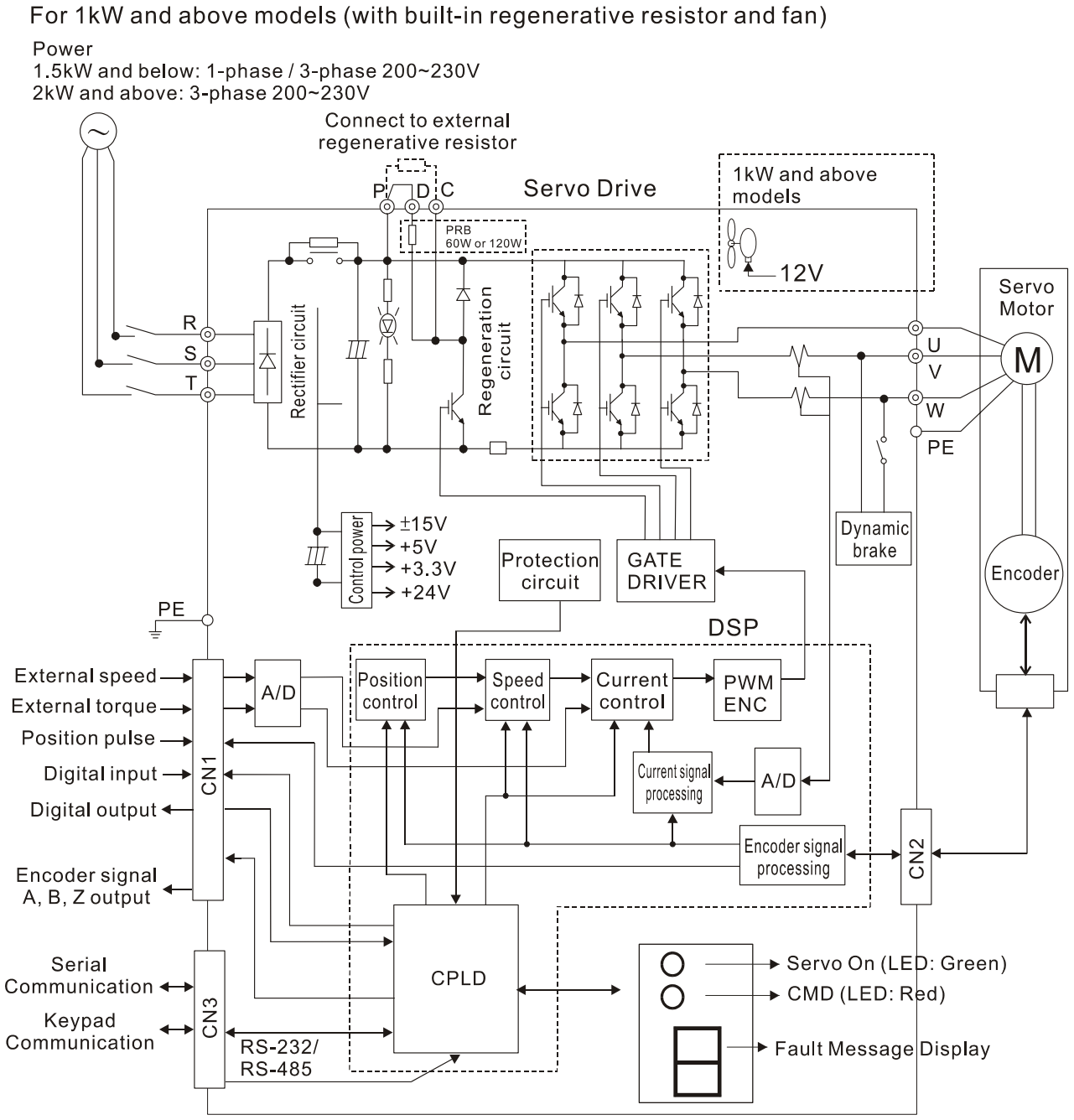


Figure 3.6 Basic Wiring Schematic of 1kW and above models



3.3 Input / Output Interface Connector -CN1

The CN1 Interface Connector provides access to three signal groups:

i General interface for the analog speed and torque control, encoder reference signal from the motor, open collector and line driver inputs, and reference voltages.

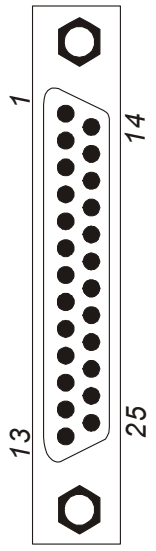
ii 6 programmable Digital Inputs (DI), can be set via parameters P2-10 ~ P2-15

iii 3 programmable Digital Outputs (DO), can be set via parameters P2-18 ~ P2-20

A detailed explanation of each group is available in Section 3.3.2, Tables 3.A, 3.B & 3.C.

3.3.1 CN1 Terminal Identification

Figure 3.7 The Layout of CN1 Drive Connector:



CN1 Terminal Signal Identification

1	D03+	Digital output
2	DO2+	Digital output
3	DI4-	Digital input
4	COM+	DI input common voltage rail
5	DI3-	Digital input
6	T-REF	Analog torque input (+)
7	VDD	+24Vpower output (for external I/O)
8	GND	Analog input signal ground
9	V-REF	Analog speed input (+)
10	OA	Encoder A pulse output
11	/OB	Encoder /B pulse output
12	OB	Encoder B pulse output
13	COM-	VDD(24V) power ground

14	DI6-	Digital input
15	DI5-	Digital input
16	DO1+	Digital output
17	DI1-	Digital input
18	DI2-	Digital input
19	/SIGN	Position sign (-)
20	SIGN	Position sign (+)
21	/PULSE	Pulse input (-)
22	PULSE	Pulse input (+)
23	/OA	Encoder /A pulse output
24	OZ	Encoder Z pulse output
25	/OZ	Encoder /Z pulse output

NOTE

1) GND (Pin 8) and COM- (Pin 13) of CN1 connector are independent respectively and do not have connection with the ground terminal outside the servo drive.

3.3.2 Signals Explanation of Connector CN1

The Tables 3.A, 3.B, & 3.C detail the three groups of signals of the CN1 interface. Table 3.A details the general signals. Table 3.B details the Digital Output (DO) signals and Table 3.C details the Digital Input (DI) signals. The General Signals are set by the factory and can not be changed, reprogrammed or adjusted. Both the Digital Input and Digital Output signals can be programmed by the users.

Table 3.A General Signals

Signal		Pin No	Details	Wiring Diagram (Refer to 3.3.3)
Analog Signal Input	V_REF	9	Motor speed command: -10V to +10V, corresponds to the maximum speed programmed P1-55 Maximum Speed Limit (Factory default 3000 RPM).	C1
	T_REF	6	Motor torque command: -10V to +10V, corresponds to -100% to +100% rated torque command.	C1
Position Pulse Input	PULSE /PULSE SIGN /SIGN	22 21 20 19	The drive can accept two different types of pulse inputs: Open Collector and Line Driver. Three different pulse commands can be selected via parameter P1-00. Quadrature, CW + CCW pulse & Pulse / Direction.	C2/C3
Position Pulse Output	OA /OA	10 23	The motor encoder signals are available through these terminals. The A, B, Z output signals can be Line Driver type. The Z output signal can be Open Collector type also, but the output maximum voltage is 5V and the maximum permissible current is 200mA.	C10/C11
	OB /OB	12 11		
	OZ /OZ	24 25		
Power	VDD	7	VDD is the +24V source voltage provided by the drive. Maximum permissible current is 500mA.	-
	COM+ COM-	4 13	COM+ is the common voltage rail of the Digital Input and Digital Output signals. Connect VDD to COM+ for source mode. For external applied power sink mode (+12V to +24V), the positive terminal should be connected to COM+ and the negative to COM-.	
Ground	GND	8	Analog input signal ground.	-

The Digital Input (DI) and Digital Output (DO) have factory default settings which correspond to the various servo drive control modes. (See section 1.5). However, both the DI's and DO's can be programmed independently to meet the requirements of the users.

Detailed in Tables 3.B and 3.C are the DO and DI functions with their corresponding signal name and wiring schematic. The factory default settings of the DI and DO signals are detailed in Table 3.F.

All of the DI's and DO's and their corresponding pin numbers are factory set and nonchangeable, however, all of the assigned signals and control modes are user changeable. For Example, the factory default setting of DO1 (pin 16) is SRDY (servo ready) signal, but it can be assigned to SON (Servo On) signal and vise versa.

The following Tables 3.B and 3.C detail the functions, applicable operational modes, signal name and relevant wiring schematic of the default DI and DO signals.

Table 3.B DO Signals

DO Signal	Assigned Control Mode	Pin No.	Details (*1)	Wiring Diagram (Refer to 3.3.3)
		+		
SRDY	ALL	16 (DO1)	SRDY is activated when the servo drive is ready to run. All fault and alarm conditions, if present, have been cleared.	C4/C5/C6/C7
SON	ALL	-	SON is activated when control power is applied to the servo drive. The drive may or may not be ready to run as a fault / alarm condition may exist. Servo ON (SON) is "ON" with control power applied to the servo drive, there may be a fault condition or not. The servo is not ready to run. Servo ready (SRDY) is "ON" where the servo is ready to run, NO fault / alarm exists.	
ZSPD	ALL	2 (DO2)	ZSPD is activated when the drive senses the motor is equal to or below the Zero Speed Range setting as defined in parameter P1-38. For Example, at default ZSPD will be activated when the drive detects the motor rotating at speed at or below 10 rpm. ZSPD will remain activated until the motor speed increases above 10 RPM.	
TSPD	ALL	-	TSPD is activated once the drive has detected the motor has reached the Target Rotation Speed setting as defined in parameter P1-39. TSPD will remain activated until the motor speed drops below the Target Rotation Speed.	
TPOS	P	-	When the drive is in P mode, TPOS will be activated when the position error is equal and below the setting value of P1-54.	
TQL	ALL	-	TQL is activated when the drive has detected that the motor has reached the torques limits set by either the parameters P1-12 ~ P1-14.	
ALRM	ALL	1 (DO3)	ALRM is activated when the drive has detected a fault condition. (However, when Reverse limit error, Forward limit error, Emergency stop, Serial communication error, and Undervoltage these fault occur, WARN is activated first.)	
BRKR	ALL	-	BRKR is activated actuation of motor brake.	
OLW	ALL	-	OLW is activated when the servo drive has detected that the motor has reached the output overload level set by parameter P2-37.	

DO Signal	Assigned Control Mode	Pin No.	Details (*1)	Wiring Diagram (Refer to 3.3.3)
		+		
WARN	ALL	-	Servo warning output. WARN is activated when the drive has detected Reverse limit error, Forward limit error, Emergency stop, Serial communication error, and Undervoltage these fault conditions.	

Footnote *1: The "state" of the output function may be turned ON or OFF as it will be dependant on the settings of P2-10~P2-15.

Table 3.C DI Signals

DI Signal	Assigned Control Mode	Pin No.	Details (*2)	Wiring Diagram (Refer to 3.3.3)
SON	ALL	17	Servo On. Switch servo to "Servo Ready".	C8/C9
ARST	ALL	18	A number of Faults (Alarms) can be cleared by activating ARST. Please see section 10.3 for applicable faults that can be cleared with the ARST command. However, please investigate Fault or Alarm if it does not clear or the fault description warrants closer inspection of the drive system.	
GAINUP	ALL	-	Gain switching in speed and position mode	
CCLR	P	5	When CCLR is activated the setting is parameter P2-48 Pulse Clear Mode is executed.	
ZCLAMP	S , T	-	When this signal is On and the motor speed value is lower than the setting value of P1-38, it is used to lock the motor in the instant position while ZCLAMP is On. The parameter P2-38 should be enabled first if the users want to set the speed command that has been accelerated and decelerated more smoothly.	
CMDINV	ALL	-	When this signal is On, the motor is in reverse rotation.	
INHP	P	-	Pulse inhibit input. When the drive is in position mode, if INHP is activated, the external pulse input command is not valid.	
TRQLM	P , S , Sz	-	ON indicates the torque limit command is valid.	
SPDLM	T , Tz	-	ON indicates the speed limit command is valid.	
GNUM0	P	-	Electronic gear ratio (Numerator) selection 0	
SPD0	ALL	-	Select the source of speed command: See Table 3.D.	
SPD1				

DI Signal	Assigned Control Mode	Pin No.	Details (*2)	Wiring Diagram (Refer to 3.3.3)
TCM0	ALL	-	Select the source of torque command: See Table 3.E.	C8/C9
TCM1				
S-P	Sz , S , P	-	Speed / Position mode switching OFF: Speed, ON: Position	
S-T	Sz , S , Tz	-	Speed / Torque mode switching OFF: Speed, ON: Torque	
T-P	T , Tz , P	-	Torque / Position mode switching OFF: Torque, ON: Position	
EMGS	ALL	14	It should be contact “b” and normally ON or a fault (ALE13) will display.	
CWL	ALL	3	Reverse inhibit limit. It should be contact “b” and normally ON or a fault (ALE14) will display.	
CCWL	ALL	15	Forward inhibit limit. It should be contact “b” and normally ON or a fault (ALE15) will display.	
TLLM	P , S	-	Torque limit - Reverse operation (Torque limit function is valid only when P1-02 is enabled)	
TRLM	P , S	-	Torque limit - Forward operation (Torque limit function is valid only when P1-02 is enabled)	

Footnote *2: The "state" of the input function may be turned ON or OFF as it will be dependant on the settings of P2-18~P2-20.

Table 3.D Source of Speed Command

SPD1	SPD0	Parameter
OFF	OFF	S mode: analog input Sz mode: 0
OFF	ON	P1-09
ON	OFF	P1-10
ON	ON	P1-11

Table 3.E Source of Torque Command

TCM1	TCM0	Parameter
OFF	OFF	T mode: analog input Tz mode: 0
OFF	ON	P1-12
ON	OFF	P1-13
ON	ON	P1-14

The user-defined DI and DO signals are defined via parameters P2-10 to P2-15 and P2-18 to P2-20. Please refer to the following Table 3.F for the settings. Although the content of the Table 3.F does not provide more information than the Table 3.B and Table 3.C above, as each control mode is separated and listed in different row, it is easy for the users to view and can avoid confusion. However, the Pin number of each signal can not be displayed in the Table 3.F.

Table 3.F Default DI Signals and DO Signals

The factory default settings of DI signals			
Signal	DI Code	Function	Default Settings
SON	01	Servo On	DI1
ARST	02	Alarm Reset	DI2
GAINUP	03	Gain switching in speed and position mode	
CCLR	04	Pulse clear	DI3
ZCLAMP	05	Zero speed CLAMP	
CMDINV	06	Command input reverse control	
INHP	07	Pulse inhibit input	
TRQLM	09	Torque limit enabled	
SPDLM	10	Speed limit enabled	
GNUM0	11	Electronic gear ratio (Numerator) selection 0	
SPD0	14	Speed command selection 0	
SPD1	15	Speed command selection 1	
TCM0	16	Torque command selection 0	
TCM1	17	Torque command selection 1	
S-P	18	Position / Speed mode switching (OFF: Speed, ON: Position)	
S-T	19	Speed / Torque mode switching (OFF: Speed, ON: Torque)	
T-P	20	Torque / Position mode switching (OFF: Torque, ON: Position)	
EMGS	21	Emergency stop (contact b)	DI6
CWL	22	Reverse inhibit limit (contact b)	DI4
CCWL	23	Forward inhibit limit (contact b)	DI5
TLLM	25	Torque limit - Reverse operation	
TRLM	26	Torque limit - Forward operation	

The factory default settings of DO signals			
Signal	DO Code	Function	Default Settings
SRDY	01	Servo ready	DO1
SON	02	Servo On	
ZSPD	03	At Zero speed	DO2
TSPD	04	At Speed reached	
TPOS	05	At Positioning completed	
TQL	06	At Torques limit	
ALRM	07	Servo alarm (Servo fault) activated	DO3
BRKR	08	Electromagnetic brake control	
OLW	09	Output overload warning	
WARN	10	Servo warning activated	

3.3.3 User-defined DI and DO signals

If the default DI and DO signals could not be able to fulfill the users' requirements, there are still user-defined DI and DO signals. The setting method is easy and they are all defined via parameters. The user-defined DI and DO signals are defined via parameters P2-10 to P2-15 and P2-18 to P2-20.

Please refer to the following Table 3.G for the settings.

Table 3.G User-defined DI and DO signals

Signal Name		Default Pin No.	Parameter
DI	DI1-	17	P2-10
	DI2-	18	P2-11
	DI3-	5	P2-12
	DI4-	3	P2-13
	DI5-	15	P2-14
	DI6-	14	P2-15

Signal Name		Default Pin No.	Parameter
DO	DO1+	16	P2-18
	DO2+	2	P2-19
	DO3+	1	P2-20

DI signal:

For example: If the users want to set DI1 to be servo on, it only needs to set the value of parameter P2-10 to 101 (refer to chapter 7).



1) 14~17: Single control mode;18~20: Dual control mode; 0: Input function disabled

Setting of parameter P2-10 to P2-15:		
DI Code	Signal	Description
01	SON	Servo On
02	ARST	Alarm Reset
03	GAINUP	Gain switching in speed and position mode
04	CCLR	Pulse clear
05	ZCLAMP	Zero speed CLAMP
06	CMDINV	Command input reverse control
07	INHP	Pulse inhibit input
09	TRQLM	Torque limit enabled
10	SPDLM	Speed limit enabled
11	GNUM0	Electronic gear ratio (Numerator) selection 0
14	SPD0	Speed command selection 0
15	SPD1	Speed command selection 1
16	TCM0	Torque command selection 0
17	TCM1	Torque command selection 1
18	S-P	Position / Speed mode switching (OFF: Speed, ON: Position)

Setting of parameter P2-10 to P2-15:		
DI Code	Signal	Description
19	S-T	Speed / Torque mode switching (OFF: Speed, ON: Torque)
20	T-P	Torque / Position mode switching (OFF: Torque, ON: Position)
21	EMGS	Emergency stop (contact b)
22	CWL	Reverse inhibit limit (contact b)
23	CCWL	Forward inhibit limit (contact b)
25	TLLM	Torque limit - Reverse operation
26	TRLM	Torque limit - Forward operation

DO signal:

For example: If the users want to set DO1 to be servo ready, it only needs to set the value of parameter P2-18 to 101 (refer to chapter 7).

NOTE

1) 0: Output function disabled

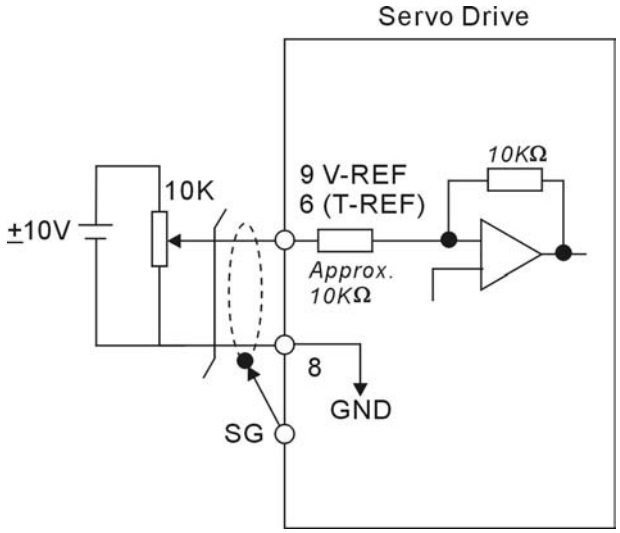
Setting of parameter P2-18 to P2-20:		
DO Code	Signal	Description
01	SRDY	Servo ready
02	SON	Servo On
03	ZSPD	At Zero speed
04	TSPD	At Speed reached
05	TPOS	At Positioning completed
06	TQL	At Torques limit
07	ALRM	Servo alarm (Servo fault) activated
08	BRKR	Electromagnetic brake control
09	OLW	Output overload warning
10	WARN	Servo warning activated

3.3.4 Wiring Diagrams of I/O Signals (CN1)

The valid voltage range of analog input command in speed and torque mode is -10V ~+10V.

The command value can be set via relevant parameters.

C1: Speed / Torque analog signal input



There are two kinds of pulse inputs, Line driver input and Open-collector input. Max. input pulse frequency of Line driver input is 500kpps and max. input pulse frequency of Open-collector input is 200kpps.

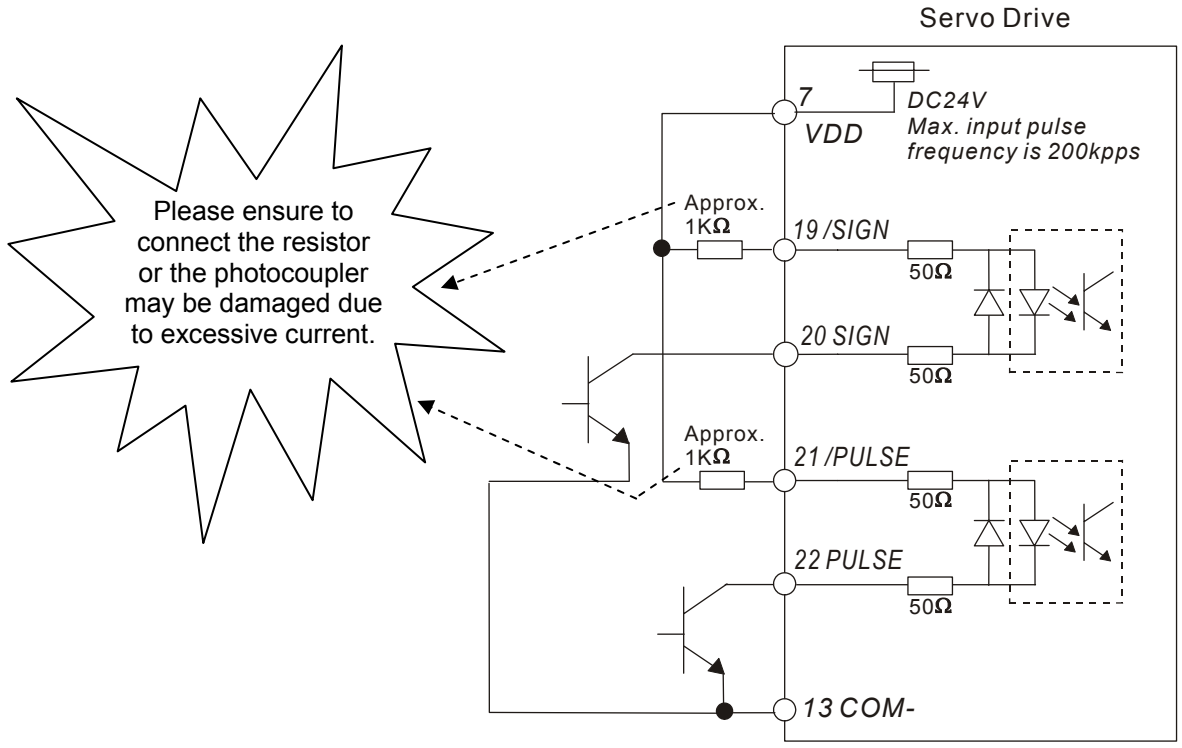
NOTE

1) In order to protect the internal circuit, when using open collector input, please ensure to connect one 1 ~ 2 KΩ current limit resistor before Pin 19(/SIGN) and Pin 21(/PULSE) respectively (Please refer to the wiring diagram on next page).
2) For the specifications of connected current limit resistor, please refer to the table below:

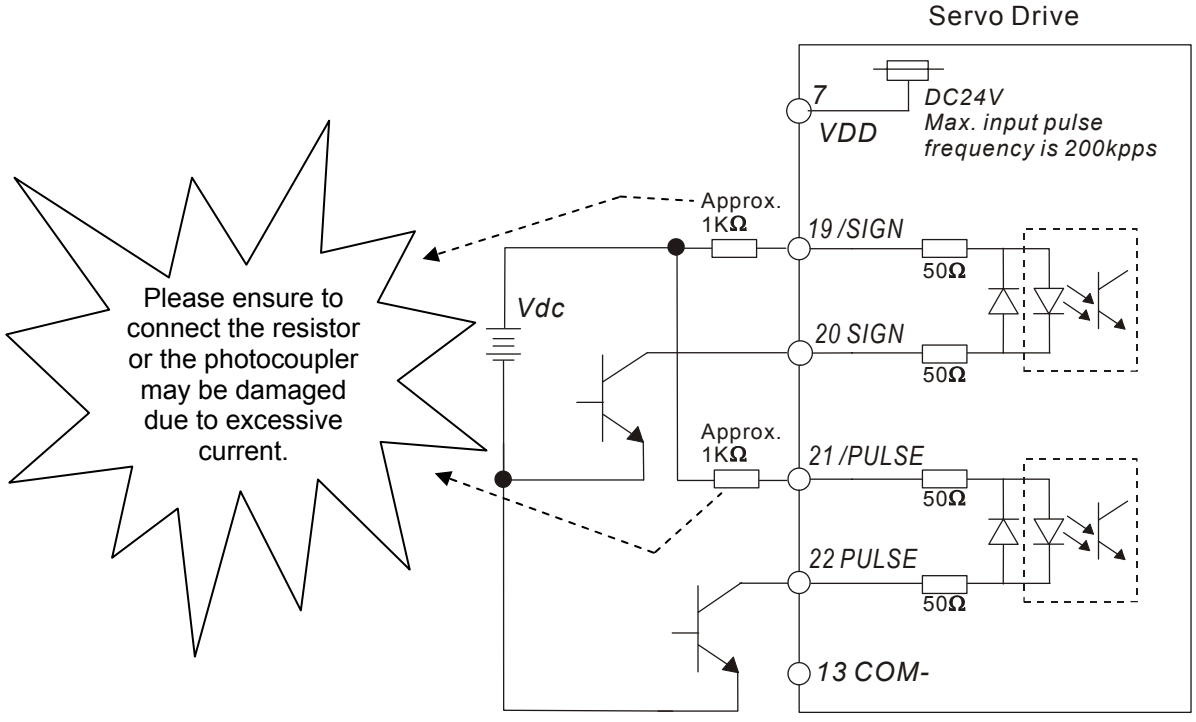
Vdc	Specifications
24V	1KΩ
12V	500Ω

Equation: $\frac{\text{Vdc} - 2}{100 + R} \cong 20mA$

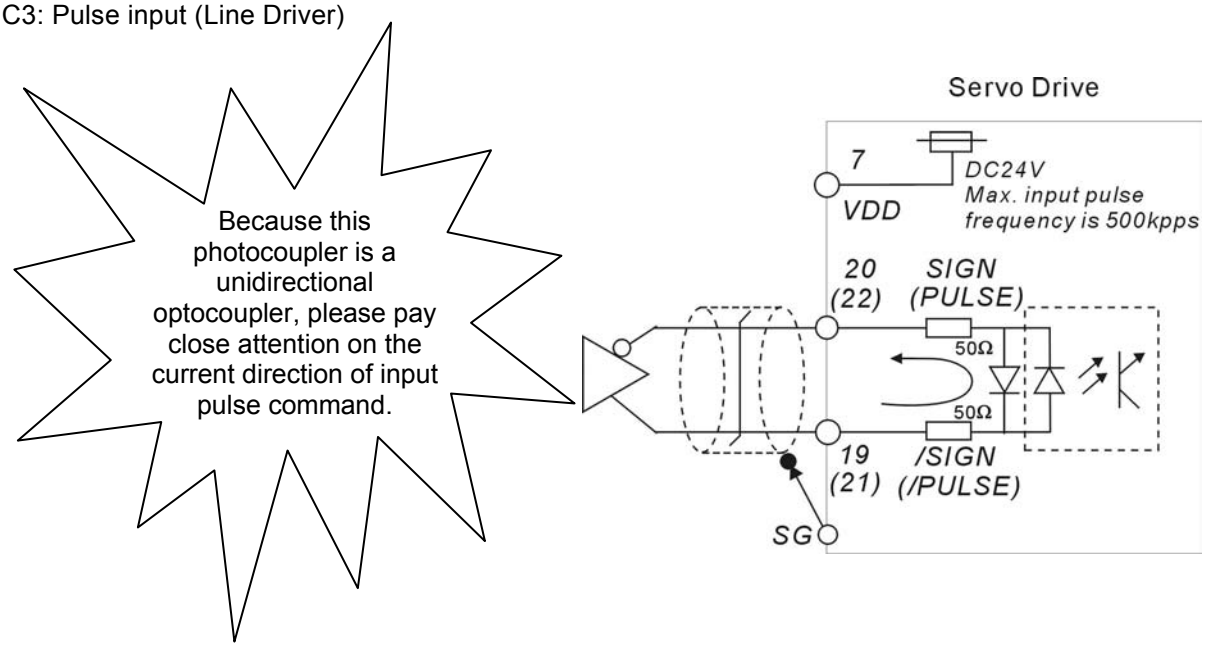
C2-1: Pulse input (Open collector – internal power)



C2-2: Pulse input (Open collector – external power)



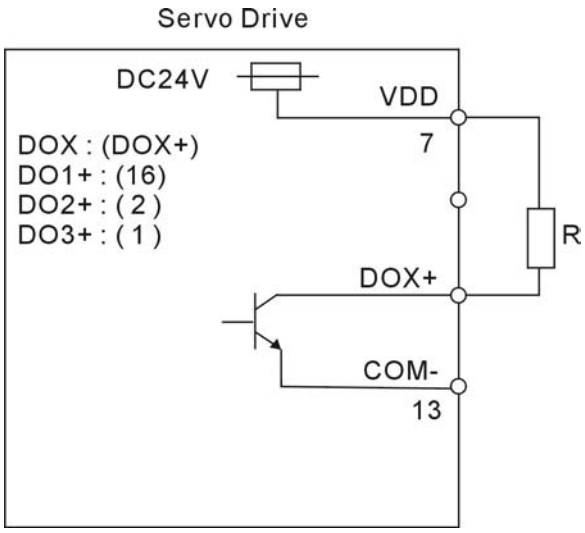
C3: Pulse input (Line Driver)



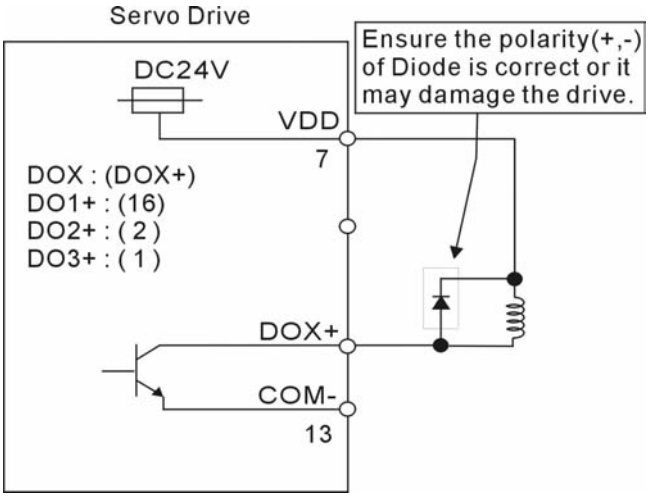
Be sure to connect a diode when the drive is applied to inductive load.

(Continuous maximum current: 40mA, Instantaneous peak current: max. 100mA)

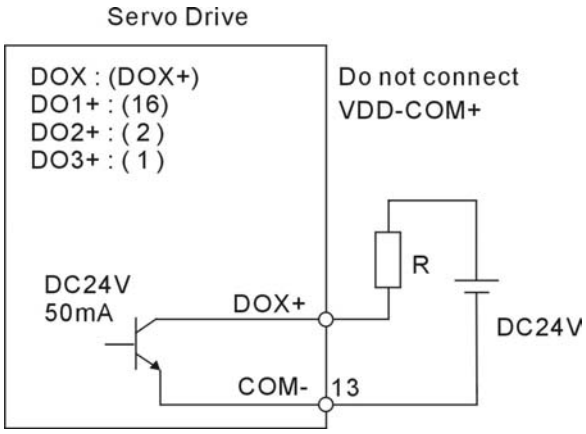
C4: Wiring of DO signal, for the use of internal power supply, general load



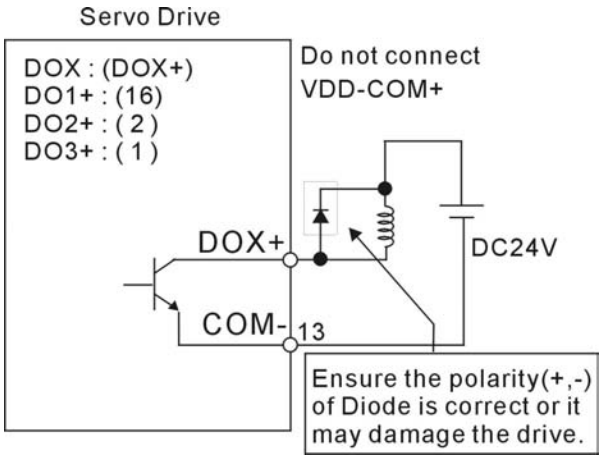
C5: Wiring of DO signal, for the use of internal power supply, inductive load



C6: Wiring of DO signal, for the use of external power supply, general load



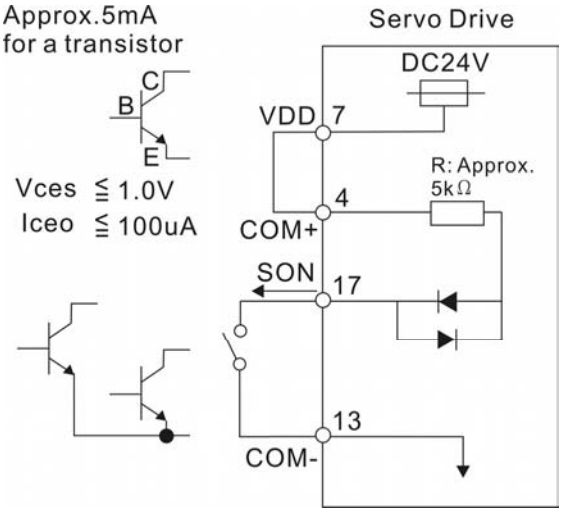
C7: Wiring of DO signal, for the use of external power supply, inductive load



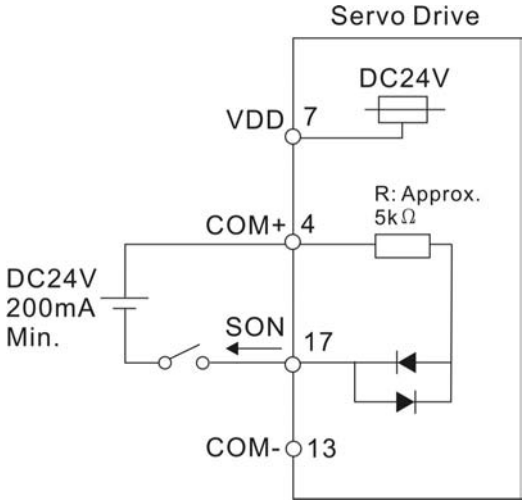
Use a relay or open-collector transistor to input signal.

NPN transistor with multiple emitter fingers (SINK Mode)

C8: Wiring of DI signal, for the use of internal power supply

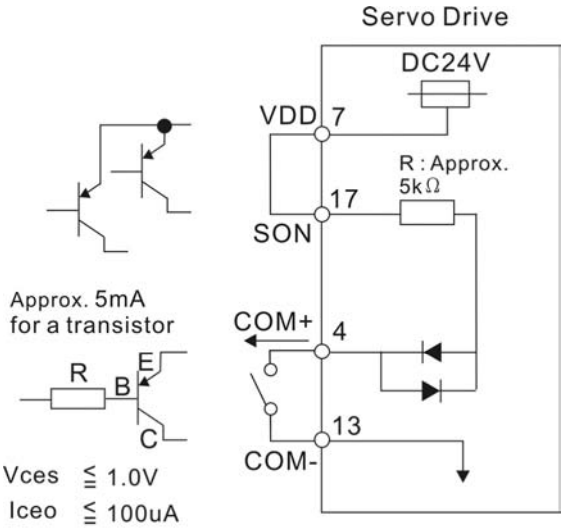


C9: Wiring of DI signal, for the use of external power supply

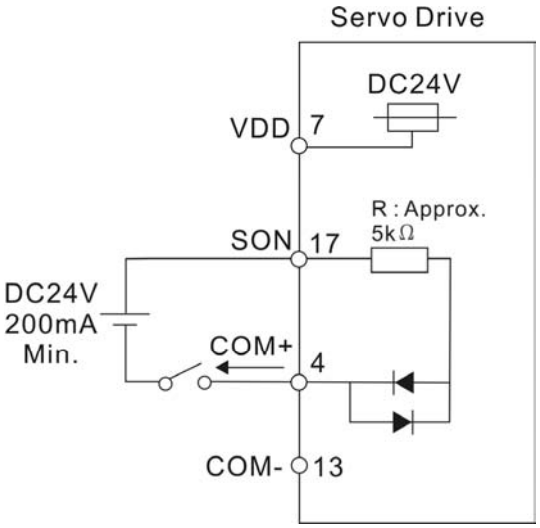


PNP transistor with multiple emitter fingers (SOURCE Mode)

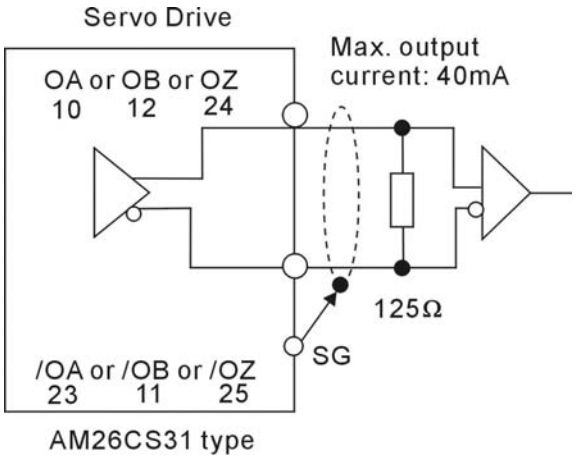
C10: Wiring of DI signal, for the use of internal power supply



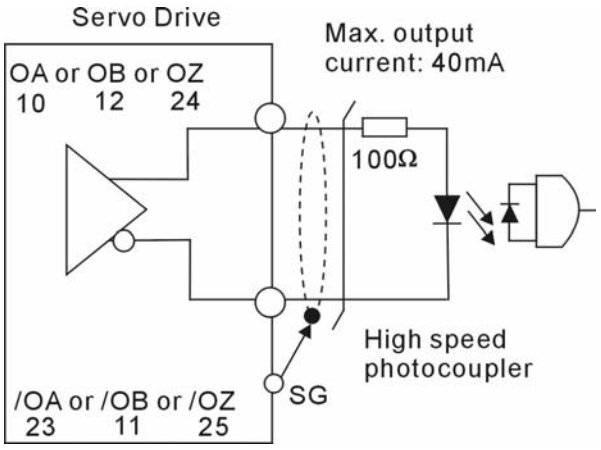
C11: Wiring of DI signal, for the use of external power supply



C12: Encoder output signal (Line driver)



C13: Encoder output signal (Photocoupler)



3.4 Encoder Connector CN2

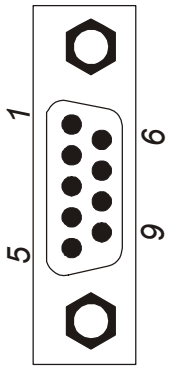
Integrated within the servo motor is an incremental encoder with 2,500PPR and commutation signal.

When power is first applied to the servo drive, control algorithms detect the motor's rotor position through imbedded sensors in the motor within 500msec approximately.

Feedback to the amplifier of the UVW signals for commutation is via the ABZ encoder signal wires. Following rotor position sensing the amplifier automatically switches to encoding for commutation control.

The 2500PPR encoder is automatically multiplied to 10000PPR by X4 logic for increased control accuracy.

Figure 3.8 The layout of CN2 Drive Connector:



CN2 Terminal Signal Identification

Pin No	Signal Name	Terminal Identification	Description	Military Connector	Fast Connector	Wire Color
4	A phase input	A	Encoder A phase output	A	A1	Black
5	/A phase input	/A	Encoder /A phase output	B	A4	Black / Red
3	B phase input	B	Encoder B phase output	C	A2	White
2	/B phase input	/B	Encoder /B phase output	D	A5	White / Red
9	Z phase input	Z	Encoder Z phase output	F	A3	Orange
1	/Z phase input	/Z	Encoder /Z phase output	G	A6	Orange / Red
8	Encoder power	+5V	Encoder 5V power	S	A7	Brown & Brown / White
6, 7	Encoder power	GND	Grounding	R	A8	Blue & Blue / White
	Shielding	Shielding	Shielding	L	A9	Shielding

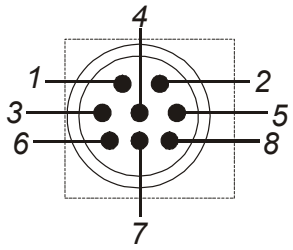
3.5 Serial Communication Connector CN3

3.5.1 CN3 Terminal Layout and Identification

The servo drive can be connected to a PC or controller via a serial communication connector. The users can operate the servo drive through PC software supplied by Delta (contact to the dealer/distributor).

The communication connector/port of Delta servo drive can provide two common serial communication interfaces: RS-232, and RS-485 connection. RS-232 is mostly be used but is somewhat limited. The maximum cable length for an RS-232 connection is 15 meters (50 feet). Using RS-485 interface can allow longer distance for transmission and support multiple drives to be connected simultaneously.

Figure 3.9 The layout of CN3 Drive Connector:





CN3 Drive Connector

CN3 Terminal Signal Identification

Pin No	Signal Name	Terminal Identification	Description
1	RS-485-	RS-485-	For data transmission of the servo drive. Connected to the RS-485- interface of PC.
2	Signal power	+5VD	
3	RS-485+	RS-485+	For data transmission of the servo drive. Connected to the RS-485+ interface of PC.
4	RS-232 data receiving	RS-232-RX	For data receiving of the servo drive. Connected to the RS-232 interface of PC.
5	RS-232 data transmission	RS-232-TX	For data transmission of the servo drive. Connected to the RS-232 interface of PC. Please refer to section 3.5.2.
6	RS-232 / RS-485 data format selection	SEL232 / 485	RS-232 & RS-485 data format selection For RS-485 connection, connect SEL232/485(Pin6) to GND(Pin8). For RS-232 connection, do not connect SEL232/485(Pin6) to GND(Pin8).
7	Re-flash selection	Boot_Load	Boot_Load terminal for DSP Reflash burn-in selection (**Do not connect this terminal**).
8	Grounding	GND	

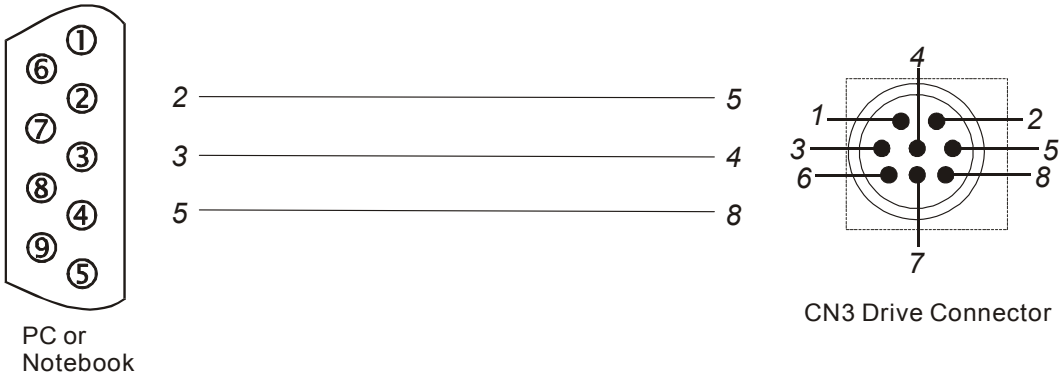
NOTE

1) In order to avoid the communication error, if the users use their own communication connector, ensure the circuit between the connector case and all pins is not closed.

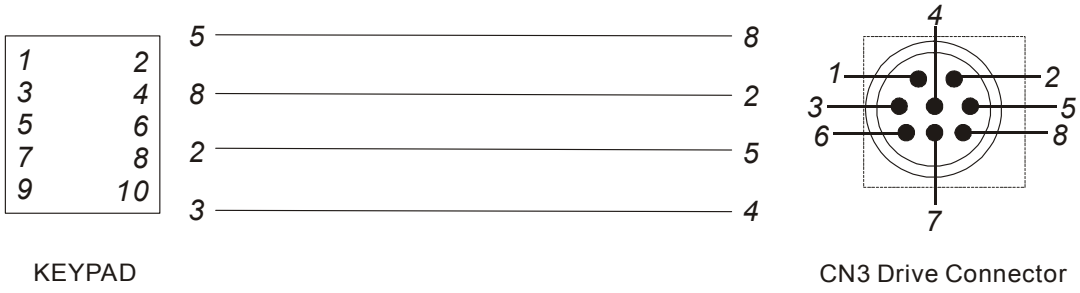
2) When using RS-232 communication, the user can use the communication cable provided by Delta PLC directly. (The PLC communication cable is compatible with all Delta Servo systems for the users' convenience)

3.5.2 Connection between PC/Keypad and Connector CN3

- **Connection between PC and CN3**

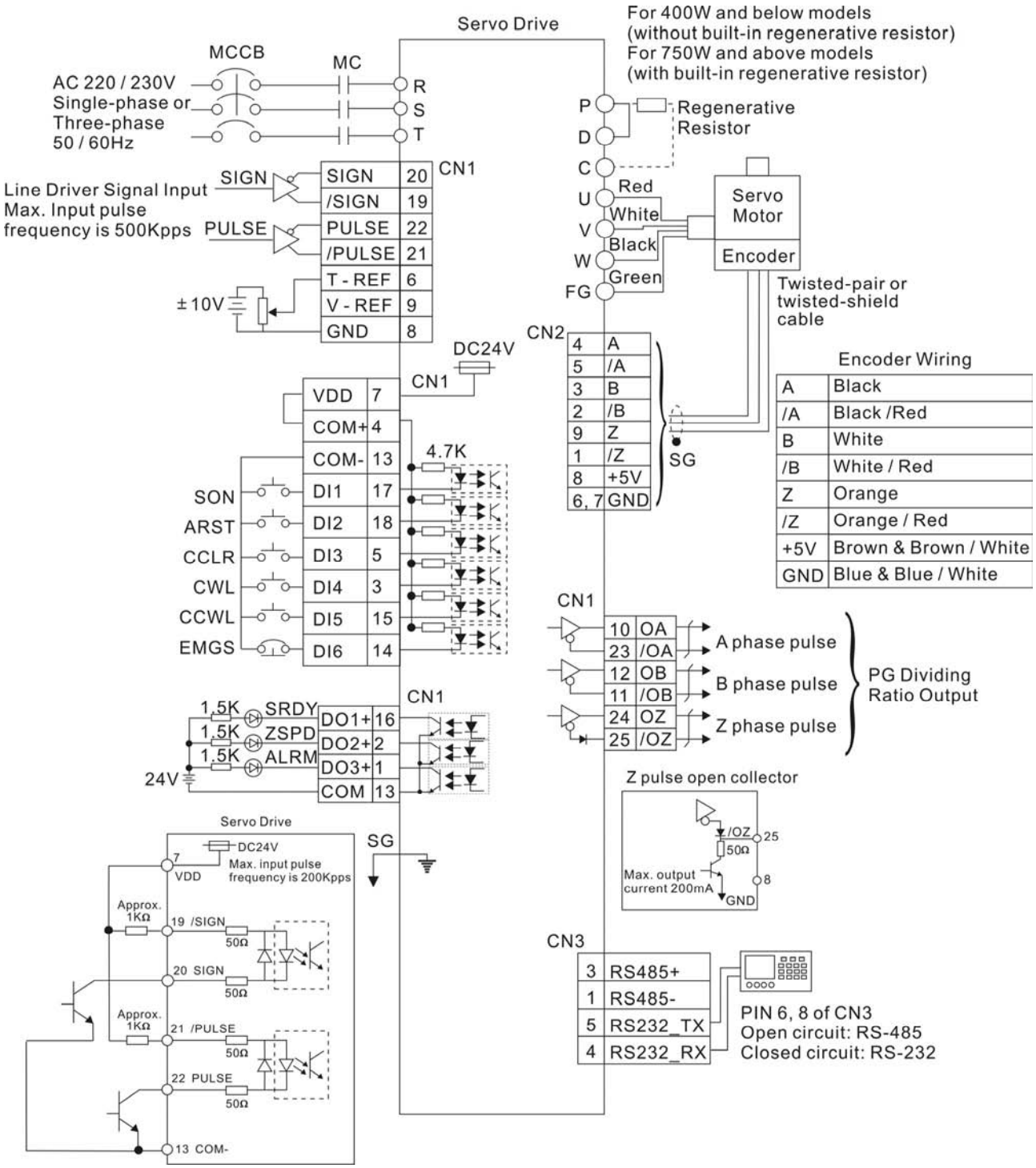


- **Connection between Keypad and CN3**

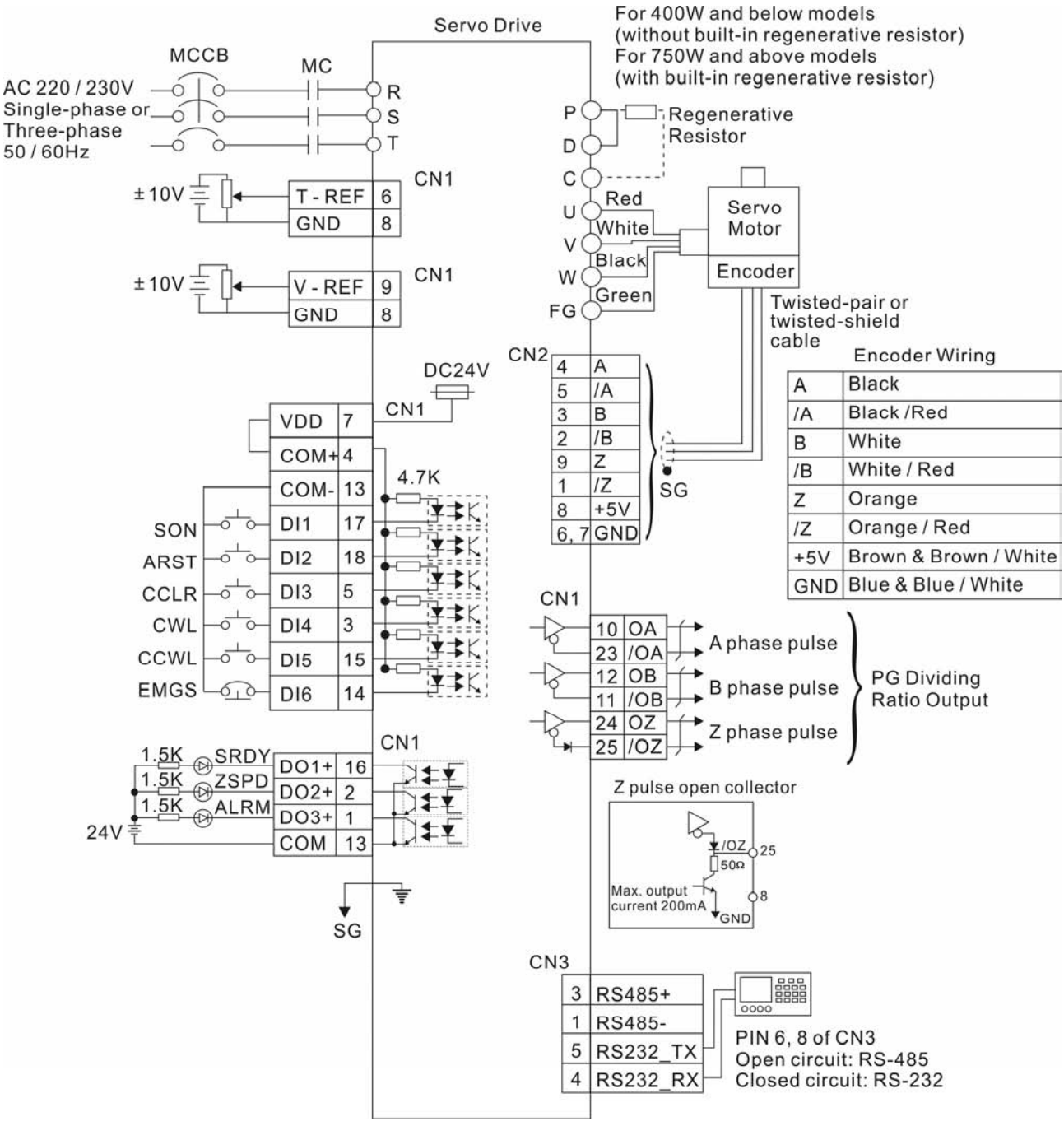


3.6 Standard Connection Example

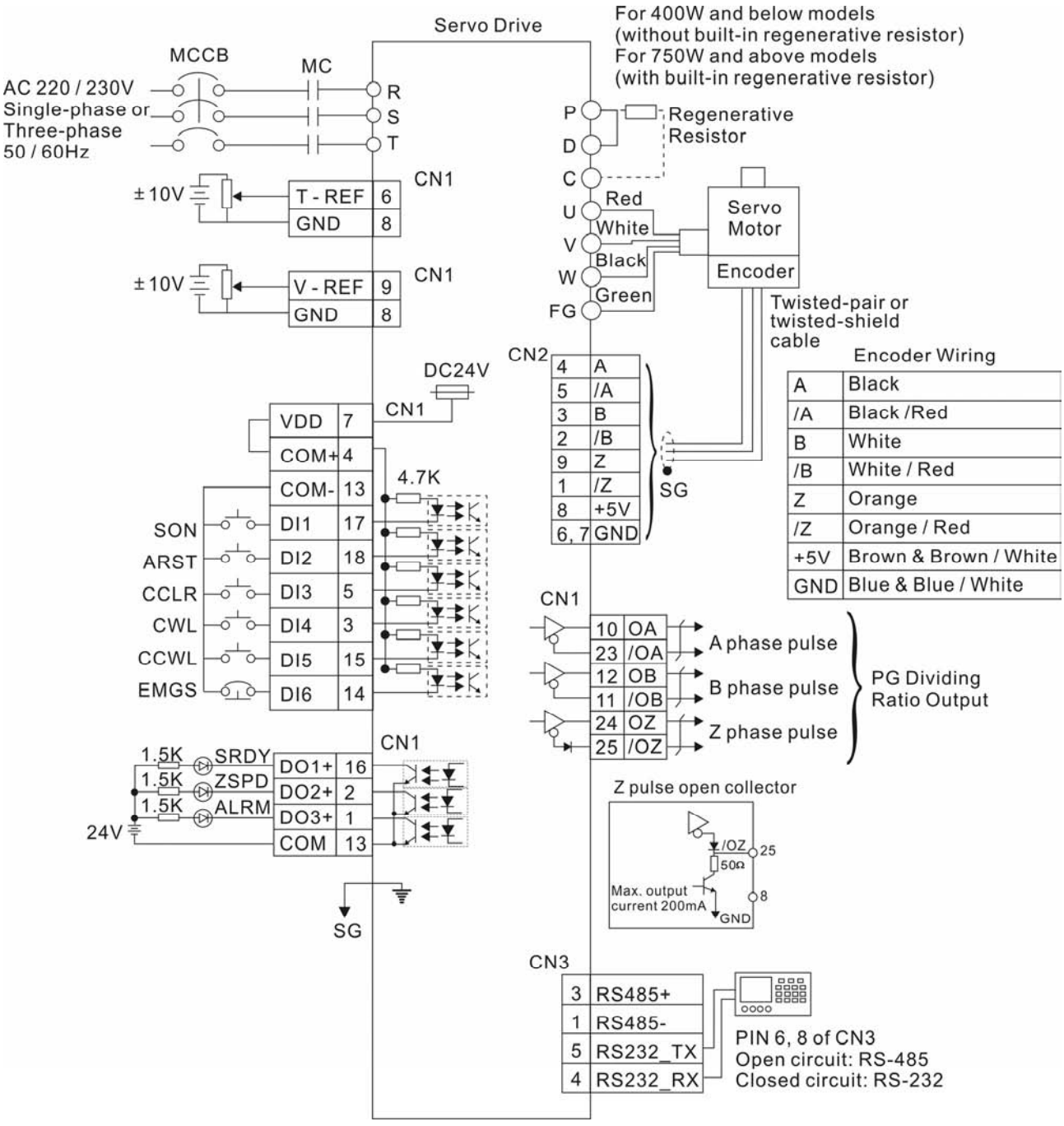
3.6.1 Position Control Mode



3.6.2 Speed Control Mode



3.6.3 Torque Control Mode



efesotomasyon.com

Chapter 4 Display and Operation

This chapter describes the basic operation of the digital keypad and the features it offers.

There are several modes of operation:

Monitor, Parameter, Parameter Setting, Save, Write and Fast Edit Mode.

In **Monitor mode**, users can display the monitor status. In **Parameter mode**, users can display and view the parameter name, unit and setting value, and also can navigate in parameter groups. In **Parameter Setting mode**, users can edit and change the parameter setting value. In **Save mode**, it allows users to save the parameters stored in PC or the servo drive into the digital keypad. In **Write mode**, it allows users to write the parameters out of the digital keypad and restored in the servo drive. Please note that the status monitor function of the servo drive is disabled and the LED indicators on the digital keypad are invalid at this time when in **Save mode** and **Write mode**. In **Fast Edit mode**, users can edit the parameters more quickly. Also, static and dynamic auto-tuning is also provided in this mode.

If users desire to upgrade the firmware version of the digital keypad, please open the rear case of the keypad and turn the switch to BOOTLOAD. Then, execute the PC program and the firmware will be upgraded.

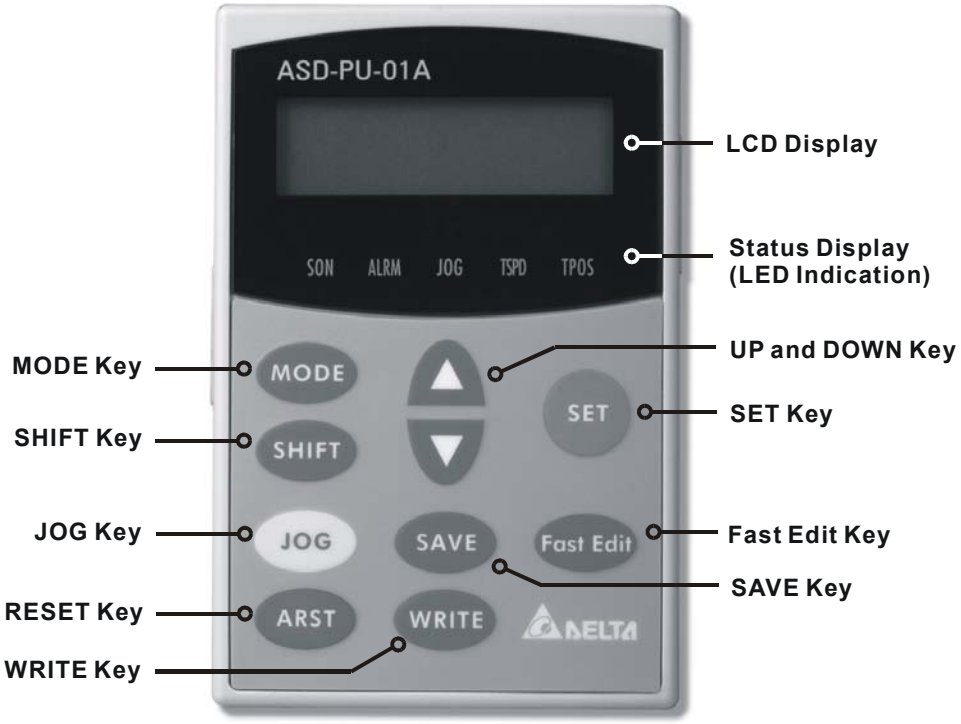
For the keypad parameters and fault messages (Alarm codes), please refer to Chapter 7 and Chapter 10.

4.1 ASD-PU-01A

4.1.1 Description of Digital Keypad ASD-PU-01A

The digital keypad includes the ASD-PU-01A display panel and function keys. The Figure 4.1 shows all of the features of the ASD-PU-01A digital keypad and an overview of their functions.

Figure 4.1



Name	Function
LCD Display	2 line × 16 character LCD display shows the monitor codes, parameter settings and operation values of the AC servo drive.
Status Display (LED Indication)	SON LED (Servo On Indicator). A lit LED illuminates to indicate that the servo drive is enabled. ALRM LED (Alarm Output Indicator). A lit ALRM LED illuminates to indicates that a alarm output is activated. JOG LED (JOG Operation Indicator). A lit JOG LED illuminates to indicates that JOG operation is enabled. TSPD LED (Speed reached Indicator). A lit TSPD LED illuminates to indicates that the target speed is reached and TSPD signal is activated. TPOS LED (Positioning completed Indicator). A lit TPOS LED illuminates to indicates that the target position is reached and TPOS signal is activated.
MODE	MODE Key. Pressing MODE key can enter or exit different parameter groups, and switch between Parameter mode and Parameter Setting mode, SAVE mode and WRITE mode.
SHIFT	SHIFT Key. In Parameter mode, pressing SHIFT key can scrolls through parameter groups. In Parameter Setting mode and SAVE mode, after a parameter is selected and its value displayed, pressing SHIFT key can move the cursor to the left and then change parameter settings (blinking digits) by using arrow keys.
▲▼	UP and DOWN arrow Key. Pressing the UP and DOWN arrow key can scroll through and change monitor codes, parameter groups and various parameter settings. In SAVE and WRITE mode, pressing UP and DOWN arrow key can scroll through and change the memory blocks. In SAVE mode, pressing UP and DOWN arrow key can select and change the memory file name also.
SET	SET Key. Pressing Set key can enter into the Parameter Setting mode, then display, select and save parameter groups and various parameter settings. During diagnosis operation, pressing SET key can execute the function in the last step. (The parameter settings changes are not effective until the SET key is pressed.)
JOG	JOG Key. Pressing JOG key can enable JOG operation immediately. 1st pressing: enter JOG operation. 2nd pressing: exit JOG operation. Please refer to Section 4.4.3 for operation.
ARST	Reset Key. Pressing ARST key can Used to clear a fault (Alarm). This key is available in any modes.
SAVE	SAVE Key. Pressing SAVE key can save parameter settings to the digital keypad. Please refer to Section 4.2.2 for operation.
WRITE	WRITE Key. Pressing WRITE key can write out the parameter settings in the digital keypad and send to the servo drive. Please refer to Section 4.2.3 for operation.
Fast Edit	Fast Edit Key. Pressing Fast Edit key can use three special functions: Fast Editing, Static Auto-tuning and Dynamic Auto-tuning. Fast editing function: 1) 1st pressing: Enable the Fast Editing function. When Fast Editing function is enabled, using UP and DOWN arrow key can browse, search and edit the parameters that have been edited before directly and quickly. The parameter setting method is the same as usual. 2) 2nd pressing: Disable the Fast Editing function. Static Auto-tuning and Dynamic Auto-tuning function: Please refer to Section 4.2.4 for operation.

NOTE

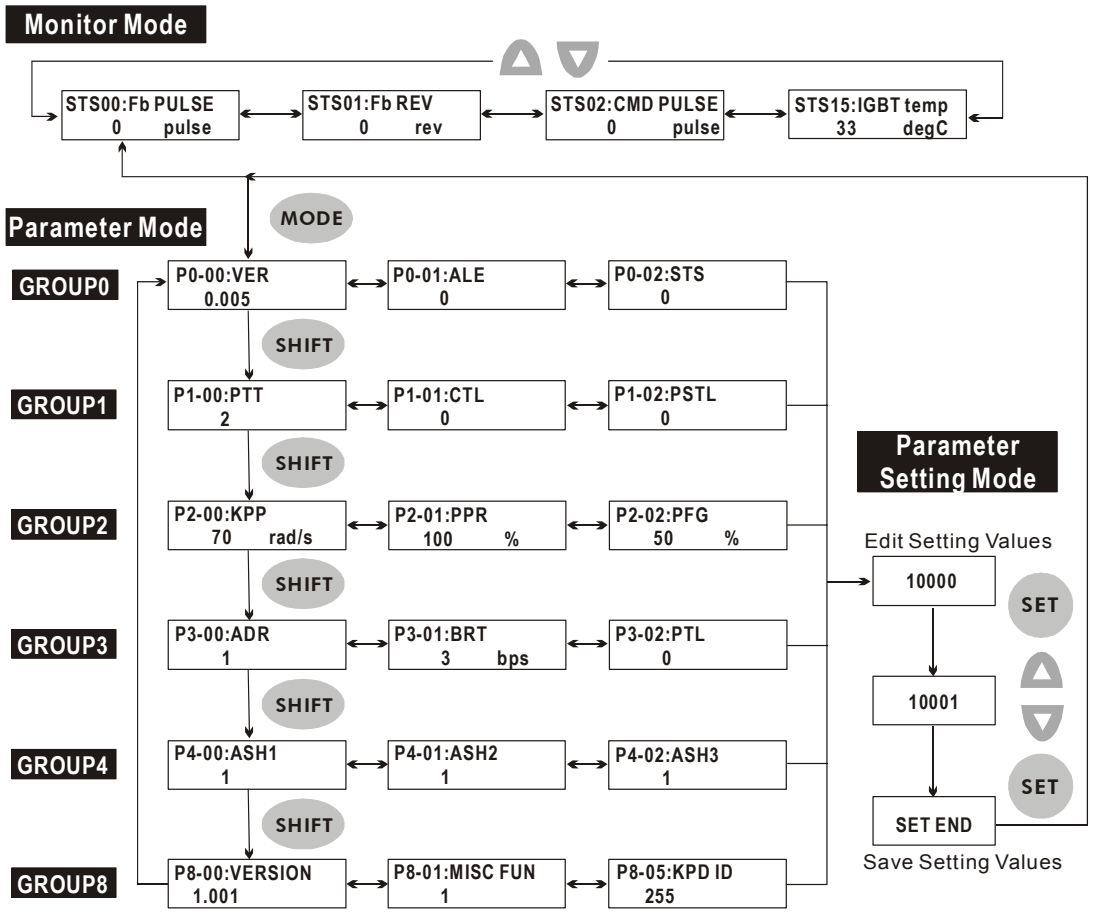
1) The functions of MODE, SHIFT, UP and DOWN, and SET keys are the same as the function keys of ASDA-A series servo drive.

4.1.2 Display Flowchart

Monitor Mode, Parameter Mode and Parameter Setting Mode

1. When the power is applied to the AC servo drive, the digital keypad will execute communication initial setup for approximately two seconds (9600bps & 7,N,2 Modbus ASCII) first, and then enter into the monitor mode.
2. In monitor mode, pressing UP or DOWN arrow key can switch monitor parameter code.
3. In monitor mode, pressing MODE key can enter into parameter mode, pressing the SHIFT key can switch parameter group and pressing UP or DOWN arrow key can change parameter group code.
4. In parameter mode, system will enter into the parameter setting mode immediately after the SET key is pressed. The LCD display will display the corresponding setting value of this parameter simultaneously. Then, users can use UP or DOWN arrow key to change parameter value or press MODE key to exit and return back to the parameter mode.
5. In parameter setting mode, users can move the cursor to left by pressing the SHIFT key and change the parameter settings (blinking digits) by pressing the UP or DOWN arrow key.
6. After the setting value change is completed, press SET key to save parameter settings or execute command.
7. When the parameter setting is completed, LCD display will show the end code "-SET END-" and automatically return back to parameter mode.

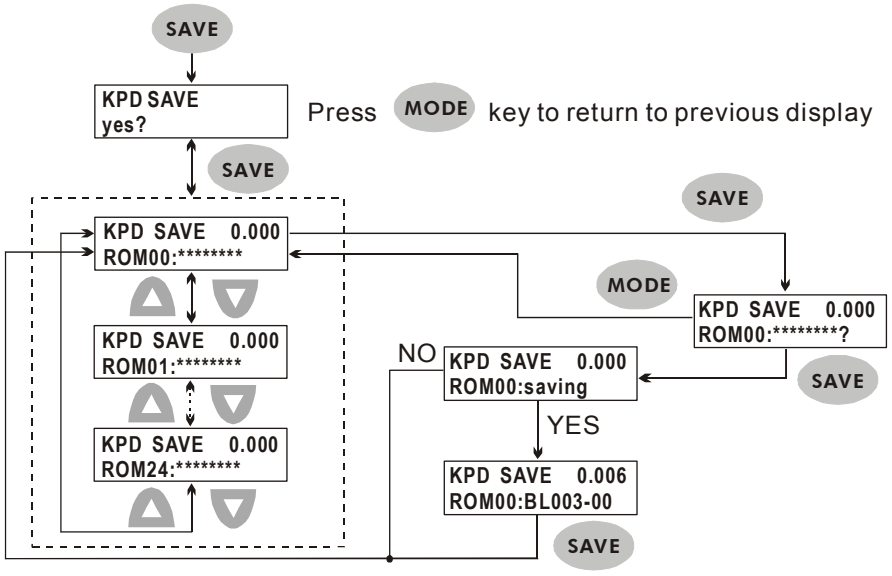
Figure 4.2



SAVE Mode (Save parameter settings from the Drive to the Keypad)

1. When the power is applied to the AC servo drive, the digital keypad will enter into the monitor mode first.
2. In monitor mode, pressing SAVE key can switch to SAVE mode.
3. In SAVE mode, pressing SAVE key can execute the function the users select and save the new parameter settings.
4. In SAVE mode, pressing UP and DOWN key can save the desired memory block that the users want to save.
5. If the desired memory block has not been used, the LCD display will show the message "xxxxxxxx". If the desired memory block has been used and there are parameters data saved in it, the LCD display will show the MCU version of the servo drive and the preset file name, such as "BL001-XX". The last two words "XX" can be modified by the users and its range is within 0 ~ 9 or A ~Z. The users can select the words by using UP and DOWN keys and change the words by using SHIFT key.
6. In SAVE mode, pressing MODE key once can return to the previous display and finally exit the SAVE mode. However, if the users have pressed the SAVE key, i.e. the SAVE operation has been executed, the MODE key will become disabled, the users cannot return to previous display and only can move to the next step.
7. The users can save the parameters in some memory block repeatedly on the condition that the version, inertia and models of the servo drives should be the same. If one of the parameters is set by the servo drive in different condition, it cannot be saved into the same memory block with other parameters and must be saved to other memory blocks. Before re-using the same memory block, please perform the "Memory Block Clear" function first (Please see the description of parameter P8-11).

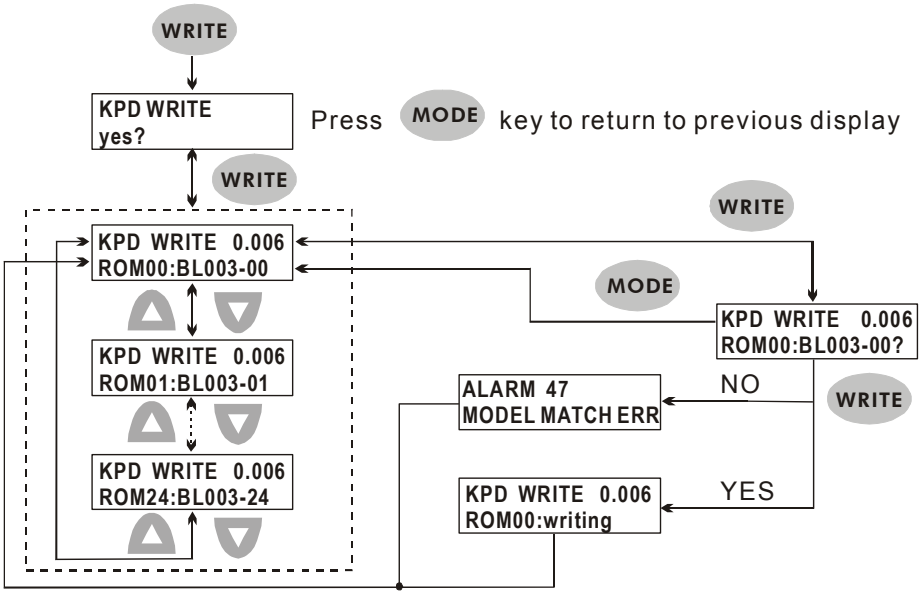
Figure 4.3



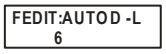
WRITE Mode (Parameter settings written out from Keypad to the Drive)

1. When the power is applied to the AC servo drive, the digital keypad will enter into the monitor mode first.
2. In monitor mode, pressing WRITE key can switch to WRITE mode.
3. In WRITE mode, pressing WRITE key can execute the function the users select and save the new parameter settings.
4. In WRITE mode, pressing UP and DOWN key can write out the desired memory block that the users want to write out.
5. If the desired memory block has not been used, the LCD display will show the message "xxxxxxxx". If the desired memory block has been used and there are parameters data saved in it, the LCD display will show the MCU version of the servo drive and the preset file name, such as "BL001-XX". The last two words "XX" can be modified by the users and its range is within 0 ~ 9 or A ~Z. The users can select the words by using UP and DOWN keys and change the words by using SHIFT key.
6. In WRITE mode, pressing MODE key once can return to the previous display and finally exit the WRITE mode.
7. Only the parameters of the same version, the same inertia and the same model type of the servo drives can be written out. If the servo drive version stored in the keypad is different than the actual servo drive version, the users can make them the same via Delta Servo Drive PC software, ASDAB_SW.

Figure 4.4

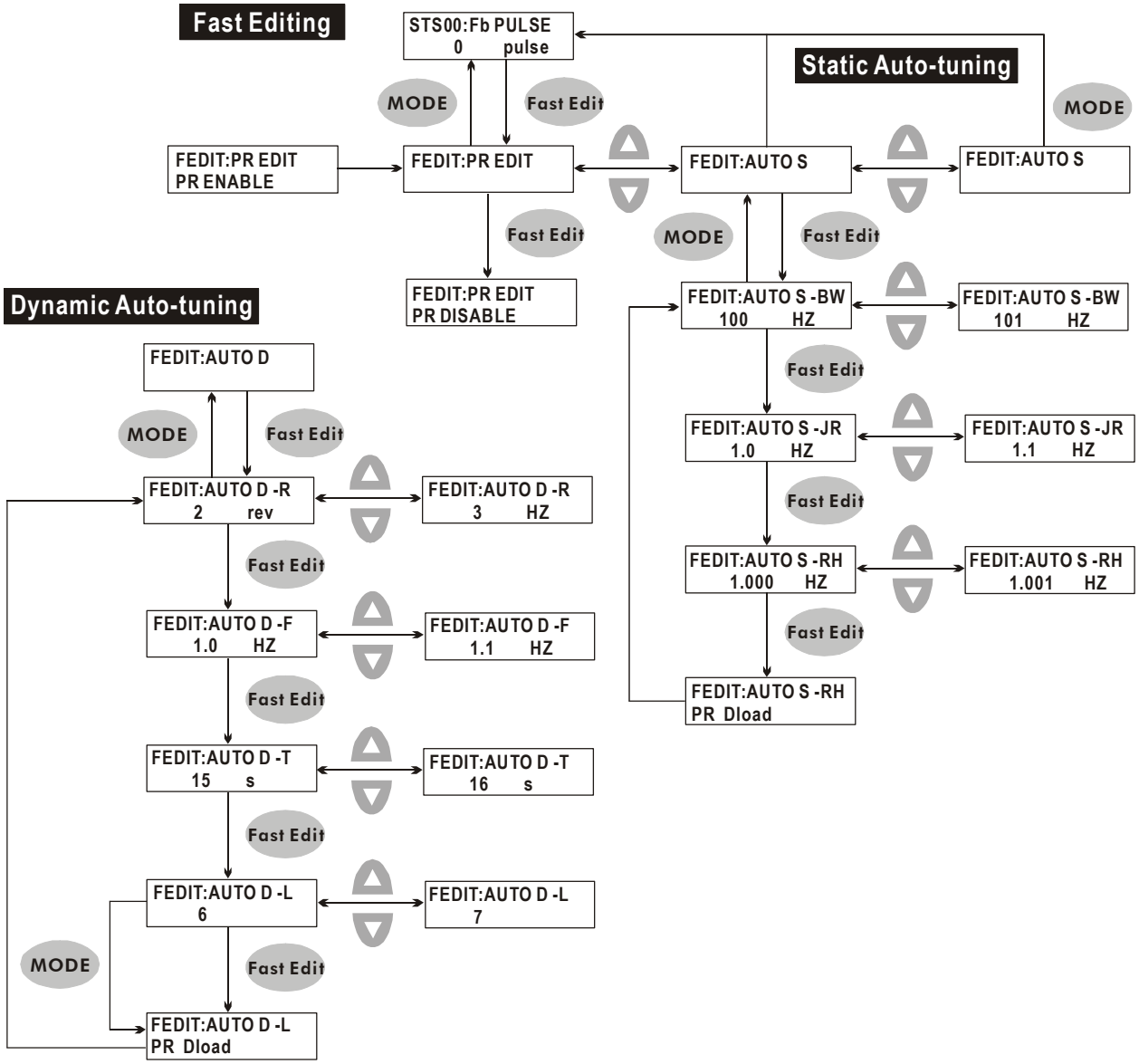


Fast Edit Mode (Fast Editing, Static & Dynamic Auto-tuning)

1. When the power is applied to the AC servo drive, the digital keypad will enter into the monitor mode first.
2. In monitor mode, pressing Fast Edit key can switch to Fast Edit mode.
3. In Fast Edit mode, pressing Fast Edit key can execute the function the users select and save the new parameter settings.
4. In Fast Edit mode, pressing UP and DOWN key can scroll through the functions freely.
5. In Fast Edit mode, the users can enable or disable the Fast Editing function and browse through the parameters that have been edited before.
6. In Fast Edit mode, when Static Auto-tuning function is enabled, the users can input the value of responsiveness (frequency width), motor load inertia and stiffness directly.
7. In Fast Edit mode, when Dynamic Auto-tuning function is enabled, the users can input the value of motor rotation number, motor rotation frequency, motor rotation time and responsiveness directly.
8. Static Auto-tuning function only can be enabled in Manual mode (P2-32 is set to 0). If it is enabled in AutoMode, an error message may display.
9. Dynamic Auto-tuning function only can be enabled in AutoMode (P2-32 is set to 1 or 2). If the users want to use the Dynamic Auto-tuning function in Manual mode, please press MODE key to skip 

this step (Please see Figure 4.5 on next page).
10. In Fast Edit mode, pressing MODE key once can return to the previous display and finally exit the Fast Edit mode (Please see Figure 4.5 on next page).

Figure 4.5


Fast Editing
STS00:Fb PULSE
0 pulse
MODE
Fast Edit
FEDIT:PR EDIT
PR ENABLE
FEDIT:PR EDIT
FEDIT:PR EDIT
PR DISABLE
Static Auto-tuning
FEDIT:AUTO S
FEDIT:AUTO S
FEDIT:AUTO S -BW
100 HZ
FEDIT:AUTO S -BW
101 HZ
FEDIT:AUTO S -JR
1.0 HZ
FEDIT:AUTO S -JR
1.1 HZ
FEDIT:AUTO S -RH
1.000 HZ
FEDIT:AUTO S -RH
1.001 HZ
FEDIT:AUTO S -RH
PR Dload
Dynamic Auto-tuning
FEDIT:AUTO D
FEDIT:AUTO D -R
2 rev
FEDIT:AUTO D -R
3 HZ
FEDIT:AUTO D -F
1.0 HZ
FEDIT:AUTO D -F
1.1 HZ
FEDIT:AUTO D -T
15 s
FEDIT:AUTO D -T
16 s
FEDIT:AUTO D -L
6
FEDIT:AUTO D -L
7
FEDIT:AUTO D -L
PR Dload

4.1.3 Status Display

Save Setting Display

After the SET key is pressed, LCD display will show the following display messages for approx. one second according to different status.

Display Message	Description
P1-00:PTT SET END	The setting value is saved correctly.
P0-00:VER READ ONLY	This parameter is read only. Write-protected. (cannot be changed)
P4-11:SOF1 NO PASSWORD	Invalid password or no password was input.
P1-02:PSTL DATA ERR	The setting value is error or input reserve setting value.
P1-01:CTL ERR SET AT SON	The servo module is enabled and this parameter cannot be changed.

Abort Setting Display

Display Message	Description
P0-00:VER ABORT	In parameter mode, pressing MODE key can abort parameter setting change and return to monitor mode. In parameter setting mode, pressing MODE key can return back to parameter mode. After returning back to parameter mode, pressing MODE key again can abort parameter setting change.

Fault Message Display

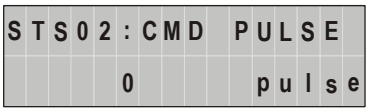
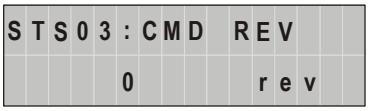
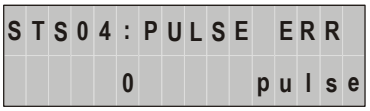
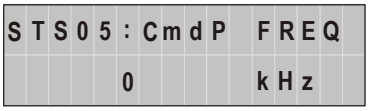
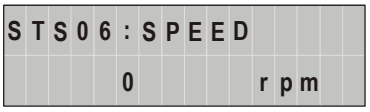
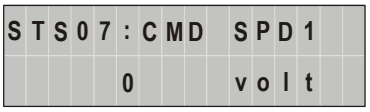
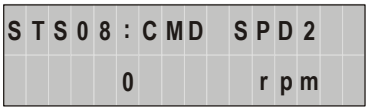
Display Message	Description
ALARM01 OVER CURRENT	When the AC servo drive has a fault, LCD display will display “ALARMnn”. “ALARM” indicates the alarm and “nn” indicates the drive fault code. The display range of alarm code “nn” is 1 to 48. For the list of drive fault code, please refer to parameter P0-01 or refer to Chapter 10 (Troubleshooting).

Polarity Setting Display

Display Message	Description
P1-09:SP1 1000 rpm	Positive value display. When entering into parameter setting mode, pressing UP or DOWN arrow key can increase or decrease the display value. SHIFT key is used to change the selected digit (The selected digit will blink).
P1-09:SP1 - 1000 rpm	Negative value display. When the parameter setting is greater than five digits, after the display value is set, continuously press SHIFT key for six times and then the negative sign will show up to indicate a negative value.

Monitor Setting Display

In monitor mode, in order to change the monitor status, the users can press UP or DOWN arrow key or change parameter P0-02 directly to specify the monitor status. When the power is applied, the monitor status depends on the setting value of P0-02. For example, if the setting value of P0-02 is 2 when the power is applied, the C.P monitor symbol will first display and then show the “Pulse counts of pulse command [pulse]” monitor status.

P0-02 Setting	Display Message	Description	Unit
0		Motor feedback pulse number	pulse
1		Motor feedback rotation number	rev
2		Pulse counts of pulse command	pulse
3		Rotation number of pulse command	rev
4		Position error counts	pulse
5		Input frequency of pulse command	kHz
6		Motor rotation speed	rpm
7		Speed input command	volt
8		Speed input command	rpm
9		Torque input command	volt
10		Torque input command	Nt-m
11		Average load	%

P0-02 Setting	Display Message	Description	Unit
12	STS12:PEAK LOAD 0 %	Peak load	%
13	STS13:Vbus 0 volt	Main circuit voltage	volt
14	STS14:JL 0 time	Ratio of load inertia to Motor inertia	time
15	STS15:IGBT Temp 0 degC	IGBT Temperature of power supply module	degC(°C)

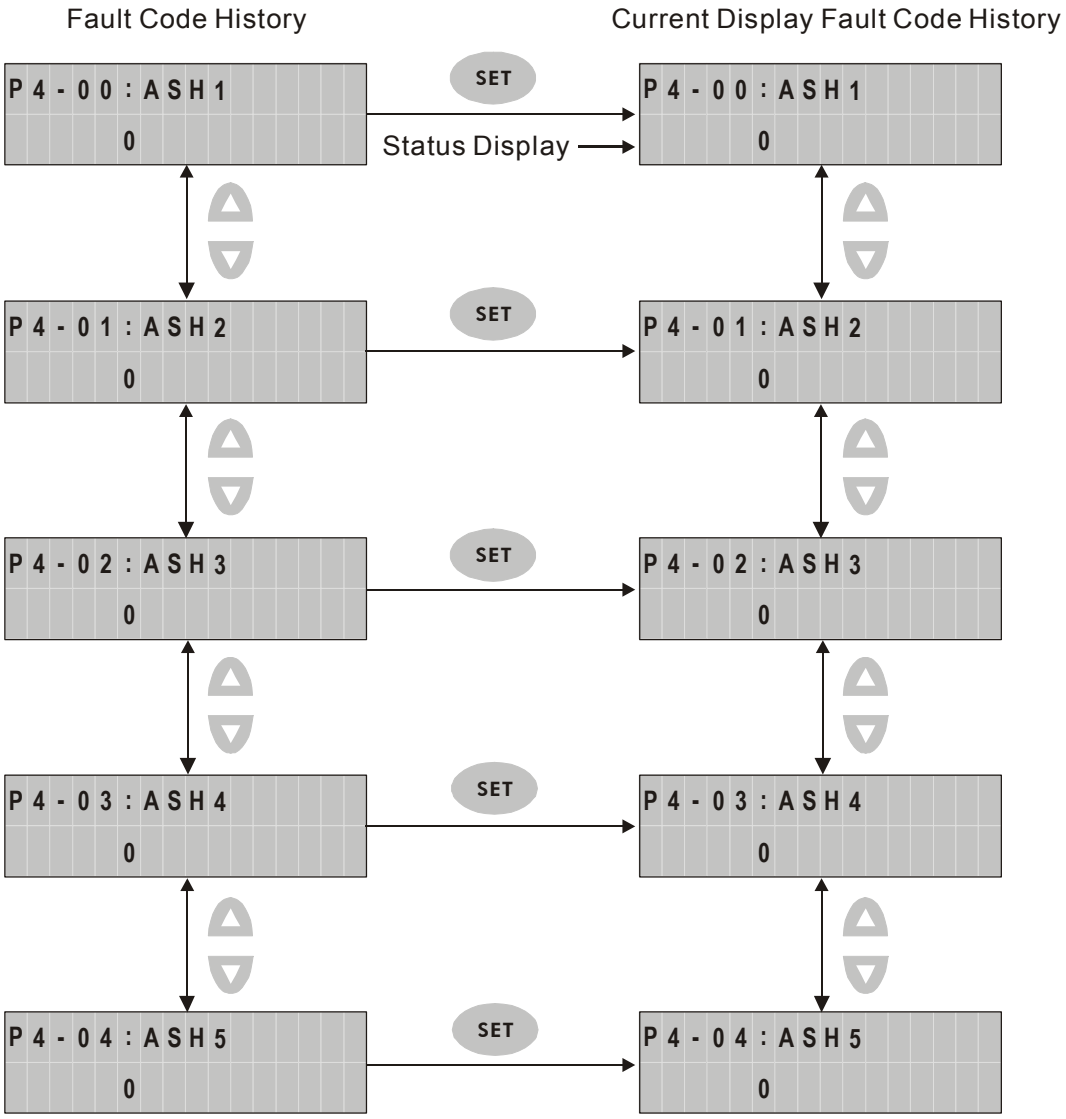
The following table lists the display examples of monitor value:

Display Message	Description
STS06:SPEED 3000 rpm	Positive value display. Display value: +3000.
STS06:SPEED -3000 rpm	Negative value display. Display value: -3000。
STS07:CMD SPD1 5.00 volt	Decimal point display. Display value: 5.00.

4.1.4 Fault Code Display Operation

After entering the parameter mode P4-00 to P4-04 (Fault Record), press SET key to display the corresponding fault code history for the parameter or press UP arrow key to display the fault code of ASH1 to ASH5 in order. ASH1 indicates the most recent occurred fault code, ASH2 is the previous occurred fault code before ASH1 and so on.

Figure 4.8



4.1.5 JOG Operation

After entering parameter mode P4-05, the users can follow the following steps to perform JOG operation or press JOG key on the digital keypad to enter into parameter setting mode of P4-05 directly.

Step 1. Press the SET key to display the JOG rpm speed. (The default value is 20 rpm).

Step 2. Press the UP or DOWN arrow keys to increase or decrease the desired JOG speed. (This also can be undertaken by using the SHIFT key to move the cursor to the desired unit column (the effected number will flash) then changed using the UP and DOWN arrow keys. The example display in Figure 4.8 is adjusted as 100rpm.)

Step 3. Press the SET key when the desired JOG speed is set. The Servo Drive will display "JOG" and JOG LED will light up.

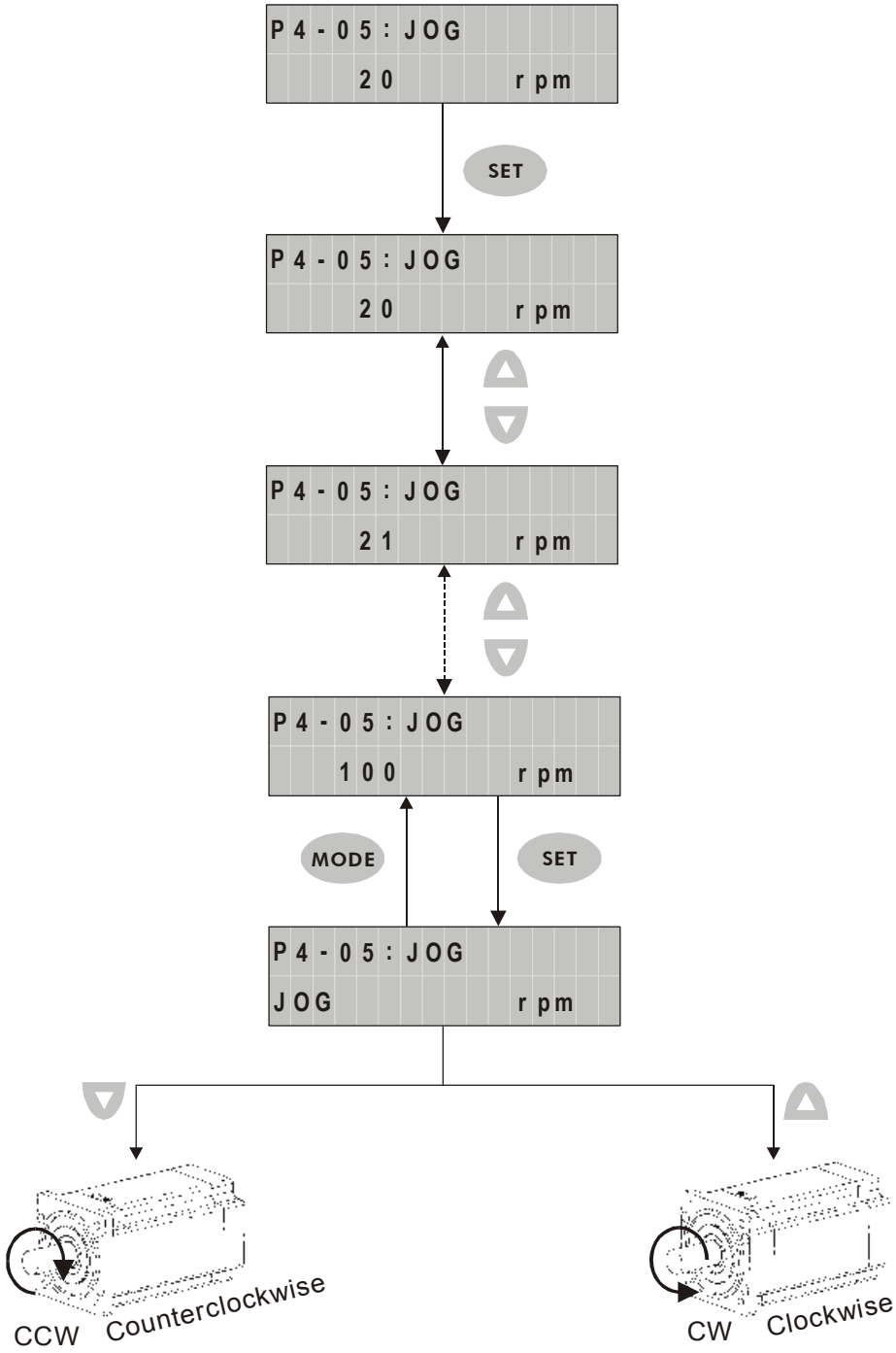
Step 4. Press the UP or DOWN arrow keys to jog the motor either CCW or CW. The motor will only rotate while the arrow key is activated.

Step 5. To change JOG speed again, press the MODE key. After JOG speed is changed, press the SET key and the JOG operation will run again. Refer back to #2 and #3 to change speed.



1) JOG operation is effective only when Servo On (when the servo drive is enabled).
2) Before pressing JOG key, please ensure to confirm that P2-10 (DI1) is set to 101 (Servo On). Otherwise, the JOG operation cannot be enabled even if the JOG key has been pressed.
3) The users can set the acceleration and deceleration time in advance (the settings of parameter P1-34, P1-35 and P1-36).

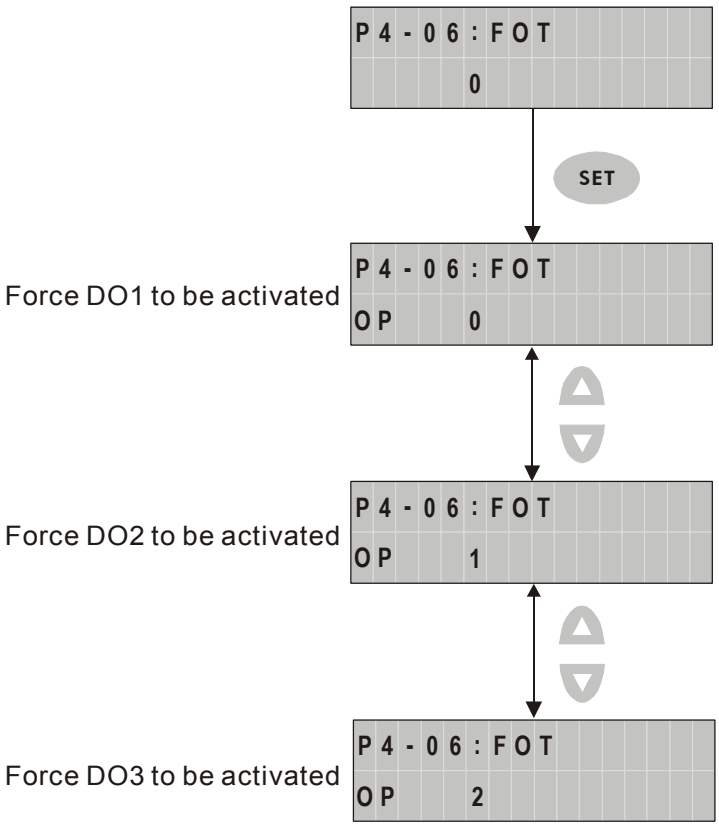
Figure 4.9


P 4 - 0 5 : J O G
2 0 r p m
SET
P 4 - 0 5 : J O G
2 0 r p m
P 4 - 0 5 : J O G
2 1 r p m
P 4 - 0 5 : J O G
1 0 0 r p m
MODE
SET
P 4 - 0 5 : J O G
J O G r p m
CCW
Counterclockwise
CW
Clockwise

4.1.6 DO Force Output Diagnosis Operation

For testing, the digital outputs can be forced to be activated (ON) or inactivated (OFF) by using parameter P4-06. Follow the setting method in Figure 4.10 to enter into DO force output diagnosis operation (OP x) mode ("x" indicates the parameter range from 0 to 7). Pressing UP or DOWN arrow key can change "x" value from 0 to 7 (hexadecimal format) and force digital outputs DO1 to DO3 to be activated (ON) or inactivated (OFF). The DO function and status is determined by P2-18 to P2-20. This function is enabled only when Servo Off (the servo drive is disabled).

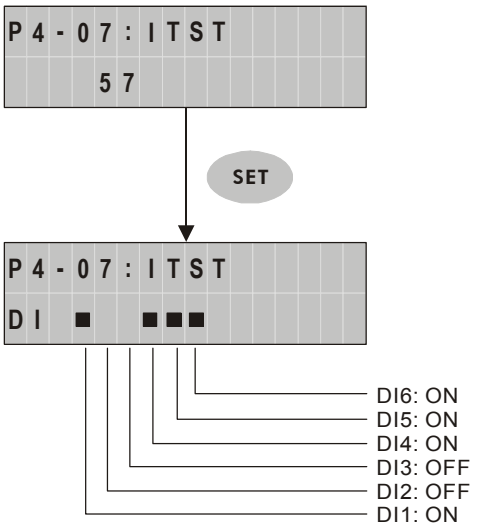
Figure 4.10



4.1.7 DI Diagnosis Operation

Following the setting method in Figure 4.11 can perform DI diagnosis operation (parameter P4-07). According to the ON and OFF status of the digital inputs DI1 to DI6, the corresponding status will display on the servo drive LCD display. When the segment lit and display on the screen, it means that the corresponding digital input signal is ON.

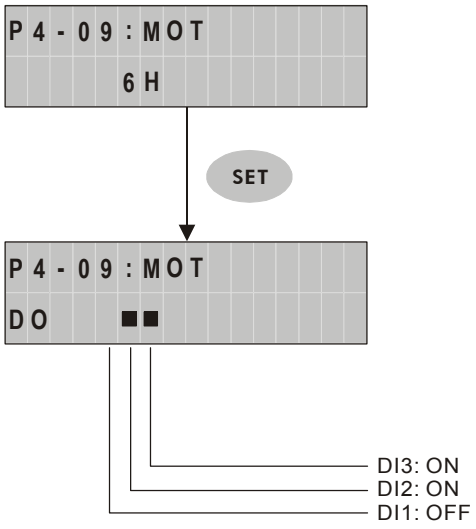
Figure 4.11



4.1.8 DO Diagnosis Operation

Following the setting method in Figure 4.12 can perform DO diagnosis operation (parameter P4-09). According to the ON and OFF status of the digital outputs DO1 to DO3, the corresponding status will display on the servo drive LCD display. When the segment lit and display on the screen, it means that the corresponding digital input signal is ON.

Figure 4.12



4.1.9 Parameters Read and Write

Digital keypad provides the servo parameters read and write function not only for the servo drive but also for PC side. The function of parameter read and write must be set via the PC software (Please see Figure 4.6 & Figure 4.7). The users can use this software to read, write and manage all parameters. When using this software to read and write parameters, the communication method of keypad parameter P8-01 must be set to 0.

Figure 4.6

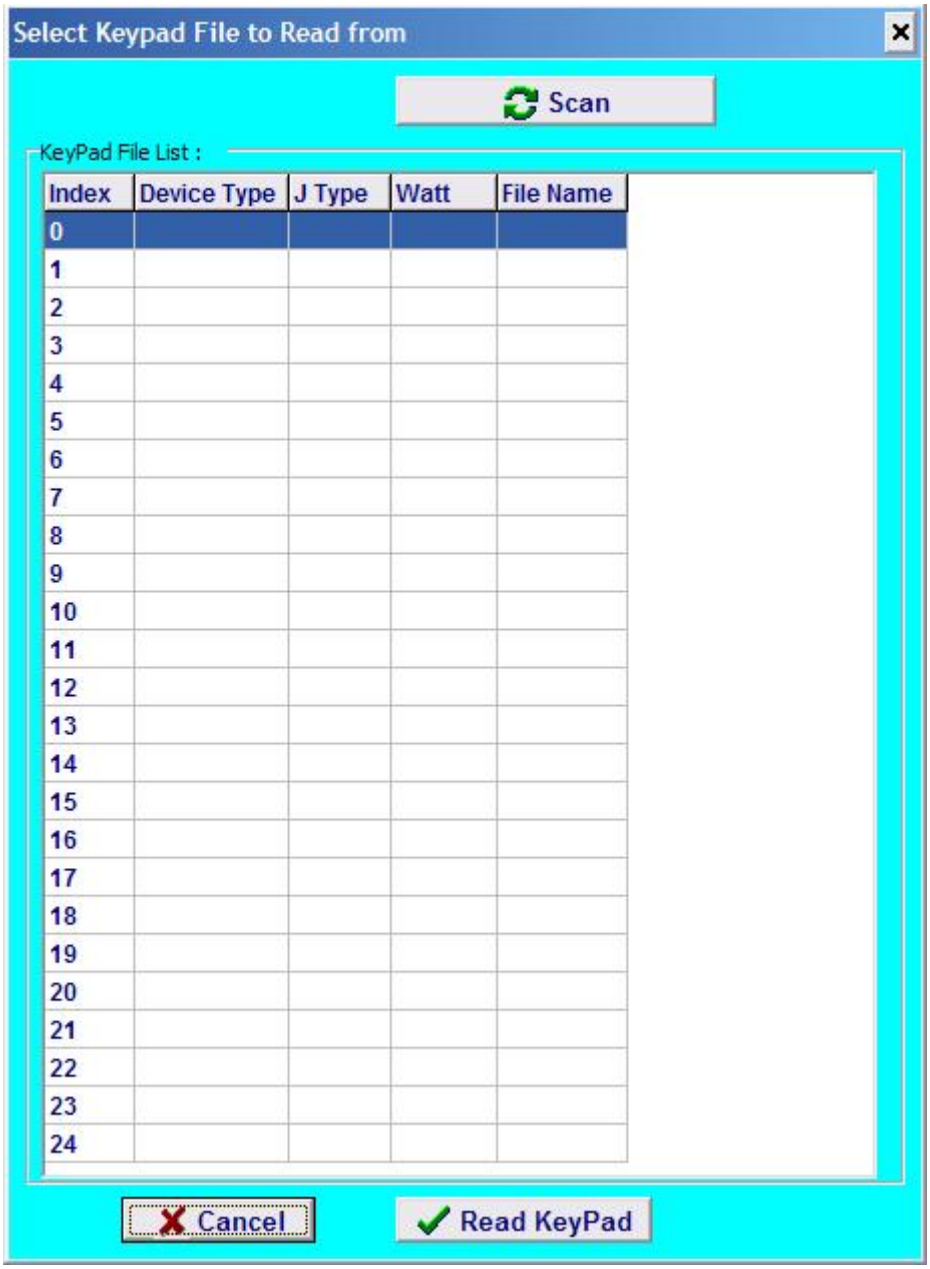


Figure 4.7

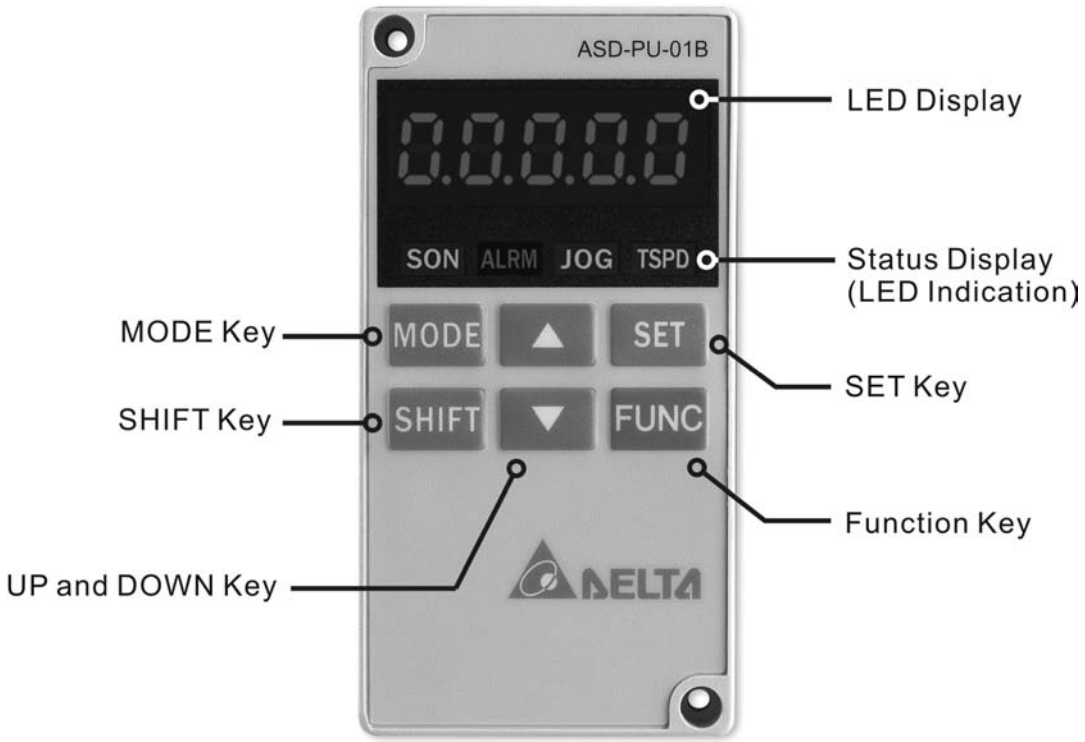

Select Keypad File to Write to
Scan
KeyPad File List :
Index
Device Type
J Type
Watt
File Name
0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
Cancel
Write KeyPad

4.2 ASD-PU-01B

4.2.1 Description of Digital Keypad ASD-PU-01B

The digital keypad includes the ASD-PU-01B display panel and function keys. The Figure 4.8 shows all of the features of the ASD-PU-01B digital keypad and an overview of their functions.

Figure 4.8



Name	Function
LED Display	5-digit LED display shows the monitor codes, parameter settings and operation values of the AC servo drive.
Status Display (LED Indication)	SON LED (Servo On Indicator). A lit LED illuminates to indicate that the servo drive is enabled. ALRM LED (Alarm Output Indicator). A lit ALRM LED illuminates to indicates that a alarm output is activated. JOG LED (JOG Operation Indicator). A lit JOG LED illuminates to indicates that JOG operation is enabled. TSPD LED (Speed reached Indicator). A lit TSPD LED illuminates to indicates that the target speed is reached and TSPD signal is activated.
MODE	MODE Key. Pressing MODE key can enter or exit different parameter groups, and switch between Parameter mode and Parameter Setting mode, SAVE (SAvE) mode and WRITE (WrItE) mode.
SHIFT	SHIFT Key. In Parameter mode, pressing SHIFT key can scrolls through parameter groups. In Parameter Setting mode and SAVE (SAvE) mode, after a parameter is selected and its value displayed, pressing SHIFT key can move the cursor to the left and then change parameter settings (blinking digits) by using arrow keys.

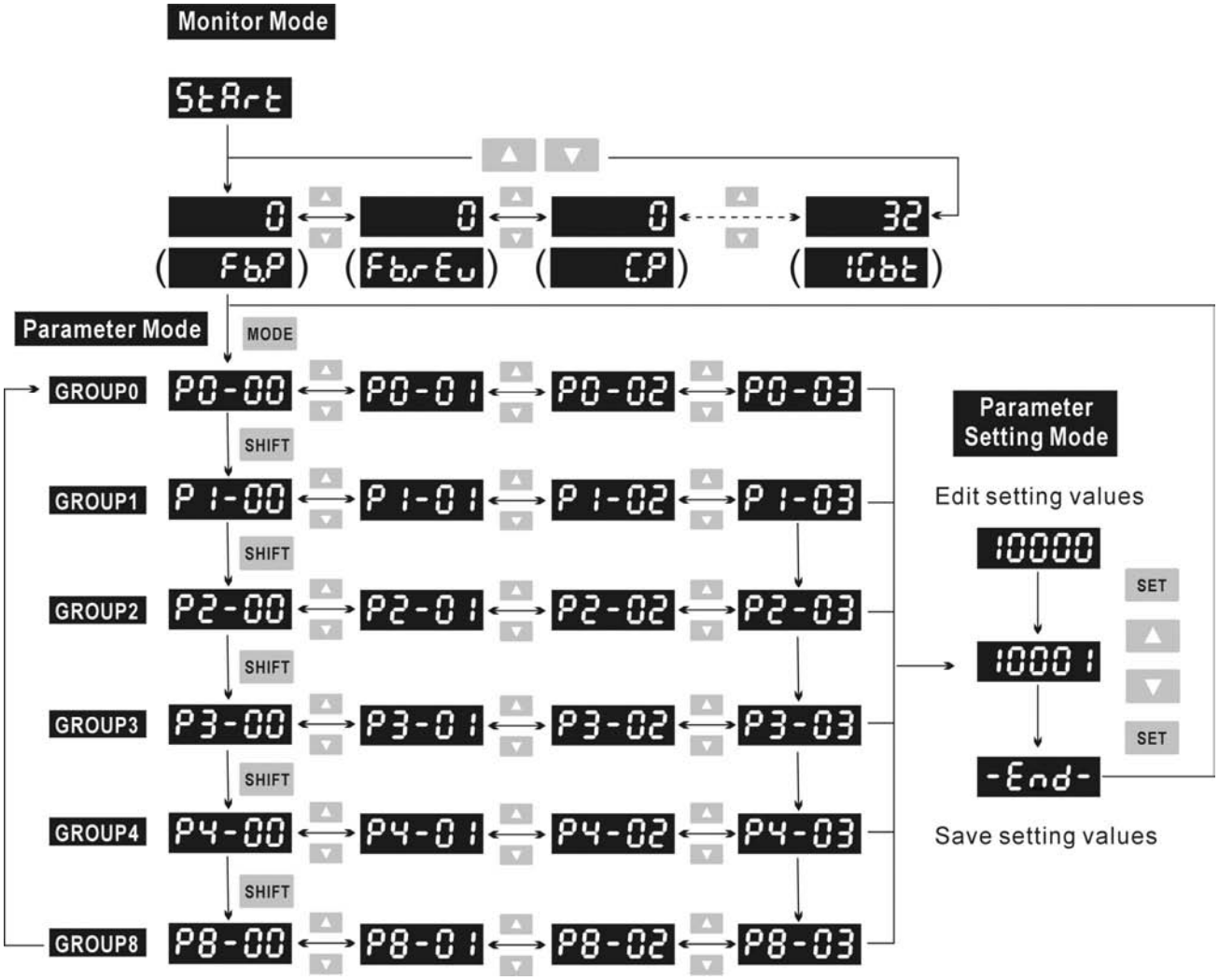
Name	Function
▲ ▼	UP and DOWN arrow Key. Pressing the UP and DOWN arrow key can scroll through and change monitor codes, parameter groups and various parameter settings. In SAVE (SAvE) mode and WRITE (Wr itE) mode, pressing UP and DOWN arrow key can scroll through and change the memory blocks. In SAVE mode, pressing UP and DOWN arrow key can select and change the memory file name also.
SET	SET Key. Pressing SET key can enter into the Parameter Setting mode, then display, select and save parameter groups and various parameter settings. During diagnosis operation, pressing SET key can execute the function in the last step. (The parameter settings changes are not effective until the SET key is pressed.)
FUNC	Function Key. Pressing Function key can enable JOG, Reset, Parameter Read & Write, Fast Editing, Static Auto-tuning and Dynamic Auto-tuning these functions.

4.2.2 Display Flowchart

Monitor Mode, Parameter Mode and Parameter Setting Mode

1. When the power is applied to the AC servo drive, the digital keypad will execute communication initial setup for approximately two seconds (9600bps & 7,N,2 Modbus ASCII) first, and then enter into the monitor mode.
2. In monitor mode, pressing UP or DOWN arrow key can switch monitor parameter code.
3. In monitor mode, pressing MODE key can enter into parameter mode, pressing the SHIFT key can switch parameter group and pressing UP or DOWN arrow key can change parameter group code.
4. In parameter mode, system will enter into the parameter setting mode immediately after the SET key is pressed. The LED display will display the corresponding setting value of this parameter simultaneously. Then, users can use UP or DOWN arrow key to change parameter value or press MODE key to exit and return back to the parameter mode.
5. In parameter setting mode, users can move the cursor to left by pressing the SHIFT key and change the parameter settings (blinking digits) by pressing the UP or DOWN arrow key.
6. After the setting value change is completed, press SET key to save parameter settings or execute command.
7. When the parameter setting is completed, LED display will show the end code “-END-“ and automatically return back to parameter mode.

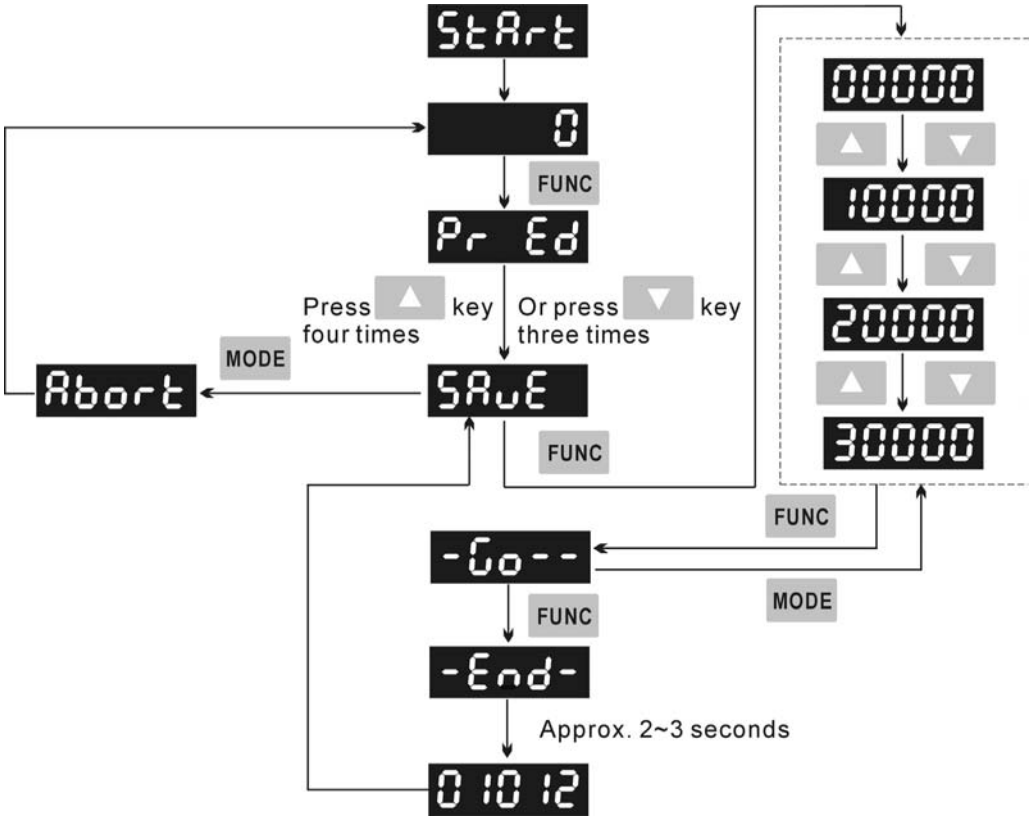
Figure 4.9


Monitor Mode
StArt
0
0
0
32
FbP
FbrEu
C.P
IGbt
Parameter Mode
MODE
GROUP0
P0-00
P0-01
P0-02
P0-03
SHIFT
GROUP1
P1-00
P1-01
P1-02
P1-03
SHIFT
GROUP2
P2-00
P2-01
P2-02
P2-03
SHIFT
GROUP3
P3-00
P3-01
P3-02
P3-03
SHIFT
GROUP4
P4-00
P4-01
P4-02
P4-03
SHIFT
GROUP8
P8-00
P8-01
P8-02
P8-03
Parameter Setting Mode
Edit setting values
10000
10001
-End-
SET
SET
Save setting values

SAVE Mode (SAvE Save parameter settings from the Drive to the Keypad)

1. When the power is applied to the AC servo drive, the digital keypad will enter into the monitor mode first.
2. In monitor mode, pressing FUNC key first. Then, pressing UP key four times or DOWN key three times can switch to SAVE mode.
3. In SAVE mode, pressing UP and DOWN key can save the desired memory block that the users want to save.
4. If the desired memory block has not been used, the LED display will show the message “00000” or “10000” or “20000” or “30000”, etc. If the desired memory block has been used and there are parameters data saved in it, the LED display will show the MCU version of the servo drive and the preset file name. For example, if the MCU version is 1.014, the message “01014” or “11014” or “21014” or “31014”, etc. will show on the LED display. The users can change the save address (memory block) by using UP and DOWN keys.
5. After the save address (memory block) is selected, press FUNC key, the LED display will show -Go--. At this time, pressing MODE key once can return to the previous display, pressing FUNC key can record the address and save the data. When recording the address, the LED display will show -End-. After the address is saved to the keypad, the LED display will show “0XXXX” (such as “01012” shown in Figure 4.10 on next page).
6. In SAVE mode, pressing MODE key once can return to the previous display and finally exit the SAVE mode. However, if the users have pressed the FUNC key and enter into SAVE mode, i.e. the SAVE operation has been executed, the MODE key will become disabled, and the users cannot return to previous display and only can move to the next step.
7. The users can save the parameters in some memory block repeatedly on the condition that the version, inertia and models of the servo drives should be the same. If one of the parameters is set by the servo drive in different condition, it cannot be saved into the same memory block with other parameters and must be saved to other memory blocks. Before re-using the same memory block, please perform the “Memory Block Clear” function first (Please see the description of parameter P8-11).

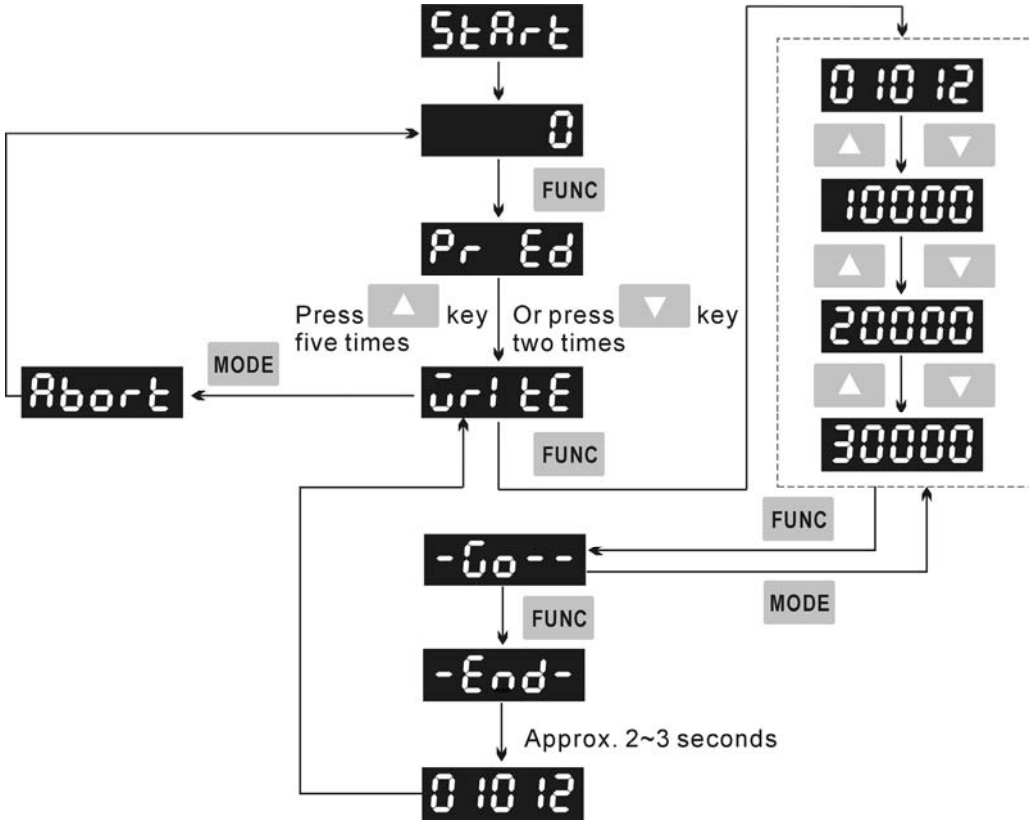
Figure 4.10


StArt
0
FUNC
Pr Ed
Press key four times
Or press key three times
MODE
Abort
SAvE
FUNC
00000
10000
20000
30000
FUNC
-Go--
MODE
FUNC
-End-
Approx. 2~3 seconds
01012

WRITE Mode ( Parameter settings written out from Keypad to the Drive)

1. When the power is applied to the AC servo drive, the digital keypad will enter into the monitor mode first.
2. In monitor mode, pressing FUNC key first. Then, pressing UP key five times or DOWN key two times can switch to WRITE mode.
3. In WRITE mode, pressing UP and DOWN key can write out the desired memory block that the users want to write out.
4. If the desired memory block has not been used, the LED display will show the message “00000” or “10000” or “20000” or “30000”, etc. If the desired memory block has been used, the LED display will show the MCU version of the servo drive and the preset file name. For example, if the MCU version is 1.014, the message “01014” or “11014” or “21014” or “31014”, etc. will show on the LED display. The users can change the write address (memory block) by using UP and DOWN keys.
5. After the write address (memory block) is selected, press FUNC key, the LED display will show . At this time, pressing MODE key once can return to the previous display, pressing FUNC key can record the address and write out the data. When recording the address, the LED display will show . After the address is written, the LED display will show “0XXXX” (such as “01012” shown in Figure 4.11 on next page).
6. In WRITE mode, pressing MODE key once can return to the previous display and finally exit the WRITE mode.
7. Only the parameters of the same version, the same inertia and the same model type of the servo drives can be written out. If the servo drive version stored in the keypad is different than the actual servo drive version, the users can make them the same via Delta Servo Drive PC software, ASDAB_SW.

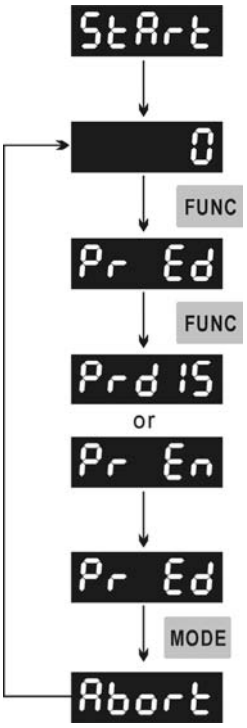
Figure 4.11


StArt
0
FUNC
Pr Ed
Press key five times
Or press key two times
MODE
Abort
WrItE
FUNC
01012
10000
20000
30000
FUNC
-Go--
MODE
FUNC
-End-
Approx. 2~3 seconds
01012

Fast Edit Mode (Pr Ed Fast Editing Function)

1. When the power is applied to the AC servo drive, the digital keypad will enter into the monitor mode first.
2. In monitor mode, pressing FUNC key once can switch to Fast Edit mode.
3. In Fast Edit mode, pressing FUNC key can enable and disable Fast Editing function. When Pr En display on the LED display, it indicates Fast Editing function is enabled. When Prd IS display on the LED display, it indicates Fast Editing function is disabled.
4. In Fast Edit mode, the users can enable or disable the Fast Editing function and browse through the parameters that have been edited before.
5. In Fast Edit mode, when Static Auto-tuning function is enabled, the users can input the value of responsiveness (frequency width), motor load inertia and stiffness directly.
6. In Fast Edit mode, when Dynamic Auto-tuning function is enabled, the users can input the value of motor rotation number, motor rotation frequency, motor rotation time and responsiveness directly.
7. Static Auto-tuning function only can be enabled in Manual mode (P2-32 is set to 0). If it is enabled in AutoMode, an error message may display.
8. Dynamic Auto-tuning function only can be enabled in AutoMode (P2-32 is set to 1 or 2). If the users want to use the Dynamic Auto-tuning function in Manual mode, please press MODE key to skip the fourth step, which is the step used to specify the responsiveness.
9. In Fast Edit mode, pressing MODE key once can return to the previous display and finally exit the Fast Edit mode (Please see Figure 4.12 below).

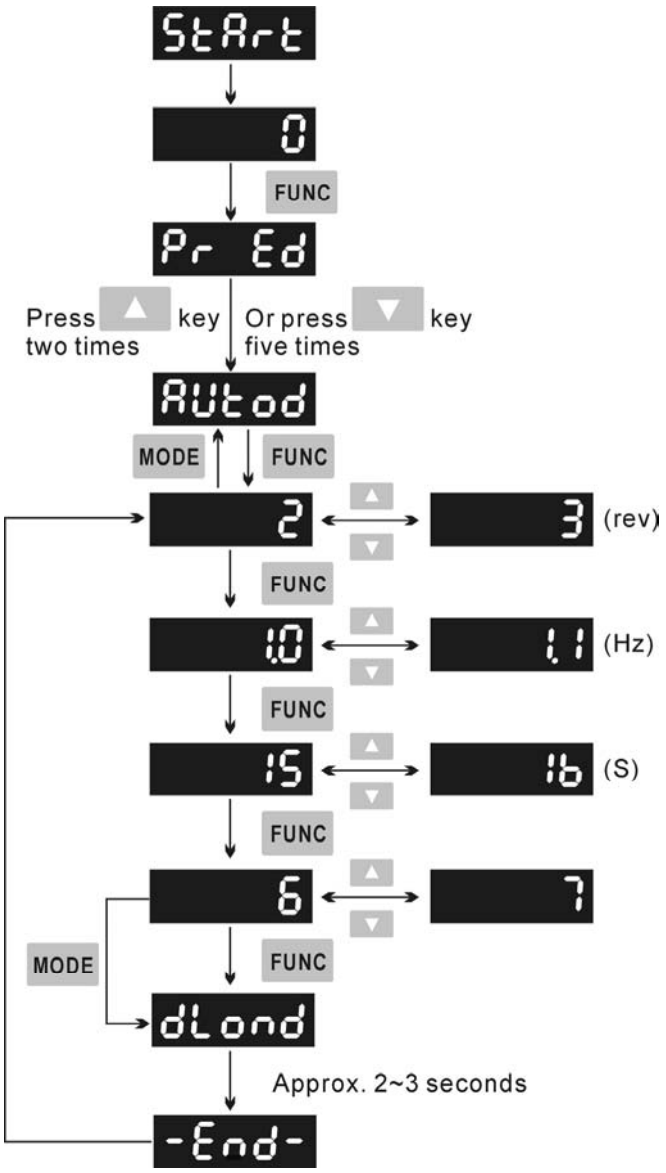
Figure 4.12



Dynamic Auto-tuning Mode (AUtod Dynamic Auto-tuning Function)

1. When the power is applied to the AC servo drive, the digital keypad will enter into the monitor mode first.
2. In monitor mode, pressing FUNC key first. Then, pressing UP key two times or DOWN key five times can switch to Dynamic Auto-tuning mode.
3. In Dynamic Auto-tuning mode, the users can input the value of motor rotation number, motor rotation frequency, motor rotation time and responsiveness directly.
4. Dynamic Auto-tuning function only can be enabled in AutoMode (P2-32 is set to 1 or 2). If the users want to use the Dynamic Auto-tuning function in Manual mode, please press MODE key to skip the fourth step, which is the step used to specify the responsiveness.
5. In Fast Edit mode, pressing MODE key once can return to the previous display and finally exit the Fast Edit mode (Please see Figure 4.13 below).

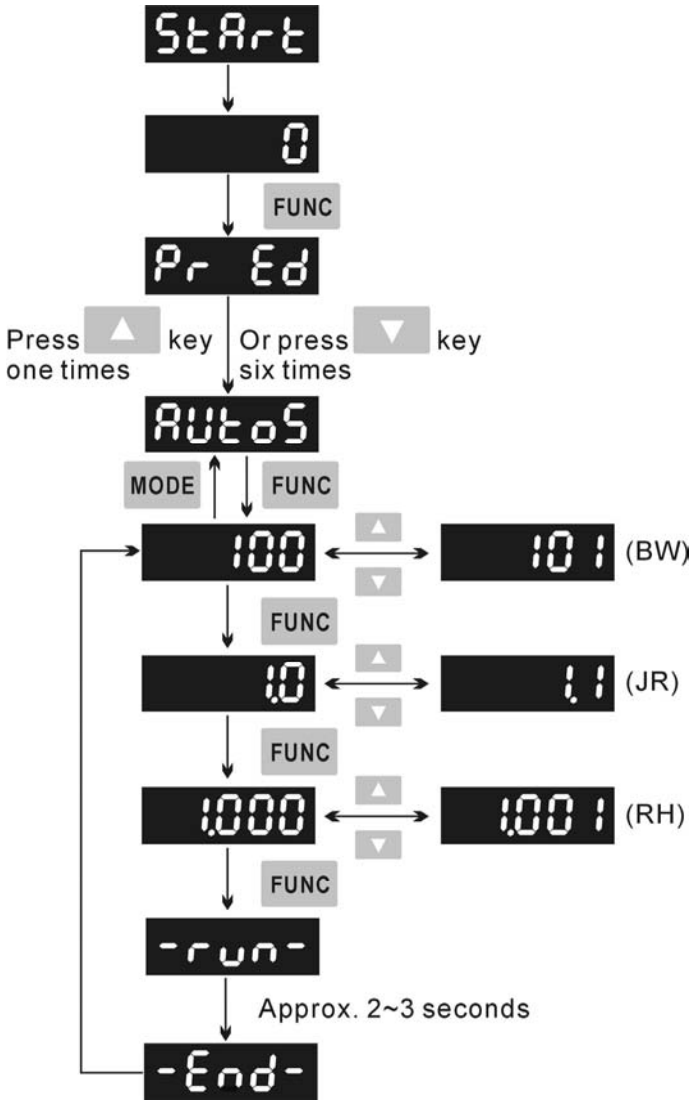
Figure 4.13



Static Auto-tuning Mode (AUtoS Static Auto-tuning Function)

1. When the power is applied to the AC servo drive, the digital keypad will enter into the monitor mode first.
2. In monitor mode, pressing FUNC key first. Then, pressing UP key two times or DOWN key five times can switch to Static Auto-tuning mode.
3. In Static Auto-tuning mode, the users can input the value of responsiveness (frequency width), motor load inertia and stiffness directly.
4. Static Auto-tuning function only can be enabled in Manual mode (P2-32 is set to 0). If it is enabled in AutoMode, an error message may display.
5. In Fast Edit mode, pressing MODE key once can return to the previous display and finally exit the Fast Edit mode (Please see Figure 4.14 below).

Figure 4.14



4.2.3 Status Display

Save Setting Display

After the SET key is pressed, LED display will show the following display messages for approx. one second according to different status.

Display Message	Description
	The setting value is saved correctly.
	This parameter is read only. Write-protected. (cannot be changed)
	Invalid password or no password was input.
	The setting value is error or input reserve setting value.
	The servo module is enabled and this parameter cannot be changed.

Abort Setting Display

Display Message	Description
	In parameter mode, pressing MODE key can abort parameter setting change and return to monitor mode. In parameter setting mode, pressing MODE key can return back to parameter mode. After returning back to parameter mode, pressing MODE key again can abort parameter setting change.

Fault Message Display

Display Message	Description
	When the AC servo drive has a fault, LED display will display “ALEnn”. “ALE” indicates the alarm and “nn” indicates the drive fault code. The display range of alarm code “nn” is 1 to 48. For the list of drive fault code, please refer to parameter P0-01 or refer to Chapter 10 (Troubleshooting).

Polarity Setting Display

Display Message	Description
	Positive value display. When entering into parameter setting mode, pressing UP or DOWN arrow key can increase or decrease the display value. SHIFT key is used to change the selected digit (The selected digit will blink).
	Negative value display. When the parameter setting is greater than five digits, after the display value is set, continuously press SHIFT key for six times and then the negative sign will show up to indicate a negative value.

Monitor Setting Display

In monitor mode, in order to change the monitor status, the users can press UP or DOWN arrow key or change parameter P0-02 directly to specify the monitor status. When the power is applied, the monitor status depends on the setting value of P0-02. For example, if the setting value of P0-02 is 2 when the power is applied, the monitor function will be “Pulse counts of pulse command”, the C.P monitor codes will first display and then the pulse number will display after.

P0-02 Setting	Display Message	Description	Unit
0		Motor feedback pulse number	pulse
1		Motor feedback rotation number	rev
2		Pulse counts of pulse command	pulse
3		Rotation number of pulse command	rev
4		Position error counts	pulse
5		Input frequency of pulse command	kHz
6		Motor rotation speed	rpm
7		Speed input command	volt
8		Speed input command	rpm
9		Torque input command	volt
10		Torque input command	Nt-m
11		Average load	%
12		Peak load	%
13		Main circuit voltage	volt

P0-02 Setting	Display Message	Description	Unit
14		Ratio of load inertia to Motor inertia	time
15		IGBT Temperature of power supply module	degC(°C)

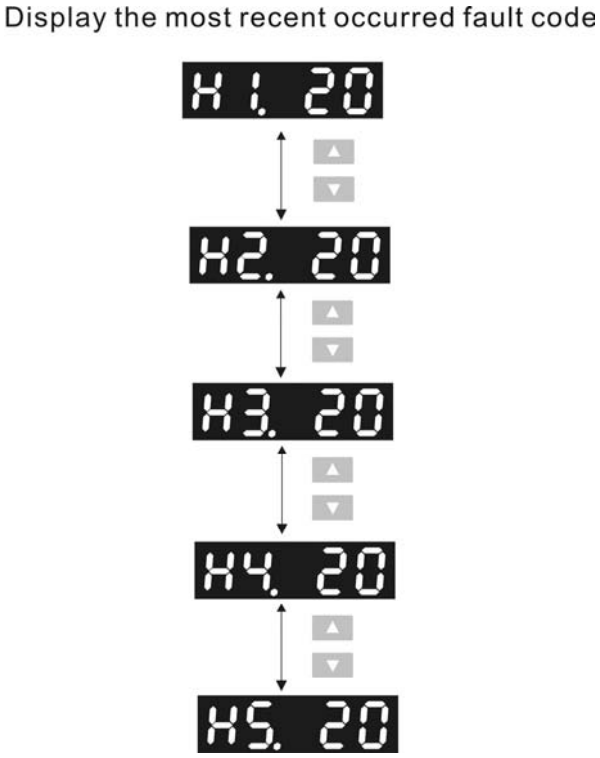
The following table lists the display examples of monitor value:

Display Message	Description
	Positive value display. Display value: +3000.
	Negative value display. Display value: -3000。
	Decimal point display. Display value: 5.00.

4.2.4 Fault Code Display Operation

After entering the parameter mode P4-00 to P4-04 (Fault Record), press SET key to display the corresponding fault code history for the parameter or press UP arrow key to display the fault code of H1 to H5 in order. H1 indicates the most recent occurred fault code, H2 is the previous occurred fault code before H1 and so on.

Figure 4.15



4.2.5 JOG Operation

After entering parameter mode P4-05, the users can follow the following steps to perform JOG operation or press FUNC key on the digital keypad to enter into JOG mode (parameter setting mode of P4-05) directly.

Step 1 Press the FUNC key to display the JOG rpm speed. (The default value is 20 rpm).

Step 2 Press the UP or DOWN arrow keys to increase or decrease the desired JOG speed. (This also can be undertaken by using the SHIFT key to move the cursor to the desired unit column (the effected number will flash) then changed using the UP and DOWN arrow keys. The example display in Figure 4.16 is adjusted as 21rpm.)

Step 3 Press the SET key when the desired JOG speed is set. The Servo Drive will display JOG and JOG LED will light up.

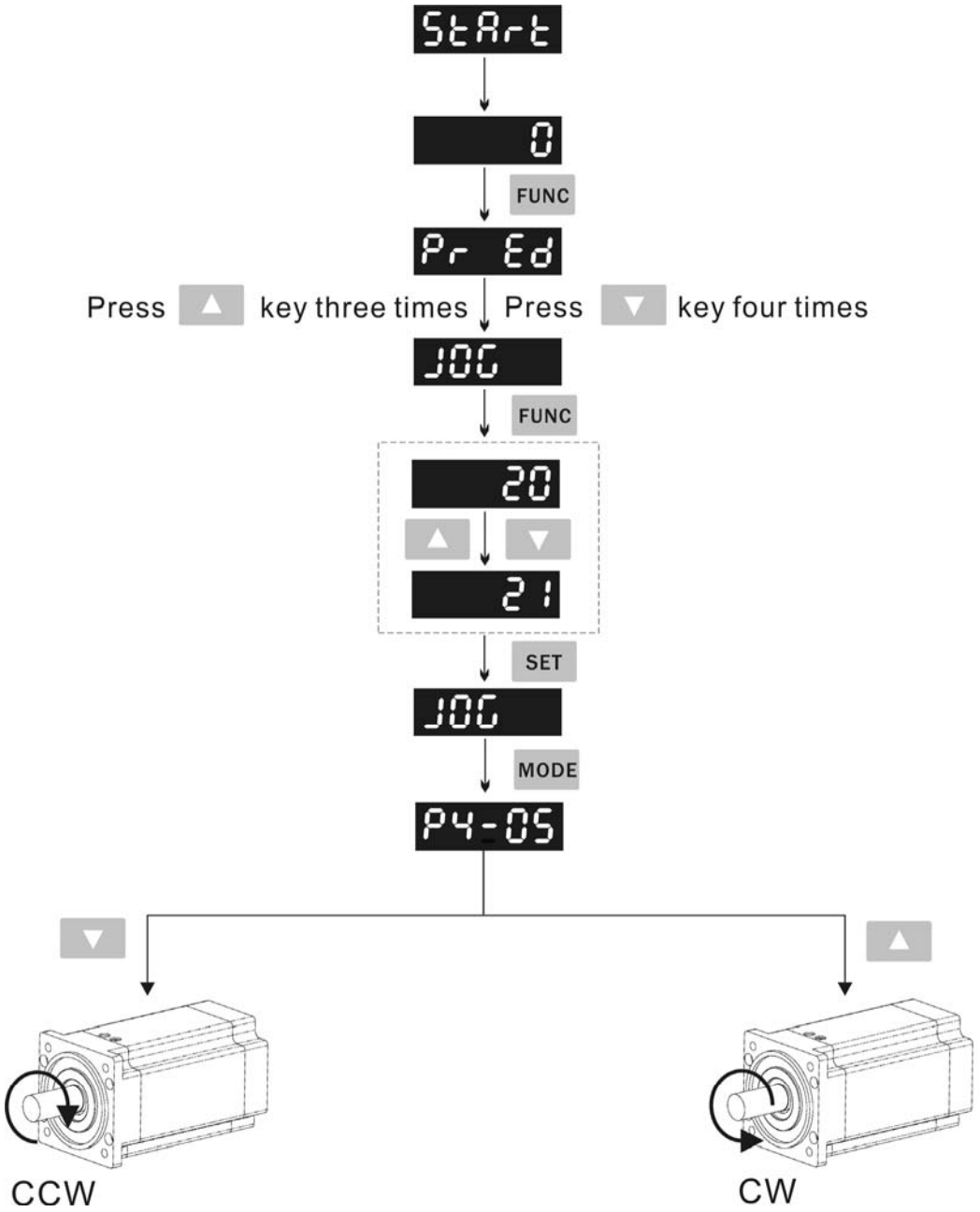
Step 4 Press the UP or DOWN arrow keys to jog the motor either CCW or CW. The motor will only rotate while the arrow key is activated.

Step 5 To change JOG speed again, press the MODE key. After JOG speed is changed, press the SET key and the JOG operation will run again. Refer back to #2 and #3 to change speed.

NOTE

1) JOG operation is effective only when Servo On (when the servo drive is enabled).
2) Before using JOG function, please ensure to confirm that P2-10 (DI1) is set to 101 (Servo On). Otherwise, the JOG operation cannot be enabled even if the FUNC key has been pressed.
3) The users can set the acceleration and deceleration time in advance (the settings of parameter P1-34, P1-35 and P1-36).

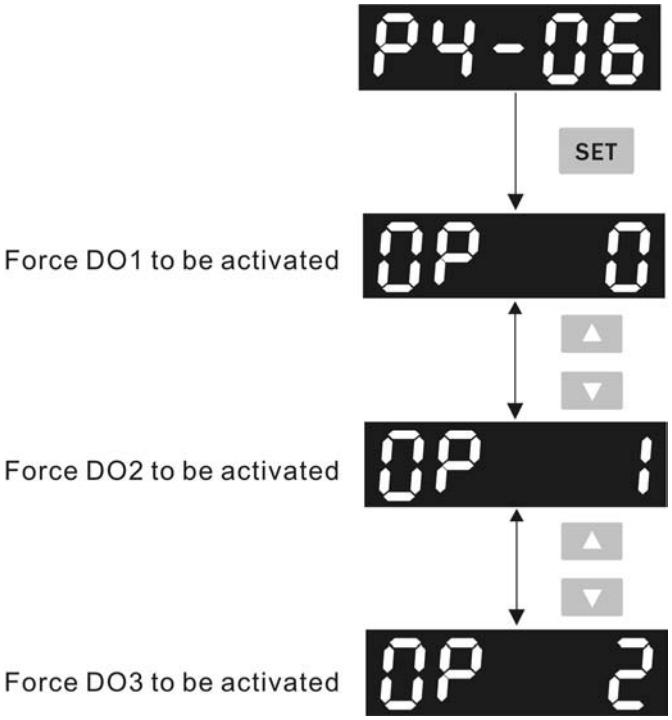
Figure 4.16



4.2.6 DO Force Output Diagnosis Operation

For testing, the digital outputs can be forced to be activated (ON) or inactivated (OFF) by using parameter P4-06. Follow the setting method in Figure 4.17 to enter into DO force output diagnosis operation (OP x) mode ("x" indicates the parameter range from 0 to 7). Pressing UP or DOWN arrow key can change "x" value from 0 to 7 (hexadecimal format) and force digital outputs DO1 to DO3 to be activated (ON) or inactivated (OFF). The DO function and status is determined by P2-18 to P2-20. This function is enabled only when Servo Off (the servo drive is disabled).

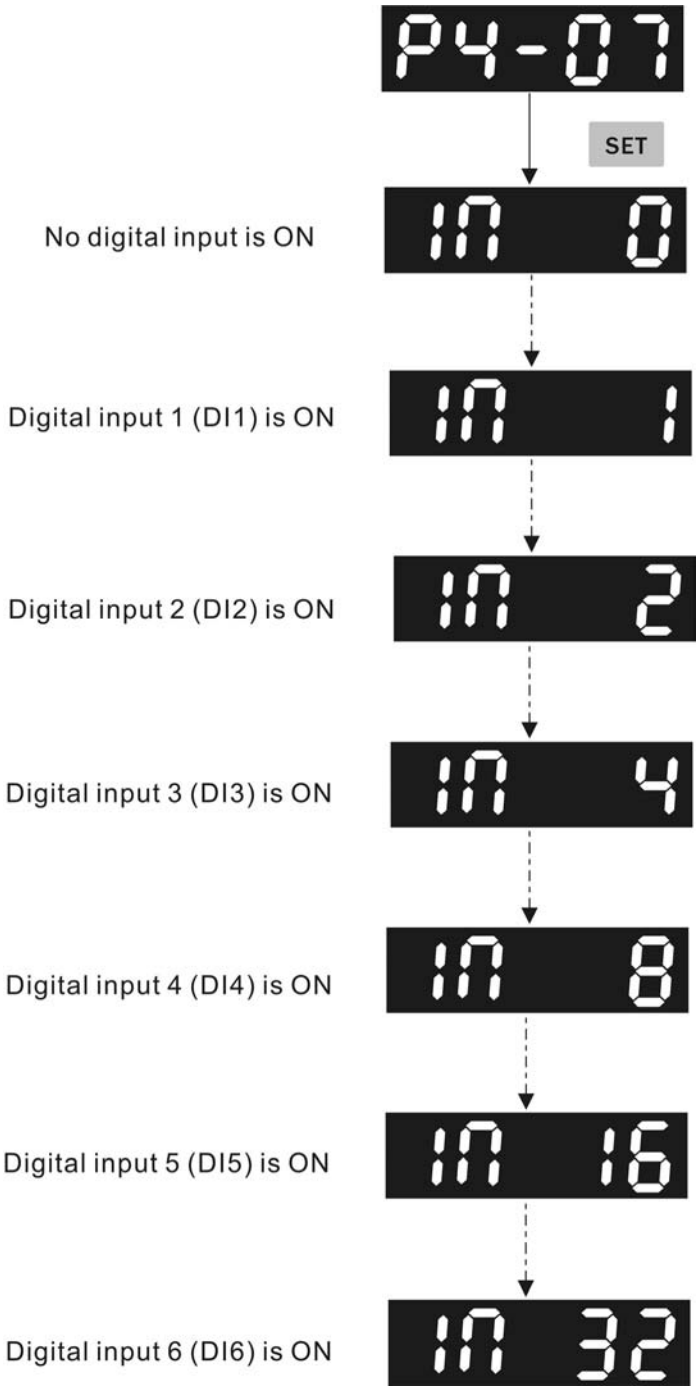
Figure 4.17



4.2.7 DI Diagnosis Operation

Following the setting method in Figure 4.18 can perform DI diagnosis operation (parameter P4-07). According to the ON and OFF status of the digital inputs DI1 to DI6, the corresponding status will display on the servo drive LED display. When the segment lit and display on the screen, it means that the corresponding digital input signal is ON.

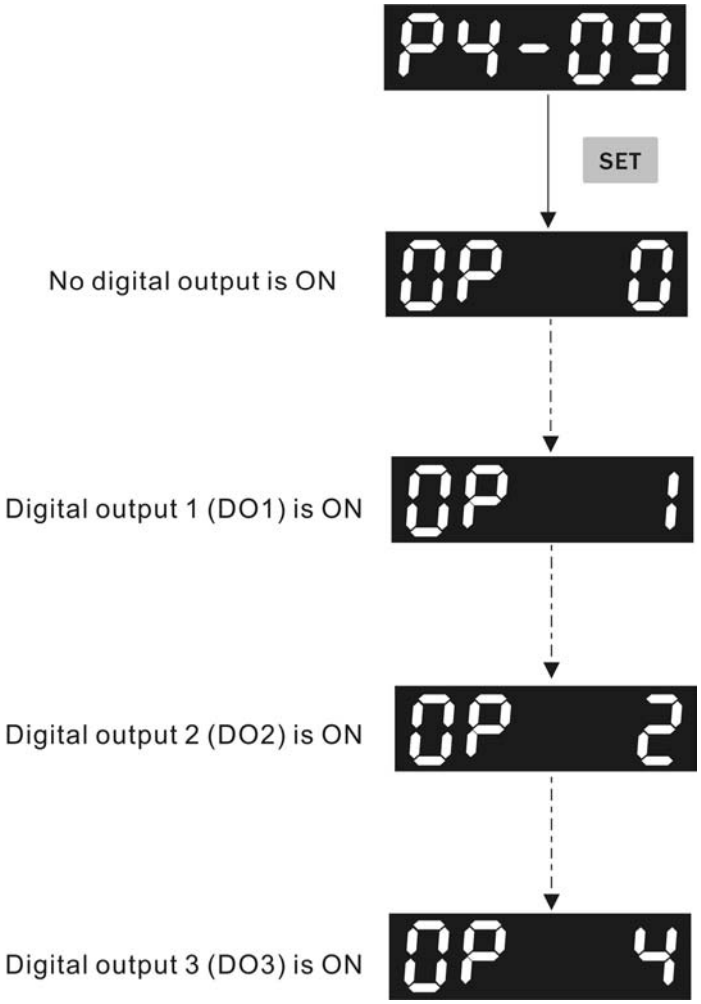
Figure 4.18



4.2.8 DO Diagnosis Operation

Following the setting method in Figure 4.19 can perform DO diagnosis operation (parameter P4-09). According to the ON and OFF status of the digital outputs DO1 to DO3, the corresponding status will display on the servo drive LED display. When the segment lit and display on the screen, it means that the corresponding digital input signal is ON.

Figure 4.19



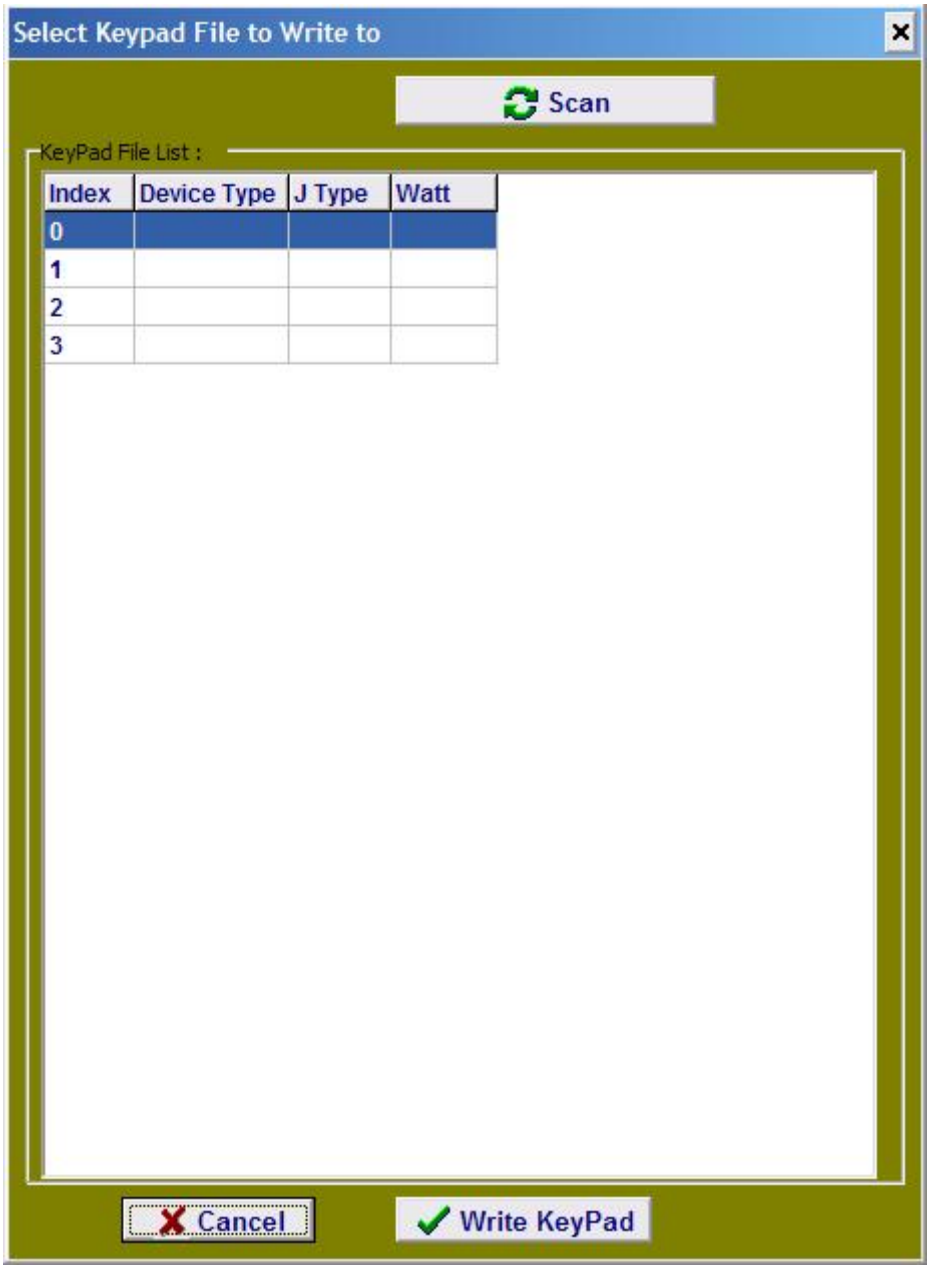
4.2.9 Parameters Read and Write

Digital keypad provides the servo parameters read and write function not only for the servo drive but also for PC side. The function of parameter read and write must be set via the PC software (Please see Figure 4.20 & Figure 4.21). The users can use this software to read, write and manage all parameters. When using this software to read and write parameters, the communication method of keypad parameter P8-01 must be set to 0.

Figure 4.20



Figure 4.21


Select Keypad File to Write to
Scan
KeyPad File List :
Index
Device Type
J Type
Watt
0
1
2
3
Cancel
Write KeyPad

This page intentionally left blank.

efesotomasyon.com

Chapter 5 Trial Run and Tuning Procedure

This chapter describes trial run and tuning procedure for servo drive and motor. Trial run, which is divided into two parts, one part is to introduce the trial run without load, and the other part is to introduce trial run with load. Ensure to complete the trial run without load first before performing the trial run with load. Tuning procedure includes the tuning process, flowchart, and the relevant parameters of AutoMode (PI & PDFF) mode and Manual mode

5.1 Inspection without Load

In order to prevent accidents and avoid damaging the servo drive and mechanical system, the trial run should be performed under no load condition (no load connected, including disconnecting all couplings and belts). Do not run servo motor while it is connected to load or mechanical system because the unassembled parts on motor shaft may easily disassemble during running and it may damage mechanical system or even result in personnel injury. After removing the load or mechanical system from the servo motor, if the servo motor can runs normally following up the normal operation procedure (when trial run without load is completed), then user can connect to the load and mechanical system to run the servo motor.



- ***In order to prevent accidents, the initial trial run for servo motor should be conducted under no load conditions (separate the motor from its couplings and belts).***
- ***Caution: Please perform trial run without load first and then perform trial run with load connected. After the servo motor is running normally and regularly without load, then run servo motor with load connected. Ensure to perform trial run in this order to prevent unnecessary danger.***

After power in connected to AC servo drive, the charge LED will light and it indicates that AC servo drive is ready. Please check the followings before trial run in order to find the problem and correct it in advance. Doing this can avoid the damage to the servo drive and servo motor.

Item	Content
Inspection before operation (Control power is not applied)	● Inspect the servo drive and servo motor to insure they were not damaged. ● To avoid an electric shock, be sure to connect the ground terminal of servo drive to the ground terminal of control panel. ● Before making any connection, wait 10 minutes for capacitors to discharge after the power is disconnected, alternatively, use an appropriate discharge device to discharge. ● Ensure that all wiring terminals are correctly insulated. ● Ensure that all wiring is correct or damage and or malfunction may result. ● Visually check to ensure that there are not any unused screws, metal strips, or any conductive or inflammable materials inside the drive. ● Never put inflammable objects on servo drive or close to the external regenerative resistor. ● Make sure control switch is OFF. ● If the electromagnetic brake is being used, ensure that it is correctly wired. ● If required, use an appropriate electrical filter to eliminate noise to the servo drive. ● Ensure that the external applied voltage to the drive is correct and matched to the controller.

Item	Content
Inspection during operation (Control power is applied)）	● Ensure that the cables are not damaged, stressed excessively or loaded heavily. When the motor is running, pay close attention on the connection of the cables and notice that if they are damaged, frayed or over extended. ● Check for abnormal vibrations and sounds during operation. If the servo motor is vibrating or there are unusual noises while the motor is running, please contact the dealer or manufacturer for assistance. ● Ensure that all user-defined parameters are set correctly. Since the characteristics of various machinery are different, in order to avoid accident or cause damage, do not adjust the parameter abnormally and ensure the parameter setting is not an excessive value. ● Ensure to reset some parameters when the servo drive is off (Please refer to Chapter 7). Otherwise, it may result in malfunction. ● If there is no contact sound or there be any unusual noises when the relay of the servo drive is operating, please contact your distributor for assistance or contact with Delta. ● Check for abnormal conditions of the power indicators and LED display. If there is any abnormal condition of the power indicators and LED display, please contact your distributor for assistance or contact with Delta.

5.2 Applying Power to the Drive

Users please observe the following steps when applying power supply to the servo drive.

1. Please check and confirm the wiring connection between the drive and motor is correct.
   1) Terminal U, V, W and FG (frame ground) must connect to Red, White, Black and Green cables separately (U: Red, V: White, W: Black, FG: Green). If not connect to the specified cable and terminal, then the drive cannot control motor. The motor grounding lead, FG must connect to grounding terminal. For more information of cables, please refer to section 3.1.
   2) Ensure to connect encoder cable to CN2 connector correctly. If users only desire to execute JOG operation, it is not necessary to make any connection to CN1 and CN3 connector. For more information of the connection of CN2 connector, please refer to Section 3.1 and 3.4.



- ***Do not connect the AC input power (R, S, T) to the (U, V, W) output terminals. This will damage the AC servo drive.***

2. Main circuit wiring

   Connect power to the AC servo. For three-phase input power connection and single-phase input power connection, please refer to Section 3.1.3.

3. Turn the Power On

   The servo power is main circuit power (R, S, T). When the power is on, the AC servo drive will start many items of self-test. After the test, if - displays and blinks on the LCD display, it indicates that the testing result is normal. If there is any text or value displayed on the display, please refer to parameter P0-01 (Drive Fault Code) to know the fault message and refer to Chapter 10 (Troubleshooting) to clear or remove the fault.

   1) When display shows:



Over voltage:

The main circuit voltage has exceeded its maximum allowable value or input power is error (Incorrect power input).

Corrective Actions:

- Use voltmeter to check whether the input voltage falls within the rated input voltage.
- Use voltmeter to check whether the input voltage is within the specified limit.

2) When display shows:



Encoder error:

Check if the wiring is correct. Check if the encoder wiring (CN2) of servo motor is loose or incorrect.

Corrective Actions:

- Check if the user performs wiring recommended in the user manual.
- Examine the encoder connector and cable.
- Inspect whether wire is loose or not.
- Check if the encoder is damaged.

3) When display shows:



Emergency stop activated:

Please check if any of digital inputs DI1~DI6 signal is set to “Emergency Stop” (EMGS).

Corrective Actions:

- If it does not need to use “Emergency Stop (EMGS)” as input signal, the users only need to confirm that if all of the digital inputs DI1~DI6 are not set to “Emergency Stop (EMGS)”. (The setting value of parameter P2-10 to P2-15 is not set to 21.)
- If it is necessary to use “Emergency Stop (EMGS)” as input signal, the users only need to confirm that which of digital inputs DI1~DI6 is set to “Emergency Stop (EMGS)” and check if the digital input signal is ON (It should be activated).

4) When display shows:



Reverse limit switch error:

Please check if any of digital inputs DI1~DI6 signal is set to “Reverse inhibit limit (CWL)” and check if the signal is ON or not.

Corrective Actions:

- If it does not need to use “Reverse inhibit limit (CWL)” as input signal, the users only need to confirm that if all of the digital inputs DI1~DI6 are not set to “Reverse inhibit limit (CWL)”. (The setting value of parameter P2-10 to P2-15 is not set to 22.)
- If it is necessary to use “Reverse inhibit limit (CWL)” as input signal, the users only need to confirm that which of digital inputs DI1~DI6 is set to “Reverse inhibit limit (CWL)” and check if the digital input signal is ON (It should be activated).

5) When display shows:



Forward limit switch error:

Please check if any of digital inputs DI1~DI6 signal is set to “Forward inhibit limit (CCWL)” and check if the signal is ON or not.

Corrective Actions:

- If it is no need to use “Forward inhibit limit (CCWL)” as input signal, the users only need to confirm that if all of the digital inputs DI1~DI8 are not set to “Forward inhibit limit (CCWL)”. (The setting value of parameter P2-10 to P2-15 is not set to 23.)
- If it is necessary to use “Forward inhibit limit (CCWL)” as input signal, the users only need to confirm that which of digital inputs DI1~DI6 is set to “Forward inhibit limit (CCWL)” and check if the digital input signal is ON (It should be activated).

When “Digital Input 1 (DI1)” is set to Servo On (SON), if DI1 is set to ON (it indicates that Servo On (SON) function is enabled) and the following fault message shows on the display:

6) When display shows:



Overcurrent:

Corrective Actions:

- Check the wiring connections between the servo drive and motor.
- Check if the circuit of the wiring is closed.
- Remove the short-circuited condition and avoid metal conductor being exposed.

7) When display shows:



Undervoltage:

Corrective Actions:

- Check whether the wiring of main circuit input voltage is normal.
- Use voltmeter to check whether input voltage of main circuit is normal.
- Use voltmeter to check whether the input voltage is within the specified specification.

8) When display shows:



Magnetic field error:

Corrective Actions:

- Check if the encoder is abnormal.
- Verify the encoder connector.

9) When display shows:



Input power phase loss:

Corrective Actions:

- Verify the main circuit power R, S, T. Check for possible poor connection on the power cable.
- Check if one phase of the input power is lost.

NOTE

1) If there are any unknown fault codes and abnormal display when applying power to the drive or servo on is activated (without giving any command), please inform the distributor or contact with Delta for assistance.

5.3 JOG Trial Run without Load

It is very convenient to use JOG trial run without load to test the servo drive and motor as it can save the wiring. The external wiring is not necessary and the users only need to connect the digital keypad (ASD-PU-01A or ASD-PU-01B) to the servo drive. For safety, it is recommended to set JOG speed at low speed. Please refer to the following steps to perform JOG trial run without load.

5.3.1 ASD-PU-01A Tuning Flowchart

STEP 1: Turn the drive ON through software. Ensure that there is no fault message display on the LCD display and the servo drive is normal.

STEP 2: Press JOG key on the keypad and the drive will enter into JOG operation mode automatically. (At this time, the servo drive is enabled (Servo On).)

STEP 3: The users can press UP and DOWN key to change JOG speed and press SHIFT key to adjust the digit number of the displayed value.

STEP 4: Pressing SET key can determine the speed of JOG operation.

STEP 5: Pressing UP key and the servo motor will run in CCW direction. After releasing UP key, the motor will stop running.

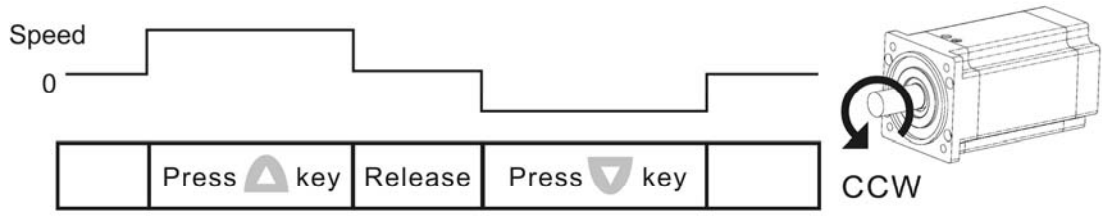
STEP 6: Pressing DOWN key and the servo motor will run in CW direction. After releasing DOWN key, the motor will stop running.

CW and CCW Definition:

CCW (Counterclockwise): when facing the servo motor shaft, CCW is reverse running.

CW (Clockwise): when facing the servo motor shaft, CW is forward running.

STEP 7: When pressing MODE key, it can exit JOG operation mode.



If the servo motor does not rotate, please check if the wiring of U, V, W terminals and encoder is correct or not.

If the servo motor does not rotate properly, please check if the phase of U, V, W cables is connected correctly.

NOTE

Please note that JOG operation cannot be used when EMGS occurs (ALE13, Emergency stop activated). However, if CWL (ALE14, Reverse inhibit limit) or CCWL (ALE15, Forward inhibit limit) occurs during JOG operation, the users can still use JOG operation without problem.

Please refer to the description of Section 4.1.5 in Chapter 4.

5.3.2 ASD-PU-01B Tuning Flowchart

STEP 1: Turn the drive ON through software. Ensure that there is no fault message display on the LED display and the servo drive is normal.

STEP 2: Press FUNC key on the keypad first. Then, press UP key three times or DOWN key four times can enter into JOG operation mode automatically. (At this time, the servo drive is enabled (Servo On).)

STEP 3: Pressing FUNC key can enter into change JOG speed mode.

STEP 4: The users can press UP and DOWN key to change JOG speed and press SHIFT key to adjust the digit number of the displayed value.

STEP 5: Pressing SET key can determine the speed of JOG operation. After the JOG speed is determined, JOG will show on the LED display.

STEP 5: Pressing UP key and the servo motor will run in CCW direction. After releasing UP key, the motor will stop running.

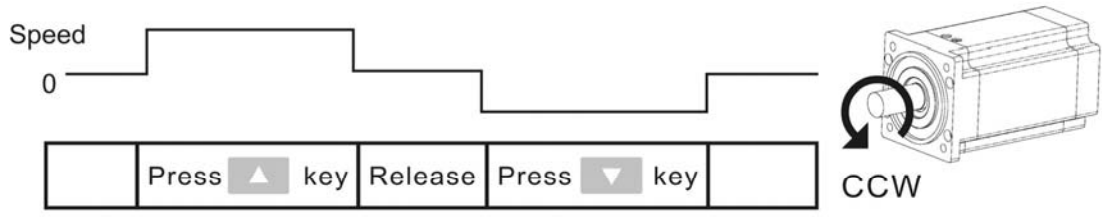
STEP 6: Pressing DOWN key and the servo motor will run in CW direction. After releasing DOWN key, the motor will stop running.

CW and CCW Definition:

CCW (Counterclockwise): when facing the servo motor shaft, CCW is reverse running.

CW (Clockwise): when facing the servo motor shaft, CW is forward running.

STEP 7: When pressing MODE key, it can exit JOG operation mode. (P4-05 will show on the LED display after exiting JOG operation mode. At this time, if the users press MODE key once, the servo drive will enter into monitor mode again.)



If the servo motor does not rotate, please check if the wiring of U, V, W terminals and encoder is correct or not.

If the servo motor does not rotate properly, please check if the phase of U, V, W cables is connected correctly.

NOTE

1) Please note that JOG operation cannot be used when EMGS occurs (ALE13, Emergency stop activated). However, if CWL (ALE14, Reverse inhibit limit) or CCWL (ALE15, Forward inhibit limit) occurs during JOG operation, the users can still use JOG operation without problem.

2) Please refer to the description of Section 4.2.5 in Chapter 4.

5.4 Speed Trial Run without Load

Before speed trial run, fix and secure the motor as possible to avoid the danger from the reacting force when motor speed changes.

STEP 1:

Set the value of parameter P1-01 to 4 and it is speed (Sz) control mode. Please ensure to set P1-01 when the servo drive is Off (Servo Off). After selecting the operation mode as speed (Sz) control mode, please restart the drive as P1-01 is effective only after the servo drive is restarted (after switching power off and on).

STEP 2:

In speed control mode, the necessary Digital Inputs are listed as follows:

Digital Input	Parameter Setting Value	Sign	Function Description	CN1 PIN No.
DI1	P2-10=101	SON	Servo On	DI1-=17
DI2	P2-11=109	TRQLM	Torque limit enabled	DI2-=18
DI3	P2-12=114	SPD0	Speed command selection 0	DI3-=5
DI4	P2-13=115	SPD1	Speed command selection 1	DI4-=3
DI5	P2-14=102	ARST	Alarm Reset	DI5-=15
DI6	P2-15=0	Disabled	This DI function is disabled	DI6-=14

By default, DI4 is the function of reverse inhibit limit, DI5 is the function of forward inhibit limit and DI6 is the function of emergency stop (DI6), if the users do not set the setting value of parameters P2-13 to P2-15 to 0 (Disabled), the faults (ALE13, 14 and 15) will occur (For the information of fault messages, please refer to Chapter 10). Therefore, if the users do not need to use these three digit inputs, please set the setting value of parameters P2-13 to P2-15 to 0 (Disabled) in advance. Now, we need to use DI4 and D5 (please refer to the above table), so it only needs to disable the DI6, i.e. set the setting value of parameter P2-15 to 0.

All the digital inputs of Delta ASDA-B series are user-defined, and the user can set the DI signals freely. Ensure to refer to the definitions of DI signals before defining them (For the description of DI signals, please refer to Table 7.A in Chapter 7).

The speed command is selected by SPD0, SPD1. Please refer to the following table:

Speed Command No.	DI signal of CN1		Command Source	Content	Range
	SPD1	SPD0			
S1	0	0	N/A	Speed command is 0(zero)	N/A
S2	0	1	Internal parameter	P1-09	-5000 ~ 5000rpm
S3	1	0		P1-10	-5000 ~ 5000rpm
S4	1	1		P1-11	-5000 ~ 5000rpm

0: indicates OFF (Normally Open); 1: indicates ON (Normally Closed)

If any alarm code displays after the setting is completed, the users can restart the drive or set DI5 to be activated to clear the fault. Please refer to section 5.2.

The settings of speed command:

P1-09 is set to 3000	Input value command	Rotation direction
P1-10 is set to 100	+	CCW
P1-11 is set to -3000	-	CW

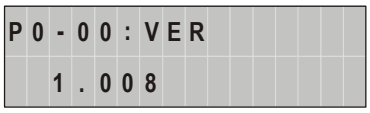
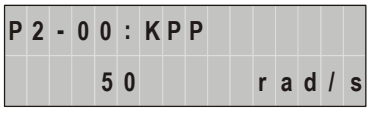
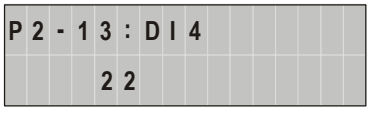
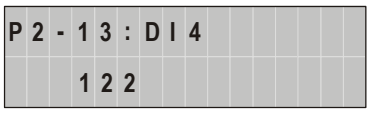
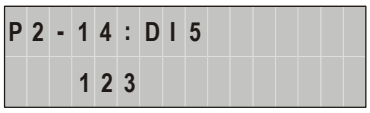
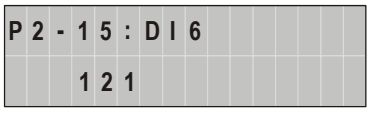
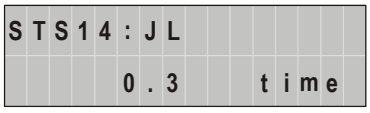
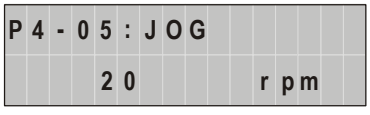
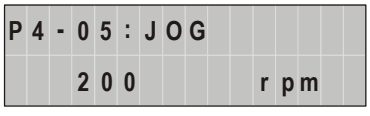
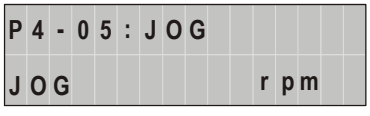
STEP 3:

1. The users can use DI1 to enable the servo drive (Servo ON).
2. If DI3 (SPD0) and DI4 (SPD1) are OFF both, it indicates S1 command is selected. At this time, the motor speed command is 0(zero).
3. If only DI3 is ON (SPD0), it indicates S2 command (P1-09 is set to 3000) is selected, and the motor speed should be 3000rpm at this time.
4. If only DI4 is ON (SPD1), it indicates S3 command (P1-10 is set to 100) is selected, and the motor speed should be 100rpm at this time.
5. If DI3 (SPD0) and DI4 (SPD1) are ON both, it indicates S4 command (P1-11 is set to -3000) is selected, and the motor speed should be -3000rpm at this time.
6. Repeat the action of (3), (4), (5) freely.
7. When the users want to stop the speed trial run, use DI1 to disable the servo drive (Servo OFF).

5.5 Tuning Procedure

■ ASD-PU-01A

Estimate the ratio of Load Inertia to Servo Motor Inertia (J_load /J_motor): JOG Mode

Tuning Procedure	Display Message
1. After wiring is completed, when power in connected to the AC servo drive, the right side display will show on the LCD display.	
2. Press MODE key to enter into parameter mode.	
3. Press SHIFT key twice to select parameter group.	
4. Press UP key to view each parameter and select parameter P2-13.	
5. Use UP and DOWN key to cycle through the available settings. Then, press SET key to set the setting value of parameter P2-13 as shown on the right side display (Set DI Enabled Status to “Normally open” status).	
6. Repeat the action of item 4 and 5. Set the setting value of parameter P2-14 as shown on the right side display.	
7. Repeat the action of item 4 and 5. Set the setting value of parameter P2-15 as shown on the right side display.	
8. Press MODE key to enter into Monitor mode.	
9. Press DOWN key twice to select the ratio of Load Inertia to Servo Motor Inertia (J_load /J_motor).	
10. Press JOG key on the keypad and the right side display will show on the LCD display (The default JOG speed value is 20rpm.)	
11. Press UP and DOWN key to increase and decrease JOG speed. Press SHIFT key one time can add one digit number. Adjust JOG speed as 200rpm shown on the right side display.	
12. After select desired JOG speed, press SET key and the right side display show on the LCD display.	

Tuning Procedure
13. Pressing UP key is forward rotation and pressing DOWN key is reverse rotation.
14. Execute JOG operation in low speed first. After the machine is running smoothly, then execute JOG operation in high speed.
15. The ratio of Load Inertia to Servo Motor Inertia (J_load /J_motor) cannot be shown in the display of JOG parameter P4-05 operation. Please press MODE key twice continuously and the users can see the ratio of Load Inertia to Servo Motor Inertia (J_load /J_motor). Then, execute JOG operation again, press MODE key once and press SET key twice to view the display on the keypad. Check if the value of J_load /J_motor is adjusted to a fixed value and displayed on the keypad after acceleration and deceleration repeatedly.

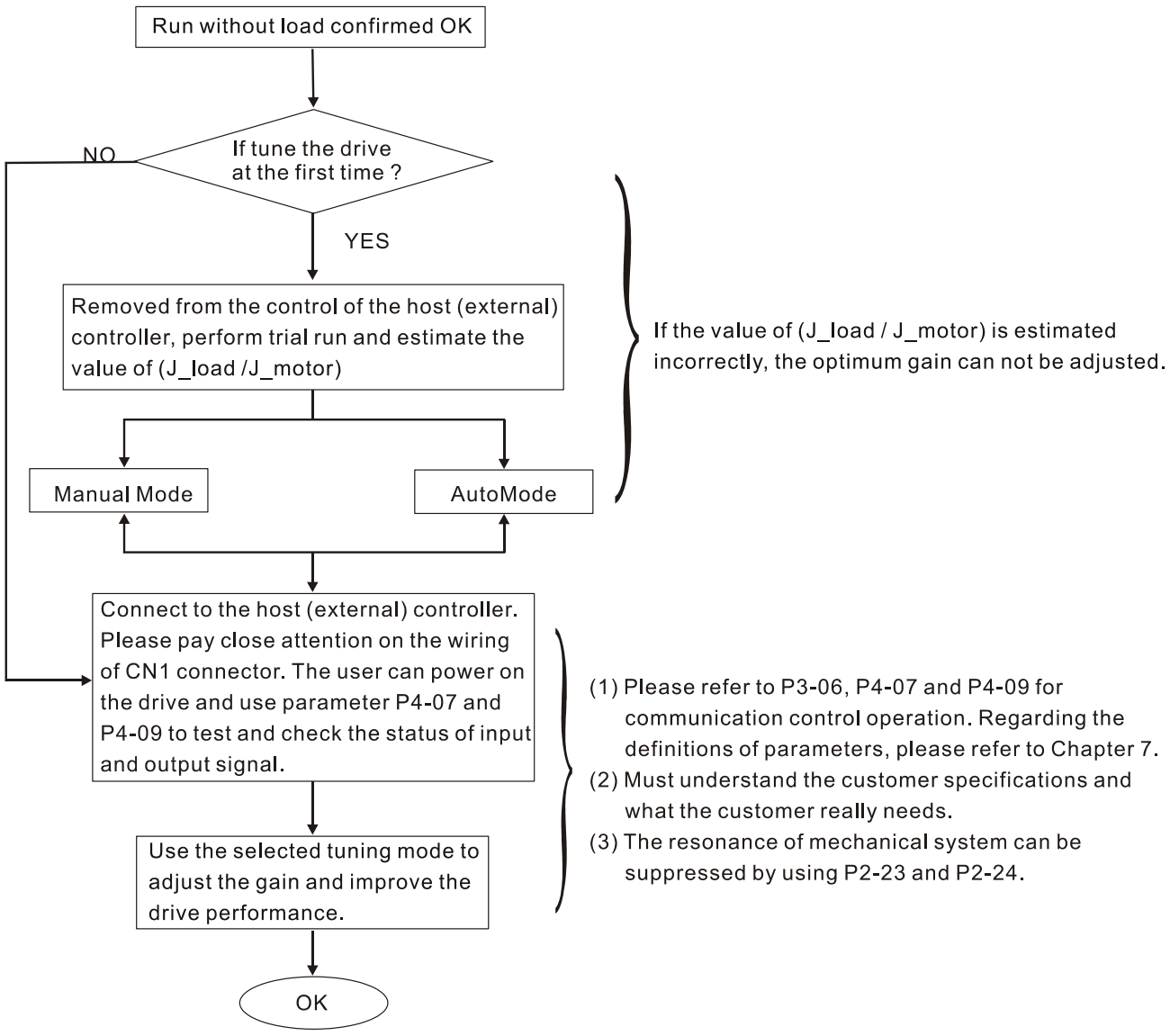
■ ASD-PU-01B

Estimate the ratio of Load Inertia to Servo Motor Inertia (J_load /J_motor): JOG Mode

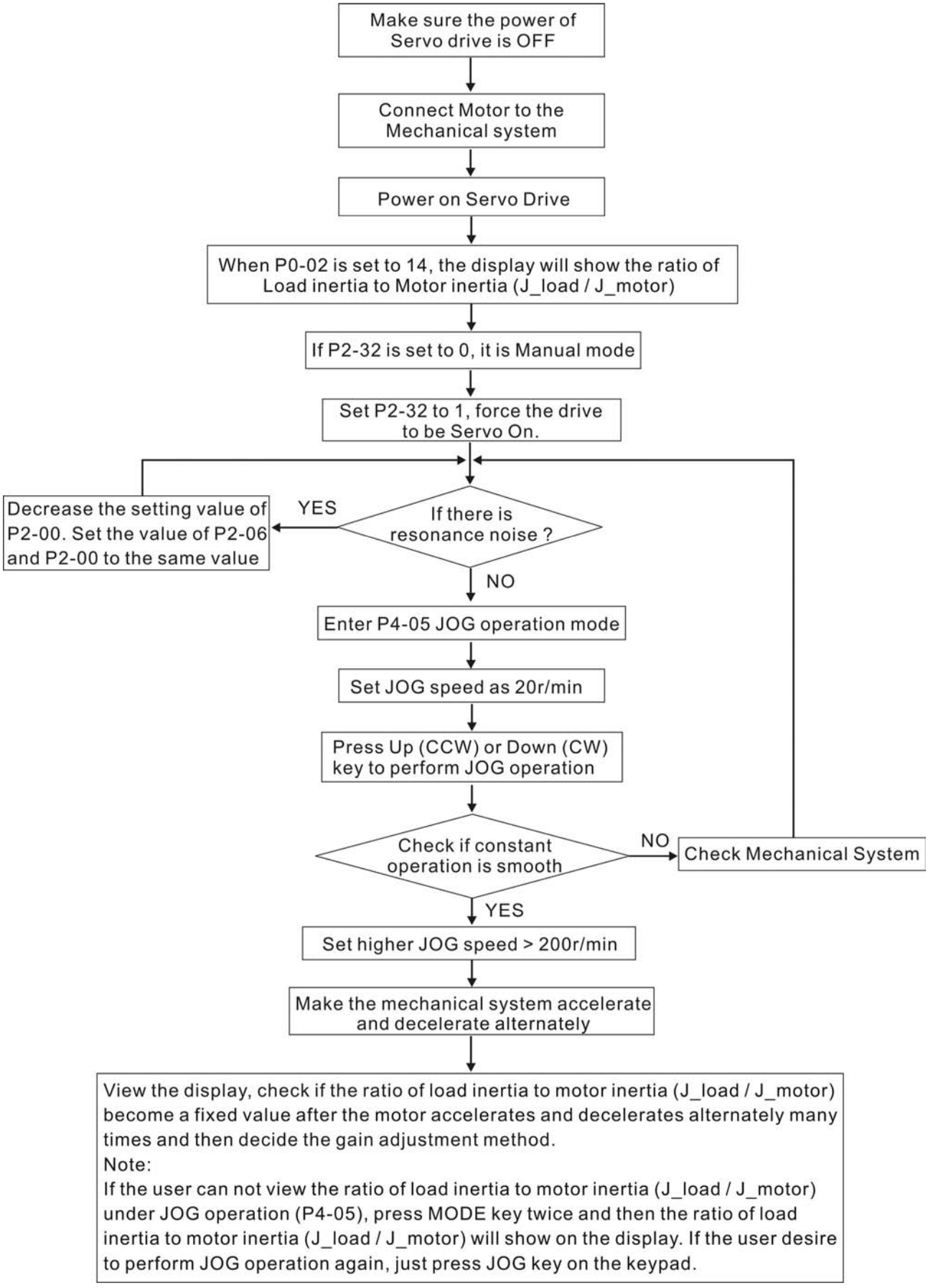
Tuning Procedure	Display Message
1. After wiring is completed, when power in connected to the AC servo drive, the right side display will show on the LED display.	
2. Press MODE key to enter into parameter mode.	
3. Press SHIFT key twice to select parameter group.	
4. Press UP key to view each parameter and select parameter P2-13.	
5. Use UP and DOWN key to cycle through the available settings. Then, press SHIFT key to set the setting value of parameter P2-13 as shown on the right side display (Set DI Enabled Status to “Normally open” status).	
6. Repeat the action of 4 and 5. Set the setting value of parameter P2-14 as shown on the right side display.	
7. Repeat the action of 4 and 5. Set the setting value of parameter P2-15 as shown on the right side display.	
8. Press MODE key to enter into Monitor mode.	
9. Press DOWN key twice to select the ratio of Load Inertia to Servo Motor Inertia (J_load /J_motor).	
10. Press FUNC key on the keypad to enter into JOG mode, and the right side display will show on the LED display	
11. The default JOG speed value is 20rpm. The users can press UP and DOWN key to increase and decrease JOG speed. Press SHIFT key one time can add one digit number. Adjust JOG speed as 200rpm shown on the right side display.	
12. After select desired JOG speed, press SET key and the right side display show on the LCD display.	

Tuning Procedure
13. Pressing UP key is forward rotation and pressing DOWN key is reverse rotation.
14. Execute JOG operation in low speed first. After the machine is running smoothly, then execute JOG operation in high speed.
15. The ratio of Load Inertia to Servo Motor Inertia (J_load /J_motor) cannot be shown in the display of JOG parameter P4-05 operation. Please press MODE key twice continuously and the users can see the ratio of Load Inertia to Servo Motor Inertia (J_load /J_motor). Then, execute JOG operation again, press MODE key once and press SET key twice to view the display on the keypad. Check if the value of J_load /J_motor is adjusted to a fixed value and displayed on the keypad after acceleration and deceleration repeatedly.

5.5.1 Tuning Flowchart



5.5.2 Load Inertia Estimation Flowchart



5.5.3 AutoMode (PI) Tuning Flowchart

P2-31 Auto Stiffness and Responsiveness Level (Default setting: 6)

Function:

This parameter allows user to set the stiffness and responsiveness level automatically. Users can control the stiffness and responsiveness according to application condition. When the setting value is higher, the stiffness and responsiveness is higher.

Adjust P2-31: Increase the setting value of P2-31 to speed the responsiveness or reduce the noise.

Continuously adjust until the satisfactory performance is achieved, and then the tuning is completed.

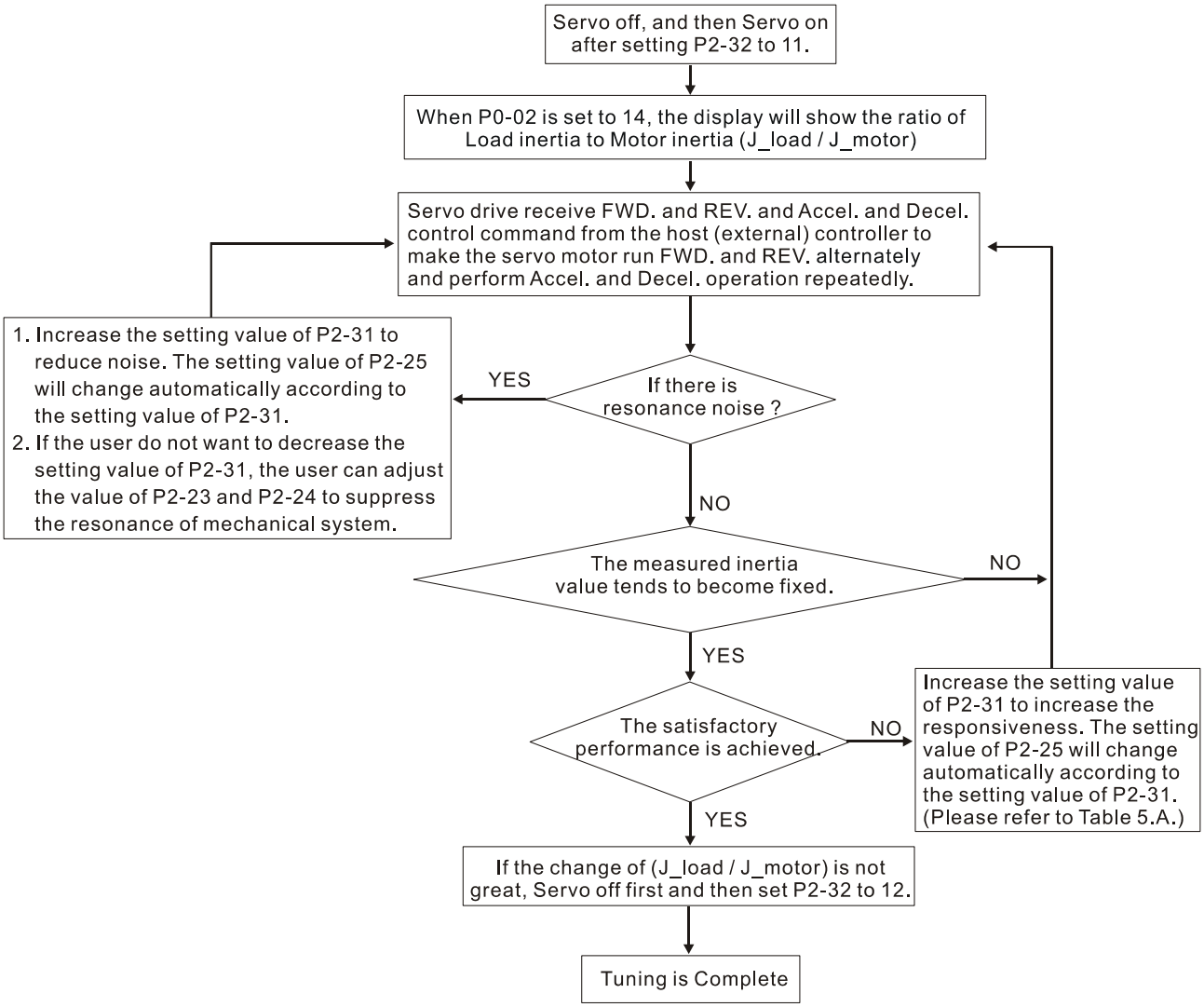


Table 5.A P2-31 Value in AutoMode(PI) and the setting of Speed Loop Responsiveness and P2-25.

Setting Value of P2-31	Speed Loop Responsiveness	Low-pass Filter Time Constant of Resonance Suppression (P2-25)
0	10 Hz	125
1	15 Hz	83
2	20 Hz	62
3	25 Hz	50
4	30 Hz	41
5	35 Hz	35
6	45 Hz	27
7	55 Hz	22
8	65 Hz	19
9	80 Hz	15
A	100 Hz	12
B	120 Hz	10
C	145 Hz	8
D	170 Hz	7
E	205 Hz	6
F	250 Hz	5

5.5.4 AutoMode (PDFF) Tuning Flowchart

P2-31 Auto Stiffness and Responsiveness Level (Default setting: 6)

Function:

This parameter allows user to set the stiffness and responsiveness level automatically. Users can control the stiffness and responsiveness according to application condition. When the setting value is higher, the stiffness and responsiveness is higher.

Adjust P2-31: Increase the setting value of P2-31 to speed the responsiveness or reduce the noise.

Adjust P2-26: Increase and adjust the setting value of P2-26 according to the setting value of P2-31.

Continuously adjust until the satisfactory performance is achieved, and then the tuning is completed.

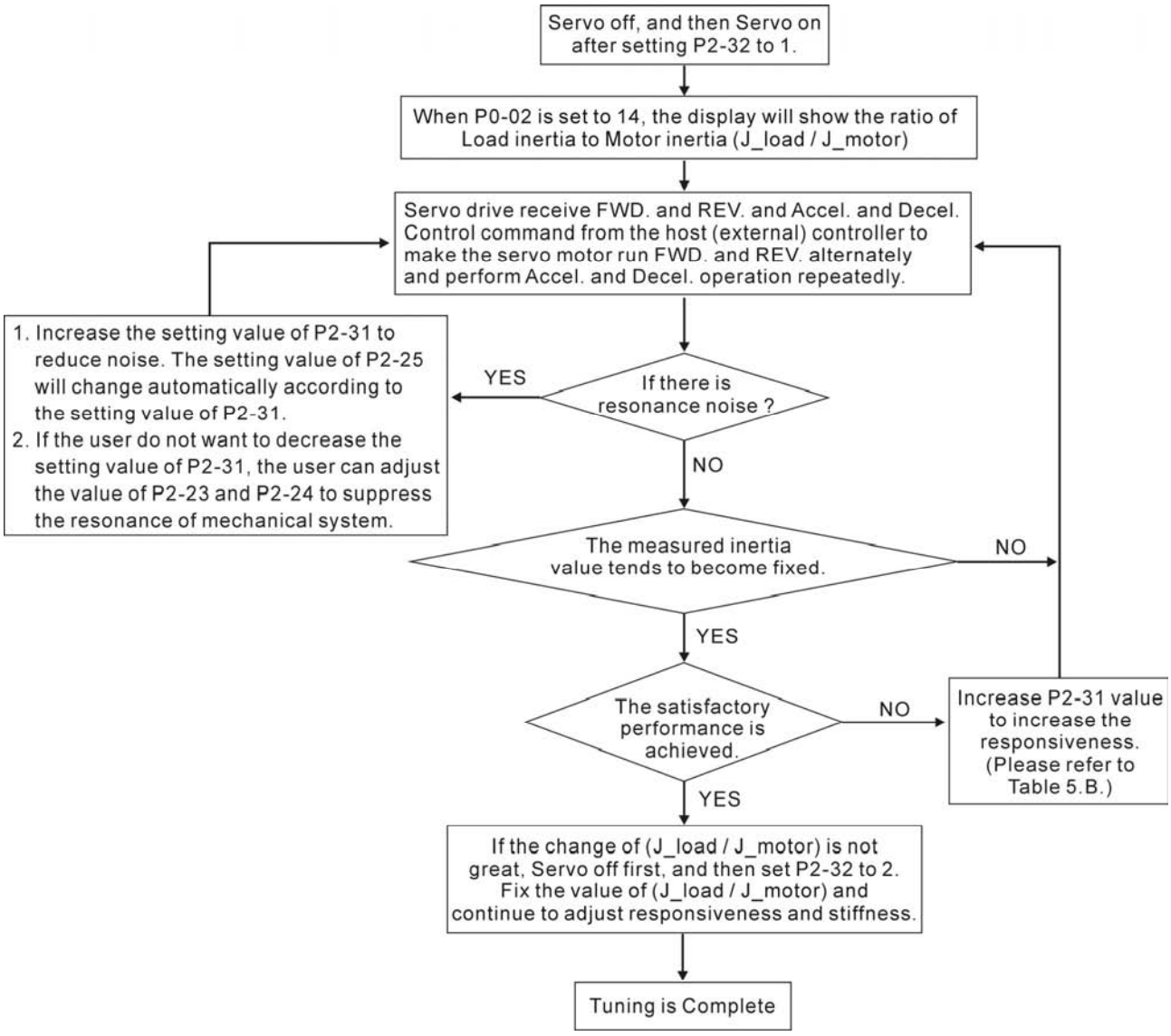


Table 5.B P2-31 Value in AutoMode(PDFF) and the setting of Speed Loop Responsiveness.

Setting Value of P2-31	Speed Loop Responsiveness	Setting Value of P2-31	Speed Loop Responsiveness
0	10 Hz	8	65 Hz
1	15 Hz	9	80 Hz
2	20 Hz	A	100 Hz
3	25 Hz	B	120 Hz
4	30 Hz	C	145 Hz
5	35 Hz	D	170 Hz
6	45 Hz	E	260 Hz
7	55 Hz	F	300 Hz

5.5.5 Limit of Load Inertia Estimation

1. The accel. / decel. time for reaching 2000RPM must be below 1 second. The rotation speed must be above 200RPM. The load inertia must be 100 multiple or less of motor inertia. The change of external force and the inertia ratio can not be too much.
2. The measured load inertia value will not be saved when the power is cut off. When re-apply the power to the drive every time, the setting value of P1-37 is equal to the initial value of load inertia value. But, when the Tuning Mode Settings of P2-32 is set from AutoMode #1 to AutoMode #2, the measured inertia value will be memorized in P1-37 automatically.

5.5.6 Relationship between Tuning Modes and Parameters

Tuning Mode	P2-32	AutoSet Parameter	User-defined Parameter	Gain Value
Manual Mode	0(Default setting)	None	P2-00 (Proportional Position Loop Gain) P2-04 (Proportional Speed Loop Gain) P2-06 (Speed Integral Compensation) P2-25 (Low-pass Filter Time Constant (Resonance Suppression)) P2-26 (External Anti-Interference Gain)	Fixed
AutoMode (PI) [Continuous]	11	P2-00 P2-04 P2-06 P2-25	P2-31 (Auto Stiffness and Responsiveness Level) P2-26 (External Anti-Interference Gain)	Continuous Adjusting
AutoMode (PI) [Fixed Inertia] (The inertia ratio is determined by P1-37)	12	P2-00 P2-04 P2-06 P2-25	P1-37 (Ratio of Load Inertia to Servo Motor Inertia [J_load / J_motor]) P2-31 (Auto Stiffness and Responsiveness Level) P2-26 (External Anti-Interference Gain)	Fixed
AutoMode (PDFF) [Continuous]	1	P2-00 P2-02 P2-04 P2-06 P2-25 P2-26	P2-31 (Auto Stiffness and Responsiveness Level)	Continuous Adjusting
AutoMode (PDFF) [Fixed Inertia] (The inertia ratio is determined by P1-37)	2	P2-00 P2-02 P2-04 P2-06 P2-25 P2-26	P1-37 (Ratio of Load Inertia to Servo Motor Inertia [J_load / J_motor]) P2-31 (Auto Stiffness and Responsiveness Level)	Fixed

5.5.7 Gain Adjustment in Manual Mode

The position and speed responsiveness selection is depending on and determined by the the control stiffness of machinery and conditions of applications. Generally, high reponsiveness is essential for the high frequency positioning control of mechanical facilities and the applications of high precision process system. However, the higher responsiveness may easily result in the resonance of machinery system. Therefore, for the applications of high responsiveness, the machinery system with control stiffness is needed to avoid the resonance. Especially when adjusting the responsiveness of unfamiliar machinery system, the users can gradually increase the gain setting value to improve responsiveness untill the resonance occurs, and then decrease the gain setting value. The relevant parameters and gain adjusting methods are described as follows:

- KPP, Parameter P2-00 Proportional Position Loop Gain

  This parameter is used to determine the responsiveness of position loop (position loop gain). It could be used to increase stiffness, expedite position loop response and reduce position error. When the setting value of KPP is higher, the response to the position command is quicker, the position error is less and the settling time is also shorter. However, if the setting value is over high, the machinery system may generate vibration or noise, or even overshoot during positioning. The position loop responsiveness is calculated as follows:

  $$\text{Position Loop Responsiveness (Hz)} = \frac{KPP}{2\pi}$$

- KVP, Parameter P2-04 Proportional Speed Loop Gain

  This parameter is used to determine the responsiveness of speed loop (speed loop gain). It could be used to expedite speed loop response. When the setting value of KVP is higher, the response to the speed command is quicker. However, if the setting value is over high, it may result in the resonance of machinery system. The responsiveness of speed loop must be higher than the 4~6 times of the responsiveness of position loop. If responsiveness of position loop is higher than the responsiveness of speed loop, the machinery system may generate vibration or noise, or even overshoot during positioning. The speed loop responsiveness is calculated as follows:

  $$\text{Speed Loop Responsiveness } fv\text{(Hz)} = \left(\frac{KVP}{2\pi}\right) \times \left[\frac{(1 + P1\text{-}37 / 10)}{(1 + (JL / JM))}\right] \times 2\pi$$

  JM: Motor inertia
  JL: Load inertia
  P1-37: 0.1 times

- KVI, Parameter P2-06 Speed Integral Compensation

  If the setting value of KVI is higher, the capability of decreasing the speed control deviation is better. However, if the setting value is over high, it may easily result in the vibration of machinery system. The recommended setting value is as follows:

  $$\text{KVI (Parameter P2-06)} \leq 1.5 \times \text{Speed Loop Responsiveness}$$

- NLP, Parameter P2-25 Low-pass Filter Time Constant (Resonance Suppression)

  When the value of (J_load / J_motor) is high, the responsiveness of speed loop may decrease. At this time, the users can increase the setting value of KVP (P2-04) to keep the responsiveness of speed loop. However, when increasing the setting value of KVP (P2-04), it may easily result in the vibration of machinery system. Please use this parameter to suppress or eliminate the noise of resonance. If the setting value of NLP is higher, the capability of improving the noise of resonance is better. However, if the setting value is over high, it may easily lead to the instability of speed loop and overshoot of machinery system.

  The recommended setting value is as follows:

  $$\text{NLP (Parameter P2-25)} \leq \frac{1000}{4 \times \text{Speed Loop Responsiveness (Hz)}}$$

- DST, Parameter P2-26 External Anti-Interference Gain

  This parameter is used to enhance the anti-interference capability and reduce the occurrence of overshoot. The default setting is 0 (Disabled). It is not recommended to use it in manual mode only when performing a few tuning in AutoMode (Please refer to P2-32).

- PFG, Parameter P2-02 Position Feed Forward Gain

  This parameter is used to reduce position error and shorten the positioning settling time. However, if the setting value is over high, it may easily lead to the overshoot of machinery system. If the value of electronic gear ratio (1-44 /1-45) is over than 10, the machinery system may also easily generate vibration or noise.

This page intentionally left blank.

efesotomasyon.com

Chapter 6 Control Modes of Operation

6.1 Control Modes of Operation

The Delta ASDA-B series Servo can be programmed to provide five single and three dual modes of operation. Their operation and description is listed in the following Table 6.A.

Mode		Code		Description
Single Mode	External Position Control	P	00	Position control for the servo motor is achieved via an external pulse command.
	Speed Control	S	02	Speed control for the servo motor can be achieved via parameters set within the controller or from an external analog -10 ~ +10 Vdc command. Control of the internal speed parameters is via the Digital Inputs (DI). (A maximum of three speeds can be stored internally).
	Internal Speed Control	Sz	04	Speed control for the servo motor is only achieved via parameters set within the controller. Control of the internal speed parameters is via the Digital Inputs (DI). (A maximum of three speeds can be stored internally).
	Torque Control	T	03	Torque control for the servo motor can be achieved via parameters set within the controller or from an external analog -10 ~ +10 Vdc command. Control of the internal torque parameters is via the Digital Inputs (DI). (A maximum of three torque levels can be stored internally).
	Internal Torque Control	Tz	05	Torque control for the servo motor is only achieved via parameters set within the controller. Control of the internal torque parameters is via the Digital Inputs (DI). (A maximum of three torque levels can be stored internally).
Dual Mode		S-P	06	Either S or P control mode can be selected via the Digital Inputs (DI). (Please refer to Chapter 7 for more detailed DI setting.)
		T-P	07	Either T or P control mode can be selected via the Digital Inputs (DI). (Please refer to Chapter 7 for more detailed DI setting.)
		S-T	10	Either S or T control mode can be selected via the Digital Inputs (DI). (Please refer to Chapter 7 for more detailed DI setting.)

Table 6.A

The steps of changing mode:

(1) Switching the servo drive to Servo Off status. Turning SON signal of Digit input to be off can complete this action.

(2) Using parameter P1-01. (Refer to chapter 7).

(3) After the setting is completed, cut the power off and restart the drive again.

The following sections describe the operation of each control mode, including control structure, command source and loop gain adjustment, etc.

6.2 Position Control Mode

The position control mode (P mode) is usually used for the applications requiring precision positioning, such as industry positioning machine, indexing table etc. Delta ASDA-B series servo drive supports one kind of command source in position control mode. That is external pulse train with direction which can control the rotation angle of servo motor. The max. input frequency for the external pulse command is 500Kpps (Line Driver) or 200Kpps (Open Collector) and it is equal to rotation speed of 3000rpm.

For the closed-loop positioning, speed control loop is the principal part and the auxiliary parameters are position loop gain and feed forward compensation. The users can also select two kinds of tuning mode (Manual/Auto modes) to perform gain adjustment. This Section 6.2 mainly describes the applicability of loop gain adjustment and feed forward compensation of Delta servo system.

6.2.1 Command Source of Position Control Mode

The command source of P mode is external pulse train input form terminals. There are three types of pulse input and each pulse type is with·logic type (positive (+), negative (-)). They all can be set in parameter P1-00. Please refer to the following:

Position pulse can be input from these terminals, PULSE (22), /PULSE (21) and SIGN (20), /SIGN (19). It can be an open-collector circuit or line driver circuit. For the detail wiring, please refer to section 3.6.1.

Relevant parameters:

P1 - 00▲	PTT	External Pulse Input Type	Communication Addr.: 0100H

Default: 2

Applicable Control Mode: P

Unit: N/A

Range: 0 ~ 142

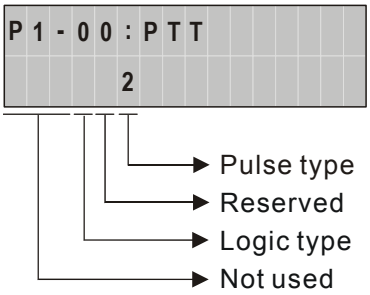
Related Section:

Section 3.3.3, Section 3.6.1,

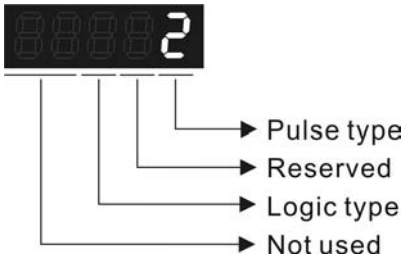
Section 6.2.1

Settings:

ASD-PU-01A



ASD-PU-01B

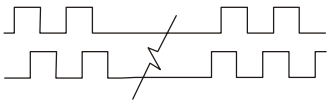
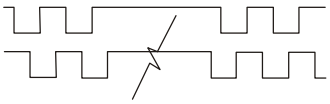
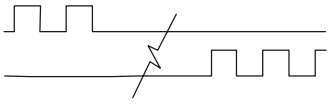
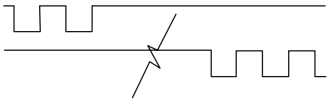
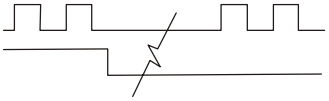
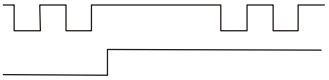


- Pulse type
  0: AB phase pulse (4x)
  1: CW + CCW pulse
  2: Pulse + Direction

Other setting: Reversed

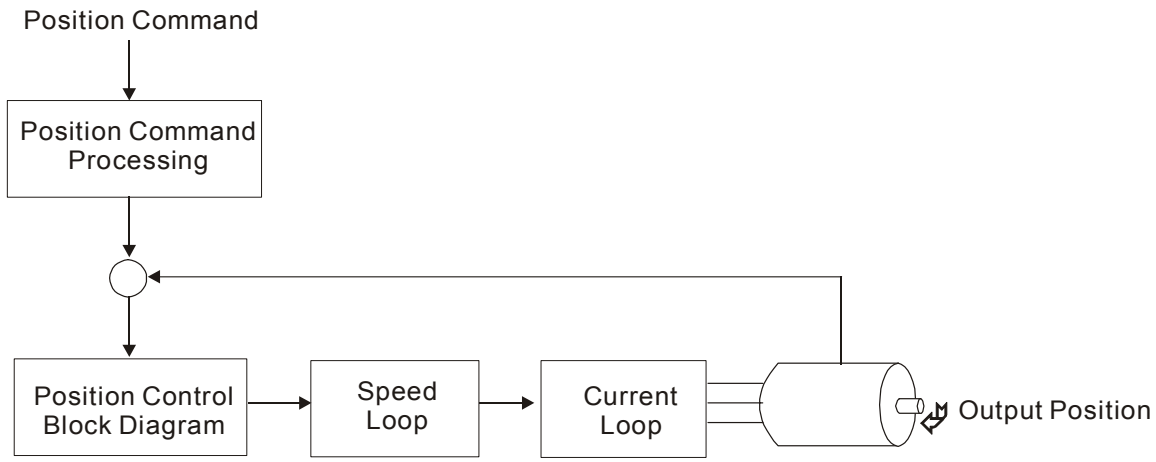
Input pulse interface	Max. input pulse frequency
Line driver	500kpps
Open collector	200kpps

- Logic type

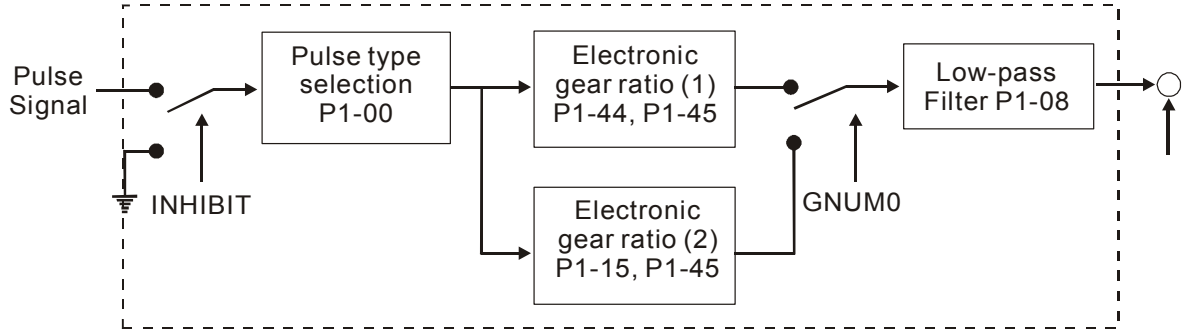
Pulse Type	0=Positive Logic		1=Negative Logic	
	Forward	Reverse	Forward	Reverse
AB phase pulse				
CW + CCW pulse				
Pulse + Direction				

6.2.2 Structure of Position Control Mode

Basic Structure:

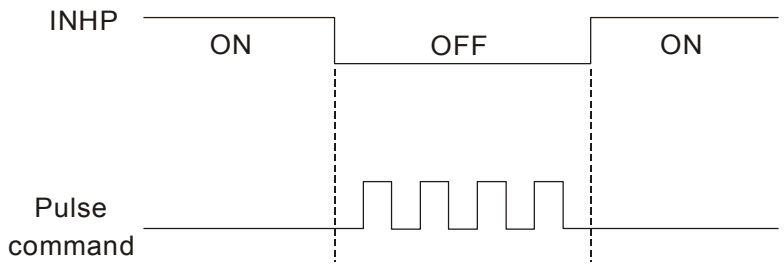


In order to pursue the goal of perfection in position control, the pulse signal should be modified through position command processing and the structure is shown as the figure below:



6.2.3 Pulse Inhibit Input Function (INHP)

INHP is activated via digital inputs (Please refer to parameter P2-10 ~ P2-15 and DI INHP(07) in Table 7.A).When the drive is in position mode, if INHP is activated, the external pulse input command is not valid and the motor will stop.



6.2.4 Electronic Gear Ratio

Relevant parameters:

P1 - 15▲	GR4	Electronic Gear Ratio (2nd Numerator) (N2)	Communication Addr.: 010FH

Default: 1

Applicable Control Mode: P

Unit: pulse

Range: 1 ~ 32767

Settings:

Related Section:

Section 6.2.4, P1-44, P1-45

DI GNUM0(11) in Table 7.A

The electronic gear numerator value can be set via external DI signal (refer to Table 7.A).

DI Name	DI Status	Selected Electronic Gear
GNUM0	Not select (Note 1)	P1-44, P1-45
	0	P1-44, P1-45
	1	P1-44, P1-45

NOTE

1) DI signal can be selected by parameter P2-10 to P2-15 and Table 7.A. If uses only need to use one group of electronic gear, it allows users not to select GNUM0.

P1 - 44▲	GR1	Electronic Gear Ratio (1st Numerator) (N1)	Communication Addr.: 012CH

Default: 1

Applicable Control Mode: P

Unit: pulse

Range: 1 ~ 32767

Settings:

Related Section:

Section 6.2.4, P1-15, P1-45

DI GNUM0(11) in Table 7.A

The electronic gear numerator value can be set via external DI signal (refer to Table 7.A).

DI Name	DI Status	Selected Electronic Gear
GNUM0	Not select (Note 1)	P1-44, P1-45
	0	P1-44, P1-45
	1	P1-44, P1-45

NOTE

1) DI signal can be selected by parameter P2-10 to P2-15 and Table 7.A. If uses only need to use one group of electronic gear, it allows users not to select GNUM0.

P1 - 45▲	GR2	Electronic Gear Ratio (Denominator)	Communication Addr.: 012DH

Default: 1

Applicable Control Mode: P

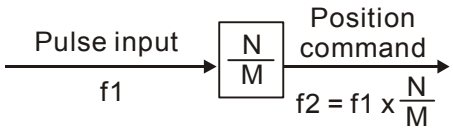
Unit: pulse

Range: 1 ~ 32767

Settings:

Please set electronic gear ratio when the servo drive is Off (Servo Off). As the wrong setting can cause motor to run chaotically (out of control) and it may lead to personnel injury, therefore, ensure to observe the following rule when setting P1-44, P1-45.

The electronic gear ratio settings:



f1: Pulse input f2: Position command

N: Numerator, the setting value of P1-15 or P1-44

M: Denominator, the setting value of P1-45

The electronic gear ratio setting range must be within: 1/50<N/M<200.

In terms of the servo drive which the firmware version is V1.018 or above, the electronic gear ratio can be set when the servo drive is On (Servo On).

Related Section:

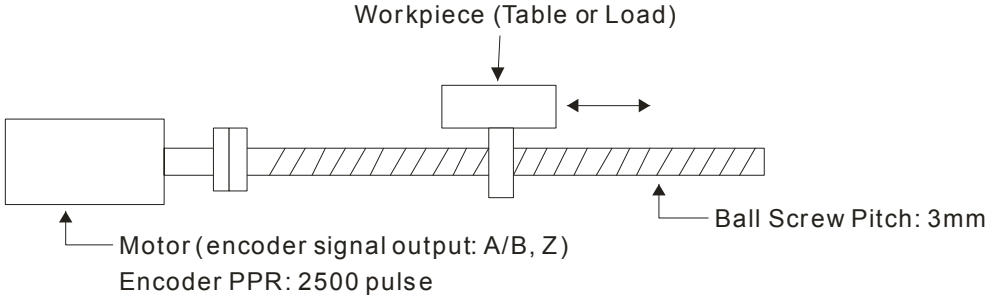
Section 6.2.4, P1-15, P1-44

DI GNUM0(11) in Table 7.A

The electronic gear function provides easy travel distance ratio change. However, the over high electronic gear ratio will command the motor to move not smoothly. At this time, the users can use low-pass filter parameter to improve this kind of situation. For example, assume that the electronic gear ratio is equal to 1 and the encoder pulse per revolution is 10000ppr, if the electronic gear ratio is changed to 0.5, then the motor will rotate one pulse when the command from external controller is two pulses.

For example, after the proper electronic gear ratio is set, the reference travel distance is 1 μm/pulse, the machinery will become easier to be used.

Travel distance per pulse = T



	Electronic Gear Ratio	Corresponding travel distance per pulse
When the electronic gear ratio is not used	$=\frac{1}{1}$	$=\frac{3x1000}{4x2500}=\frac{3000}{10000}$ μm
When the electronic gear ratio is not used	$=\frac{10000}{3000}$	= 1 μm

Table 6.B

6.2.5 Low-pass Filter

Relevant parameters:

P1 - 08	PFLT	Smooth Constant of Position Command (Low-pass Filter)	Communication Addr.: 0108H

Default: 0

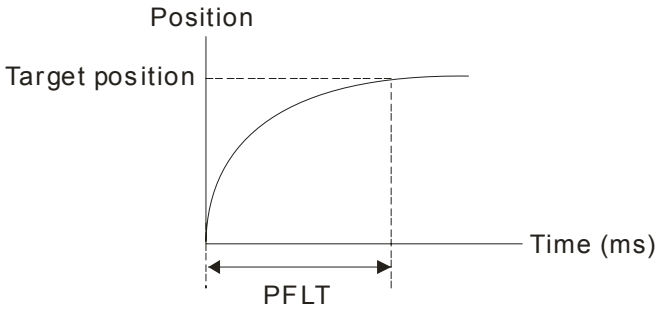
Applicable Control Mode: P

Unit: 10ms

Range: 0 ~ 1000 (0: Disabled)

Related Section:

Section 6.2.5



6.2.6 Position Loop Gain Adjustment

Before performing position control (setting position control block diagram), the users should complete the speed control setting by using Manual mode (parameter P-32) since the position loop contains speed loop. Then, adjust the Proportional Position Loop Gain, KPP (parameter P2-00) and Position Feed Forward Gain, PFG (parameter P2-02). Or use Auto mode to adjust the gain of speed and position control block diagram automatically.

1) Proportional Position Loop Gain: To increase this gain can enhance the position loop responsiveness.
2) Position Feed Forward Gain: To increase this gain can reduce the position track error during operation.

The position loop responsiveness cannot exceed the speed loop responsiveness, and it is recommended that the speed loop responsiveness should be at least four times faster than the position loop responsiveness. This also means that the setting value of Proportional Speed Loop Gain, KVP should be at least four times faster than Proportional Position Loop Gain, KPP.

The equation is shown as follows:

$fp \leq \frac{fv}{4}$, fv : Speed Loop Responsiveness (Hz), fp : Position Loop Responsiveness (Hz)

KPP = 2 × π × fp.

For example, the desired position loop responsiveness is equal to 20 Hz.

Then, KPP = 2 × π × 20= 125 rad/s.

Relevant parameters:

P2 - 00	KPP	Proportional Position Loop Gain	Communication Addr.: 0200H

Default: 50

Applicable Control Mode: P

Unit: rad/s

Range: 0 ~ 1023

Related Section:

Section 6.2.6, P2-27

Settings:

This parameter is used to set the position loop gain. It can increase stiffness, expedite position loop response and reduce position error. However, if the setting value is over high, it may generate vibration or noise. In AutoMode, the value of this parameter will be changed in accordance with the setting value of parameter P2-31 automatically (Please refer Table 6.D & 6.E in Chapter 6).

P2 - 01	PPR	Position Loop Gain Switching Rate	Communication Addr.: 0201H

Default: 100

Applicable Control Mode: P

Unit: %

Range: 10 ~ 500

Related Section:

Section 6.2.6, P2-27, P2-29

Settings:

This parameter is used to set the position gain switching rate when the gain switching condition is satisfied. Please refer to P2-27 for gain switching control selection settings and refer to P2-29 for gain switching condition settings.

P2 - 02	PFG	Position Feed Forward Gain	Communication Addr.: 0202H

Default: 0

Applicable Control Mode: P

Unit: %

Range: 0 ~ 100

Related Section:

Section 6.2.6, P2-03

This parameter is used to set the feed forward gain when executing position control command.

When using position smooth command, increase gain can improve position track deviation. When not using position smooth command, decrease gain can improve the resonance condition

of mechanical system. In PDFF control AutoMode, the value of this parameter will be changed in accordance with the setting value of parameter P2-31 automatically (Please refer Table 6.D & 6.E in Chapter 6).

P2 - 03	PFF	Smooth Constant of Position Feed Forward Gain	Communication Addr.: 0203H

Default: 5

Related Section:

Applicable Control Mode: P

Section 6.2.6, P2-02

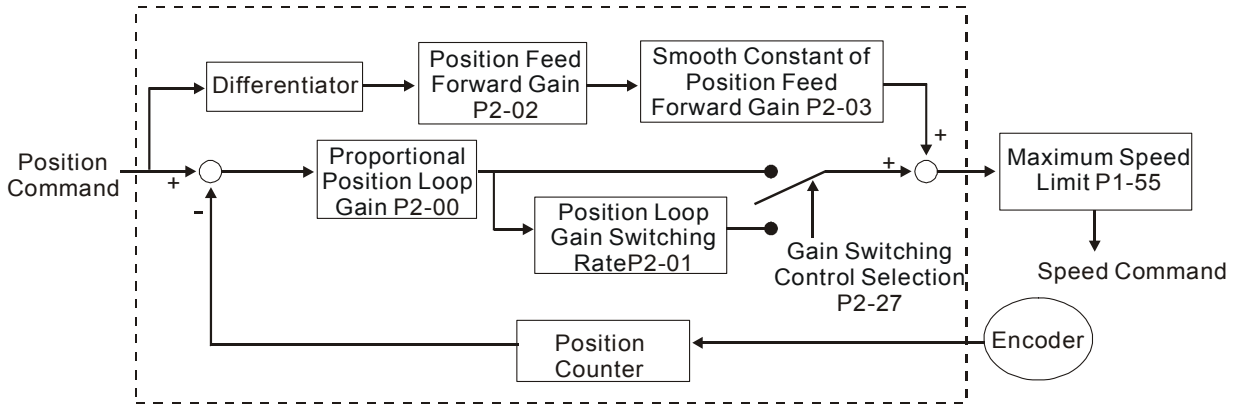
Unit: ms

Range: 2 ~ 100

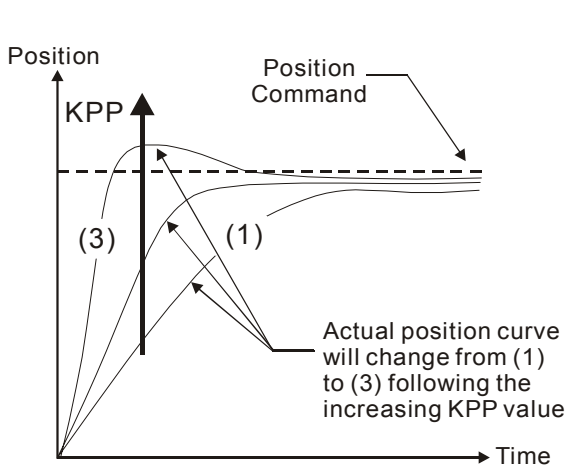
Settings:

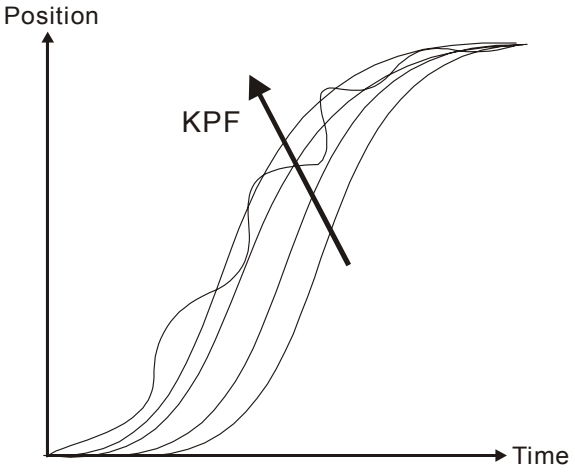
When using position smooth command, increase gain can improve position track deviation. When not using position smooth command, decrease gain can improve the resonance condition of mechanical system.

Position Control Block Diagram



When the value of Proportional Position Loop Gain, KPP is too great, the position loop responsiveness will be increased and it will result in small phase margin. If this happens, the rotor of motor will oscillate. At this time, the users have to decrease the value of KPP until the rotor of motor stop oscillating. When there is an external torque command interrupted, over low KPP value will let the motor cannot overcome the external strength and fail to meet the requirement of reasonable position track error demand. Adjust feed forward gain, KPF (P2-02) to efficiently reduce the dynamic position track error.





6.3 Speed Control Mode

The speed control mode (S or Sz) is usually used on the applications of precision speed control, such as CNC machine, etc. ASDA-B series servo drive supports two kinds of command sources in speed control mode. One is external analog signal and the other is internal parameter. The external analog signal is from external voltage input and it can control the speed of servo motor. There are two usage of internal parameter, one is set different speed command in three speed control parameters before operation and then using SP0 and SP1 of CN1 DI signal perform switching. The other usage is using serial communication to change the setting value of parameter.

Beside, in order to make the speed command switch more smoothly, ASDA-B series servo drive also provides complete S-curve profile for speed control mode. For the closed-loop speed control, ASDA-B series servo drive provides gain adjustment function and an integrated PI or PDFF controller. Besides, two modes of tuning technology (Manual/Auto) are also provided for the users to select (parameter P2-32).

6.3.1 Command Source of Speed Control Mode

Speed command Sources:

1) External analog signal: External analog voltage input, -10V to +10V
2) Internal parameter: P1-09 to P1-11

Speed Command	CN1 DI signal		Command Source			Content	Range
	SPD1	SPD0					
S1	0	0	Mode	S	External analog signal	Voltage between V-REF-GND	+/-10 V
				Sz	N/A	Speed command is 0	0
S2	0	1	Internal parameter			P1-09	+/-5000 rpm
S3	1	0				P1-10	+/-5000 rpm
S4	1	1				P1-11	+/-5000 rpm

Table 6.C

- State of SPD0~1: 0: indicates OFF (Normally Open); 1: indicates ON (Normally Closed)
- When SPD0 and SPD1 are both = 0 (OFF), if the control mode of operation is Sz, then the speed command is 0. Therefore, if the users do not use analog voltage as speed command, the users can choose Sz mode and avoid the zero point drift problem(Note1) of analog voltage signal. If the speed control mode is S mode, then the command is the analog voltage between V-REF and GND. The setting range of the input voltage is from -10V to +10V and the corresponding motor speed is adjustable (Please see parameter P1-40).
- When at least one of SPD0 and SPD1 is not 0 (OFF), the speed command is internal parameter (P1-09 to P1-11). The command is valid (enabled) after either SPD0 or SPD1 is changed.

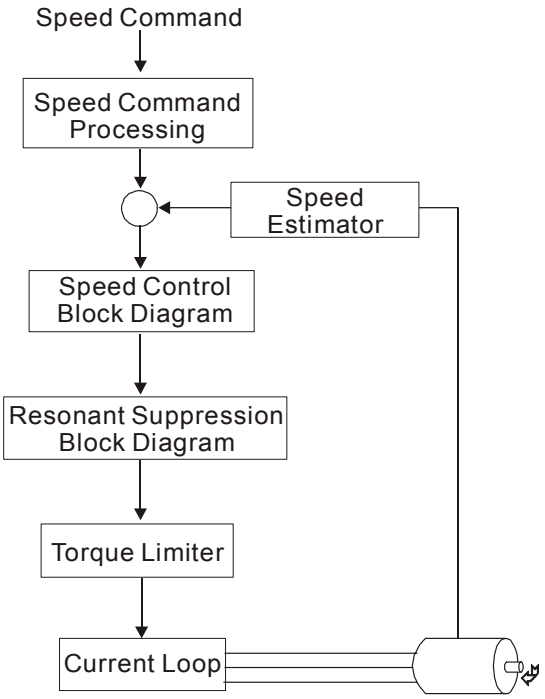
The speed command that is described in this section not only can be taken as speed command in speed control mode (S or Sz mode) but also can be the speed limit input command in torque control mode (T or Tz mode).

NOTE

1) In speed control mode, if the users want to adjust analog speed input offset value, please refer to parameter 4-22 for the operation.

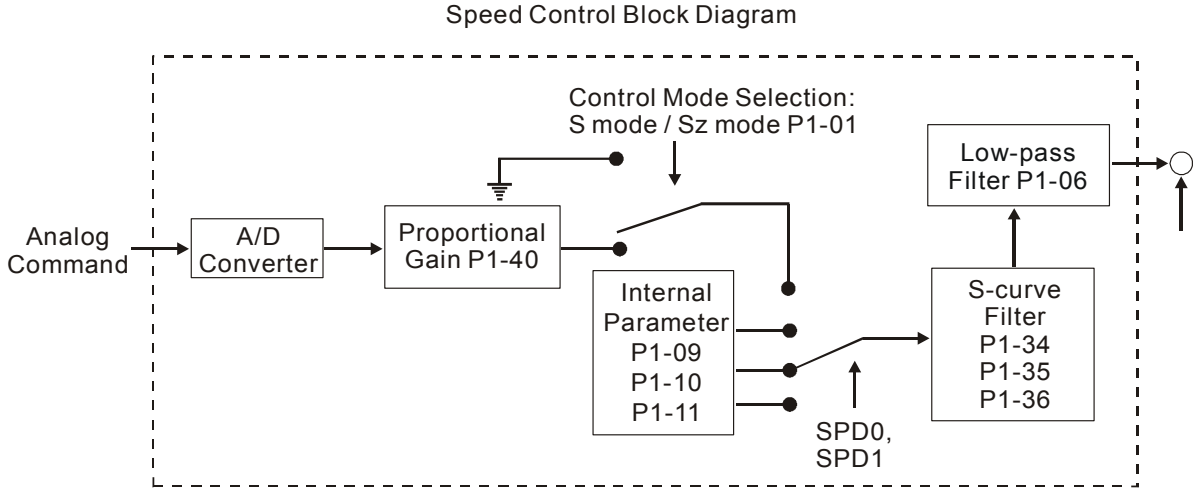
6.3.2 Structure of Speed Control Mode

Basic Structure:



In the figure above, the speed command processing is used to select the command source of speed control according to chapter 6.3.1, including proportional gain (P1-40) and S-curve filter smoothing strategy of speed control. The speed control block diagram is used to manage the gain parameters of the servo drive and calculate the current input provided to motor instantaneously. The resonance suppression block diagram is used to suppress the resonance of mechanical system.

The function and structure of speed command processing is shown as the figure below:

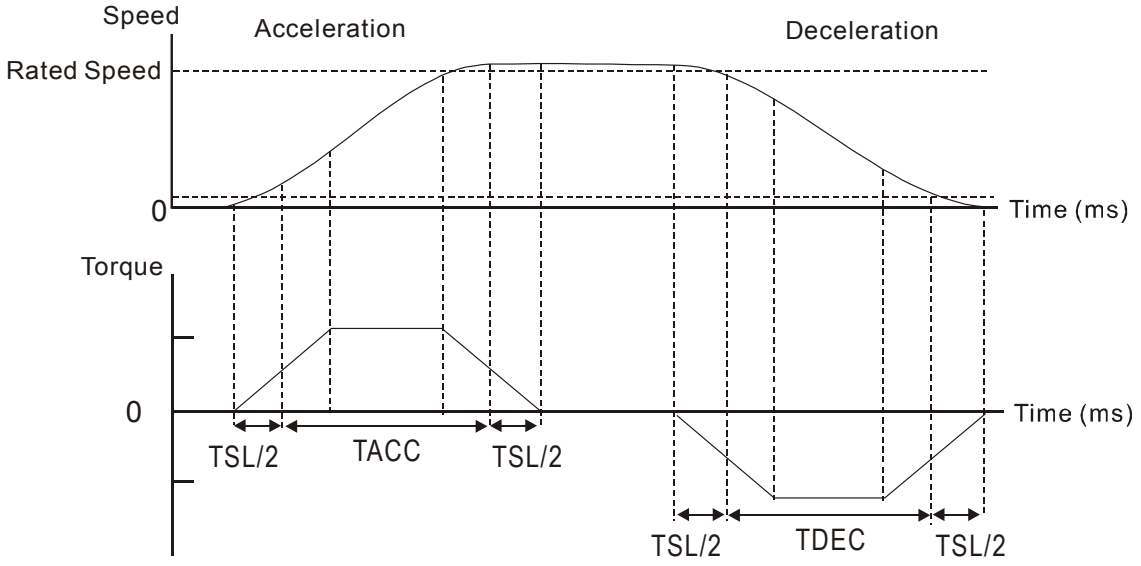


The command source is selected according to the state of SPD0, SPD1 and parameter P1-01 (S or Sz). Whenever the command signal needs to be more smoothly, we recommend the users to use S-curve and low-pass filter.

6.3.3 Smoothing Strategy of Speed Control Mode

S-curve Filter

The S-curve filter is a speed smoothing command which provides 3 steps accel / decel S-curve to smooth the speed command change of the motor during acceleration and deceleration. Using S-curve filter can let the servo motor run more smoothly in response to a sudden speed command change. Since the speed and acceleration curve are both continuous, in order to avoid the mechanical resonance and noise may occur due to a sudden speed command (differentiation of acceleration), using S-curve filter not only can improve the performance when servo motor accelerate or decelerate but also can make the motor run more smoothly. S-curve filter parameters include P1-34 Acceleration Time (TACC), P1-35 Deceleration Time (TDEC) and Accel /Decel S-curve (TSL), and the users can use these three parameters to improve the motor performance during acceleration, deceleration and operation. ASDA-B series servo drives also support the time calculation of completing speed command. T (ms) is the operation (running) time. S (rpm) is absolute speed command, i.e. the absolute value (the result) after starting speed subtracts the final speed.



S-curve characteristics and Time relationship

Relevant parameters:

P1 - 34	TACC	Acceleration Time	Communication Addr.: 0122H

Default: 200
Applicable Control Mode: S
Unit: ms
Range: 1 ~ 20000

Related Section:
P1-35, P1-36, Section 6.3.3

Settings:

It is used to determine the acceleration time to accelerate from 0 to its rated rotation speed.
(When P1-36 is set to 0: Accel/Decel function is disabled, i.e. P1-34, P1-35 is disabled)

P1 - 35	TDEC	Deceleration Time	Communication Addr.: 0123H

Default: 200

Applicable Control Mode: S

Unit: ms

Range: 1 ~ 20000

Related Section:

P1-34, P1-36, Section 6.3.3

Settings:

It is used to determine the deceleration time to decelerate from its rated rotation speed to 0.
(When P1-36 is set to 0: Accel/Decel function is disabled, i.e. P1-34, P1-35 is disabled)

P1 - 36	TSL	Accel /Decel S-curve	Communication Addr.: 0124H

Default: 0

Applicable Control Mode: S

Unit: ms

Range: 0 ~ 10000 (0: Disabled)

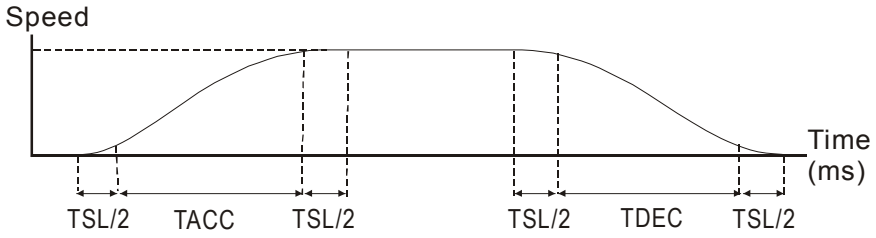
Related Section:

P1-34, P1-35, Section 6.3.3

Settings:

This parameter is used to make the motor run more smoothly when startup and windup.

Using this parameter can improve the motor running stability.



TSL: P1-36, Accel /Decel S-curve

TACC: P1-34, Acceleration time

TDEC: P1-35, Deceleration time

Total acceleration time = TACC + TSL

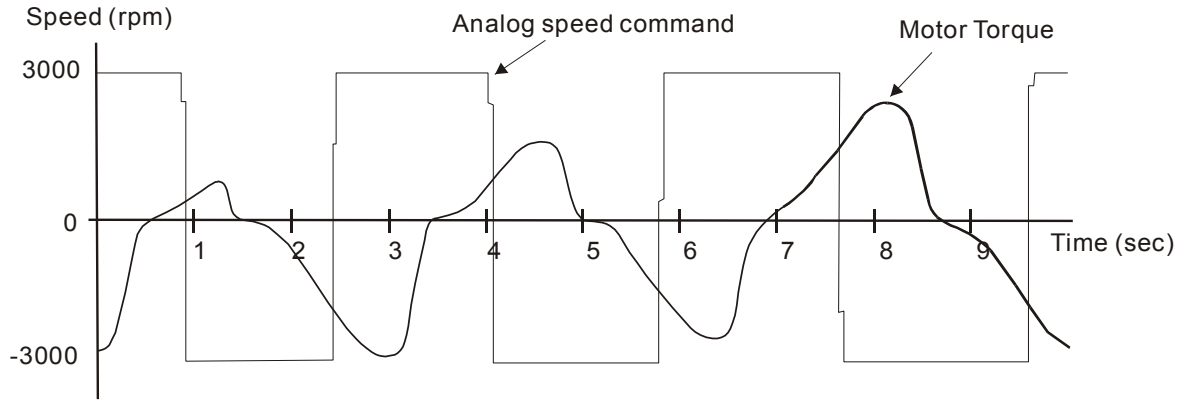
Total deceleration time = TDEC + TSL

NOTE

1) If the setting value of parameter P1-36 is set to 0, it indicates Accel / Decel S-curve function is disabled and the command is just By-Pass.

Analog Speed Command S-curve Filter

ASDA-B series servo drives also provide Analog Speed Command S-curve Filter for the smoothing in response to a sudden analog input signal.



The analog speed command S-curve filter is for the smoothing of analog input signal and its function is the same as the S-curve filter. The speed and acceleration curve of analog speed command S-curve filter are both continuous. The above figure shows the curve of analog speed command S-curve filter and the users can see the ramp of speed command is different during acceleration and deceleration. Also, the users can see the difference of input command tracking and can adjust time setting by using parameter P1-34, P1-35, P1-36 to improve the actual motor performance according to actual condition.

Analog Speed Command Low-pass Filter

Analog Speed Command Low-pass Filter is used to eliminate high frequency response and electrical interference from an analog speed command and it is also with smoothing function.

Relevant parameters:

P1 - 06	SFLT	Accel / Decel Smooth Constant of Analog Speed Command (Low-pass Filter)	Communication Addr.: 0106H

Default: 0

Applicable Control Mode: S

Unit: ms

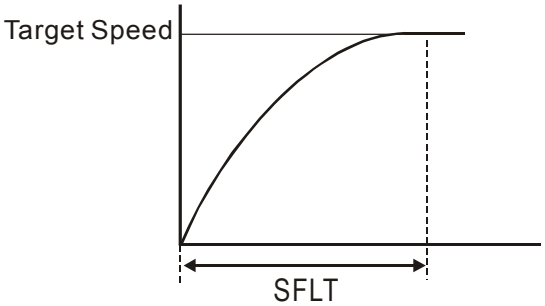
Range: 0 ~ 1000 (0: Disabled)

Related Section:

Section 6.3.3

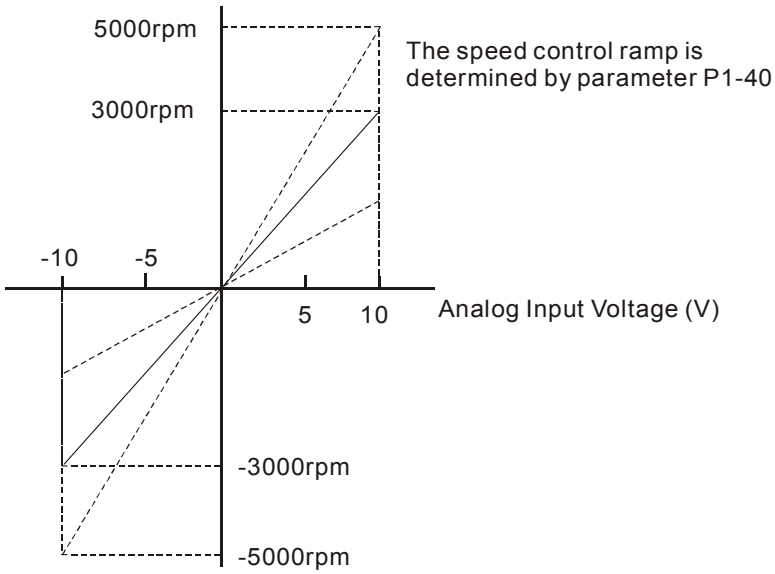
NOTE

1) If the setting value of parameter P1-06 is set to 0, it indicates the function of this parameter is disabled and the command is just By-Pass.



6.3.4 Analog Speed Input Scaling

The analog voltage between **V_REF and GND** determines the motor speed command. Using with parameter P1-40 (Max. Analog Speed Command) can adjust the speed control ramp and its range.



Relevant parameters:

P1 - 40▲	VCM	Max. Analog Speed Command or Limit	Communication Addr.: 0128H

Default: rated speed

Related Section:

Applicable Control Mode: S/T

Section 6.3.4, P1-55

Unit: rpm

Range: 0 ~ 5000

Settings:

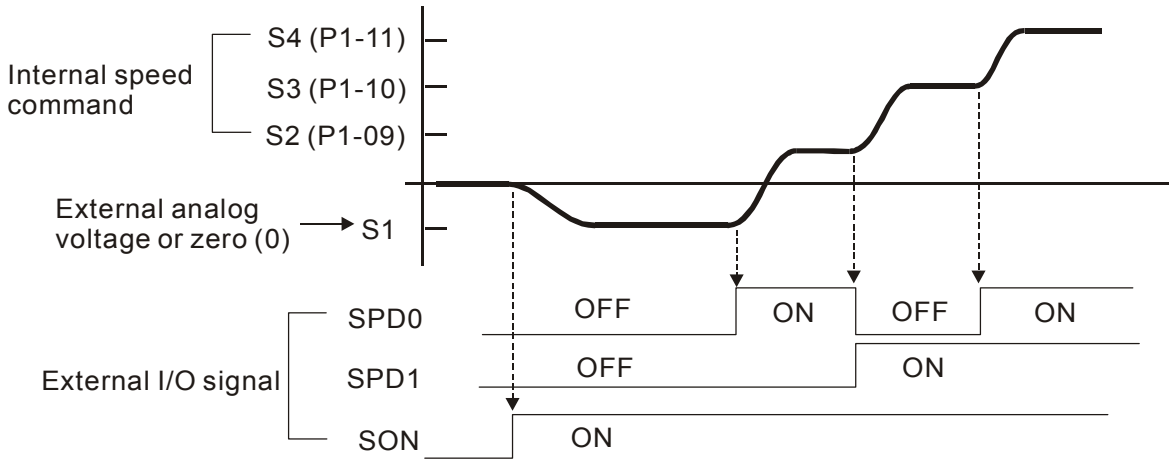
In **Speed mode**, this parameter is used to set the speed at the maximum input voltage (10V) of the analog speed command.

In **Torque mode**, this parameter is used to set the speed at the maximum input voltage (10V) of the analog speed limit.

For example, in speed mode, if P1-40 is set to 3000 and the input voltage is 10V, it indicates that the speed command is 3000rpm. If P1-40 is set to 3000, but the input voltage is changed to 5V, then the speed command is changed to 1500rpm.

Speed command / limit = Input voltage x setting/10

6.3.5 Timing Chart of Speed Control Mode

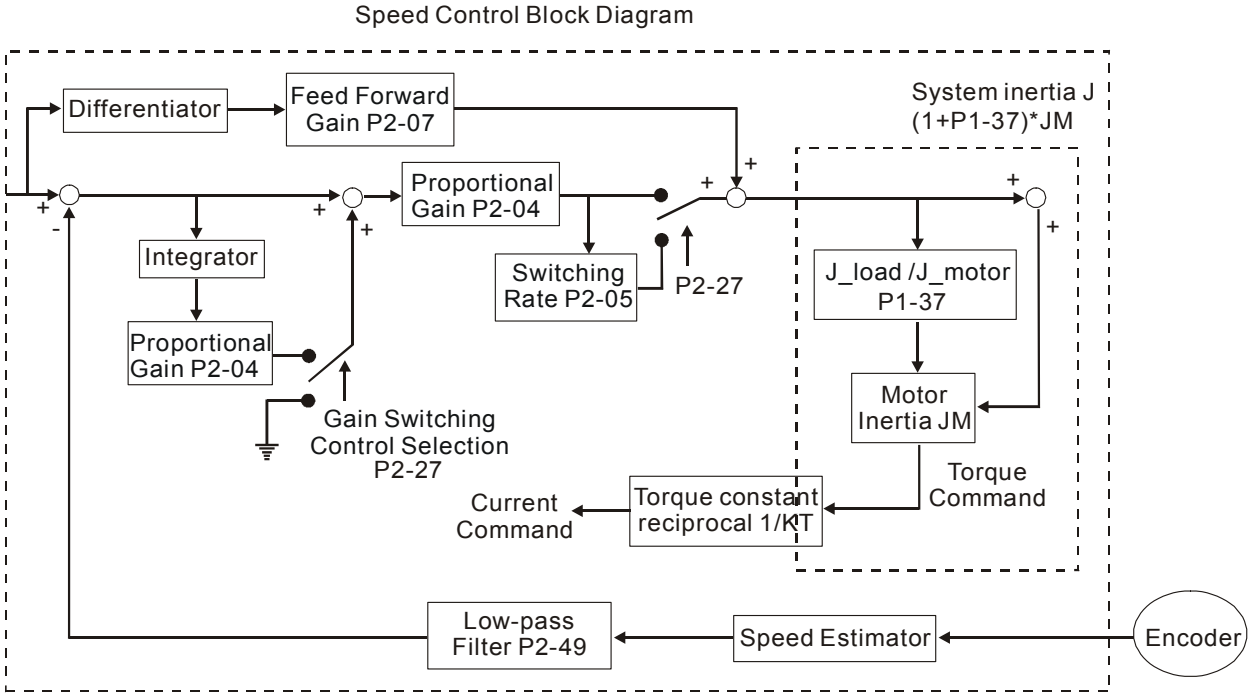


NOTE

1) OFF indicates normally open and ON indicates normally closed.
2) When speed control mode is Sz, the speed command S1=0; when speed control mode is S, the speed command S1 is external analog voltage input (Please refer to P1-01).
3) After Servo ON, the users can select command according to the state of SPD0~1.

6.3.6 Speed Loop Gain Adjustment

The function and structure of **speed control mode** is shown as the figure shown below:



There are two turning modes of gain adjustment: Manual and Auto modes. The gain of ASDA-B series servo drives can be adjusted by using any one of two tuning modes.

- **Manual Mode:**

  User-defined loop gain adjustment. When using this mode, all auto and auxiliary function will be disabled.

- **Auto Mode:**

  Continuous adjustment of loop gains according to measured inertia automatically.

In Auto mode, if the users change the setting value of P2-31, the setting value of the parameters listed in the Table 6.4 and 6.5 will also be changed.

PI Structure (P2-32)

Stiffness Setting P2-31	Speed Loop Responsive-ness (Hz)	Proportional Position Loop Gain P2-00	Proportional Speed Loop Gain P2-04	Speed Integral Compensation P2-06	Low-pass Filter Time Constant (Resonance Suppression) P2-25	External Anti-Interference Gain P2-26
0	10	10	62	10	125	0
1	5	15	94	15	83	0
2	20	20	125	20	62	0
3	25	25	157	25	50	0
4	30	30	188	30	41	0
5	35	35	219	35	35	0
6	45	45	282	45	27	0
7	55	55	345	55	22	0
8	65	65	408	65	19	0
9	80	80	502	80	15	0
A	100	100	628	100	12	0
B	120	120	753	120	10	0
C	145	145	911	145	8	0
D	170	170	1068	170	7	0
E	205	205	1288	205	6	0
F	250	250	1570	250	5	0

Table 6.D

PDFF Structure (P2-32)

Stiffness Setting P2-31	Speed Loop Responsive-ness (Hz)	Proportional Position Loop Gain P2-00	Position Feed Forward Gain (%) P2-02	Proportional Speed Loop Gain P2-04	Speed Integral Compensation P2-06	Low-pass Filter Time Constant (Resonance Suppression) P2-25	External Anti-Interference Gain P2-26
0	10	15	50	62	10	166	10
1	5	23	50	94	15	111	15
2	20	31	50	125	20	83	20
3	25	39	50	157	25	66	25
4	30	47	50	188	30	55	30
5	35	54	50	219	35	47	35
6	45	70	50	282	45	37	45
7	55	86	50	345	55	30	55
8	65	102	50	408	65	25	65
9	80	125	50	502	80	20	80
A	100	157	50	628	100	16	100
B	120	188	50	753	120	13	120
C	145	227	50	911	145	11	145
D	170	267	50	1068	170	9	170
E	205	322	50	1288	205	8	205
F	250	392	50	1570	250	6	250

Table 6.E

The mode of gain adjustment can be selected by parameter P2-32:

P2 - 32▲	AUT2	Tuning Mode Selection	Communication Addr.: 0220H

Default: 0

Applicable Control Mode: P/S/T

Unit: N/A

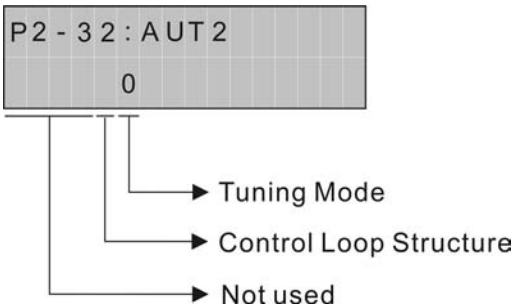
Range: 0 ~ 12

Settings:

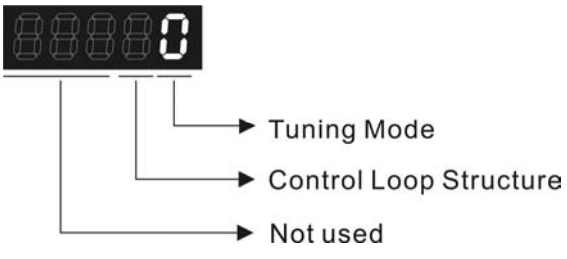
Related Section:

Section 6.3.6, P2-31

ASD-PU-01A



ASD-PU-01B



- Tuning Mode Settings:

  0: Manual mode

  1: AutoMode (Continuous adjustment)

  The ratio of Load Inertia to servo motor inertia can be continuously adjusted.

  The level of stiffness and responsiveness are adjusted by parameter P2-31.

  2: AutoMode (The ratio of Load Inertia to servo motor inertia is fixed)

  The ratio of Load Inertia to servo motor inertia is set by parameter P1-37.

  The level of stiffness and responsiveness are adjusted by parameter P2-31.

- Control Loop Structure Settings:

  0: PDFF Control. PDFF : Pseudo-Derivative Feedback and Feedforward

  1: PI Control. PI : Proportional - Integral control

Explanation of Auto-tuning:

1. When switching mode #1 to #2 or #0, the system will save the measured load inertia value automatically and memorized in P1-37 and related gain parameters.
2. In AutoMode #1, the system will save the measured load inertia value every 30 minutes automatically and memorized in P1-37.
3. In AutoMode #2, if the setting value of P2-31 changes, the related gain parameters will also change. However, the setting value of P1-37 will retain its value.
4. When switching mode #2 to #0, it indicates the setting of P1-37 and all settings of related gain parameters will be returned to original setting value in #0 manual mode.
5. No matter in Manual mode #0 or in AutoMode #2, the users should enter the appropriate load inertia value in P1-37.
6. If the users use the servo dynamic auto-tuning function of ASDA-B software (Tools → Servo Tuning → Dynamic Auto tuning), it will save the measured load inertia value and memorized in P1-37 and related gain parameters.

Manual Mode

When·Tuning Mode Settings of P2-32 is set to 0, the users can define the proportional speed loop gain (P2-04), speed integral gain (P2-06) feed forward gain (P2-07) and ratio of load inertia to servo motor Inertia (1-37). Please refer to the following description:

- Proportional gain: Adjust this gain can increase the position loop responsiveness.
- Integral gain: Adjust this gain can enhance the low-frequency stiffness of speed loop and eliminate the steady error. Also, reduce the value of phase margin. Over high integral gain will result in the unstable servo system.
- Feed forward gain: Adjust this gain can decrease the phase delay error

NOTE

1) Before adjusting the gain manually, ensure to set P1-37 in advance. If the setting value of P1-37 is quite different than the actual load inertia ratio, the responsiveness that represented by P2-04 has no meaning.

Relevant parameters:

P1 - 37	GDR	Ratio of Load Inertia to Servo Motor Inertia	Communication Addr.: 0125H

Default: 10

Applicable Control Mode: P/S/T

Unit: 0.1times

Range: 0 ~ 2000

Settings:

Ratio of load inertia to servo motor inertia: (J_load /J_motor)

Related Section:

P2-31, P2-32, Section 6.3.6

P2 - 04	KVP	Proportional Speed Loop Gain	Communication Addr.: 0204H

Default: 300

Applicable Control Mode: P/S

Unit: rad/s

Range: 0 ~ 4095

Settings:

This parameter is used to set the speed loop gain. When the value of proportional speed loop gain is increased, it can expedite speed loop response. However, if the setting value is over high, it may generate vibration or noise. In AutoMode, the value of this parameter will be changed in accordance with the setting value of parameter P2-31 automatically (Please refer Table 6.D & 6.E in Chapter 6).

Speed Loop Responsiveness $f_V = (\frac{KVP}{2\pi}) X [\frac{(1+P1\text{-}37/10)}{(1+JL/JM)}]$ Hz

JM: Motor inertia
JL: Load inertia
P1-37: 0.1 times

When the setting value of P1-37(no matter it is a measured value or set by the users) is equal to the actual ratio of load inertia to servo motor inertia, then the actual responsiveness will be equal to: $f_V = \frac{KVP}{2\pi}$ Hz

For example, assume that the desired speed loop responsiveness is 60 Hz =>

KVP (P2-04, Proportional Speed Loop Gain) = $2 \times \pi \times 60$ = 376 rad/s

Related Section:

Section 6.3.6, P2-27

P2 - 06	KVI	Speed Integral Compensation	Communication Addr.: 0206H

Default: 50

Applicable Control Mode: P/S

Unit: rad/s

Range: 0 ~ 1023

Settings:

This parameter is used to set the integral time of speed loop. When the value of speed integral compensation is increased, it can improve the speed response ability and decrease the speed control deviation. However, if the setting value is over high, it may generate vibration or noise. In

Related Section:

Section 6.3.6

AutoMode, the value of this parameter will be changed in accordance with the setting value of parameter P2-31 automatically (Please refer Table 6.D & 6.E in Chapter 6).

Time constant of speed integral compensation: (1000/KVI) ms

P2 - 07	SFG	Speed Feed Forward Gain	Communication Addr.: 0207H

Default: 0

Related Section:

Applicable Control Mode: S

Section 6.3.6

Unit: %

Range: 0 ~ 100

Settings:

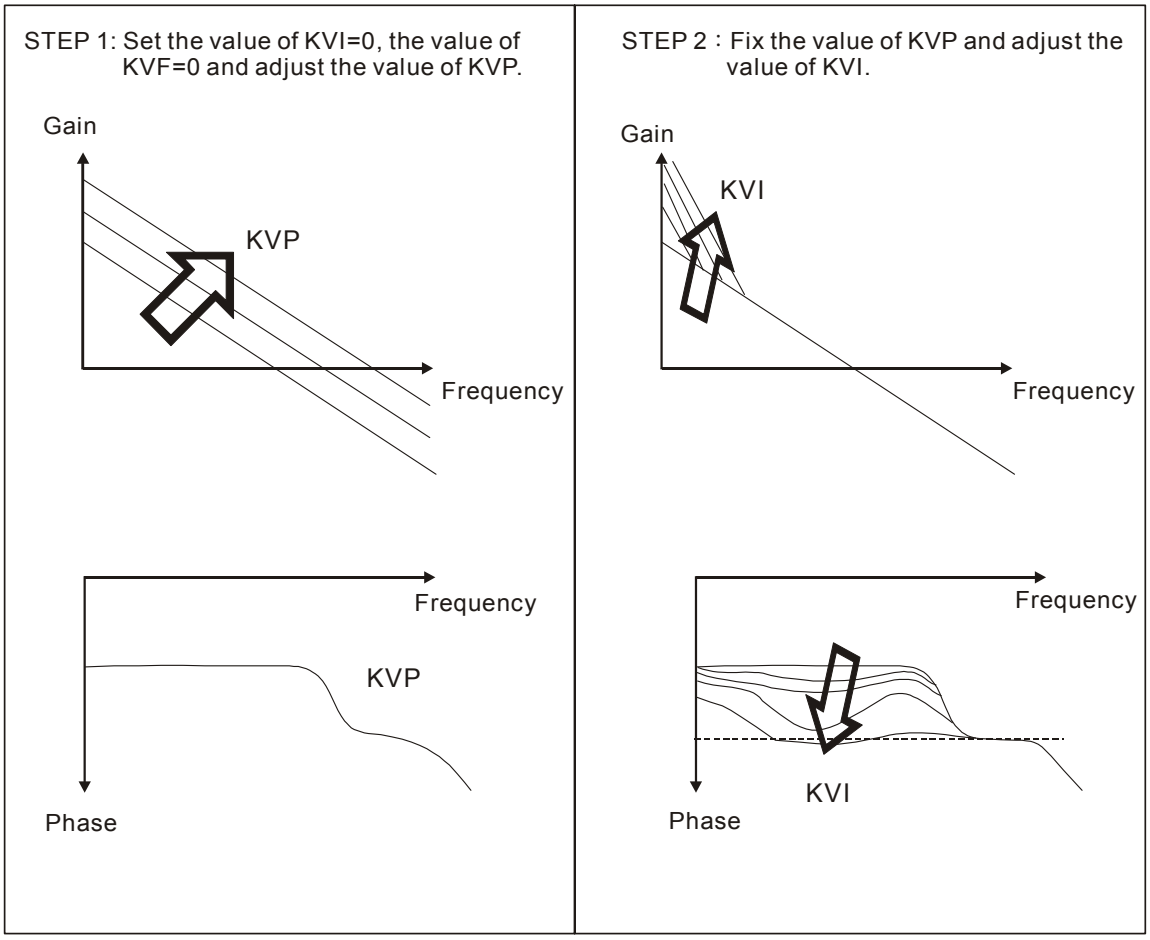
This parameter is used to set the feed forward gain when executing speed control command.

When using speed smooth command, increase gain can improve speed track deviation.

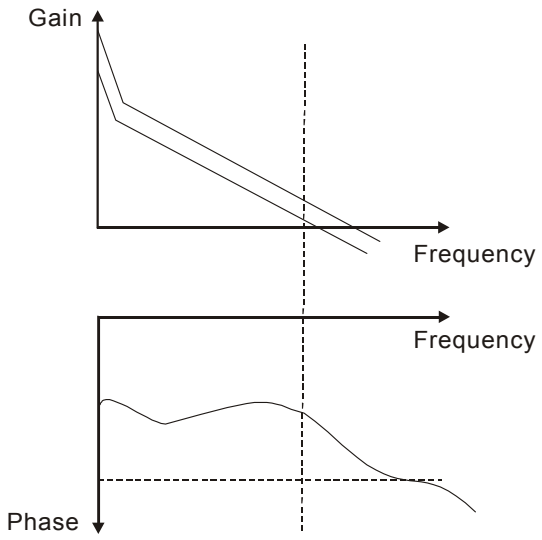
When not using speed smooth command, decrease gain can improve the resonance condition of mechanical system.

In theory, stepping response can be used to explain proportional gain (KVP), integral gain (KVI) and feed forward gain (SFG). Now we use frequency area and time area respectively to explain the logic.

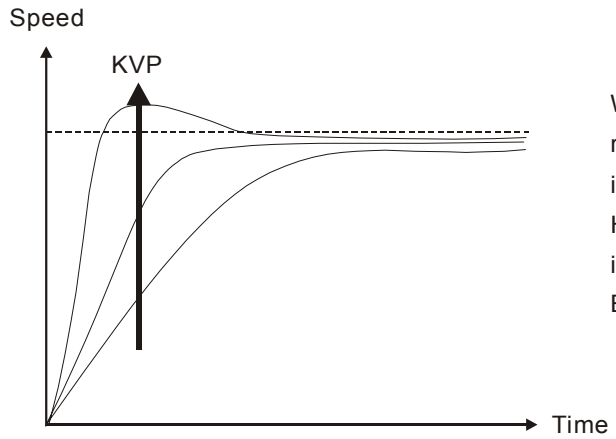
Frequency Domain



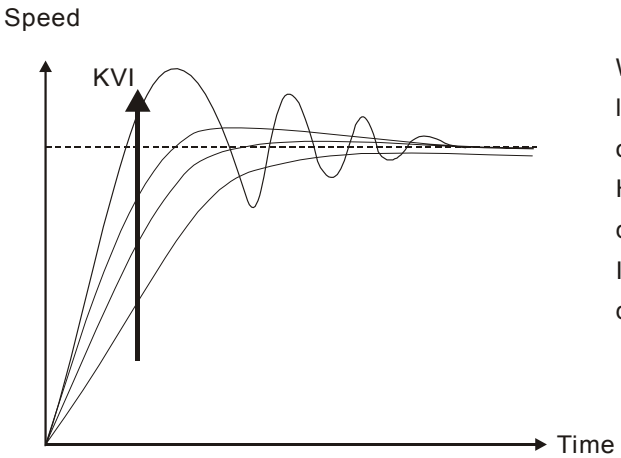
STEP 3：Select the value of KVI, if the value of phase margin is too small, re-adjust the value of KVP again to obtain the value, 45deg of phase margin.



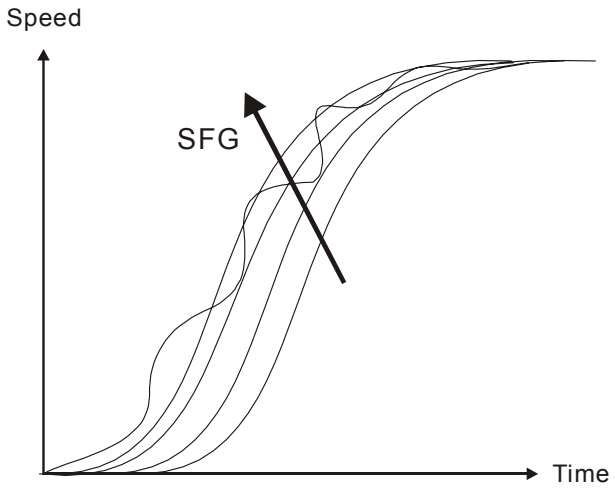
Time Domain



When the value of KVP is greater , the value of the responsiveness is also greater and the raising time is shorter.
However, when the value of phase margin is over low, it is not helpful to steady error.
But it is helpful to dynamic tracking error.



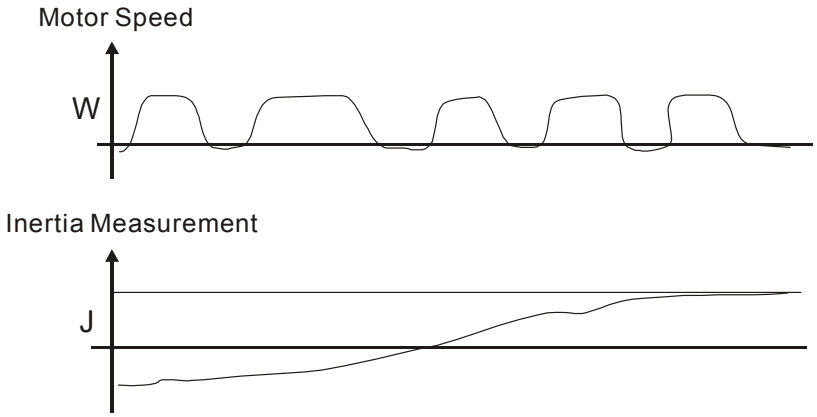
When the value of KVI is greater, the value of low-frequency gain is also greater and the value of steady error is nearly zero (0).
However, the value of phase margin will reduce quite substantially.
It is helpful to steady error. But it is not helpful to dynamic tracking error.



When the value of SFG is nearly to 1and the forward compensation is more complete, then the value of dynamic tracking error will become very small. However, when the value of SFG is too great, it may cause vibration.

Auto Mode (Continuous adjustment))

When Tuning Mode Settings of P2-32 is set to 1, the ratio of Load Inertia to servo motor inertia can be continuously adjusted. This Auto Mode provides continuous adjustment of loop gains according to measured inertia automatically. It is suitable when the load inertia is fixed or the load inertia change is small and is not suitable for wide range of load inertia change. The period of adjustment time is different depending on the acceleration and deceleration of servo motor. To change the stiffness and responsiveness, please use parameter P2-31.



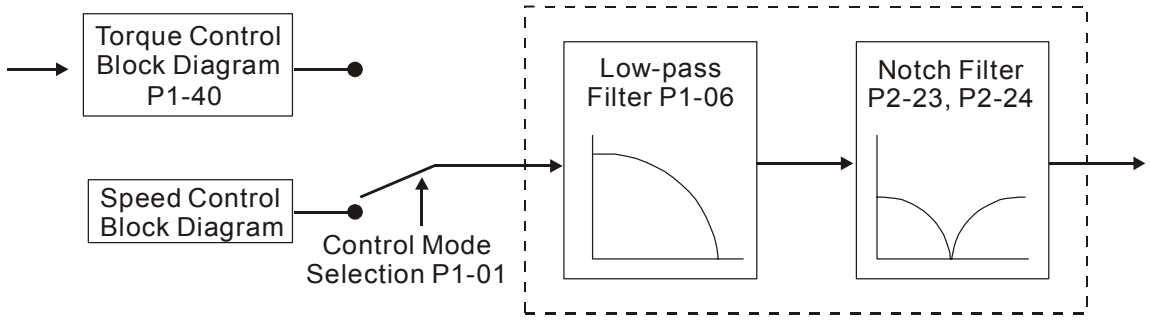
Auto Mode (The ratio of Load Inertia to servo motor inertia is fixed)

When Tuning Mode Settings of P2-32 is changed from 1 to 2, the measured load inertia value will be saved and memorized in P1-37 automatically. Otherwise, the users should set the ratio of load inertia to servo motor inertia via parameter P1-37 in advance. To change the stiffness and responsiveness, please use parameter P2-31.

6.3.7 Resonance Suppression

The resonance of mechanical system may occur due to excessive system stiffness or frequency response. However, this kind of resonance condition can be improved, suppressed, even can be eliminated by using low-pass filter (parameter P2-25) and notch filter (parameter P2-23, P2-24) without changing control parameter.

Resonance Suppression Block Diagram



Relevant parameters:

P2 - 23	NCF	Notch Filter (Resonance Suppression)	Communication Addr.: 0217H

Default: 1000

Related Section:

Section 6.3.7, P2-24

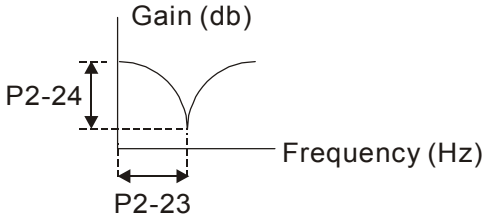
Applicable Control Mode: P/S/T

Unit: Hz

Range: 50 ~ 1000

Settings:

This parameter is used to set resonance frequency of mechanical system. It can be used to suppress the resonance of mechanical system. If P2-24 is set to 0, this parameter is disabled.



P2 - 24	DPH	Notch Filter Attenuation Rate (Resonance Suppression)	Communication Addr.: 0218H

Default: 0

Related Section:

Section 6.3.7, P2-23

Applicable Control Mode: P/S/T

Unit: dB

Unit: Hz

Range: 0 ~ 32

Settings:

0: Disabled

P2 - 25	NLP	Low-pass Filter Time Constant (Resonance Suppression)	Communication Addr.: 0219H

Default: 20

Applicable Control Mode: P/S/T

Unit: 0.1ms

Range: 0 ~ 10000

Related Section:

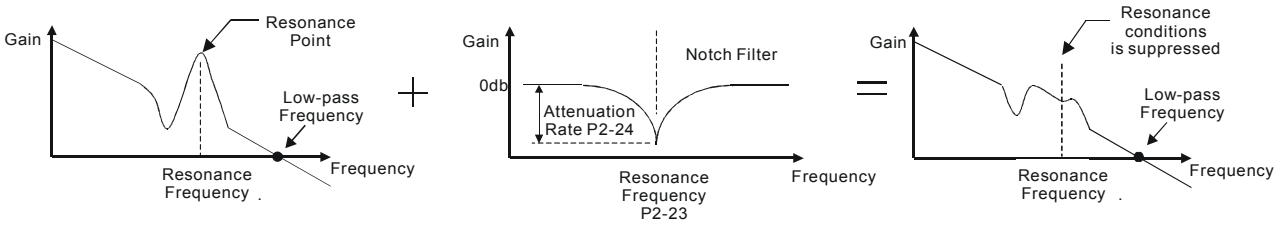
Section 6.3.7, P2-32

Settings:

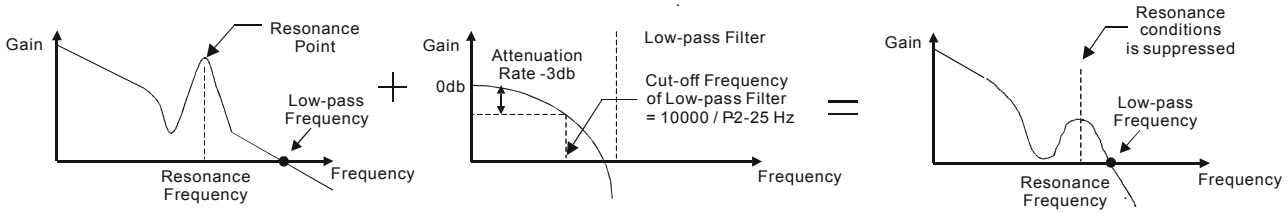
This parameter is used to set low-pass filter time constant of resonance suppression.

0: Disabled

Use Notch Filter to suppress resonance



Use Low-pass Filter to suppress resonance



When the low-pass filter (parameter P2-25) is adjusted from 0 to high value, the value of Low-pass frequency will become smaller (see the figures above). The resonant condition is improved but the frequency response and phase margin will also decrease and the system may become unstable. Therefore, if the users know the resonance frequency, the users can eliminate the resonance conditions directly by using notch filter (parameter P2-23, P2-24). Usually, if the resonant frequency can be recognized, we recommend the users can directly use notch filter (parameter P2-23, P2-24) to eliminate the resonance. However, if the resonant frequency will drift or drift out of the notch filter range, we recommend the users not to use notch filter and use low-pass filter to improve resonant conditions.

6.4 Torque Control Mode

The torque control mode (T or Tz) is usually used on the applications of torque control, such as printing machine, spinning machine, twister, etc. Delta ASDA-B series servo drive supports two kinds of command sources in torque control mode. One is external analog signal and the other is internal parameter. The external analog signal is from external voltage input and it can control the torque of servo motor. The internal parameters are from P1-12 to P1-14 which are used to be the torque command in torque control mode.

6.4.1 Command Source of Torque Control Mode

Torque command Sources:

1) External analog signal: External analog voltage input, -10V to +10V
2) Internal parameter: P1-12 to P1-14

The command source selection is determined by the DI signal of CN1 connector. Please refer to the Table 6.F below:

Torque Command	DI signal of CN1		Command Source			Content	Range
	TCM1	TCM0					
T1	0	0	Mode	T	External analog signal	Voltage between T-REF-GND	+/- 10 V
				Tz	None	Torque command is 0	0
T2	0	1	Internal parameter			P1-12	+/- 300 %
T3	1	0				P1-13	+/- 300 %
T4	1	1				P1-14	+/- 300 %

Table 6.F

- State of TCM0~1: 0: indicates OFF (Normally Open); 1: indicates ON (Normally Closed)
- When TCM0 and TCM1 are both 0 (OFF), if the control mode of operation is Tz, then the command is 0. Therefore, if the users do not use analog voltage as torque command, the users can choose Tz mode to operation torque control to avoid the zero point drift problem(Note1) of analog voltage. If the control mode of operation is T, then the command is the analog voltage between T-REF and GND. The setting range of the input voltage is from -10V to +10V and the corresponding torque is adjustable (see parameter P1-41).
- When at least one of TCM0 and TCM1 is not 0 (OFF), the torque command is internal parameter. The command is valid (enabled) after either TCM0 or TCM1 is changed.

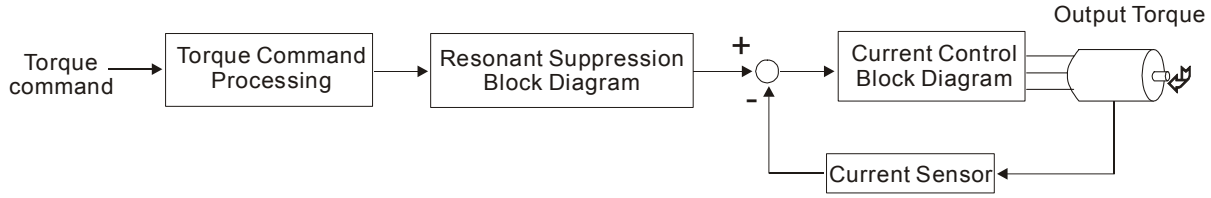
The torque command that is described in this section not only can be taken as torque command in torque control mode (T or Tz mode) but also can be the torque limit input command in position mode (P mode) and speed control mode (S or Sz mode).

NOTE

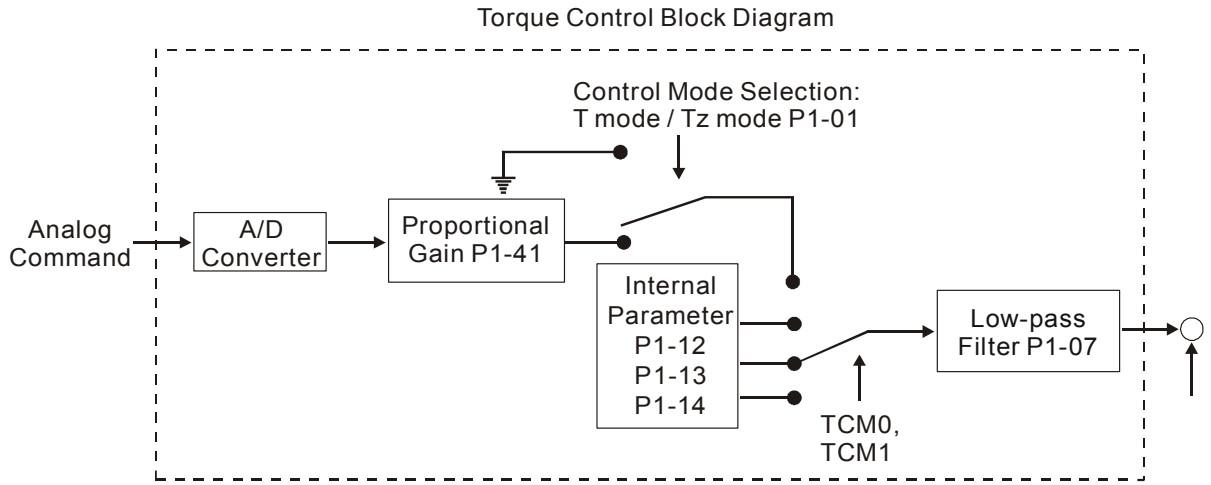
1) In torque control mode, if the users want to adjust analog torque input offset value, please refer to parameter 4-23 for the operation.

6.4.2 Structure of Torque Control Mode

Basic Structure:



In the above figure, the toque command processing is used to select the command source of torque control according to chapter 6.4.1, including max. analog torque command (parameter P1-41) and smoothing strategy of torque control mode. The current control block diagram is used to manage the gain parameters of the servo drive and calculate the current input provided to motor instantaneously. As current control block diagram is too complicated, setting the parameters of current control block diagram is not allowed. The function and structure of torque command processing is shown as the figure below:



The command source is selected according to the state of TCM0, TCM1 and parameter P1-01 (T or Tz). Whenever the command signal needs to be more smoothly, we recommend the users to use proportional gain (scalar) and low-pass filter to adjust torque.

6.4.3 Smoothing Strategy of Torque Control Mode

Relevant parameters:

P1 - 07	TFLT	Smooth Constant of Analog Torque Command (Low-pass Filter)	Communication Addr.: 0107H

Default: 0

Applicable Control Mode: T

Unit: ms

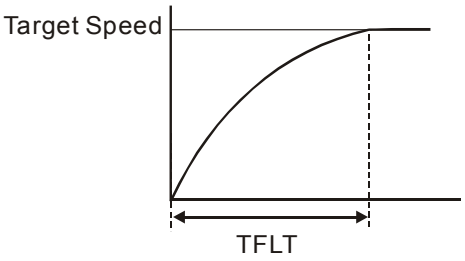
Range: 0 ~ 1000 (0: Disabled)

Related Section:

Section 6.4.3

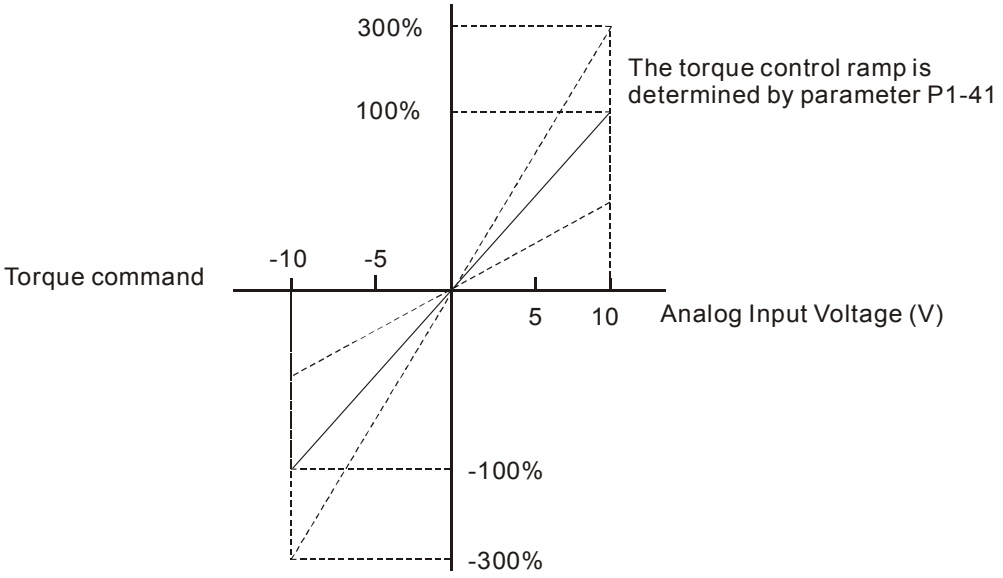
NOTE

1) If the setting value of parameter P1-07 is set to 0, it indicates the function of this parameter is disabled and the command is just By-Pass.



6.4.4 Analog Torque Input Scaling

The analog voltage between T_REF and GND controls the motor torque command. Using with parameter P1-41 can adjust the torque control ramp and its range.



Relevant parameters:

P1 - 41▲	TCM	Max. Analog Torque Command or Limit	Communication Addr.: 0129H

Default: 100

Applicable Control Mode: T / S, P

Unit: %

Range: 0 ~ 300

Related Section:

Section 6.4.4, P1-55

Settings:

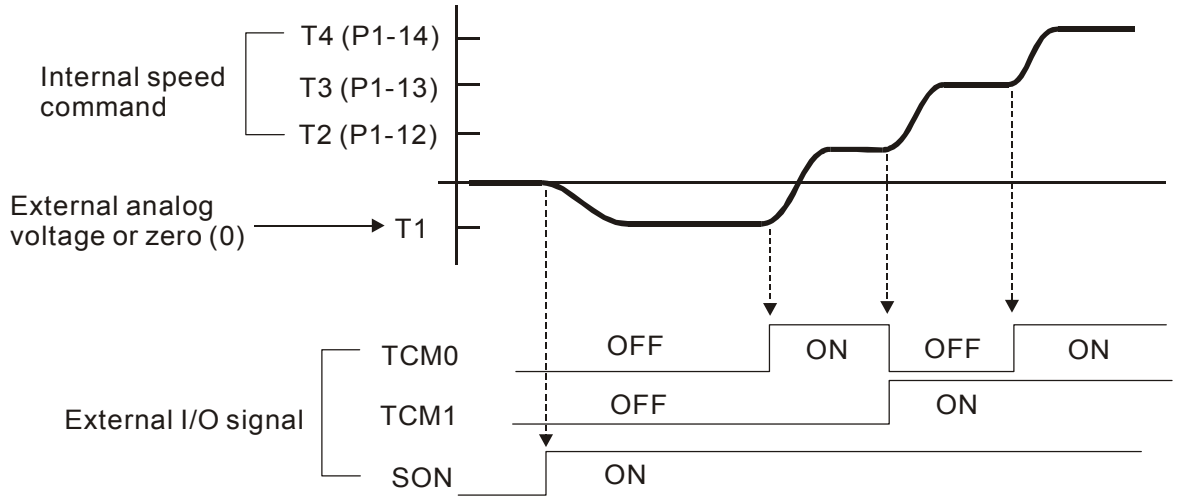
In **Torque mode**, this parameter is used to set the output torque at maximum input voltage (10V) of analog torque command.

In **Position** and **Speed mode**, this parameter is used to set output torque at maximum input voltage (10V) of analog torque limit

For example, in torque mode, if P1-41 is set to 100 and the input voltage is 10V, it indicates that the torque command is 100% rated torque. If P1-41 is set to 100, but the input voltage is changed to 5V, then the torque command is changed to 50% rated torque.

Torque command / limit = Input voltage x setting/10 (%)

6.4.5 Timing Chart of Speed Control Mode



NOTE

1) OFF indicates normally open and ON indicates normally closed.
2) When torque control mode is Tz, the torque command T1=0; when torque control mode is T, the speed command T1 is external analog voltage input (Please refer to P1-01).
3) After Servo ON, the users can select command according to the state of TCM0~1.

6.5 Control Modes Selection

Except signal control mode operation, ASDA-B series AC drive also provide S-P, S-T, T-P these three multiple modes for the users to select.

1） Speed / Position mode selection: S-P

2） Speed / Torque mode selection: S-T

3） Torque / Position mode selection: T-P

Mode	Name	Code	Description
Dual Mode	S-P	06	Either S or P control mode can be selected via the Digital Inputs (DI)
	S-T	10	Either S or T control mode can be selected via the Digital Inputs (DI)
	T-P	07	Either T or P control mode can be selected via the Digital Inputs (DI)

Table 6.G

Sz and Tz mode selection is not provided. In order to avoid using too much DI inputs, we recommend that the users can use external analog signal as input command in speed and torque mode to reduce the use of DI inputs (SPD0~1 or TCM0~1).

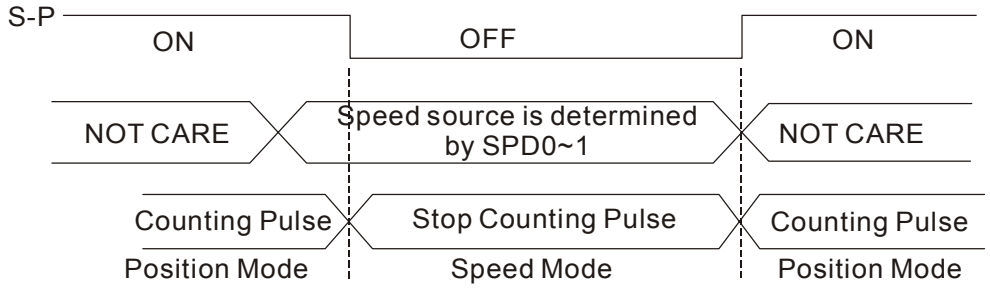
Please refer to table 3.B and table 3.C in section 3.3.2 to see the default pin number of DI/DO signal.

6.5.1 Speed / Position Control Mode Selection

S-P Mode:

The command source of S-P mode is from external input pulse. The speed command can be the external analog voltage or internal parameters (P1-09 to P1-11). The speed and position mode switching is controlled by the S-P signal.

The timing chart of speed / position control mode selection is shown as the figure below:



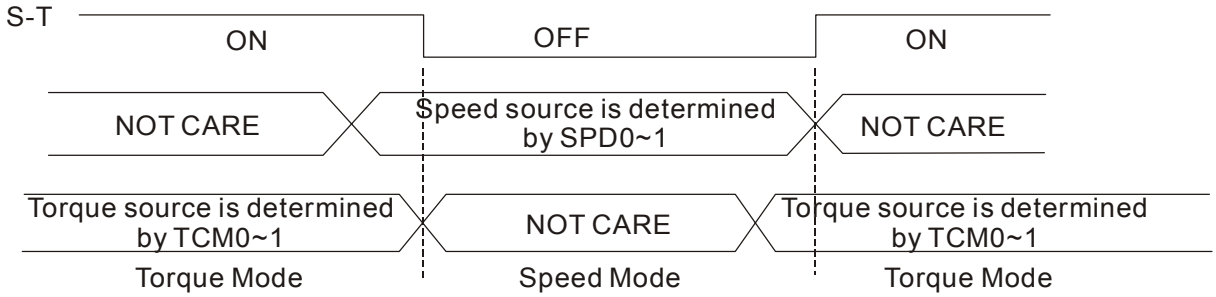
In position mode (when S-P is ON), the motor will start to count pulse and operate following the external pulse command. When switching to the speed mode (when S-P is OFF), it will stop counting pulse even if the pulse command is continuously sent out. The speed command is determined by SPD0~1 and the motor will rotate following the command. After S-P is ON again, it will immediately return to position mode.

6.5.2 Speed / Torque Control Mode Selection

S-T Mode:

The speed command can be the external analog voltage or internal parameters (P1-09 to P1-11) and SPD0~1 is used to select speed command. The same as speed command, the torque command can be the external analog voltage or internal parameters (P1-12 to P1-14) and TCM0~1 is used to select torque command. The speed and torque mode switching is controlled by the S-T signal.

The timing chart of speed / torque control mode selection is shown as the figure below:



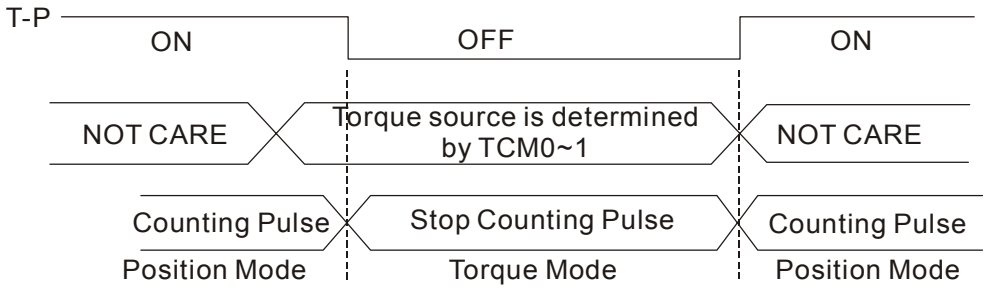
In torque mode (when S-T is ON), torque command is selected by TCM0~1. When switching to the speed mode (when S-T is OFF), the speed command is selected by SPD0~1, and then the motor will immediately rotate following the command. After S-T is ON again, it will immediately return to torque mode.

6.5.3 Torque / Position Control Mode Selection

T-P Mode:

The command source of T-P mode is from external input pulse. The torque command can be the external analog voltage or internal parameters (P1-12 to P1-14). The torque and position mode switching is controlled by the T-P signal.

The timing chart of speed / position control mode selection is shown as the figure below:



In position mode (when T-P is ON), the motor will start to count pulse and operate following the external pulse command. When switching to the torque mode (when T-P is OFF), it will stop counting pulse even if the pulse command is continuously sent out. The torque command is determined by TCM0~1 and the motor will rotate following the command. After T-P is ON again, it will immediately return to position mode.

6.6 Others

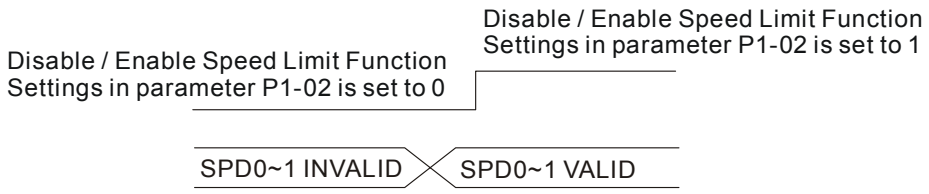
6.6.1 Speed Limit

The max. servo motor speed can be limited by using parameter P1-55 no matter in position, speed or torque control mode.

The command source of speed limit command is the same as speed command. It can be the external analog voltage but also can be internal parameters (P1-09 to P1-11). For more information of speed command source, please refer to chapter 6.3.1.

The speed limit only can be used in torque mode (T mode) to limit the servo motor speed. When the torque command is the external analog voltage, there should be surplus DI signal that can be treated as SPD0~1 and be used to select speed limit command (internal parameter). If there is not enough DI signal, the external voltage input can be used as speed limit command. When the Disable / Enable Speed Limit Function Settings in parameter P1-02 is set to 1, the speed limit function is activated.

The timing chart of speed limit is shown as the figure below:



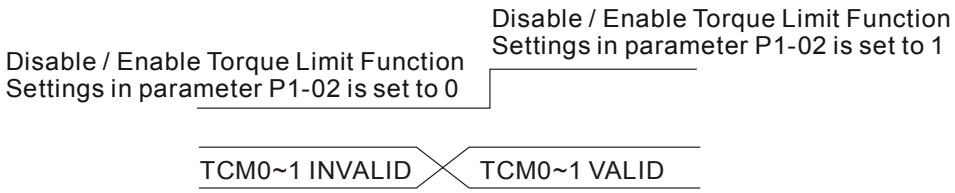
Command Source Selection of Speed Limit

6.6.2 Torque Limit

The command source of torque limit command is the same as torque command. It can be the external analog voltage but also can be internal parameters (P1-12 to P1-14). For more information of torque command source, please refer to chapter 6.4.1.

The torque limit only can be used in position mode (P mode) and speed mode (S mode) to limit the output torque of servo motor. When the position command is the external pulse and speed command is the external analog voltage, there should be surplus DI signal that can be treated as TCM0~1 used to select torque limit command (internal parameter). If there is not enough DI signal, the external voltage input can be used as torque limit command. When the Disable / Enable Torque Limit Function Settings in parameter P1-02 is set to 1, the torque limit function is activated.

The timing chart of torque limit is shown as the figure below:



Command Source Selection of Torque Limit

6.6.3 Regenerative Resistor

■ **Built-in Regenerative Resistor**

When the output torque of servo motor in reverse direction of motor rotation speed, it indicates that there is a regenerative power returned from the load to the servo drive. This power will be transmitted into the capacitance of DC Bus and result in rising voltage. When the voltage has risen to some high voltage, the servo system need to dissipate the extra energy by using a regenerative resistor. ASDA-B series servo drive provides a built-in regenerative resistor and the users also can connect to external regenerative resistor if more regenerative capacity is needed.

The following table 6.H shows the specifications of the servo drive's built-in regenerative resistor and the amount of regenerative power (average value) that it can process.

Built-in Regenerative Resistor Specifications				
Servo Drive (kW)	Resistance (Ohm) (parameter P1-52)	Capacity (Watt) (parameter P1-53)	Regenerative Power processed by built-in regenerative resistor (Watt) *1	Min. Allowable Resistance (Ohm)
0.1	No built-in regenerative resistor		-	40
0.2	No built-in regenerative resistor		-	40
0.4	No built-in regenerative resistor		-	20
0.75	40	60	30	20
1.0	40	60	30	20
1.5	40	60	30	20
2.0	40	60	30	10
*1: Regenerative power calculation: The amount of regenerative power (average value) that can be processed is rated at 50% of the capacity of the servo drive's built-in regenerative resistor. The regenerative power calculation method of external regenerative resistor is the same.				

Table 6.H

When the regenerative power exceeds the processing capacity of the servo drive, install an external regenerative resistor. Please pay close attention on the following notes when using a regenerative resistor.

1. Make sure that the settings of resistance (parameter P1-52) and capacity (parameter P1-53) is set correctly.
2. When the users want to install an external regenerative resistor, ensure that its resistance value is the same as the resistance of built-in regenerative resistor. If combining multiple small-capacity regenerative resistors in parallel to increase the regenerative resistor capacity, make sure that the resistance value of the regenerative resistor should comply with the specifications listed in the above table.
3. In general, when the amount of regenerative power (average value) that can be processed is used at or below the rated load ratio, the resistance temperature will increase to 120°C or higher (on condition that when the regeneration continuously occurred). For safety reasons, forced air cooling is good way that can be used to reduce the temperature of the regenerative resistors. We also

recommend the users to use the regenerative resistors with thermal switches. As for the load characteristics of the regenerative resistors, please check with the manufacturer.

■ External Regenerative Resistor

When using external regenerative resistor, connect it to P and C, and make sure the circuit between P and D is open. We recommend the users should use the external regenerative resistor that the resistance value following the above table 6.H. We ignore the dissipative power of IGBT in order to let the users easily calculate the capacity of regenerative resistor. In the following sections, we will describe Regenerative Power Calculation Method and Simple Calculation Method for calculating the regenerative power capacity of external regenerative resistors.

■ Regenerative Power Calculation Method

(1) Without Load

When there is no external load torque, if the servo motor repeats operation, the returned regenerative power generated when braking will transmitted into the capacitance of DC bus. After the capacitance voltage exceeds some high value, regenerative resistor can dissipate the remained regenerative power. Use the table and procedure described below to calculate the regenerative power.

Servo Drive (kW)	Servo Motor (kW) (Frame Size)	Rotor Inertia J (kg. m^2)	Regenerative power from empty load 3000rpm to stop Eo (joule)	Max. regenerative power of capacitance Ec (joule)
0.1	0.1	0.037 E-4	0.179	3.11
0.2	0.2	0.169 E-4	0.818	4.5
0.4	0.3	8.17 E-4	39.5	6.22
	0.4 (60 mm)	0.277 E-4	1.34	
	0.4 (80 mm)	0.68 E-4	3.29	
0.75	0.5	8.17 E-4	39.5	11.07
	0.6	8.41 E-4	40.7	
	0.75	1.13 E-4	5.47	
1.0	0.9	11.18 E-4	54.1	13.5
	1 (100 mm)	2.578 E-4	12.5	
	1 (130 mm)	8.41 E-4	40.7	
1.5	1.5	11.18 E-4	54.1	18.18
2.0	2 (100 mm)	4.239 E-4	20.5	22.5
	2 (130 mm)	14.59 E-4	70.6	
	2 (180 mm)	34.68 E-4	168	

Table 6.I

Eo= J * wr^2/182 (joule) , wr : rpm

If the load inertia is N × motor inertia, the regenerative power will be (N+1) × E0 when servo motor brakes from 3000rpm to 0. Then, the regenerative resistor can dissipate: (N+1) × E0 - Ec (joule). If the time of repeat operation cycle is T sec, then the regenerative power = 2 × ((N+1) × E0 - Ec) / T. The calculating procedure is as follows:

Step	Procedure	Equation and Setting Method
1	Set the capacity of regenerative resistor to the maximum	Change the value of P1-53 to maximum
2	Set the operation cycle T	Input by the users
3	Set motor speed wr	Input by the users or read via P0-02 Drive State Display
4	Set load/motor inertia ratio N	Input by the users or read via P0-02 Drive State Display
5	Calculate the max. regenerative power Eo	Eo= J * wr^2/182
6	Set the regenerative power Ec that can be absorbed	Refer to the table 6.I above
7	Calculate the required regenerative power capacity	2 × (N+1) × Eo − Ec) / T

Table 6.J

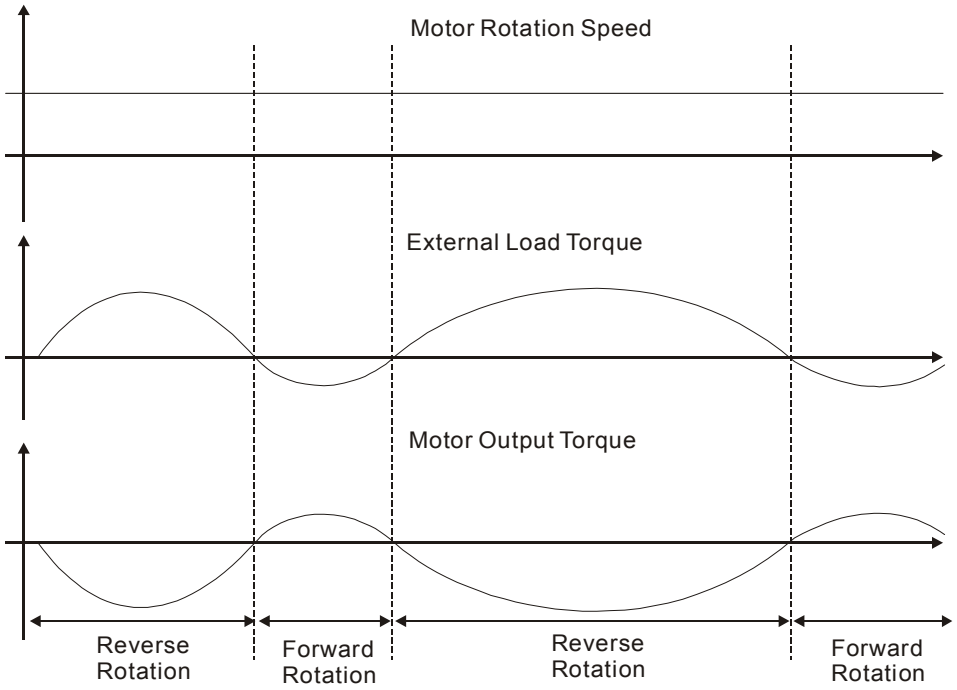
For example:

If we use 750W servo drive, the time of repeat operation cycle is T = 0.4 sec, max. motor speed is 3000rpm, the load inertia = 4 × motor inertia, then the necessary the power of regenerative resistor = 2 × ((4+1) × 5.36 – 11.07) / 0.75 = 41.9W. If the calculation result is smaller than regenerative power, we recommend the users to use the built-in 60W regenerative resistor. Usually the built-in regenerative resistor provided by ASDA-B series can meet the requirement of general application when the external load inertia is not excessive.

The users can see when the capacity of regenerative resistor is too small, the accumulated power will be larger and the temperature will also increase. The fault, ALE05 may occur if the temperature is over high. The figure on next page shows the actual operation of regenerative resistor.

(2) With Load

When there is an external load torque, servo motor is in reverse rotation when external load greater than motor torque. Servo motor is usually in forward rotation and the motor torque output direction is the same as the rotation direction. However, there is still some special condition. If the motor output torque is in the reverse direction of rotation, the servo motor is also in the reverse direction of rotation. The external power is input into the servo drive through servo motor. The figure on next page is an example. The users can see the motor is in forward rotation at constant speed when a sudden external load torque change and great power is transmitted to regenerative resistor rapidly.



External load torque in reverse direction: TL* Wr TL : External load torque

For the safety, we strongly recommend the users should select the proper resistance value according to the load.

For example, when external load torque is a +70% rated torque and rotation speed reaches 3000 rpm, if using 400W servo drive (rated torque: 1.27Nt-m), then the users need to connect a external regenerative resistor which power is 2 × (0.7 × 1.27) × (3000 × 2 × π/ 60) = 560W, 40Ω.

■ **Simple Calculation Method**

The users can select the adequate regenerative resistors according to the allowable frequency required by actual operation and the allowable frequency when the servo motor run without load. The allowable frequency when the servo motor run without load is the maximum frequency that can be operated during continuous operation when servo motor accelerate from 0rpm to rated speed and decelerate from rated speed down to 0rpm. The allowable frequencies when the servo motor run without load are summarized in the following table.

Allowable frequency when the servo motor run without load (times/min)								
ECMA Series Power Range (Frame Size)	100W	200W	300W	400W (60mm)	400W (80mm)	500W	600W	750W
	01	02	03	04	04	05	06	07
Allowable Frequency (times/min)	-	-	-	1275	519	43	41	319
ECMA Series Power Range (Frame Size)	900W	1.0kW (100mm)	1.0KW (130mm)	1.5KW	2.0kW (100mm)	2.0KW (130mm)	2.0KW (180mm)	
	09	10	10	15	20	20	20	
Allowable Frequency (times/min)	31	137	42	31	82	24	10	

Table 6.K

When the servo motor runs with load, the allowable frequencies will change according to the changes of the load inertia and rotation speed. Use the following equation to calculate the allowable frequency.

$$\text{Allowable frequency} = \frac{\text{Allowable frequency when servo motor run without load}}{m+1} \times \left(\frac{\text{Rated speed}}{\text{Operating speed}}\right)^2 \frac{\text{times}}{\text{min.}}$$

m = load/motor inertia ratio

The users can select the adequate regenerative resistors according to the allowable frequencies by referring to the table below:

Allowable frequency when the servo motor run without load (times/min)					
ECMA Series / Regenerative Resistors	100W	200W	300W	400W (60mm)	400W (80mm)
	01	02	03	04	04
BR400W040	-	-	-	8608	3279
BR1K0W020	-	-	-	21517	8765
ECMA Series / Regenerative Resistors	500W	600W	750W	900W	1.0kW (100 mm)
	05	06	07	09	10
BR400W040	291	283	2128	213	925
BR1K0W020	729	708	5274	533	2312
ECMA Series / Regenerative Resistors	1.0KW (130mm)	1.5KW	2.0kW (100mm)	2.0KW (130mm)	2.0KW (180mm)
	10	15	20	20	20
BR400W040	283	213	562	163	68
BR1K0W020	708	533	1363	408	171

( ) : motor frame size, unit is in millimeters.

Table 6.L

6.6.4 Electromagnetic Brake

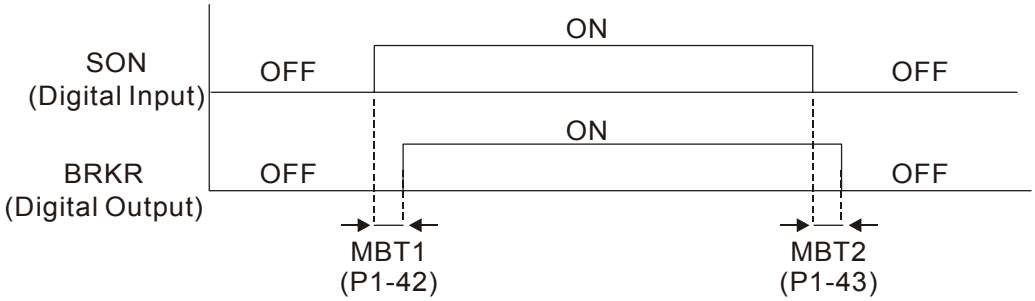
When the servo drive is operating, if the digital output BRKR is set to Off, it indicates the electromagnetic brake is disabled and motor is stop running and locked. If the digital output BRKR is set to ON, it indicates electromagnetic brake is enabled and motor can run freely.

There are two parameters that affect the electromagnetic brake. One is parameter P1-42 (MBT1) and the other is parameter P1-43 (MBT2). The users can use these two parameters to set the On and Off delay time of electromagnetic brake. The electromagnetic brake is usually used in perpendicular axis (Z-axis) direction to reduce the large energy generated from servo motor. Using electromagnetic brake can avoid the load may slip since there is no motor holding torque when power is off. Without using electromagnetic brake may reduce the life of servo motor. To avoid malfunction, the electromagnetic brake should be activated after servo system is off (Servo Off).

If the users desire to control electromagnetic brake via external controller, not by the servo drive, the users must execute the function of electromagnetic brake during the period of time when servo motor is braking. The braking strength of motor and electromagnetic brake must be in the same direction when servo motor is braking. Then, the servo drive will operate normally. However, the servo drive may generate larger current during acceleration or at constant speed and it may the cause of overload (servo fault).

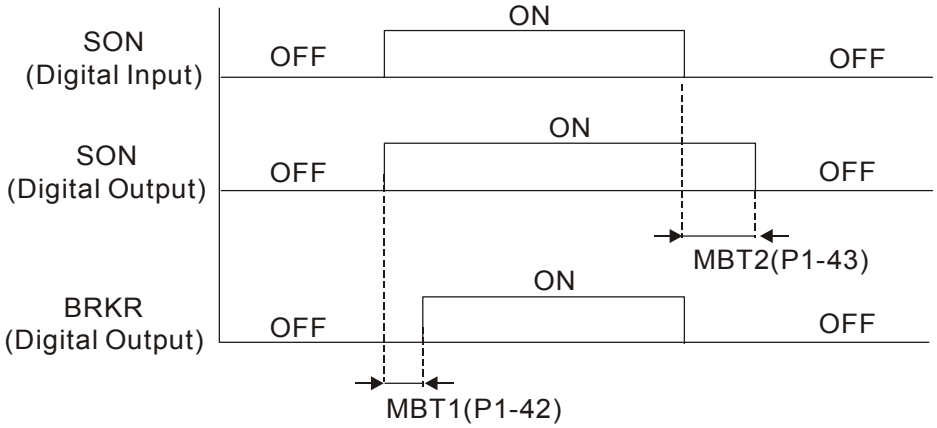
Timing chart for using servo motor with electromagnetic brake:

1. When the setting value of P1-43 is greater than or equal to 0 (zero)



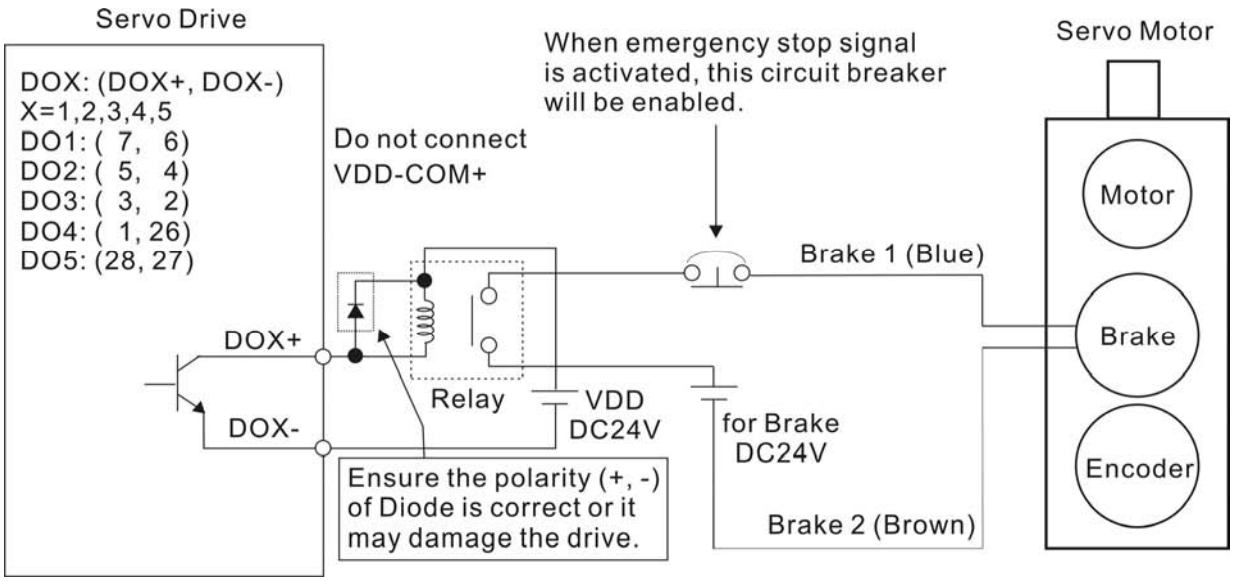
When SERVO OFF (when DI SON is not activated), the BRKR output goes Off (electromagnetic brake is locked) after the delay time set by P1-43 is reached.

2. When the setting value of P1-43 is greater than or equal to 0 (zero)



When SERVO OFF (when DI SON is not activated), if the BRKR output goes Off (electromagnetic brake is locked), the servo motor goes Off after the delay time set by P1-43 is reached.

Electromagnetic Brake Wiring Diagram



NOTE

1) Please refer to Chapter 3 Connections and Wiring for more wiring information.
2) Please note that the coil of brake has no polarity.
3) The power supply for brake is DC24V. Never use it for VDD, the +24V source voltage.

efesotomasyon.com

Chapter 7 Servo Parameters

7.1 Definition

There are following five groups for drive parameters:

Group 0: Monitor parameter (example: P0-xx)

Group 1: Basic parameter (example: P1-xx)

Group 2: Extension parameter (example: P2-xx)

Group 3: Communication parameter (example: P3-xx)

Group 4: Diagnosis parameter (example: P4-xx)

There is following one group for keypad parameters:

Group 8: Keypad parameter (example: P8-xx)

Abbreviation of control modes:

P : Position control mode

S : Speed control mode

T : Torque control mode

Explanation of symbols (marked after parameter)

(★) Read-only register, such as P0-00, P0-01, P4-00.

(▲) Parameter cannot be set when Servo On (when the servo drive is enabled).

(●) Parameter is effective only after the servo drive is restarted (after switching power off and on), such as P1-01.

(■) Parameter setting values are not retained when power is off.

7.2 Parameters Summary

7.2.1 Parameters List by Group

Group 0: P0-xx

Monitor Parameters							
Parameter	**Name**	**Function**	**Default**	**Unit**	**Control Mode**		
					P	**S**	**T**
P0-00★	VER	Firmware Version	Factory setting	N/A	○	○	○
P0-01★	ALE	Drive Fault Code	N/A	N/A	○	○	○
P0-02	STS	Drive Status	0	N/A	○	○	○
P0-03	Reserved						
P0-04	CM1	Status Monitor 1	0	N/A	○	○	○
P0-05	CM2	Status Monitor 2	0	N/A	○	○	○
P0-06	CM3	Status Monitor 3	0	N/A	○	○	○
P0-07	Reserved						
P0-08	Reserved						
P0-09★	SVSTS	Servo Output Status Display	N/A	N/A	○	○	○

Explanation of symbols (marked after parameter)

(★) Read-only register.
(▲) Parameter cannot be set when Servo On (when the servo drive is enabled).
(●) Parameter is effective only after the servo drive is restarted (after switching power off and on).
(■) Parameter setting values are not retained when power is off.

Group 1: P1-xx

Basic Parameters							
Parameter	**Name**	**Function**	**Default**	**Unit**	**Control Mode**		
					P	**S**	**T**
P1-00▲	PTT	External Pulse Input Type	2	N/A	○		
P1-01●	CTL	Control Mode and Output Direction	0	pulse Rpm N.M	○	○	○
P1-02▲	PSTL	Speed and Torque Limit	0	N/A	○	○	○
P1-03	AOUT	Pulse Output Polarity Setting	0	N/A	○	○	○
P1-04	Reserved						
P1-05	Reserved						
P1-06	SFLT	Accel / Decel Smooth Constant of Analog Speed Command (Low-pass Filter)	0	ms		○	
P1-07	TFLT	Smooth Constant of Analog Torque Command (Low-pass Filter)	0	ms			○
P1-08	PFLT	Smooth Constant of Position Command (Low-pass Filter)	0	10ms	○		
P1-09 ~ P1-11	SPD1 ~ 3	1st ~ 3rd Speed Command or Limit	100 ~ 300	rpm		○	○
P1-12 ~ P1-14	TQ1 ~ 3	1st ~ 3rd Torque Command or Limit	100	%	○	○	○
P1-15▲	GR4	Electronic Gear Ratio (2nd Numerator) (N2)	1	pulse	○		
P1-16 ~ P1-31	Reserved						
P1-32	LSTP	Motor Stop Mode Selection	0	N/A	○	○	○
P1-33	Reserved						
P1-34	TACC	Acceleration Time	200	ms		○	
P1-35	TDEC	Deceleration Time	200	ms		○	
P1-36	TSL	Accel / Decel S-curve	0	ms		○	
P1-37	GDR	Ratio of Load Inertia to Servo Motor Inertia	10	0.1 times	○	○	○
P1-38	ZSPD	Zero Speed Range Setting	10	rpm	○	○	○
P1-39	SSPD	Target Rotation Speed	3000	rpm	○	○	○
P1-40▲	VCM	Max. Analog Speed Command or Limit	rated speed	rpm		○	○
P1-41▲	TCM	Max. Analog Torque Command or Limit	100	%	○	○	○
P1-42	MBT1	On Delay Time of Electromagnetic Brake	100	ms	○	○	○
P1-43	MBT2	OFF Delay Time of Electromagnetic Brake	100	ms	○	○	○

Basic Parameters							
Parameter	**Name**	**Function**	**Default**	**Unit**	**Control Mode**		
					P	**S**	**T**
P1-44▲	GR1	Electronic Gear Ratio (1st Numerator) (N1)	1	pulse	○		
P1-45▲	GR2	Electronic Gear Ratio (Denominator)	1	pulse	○		
P1-46▲	GR3	Encoder Output Pulse Number	2500	pulse	○	○	○
P1-47 ~ P1-51	Reserved						
P1-52	RES1	Regenerative Resistor Value	40	Ohm	○	○	○
P1-53	RES2	Regenerative Resistor Capacity	60	Watt	○	○	○
P1-54	PER	Positioning Completed Width	100	pulse	○		
P1-55	MSPD	Maximum Speed Limit	rated speed	rpm	○	○	○

Explanation of symbols (marked after parameter)

(★) Read-only register.
(▲) Parameter cannot be set when Servo On (when the servo drive is enabled).
(●) Parameter is effective only after the servo drive is restarted (after switching power off and on).
(■) Parameter setting values are not retained when power is off.

Group 2: P2-xx

Extension Parameters							
Parameter	**Name**	**Function**	**Default**	**Unit**	**Control Mode**		
					P	**S**	**T**
P2-00	KPP	Proportional Position Loop Gain	50	rad/s	○		
P2-01	PPR	Position Loop Gain Switching Rate	100	%	○		
P2-02	PFG	Position Feed Forward Gain	0	%	○		
P2-03	PFF	Smooth Constant of Position Feed Forward Gain	5	ms	○		
P2-04	KVP	Proportional Speed Loop Gain	300	rad/s	○	○	
P2-05	SPR	Speed Loop Gain Switching Rate	100	%	○	○	
P2-06	KVI	Speed Integral Compensation	50	rad/s	○	○	
P2-07	SFG	Speed Feed Forward Gain	0	%		○	
P2-08■	PCTL	Special Factory Setting	0	N/A	○	○	○
P2-09	DRT	Bounce Filter	2	2ms	○	○	○
P2-10	DI1	Digital Input Terminal 1 (DI1)	101	N/A	○	○	○
P2-11	DI2	Digital Input Terminal 2 (DI2)	102	N/A	○	○	○
P2-12	DI3	Digital Input Terminal 3 (DI3)	104	N/A	○	○	○
P2-13	DI4	Digital Input Terminal 4 (DI4)	22	N/A	○	○	○
P2-14	DI5	Digital Input Terminal 5 (DI5)	23	N/A	○	○	○
P2-15	DI6	Digital Input Terminal 6 (DI6)	21	N/A	○	○	○
P2-16 ~ P2-17	Reserved						
P2-18	DO1	Digital Output Terminal 1 (DO1)	101	N/A	○	○	○
P2-19	DO2	Digital Output Terminal 2 (DO2)	103	N/A	○	○	○
P2-20	DO3	Digital Output Terminal 3 (DO3)	7	N/A	○	○	○
P2-21 ~ P2-22	Reserved						
P2-23	NCF	Notch Filter (Resonance Suppression)	1000	Hz	○	○	○
P2-24	DPH	Notch Filter Attenuation Rate (Resonance Suppression)	0	dB	○	○	○
P2-25	NLP	Low-pass Filter Time Constant (Resonance Suppression)	20	0.1ms	○	○	○
P2-26	DST	External Anti-Interference Gain	0	N/A	○	○	○
P2-27	GCC	Gain Switching Control Selection	0	N/A	○	○	
P2-28	GUT	Gain Switching Time Constant	10	10ms	○	○	
P2-29	GPE	Gain Switching Condition	10000	pulse Kpps rpm	○	○	
P2-30■	INH	Auxiliary Function	0	N/A	○	○	○

Extension Parameters							
Parameter	**Name**	**Function**	**Default**	**Unit**	**Control Mode**		
					P	**S**	**T**
P2-31■	AUT1	Auto Stiffness and Responsiveness Level	6	N/A	○	○	○
P2-32▲	AUT2	Tuning Mode Selection	0	N/A	○	○	○
P2-33	Reserved						
P2-34	SDEV	Overspeed Warning Condition	5000	rpm		○	
P2-35	PDEV	Excessive Error Warning Condition	3000	10pls	○		
P2-36	OVL	Overload Protection Level	100	%	○	○	○
P2-37	OVW	Output Overload Warning Level	50%	N/A	○	○	○
P2-38	GBIT	Special Function	0	N/A	○	○	○
P2-39 ~ P2-43	Reserved						
P2-44	ATUR	Motor Rotation Number	2	turn	○	○	○
P2-45	AFRQ	Motor Rotation Frequency	10	0.1Hz	○	○	○
P2-46	ATME	Motor Rotation Time	15	sec	○	○	○
P2-47■	ASTR	Auto-Tuning Start Function	0	N/A	○	○	○
P2-48	CLRT	Pulse Deviation Clear Mode	0	N/A	○		
P2-49	SJIT	Speed Detection Filter and Jitter Suppression	110	N/A	○	○	

Explanation of symbols (marked after parameter)

(★) Read-only register.
(▲) Parameter cannot be set when Servo On (when the servo drive is enabled).
(●) Parameter is effective only after the servo drive is restarted (after switching power off and on).
(■) Parameter setting values are not retained when power is off.

Group 3: P3-xx

Communication Parameters							
Parameter	**Name**	**Function**	**Default**	**Unit**	**Control Mode**		
					P	**S**	**T**
P3-00	ADR	Communication Address Setting	1	N/A	○	○	○
P3-01	BRT	Transmission Speed	3	bps	○	○	○
P3-02	PTL	Communication Protocol	0	N/A	○	○	○
P3-03	FLT	Transmission Fault Treatment	0	N/A	○	○	○
P3-04	CWD	Communication Time Out Detection	0	sec	○	○	○
P3-05	Reserved						
P3-06■	SDI	Digital Input Communication Function	0	N/A	○	○	○
P3-07	CDT	Communication Response Delay Time	0	ms	○	○	○

Explanation of symbols (marked after parameter)

(★) Read-only register.
(▲) Parameter cannot be set when Servo On (when the servo drive is enabled).
(●) Parameter is effective only after the servo drive is restarted (after switching power off and on).
(■) Parameter setting values are not retained when power is off.

Group 4: P4-xx

Diagnosis Parameters							
Parameter	**Name**	**Function**	**Default**	**Unit**	**Control Mode**		
					P	**S**	**T**
P4-00★	ASH1	Fault Record (N)	0	N/A	○	○	○
P4-01★	ASH2	Fault Record (N-1)	0	N/A	○	○	○
P4-02★	ASH3	Fault Record (N-2)	0	N/A	○	○	○
P4-03★	ASH4	Fault Record (N-3)	0	N/A	○	○	○
P4-04★	ASH5	Fault Record (N-4)	0	N/A	○	○	○
P4-05	JOG	JOG Operation	20	rpm	○	○	○
P4-06▲■	FOT	Force Output Control	0	N/A	○	○	○
P4-07■	ITST	Input Status or Force Input Control	N/A	N/A	○	○	○
P4-08	Reserved						
P4-09★	MOT	Output Status Display	N/A	N/A	○	○	○
P4-10▲	CEN	Adjustment Function	0	N/A	○	○	○
P4-11	SOF1	Analog Speed Input Drift Adjustment 1	Factory setting	N/A	○	○	○
P4-12	SOF2	Analog Speed Input Drift Adjustment 2	Factory setting	N/A	○	○	○
P4-13	TOF1	Analog Torque Drift Adjustment 1	Factory setting	N/A	○	○	○
P4-14	Reserved						
P4-15	COF1	Current Detector Drift Adjustment (V1 phase)	Factory setting	N/A	○	○	○
P4-16	COF2	Current Detector Drift Adjustment (V2 phase)	Factory setting	N/A	○	○	○
P4-17	COF3	Current Detector Drift Adjustment (W1 phase)	Factory setting	N/A	○	○	○
P4-18	COF4	Current Detector Drift Adjustment (W2 phase)	Factory setting	N/A	○	○	○
P4-19	TIGB	IGBT NTC Calibration	Factory setting	N/A	○	○	○
P4-20	Reserved						
P4-21	Reserved						
P4-22	SAO	Analog Speed Input Offset	0	mV		○	
P4-23	TAO	Analog Torque Input Offset	0	mV			○

Explanation of symbols (marked after parameter)

(★) Read-only register.
(▲) Parameter cannot be set when Servo On (when the servo drive is enabled).
(●) Parameter is effective only after the servo drive is restarted (after switching power off and on).
(■) Parameter setting values are not retained when power is off.

Group 8: P8-xx

Keypad Parameters							
Parameter	**Name**	**Function**	**Default**	**Unit**	**Control Mode**		
					P	**S**	**T**
P8-00★	KVER	Keypad Firmware Version	Factory setting	N/A	○	○	○
P8-01	KFUN	Keypad Communication and Reset Setting	1	N/A	○	○	○
P8-02	Reserved						
P8-03	Reserved						
P8-04	Reserved						
P8-05	KADR	Communication Address Setting (Drive)	255	N/A	○	○	○
P8-06	KBRT	Transmission Speed (Keypad)	1	bps	○	○	○
P8-07	KPTL	Communication Protocol (Keypad)	0	N/A	○	○	○
P8-08	KCMM	Communication Selection (Keypad)	0	N/A	○	○	○
P8-09	KTST	Keypad Hardware Testing	0	N/A	○	○	○
P8-10	KBLT	LCD Backlight Display	0	N/A	○	○	○
P8-11	KCLR	Memory Block Clear	0	N/A	○	○	○
P8-12	KRNO	Memory Block Position Number (ROMx)	0	N/A	○	○	○
P8-13★	KBL0	Status of Memory Block (ROMx)	0	N/A	○	○	○
P8-14★	KBL1	Firmware Version of Memory Block (ROMx)	0	N/A	○	○	○

Explanation of symbols (marked after parameter)

(★) Read-only register.
(▲) Parameter cannot be set when Servo On (when the servo drive is enabled).
(●) Parameter is effective only after the servo drive is restarted (after switching power off and on).
(■) Parameter setting values are not retained when power is off.

7.2.2 Parameters List by Function

Monitor and General Use							
Parameter	**Name**	**Function**	**Default**	**Unit**	**Control Mode**		
					P	**S**	**T**
P0-00★	VER	Firmware Version	Factory setting	N/A	○	○	○
P0-01★	ALE	Drive Fault Code	N/A	N/A	○	○	○
P0-02	STS	Drive Status	0	N/A	○	○	○
P0-04	CM1	Status Monitor 1	0	N/A	○	○	○
P0-05	CM2	Status Monitor 2	0	N/A	○	○	○
P0-06	CM3	Status Monitor 3	0	N/A	○	○	○
P1-03	AOUT	Pulse Output Polarity Setting	0	N/A	○	○	○

Smooth Filter and Resonance Suppression							
Parameter	**Name**	**Function**	**Default**	**Unit**	**Control Mode**		
					P	**S**	**T**
P1-06	SFLT	Accel / Decel Smooth Constant of Analog Speed Command (Low-pass Filter)	0	ms		○	
P1-07	TFLT	Smooth Constant of Analog Torque Command (Low-pass Filter)	0	ms			○
P1-08	PFLT	Smooth Constant of Position Command (Low-pass Filter)	0	10ms	○		
P1-34	TACC	Acceleration Time	200	ms		○	
P1-35	TDEC	Deceleration Time	200	ms		○	
P1-36	TSL	Accel / Decel S-curve	0	ms		○	
P2-23	NCF	Notch Filter (Resonance Suppression)	1000	Hz	○	○	○
P2-24	DPH	Notch Filter Attenuation Rate (Resonance Suppression)	0	dB	○	○	○
P2-25	NLP	Low-pass Filter Time Constant (Resonance Suppression)	20	0.1ms	○	○	○
P2-49	SJIT	Speed Detection Filter and Jitter Suppression	110	N/A	○	○	

Explanation of symbols (marked after parameter)

(★) Read-only register.
(▲) Parameter cannot be set when Servo On (when the servo drive is enabled).
(●) Parameter is effective only after the servo drive is restarted (after switching power off and on).
(■) Parameter setting values are not retained when power is off.

Gain and Switch							
Parameter	**Name**	**Function**	**Default**	**Unit**	**Control Mode**		
					P	**S**	**T**
P2-00	KPP	Proportional Position Loop Gain	50	rad/s	○		
P2-01	PPR	Position Loop Gain Switching Rate	100	%	○		
P2-02	PFG	Position Feed Forward Gain	0	%	○		
P2-03	PFF	Smooth Constant of Position Feed Forward Gain	5	ms	○		
P2-04	KVP	Proportional Speed Loop Gain	300	rad/s	○	○	
P2-05	SPR	Speed Loop Gain Switching Rate	100	%	○	○	
P2-06	KVI	Speed Integral Compensation	50	rad/s	○	○	
P2-07	SFG	Speed Feed Forward Gain	0	%		○	
P2-26	DST	External Anti-Interference Gain	0	N/A	○	○	○
P2-27	GCC	Gain Switching Control Selection	0	N/A	○	○	
P2-28	GUT	Gain Switching Time Constant	10	10ms	○	○	
P2-29	GPE	Gain Switching Condition	10000	pulse Kpps rpm	○	○	
P2-31■	AUT1	Auto Stiffness and Responsiveness Level	6	N/A	○	○	○
P2-32▲	AUT2	Tuning Mode Selection	0	N/A	○	○	○

Explanation of symbols (marked after parameter)

(★) Read-only register.

(▲) Parameter cannot be set when Servo On (when the servo drive is enabled).

(●) Parameter is effective only after the servo drive is restarted (after switching power off and on).

(■) Parameter setting values are not retained when power is off.

Position Control							
Parameter	**Name**	**Function**	**Default**	**Unit**	**Control Mode**		
					P	**S**	**T**
P1-01●	CTL	Control Mode and Output Direction	0	pulse rpm N.M	○	○	○
P1-02▲	PSTL	Speed and Torque Limit	0	N/A	○	○	○
P1-55	MSPD	Maximum Speed Limit	rated speed	rpm	○	○	○
P1-12 ~ P1-14	TQ1 ~ 3	1st ~ 3rd Torque Limit	100	%	○	○	○
P1-46▲	GR3	Encoder Output Pulse Number	2500	pulse	○	○	○
External pulse control command (P mode)							
P1-00▲	PTT	External Pulse Input Type	2	---	○		
P1-41▲	TCM	Max. Analog Torque Limit	100	%	○	○	
P1-44▲	GR1	Electronic Gear Ratio (1st Numerator) (N1)	1	pulse	○		
P1-45▲	GR2	Electronic Gear Ratio (Denominator)	1	pulse	○		
P1-15▲	GR4	Electronic Gear Ratio (2nd Numerator) (N2)	1	pulse	○		

Explanation of symbols (marked after parameter)

(★) Read-only register.

(▲) Parameter cannot be set when Servo On (when the servo drive is enabled).

(●) Parameter is effective only after the servo drive is restarted (after switching power off and on).

(■) Parameter setting values are not retained when power is off.

Speed Control							
Parameter	**Name**	**Function**	**Default**	**Unit**	**Control Mode**		
					P	**S**	**T**
P1-01●	CTL	Control Mode and Output Direction	0	pulse rpm N.M	○	○	○
P1-02▲	PSTL	Speed and Torque Limit	0	N/A	○	○	○
P1-46▲	GR3	Encoder Output Pulse Number	2500	pulse	○	○	○
P1-55	MSPD	Maximum Speed Limit	rated speed	rpm	○	○	○
P1-09 ~ P1-11	SPD1 ~ 3	1st ~ 3rd Speed Command	100 ~300	rpm		○	○
P1-12 ~ P1-14	TQ1 ~ 3	1st ~ 3rd Torque Limit	100	%	○	○	○
P1-40▲	VCM	Max. Analog Speed Command	rated speed	rpm		○	
P1-41▲	TCM	Max. Analog Torque Limit	100	%	○	○	

Torque Control							
Parameter	**Name**	**Function**	**Default**	**Unit**	**Control Mode**		
					P	**S**	**T**
P1-01●	CTL	Control Mode and Output Direction	0	pulse rpm N.M	○	○	○
P1-02▲	PSTL	Speed and Torque Limit	0	N/A	○	○	○
P1-55	MSPD	Maximum Speed Limit	rated speed	rpm	○	○	○
P1-09 ~ P1-11	SPD1 ~ 3	1st ~ 3rd Speed Limit	100 ~ 300	rpm		○	○
P1-12 ~ P1-14	TQ1 ~ 3	1st ~ 3rd Torque Command	100	%	○	○	○
P1-40▲	VCM	Max. Analog Speed Limit	rated speed	rpm			○
P1-41▲	TCM	Max. Analog Torque Command	100	%			○

Explanation of symbols (marked after parameter)

(★) Read-only register.

(▲) Parameter cannot be set when Servo On (when the servo drive is enabled).

(●) Parameter is effective only after the servo drive is restarted (after switching power off and on).

(■) Parameter setting values are not retained when power is off.

Digital I/O and relative input output setting

Digital I/O							
Parameter	Name	Function	Default	Unit	Control Mode		
					P	S	T
P2-09	DRT	Bounce Filter	2	2ms	○	○	○
P2-10	DI1	Digital Input Terminal 1 (DI1)	101	N/A	○	○	○
P2-11	DI2	Digital Input Terminal 2 (DI2)	102	N/A	○	○	○
P2-12	DI3	Digital Input Terminal 3 (DI3)	104	N/A	○	○	○
P2-13	DI4	Digital Input Terminal 4 (DI4)	22	N/A	○	○	○
P2-14	DI5	Digital Input Terminal 5 (DI5)	23	N/A	○	○	○
P2-15	DI6	Digital Input Terminal 6 (DI6)	21	N/A	○	○	○
P2-18	DO1	Digital Output Terminal 1 (DO1)	101	N/A	○	○	○
P2-19	DO2	Digital Output Terminal 2 (DO2)	103	N/A	○	○	○
P2-20	DO3	Digital Output Terminal 3 (DO3)	7	N/A	○	○	○
P1-38	ZSPD	Zero Speed Range Setting	10	rpm	○	○	○
P1-39	SSPD	Target Rotation Speed	3000	rpm	○	○	○
P1-42	MBT1	On Delay Time of Electromagnetic Brake	100	ms	○	○	○
P1-43	MBT2	OFF Delay Time of Electromagnetic Brake	100	ms	○	○	○
P1-54	PER	Positioning Completed Width	100	pulse	○		

Explanation of symbols (marked after parameter)

(★) Read-only register.

(▲) Parameter cannot be set when Servo On (when the servo drive is enabled).

(●) Parameter is effective only after the servo drive is restarted (after switching power off and on).

(■) Parameter setting values are not retained when power is off.

Communication							
Parameter	**Name**	**Function**	**Default**	**Unit**	**Control Mode**		
					P	**S**	**T**
P3-00	ADR	Communication Address Setting	1	N/A	○	○	○
P3-01	BRT	Transmission Speed	3	bps	○	○	○
P3-02	PTL	Communication Protocol	0	N/A	○	○	○
P3-03	FLT	Transmission Fault Treatment	0	N/A	○	○	○
P3-04	CWD	Communication Time Out Detection	0	sec	○	○	○
P3-06■	SDI	Digital Input Communication Function	0	N/A	○	○	○
P3-07	CDT	Communication Response Delay Time	0	ms	○	○	○

Explanation of symbols (marked after parameter)

(★) Read-only register.

(▲) Parameter cannot be set when Servo On (when the servo drive is enabled).

(●) Parameter is effective only after the servo drive is restarted (after switching power off and on).

(■) Parameter setting values are not retained when power is off.

Diagnosis Parameters							
Parameter	**Name**	**Function**	**Default**	**Unit**	**Control Mode**		
					P	**S**	**T**
P4-00★	ASH1	Fault Record (N)	0	N/A	○	○	○
P4-01★	ASH2	Fault Record (N-1)	0	N/A	○	○	○
P4-02★	ASH3	Fault Record (N-2)	0	N/A	○	○	○
P4-03★	ASH4	Fault Record (N-3)	0	N/A	○	○	○
P4-04★	ASH5	Fault Record (N-4)	0	N/A	○	○	○
P4-05	JOG	JOG Operation	20	rpm	○	○	○
P4-06▲■	FOT	Force Output Control	0	N/A	○	○	○
P4-07■	ITST	Input Status or Force Input Control	N/A	N/A	○	○	○
P4-09★	MOT	Output Status Display	N/A	N/A	○	○	○
P4-10▲	CEN	Adjustment Function	0	N/A	○	○	○
P4-11	SOF1	Analog Speed Input Drift Adjustment 1	Factory setting	N/A	○	○	○
P4-12	SOF2	Analog Speed Input Drift Adjustment 2	Factory setting	N/A	○	○	○
P4-13	TOF1	Analog Torque Drift Adjustment 1	Factory setting	N/A	○	○	○
P4-15	COF1	Current Detector Drift Adjustment (V1 phase)	Factory setting	N/A	○	○	○
P4-16	COF2	Current Detector Drift Adjustment (V2 phase)	Factory setting	N/A	○	○	○
P4-17	COF3	Current Detector Drift Adjustment (W1 phase)	Factory setting	N/A	○	○	○
P4-18	COF4	Current Detector Drift Adjustment (W2 phase)	Factory setting	N/A	○	○	○
P4-19	TIGB	IGBT NTC Calibration	Factory setting	N/A	○	○	○
P4-22	SAO	Analog Speed Input Offset	0	mV		○	
P4-23	TAO	Analog Torque Input Offset	0	mV			○

Explanation of symbols (marked after parameter)

(★) Read-only register.

(▲) Parameter cannot be set when Servo On (when the servo drive is enabled).

(●) Parameter is effective only after the servo drive is restarted (after switching power off and on).

(■) Parameter setting values are not retained when power is off.

Others							
Parameter	**Name**	**Function**	**Default**	**Unit**	**Control Mode**		
					P	**S**	**T**
P1-32	LSTP	Motor Stop Mode Selection	0	N/A	○	○	○
P1-37	GDR	Ratio of Load Inertia to Servo Motor Inertia	10	0.1 times	○	○	○
P1-52	RES1	Regenerative Resistor Value	40	Ohm	○	○	○
P1-53	RES2	Regenerative Resistor Capacity	60	Watt	○	○	○
P2-08■	PCTL	Special Factory Setting	0	N/A	○	○	○
P2-30■	INH	Auxiliary Function	0	N/A	○	○	○
P2-34	SDEV	Overspeed Warning Condition	5000	rpm		○	
P2-35	PDEV	Excessive Error Warning Condition	3000	10pls	○		
P2-36	OVL	Overload Protection Level	100	%	○	○	○
P2-37	OVW	Output Overload Warning Level	50%	N/A	○	○	○
P2-38	GBIT	Special Function	0	N/A	○	○	○

Explanation of symbols (marked after parameter)

(★) Read-only register.

(▲) Parameter cannot be set when Servo On (when the servo drive is enabled).

(●) Parameter is effective only after the servo drive is restarted (after switching power off and on).

(■) Parameter setting values are not retained when power is off.

Keypad Parameters							
Parameter	**Name**	**Function**	**Default**	**Unit**	**Control Mode**		
					P	**S**	**T**
P8-00★	KVER	Keypad Firmware Version	Factory setting	N/A	○	○	○
P8-01	KFUN	Keypad Communication and Reset Setting	1	N/A	○	○	○
P8-05	KADR	Communication Address Setting (Drive)	255	N/A	○	○	○
P8-06	KBRT	Transmission Speed (Keypad)	1	bps	○	○	○
P8-07	KPTL	Communication Protocol (Keypad)	0	N/A	○	○	○
P8-08	KCMM	Communication Selection (Keypad)	0	N/A	○	○	○
P8-09	KTST	Keypad Hardware Testing	0	N/A	○	○	○
P8-10	KBLT	LCD Backlight Display	0	N/A	○	○	○
P8-11	KCLR	Memory Block Clear	0	N/A	○	○	○
P8-12	KRNO	Memory Block Position Number (ROMx)	0	N/A	○	○	○
P8-13★	KBL0	Status of Memory Block (ROMx)	0	N/A	○	○	○
P8-14★	KBL1	Firmware Version of Memory Block (ROMx)	0	N/A	○	○	○

Explanation of symbols (marked after parameter)

(★) Read-only register.

(▲) Parameter cannot be set when Servo On (when the servo drive is enabled).

(●) Parameter is effective only after the servo drive is restarted (after switching power off and on).

(■) Parameter setting values are not retained when power is off.

7.3 Detailed Parameter Listings

Group 0: P0-xx Monitor Parameters

P0 - 00★	VER	Firmware Version	Communication Addr.: 0000H

Default: Factory setting

Related Section: N/A

Applicable Control Mode: P/S/T

Unit: N/A

Range: N/A

P0 - 01★	ALE	Drive Fault Code	Communication Addr.: 0001H

Default: Factory setting

Related Section:

Applicable Control Mode: P/S/T

Chapter 10

Unit: N/A

Range: 1 ~ 20

Settings:

1 : Overcurrent (Note 1)

2 : Overvoltage (Note 2)

3 : Undervoltage (Note 2)

4 : Z Pulse shift (Note 3)

5 : Regeneration error (Note 1)

6 : Overload (Note 1)

7 : Overspeed (Note 1)

8 : Abnormal pulse control command (Note 1)

9 : Excessive deviation (Note 1)

A : Serial communication error (Note 2)

b : Encoder error (Position detector fault) (Note 3)

C : Adjustment error (Note 1)

d : Emergency stop (Note 2)

E : Reverse (CWL) limit error (Note 2)

F : Forward (CCWL) limit error (Note 2)

G : IGBT temperature error (Note 2)

h : Memory error (Note 4)

J : Serial communication time out (Note 2)

L : Motor type error (Note 2)

P : Input power phase loss (Note 2)

NOTE

1) When this fault occurs, users can use ARST signal to clear the fault message.
2) This fault can be cleared automatically when users eliminate the error source. Using ARST signal can not clear this fault message.
3) This fault can not be cleared even if users eliminate the error source. Users must restart the servo drive (after switching power off and on) and then the fault can be cleared.
4) When this fault occurs, it indicates the internal EEPROM may be damaged and using ARST signal can not clear this fault message.

The fault display shown on PC-Based communication software and Keypad:

Settings:

1 : Overcurrent

2 : Overvoltage

3 : Undervoltage

4 : Z Pulse shift

5 : Regeneration error

6 : Overload

7 : Overspeed

8 : Abnormal pulse control command

9 : Excessive deviation

10 : Serial communication error

11 : Encoder error (Position detector fault)

12 : Adjustment error

13 : Emergency stop

14 : Reverse (CWL) limit error

15 : Forward (CCWL) limit error

16 : IGBT temperature error

17 : Memory error

18 : Serial communication time out

19 : Motor type error

20 : Input power phase loss

P0 - 02	STS	Drive Status	Communication Addr.: 0002H

Default: 0

Related Section:

Applicable Control Mode: P/S/T

Section 4.3.5

Unit: N/A

Range: 0 ~ 15

Settings:

0 : Motor feedback pulse number [pulse]

1 : Motor feedback rotation number [rev]

2 : Pulse counts of pulse command [pulse]

3 : Rotation number of pulse command [rev]

4 : Position error counts [pulse]

5 : Input frequency of pulse command [kHz]

6 : Motor rotation speed [rpm]

7 : Speed input command [volt]

8 : Speed input command [rpm]

9 : Torque input command [volt]

10 : Torque input command [Nt-M]

11 : Average load [%]

12 : Peak load [%]

13 : Main circuit voltage [volt]

14 : Ratio of load inertia to Motor inertia [time]

15 : IGBT Temperature of power supply module [°C]

P0 - 03	Reserved	Communication Addr.: 0003H

P0 - 04	CM1	Status Monitor 1	Communication Addr.: 0004H

Default: 0

Related Section:

Applicable Control Mode: P/S/T

P0-02

Unit: N/A

Range: Write: 0 ~ 15, Read: N/A

Settings:

Select the desired drive status through communication setting or the keypad (please refer to P0-02). The drive status can be read from the communication address of this parameter via communication port.

For example:

Set P0-04 to 1 and then all consequent reads of P0-04 will return the motor feedback rotation number in turn.

P0 - 05	CM2	Status Monitor 2	Communication Addr.: 0005H

Default: 0

Applicable Control Mode: P/S/T

Unit: N/A

Range: 0 ~ 15

Settings:

See P0-04 for explanation.

Related Section:

P0-02

P0 - 06	CM3	Status Monitor 3	Communication Addr.: 0006H

Default: 0

Applicable Control Mode: P/S/T

Unit: N/A

Range: 0 ~ 15

Settings:

See P0-04 for explanation.

Related Section:

P0-02

P0 - 07	Reserved	Communication Addr.: 0007H

P0 - 08	Reserved	Communication Addr.: 0008H

P0 - 09★	SVSTS	Servo Output Status Display	Communication Addr.: 0009H

Default: 0

Applicable Control Mode: P/S/T

Unit: N/A

Range: N/A

Settings:

Bit0: SRDY (Servo ready)

Bit1: SON (Servo On)

Bit2: ZSPD (Zero speed)

Bit3: TSPD (Speed reached)

Bit4: TPOS (Positioning completed)

Bit5: TQL (Reached torques limits)

Bit6: OLW (Overload warning)

Bit7: ALRM (Servo alarm output)

Bit8: BRKR (Electromagnetic brake)

Related Section:

Table 7.B

Bit9: WARN (Servo warning output. WARN is activated when the drive has detected Reverse limit error, Forward limit error, Emergency stop, Serial communication error, and Undervoltage these fault conditions.)

Bit10 ~ 15 : Reserved

Group 1: P1-xx Basic Parameters

P1 - 00▲	PTT	External Pulse Input Type	Communication Addr.: 0100H

Default: 2

Applicable Control Mode: P

Unit: N/A

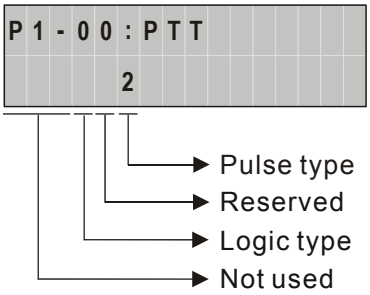
Range: 0 ~ 142

Settings:

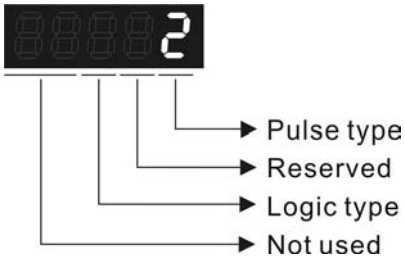
Related Section:

Section 3.3.3, Section 3.6.1, Section 6.2.1

ASD-PU-01A



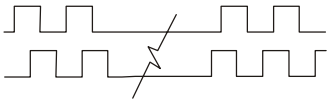
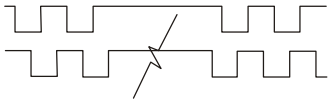
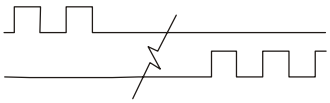
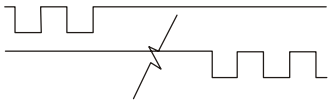
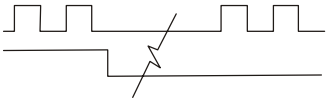
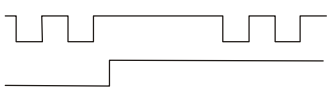
ASD-PU-01B



- Pulse type
  0: AB phase pulse (4x)
  1: CW + CCW pulse
  2: Pulse + Direction
  Other setting: Reversed

Input pulse interface	Max. input pulse frequency
Line driver	500kpps
Open collector	200kpps

- Logic type

Pulse Type	0=Positive Logic		1=Negative Logic	
	Forward	Reverse	Forward	Reverse
AB phase pulse				
CW + CCW pulse				
Pulse + Direction				

P1 - 01●	CTL	Control Mode and Output Direction	Communication Addr.: 0101H

Default: 0

Applicable Control Mode: P/S/T

Unit: pulse (P mode), rpm (S mode), N.M (T mode)

Range: 0 ~ 110

Settings:

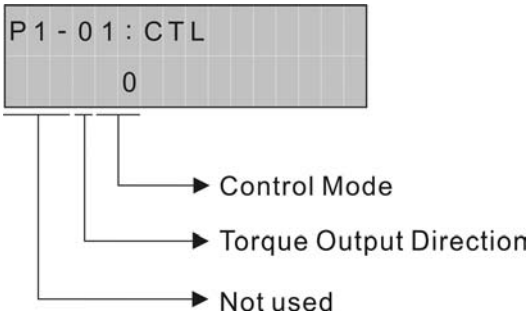
Related Section:

P mode: See Section 6.2.1

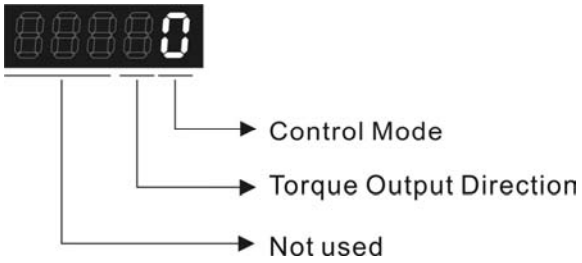
S, Sz mode: See Section 6.3.1

T, Tz mode: See Section 6.4.1

ASD-PU-01A



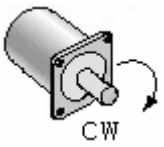
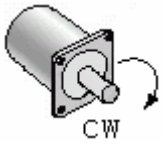
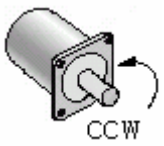
ASD-PU-01B



- Control Mode Settings:

	P	S	T	Sz	Tz
00	▲				
02		▲			
03			▲		
04				▲	
05					▲
06	▲	▲			
07	▲		▲		
10		▲	▲		

- Torque Output Direction Settings:

	0	1
Forward		
Reverse		

P: Position control mode (command from external signal)

S: Speed control mode (external command / internal command)

T: Torque control mode (external command / internal command)

Sz: Zero speed control mode (internal speed command)

Tz: Zero torque control mode (internal torque command)

P1 - 02▲	PSTL	Speed and Torque Limit	Communication Addr.: 0102H

Default: 0

Applicable Control Mode: P/S/T

Unit: N/A

Range: 0 ~ 11

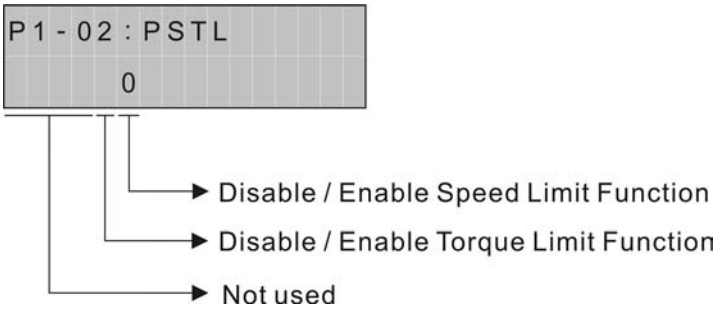
Related Section:

Section 6.1.1, Section 6.6.2

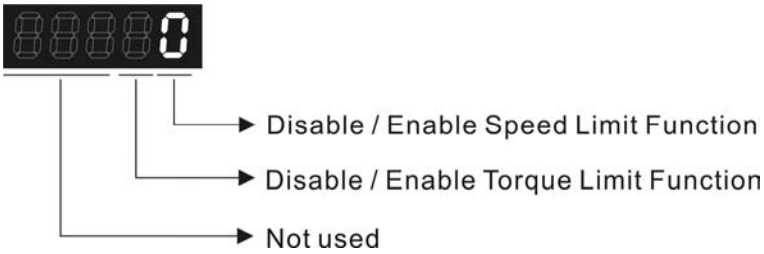
Table 7.A

Settings:

ASD-PU-01A



ASD-PU-01B



- Disable / Enable Speed Limit Function Settings

  0: Disable Speed Limit Function

  1: Enable Speed Limit Function (It is valid only in Torque mode)

  The source of speed limit is determined by the speed command (SPD1, SPD0) of DI signal.

DI Name	DI Status	Command Source
SPD1, SPD0	Not select (Note 1)	External analog command
	00	
	01	P1-09
	10	P1-10
	11	P1-11

- Disable / Enable Torque Limit Function Settings

  0: Disable Torque Limit Function

  1: Enable Torque Limit Function (It is valid only in Position and Speed mode)

  The source of torque limit is determined by the torque command (TCM1, TCM0) of DI signal.

DI Name	DI Status	Command Source
TCM1, TCM0	Not select (Note 1)	External analog command
	00	
	01	P1-09
	10	P1-10
	11	P1-11

NOTE

1) DI signal can be selected by parameter P2-11 to P2-15 and Table 7.A.

P1 - 03	AOUT	Pulse Output Polarity Setting	Communication Addr.: 0103H

Default: 0

Applicable Control Mode: P/S/T

Unit: N/A

Range: 0 ~ 1

Settings:

- Pulse Output Polarity Settings (A/B phase deviation from 90 degrees (Quadrature))

  0: Forward output

  1: Reverser output

Related Section:

P1-46

P1 - 04	Reserved	Communication Addr.: 0104H

P1 - 05	Reserved	Communication Addr.: 0105H

P1 - 06	SFLT	Accel / Decel Smooth Constant of Analog Speed Command (Low-pass Filter)	Communication Addr.: 0106H

Default: 0

Applicable Control Mode: S

Unit: ms

Range: 0 ~ 1000 (0: Disabled)

Related Section:

Section 6.3.3

P1 - 07	TFLT	Smooth Constant of Analog Torque Command (Low-pass Filter)	Communication Addr.: 0107H

Default: 0

Applicable Control Mode: T

Unit: ms

Range: 0 ~ 1000 (0: Disabled)

Related Section:

Section 6.4.3

P1 - 08	PFLT	Smooth Constant of Position Command (Low-pass Filter)	Communication Addr.: 0108H

Default: 0

Applicable Control Mode: P

Unit: 10ms

Range: 0 ~ 1000 (0: Disabled)

Related Section:

Section 6.2.5

P1 - 09	SPD1	1st Speed Command or Limit	Communication Addr.: 0109H

Default: 100

Applicable Control Mode: S/T

Unit: rpm

Range: -5000 ~ +5000

Settings:

Related Section:

S mode: Section 6.3.5

T mode: P1-02

1st Speed Command

In Speed mode, this parameter is used to set speed 1 of internal speed command.

1st Speed Limit

In Torque mode, this parameter is used to set speed limit 1 of internal speed command.

P1 - 10	SPD2	2nd Speed Command or Limit	Communication Addr.: 010AH

Default: 200

Applicable Control Mode: S/T

Unit: rpm

Range: -5000 ~ +5000

Settings:

Related Section:

S mode: Section 6.3.5

T mode: P1-02

2nd Speed Command

In Speed mode, this parameter is used to set speed 2 of internal speed command.

2nd Speed Limit

In Torque mode, this parameter is used to set speed limit 2 of internal speed command.

P1 - 11	SPD3	3rd Speed Command or Limit	Communication Addr.: 010BH

Default: 300

Applicable Control Mode: S/T

Unit: rpm

Range: -5000 ~ +5000

Settings:

Related Section:

S mode: Section 6.3.5

T mode: P1-02

3rd Speed Command

In Speed mode, this parameter is used to set speed 3 of internal speed command.

3rd Speed Limit

In Torque mode, this parameter is used to set speed limit 3 of internal speed command.

P1 - 12	TQ1	1st Torque Command or Limit	Communication Addr.: 010CH

Default: 100

Applicable Control Mode: T / P, S

Unit: %

Range: -300 ~ +300

Settings:

Related Section:

T mode: Section 6.4.5

P, S mode: P1-02

1st Torque Command

In Torque mode, this parameter is used to set torque 1 of internal torque command.

1st Torque Limit

In Position and Speed mode, this parameter is used to set torque limit 1 of internal torque command.

P1 - 13	TQ2	2nd Torque Command or Limit	Communication Addr.: 010DH

Default: 100

Applicable Control Mode: T / P, S

Unit: %

Range: -300 ~ +300

Settings:

Related Section:

T mode: Section 6.4.5

P, S mode: P1-02

2nd Torque Command

In Torque mode, this parameter is used to set torque 2 of internal torque command.

2nd Torque Limit

In Position and Speed mode, this parameter is used to set torque limit 2 of internal torque command.

P1 - 14	SPD3	3rd Torque Command or Limit	Communication Addr.: 010EH

Default: 100

Applicable Control Mode: T / P, S

Unit: rpm

Range: -300 ~ +300

Settings:

Related Section:

T mode: Section 6.4.5

P, S mode: P1-02

3rd Speed Command

In Torque mode, this parameter is used to set torque 3 of internal torque command.

3rd Speed Limit

In Position and Speed mode, this parameter is used to set torque limit 3 of internal torque command.

P1 - 15▲	GR4	Electronic Gear Ratio (2nd Numerator) (N2)	Communication Addr.: 010FH

Default: 1

Applicable Control Mode: P

Unit: pulse

Range: 1 ~ 32767

Settings:

Related Section:

Section 6.2.4, P1-44, P1-45

DI GNUM0(11) in Table 7.A

The electronic gear numerator value can be set via external DI signal (refer to Table 7.A).

DI Name	DI Status	Selected Electronic Gear
GNUM0	Not select (Note 1)	P1-44, P1-45
	0	P1-44, P1-45
	1	P1-44, P1-45



1) DI signal can be selected by parameter P2-10 to P2-15 and Table 7.A. If uses only need to use one group of electronic gear, it allows users not to select GNUM0.

P1 - 16	Reserved	Communication Addr.: 0110H

P1 - 17	Reserved	Communication Addr.: 0111H

P1 - 18	Reserved	Communication Addr.: 0112H

P1 - 19	Reserved	Communication Addr.: 0113H

P1 - 20	Reserved	Communication Addr.: 0114H

P1 - 21	Reserved	Communication Addr.: 0115H

P1 - 22	Reserved	Communication Addr.: 0116H

P1 - 23	Reserved	Communication Addr.: 0117H

P1 - 24	Reserved	Communication Addr.: 0118H

P1 - 25	Reserved	Communication Addr.: 0119H

P1 - 26	**Reserved**	**Communication Addr.: 011AH**
P1 - 27	**Reserved**	**Communication Addr.: 011BH**
P1 - 28	**Reserved**	**Communication Addr.: 011CH**
P1 - 29	**Reserved**	**Communication Addr.: 011DH**
P1 - 30	**Reserved**	**Communication Addr.: 011EH**
P1 - 31	**Reserved**	**Communication Addr.: 011FH**

P1 - 32	**LSTP**	**Motor Stop Mode Selection**	**Communication Addr.: 0120H**

Default: 0 Related Section: N/A

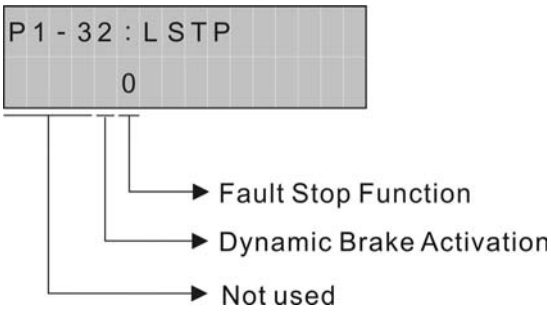
Applicable Control Mode: P/S/T

Unit: N/A

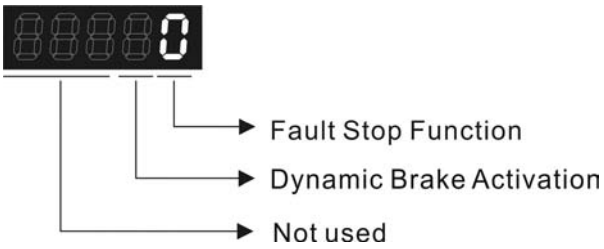
Range: 0 ~ 11

Settings: This parameter is used to select servo motor stop mode.

ASD-PU-01A



ASD-PU-01B



- Fault Stop Function Settings:

  When a fault occurs (except for CWL, CCWL, EMGS and serial communication error), it is used to set servo motor stop mode.

  0: Stop instantly

  1: Decelerate to stop

- Dynamic Brake Activation Settings:

  When a fault occurs (except for CWL, CCWL, EMGS and serial communication error), the servo drive will turn on (Servo On) and then off (Servo Off) automatically.

  0: Use dynamic brake when Servo Off (the servo drive is disabled).

  1: Allow servo motor to coast to stop when Servo Off (the servo drive is disabled).

P1 - 33	Reserved	Communication Addr.: 0121H

P1 - 34	TACC	Acceleration Time	Communication Addr.: 0122H

Default: 200

Applicable Control Mode: S

Unit: ms

Range: 1 ~ 20000

Settings:

It is used to determine the acceleration time to accelerate from 0 to its rated rotation speed.
(When P1-36 is set to 0: Accel/Decel function is disabled, i.e. P1-34, P1-35 is disabled)

Related Section:

P1-35, P1-36, Section 6.3.3

P1 - 35	TDEC	Deceleration Time	Communication Addr.: 0123H

Default: 200

Applicable Control Mode: S

Unit: ms

Range: 1 ~ 20000

Settings:

It is used to determine the deceleration time to decelerate from its rated rotation speed to 0.
(When P1-36 is set to 0: Accel/Decel function is disabled, i.e. P1-34, P1-35 is disabled)

Related Section:

P1-34, P1-36, Section 6.3.3

P1 - 36	TSL	Accel /Decel S-curve	Communication Addr.: 0124H

Default: 0

Applicable Control Mode: S

Unit: ms

Range: 0 ~ 10000 (0: Disabled)

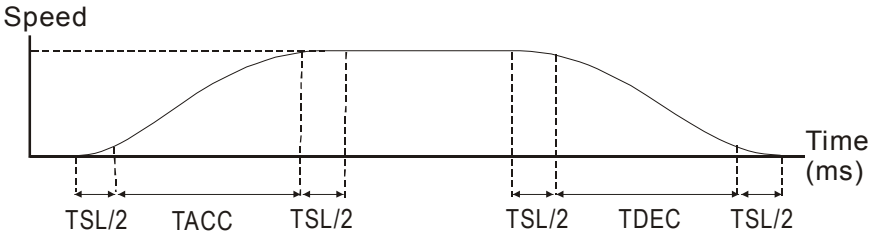
Settings:

This parameter is used to make the motor run more smoothly when startup and windup.

Using this parameter can improve the motor running stability.

Related Section:

P1-34, P1-35, Section 6.3.3



TSL: P1-36, Accel /Decel S-curve

TACC: P1-34, Acceleration time

TDEC: P1-35, Deceleration time

Total acceleration time = TACC + TSL

Total deceleration time = TDEC + TSL

P1 - 37	GDR	Ratio of Load Inertia to Servo Motor Inertia	Communication Addr.: 0125H

Default: 10

Applicable Control Mode: P/S/T

Unit: 0.1times

Range: 0 ~ 2000

Settings:

Ratio of load inertia to servo motor inertia: (J_load /J_motor)

Related Section:

P2-31, P2-32, Section 6.3.6

P1 - 38	ZSPD	Zero Speed Range Setting	Communication Addr.: 0126H

Default: 10

Applicable Control Mode: P/S/T

Unit: rpm

Range: 0 ~ 200

Settings:

This parameter is used to set output range of zero speed signal (ZSPD).

ZSPD is activated when the drive senses the motor is equal to or below the Zero Speed Range setting as defined in parameter P1-38.

For Example, at default ZSPD will be activated when the drive detects the motor rotating at speed at or below 10 rpm. ZSPD will remain activated until the motor speed increases above 10 RPM.

Related Section:

DO ZSPD(03) in Table 7.B

P1 - 39	SSPD	Target Rotation Speed	Communication Addr.: 0127H

Default: 3000

Applicable Control Mode: P/S/T

Unit: rpm

Range: 0 ~ 5000

Settings:

When target rotation speed reaches its preset value, digital output (TSPD) is enabled. When the forward and reverse speed of servo motor is equal and higher than the setting value, the motor will reach the target rotation speed, and then TSPD signal will output.

TSPD is activated once the drive has detected the motor has reached the Target Rotation Speed setting as defined in parameter P1-39. TSPD will remain activated until the motor speed drops below the Target Rotation Speed.

Related Section:

DO TSPD(04) in Table 7.B

P1 - 40▲	VCM	Max. Analog Speed Command or Limit	Communication Addr.: 0128H

Default: rated speed

Applicable Control Mode: S/T

Unit: rpm

Range: 0 ~ 5000

Settings:

Related Section:

Section 6.3.4, P1-55

In **Speed mode**, this parameter is used to set the speed at the maximum input voltage (10V) of the analog speed command.

In **Torque mode**, this parameter is used to set the speed at the maximum input voltage (10V) of the analog speed limit.

For example, in speed mode, if P1-40 is set to 3000 and the input voltage is 10V, it indicates that the speed command is 3000rpm. If P1-40 is set to 3000, but the input voltage is changed to 5V, then the speed command is changed to 1500rpm.

Speed command / limit = Input voltage x setting/10

P1 - 41▲	TCM	Max. Analog Torque Command or Limit	Communication Addr.: 0129H

Default: 100

Applicable Control Mode: T / S, P

Unit: %

Range: 0 ~ 300

Settings:

Related Section:

Section 6.4.4, P1-55

In **Torque mode**, this parameter is used to set the output torque at maximum input voltage (10V) of analog torque command.

In **Position** and **Speed mode**, this parameter is used to set output torque at maximum input voltage (10V) of analog torque limit

For example, in torque mode, if P1-41 is set to 100 and the input voltage is 10V, it indicates that the torque command is 100% rated torque. If P1-41 is set to 100, but the input voltage is changed to 5V, then the torque command is changed to 50% rated torque.

Torque command / limit = Input voltage x setting/10 (%)

P1 - 42	MBT1	On Delay Time of Electromagnetic Brake	Communication Addr.: 012AH

Default: 100

Applicable Control Mode: P/S/T

Unit: ms

Range: 0 ~ 1000

Settings:

Related Section:

DO BRKR(08) in Table 7.B

P1-43, Section 6.6.4

Used to set the period of time between when the servo drive is On (Servo On) and when electromagnetic brake output signal (BRKR) is activated.

P1 - 43	MBT2	OFF Delay Time of Electromagnetic Brake	Communication Addr.: 012BH

Default: 100

Applicable Control Mode: P/S/T

Unit: ms

Range: -1000 ~ 1000

Settings:

Related Section:

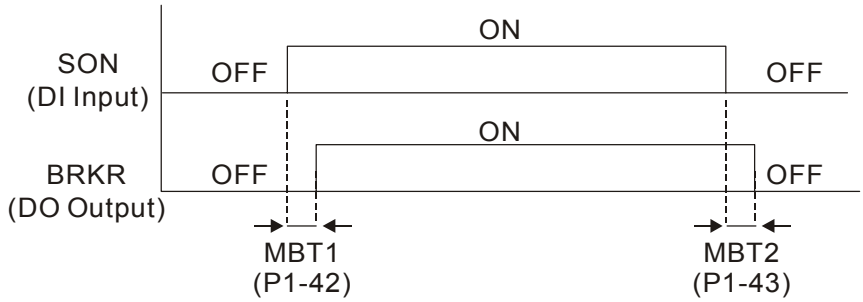
DO BRKR(08) in Table 7.B

P1-42, Section 6.6.4

Used to set the period of time between when the servo drive is Off (Servo Off) and when electromagnetic brake output signal (BRKR) is unactivated.

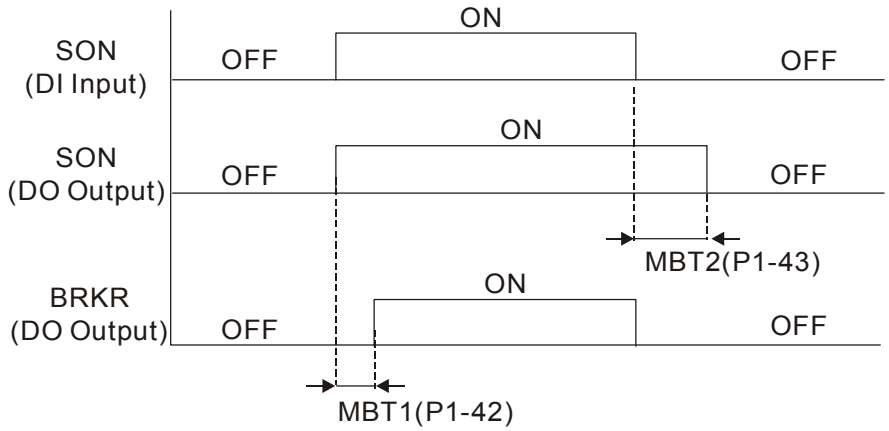
NOTE

1) When the setting value of P1-43 is higher than or equal to 0(zero)



When Servo Off (the servo motor is disabled), the BRKR output will be Off after the Off delay time set by P1-43.

2) When the setting value of P1-43 is lower than 0(zero)



When Servo Off (the servo motor is disabled) and the BRKR output is also Off, the servo drive will be Off after the Off delay time set by P1-43.

P1 - 44▲	GR1	Electronic Gear Ratio (1st Numerator) (N1)	Communication Addr.: 012CH

Default: 1

Applicable Control Mode: P

Unit: pulse

Range: 1 ~ 32767

Settings:

Related Section:

Section 6.2.4, P1-15, P1-45

DI GNUM0(11) in Table 7.A

The electronic gear numerator value can be set via external DI signal (refer to Table 7.A).

DI Name	DI Status	Selected Electronic Gear
GNUM0	Not select (Note 1)	P1-44, P1-45
	0	P1-44, P1-45
	1	P1-44, P1-45

NOTE

1) DI signal can be selected by parameter P2-10 to P2-15 and Table 7.A. If uses only need to use one group of electronic gear, it allows users not to select GNUM0.

P1 - 45▲	GR2	Electronic Gear Ratio (Denominator)	Communication Addr.: 012DH

Default: 1

Applicable Control Mode: P

Unit: pulse

Range: 1 ~ 32767

Settings:

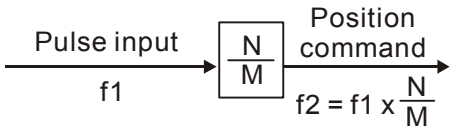
Related Section:

Section 6.2.4, P1-15, P1-44

DI GNUM0(11) in Table 7.A

Please set electronic gear ratio when the servo drive is Off (Servo Off). As the wrong setting can cause motor to run chaotically (out of control) and it may lead to personnel injury, therefore, ensure to observe the following rule when setting P1-44, P1-45.

The electronic gear ratio settings:



f1: Pulse input f2: Position command

N: Numerator, the setting value of P1-15 or P1-44

M: Denominator, the setting value of P1-45

The electronic gear ratio setting range must be within: 1/50<N/M<200.

In terms of the servo drive which the firmware version is V1.018 or above, the electronic gear ratio can be set when the servo drive is On (Servo On).

P1 - 46▲	GR3	Encoder Output Pulse Number	Communication Addr.: 012EH

Default: 2500

Applicable Control Mode: P/S/T

Unit: pulse

Range: 1 ~ 2500 (0 = By pass)

Settings:

This parameter is used to set the pulse number of encoder outputs.

Encoder output pulse number (A/B phase deviation from 90 degrees (Quadrature))

$$= \frac{2500ppr}{2500} \text{ x setting value of P1-46}$$

Related Section:

P1-03

P1 - 47	Reserved	Communication Addr.: 012FH

P1 - 48	Reserved	Communication Addr.: 0130H

P1 - 49	Reserved	Communication Addr.: 0131H

P1 - 50	Reserved	Communication Addr.: 0132H

P1 - 51	Reserved	Communication Addr.: 0133H

P1 - 52	RES1	Regenerative Resistor Value	Communication Addr.: 0134H

Default: 40

Applicable Control Mode: P/S/T

Unit: Ohm

Range: 10 ~ 750

Related Section:

Section 6.6.3

P1 - 53	RES2	Regenerative Resistor Capacity	Communication Addr.: 0135H

Default: 60

Applicable Control Mode: P/S/T

Unit: Watt

Range: 30 ~ 1000

Related Section:

Section 6.6.3

P1 - 54	PER	Positioning Completed Width	Communication Addr.: 0136H

Default: 100

Related Section:

Applicable Control Mode: P

DO TPOS(05) in Table 7.B

Unit: pulse

Range: 0 ~ 10000

Settings:

This parameter is used to set the width of pulse output range in which TPOS (positioning completed signal) will activate. TPOS will be activated when the position error is below the setting value of P1-54.

P1 - 55	MSPD	Maximum Speed Limit	Communication Addr.: 0137H

Default: rated speed

Related Section:

Applicable Control Mode: P/S/T

Section 6.2.6

Unit: rpm

Range: 0 ~ Max. speed

Settings:

This parameter is used to set maximum motor speed. The default setting is rated speed.

Group 2: P2-xx Extension Parameters

P2 - 00	KPP	Proportional Position Loop Gain	Communication Addr.: 0200H

Default: 50

Applicable Control Mode: P

Unit: rad/s

Range: 0 ~ 1023

Settings:

Related Section:

Section 6.2.6, P2-27

This parameter is used to set the position loop gain. It can increase stiffness, expedite position loop response and reduce position error. However, if the setting value is over high, it may generate vibration or noise. In AutoMode, the value of this parameter will be changed in accordance with the setting value of parameter P2-31 automatically (Please refer Table 6.D & 6.E in Chapter 6).

P2 - 01	PPR	Position Loop Gain Switching Rate	Communication Addr.: 0201H

Default: 100

Applicable Control Mode: P

Unit: %

Range: 10 ~ 500

Settings:

Related Section:

Section 6.2.6, P2-27, P2-29

This parameter is used to set the position gain switching rate when the gain switching condition is satisfied. Please refer to P2-27 for gain switching control selection settings and refer to P2-29 for gain switching condition settings.

P2 - 02	PFG	Position Feed Forward Gain	Communication Addr.: 0202H

Default: 0

Applicable Control Mode: P

Unit: %

Range: 0 ~ 100

Related Section:

Section 6.2.6, P2-03

This parameter is used to set the feed forward gain when executing position control command.

When using position smooth command, increase gain can improve position track deviation. When not using position smooth command, decrease gain can improve the resonance condition of mechanical system. In PDFF control AutoMode, the value of this parameter will be changed in accordance with the setting value of parameter P2-31 automatically (Please refer Table 6.D & 6.E in Chapter 6).

P2 - 03	PFF	Smooth Constant of Position Feed Forward Gain	Communication Addr.: 0203H

Default: 5

Applicable Control Mode: P

Unit: ms

Range: 2 ~ 100

Settings:

When using position smooth command, increase gain can improve position track deviation. When not using position smooth command, decrease gain can improve the resonance condition of mechanical system.

Related Section:

Section 6.2.6, P2-02

P2 - 04	KVP	Proportional Speed Loop Gain	Communication Addr.: 0204H

Default: 300

Applicable Control Mode: P/S

Unit: rad/s

Range: 0 ~ 4095

Settings:

This parameter is used to set the speed loop gain. When the value of proportional speed loop gain is increased, it can expedite speed loop response. However, if the setting value is over high, it may generate vibration or noise. In AutoMode, the value of this parameter will be changed in accordance with the setting value of parameter P2-31 automatically (Please refer Table 6.D & 6.E in Chapter 6).

Related Section:

Section 6.3.6, P2-27

P2 - 05	SPR	Speed Loop Gain Switching Rate	Communication Addr.: 0205H

Default: 100

Applicable Control Mode: P/S

Unit: %

Range: 10 ~ 500

Settings:

This parameter is used to set the speed gain switching rate when the gain switching condition is satisfied. Please refer to P2-27 for gain switching control selection settings and refer to P2-29 for gain switching condition settings.

Related Section:

Section 6.3.6, P2-27, P2-29

P2 - 06	KVI	Speed Integral Compensation	Communication Addr.: 0206H

Default: 50

Applicable Control Mode: P/S

Unit: rad/s

Range: 0 ~ 1023

Related Section:

Section 6.3.6

Settings:

This parameter is used to set the integral time of speed loop. When the value of speed integral compensation is increased, it can improve the speed response ability and decrease the speed control deviation. However, if the setting value is over high, it may generate vibration or noise. In AutoMode, the value of this parameter will be changed in accordance with the setting value of parameter P2-31 automatically (Please refer Table 6.D & 6.E in Chapter 6).

Time constant of speed integral compensation: (1000/KVI) ms

P2 - 07	SFG	Speed Feed Forward Gain	Communication Addr.: 0207H

Default: 0

Related Section:

Section 6.3.6

Applicable Control Mode: S

Unit: %

Range: 0 ~ 100

Settings:

This parameter is used to set the feed forward gain when executing speed control command.

When using speed smooth command, increase gain can improve speed track deviation.

When not using speed smooth command, decrease gain can improve the resonance condition of mechanical system.

P2 - 08■	PCTLC	Special Factory Setting	Communication Addr.: 0208H

Default: 0

Related Section: N/A

Applicable Control Mode: P/S/T

Unit: N/A

Range: 0 ~ 32767

Settings:

This parameter can be used to reset all parameters to their original factory settings and enable some parameters functions.

- Reset parameters settings:

  10: Users can reset all parameter values to factory defaults. All parameter values will be reset after re-power the servo drive.

- Enable parameters functions:

  20: If P2-08 is set to 20, then the parameter P4-10 is enabled.

  22: If P2-08 is set to 22, then the parameters P4-11 ~ P4-19 are enabled.

  26: If P2-08 is set to 26, then the parameter P2-27 is enabled.

P2 - 09	DRT	Bounce Filter	Communication Addr.: 0209H

Default: 2

Related Section:

Applicable Control Mode: P/S/T

Section 6.3.6

Unit: 2ms

Range: 0 ~ 20

Settings:

For example, if P2-09 is set to 5, the bounce filter time is 5 x 2ms=10ms.

When there are too much vibration or noises around environment, increasing this setting value (bounce filter time) can improve reliability. However, if the time is too long, it may affect the response time.

P2 - 10	DI1	Digital Input Terminal 1 (DI1)	Communication Addr.: 020AH

Default: 101

Related Section:

Applicable Control Mode: P/S/T

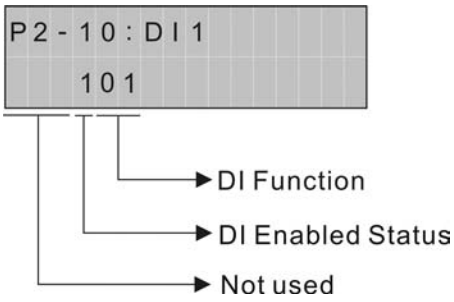
Section 3.3.4, Table 7.A

Unit: N/A

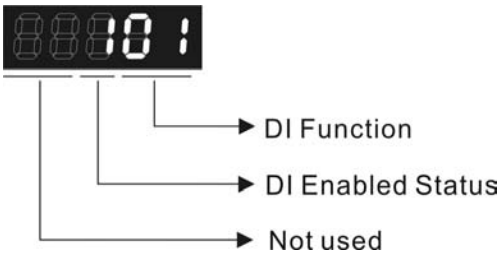
Range: 0 ~ 126

Settings:

ASD-PU-01A



ASD-PU-01B



This parameter is used to determine the function and status of DI1.

- DI Function Settings:

  For the setting value of P2-10 ~ P2-15, please refer to Table 7.A.

- DI Enabled Status Settings:

  0: Normally closed (contact b)

  1: Normally open (contact a)

Please re-start the servo drive after parameters have been changed.

P2 - 11	DI2	Digital Input Terminal 2 (DI2)	Communication Addr.: 020BH

Default: 102

Applicable Control Mode: P/S/T

Unit: N/A

Range: 0 ~ 126

Settings:

See P2-10 for explanation.

Related Section:

Section 3.3.4, Table 7.A

P2 - 12	DI3	Digital Input Terminal 3 (DI3)	Communication Addr.: 020CH

Default: 104

Applicable Control Mode: P/S/T

Unit: N/A

Range: 0 ~ 126

Settings:

See P2-10 for explanation.

Related Section:

Section 3.3.4, Table 7.A

P2 - 13	DI4	Digital Input Terminal 4 (DI4)	Communication Addr.: 020DH

Default: 22

Applicable Control Mode: P/S/T

Unit: N/A

Range: 0 ~ 126

Settings:

See P2-10 for explanation.

Related Section:

Section 3.3.4, Table 7.A

P2 - 14	DI5	Digital Input Terminal 5 (DI5)	Communication Addr.: 020EH

Default: 23

Applicable Control Mode: P/S/T

Unit: N/A

Range: 0 ~ 126

Settings:

See P2-10 for explanation.

Related Section:

Section 3.3.4, Table 7.A

P2 - 15	DI6	Digital Input Terminal 6 (DI6)	Communication Addr.: 020EH

Default: 21

Applicable Control Mode: P/S/T

Unit: N/A

Range: 0 ~ 126

Settings:

See P2-10 for explanation.

Related Section:

Section 3.3.4, Table 7.A

P2 - 16	Reserved	Communication Addr.: 0210H

P2 - 17	Reserved	Communication Addr.: 0211H

P2 - 18	DO1	Digital Output Terminal 1 (DO1)	Communication Addr.: 0212H

Default: 101

Applicable Control Mode: P/S/T

Unit: N/A

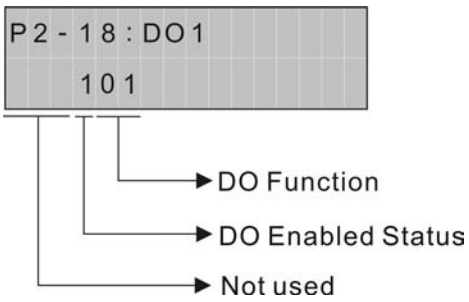
Range: 0 ~ 110

Settings:

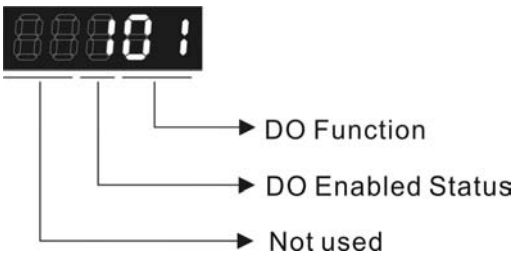
Related Section:

Section 3.3.4, Table 7.B

ASD-PU-01A



ASD-PU-01B



This parameter is used to determine the function and status of DO1.

- DO Function Settings:

  For the setting value of P2-18 ~ P2-20, please refer to Table 7.B.

- DO Enabled Status Settings:

  0: Normally closed (contact b)

  1: Normally open (contact a)

Please re-start the servo drive after parameters have been changed.

P2 - 19	DO2	Digital Output Terminal 2 (DO2)	Communication Addr.: 0213H

Default: 103

Applicable Control Mode: P/S/T

Unit: N/A

Range: 0 ~ 110

Settings:

See P2-18 for explanation.

Related Section:

Section 3.3.4, Table 7.B

P2 - 20	DO3	Digital Output Terminal 3 (DO3)	Communication Addr.: 0214H

Default: 7

Applicable Control Mode: P/S/T

Unit: N/A

Range: 0 ~ 110

Settings:

See P2-18 for explanation.

Related Section:

Section 3.3.4, Table 7.B

P2 - 21	Reserved	Communication Addr.: 0215H

P2 - 22	Reserved	Communication Addr.: 0216H

P2 - 23	NCF	Notch Filter (Resonance Suppression)	Communication Addr.: 0217H

Default: 1000

Applicable Control Mode: P/S/T

Unit: Hz

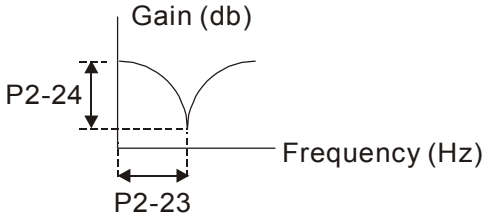
Range: 50 ~ 1000

Settings:

This parameter is used to set resonance frequency of mechanical system. It can be used to suppress the resonance of mechanical system. If P2-24 is set to 0, this parameter is disabled.

Related Section:

Section 6.3.7, P2-24



P2 - 24	DPH	Notch Filter Attenuation Rate (Resonance Suppression)	Communication Addr.: 0218H

Default: 0

Related Section:

Applicable Control Mode: P/S/T

Section 6.3.7, P2-23

Unit: dB

Unit: Hz

Range: 0 ~ 32

Settings:

0: Disabled

P2 - 25	NLP	Low-pass Filter Time Constant (Resonance Suppression)	Communication Addr.: 0219H

Default: 20

Related Section:

Applicable Control Mode: P/S/T

Section 6.3.7, P2-32

Unit: 0.1ms

Range: 0 ~ 10000

Settings:

This parameter is used to set low-pass filter time constant of resonance suppression.

0: Disabled

P2 - 26	DST	External Anti-Interference Gain	Communication Addr.: 021AH

Default: 0

Related Section:

Applicable Control Mode: P/S/T

Section 6.3.7, P2-32

Unit: N/A

Range: 0 ~ 511

Settings:

0: Disabled

P2 - 27	GCC	Gain Switching Control Selection	Communication Addr.: 021BH

Default: 0

Related Section:

Applicable Control Mode: P/S

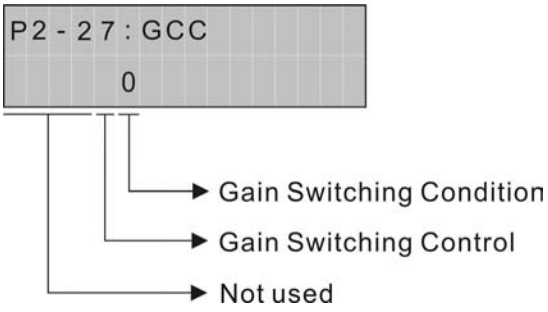
P2-01, P2-05, P2-28, P2-29

Unit: N/A

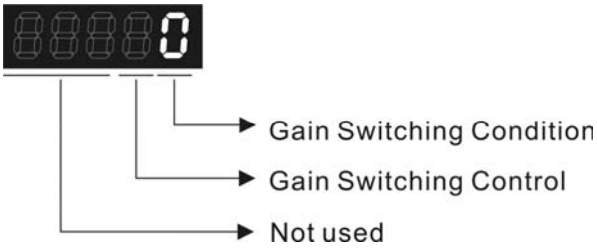
Range: 0 ~ 14

Settings:

ASD-PU-01A



ASD-PU-01B



- Gain Switching Condition Settings:

  0: Disabled

  1: Gain switching DI signal (GAINUP) is On. (see Table 7.A)

  2: In position mode, position deviation is higher than the setting value of P2-29.

  3: Position command frequency is higher than the setting value of P2-29.

  4: Servo motor speed is higher than the setting value of P2-29.

- Gain Switching Control Settings:

  0: Gain multiple switching

  1: P → PI switching

Setting	P mode	P, S mode	Status
0	P2-00 x 100%	P2-04 x 100%	Before switching
	P2-00 x P2-01	P2-04 x P2-05	After switching
1	P2-06 x 0%		Before switching
	P2-06 x 100%		After switching

P2 - 28	GUT	Gain Switching Time Constant	Communication Addr.: 021CH

Default: 10

Related Section:

Applicable Control Mode: P/S

P2-27, P2-29

Unit: 10ms

Range: 0 ~ 1000

Settings:

0: Disabled

This parameter is used to set the time constant when switching the smooth gain.

P2 - 29	GPE	Gain Switching Condition	Communication Addr.: 021DH

Default: 10000

Related Section:

Applicable Control Mode: P/S

P2-27, P2-28

Unit: pulse, Kpps, rpm

Range: 0 ~ 30000

Settings:

0: Disabled

This parameter is used to set the value of gain switching condition (pulse error, Kpps, rpm) selected in P2-27. The setting value will be different depending on the different gain switching condition.

P2 - 30■	INH	Auxiliary Function	Communication Addr.: 021EH

Default: 0

Related Section: N/A

Applicable Control Mode: P/S/T

Unit: N/A

Range: 0 ~ 5

Settings:

0: Normal operation of Digital Inputs SON, CW, and CCW.

1: Force the servo drive to be Servo On (ignore CW and CCW signal)

2: Ignore CW digital input signal

3: Ignore CCW digital input signal

4: Reserved

5: After setting P2-30 to 5, the setting values of all parameters will lost (not remain in memory) at power-down. When the parameters data are no more needed, using this mode can allows users not to save parameters data into memory without damaging the EEPROM.

NOTE

1) Please set P2-30 to 0 during normal operation. The setting value of P2-30 will return to 0 automatically after re-power the servo drive.

P2 - 31■	AUT1	Auto Stiffness and Responsiveness Level	Communication Addr.: 021FH

Default: 6

Related Section:

Applicable Control Mode: P/S/T

Section 6.3.6, P1-37, P2-32

Unit: N/A

Range: 0 ~ F

Settings:

This parameter allows user to set the stiffness and responsiveness level automatically.

Users can control the stiffness and responsiveness according to application condition.

When the setting value is higher, the stiffness and responsiveness is higher.

Setting Value of P2-31	Speed Loop Responsiveness (Hz)	Stiffness and Responsiveness
0	10	Low Stiffness Low Responsiveness
1	15	
2	20	↕
3	25	
4	30	
5	35	
6	45	
7	55	Medium Stiffness Medium Responsiveness
8	65	
9	80	↕
A	100	
B	120	
C	145	
D	170	
E	205	High Stiffness High Responsiveness
F	250	

NOTE

1) This parameter is activated by P2-32.

P2 - 32▲	AUT2	Tuning Mode Selection	Communication Addr.: 0220H

Default: 0

Related Section:

Applicable Control Mode: P/S/T

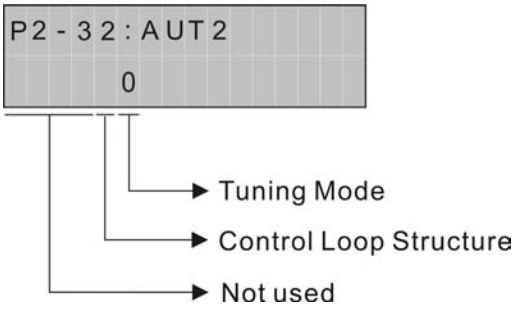
Section 6.3.6, P2-31

Unit: N/A

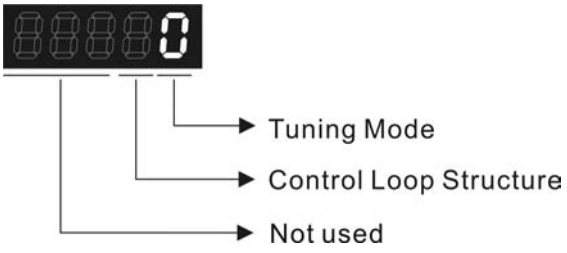
Range: 0 ~ 12

Settings:

ASD-PU-01A



ASD-PU-01B



- Tuning Mode Settings:

  0: Manual mode

  1: AutoMode (Continuous adjustment)

  The ratio of Load Inertia to servo motor inertia can be continuously adjusted.

  The level of stiffness and responsiveness are adjusted by parameter P2-31.

2: AutoMode (The ratio of Load Inertia to servo motor inertia is fixed)

The ratio of Load Inertia to servo motor inertia is set by parameter P1-37.

The level of stiffness and responsiveness are adjusted by parameter P2-31.

- Control Loop Structure Settings:

  0: PDFF Control. PDFF : Pseudo-Derivative Feedback and Feedforward

  1: PI Control. PI : Proportional - Integral control

Explanation of Auto-tuning:

1. When switching mode #1 to #2 or #0, the system will save the measured load inertia value automatically and memorized in P1-37 and related gain parameters.
2. In AutoMode #1, the system will save the measured load inertia value every 30 minutes automatically and memorized in P1-37.
3. In AutoMode #2, if the setting value of P2-31 changes, the related gain parameters will also change. However, the setting value of P1-37 will retain its value.
4. When switching mode #2 to #0, it indicates the setting of P1-37 and all settings of related gain parameters will be returned to original setting value in #0 manual mode.
5. No matter in Manual mode #0 or in AutoMode #2, the users should enter the appropriate load inertia value in P1-37.
6. If the users use the servo dynamic auto-tuning function of ASDA-B software (Tools → Servo Tuning → Dynamic Auto tuning), it will save the measured load inertia value and memorized in P1-37 and related gain parameters.

P2 - 33	Reserved	Communication Addr.: 0221H

P2 - 34	SDEV	Overspeed Warning Condition	Communication Addr.: 0222H

Default: 5000

Applicable Control Mode: S

Unit: rpm

Range: 1 ~ 6000

Settings:

This parameter is used to set the over speed condition of the drive fault code. (See P0-01)

Related Section:

Fault Code 07 in P0-01

P2 - 35	PDEV	Excessive Error Warning Condition	Communication Addr.: 0223H

Default: 3000

Applicable Control Mode: P

Unit: 10 pulse (10pls)

Range: 1 ~ 30000

Settings:

This parameter is used to set the excessive error condition of the drive fault code. (See P0-01)

Related Section:

Fault Code 09 in P0-01

P2 - 36	OVL	Overload Protection Level	Communication Addr.: 0224H

Default: 100

Related Section:

Applicable Control Mode: P/S/T

Fault Code 06 in P0-01, P2-37

Unit: %

Range: 70 ~ 100

Settings:

100: The overload time will not be extended.

70: The overload time will be extended. The extended overload time is equal to the original overload time multiply by P2-37/70.

This parameter is used to set the overload protection level that is used to determine the overload fault condition (ALE06). However, when using this parameter, the operating temperature of the servo motor should be lower, the ventilation should be adequate for heat dissipation or the motor should be provided with fans to ensure the surface temperature of the motor will not exceed the specification.

For example, suppose that ECMA-C30807S servo motor is used, the normal current is 200% and the overload time is 8 seconds, if P2-36 is set to 100% and P2-37 is set 100% also, the servo fault message, overload (ALE06) will occur when the overload time, 8 x (100%/100%) = 8 seconds has been reached. However, if P2-36 is set to 70% and P2-37 is set to 100%, the servo fault message, overload (ALE06) will occur when the overload time, 8 x (100%/70%) = 11.43 seconds has been reached.

P2 - 37	OVW	Output Overload Warning Level	Communication Addr.: 0225H

Default: 50%

Related Section:

Applicable Control Mode: P/S/T

P2-36

Unit: N/A

DO OLW(09) in Table 7.B

Range: 0 ~ 100%

Settings:

This parameter is used to set the output overload warning level that is used to activate the DO signal OLW. (See Table 7.B). When the motor has reached the output overload level set by parameter P2-37, the motor will send a warning to the drive. After the drive has detected the warning, the DI signal OLW will be activated.

For example, suppose that ECMA-C30807S servo motor is used, when the normal current is 200%, and the overload time is 8 seconds, if P2-36 is set to 100% and P2-37 is set 100% also, the servo fault message, overload (ALE06) will be detected and show on the LED display when the overload time, 8 x (100%/100%) = 8 seconds has been reached. However, if P2-36 is set to 100% and P2-37 is set to 50%, the servo fault message, overload (ALE06) will be detected and show on the LED display when the overload time, 8 x (50%/100%) = 4 seconds has been reached.

P2 - 38	GBIT	Special Function	Communication Addr.: 0226H

Default: 0

Related Section:

Applicable Control Mode: P/S/T

P1-34, P1-35, P1-36

Unit: N/A

Range: 0H ~ FFFFH

Settings:

0	0	0	0	0	Bit10	0	0	0	0	0	0	0	0	0	0

Bit0 ~ Bit9 and Bit11 ~ Bit15: Reserved. Must be set to 0.

Bit10: DI ZCLAMP function selection (The users should set Bit10 to 400H directly.)

When the following conditions are all met, ZCLAMP function will be activated.

Condition1: Speed mode

Condition2: DI ZCLAMP is activated.

Condition3: External analog speed command or internal registers speed command is less than parameter P1-38.

Bit10 = 0: Locked at the position when ZCLAMP conditions are satisfied.

Bit10 = 1: Speed command is forced to 0 RPM when ZCLAMP conditions are satisfied.

How to select these two functions?

If the users want to use the edge of a D1 signal to stop the motor at the desired position and do not care the speed deceleration curve, then set Bit10 of P2-38 to 0.

If the users want to eliminate the analog voltage offset to stop the motor at low voltage and they want to keep the acceleration and deceleration speed curve, then set Bit10 of P2-38 to 1.

P2 - 39	Reserved	Communication Addr.: 0227H

P2 - 40	Reserved	Communication Addr.: 0228H

P2 - 41	Reserved	Communication Addr.: 0229H

P2 - 42	Reserved	Communication Addr.: 022AH

P2 - 43	Reserved	Communication Addr.: 022BH

P2 - 44	ATUR	Motor Rotation Number	Communication Addr.: 022CH

Default: 2

Applicable Control Mode: P/S/T

Unit: turn

Range: 1 ~ 3

Settings:

This parameter is used to set the motor rotation number when auto-tuning parameters.

Related Section:

P2-45, P2-46, P2-47

P2 - 45	AFRQ	Motor Rotation Frequency	Communication Addr.: 022DH

Default: 10

Applicable Control Mode: P/S/T

Unit: 0.1Hz

Range: 1 ~ 100

Settings:

This parameter is used to set the motor rotation frequency when auto-tuning parameters.

Related Section:

P2-44, P2-46, P2-47

P2 - 46	ATME	Motor Rotation Time	Communication Addr.: 022EH

Default: 15

Applicable Control Mode: P/S/T

Unit: sec

Range: 1 ~ 60

Settings:

This parameter is used to set the motor rotation time when auto-tuning parameters.

Related Section:

P2-44, P2-45, P2-47

P2 - 47■	ASTR	Auto-Tuning Start Function	Communication Addr.: 022FH

Default: 0

Applicable Control Mode: P/S/T

Unit: N/A

Range: 0 ~ 11

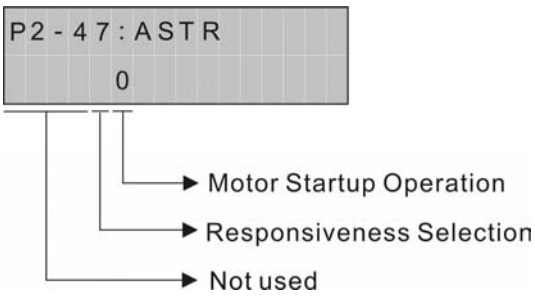
Settings:

This parameter is used to set the motor startup operation when auto-tuning parameters.

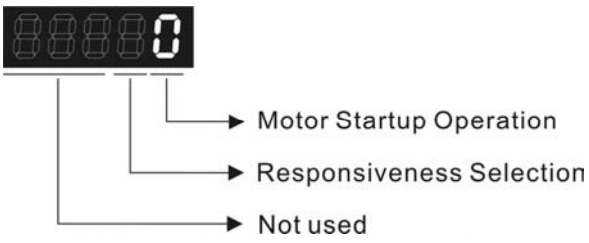
Related Section:

P2-44, P2-45, P2-46

ASD-PU-01A



ASD-PU-01B



- Motor Startup Operation Settings:

  0: No operation. The motor does not run.

  1: Motor startup operation. The motor starts to run.

- Responsiveness Selection Settings:

  0: Auto-select the appropriate responsiveness according to the measured load inertia value

  1: Select the responsiveness set by parameter P2-31

P2 - 48	CCLR	Pulse Deviation Clear Mode	Communication Addr.: 0230H

Default: 0

Related Section:

Applicable Control Mode: P

DI CCLR(04) in Table 7.A

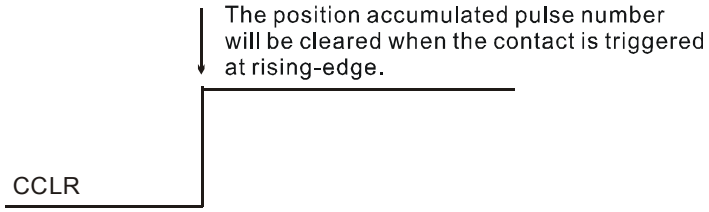
Unit: N/A

Range: 0 ~ 1

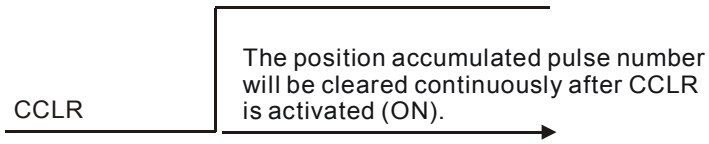
Settings:

When the servo drive is set to CCLR mode, the pulse deviation clear function is enabled.

0: When the input terminal is rising-edge triggered, the position accumulated pulse number will be cleared.



1: After CCLR is activated (ON), the position accumulated pulse number will be cleared continuously.



P2 - 49	SJIT	Speed Detection Filter and Jitter Suppression	Communication Addr.: 0231H

Default: 10

Related Section:

Applicable Control Mode: P/S

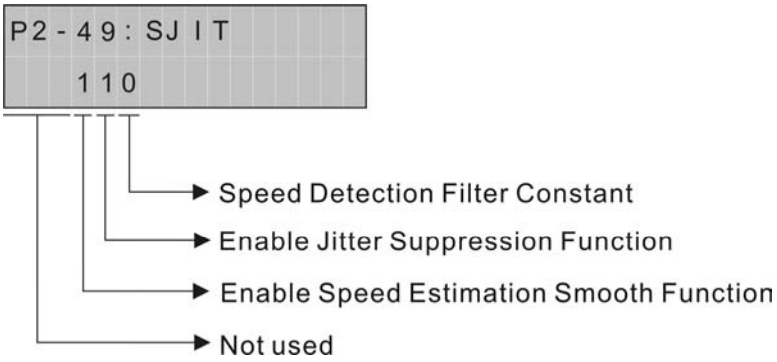
Section 6.3.6

Unit: N/A

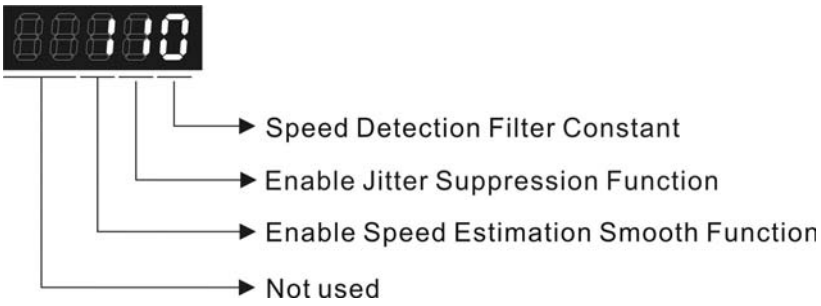
Range: 0 ~ 119

Settings:

ASD-PU-01A



ASD-PU-01B



- Speed Detection Filter Constant Settings:

Setting Value	Speed Detection Frequency of Low-pass Filter (Hz)	Filter Time (ms)
0	500	2.0
1	450	2.2
2	400	2.5
3	350	2.8
4	300	3.3
5	250	4.0
6	200	5.0
7	150	6.6
8	100	10.0
9	80	12.5

- Enable Jitter Suppression Function Settings:

  0: Disable Jitter Suppression function

  1: Enable Jitter Suppression function

- Enable Speed Estimation Smooth Function:

  0: Disable Speed Estimation Smooth function

  1: Enable Speed Estimation Smooth function

Group 3: P3-xx Communication Parameters

P3 - 00	ADR	Communication Address Setting	Communication Addr.: 0300H

Default: 1

Related Section:

Applicable Control Mode: P/S/T

Section 3.5.1, Section 8.2

Unit: N/A

Range: 1 ~ 254

Settings:

If the AC servo drive is controlled by RS-232/485 communication, each drive (or device) must be uniquely identified and addressed between 1 and 254. Access to program this number is via parameter P3-00.

One servo drive only can set one address. If the address is duplicate, there will be a communication fault.

NOTE

1) When the address of host (external) controller is set to 0, it is with broadcast function. Then, the servo drive will receive from host (external) controller only and will not respond to host (external) controller no matter the address is matching or not.
2) When the address of host (external) controller is set to 255, it is with auto-respond function. Then, the servo drive will receive from and respond to host (external) controller both no matter the address is matching or not.

P3 - 01	BRT	Transmission Speed	Communication Addr.: 0301H

Default: 1

Related Section:

Applicable Control Mode: P/S/T

Section 8.2

Unit: bps

Range: 0 ~ 5

Settings:

0: Baud rate 4800 (data transmission speed: bits / second)

1: Baud rate 9600 (data transmission speed: bits / second)

2: Baud rate 19200 (data transmission speed: bits / second)

3: Baud rate 38400 (data transmission speed: bits / second)

4: Baud rate 57600 (data transmission speed: bits / second)

5: Baud rate 115200 (data transmission speed: bits / second)

This parameter is used to set the desired transmission speed between the computer and AC servo drive. Users can set this parameter and control transmission speed to reach the maximum baud rate of 115200 bps.

P3 - 02	PTL	Communication Protocol	Communication Addr.: 0302H

Default: 0

Related Section:

Applicable Control Mode: P/S/T

Section 8.2

Unit: N/A

Range: 0 ~ 8

Settings:

0: Modbus ASCII mode, <7,N,2>

1: Modbus ASCII mode, <7,E,1 >

2: Modbus ASCII mode, <7,O,1>

3: Modbus ASCII mode, <8,N,2 >

4: Modbus ASCII mode, <8,E,1>

5: Modbus ASCII mode, <8,O,1>

6: Modbus RTU mode, <8,N,2>

7: Modbus RTU mode, <8,E,1>

8: Modbus RTU mode, <8,O,1>

This parameter is used to set the communication protocol. The alphanumeric characters represent the following: 7 or 8 is the number of data bits; N, E or O refer to the parity bit, Non, Even or Odd; the 1 or 2 is the numbers of stop bits.

P3 - 03	FLT	Transmission Fault Treatment	Communication Addr.: 0303H

Default: 0

Related Section:

Applicable Control Mode: P/S/T

Section 8.2

Unit: N/A

Range: 0 ~ 1

Settings:

0: Display fault and continue operating

1: Display fault and stop operating

This parameter is used to determine the operating sequence once a communication fault has been detected. If '1' is selected the drive will stop operating upon detection the communication fault. The mode of stopping is set by parameter P1-32.

P3 - 04	CWD	Communication Time Out Detection	Communication Addr.: 0304H

Default: 0

Related Section:

Applicable Control Mode: P/S/T

Section 8.2

Unit: N/A

Range: 0 ~ 20

Settings:

0: Disabled

This parameter is used to set the maximum permissible time before detecting a fault due to communication time out. When this parameter is set to a value over than 0, it indicates this function is enabled. However, if not communicating with the servo in this period of time, the servo drive will assume the communication has failed and show the communication error fault message.

P3 - 05	Reserved	Communication Addr.: 0305H

P3 - 06■	SDI	Digital Input Communication Function	Communication Addr.: 0306H

Default: 0 | Related Section:

Applicable Control Mode: P/S/T | P4-07, Section 8.2

Unit: N/A

Range: 0 ~ 3F

Settings:

The setting of this parameter determines how the Digital Inputs (DI) accept commands and signals.

If the Digital Input Contact Control parameter for the DI 1 ~ DI 6 is set to "0", command is external, and via CN1; if it is set to "1" the DI signal is via communication.

The Digital Input Control Contact parameter, P3-06 also works in conjunction with the Multi Function Digital Input parameter P4-07 which has several functions. Please see section 8.2 for details.

For example, when P3-06 is set to 3, it indicates that DI 1 and DI 2 are both ON and they can be controlled via P4-07. Then, DI 3 ~ DI 6 are activated via external command, i.e. through CN1.

P3 - 07	CDT	Communication Response Delay Time	Communication Addr.: 0307H

Default: 0 | Related Section: N/A

Applicable Control Mode: P/S/T

Unit: ms

Range: 0 ~ 255

Settings:

This parameter is used to delay the communication time that servo drive respond to host controller (external controller).

NOTE

1) When the communication address of the host (external) controller is set to 255, the communication response delay time will be 0 (zero) no matter what the setting value of P3-07 is.

Group 4: P4-xx Diagnosis Parameters

P4 - 00★	ASH1	Fault Record (N)	Communication Addr.: 0400H

Default: 0 Related Section: N/A

Applicable Control Mode: P/S/T

Unit: N/A

Range: N/A

Settings:

The latest fault record.

P4 - 01★	ASH2	Fault Record (N-1)	Communication Addr.: 0401H

Default: 0 Related Section: N/A

Applicable Control Mode: P/S/T

Unit: N/A

Range: N/A

P4 - 02★	ASH3	Fault Record (N-2)	Communication Addr.: 0402H

Default: 0 Related Section: N/A

Applicable Control Mode: P/S/T

Unit: N/A

Range: N/A

P4 - 03★	ASH4	Fault Record (N-3)	Communication Addr.: 0403H

Default: 0 Related Section: N/A

Applicable Control Mode: P/S/T

Unit: N/A

Range: N/A

P4 - 04★	ASH5	Fault Record (N-4)	Communication Addr.: 0404H

Default: 0 Related Section: N/A

Applicable Control Mode: P/S/T

Unit: N/A

Range: N/A

P4 - 05	JOG	JOG Operation	Communication Addr.: 0405H

Default: 20

Related Section:

Applicable Control Mode: P/S/T

Section 4.4.3

Unit: rpm

Range: 0 ~ 5000

Settings:

JOG operation command:

To perform a JOG Operation via communication command, use communication address 0405H

Enter 0 ~ 4997 for the desired JOG rpm. The setting value will be written into P4-05.

If the setting value exceeds the motor rated speed, this parameter is not be effective and the motor will stop.

Enter 4998 to JOG in the CCW direction

Enter 4999 to JOG in the CW direction

Enter 5000 to stop the JOG operation

If change the speed during JOG operation, the new setting value is effective only after the servo drive is restarted (after switching power off and on).

NOTE

1) If the communication write-in frequency is too high, please set P2-30 to 5.

P4 - 06 ▲■	FOT	Force Output Control	Communication Addr.: 0406H

Default: 0

Related Section:

Applicable Control Mode: P/S/T

Section 4.4.4

Unit: N/A

Range: 0 ~ 7

Settings:

0: Disabled

This parameter is used to check if there is any damage DO terminal. This parameter is not effective when the servo drive is enabled (Servo ON).

When the value of P4-06 is a non-zero value, it indicates this function is enabled.

For example:

When P4-06 is set to 3, it indicates that DI 1 and DI 2 are both ON.

NOTE

1) When users select P4-06 and press the Set key, the display will show “OP x”. “x” stands for the parameter range from 0 to 7 (For the example display, refer to Section 4.4.4).

P4 - 07■	ITST	Input Status or Force Input Control	Communication Addr.: 0407H

Default: 0

Applicable Control Mode: P/S/T

Unit: N/A

Range: 0 ~ 63

Related Section:

P3-06, Section 4.4.5,

Section 8.2

Settings:

Please see P3-06 and Section 8.2 for setting method.

External Control: Display the status of DI input signal

Communication Control: Read the status of input signal (upon software)

For the status of DI input signal, please refer to P2-10 ~ P2-15.

The contents of P4-07 is "read only" via the drive keypad or the communication software and will display the state on or off of the six Digital Inputs which have been set in accordance to P3-06. The least significant bit (Bit 0) stands for Digital Inputs 1 (DI 1) and the most significant bit (Bit5) stands for Digital Inputs 1 (DI 6).

For example:

If the content of P4-07 is being read as 3, it indicates that the Digital Inputs 1, 2 are "ON" and Digital Inputs 3, 4, 5, & 6 are "OFF".

If P3-06 has been set to 1 and the written value of Bit 0 of P4-07 is 1, it indicates the status of DI 1 is “ON”. On the contrary, if the written value of Bit 0 of P4-07 is 0, then the status of DI 1 is “OFF”.

NOTE

1) When the written value of Bit is 1, the corresponding DI is activated (ON). When the written value of Bit is 0, the corresponding DI is inactivated (OFF).
2) Please pay close attention on the property of Digital Inputs. When the Digital Input is a contact “a”, if the input signal is ON, it indicates that this is a conductive circuit. When the Digital Input is a contact “b”, even if the input signal is ON, it indicates that this is a non-conductive circuit.

P4 - 08	Reserved	Communication Addr.: 0408H

P4 - 09	MOT	Output Status Display	Communication Addr.: 0409H

Default: 0

Applicable Control Mode: P/S/T

Unit: N/A

Range: 0 ~ 7

Related Section:

Section 4.4.6

Settings:

External Control: Display the status of DO output signal

Communication Control: Read the status of output signal

The status of DO signal, please refer to P2-18 ~ P2-20.

For example:

If P4-09 is set to 3, it indicates that the Digital Outputs 1, 2 are "ON" and Digital Output 3 is "OFF".

NOTE

1) Please pay close attention on the property of Digital Outputs. When the Digital Output is a contact “a”, if the output signal is ON, it indicates that this is a conductive circuit. When the Digital Output is a contact “b”, even if the output signal is ON, it indicates that this is a non-conductive circuit.

P4 - 10▲	CEN	Adjustment Function	Communication Addr.: 040AH

Default: 0

Applicable Control Mode: P/S/T

Unit: N/A

Range: 0 ~ 8

Related Section:

P2-08, P4-11, P4-15, P4-19

P4-22, P4-23

Settings:

0: Reserved

1: Execute analog speed input drift adjustment

2: Execute analog torque input drift adjustment

3: Execute current detector (V phase) drift adjustment

4: Execute current detector (W phase) drift adjustment

5: Execute drift adjustment of the above 1 ~ 4

6: Execute IGBT NTC calibration

7: Auto-adjust P4-22 (Analog Speed Input Offset)

8: Auto-adjust P4-23 (Analog Torque Input Offset)

This adjustment function is enabled after parameter P2-08 is set to 20.

When setting P4-10 to 1 (executing analog speed input drift adjustment), please refer to P4-11 and P4-12. When setting P4-10 to 2 (executing analog torque input drift adjustment), please refer to P4-13 and vise versa.

When executing any adjustment, the external wiring connected to analog speed or torque must be removed and the servo system should be off (Servo off).

NOTE

1) When using this parameter, the setting value of the display will not be written (not retained). After the adjustment is done, the setting value on the display will return to the default (0).

P4 - 11	SOF1	Analog Speed Input Drift Adjustment 1	Communication Addr.: 040BH

Default: Factory setting

Related Section:

Applicable Control Mode: P/S/T

P4-10

Unit: N/A

Range: 0 ~ 32767

Settings:

Manual Adjustment Operation:

Set parameter P2-08 to 22 and then change this parameter. This is an auxiliary adjusting function, although this parameter allows the users can execute manual adjustment, we still do not recommend users to change the default setting manually.

Auto Adjustment Operation:

Set parameter P2-08 to 20 first and then set parameter P4-10 to 1.

When executing this auto adjustment, ensure that the external wiring connected to analog speed must be removed or an external zero voltage power is applied to the servo drive from the host controller and the servo system should be off (Servo off).

NOTE

1) When P2-08 is set to 10, users cannot reset this parameter.

P4 - 12	SOF2	Analog Speed Input Drift Adjustment 2	Communication Addr.: 040CH

Default: Factory setting

Related Section:

Applicable Control Mode: P/S/T

P4-10

Unit: N/A

Range: 0 ~ 32767

Settings:

Please see P4-11 for explanation.

NOTE

1) When P2-08 is set to 10, users cannot reset this parameter.

P4 - 13	TOF1	Analog Torque Drift Adjustment 1	Communication Addr.: 040DH

Default: Factory setting

Related Section:

Applicable Control Mode: P/S/T

P4-10

Unit: N/A

Range: 0 ~ 32767

Settings:

Manual Adjustment Operation:

Set parameter P2-08 to 22 and then change this parameter. This is an auxiliary adjusting

function, although this parameter allows the users can execute manual adjustment, we still do not recommend users to change the default setting manually.

Auto Adjustment Operation:

Set parameter P2-08 to 20 first and then set parameter P4-10 to 2.

When executing this auto adjustment, ensure that the external wiring connected to analog speed must be removed or an external zero voltage power is applied to the servo drive from the host controller and the servo system should be off (Servo off).

NOTE

1) When P2-08 is set to 10, users cannot reset this parameter.

P4 - 14	Reserved	Communication Addr.: 040EH

P4 - 15	COF1	Current Detector Drift Adjustment (V1 phase)	Communication Addr.: 040FH

Default: Factory setting

Related Section:

Applicable Control Mode: P/S/T

P4-10

Unit: N/A

Range: 0 ~ 32767

Settings:

Manual Adjustment Operation:

Set parameter P2-08 to 22 and then change this parameter. This is an auxiliary adjusting function, although this parameter allows the users can execute manual adjustment, we still do not recommend users to change the default setting manually.

Auto Adjustment Operation:

Set parameter P2-08 to 20 first and then set parameter P4-10 to 3.

When executing this auto adjustment, ensure that the servo system should be off (Servo off) and the servo motor has stopped.

NOTE

1) When P2-08 is set to 10, users can not reset this parameter.

P4 - 16	COF2	Current Detector Drift Adjustment (V2 phase)	Communication Addr.: 0410H

Default: Factory setting

Related Section:

Applicable Control Mode: P/S/T

P4-10

Unit: N/A

Range: 0 ~ 32767

Settings:

Please see P4-15 for explanation.

NOTE

1) When P2-08 is set to 10, users cannot reset this parameter.

P4 - 17	COF3	Current Detector Drift Adjustment (W1 phase)	Communication Addr.: 0411H

Default: Factory setting

Related Section:

Applicable Control Mode: P/S/T

P4-10

Unit: N/A

Range: 0 ~ 32767

Settings:

Manual Adjustment Operation:

Set parameter P2-08 to 22 and then change this parameter. This is an auxiliary adjusting function, although this parameter allows the users can execute manual adjustment, we still do not recommend users to change the default setting manually.

Auto Adjustment Operation:

Set parameter P2-08 to 20 first and then set parameter P4-10 to 4.

When executing this auto adjustment, ensure that the servo system should be off (Servo off) and the servo motor has stopped.

NOTE

1) When P2-08 is set to 10, users cannot reset this parameter.

P4 - 18	COF4	Current Detector Drift Adjustment (W2 phase)	Communication Addr.: 0412H

Default: Factory setting

Related Section:

Applicable Control Mode: P/S/T

P4-10

Unit: N/A

Range: 0 ~ 32767

Settings:

Please see P4-17 for explanation.

NOTE

1) When P2-08 is set to 10, users cannot reset this parameter.

P4 - 19	TIGB	IGBT NTC Calibration	Communication Addr.: 0413H

Default: Factory setting

Related Section:

Applicable Control Mode: P/S/T

Parameter P4-10

Unit: N/A

Range: 1 ~ 3

Settings:

Manual Adjustment Operation:

Set parameter P2-08 to 22 and then change this parameter. This is an auxiliary adjusting function, although this parameter allows the users can execute manual adjustment, we still do not recommend users to change the default setting manually.

Auto Adjustment Operation:

Set parameter P2-08 to 20 first and then set parameter P4-10 to 6.

When executing this auto adjustment, ensure to cool the servo drive to 25°C.

NOTE

1) When P2-08 is set to 10, users cannot reset this parameter.

P4 - 20	Reserved	Communication Addr.: 0414H

P4 - 21	Reserved	Communication Addr.: 0415H

P4 - 22	SAO	Analog Speed Input Offset	Communication Addr.: 0416H

Default: 0

Applicable Control Mode: S

Unit: mV

Range: -5000 ~ 5000

Settings:

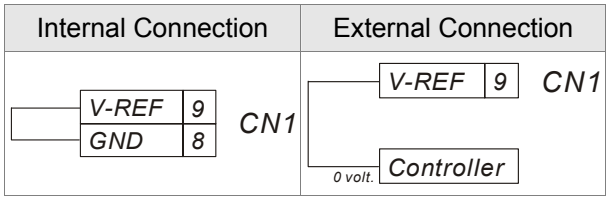
Users can use this parameter to adjust analog speed input offset value manually.

Related Section:

Parameter P4-10

NOTE

1) Before using this function, please short the internal circuit first or connecting to a 0V output of the external controller in advance (Please refer to the figure below).



P4 - 23	TAO	Analog Torque Input Offset	Communication Addr.: 0417H

Default: 0

Applicable Control Mode: T

Unit: mV

Range: -5000 ~ 5000

Settings:

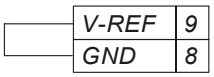
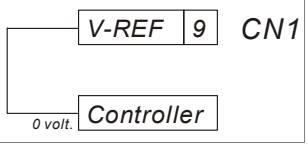
Related Section:

Parameter P4-10

Users can use this parameter to adjust analog torque input offset value manually.

NOTE

1) Before using this function, please short the internal circuit first or connecting to a 0V output of the external controller in advance (Please refer to the figure below).

Internal Connection	External Connection
	

Group 8: P8-xx Keypad Parameters

NOTE

All the keypad parameters cannot be download to PC or the servo drive via communication. Users only can edit and change the keypad parameters through the keypad.

P8 - 00★	KVER	Keypad Firmware Version	Communication Addr.: 0800H

Default: Factory setting — Related Section: N/A

Applicable Control Mode: P/S/T

Unit: N/A

Range: N/A

P8 - 01	KFUN	Keypad Communication and Reset Setting	Communication Addr.: 0801H

Default: 1 — Related Section: N/A

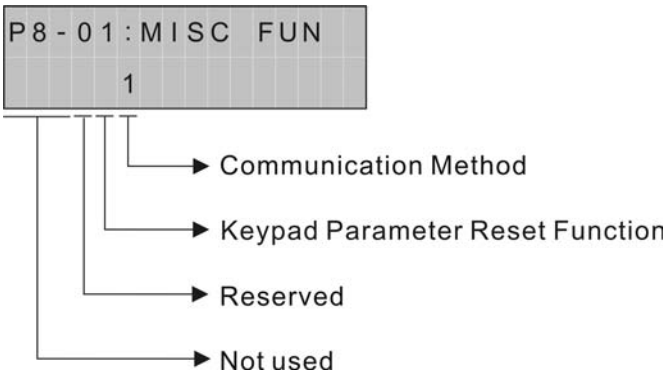
Applicable Control Mode: P/S/T

Unit: N/A

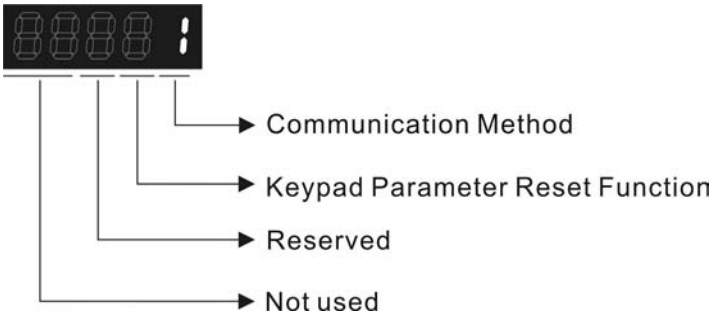
Range: 0 ~ 011

Settings:

ASD-PU-01A



ASD-PU-01B



- Communication Method Settings:

  0: If 0 is set, it indicates the keypad is the slave side during communication. 0 must be set when communicating with PC, or there will be a communication fault.

1: If 1 is set, it indicates the keypad is the master side during communication. 1 must be set when communicating with servo drive, or there will be a communication fault.

- Keypad Parameter Reset Function Settings:

  0: Disable keypad parameter reset function.

  1: Enable keypad parameter reset function. All keypad parameter settings will be reset to default setting if this function is selected. (All keypad parameter settings will be cleared after this function is executing.)

  After parameter P8-01 is set, users must restart the servo drive (switching power off and on).

P8 - 02	Reserved	Communication Addr.: 0802H

P8 - 03	Reserved	Communication Addr.: 0803H

P8 - 04	Reserved	Communication Addr.: 0804H

P8 - 05	KADR	Communication Address Setting (Drive)	Communication Addr.: 0805H

Default: 255 Related Section: N/A

Applicable Control Mode: P/S/T

Unit: N/A

Range: 1 ~ 255

Settings:

If the AC servo drive is controlled by RS-232/485 communication, each drive (or device) must be uniquely identified and addressed between 1 and 255.

One servo drive only can set one communication address.

If the address is duplicated, there will be a communication fault.

When the address is set to 255, it is with auto communication function.

P8 - 06	KBRT	Transmission Speed (Keypad)	Communication Addr.: 0806H

Default: 1 Related Section: N/A

Applicable Control Mode: P/S/T

Unit: bps

Range: 0 ~ 5

Settings:

0: Baud rate 4800 (data transmission speed: bits / second)

1: Baud rate 9600 (data transmission speed: bits / second)

2: Baud rate 19200 (data transmission speed: bits / second)

3: Baud rate 38400 (data transmission speed: bits / second)

4: Baud rate 57600 (data transmission speed: bits / second)

5: Baud rate 115200 (data transmission speed: bits / second)

P8 - 07	KPTL	Communication Protocol (Keypad)	Communication Addr.: 0807H

Default: 0 Related Section: N/A

Applicable Control Mode: P/S/T

Unit: N/A

Range: 0 ~ 8

Settings:

0: Modbus ASCII mode, <7,N,2>

1: Modbus ASCII mode, <7,E,1 >

2: Modbus ASCII mode, <7,O,1>

3: Modbus ASCII mode, <8,N,2 >

4: Modbus ASCII mode, <8,E,1>

5: Modbus ASCII mode, <8,O,1>

6: Modbus RTU mode, <8,N,2>

7: Modbus RTU mode, <8,E,1>

8: Modbus RTU mode, <8,O,1>

P8 - 08	KCMM	Communication Selection (Keypad)	Communication Addr.: 0808H

Default: 0 Related Section: N/A

Applicable Control Mode: P/S/T

Unit: N/A

Range: 0 ~ 1

Settings:

0: RS-232

1: RS-485

Multiple communication modes RS-232, RS-485 cannot be used within one communication ring.

P8 - 09	KTST	Keypad Hardware Testing	Communication Addr.: 0809H

Default: 0 Related Section: N/A

Applicable Control Mode: P/S/T

Unit: N/A

Range: 0 ~ 4

Settings:

0: Disabled.

1: Function key testing. Pressing MODE key can exit this testing mode.

2: LED testing.

3: Dynamical memory testing (RAM). The testing time is approx. 18 seconds.

4: Data memory testing (EEPROM). The testing time is approx. 140 seconds.

This parameter is used to test the hardware of the keypad. Since the life of the data memory is limited and using this parameter will consumed the life of data memory, it is not recommended to use this parameter and change the factory default setting if not necessary.

P8 - 10	KBLT	LCD Backlight Display	Communication Addr.: 080AH

Default: 0 Related Section: N/A

Applicable Control Mode: P/S/T

Unit: N/A

Range: 0 ~ 1

Settings:

0: OFF. LCD backlight is going off.

1: ON. LCD backlight is going on.

P8 - 11	KCLR	Memory Block Clear	Communication Addr.: 080BH

Default: 0 Related Section: N/A

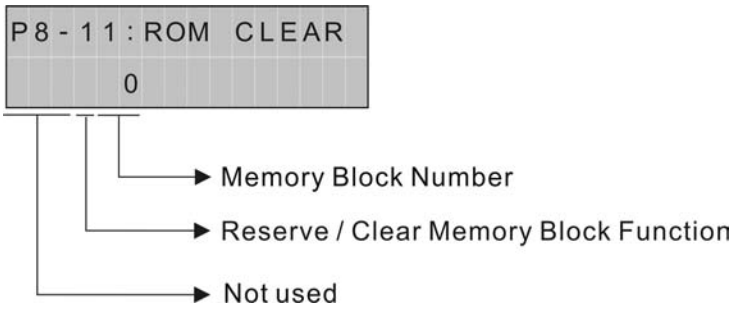
Applicable Control Mode: P/S/T

Unit: N/A

Range: 0 ~ 124

Settings:

ASD-PU-01A



ASD-PU-01B



- Reserve / Clear Memory Block Function Settings

  0: Reserve memory block

  1: Clear memory block

When the clear memory block function is selected, the memory block will be cleared.

This parameter setting will return to its default setting after clear function is executed successfully.

P8 - 12	KRNO	Memory Block Position Number (ROMx)	Communication Addr.: 080CH

Default: 0 Related Section: N/A

Applicable Control Mode: P/S/T

Unit: N/A

Range: 0 ~ 24

This parameter is used to determine the memory block number (ROMx) shown on the keypad display.

P8 - 13★	KBL0	Status of Memory Block (ROMx)	Communication Addr.: 080DH

Default: 0 Related Section: N/A

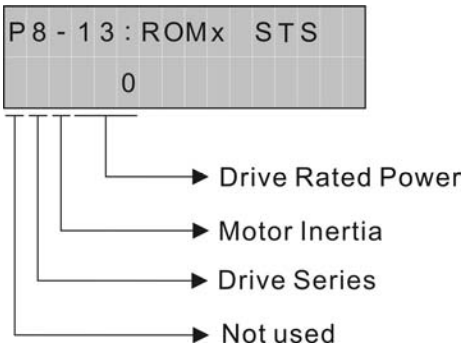
Applicable Control Mode: P/S/T

Unit: N/A

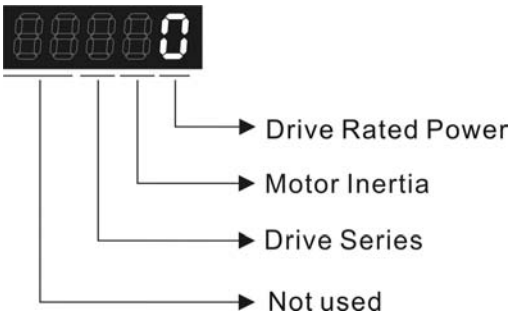
Range: 0 ~ 23999

Settings:

ASD-PU-01A



ASD-PU-01B



- Drive Rated Power Settings:
  002: 200W
  003: 400W (F604)
  004: 750W
  005: 1kW
  006: 1.5kW
  007: 2kW
  103: 400W(F804)
- Motor Inertia Settings:
  1: Low inertia
  2: Medium inertia
  3: High inertia
- Drive Series Settings:
  1: ASDA-A series
  2: ASDA-B series

This parameter displays the status of memory block number (ROMx) by referring the setting of parameter P8-12.

P8 - 14★	KBL1	Firmware Version of Memory Block (ROMx)	Communication Addr.: 080EH

Default: 0 Related Section: N/A

Applicable Control Mode: P/S/T

Unit: N/A

Range: N/A

This parameter displays the firmware version of parameter memory number (ROMx) by referring the setting of parameter P8-12.

Table 7.A Input Function Definition

Setting value of P2-10 ~ P2-15: 01

DI Name	DI Function Description	Trigger Method	Control Mode
SON	Servo On. When this DI is activated, it indicates the servo drive is enabled.	Level Triggered	P, S, T

Setting value of P2-10 ~ P2-15: 02

DI Name	DI Function Description	Trigger Method	Control Mode
ARST	Alarm Reset. A number of Faults (Alarms) can be cleared by activating ARST.	Rising-edge Triggered	P, S, T

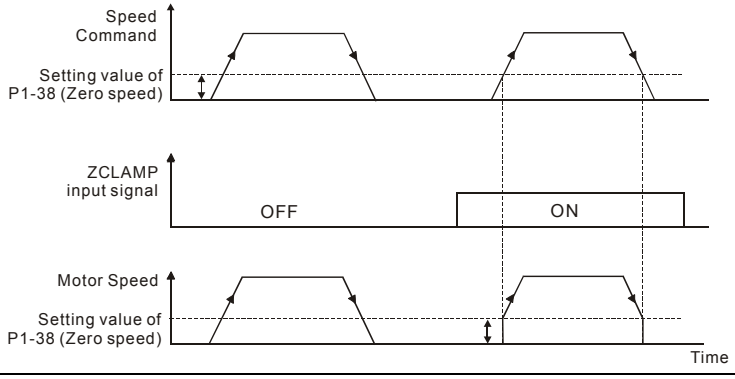
Setting value of P2-10 ~ P2-15: 03

DI Name	DI Function Description	Trigger Method	Control Mode
GAINUP	Gain switching in speed and position mode. When GAINUP is activated (P2-27 is set to 1), the gain is switched to the gain multiplied by gain switching rate.	Level Triggered	P, S, T

Setting value of P2-10 ~ P2-15: 04

DI Name	DI Function Description	Trigger Method	Control Mode
CCLR	Pulse clear (see P2-48). When CCLR is activated, the setting is parameter P2-48 Pulse Deviation Clear Mode is executed and the position accumulated pulse deviation number will be cleared to 0. 0: When the input terminal is rising-edge triggered, the position accumulated pulse number will be cleared. 1: After CCLR is activated (ON), the position accumulated pulse number will be cleared continuously.	Rising-edge Triggered, Level Triggered	P

Setting value of P2-10 ~ P2-15: 05

DI Name	DI Function Description	Trigger Method	Control Mode
ZCLAMP	Zero speed CLAMP. When ZCLAMP is activated (ON) and the motor speed value is below the setting value of P1-38, it is used to lock the motor in the instant position. 	Level Triggered	S

Setting value of P2-10 ~ P2-15: 06

DI Name	DI Function Description	Trigger Method	Control Mode
CMDINV	Command input reverse control. When the drive is in the Position, Speed and Torque mode, and CMDINV is activated, the motor is in reverse rotation.	Level Triggered	S, T

Setting value of P2-10 ~ P2-15: 07

DI Name	DI Function Description	Trigger Method	Control Mode
INHP	Pulse inhibit input. When the drive is in position mode, if INHP is activated, the external pulse input command is not valid.	Level Triggered	P

Setting value of P2-10 ~ P2-15: 08

DI Name	DI Function Description	Trigger Method	Control Mode
Reserved			

Setting value of P2-10 ~ P2-15: 09

DI Name	DI Function Description	Trigger Method	Control Mode
TRQLM	Torque limit enabled. When the drive is in speed and position mode, and TRQLM is activated, it indicates the torque limit command is valid. The torque limit command source is internal parameter or analog voltage.	Level Triggered	P, S

Setting value of P2-10 ~ P2-15: 10

DI Name	DI Function Description	Trigger Method	Control Mode
SPDLM	Speed limit enabled. When the drive is in torque mode and SPDLM is activated, it indicates the speed limit command is valid. The speed limit command source is internal parameter or analog voltage.	Level Triggered	T

Setting value of P2-10 ~ P2-15: 11

DI Name	DI Function Description	Trigger Method	Control Mode
GNUM0	Electronic gear ratio (Numerator) selection. When users use two groups of electronic gear ratio, this DI signal can be used to switch the Numerator. When GNUM0 is not activated, it indicates the first Numerator (N1, see P1-44) is used. When GNUM0 is activated, it indicates the second Numerator (N2, see P1-15) is used.	Level Triggered	P

Setting value of P2-10 ~ P2-15: 12 ~ 13

DI Name	DI Function Description	Trigger Method	Control Mode
Reserved			

Setting value of P2-10 ~ P2-15: 14 ~ 15

<table>
<tr><th>DI Name</th><th>DI Function Description</th><th>Trigger Method</th><th>Control Mode</th></tr>
<tr><td>SPD0
SPD1</td><td>
Speed command selection (1 ~ 4)
Speed command number: S1
<table>
<tr><th colspan="2">CN1 DI signal</th><th colspan="3" rowspan="2">Command Source</th><th rowspan="2">Content</th><th rowspan="2">Range</th></tr>
<tr><th>SPD1</th><th>SPD0</th></tr>
<tr><td rowspan="2">0</td><td rowspan="2">0</td><td rowspan="2">Mode</td><td>S</td><td>External analog command</td><td>Voltage between V-REF and GND</td><td>+/-10 V</td></tr>
<tr><td>Sz</td><td>None</td><td>Speed command is 0 (zero)</td><td>0</td></tr>
</table>
Speed command number: S2
<table>
<tr><th colspan="2">CN1 DI signal</th><th rowspan="2">Command Source</th><th rowspan="2">Content</th><th rowspan="2">Range</th></tr>
<tr><th>SPD1</th><th>SPD0</th></tr>
</table>
</td><td>Level Triggered</td><td>S</td></tr>
</table>

<table>
<tr><th>DI Name</th><th>DI Function Description</th><th>Trigger Method</th><th>Control Mode</th></tr>
<tr><td>SPD0
SPD1</td><td>Speed command number: S3
<table>
<tr><th colspan="2">CN1 DI signal</th><th rowspan="2">Command Source</th><th rowspan="2">Content</th><th rowspan="2">Range</th></tr>
<tr><th>SPD1</th><th>SPD0</th></tr>
<tr><td>1</td><td>0</td><td>Internal parameter</td><td>P1-10</td><td>+/- 5000 rpm</td></tr>
</table>
Speed command number: S4
<table>
<tr><th colspan="2">CN1 DI signal</th><th rowspan="2">Command Source</th><th rowspan="2">Content</th><th rowspan="2">Range</th></tr>
<tr><th>SPD1</th><th>SPD0</th></tr>
<tr><td>1</td><td>1</td><td>Internal parameter</td><td>P1-11</td><td>+/- 5000 rpm</td></tr>
</table></td><td>Level Triggered</td><td>S</td></tr>
</table>

Setting value of P2-10 ~ P2-15: 16 ~ 17

<table>
<tr><th>DI Name</th><th>DI Function Description</th><th>Trigger Method</th><th>Control Mode</th></tr>
<tr><td>TCM0
TCM1</td><td>Torque command selection (1 ~ 4)
Torque command number: T1
<table>
<tr><th colspan="2">CN1 DI signal</th><th colspan="3" rowspan="2">Command Source</th><th rowspan="2">Content</th><th rowspan="2">Range</th></tr>
<tr><th>TCM1</th><th>TCM0</th></tr>
<tr><td rowspan="2">0</td><td rowspan="2">0</td><td rowspan="2">Mode</td><td>T</td><td>External analog command</td><td>Voltage between V-REF and GND</td><td>+/- 300%</td></tr>
<tr><td>Tz</td><td>None</td><td>Torque command is 0 (zero)</td><td>0</td></tr>
</table>
Torque command number: T2
<table>
<tr><th colspan="2">CN1 DI signal</th><th rowspan="2">Command Source</th><th rowspan="2">Content</th><th rowspan="2">Range</th></tr>
<tr><th>TCM1</th><th>TCM0</th></tr>
<tr><td>0</td><td>1</td><td>Internal parameter</td><td>P1-12</td><td>+/- 300%</td></tr>
</table>
Torque command number: T3
<table>
<tr><th colspan="2">CN1 DI signal</th><th rowspan="2">Command Source</th><th rowspan="2">Content</th><th rowspan="2">Range</th></tr>
<tr><th>TCM1</th><th>TCM0</th></tr>
<tr><td>1</td><td>0</td><td>Internal parameter</td><td>P1-13</td><td>+/- 300%</td></tr>
</table>
Torque command number: T4
<table>
<tr><th colspan="2">CN1 DI signal</th><th rowspan="2">Command Source</th><th rowspan="2">Content</th><th rowspan="2">Range</th></tr>
<tr><th>TCM1</th><th>TCM0</th></tr>
<tr><td>1</td><td>1</td><td>Internal parameter</td><td>P1-14</td><td>+/- 300%</td></tr>
</table></td><td>Level Triggered</td><td>T</td></tr>
</table>

Setting value of P2-10 ~ P2-15: 18

DI Name	DI Function Description	Trigger Method	Control Mode
S-P	Speed / Position mode switching. OFF: Speed mode, ON: Position mode	Level Triggered	P, S

Setting value of P2-10 ~ P2-15: 19

DI Name	DI Function Description	Trigger Method	Control Mode
S-T	Speed / Torque mode switching. OFF: Speed mode, ON: Torque mode	Level Triggered	S, T

Setting value of P2-10 ~ P2-15: 20

DI Name	DI Function Description	Trigger Method	Control Mode
T-P	Torque / Position mode switching. OFF: Torque mode, ON: Position mode	Level Triggered	P, T

Setting value of P2-10 ~ P2-15: 21

DI Name	DI Function Description	Trigger Method	Control Mode
EMGS	Emergency stop. It should be contact “b” and normally ON or a fault (ALE13) will display.	Level Triggered	P, S, T

Setting value of P2-10 ~ P2-15: 22

DI Name	DI Function Description	Trigger Method	Control Mode
CWL	Reverse inhibit limit. It should be contact “b” and normally ON or a fault (ALE14) will display.	Level Triggered	P, S, T

Setting value of P2-10 ~ P2-15: 23

DI Name	DI Function Description	Trigger Method	Control Mode
CCWL	Forward inhibit limit. It should be contact “b” and normally ON or a fault (ALE15) will display.	Level Triggered	P, S, T

Setting value of P2-10 ~ P2-15: 24

DI Name	DI Function Description	Trigger Method	Control Mode
Reserved			

Setting value of P2-10 ~ P2-15: 25

DI Name	DI Function Description	Trigger Method	Control Mode
TLLM	Torque limit - Reverse operation (Torque limit function is valid only when P1-02 is enabled)	Level Triggered	P, S

Setting value of P2-10 ~ P2-15: 26

DI Name	DI Function Description	Trigger Method	Control Mode
TRLM	Torque limit - Forward operation (Torque limit function is valid only when P1-02 is enabled)	Level Triggered	P, S

NOTE

1) 14 ~ 17: Single control mode, 18 ~ 20: Dual control mode

2) When P2-10 to P2-15 is set to 0, it indicates output function is disabled.

Table 7.B Output Function Definition

Setting value of P2-18 ~ P2-20: 01

DO Name	DO Function Description	Control Mode
SRDY	Servo ready. SRDY is activated when the servo drive is ready to run. All fault and alarm conditions, if present, have been cleared.	P, S, T

Setting value of P2-18 ~ P2-20: 02

DO Name	DO Function Description	Control Mode
SON	Servo On. SON is activated when control power is applied to the servo drive. The drive may or may not be ready to run as a fault / alarm condition may exist. Servo ON (SON) is "ON" with control power applied to the servo drive, there may be a fault condition or not. The servo is not ready to run. Servo ready (SRDY) is "ON" where the servo is ready to run, NO fault / alarm exists. (P2-51 should turn servo ready SRDY off / on)	P, S, T

Setting value of P2-18 ~ P2-20: 03

DO Name	DO Function Description	Control Mode
ZSPD	At Zero speed. ZSPD is activated when the drive senses the motor is equal to or below the Zero Speed Range setting as defined in parameter P1-38. For Example, at default ZSPD will be activated when the drive detects the motor rotating at speed at or below 10 rpm. ZSPD will remain activated until the motor speed increases above 10 RPM.	P, S, T

Setting value of P2-18 ~ P2-20: 04

DO Name	DO Function Description	Control Mode
TSPD	At Speed reached. TSPD is activated once the drive has detected the motor has reached the Target Rotation Speed setting as defined in parameter P1-39. TSPD will remain activated until the motor speed drops below the Target Rotation Speed.	S

Setting value of P2-18 ~ P2-20: 05

DO Name	DO Function Description	Control Mode
TPOS	At Positioning completed. When the drive is in position mode, TPOS will be activated when the position error is equal and below the setting value of P1-54.	P

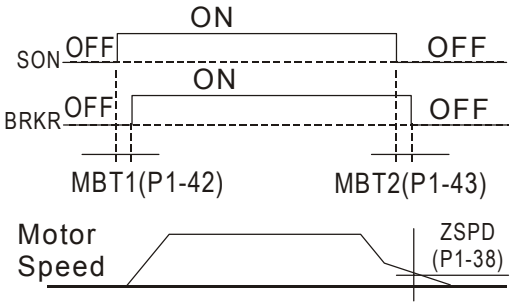
Setting value of P2-18 ~ P2-20: 06

DO Name	DO Function Description	Control Mode
TQL	At Torques limit. TQL is activated when the drive has detected that the motor has reached the torques limits set by either the parameters P1-12 ~ P1-14.	P, S

Setting value of P2-18 ~ P2-20: 07

DO Name	DO Function Description	Control Mode
ALRM	Servo alarm (Servo fault) activated. ALRM is activated when the drive has detected a fault condition.	P, S, T

Setting value of P2-18 ~ P2-20: 08

DO Name	DO Function Description	Control Mode
BRKR	Electromagnetic brake control. BRKR is activated actuation of motor brake. (Please refer to parameters P1-42 ~ P1-43) 	P, S, T

Setting value of P2-18 ~ P2-20: 09

DO Name	DO Function Description	Control Mode
OLW	Output overload warning. OLW is activated when the servo drive has detected that the motor has reached the output overload level set by parameter P2-37. This parameter is used to set output overload level. When the motor has reached the output overload level set by parameter P2-37, the motor will send a warning to the drive. After the drive has detected the warning, the DI signal OLW will be activated. tOL = Permissible Time for Overload x setting value of P2-37 When overload accumulated time (continuously overload time) exceeds the value of tOL, the overload warning signal will output, i.e. DO signal, OLW will be ON. However, if the overload accumulated time (continuously overload time) exceeds the permissible time for overload, the overload alarm (ALE06) will output. For example: If the setting value of parameter P2-37 (Overload Warning Level) is 60%, when the permissible time for overload exceeds 8 seconds at 200% rated output, the overload fault (ALE06) will be detected and shown on the LED display. At this time, tOL = 8 x 60% = 4.8 seconds	P, S, T

DO Name	DO Function Description	Control Mode
OLW	Result: When the drive output is at 200% rated output and the drive is continuously overloaded for 4.8 seconds, and the overload warning signal will be ON (DO code is 10, i.e. DO signal OLW will be activated). If the drive is continuously overloaded for 8 seconds, the overload alarm will be detected and shown on the LED display (ALE06). Then, Servo Fault signal will be ON (DO signal ALRM will be activated)	P, S, T

Setting value of P2-18 ~ P2-20: 10

DO Name	DO Function Description	Control Mode
WARN	Servo warning activated. WARN is activated when the drive has detected Reverse limit error, Forward limit error, Emergency stop, Serial communication error, and Undervoltage these fault conditions.	P, S, T

NOTE

1) When P2-18 to P2-20 is set to 0, it indicates output function is disabled.

efesotomasyon.com

Chapter 8 MODBUS Communications

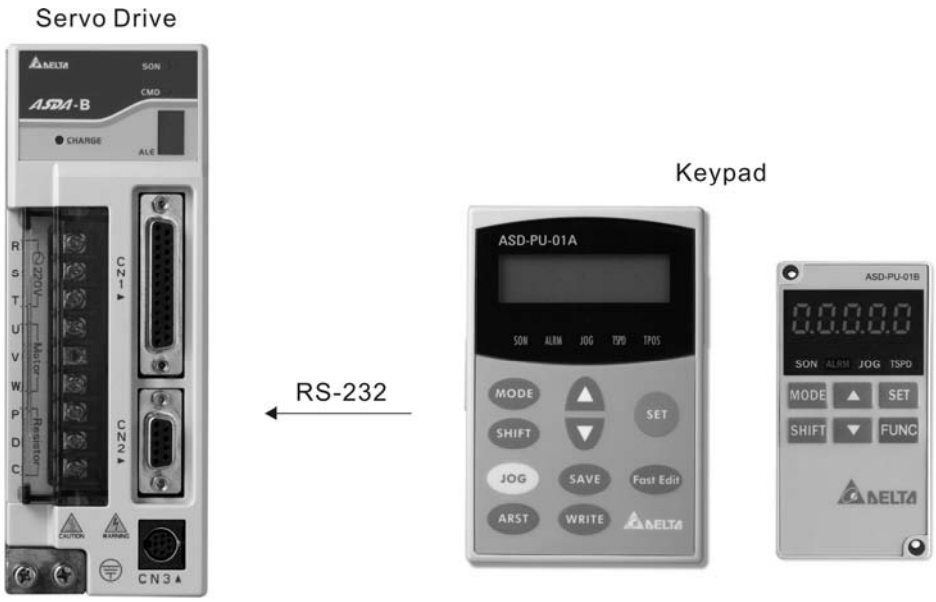
8.1 Communication Hardware Interface

The ASDA-B series servo drive has two modes of communication: RS-232, and RS-485. All aspects of control, operation and monitoring as well as programming of the controller can be achieved via communication. However, only one communication mode can be used at a time. Users can select the desired communication mode via SEL232/485 (pin6) of CN3 connector (Refer to Section 3.5.1).

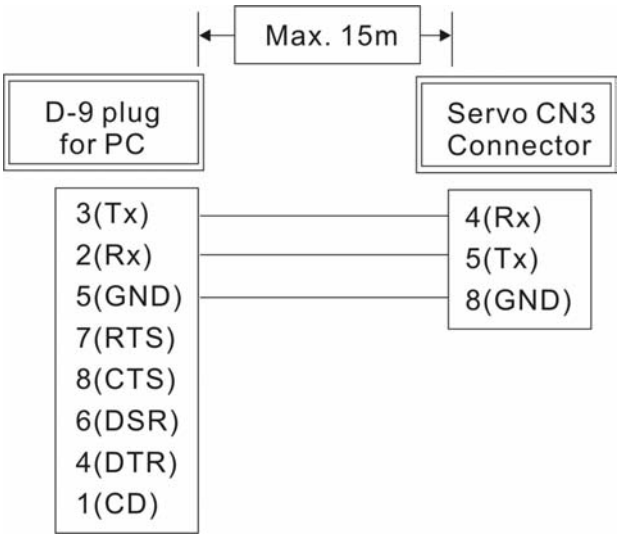
Please refer to the following sections for connections and limitations.

RS-232

■ **Configuration**



■ **Cable Connection**



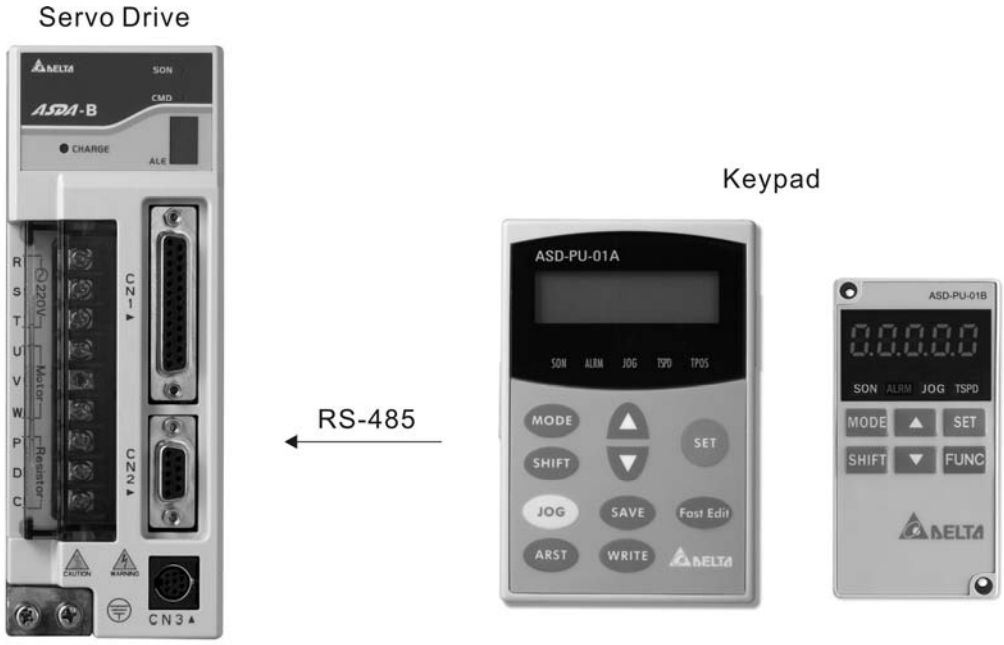
NOTE

1) For RS-232 connection, the recommended maximum cable length is 15m (50ft.). Please note, RFI / EME noise should be kept to a minimum, communication cable should kept apart from high voltage wires. If a transmission speed of 38400 bps or greater is required, the maximum length of the communication cable is 3m (9.84ft.) which will ensure the correct and desired baud rate.

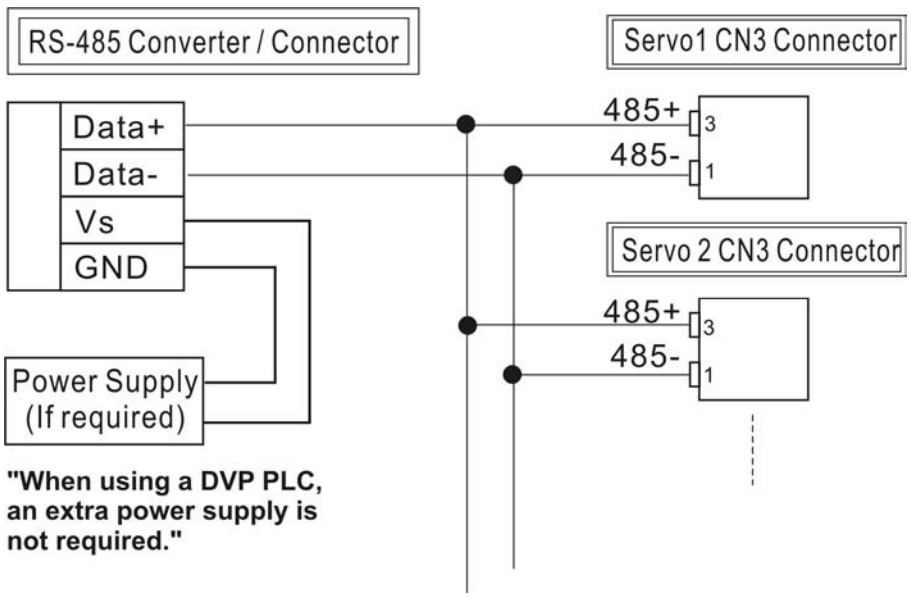
2) The number shown in the pervious figure indicates the terminal number of each connector.

RS-485, RS-422

■ **Configuration**



■ **Cable Connection**



NOTE

1) For RS-485 and RS-422 connections, the recommended maximum cable length is 100m (300ft.). Please note, RFI / EME noise should be kept to a minimum, communication cable should kept apart from high voltage wires. If a transmission speed of 38400 bps or greater is required the maximum length of the communication cable is 15m (50ft.) which will ensure the correct and desired baud rate.
2) The number shown in the pervious figure indicates the terminal number of each connector.
3) The power supply should provide a +12V and higher DC voltage.
4) Please use a REPEATER if more than 32 synchronous axes are required.
5) For the terminal identification of CN3, please refer to Section 3.5.

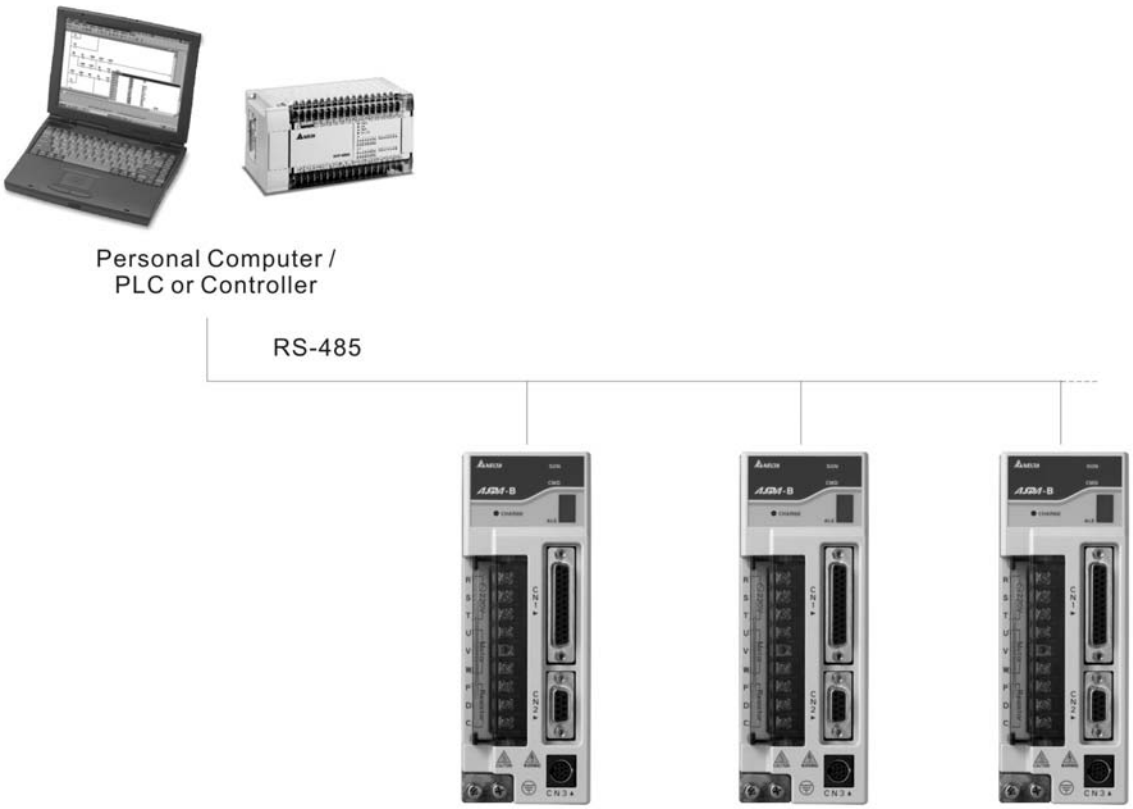
8.2 Communication Parameter Settings

The following describes the communication addresses for the communication parameters.

For communication parameters, please refer to the Chapter 7.

0300H Address Setting	Default: 1 Range: 1 ~ 254

🕮 If the AC servo drive is controlled by RS-485 communication, each drive (or device) must be uniquely identified and addressed between 1 and 254. Access to program this number is via parameter P3-00.



0301H Transmission Speed	Default: 3 Settings: 0: Baud rate 4800 (data transmission speed: bits / second) 1: Baud rate 9600 (data transmission speed: bits / second) 2: Baud rate 19200 (data transmission speed: bits / second) 3: Baud rate 38400 (data transmission speed: bits / second) 4: Baud rate 57600 (data transmission speed: bits / second) 5: Baud rate 115200 (data transmission speed: bits / second)

🕮 This parameter is used to set the desired transmission speed between the computer and AC servo drive. Users can set this parameter and control transmission speed to reach the maximum baud rate of 115200 bps.

0302H Communication Protocol	Default: 0 Settings: 0: Modbus ASCII mode, <7,N,2> 1: Modbus ASCII mode, <7,E,1 > 2: Modbus ASCII mode, <7,O,1> 3: Modbus ASCII mode, <8,N,2 > 4: Modbus ASCII mode, <8,E,1> 5: Modbus ASCII mode, <8,O,1> 6: Modbus RTU mode, <8,N,2> 7: Modbus RTU mode, <8,E,1> 8: Modbus RTU mode, <8,O,1>

🕮 This parameter is used to set the communication protocol. The alphanumeric characters represent the following: 7 or 8 is the number of data bits; N, E or O refer to the parity bit, Non, Even or Odd; the 1 or 2 is the numbers of stop bits.

0303H Transmission Fault Treatment	Default: 0 Settings: 0: Display fault and continue operating 1: Display fault and stop operating

🕮 This parameter is used to determine the operating sequence once a communication fault has been detected. If '1' is selected the drive will stop operating upon detection the communication fault. The mode of stopping is set by parameter P1-32.

0304H Communication Time Out Detection	Watch Dog Timer (It is not recommended to change the factory default setting if not necessary) Default: 0 Range: 0 ~ 20 sec. The factory default setting is set to 0 and it indicates this function is disabled.

🕮 When this parameter is set to any value over 0, it indicates that the timer is enabled. The value set in this parameter is the communication time and the communication time out detection should be completed within the time. Otherwise, a communication error will occur. For example, if the value set in this parameter is 5, it indicates that the communication time out detection will be activated once in five seconds or a communication error will occur.

0306H Digital Input Communication Function	Digital Input Contact Control: Default: 0 Settings: 0 ~ 3F (hexadecimal number)

🕮 The setting of this parameter determines how the Digital Inputs (DI) accept commands and signals.

🕮 Input commands or signals through the DI can be either from an external source, through the CN 1 interface connector, or via communication, (RS-232, RS-485). If the Digital Input Contact Control parameter for the DI 1 ~ 6 is set to "0", command is external, and via CN1; if it is set to "1" (decimal number) the DI signal is via communication. Each of the six Digital Inputs are accessed individually and can be set independently of each other. They can be programmed either via the drive's keypad or via

communication and computer UI. If they are programmed via the keypad a hexadecimal number is entered; if programmed via communication or UI a decimal or hexadecimal number can be used. In both methods of programming, a single number is used for all six Digital Inputs. The following example shows how each DI is addressed and converted to a single decimal or hexadecimal number.

- The six Digital Inputs are noted from the right, DI 1 to left, DI 6 with their desired input command or signal method, 0 or 1. Once all six Digital Inputs have been noted this binary number is converted to a decimal or hexadecimal number and entered into P3-06.

Bit	5	4	3	2	1	0	
Decimal value	32	16	8	4	2	1	
Input	DI6	DI5	DI4	DI3	DI2	DI1	
State	0	1	0	1	0	1	= D6 Hex (Keypad, Communication or UI)
(External CN1 Communication)						or	= 63 Dec (Communication or UI only)

- Please see Chapter 4.4.5 DI Signal Display Diagnosis Operation for display layout of the Digital Signal selection.
- The Digital Input Control Contact parameter, P3-06 also works in conjunction with the Multi Function Digital Input parameter P4-07 which has several functions.
- The contents of P4-07 is "read only" via the drive keypad and will display the state on or off ("blank" or "|") of the six Digital Inputs which have been set in accordance to P3-06. For example; if P3-06 has been set to 0 (All DI is external and via the CN 1 interface) and the P4-07 display is indicating the following:

  _ | | _ _ | (for the manual this picture should be similar to the one shown on page 4-8 (Ch 4.4.5))

  The Digital Inputs 1, 4, & 5 are "on" (high) and Digital Inputs 2, 3, & 6 are "off" (low).

  If the contents of P4-07 is being read via communication the output will be a decimal number that will represent the "binary" display. Therefore in the previous example the decimal number being read would be 25.

  However, in the communication mode the user can write to P4-07 to turn the Digital Inputs either "on" or "off". Again this achieved by sending a decimal or hexadecimal number that corresponds to the binary representation of the Digital Inputs being addressed. Therefore in the previous example 25 or 19 hex would be sent to 407H to switch on Digital Inputs 1, 4, & 5. Remember, previous to this P3-06 would have been set to either 63 / 3F or 25 / 19 (This sets the Digital Inputs 1, 4, & 5 to communication).

0307H Communication Response Delay Time	Default: 0 Range: 0~255

- This parameter is used to delay the communication time that servo drive respond to host controller (external controller)
- When the communication address is set to 255, the communication response delay time will be 0 (zero) no matter what the setting value of P3-07 is.

8.3 MODBUS Communication Protocol

When using RS-232/485 serial communication interface, each ASDA-B series AC servo drive has a pre-assigned communication address specified by parameter “P3-00”. The computer then controls each AC servo drive according to its communication address. ASDA-B series AC servo drive can be set up to communicate on a MODBUS networks using on of the following modes: ASCII (American Standard Code for Information Interchange) or RTU (Remote Terminal Unit). Users can select the desired mode along with the serial port communication protocol in parameter “P3-02”.

■ **Code Description:**

ASCII Mode:

Each 8-bit data is the combination of two ASCII characters. For example, a 1-byte data: 64 Hex, shown as ‘64’ in ASCII, consists of ‘6’ (36Hex) and ‘4’ (34Hex).

The following table shows the available hexadecimal characters and their corresponding ASCII codes.

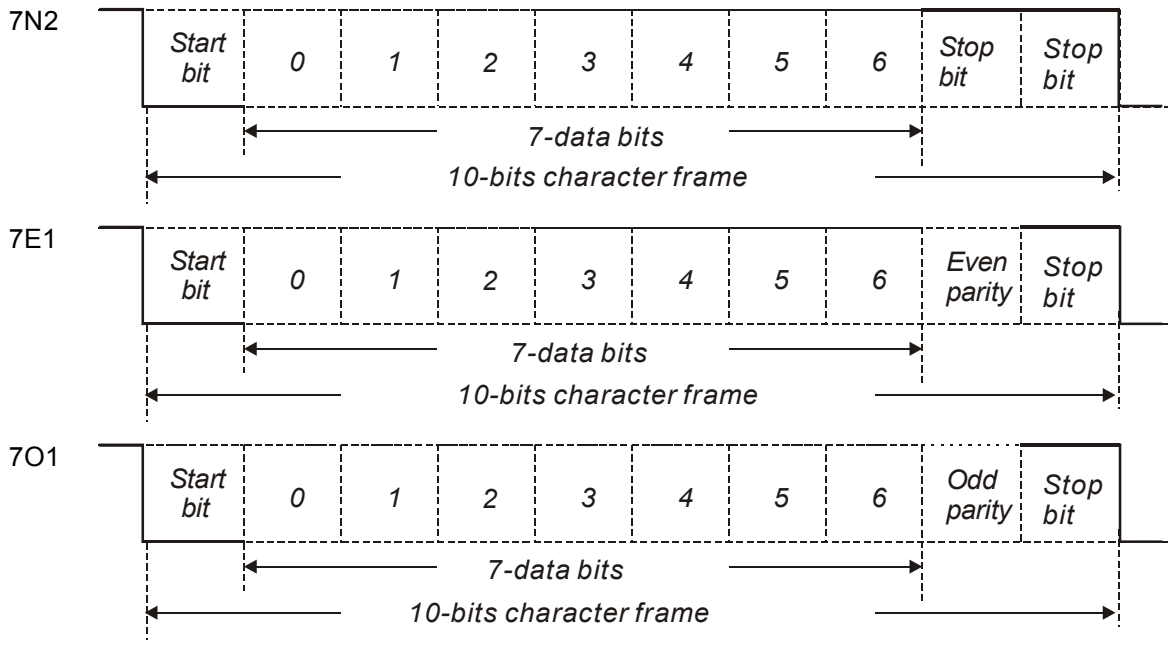
Character	‘0’	‘1’	‘2’	‘3’	‘4’	‘5’	‘6’	‘7’
ASCII code	30H	31H	32H	33H	34H	35H	36H	37H
Character	‘8’	‘9’	‘A’	‘B’	‘C’	‘D’	‘E’	‘F’
ASCII code	38H	39H	41H	42H	43H	44H	45H	46H

RTU Mode:

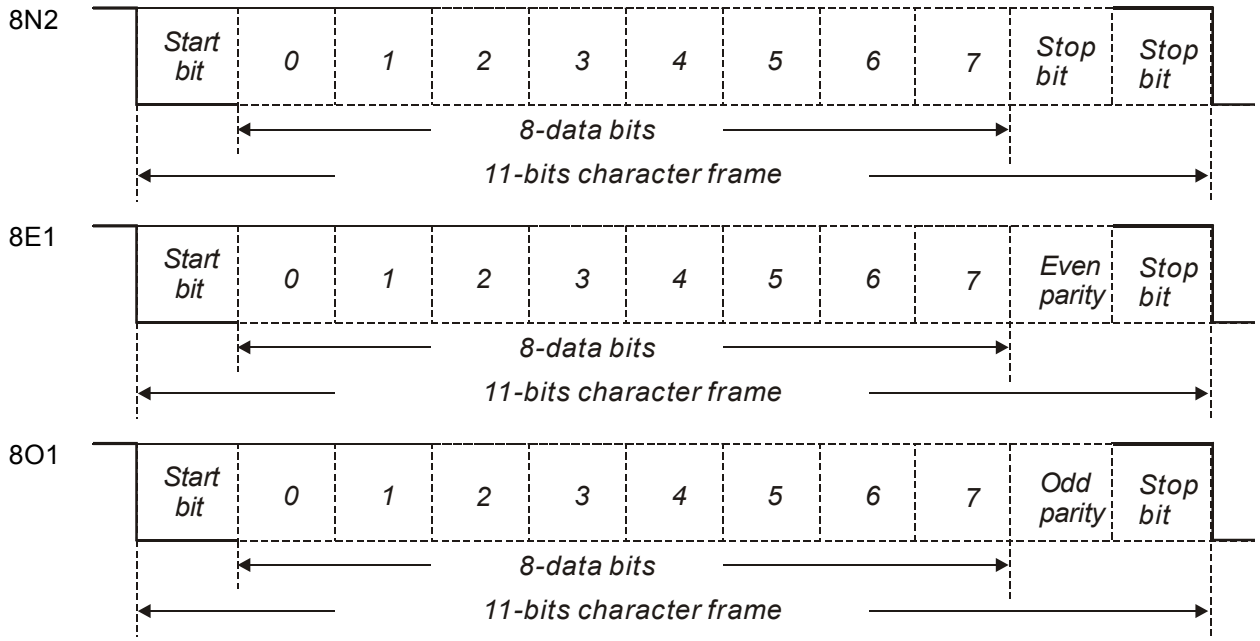
Each 8-bit data is the combination of two 4-bit hexadecimal characters. For example, a 1-byte data: 64 Hex.

■ **Data Format:**

10-bit character frame (For 7-bit character)



11-bit character frame (For 8-bit character)



■ **Communication Protocol:**

ASCII Mode:

STX	Start character': ' (3AH)
ADR	Communication address: 1-byte consists of 2 ASCII codes
CMD	Command code: 1-byte consists of 2 ASCII codes
DATA(n-1)	Contents of data: n word = n x 2-byte consists of n x 4 ASCII codes, n≤12
…….	
DATA(0)	
LRC	Command code: 1-byte consists of 2 ASCII codes
End 1	End code 1: (0DH)(CR)
End 0	End code 0: (0AH)(LF)

RTU Mode:

STX	A silent interval of more than 10ms
ADR	Communication address: 1-byte
CMD	Command code: 1-byte
DATA(n-1)	Contents of data: n word = n x 2-byte, n≤12
…….	
DATA(0)	
CRC	Command code: 1-byte
End 1	A silent interval of more than 10ms

STX (Communication Start)

ASCII Mode: ':' character

RTU Mode: A silent interval of more than 10ms

ADR (Communication Address)

The valid communication addresses are in the range of 1 to 254.

For example, communication to AC servo drive with address 16 decimal:

ASCII Mode: ADR='1','0' => '1'=31H，'0'=30H

RTU Mode: ADR = 10H

CMD (Command Codes) and DATA (Data Characters)

The format of data characters depends on the command code. The available command codes and examples for AC servo drive are described as follows:

Command code: 03H, read N words. The maximum value of N is 10.

For example, reading continuous 2 words from starting address 0200H of AC servo drive with address 01H.

ASCII Mode:

Command message:

STX	':'
ADR	'0'
	'1'
CMD	'0'
	'3'
Starting data address	'0'
	'2'
	'0'
	'0'
Number of data	'0'
	'0'
	'0'
	'2'
LRC Check	'F'
	'8'
End 1	(0DH)(CR)
End 0	(0AH)(LF)

Response message:

STX	':'
ADR	'0'
	'1'
CMD	'0'
	'3'
Number of data (Count by byte)	'0'
	'4'
Contents of starting data address 0200H	'0'
	'0'
	'B'
	'1'
Contents of second data address 0201H	'1'
	'F'
	'4'
	'0'
LRC Check	'E'
	'8'
End 1	(0DH)(CR)
End 0	(0AH)(LF)

RTU Mode:

Command message:

ADR	01H
CMD	03H
Starting data address	02H (Upper bytes)
	00H (Lower bytes)
Number of data (Count by word)	00H
	02H
CRC Check Low	C5H (Lower bytes)
CRC Check High	B3H (Upper bytes)

Response message:

ADR	01H
CMD	03H
Number of data (Count by byte)	04H
Contents of starting data address 0200H	00H (Upper bytes)
	B1H (Lower bytes)
Contents of second data address 0201H	1FH (Upper bytes)
	40H (Lower bytes)
CRC Check Low	A3H (Lower bytes)
CRC Check High	D4H (Upper bytes)

Command code: 06H, write 1 word

For example, writing 100 (0064H) to starting data address 0200H of ASDA-B series with address 01H.

ASCII Mode:

Command message:

STX	‘:’
ADR	‘0’
	‘1’
CMD	‘0’
	‘6’
Starting data address	‘0’
	‘2’
	‘0’
	‘0’
Content of data	‘0’
	‘0’
	‘6’
	‘4’
LRC Check	‘9’
	‘3’
End 1	(0DH)(CR)
End 0	(0AH)(LF)

Response message:

STX	‘:’
ADR	‘0’
	‘1’
CMD	‘0’
	‘6’
Starting data address	‘0’
	‘2'
	‘0’
	‘0’
Content of data	‘0’
	‘0’
	‘6’
	‘4’
LRC Check	‘9’
	‘3’
End 1	(0DH)(CR)
End 0	(0AH)(LF)

RTU Mode:

Command message:

ADR	01H
CMD	06H
Starting data address	02H (Upper bytes)
	00H (Lower bytes)
Content of data	00H (Upper bytes)
	64H (Lower bytes)
CRC Check Low	89H (Lower bytes)
CRC Check High	99H (Upper bytes)

Response message:

ADR	01H
CMD	06H
Starting data address	02H (Upper bytes)
	00H (Lower bytes)
Content of data	00H (Upper bytes)
	64H (Lower bytes)
CRC Check Low	89H (Lower bytes)
CRC Check High	99H (Upper bytes)

LRC (ASCII Mode):

LRC (Longitudinal Redundancy Check) is calculated by summing up, module 256, the values of the bytes from ADR to last data character then calculating the hexadecimal representation of the 2's-complement negation of the sum.

For example, reading 1 word from address 0201H of the ASDA-B series AC servo drive with address 01H.

STX	':'
ADR	'0'
	'1'
CMD	'0'
	'3'
Starting data address	'0'
	'2'
	'0'
	'1'
Number of data	'0'
	'0'
	'0'
	'1'
LRC Check	'F'
	'8'
End 1	(0DH)(CR)
End 0	(0AH)(LF)

01H+03H+02H+01H+00H+01H = 08H, the 2's complement negation of 08H is F8H.

Hence, we can know that LRC CHK is 'F','8'.

CRC (RTU Mode):

CRC (Cyclical Redundancy Check) is calculated by the following steps:

Step 1: Load a 16-bit register (called CRC register) with FFFFH.

Step 2: Exclusive OR the first 8-bit byte of the command message with the low order byte of the 16-bit CRC register, putting the result in the CRC register.

Step 3: Extract and examine the LSB. If the LSB of CRC register is 0, shift the CRC register one bit to the right. If the LSB of CRC register is 1, shift the CRC register one bit to the right, then Exclusive OR the CRC register with the polynomial value A001H.

Step 4: Repeat step 3 until eight shifts have been performed. When this is done, a complete 8-bit byte will have been processed, then perform step 5.

Step 5: Repeat step 2 to step 4 for the next 8-bit byte of the command message.

Continue doing this until all bytes have been processed. The final contents of the CRC register are the CRC value.



1) When transmitting the CRC value in the message, the upper and lower bytes of the CRC value must be swapped, i.e. the lower order byte will be transmitted first.

2) For example, reading 2 words from address 0101H of the AC servo drive with address 01H. The final content of the CRC register from ADR to last data character is 3794H, then the command message is shown as follows. What should be noticed is that 94H have to be transmitted before 37H.

Command Message	
ADR	01H
CMD	03H
Starting data address	01H (Upper byte)
	01H (Lower bytes)
Number of data (Count by word)	00H (Upper bytes)
	02H (Lower bytes)
CRC Check Low	94H (Lower bytes)
CRC Check High	37H (Upper bytes)

End1, End0 (Communication End)

ASCII Mode:

In ASCII mode, (0DH) stands for character '\r' (carriage return) and (0AH) stands for character '\n' (new line), they indicate communication end.

RTU Mode:

In RTU mode, a silent interval of more than 10ms indicates communication end.

■ Communication Related Error Code

If one communication error occurs during communication, the AC servo drive will respond the corresponding error value and command code plus 80H back to the external controller.

For example,

ASCII Mode

STX	':'
ADR	'0'
	'1'
CMD	'8'
	'6'
Error Code	'0'
	'2'
LRC Check	'7'
	'7'
End 1	CR
End 0	LF

RTU Mode

ADR	01H
CMD	86H
Error Code	02H
CRC Check Low	C3H
CRC Check High	A1H

Error Code

Error Code	Error Code	Description
0x01	GRP_ERR	Group Error: Read/Write unexisted parameter group
0x02	IDX_ERR	Parameter Error: Read/Write unexisted parameter
0x03	VAL_ERR	Value Error: Setting value is not within the setting range. (Higher than the maximum setting value or lower than the minimum setting value)
0x04	OV_PT	Numbers of Data Error: Numbers of read and write data exceed the maximum. (9 numbers)
0x05	ZO_PT	0 Number Error: Number of read and write data is 0.
0x06	WRITE_ERR	Write Error: Write the read-only and reserved parameters.
0x27	OUT_OF_RANGE	Illegal Value: Although the setting value is within the setting range, it is not a legal value for this parameter.
0x28	PASSWORD_FAIL	Password error: For security, password is needed for reading and writing some parameters. For example, before enabling P4-10, users have to set P2-08 to 20 first.
0x29	SRVON_WR_DISABLE	SON Protection: Some parameters cannot be enabled when Servo On. (SON signal is activated.)

The following is an example of CRC generation using C language. The function takes two arguments:

unsigned char* data;

unsigned char length

The function returns the CRC value as a type of unsigned integer.

```
unsigned int crc_chk(unsigned char* data, unsigned char length) {
        int j;
        unsigned int reg_crc=0xFFFF;

        while( length-- ) {
                reg_crc^= *data++;
                for (j=0; j<8; j++ ) {
                        if( reg_crc & 0x01 ) { /*LSB(bit 0 ) = 1 */
                                reg_crc = (reg_crc >> 1)^0xA001;
                        } else {
                                reg_crc = (reg_crc>>1);
                        }
                }
        }
        return reg_crc;
}
```

PC communication program example:

```
#include<stdio.h>
#include<dos.h>
#include<conio.h>
#include<process.h>
#define PORT 0x03F8          /*  the address of COM 1  */
#define THR 0x0000
#define RDR 0x0000
#define BRDL 0x0000
#define IER 0x0001
#define BRDH 0x0001
#define LCR 0x0003
#define MCR 0x0004
#define LSR 0x0005
#define MSR 0x0006
unsigned char rdat[60];
/* read 2 data from address 0200H of ASD with address 1 */
unsigned char tdat[60]={':','0','1','0','3','0','2','0','0','0','0','0','2','F','8','\r','\n'};
void main() {
```

```
int I;
outportb(PORT+MCR,0x08);            /*  interrupt enable  */
outportb(PORT+IER,0x01);                    /*  interrupt as data in  */
outportb(PORT+LCR,( inportb(PORT+LCR) | 0x80 ) );
/*  the BRDL/BRDH can be access as LCR.b7 == 1  */
outportb(PORT+BRDL,12);
outportb(PORT+BRDH,0x00);
outportb(PORT+LCR,0x06);            /* set prorocol
                                                <7,E,1> = 1AH,          <7,O,1> = 0AH
                                                <8,N,2> = 07H           <8,E,1> = 1BH
                                                <8,O,1> = 0BH                                   */

for( I = 0; I<=16; I++ ) {
      while( !(inportb(PORT+LSR) & 0x20) );   /*  wait until THR empty  */
      outportb(PORT+THR,tdat[I]);               /*  send data to THR  */
}
I = 0;
while( !kbhit() ) {
      if( inportb(PORT+LSR)&0x01 ) {  /*  b0==1, read data ready  */
            rdat[I++] = inportb(PORT+RDR); /*   read data from RDR  */
      }
}
}
```

efesotomasyon.com

Chapter 9 Maintenance and Inspection

Delta AC servo drives are based on solid state electronics technology. Preventive maintenance is required to operate this AC servo drives in its optimal condition, and to ensure a long life. It is recommended to perform a periodic maintenance and inspection of the AC servo drive by a qualified technician. Before any maintenance and inspection, always turn off the AC input power to the unit.



➢ ***Be sure to disconnect AC power and ensure that the internal capacitors have fully discharged before performing the maintenance and inspection!***

9.1 Basic Inspection

After power is in connected to the AC servo drive, the charge LED will be lit which indicates that the AC servo drive is ready.

Item	Content
General Inspection	● Periodically inspect the screws of the servo drive, motor shaft, terminal block and the connection to mechanical system. Tighten screws as necessary as they may loosen due to vibration and varying temperatures. ● Ensure that oil, water, metallic particles or any foreign objects do not fall inside the servo drive, motor, control panel or ventilation slots and holes. As these will cause damage. ● Ensure the correct installation and the control panel. It should be free from airborne dust, harmful gases or liquids. ● Ensure that all wiring instructions and recommendations are followed; otherwise damage to the drive and or motor may result.
Inspection before operation (Control power is not applied)	● Inspect the servo drive and servo motor to insure they were not damaged. ● To avoid an electric shock, be sure to connect the ground terminal of servo drive to the ground terminal of control panel. ● Before making any connection, wait 10 minutes for capacitors to discharge after the power is disconnected, alternatively, use an appropriate discharge device to discharge. ● Ensure that all wiring terminals are correctly insulated. ● Ensure that all wiring is correct or damage and or malfunction may result. ● Visually check to ensure that there are not any unused screws, metal strips, or any conductive or inflammable materials inside the drive. ● Never put inflammable objects on servo drive or close to the external regenerative resistor. ● Make sure control switch is OFF. ● If the electromagnetic brake is being used, ensure that it is correctly wired. ● If required, use an appropriate electrical filter to eliminate noise to the servo drive. ● Ensure that the external applied voltage to the drive is correct and matched to the controller.

Item	Content
Inspection during operation (Control power is applied)）	● Ensure that the cables are not damaged, stressed excessively or loaded heavily. When the motor is running, pay close attention on the connection of the cables and notice that if they are damaged, frayed or over extended. ● Check for abnormal vibrations and sounds during operation. If the servo motor is vibrating or there are unusual noises while the motor is running, please contact the dealer or manufacturer for assistance. ● Ensure that all user-defined parameters are set correctly. Since the characteristics of various machinery are different, in order to avoid accident or cause damage, do not adjust the parameter abnormally and ensure the parameter setting is not an excessive value. ● Ensure to reset some parameters when the servo drive is off (Please refer to Chapter 7). Otherwise, it may result in malfunction. ● If there is no contact sound or there be any unusual noises when the relay of the servo drive is operating, please contact your distributor for assistance or contact with Delta. ● Check for abnormal conditions of the power indicators and LED display. If there is any abnormal condition of the power indicators and LED display, please contact your distributor for assistance or contact with Delta.

9.2 Maintenance

- Use and store the product in a proper and normal environment.
- Periodically clean the surface and panel of servo drive and motor.
- Make sure the conductors or insulators are corroded and/or damaged.
- Do not disassemble or damage any mechanical part when performing maintenance.
- Clean off any dust and dirt with a vacuum cleaner. Place special emphasis on cleaning the ventilation ports and PCBs. Always keep these areas clean, as accumulation of dust and dirt can cause unforeseen failures.

9.3 Life of Replacement Components

- **Smooth capacitor**

  The characteristics of smooth capacitor would be deteriorated by ripple current affection. The life of smooth capacitor varies according to ambient temperature and operating conditions. The common guaranteed life of smooth capacitor is ten years when it is properly used in normal air-conditioned environment.

- **Relay**

  The contacts will wear and result in malfunction due to switching current. The life of relay varies according to power supply capacity. Therefore, the common guaranteed life of relay is cumulative 100,000 times of power on and power off.

■ Cooling fan

The cooling fan life is limited and should be changed periodically. The cooling fan will reach the end of its life in 2~3 years when it is in continuous operation. However, it also must be replaced if the cooling fan is vibrating or there are unusual noises.

This page intentionally left blank.

efesotomasyon.com

Chapter 10 Troubleshooting

If a fault is detected on the servo drive or motor, a corresponding alarm will be activated and the fault message will be displayed on the LCD display of the digital keypad and the fault code will be shown on the 1-digit 7-segment LED display of the servo drive.

10.1 Fault Messages Table

Servo Drive Fault Messages

Fault Messages		
Display	**Fault Name**	**Fault Description**
ALE 1	Overcurrent	Main circuit current is higher than 1.5 multiple of motor's instantaneous maximum current value.
ALE 2	Overvoltage	Main circuit voltage has exceeded its maximum allowable value.
ALE 3	Undervoltage	Main circuit voltage is below its minimum specified value.
ALE 4	Z Pulse shift	The corresponding angle of magnetic field of Z phase is error.
ALE 5	Regeneration error	Regeneration control operation is in error.
ALE 6	Overload	Servo motor and drive is overload.
ALE 7	Overspeed	Motor's control speed exceeds the limit of normal speed.
ALE 8	Abnormal pulse control command	Input frequency of pulse command exceeds the limit of its allowable setting value.
ALE 9	Excessive deviation	Position control deviation value exceeds the limit of its allowable setting value.
ALE 10/ALE A	Serial communication error	RS-232/485 serial communication is in error.
ALE 11/ALE b	Encoder error (Position detector fault)	Pulse signal is in error.
ALE 12/ALE C	Adjustment error	Adjusted value exceeds the limit of its allowable setting value when perform electrical adjustment.
ALE 13/ALE d	Emergency stop activated	Emergency stop is activated.
ALE 14/ALE E	Reverse limit switch error	Reverse limit switch is activated.
ALE 15/ALE F	Forward limit switch error	Forward limit switch is activated.
ALE 16/ALE G	IGBT temperature error	The temperature of IGBT is over high.
ALE 17/ALE H	Memory error	EE-PROM write-in and read-out is in error.
ALE 18/ALE J	Serial communication time out	RS-232/485 serial communication time out
ALE 19/ALE L	Motor type error	The motor capacity does not match the servo drive setting

Fault Messages		
Display	**Fault Name**	**Fault Description**
ALE 20/ALE	Input power phase loss	One phase of the input power is loss.

Keypad Fault Messages

Fault Messages		
Display	**Fault Name**	**Fault Description**
ALE 30	LCM hardware error	The character display on LCM is in error.
ALE 31	LED hardware error	When parameter P8-09 is enabled, LED indicator is abnormal.
ALE 32	KEY hardware error	When parameter P8-09 is enabled, the function key is disabled.
ALE 33	RAM hardware error	When parameter P8-09 is enabled, the dynamical memory (RAM) is abnormal.
ALE 34	EEPROM hardware error	The data memory (EEPROM) is abnormal.
ALE 35	COMM hardware error	Communication is in error during communication initial setup.
ALE 36	Reserved	
ALE 37	Reserved	
ALE 38	Reserved	
ALE 39	Reserved	
ALE 40	Initial setup error	Communication initial setup has not completed yet.
ALE 41	Communication receive time out	Communication time out when receiving data (continuously communicate over three times)
ALE 42	Communication receive error	Checksum error when receiving data during communication.
ALE 43	Error communication response address	Respond the error communication address.
ALE 44	Error communication response command	Respond the error communication command.
ALE 45	Communication parameter address error	Respond the error parameter communication address.
ALE 46	Communication parameter content error	Respond the error parameter content.
ALE 47	Drive specification error	The servo drive specification does not match when save and write out parameter.
ALE 48	Fast editing function error	The function of static and dynamic auto-tuning is in error.

10.2 Potential Cause and Corrective Actions

Servo Drive Fault Messages

ALE 1 / ALE : Overcurrent

- When SERVO OFF, but the power is on:

Potential Cause	Checking Method	Corrective Actions
Short-circuit at drive output (U, V, W).	1. Check the wiring connections between drive and motor. 2. Check if the wire is short-circuited.	Repair the short-circuited and avoid metal conductor being exposed.

- When SERVO ON and the cable connected to U, V, W terminal is removed:

Potential Cause	Checking Method	Corrective Actions
Motor wiring error.	Check if the wiring steps are all correct when connecting motor to drive.	Follow the wiring steps in the user manual to reconnect wiring.

- When SERVO ON and the cable connected to U, V, W terminal is not removed or the servo motor is running:

Potential Cause	Checking Method	Corrective Actions
Short-circuit at drive output (U, V, W).	1. Check the wiring connections between drive and motor. 2. Check if the wire is short-circuited.	Repair the short-circuited and avoid metal conductor being exposed.
Motor wiring error.	Check if the wiring steps are all correct when connecting motor to drive.	Follow the wiring steps in the user manual to reconnect wiring.
IGBT error or servo hardware is damaged.	Heat sink overheated.	Please contact your distributor for assistance or contact with Delta.

ALE 2 / ALE : Overvoltage

- When SERVO OFF, but the power is on:
- When SERVO ON:

Potential Cause	Checking Method	Corrective Actions
The main circuit voltage has exceeded its maximum allowable value.	Use voltmeter to check whether the input voltage falls within the rated input voltage. (For voltage specification, please refer to section 11.1 in Chapter 11).	Use correct power supply or stabilizing power.
Power input error. (Incorrect power input)	Use voltmeter to check whether the input voltage is within the specified limit.	Use correct power supply or stabilizing power.
Servo drive hardware may be damaged.	The servo drive hardware may be damaged after the users have used voltmeter to check the input voltage falls within the rated input voltage.	Please contact your distributor for assistance or contact with Delta.

ALE 3 / ALE3 : Undervoltage

Potential Cause	Checking Method	Corrective Actions
The main circuit voltage is below its minimum specified value.	Check whether the wiring of main circuit input voltage is correct.	Reconfirm voltage wiring. Correct input wiring is needed.
No input voltage at main circuit.	Use voltmeter to check whether input voltage at main circuit is normal.	Reconfirm power supply, including switches.
Power input error. (Incorrect power input)	Use voltmeter to check whether the input voltage is within the specified limit.	Use correct power supply or stabilizing power.
Servo drive hardware is damaged.	The servo drive hardware is damaged after the users have used voltmeter to check the input voltage falls within the rated input voltage.	Please contact your distributor for assistance or contact with Delta.

ALE 4 / ALE4 : Z Pulse shift

Potential Cause	Checking Method	Corrective Actions
Encoder is damage.	Check Encoder for the damage.	Repair or replace the motor.
Encoder is loose.	Examine the Encoder connector.	Install the motor again.

ALE 5 / ALE5 : Regeneration error

- When the power is on:

Potential Cause	Checking Method	Corrective Actions
Servo drive hardware is damaged.	Please contact your distributor for assistance or contact with Delta.	

- When the motor is running:

Potential Cause	Checking Method	Corrective Actions
Regenerative resistor is not connected.	Check the wiring connection of regenerative resistor.	Reconnect regenerative resistor.
The transistor for regeneration is disabled.	Check if the transistor for regeneration is short-circuited.	Please contact your distributor for assistance or contact with Delta.
Parameter setting is in error.	Confirm the parameter setting and specifications of regenerative resistor.	Correctly reset parameter again.
Servo drive hardware is damaged.	Please contact your distributor for assistance or contact with Delta.	

ALE 6 / ALE6 : Overload

- When the motor is started within 30 minutes:

Potential Cause	Checking Method	Corrective Actions
The drive has exceeded its rated load during continuous operation.	Check if the drive is overloaded.	Increase motor capacity or reduce load.
Control system parameter setting is incorrect.	Check if there is mechanical vibration	Adjust gain value of control circuit.
	Accel/Decel time setting is too fast.	Decrease Accel/Decel time setting.
The wiring of drive and encoder is in error.	Check the wiring of U, V, W and encoder.	Ensure all wiring is correct.
The encoder of the motor is damaged.	Please contact your distributor for assistance or contact with Delta.	
The connection of U, V, W is incorrect.	Ensure the U, V, W of the motor is connected to the U, V, W of the drive correctly.	Ensure all wiring is correct.

- When the motor start running for 3 minutes above:

Potential Cause	Checking Method	Corrective Actions
The drive has exceeded its rated load during continuous operation.	Check if the drive is overloaded.	Increase motor capacity or reduce load.
Control system parameter setting is incorrect.	Check if there is mechanical vibration	Adjust gain value of control circuit.
	Accel/Decel time setting is too fast.	Decrease Accel/Decel time setting.
The wiring of drive and encoder is in error.	Check the wiring of U, V, W and encoder.	Ensure all wiring is correct.

ALE 7 / ALE7 : Overspeed

- When SERVO ON:

Potential Cause	Checking Method	Corrective Actions
The wiring of motor is incorrect.	Check the wiring of U, V, W and encoder.	Ensure all wiring is correct.
The encoder of the motor is damaged.	Please contact your distributor for assistance or contact with Delta.	

- When the motor Accel/Decel in high-speed:

Potential Cause	Checking Method	Corrective Actions
Speed input command is not stable (too much fluctuation).	Use signal detector to detect if input signal is abnormal.	Ensure that input command frequency is stable (not fluctuate too much) and activate filter function (P1-06, P1-07 and P1-08).
Over-speed parameter setting is defective.	Check if over-speed parameter setting value is too low.	Correctly set over-speed parameter setting (P2-34).

ALE 8 / ALE8 : Abnormal pulse control command

Potential Cause	Checking Method	Corrective Actions
Pulse command frequency is higher than rated input frequency.	Use pulse frequency detector to measure input frequency.	Correctly set the input pulse frequency.

ALE 9 / ALE9 : Excessive deviation

- When the motor is running:

Potential Cause	Checking Method	Corrective Actions
Maximum deviation parameter setting is too small.	Check the maximum deviation parameter setting and observe the position error value when the motor is running.	Increases the parameter setting value of P2-35.
Torque limit is too low.	Check torque limit value.	Correctly adjust torque limit value.
There is an overload.	Check for overload condition.	Reduce external applied load or re-estimate the motor capacity.

- When pulse command is input but the motor does not run or the moving is very slow:

Potential Cause	Checking Method	Corrective Actions
Gain value is too small.	Check for proper gain value.	Correctly adjust gain value.
Torque limit is too low.	Check torque limit value.	Correctly adjust torque limit value.
There is an overload.	Check for overload condition.	Reduce external applied load or re-estimate the motor capacity.

- The excessive deviation fault occurs immediately when the pulse command is given:

Potential Cause	Checking Method	Corrective Actions
Maximum deviation parameter setting is too small.	Check the maximum deviation parameter setting and observe the position error value when the motor is running.	Increases the parameter setting value of P2-35.
Too much fluctuation of pulse command.	Check the pulse frequency.	Adjust pulse frequency and activate filter function (P1-06, P1-07 and P1-08).

ALE 10 / ALEA : Serial communication error

- Please refer to section 8.3.4 in Chapter 8 for the related error codes.

Potential Cause	Checking Method	Corrective Actions
Communication parameter setting is defective.	Check the communication parameter setting.	Correctly set parameter setting.
Communication address is incorrect.	Check the communication address.	Correctly set communication address.
Communication value is incorrect.	Check the communication value.	Correctly set communication value.

ALE 11 / ALE : Encoder error (Position detector fault)

Potential Cause	Checking Method	Corrective Actions
The wiring of encoder is in error.	1. Check if all wiring is correct. 2. Check if the users conduct the wiring by the wiring information in the user manual.	Ensure all wiring is correct.
Encoder is loose	Examine the encoder connector.	Install the motor again.
The wiring of encoder is defective.	Check if all connections are tight.	Conduct the wiring again.
Encoder is damage	Check the encoder for the damage.	Repair or replace the motor.

ALE 12 / ALE : Adjustment error

Potential Cause	Checking Method	Corrective Actions
The motor is running.	Check if the motor is running.	Turn off the motor.
Analog input contact does not correctly return to zero.	Measure and check if the voltage level of analog input contact is the same as the electrical potential of grounding.	Correctly ground analog input contact.
Detection device may be damaged.	Check and reset the power supply.	Please contact your distributor for assistance or contact with Delta.

ALE 13 / ALE : Emergency stop activated

Potential Cause	Checking Method	Corrective Actions
Emergency stop switch is activated.	Check if emergency stop switch is On or Off.	Activate emergency stop switch.

ALE 14 / ALE : Reverse (CWL) limit switch error

Potential Cause	Checking Method	Corrective Actions
Reverse limit switch is activated.	Check if reverse limit switch is On or Off.	Activate reverse limit switch.
Servo system is not stable.	Check the value of control parameter setting and load inertia.	Modify parameter setting and re-estimate motor capacity.

ALE 15 / ALE : Forward (CCWL) limit switch error

Potential Cause	Checking Method	Corrective Actions
Forward limit switch is activated.	Check if forward limit switch is On or Off.	Activate forward limit switch.
Servo system is not stable.	Check the value of control parameter setting and load inertia.	Modify parameter setting and re-estimate motor capacity.

ALE 16 / ALE : IGBT temperature error

Potential Cause	Checking Method	Corrective Actions
The drive has exceeded its rated load during continuous operation.	Check if there is overload or the motor current is too high.	Increase motor capacity or reduce load.
Short-circuit at drive output.	Check the drive input wiring.	Ensure all wiring is correct.

ALE 17 / ALE : Memory error

Potential Cause	Checking Method	Corrective Actions
Data error in Memory read-out / write-in.	Reset parameter or power supply.	Please contact your distributor for assistance or contact with Delta.

ALE 18 / ALE : Serial communication time out

Potential Cause	Checking Method	Corrective Actions
Setting value in time out parameter is not correct.	Check communication time out parameter setting.	Correctly set P3-07.
Not receiving communication command for a long time.	Check whether communication cable is loose or broken.	Tighten the communication cable, make sure the communication cable is not damaged and ensure all wiring is correct.

ALE 19 / ALE : Motor type error

Potential Cause	Checking Method	Corrective Actions
Servo drive and servo motor do not match.	Check the type of servo drive and servo motor and their combination.	Replace the servo drive or replace the servo motor.

ALE 20 / ALE : Input power phase loss

Potential Cause	Checking Method	Corrective Actions
Control power supply is in error.	Check the power cable and connections of R, S, T. Check whether the power cable is loose or the possible loss of phase on input power.	If the fault does not clear even when the three-phase power is connected correctly, please contact your distributor for assistance or contact with Delta.

Keypad Fault Messages

ALE 30 : LCM hardware error

Potential Cause	Checking Method	Corrective Actions
No display	Check if the 4th Pin of LCM is normal.	Please contact your distributor for assistance or contact with Delta.
Error characters display.	Check if the related Pins is short-circuited and check if IC operation is normal.	Please contact your distributor for assistance or contact with Delta.

ALE 31 : LED hardware error

Potential Cause	Checking Method	Corrective Actions
LED indicator is abnormal.	Check if LED is normal.	Please contact your distributor for assistance or contact with Delta.
	Check if the transistor is abnormal and check if IC operation is normal by setting P8-09 to 2.	Please contact your distributor for assistance or contact with Delta.

ALE 32 : KEY hardware error

Potential Cause	Checking Method	Corrective Actions
The function key is disabled.	Check if IC operation is normal by setting P8-09 to 1.	1. Activate P8-09 to perform the testing. 2. Please contact your distributor for assistance or contact with Delta.

ALE 33 : RAM hardware error

Potential Cause	Checking Method	Corrective Actions
LCM display is abnormal.	In regular condition, disorganized display or abnormal display shows on LCM. Please check if the working voltage of RAM is normal.	1. Activate P8-09 to perform the testing. 2. Please contact your distributor for assistance or contact with Delta.
Function key is abnormal.	Check if the transistor is abnormal and check if IC operation is normal by setting P8-09 to 3.	1. Activate P8-09 to perform the testing. 2. Please contact your distributor for assistance or contact with Delta.

ALE 34 : EEPROM hardware error

Potential Cause	Checking Method	Corrective Actions
Store data error	Check if the operation of MCU or EEPROM is normal by setting P8-09 to 4.	1. Activate P8-09 to perform the testing. 2. Please contact your distributor for assistance or contact with Delta.

ALE 35 : COMM hardware error

Potential Cause	Checking Method	Corrective Actions
Hardware error	Check if the serial communication signal is normal.	1. Activate P8-09 to perform the testing. 2. Please contact your distributor for assistance or contact with Delta.
Communication parameter setting is defective.	Check the communication parameter setting.	Correctly set parameter setting.

ALE 40 : Initial setup error

Potential Cause	Checking Method	Corrective Actions
Communication error occurs when initial setup.	Communication initial setup has not completed yet. Please check if the communication serial signal is normal.	1. Correctly set communication parameter setting. 2. Please contact your distributor for assistance or contact with Delta.
Parameter read error when initial setup.	EEPROM cannot read normally. Set P8-09 to 4 to test EEPROM and check if EEPROM is normal.	1. Activate P8-09 to perform the testing. 2. Please contact your distributor for assistance or contact with Delta.
Communication mode is error.	Check if using ASDA series servo drive.	Please use ASDA series servo drive.

ALE 41 : Communication receive time out

Potential Cause	Checking Method	Corrective Actions
Not receiving communication data for a long time.	Check if the communication cable is loose or broken.	Ensure all wiring is correct. Please contact your distributor for assistance or contact with Delta.
Data receiving is not completed.	Check if the serial communication signal is normal.	Please contact your distributor for assistance or contact with Delta.

ALE 42 : Communication receive error

Potential Cause	Checking Method	Corrective Actions
Checksum error	Check if the checksum of the receiving data is correct.	Verify the sending and receiving data format. Please contact your distributor for assistance or contact with Delta.
Checksum error	Check the communication quality.	Please contact your distributor for assistance or contact with Delta.

ALE 43 : Error communication response address

Potential Cause	Checking Method	Corrective Actions
Receive the error communication response address	Check if the sending and receiving communication address are the same.	Check if the communication setting is correct by using P8-05. Verify the sending and receiving data format.

ALE 44 : Error communication response command

Potential Cause	Checking Method	Corrective Actions
Respond the error communication command.	Respond the error Modbus command	Verify the sending and receiving data format.

ALE 45 : Communication parameter address error

Potential Cause	Checking Method	Corrective Actions
Respond the error parameter address	Check if the sending and receiving communication code are the same.	Verify the sending and receiving data format.

ALE 46 : Communication parameter content error

Potential Cause	Checking Method	Corrective Actions
Respond error parameter content when reading parameter.	The data length of the content is error.	Verify the sending and receiving data format.
Respond error parameter content when writing parameter.	The data content is in error.	Verify the sending and receiving data format.

ALE 47 : Drive specification error

Potential Cause	Checking Method	Corrective Actions
Parameter SAVE operation is in error.	Use P8-13 to check if the specification stored in the memory block match the actual servo drive specification when executing SAVE function (Save parameter settings to the Keypad).	1. Select the unused memory block to save the parameter. 2. Delete the memory block.
Parameter WRITE operation is in error.	Use P8-13 to check if the specification stored in the memory block match the actual servo drive specification when executing WRITE function (Parameter settings written out to the Drive).	Select the correct memory block.

ALE 48 : Fast editing function error

Potential Cause	Checking Method	Corrective Actions
The function of static and auto-tuning is in error.	The setting of P2-32 is incorrect.	Set P2-32 to Manual mode.
The function of dynamic auto-tuning is in error.	Execution time out or the function is not executed completely.	Please contact your distributor for assistance or contact with Delta.

10.3 Clearing Servo Drive Faults

Display	Fault Name	Clearing Method
ALE 1	Overcurrent	Turn ARST (DI signal) ON to clear the fault or restart the servo drive.
ALE 2	Overvoltage	Turn ARST (DI signal) ON to clear the fault or restart the servo drive.
ALE 3	Undervoltage	This fault message can be removed automatically after the voltage has returned within its specification.
ALE 4	Z Pulse shift	Restart the servo drive.
ALE 5	Regeneration error	Turn ARST (DI signal) ON to clear the fault or restart the servo drive.
ALE 6	Overload	Turn ARST (DI signal) ON to clear the fault or restart the servo drive.
ALE 7	Overspeed	Turn ARST (DI signal) ON to clear the fault or restart the servo drive.
ALE 8	Abnormal pulse control command	Turn ARST (DI signal) ON to clear the fault or restart the servo drive.
ALE 9	Excessive deviation	Turn ARST (DI signal) ON to clear the fault or restart the servo drive.
ALE 10/ALE A	Serial communication error	Turn ARST (DI signal) ON to clear the fault. This fault message can also be removed automatically after the communication is normal.
ALE 11/ALE b	Encoder error (Position detector fault)	Restart the servo drive.
ALE 12/ALE C	Adjustment error	This fault message can be removed after the wiring of CN1 connector (I/O signal connector) is removed and auto adjustment function is executed.
ALE 13/ALE d	Emergency stop activated	Turn ARST (DI signal) ON to clear the fault or restart the servo drive.
ALE 14/ALE E	Reverse limit switch error	Turn ARST (DI signal) ON to clear the fault or restart the servo drive.
ALE 15/ALE F	Forward limit switch error	Turn ARST (DI signal) ON to clear the fault or restart the servo drive.
ALE 16/ALE G	IGBT temperature error	Turn ARST (DI signal) ON to clear the fault or restart the servo drive.
ALE 17/ALE h	Memory error	Turn ARST (DI signal) ON to clear the fault or restart the servo drive.
ALE 18/ALE J	Serial communication time out	Turn ARST (DI signal) ON to clear the fault. This fault message can also be removed automatically after the communication is normal.
ALE 19/ALE J	Motor type error	Restart the servo drive.
ALE 20/ALE P	Input power phase loss	This fault message can be removed automatically after input power phase lost problem is solved.

efesotomasyon.com

Chapter 11 Specifications

11.1 Specifications of Servo Drive (ASDA-B Series)

Model: ASDA-B Series			100W	200W	400W	750W	1kW	1.5kW	2kW
			01	02	04	07	10	15	20
Power Supply	Voltage / Frequency		Three-phase or Single-phase 220VAC						Three-phase 220VAC
	Permissible Voltage Range		Three-phase or Single-phase 200 ~ 230VAC, -15% ~ 10%						Three-phase 200 ~ 230VAC, -15% ~ 10%
	Permissible Frequency Range		50/60Hz ±5%						
Cooling System			Natural Air Circulation				Fan Cooling		
Encoder Resolution / Feedback Resolution			2500ppr/10000ppr						
Control of Main Circuit			SVPWM (Space Vector Pulse Width Modulation) Control						
Tuning Modes			Auto / Manual						
Regenerative Resistor			None			Built-in			
Position Control Mode	Max. Input Pulse Frequency		Max. 500KPPS (Line driver) / Max. 200KPPS (Open collector)						
	Pulse Type		Pulse + Direction, A phase + B phase, CCW pulse + CW pulse						
	Command Source		External pulse train						
	Smoothing Strategy		Low-pass smoothing filter						
	Electronic Gear		Electronic gear N/M multiple N: 1~32767, M: 1:32767(1/50<N/M<200)						
	Torque Limit Operation		Set by parameters						
	Feed Forward Compensation		Set by parameters						
Speed Control Mode	Analog Input Command	Voltage Range	0 ~ ±10 VDC						
		Input Resistance	10KΩ						
		Time Constant	2.2 μs						
	Speed Control Range (Note 1)		1:5000						
	Command Source		External analog signal / Internal parameters						
	Smoothing Strategy		Low-pass and S-curve filter						
	Torque Limit Operation		Set by parameters						
	Frequency Response Characteristic		Maximum 250Hz						
	Speed Accuracy (Note 2) (at rated rotation speed)		0.01% or less at 0 to 100% load fluctuation						
			0.01% or less at ±10% power fluctuation						
			0.01% or less at 0°C to 50°C ambient temperature fluctuation						

Model: ASDA-B Series			100W	200W	400W	750W	1kW	1.5kW	2kW
			01	02	04	07	10	15	20
Torque Control Mode	Analog Input Command	Voltage Range	0 ~ ±10 VDC						
		Input Resistance	10KΩ						
		Time Constant	2.2 us						
	Command Source		External analog signal / Internal parameters						
	Smoothing Strategy		Low-pass smoothing filter						
	Speed Limit Operation		Set by parameters						
Digital Input/Output	Input		Servo On, Reset, Gain switching, Pulse clear, Emergency stop, Forward / Reverse inhibit limit						
			Torque limit activation, Speed limit activation, Internal parameter selection, Torque limit activation, Speed limit activation, Control mode selection (Position / Speed mode selection, Speed / Torque mode selection, Position / Torque mode selection)						
	Output		Encoder signal output (A, B, Z Line Driver / Z Open collector)						
			Servo ready, Servo On, Zero speed, Speed reached, Positioning completed, At torque limit, Servo alarm output (Servo fault), Electromagnetic brake, Home completed						
Protective Functions			Overcurrent, Overvoltage, Undervoltage, Z Pulse shift, Regeneration error, Overload, Overspeed, Excessive deviation, Encoder error, Emergency stop activated, Memory error, Serial communication error						
Communication Interface			RS-232 / RS-485						
Environment	Installation Site		Indoor location (free from direct sunlight), no corrosive liquid and gas (far away from oil mist, flammable gas, dust)						
	Altitude		Altitude 1000m or lower above sea level						
	Atmospheric pressure		86kPa to 106kPa						
	Operating Temperature		0°C to 45°C (If operating temperature is above specified range, forced cooling will be required)						
	Storage Temperature		-20°C to 65°C (-4°F to 149°F)						
	Humidity		0 to 90% (non-condensing)						
	Vibration		10Hz ≦ F ≦ 57Hz 0.075mm 57Hz < F ≦ 150Hz 1G						
	IP rating		IP20						
	Power System		TN / TT System (Note 3)						
	Approvals								

NOTE

1) Rated rotation speed: When full load, speed ratio is defined as the minimum speed (the motor will not pause).
2) When command is rated rotation speed, the speed fluctuation rate is defined as: (Empty load rotation speed – Full load rotation speed) / Rated rotation speed
3) TN system: A power distribution system having one point directly earthed, the exposed conductive parts of the installation being connected to that points by protective earth conductor.

   TT system: A power distribution system having one point directly earthed, the exposed conductive parts of the installation being connected to earth independent of the power system.
4) Please refer to “Chart of load and operating time” in section 11.5 “Overload Characteristics”.

11.2 Specifications of Servo Motor (ECMA Series)

Low Inertia Servo Motor

Model: ECMA Series	C304	C306		C308		C310	
	100W	200W	400W	400W	750W	1kW	2kW
	01	02	04	04	07	10	20
Rated output power (kW)	0.1	0.2	0.4	0.4	0.75	1.0	2.0
Rated torque (N-m) (Note 1)	0.32	0.64	1.27	1.27	2.39	3.18	6.37
Maximum torque (N-m)	0.96	1.92	3.82	3.82	7.16	9.54	19.11
Rated speed (rpm)	3000						
Maximum speed (rpm)	5000						
Rated current (A)	0.9	1.55	2.6	2.6	5.1	7.3	12.05
Maximum current (A)	2.7	4.65	7.8	7.8	15.3	21.9	36.15
Power rating (kW/s) (without brake)	27.7	22.4	57.6	24.0	50.4	38.1	90.6
Rotor moment of inertia ($Kg.m^2$) (without brake)	0.037E-4	0.177E-4	0.277E-4	0.68E-4	1.13E-4	2.65E-4	4.45E-4
Mechanical time constant (ms) (without brake)	0.75	0.80	0.53	0.74	0.63	0.74	0.61
Torque constant-KT (N-m/A)	0.36	0.41	0.49	0.49	0.47	0.44	0.53
Voltage constant-KE (mV/rpm)	13.6	16	17.4	18.5	17.2	16.8	19.2
Armature resistance (Ohm)	9.3	2.79	1.55	0.93	0.42	0.20	0.13
Armature inductance (mH)	24	12.07	6.71	7.39	3.53	1.81	1.50
Electrical time constant (ms)	2.58	4.3	4.3	7.96	8.37	9.3	11.4
Insulation class	Class A (UL), Class B (CE)						
Insulation resistance	100MΩ, DC 500V						
Insulation strength	AC 1500V, 60 seconds						
Weight (kg) (without brake)	0.5	1.2	1.6	2.1	3.0	4.3	6.2
Weight (kg) (with brake)	-	1.5	2.0	2.9	3.8	4.7	7.2
Max. radial shaft load (N)	78.4	196	196	245	245	490	490
Max. thrust shaft load (N)	39.2	68	68	98	98	98	98
Power rating (kW/s) (with brake)	-	21.3	53.8	22.1	48.4	30.4	82
Rotor moment of inertia ($Kg.m^2$) (with brake)	-	0.192E-4	0.30E-4	0.73E-4	1.18E-4	3.33E-4	4.953E-4
Mechanical time constant (ms) (with brake)	-	0.85	0.57	0.78	0.65	0.93	0.66
Brake holding torque [Nt-m (min)]	-	1.3	1.3	2.5	2.5	12	12
Brake power consumption (at 20 °C) [W]	-	7.2	7.2	8.5	8.5	19.4	19.4
Brake release time [ms (Max)]	-	10	10	10	10	10	10
Brake pull-in time [ms (Max)]	-	70	70	70	70	70	70

Model: ECMA Series	C304	C306		C308		C310	
	100W	200W	400W	400W	750W	1kW	2kW
	01	02	04	04	07	10	20
Vibration grade (um)	15						
Operating temperature	0°C to 40°C (32°F to 104°F)						
Storage temperature	-10°C to 80°C (-14°F to 176°F)						
Operating humidity	20% to 90% RH (non-condensing)						
Storage humidity	20% to 90% RH (non-condensing)						
Vibration capacity	2.5G						
IP rating	IP65 (using waterproof connectors and shaft seal installation (or using oil seal models))						
Approvals	CE c UL US						

Footnote:

*1 Rated torque is the continuous permissible torque under the following installation conditions:

Ambient temperature: 0~40°C

Heat sink dimensions: ECMA-__04 / 06 / 08: 250mm x 250mm x 6mm

ECMA-__10: 300mm x 300mm x 12mm

Material type: Aluminum – F40, F60, F80, F100, F130, F180

Medium / High Inertia Servo Motor

Model: ECMA Series	E313				E318	G313		
	500W	1kW	1.5kW	2kW	2kW	300W	600W	900W
	05	10	15	20	20	03	06	09
Rated output power (kW)	0.5	1.0	1.5	2.0	2.0	0.3	0.6	0.9
Rated torque (N-m) (Note 1)	2.39	4.77	7.16	9.55	9.55	2.86	5.73	8.59
Maximum torque (N-m)	7.16	14.3	21.48	28.65	28.65	8.59	17.19	21.48
Rated speed (rpm)	2000					1000		
Maximum speed (rpm)	3000					2000		
Rated current (A)	2.9	5.6	8.3	11.01	11.22	2.5	4.8	7.5
Maximum current (A)	8.7	16.8	24.9	33.03	33.66	7.5	14.4	22.5
Power rating (kW/s) (without brake)	7	27.1	45.9	62.5	26.3	10.0	39.0	66.0
Rotor moment of inertia ($Kg.m^2$) (without brake)	8.17E-4	8.41E-4	11.18E-4	14.59E-4	34.68E-4	8.17E-4	8.41E-4	11.18E-4
Mechanical time constant (ms) (without brake)	1.91	1.51	1.10	0.96	1.62	1.84	1.40	1.06
Torque constant-KT (N-m/A)	0.83	0.85	0.87	0.87	0.85	1.15	1.19	1.15
Voltage constant-KE (mV/rpm)	30.9	31.9	31.8	31.8	31.4	42.5	43.8	41.6
Armature resistance (Ohm)	0.57	0.47	0.26	0.174	0.119	1.06	0.82	0.43
Armature inductance (mH)	7.39	5.99	4.01	2.76	2.84	14.29	11.12	6.97

Model: ECMA Series	E313				E318	G313		
	500W	1kW	1.5kW	2kW	2kW	300W	600W	900W
	05	10	15	20	20	03	06	09
Electrical time constant (ms)	12.96	12.88	15.31	15.86	23.87	13.55	13.50	16.06
Insulation class	Class A (UL), Class B (CE)							
Insulation resistance	100MΩ, DC 500V							
Insulation strength	AC 1500V, 60 seconds							
Weight (kg) (without brake)	6.8	7	7.5	7.8	13.5	6.8	7	7.5
Weight (kg) (with brake)	8.2	8.4	8.9	9.2	17.5	8.2	8.4	8.9
Max. radial shaft load (N)	490	490	490	490	1176	490	490	490
Max. thrust shaft load (N)	98	98	98	98	490	98	98	98
Power rating (kW/s) (with brake)	6.4	24.9	43.1	59.7	24.1	9.2	35.9	62.1
Rotor moment of inertia ($Kg.m^2$) (with brake)	8.94E-4	9.14E-4	11.90E-4	15.88E-4	37.86E-4	8.94E-4	9.14E-4	11.9E-4
Mechanical time constant (ms) (with brake)	2.07	1.64	1.19	1.05	1.77	2.0	1.51	1.13
Brake holding torque [Nt-m (min)]	16.5	16.5	16.5	16.5	25	16.5	16.5	16.5
Brake power consumption (at 20 °C) [W]	21.0	21.0	21.0	21.0	31.1	21.0	21.0	21.0
Brake release time [ms (Max)]	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Brake pull-in time [ms (Max)]	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0
Vibration grade (um)	15							
Operating temperature	0°C to 40°C (32°F to 104°F)							
Storage temperature	-10°C to 80°C (-14°F to 176°F)							
Operating humidity	20% to 90% RH (non-condensing)							
Storage humidity	20% to 90% RH (non-condensing)							
Vibration capacity	2.5G							
IP rating	IP65 (using waterproof connectors and shaft seal installation (or using oil seal models))							
Approvals	CE cULus							

Footnote:

*1 Rated torque is the continuous permissible torque under the following installation conditions:

Ambient temperature: 0~40˚C

Heat sink dimensions: ECMA-__13：400mm x 400mm x 20mm

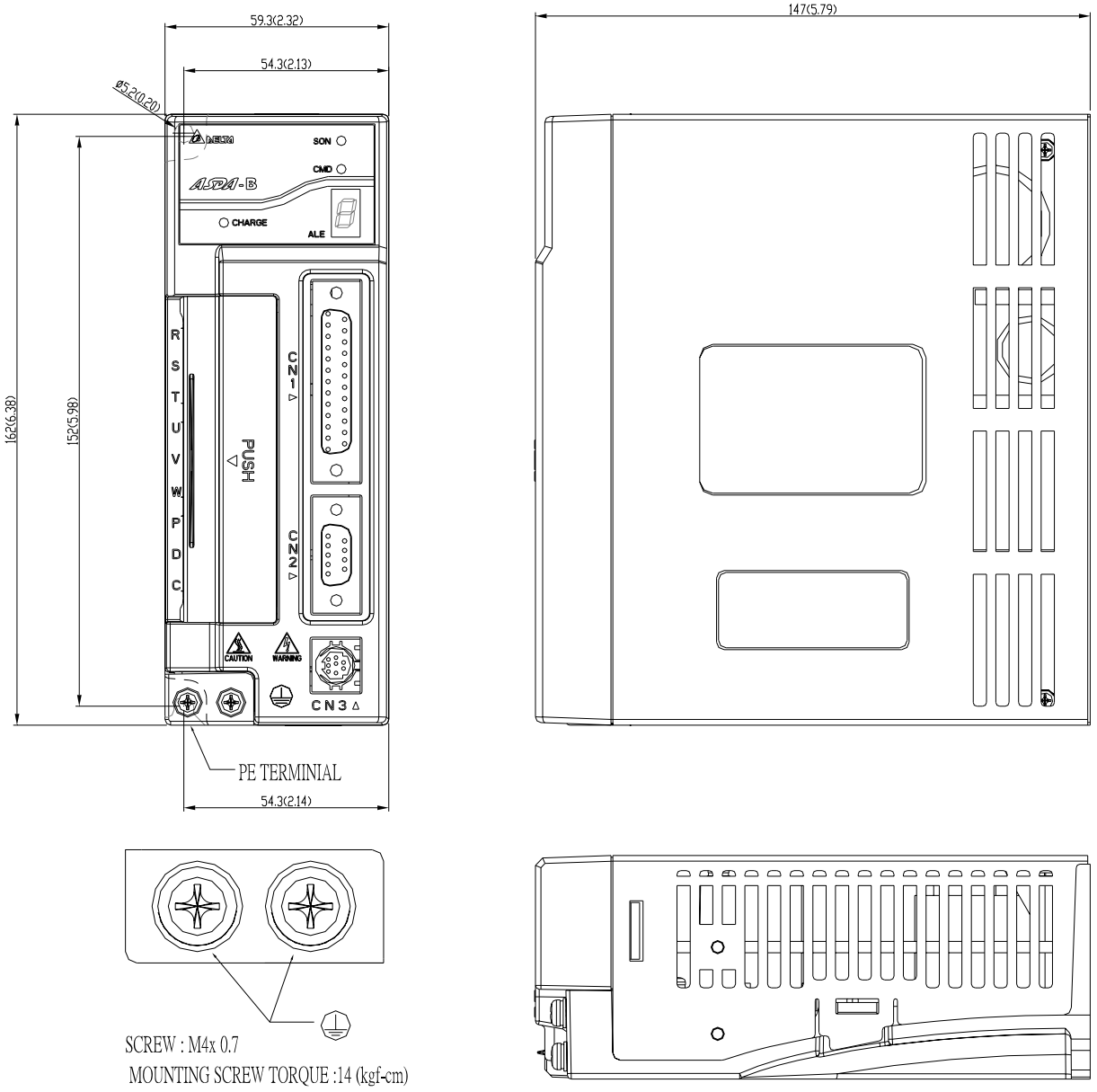
ECMA-__18: 550mm x 550mm x 30mm

Material type: Aluminum – F40, F60, F80, F100, F130, F180

NOTE 1) Please refer to Section 1.2 for details about the model explanation.

11.3 Dimensions of Servo Drive

Order P/N: ASD-B0121-A, ASD-B0221-A, ASD-B0421-A (100W to 400W)

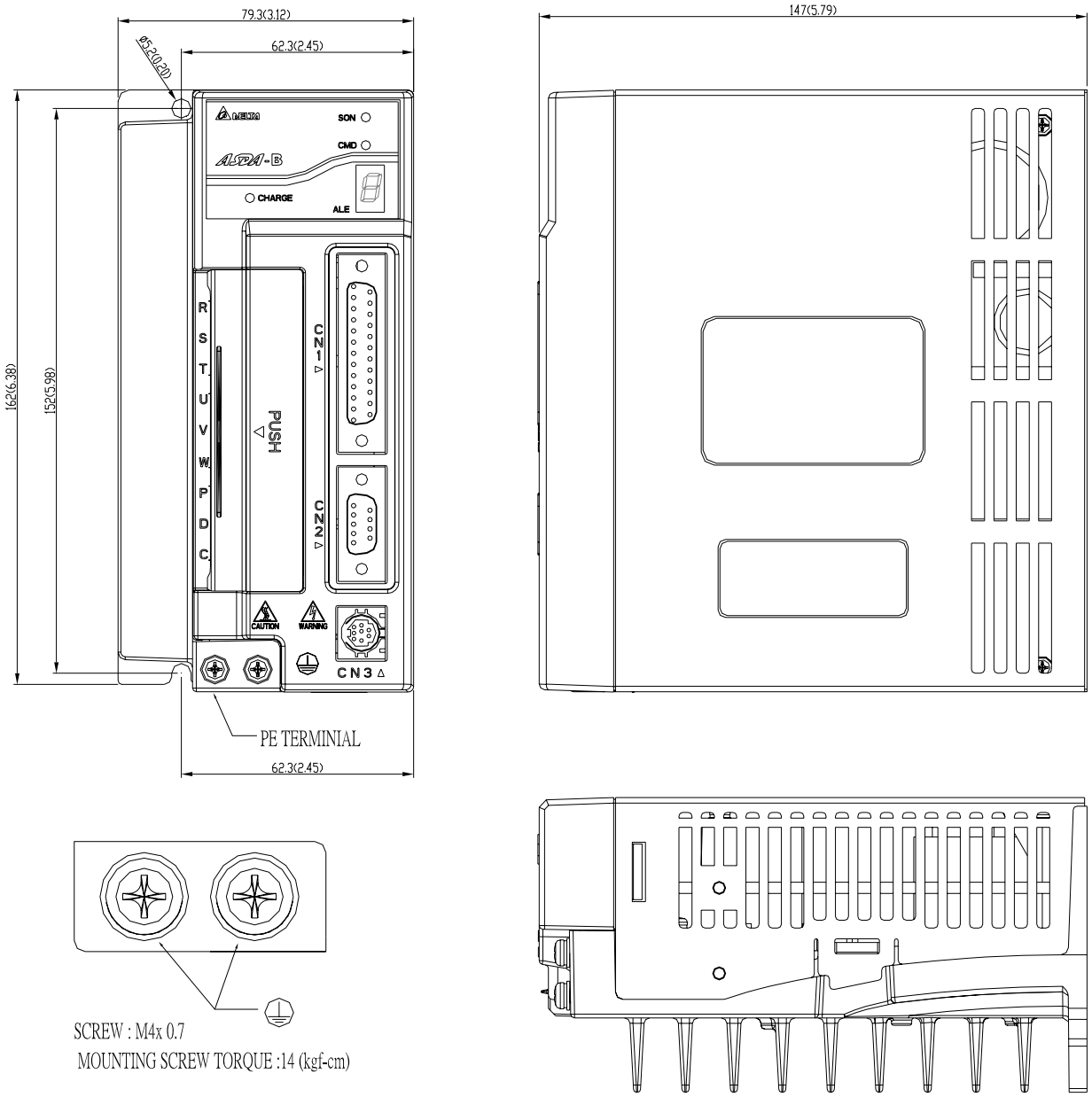


WEIGHT	1.2 (2.64)

NOTE

1) Dimensions are in millimeters (inches).
2) Weights are in kilograms (kg) and (pounds (lbs))
3) In this manual, actual measured values are in metric units. Dimensions in (imperial units) are for reference only. Please use metric for precise measurements.

Order P/N: ASD-B0721-A (750W)

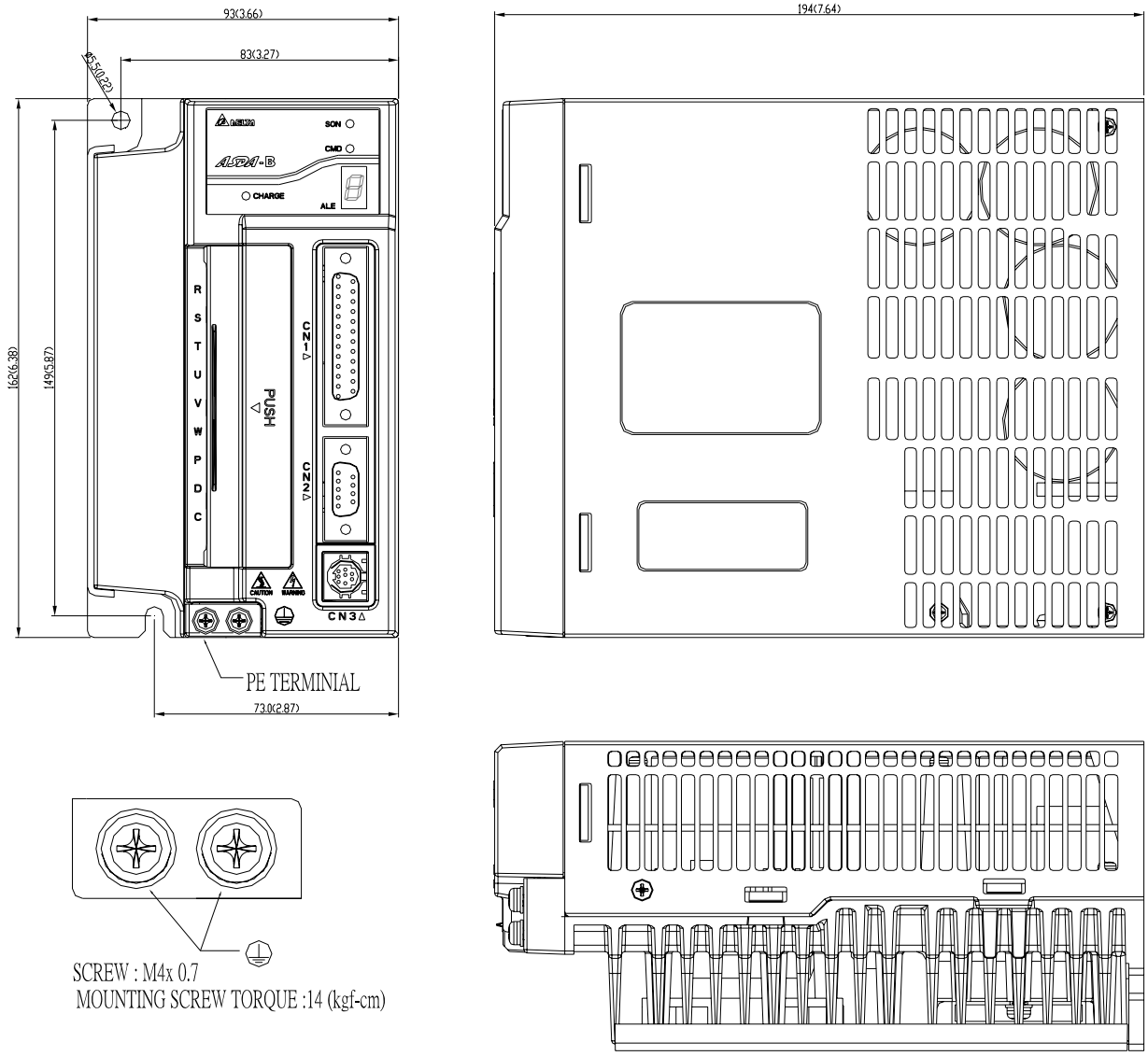


WEIGHT	1.5 (3.3)

NOTE

1) Dimensions are in millimeters (inches).
2) Weights are in kilograms (kg) and (pounds (lbs))
3) In this manual, actual measured values are in metric units. Dimensions in (imperial units) are for reference only. Please use metric for precise measurements.

Order P/N: ASD-B1021-A, ASD-B1521-A, ASD-B2023-A (1kW to 2kW)

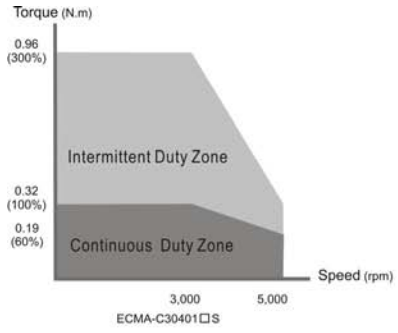


WEIGHT	2.0 (4.4)

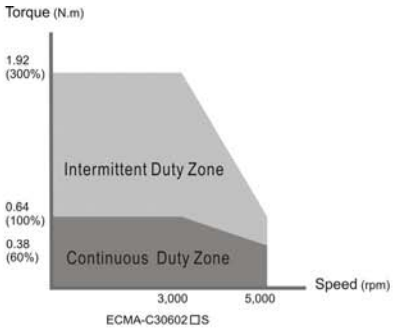
NOTE

1) Dimensions are in millimeters (inches).
2) Weights are in kilograms (kg) and (pounds (lbs))
3) In this manual, actual measured values are in metric units. Dimensions in (imperial units) are for reference only. Please use metric for precise measurements.

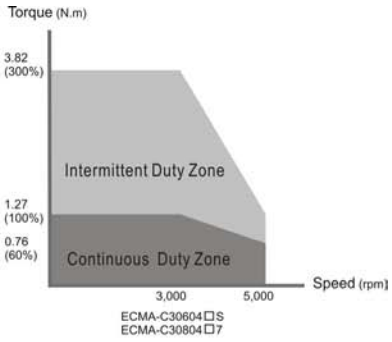
11.4 Servo Motor Speed-Torque Curves (T-N Curve)



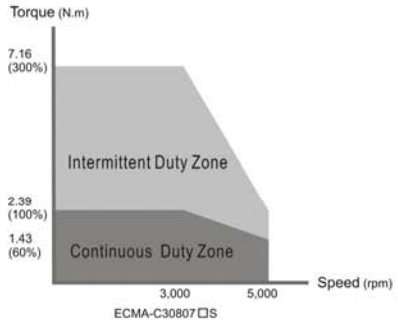
ECMA-C30401☐S



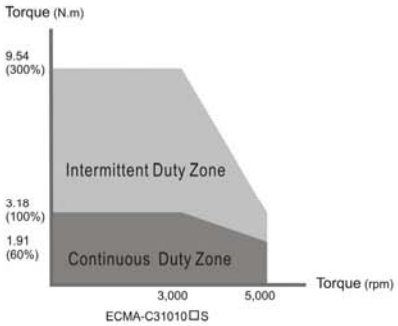
ECMA-C30602☐S



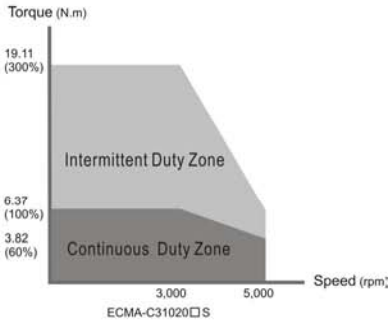
ECMA-C30604☐S
ECMA-C30804☐7



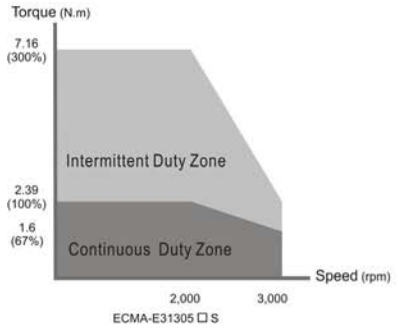
ECMA-C30807☐S



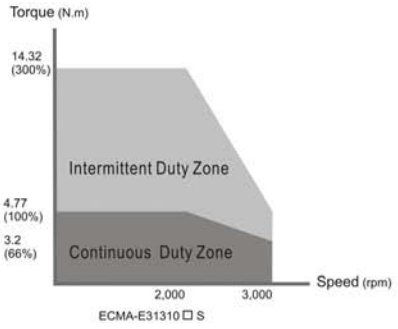
ECMA-C31010☐S



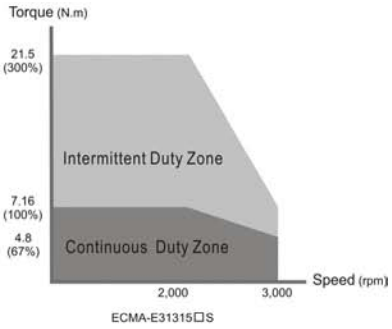
ECMA-C31020☐S



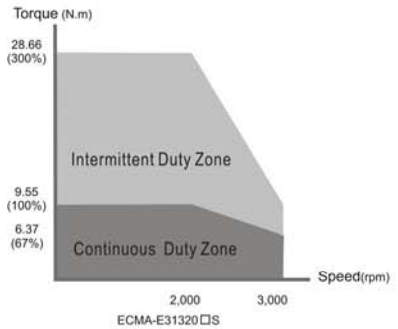
ECMA-E31305☐S



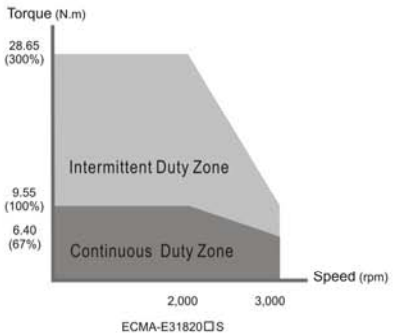
ECMA-E31310☐S



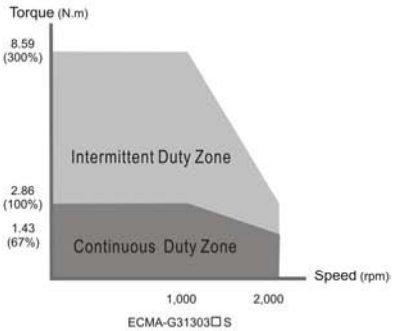
ECMA-E31315☐S



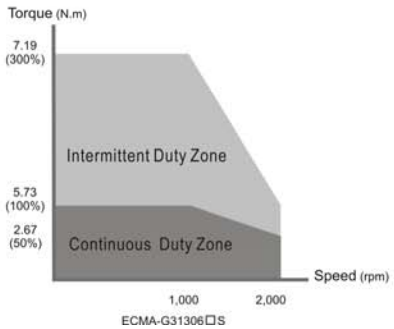
ECMA-E31320☐S



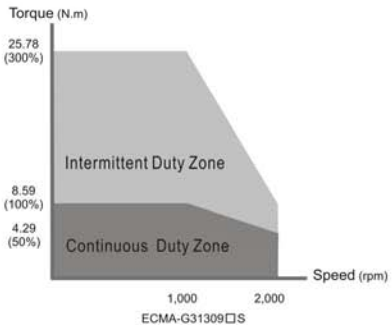
ECMA-E31820☐S



ECMA-G31303☐S



ECMA-G31306☐S



ECMA-G31309☐S

11.5 Overload Characteristics

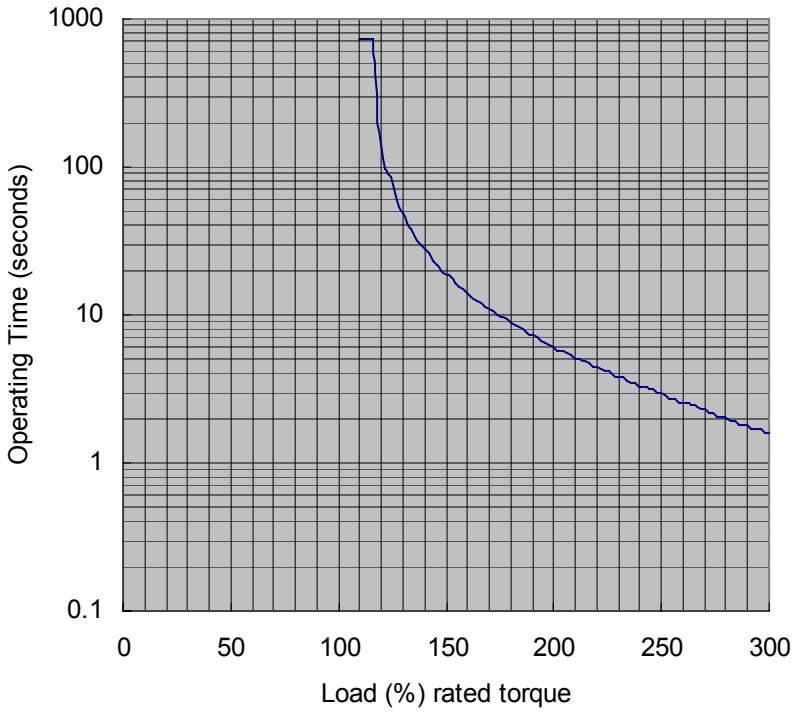
■ Overload Protection Function

Overload protection is a built-in protective function to prevent a motor from overheating.

■ Occasion of Overload

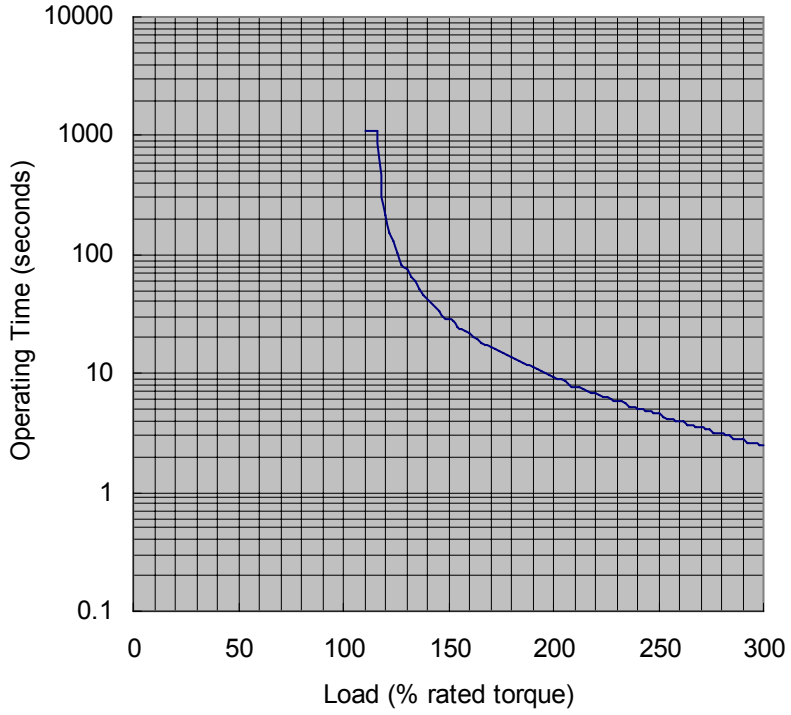
1. Motor was operated for several seconds under a torque exceeding 100% torque.
2. Motor had driven high inertia machine and had accelerated and decelerated at high frequency.
3. Motor UVW cable or encoder cable was not connected correctly.
4. Servo gain was not set properly and caused motor hunting.
5. Motor holding brake was not released.

■ Chart of load and operating time (ECMAC30401☐S)



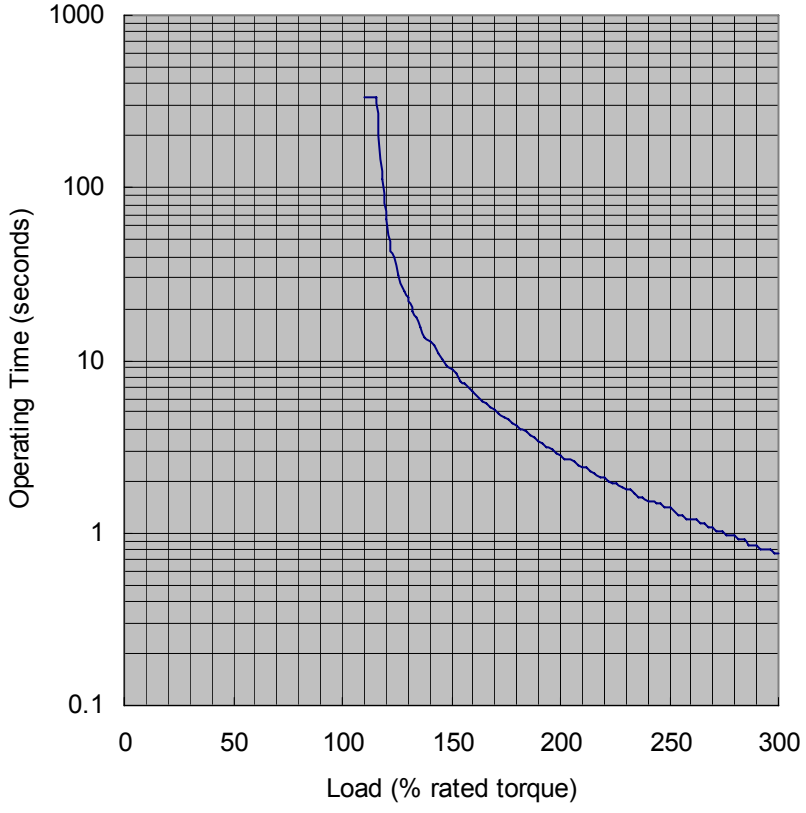
Load	Operating Time
120%	139.335s
140%	27.585s
160%	14.235s
180%	8.9625s
200%	6s
220%	4.4925s
240%	3.2925s
260%	2.58s
280%	2.07s
300%	1.6125s

■ **Chart of load and operating time (ECMAC30602□S)**



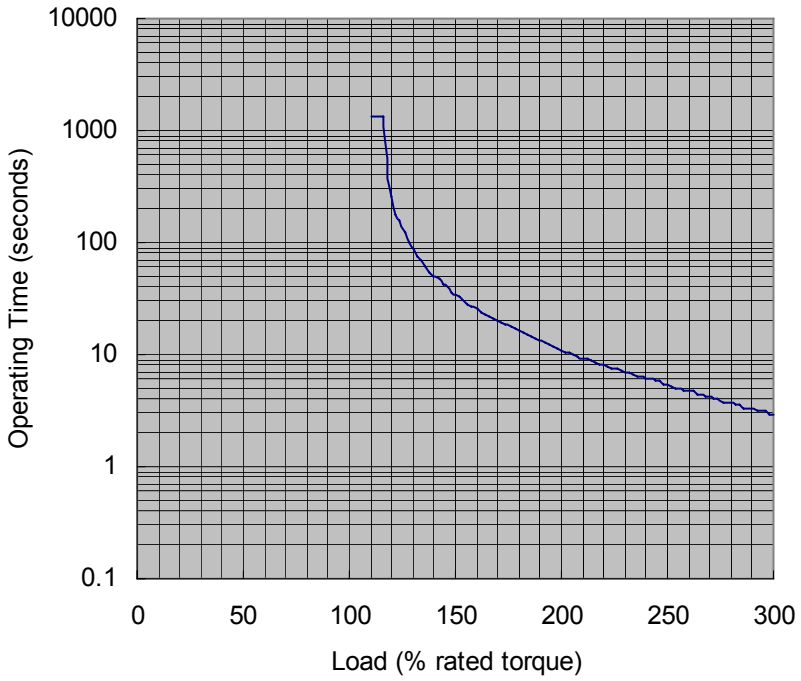
Load	Operating Time
120%	213.6s
140%	42.3s
160%	21.8s
180%	13.7s
200%	9.2s
220%	6.9s
240%	5.0s
260%	3.9s
280%	3.2s
300%	2.5s

■ **Chart of load and operating time (ECMAC30604□S)**



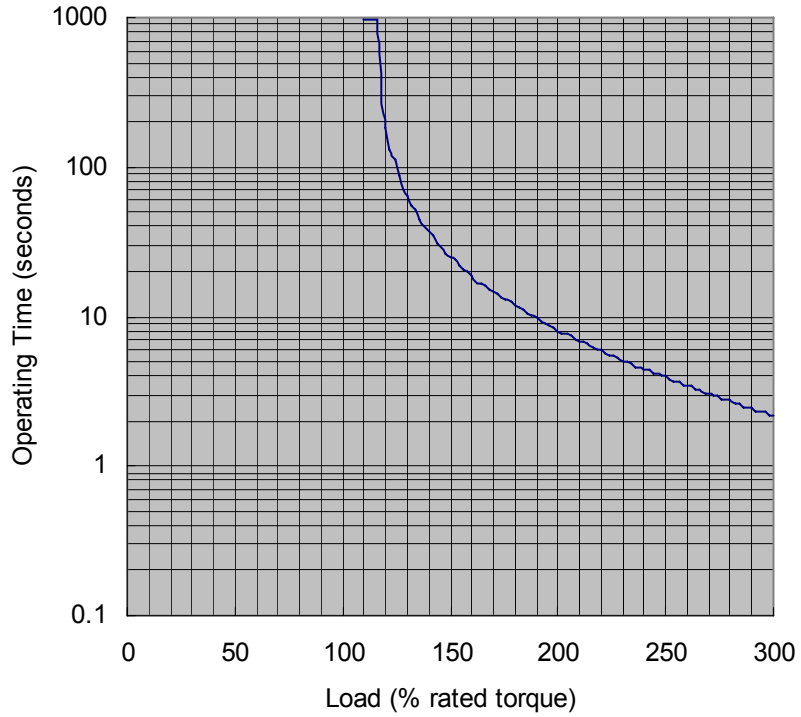
Load	Operating Time
120%	65.0s
140%	12.9s
160%	6.6s
180%	4.2s
200%	2.8s
220%	2.1s
240%	1.5s
260%	1.2s
280%	1.0s
300%	0.8s

■ **Chart of load and operating time (ECMAC30804□7)**



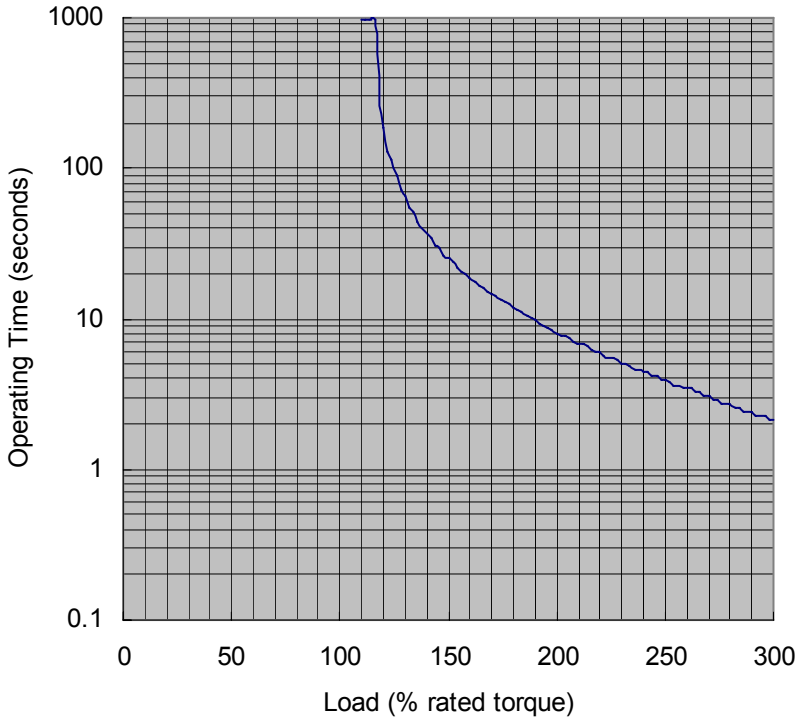
Load	Operating Time
120%	254.5s
140%	50.4s
160%	26.0s
180%	16.4s
200%	11.0s
220%	8.2s
240%	6.0s
260%	4.7s
280%	3.8s
300%	2.9s

■ **Chart of load and operating time (ECMAC30807□S)**



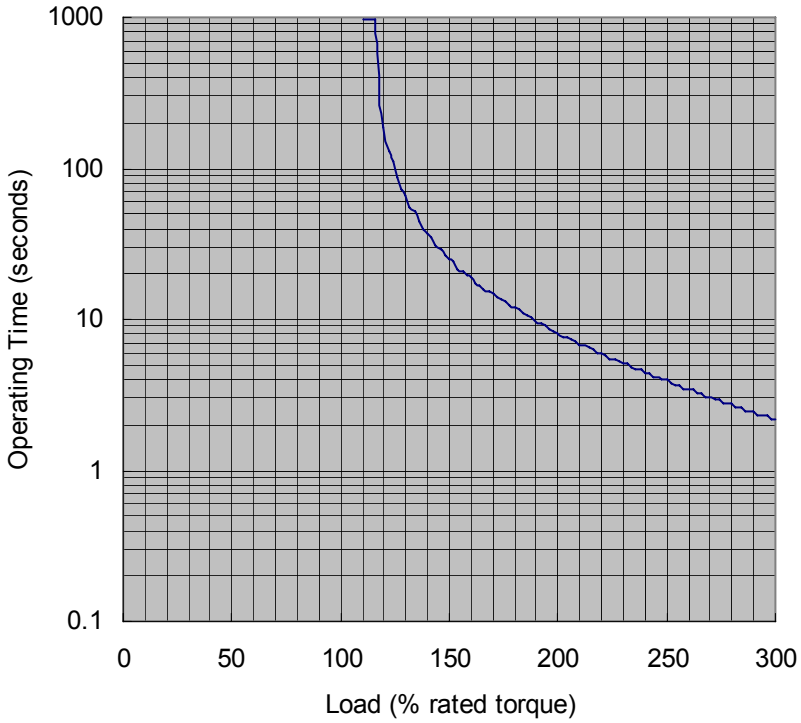
Load	Operating Time
120%	185.8s
140%	36.8s
160%	19.0s
180%	12.0s
200%	8.0s
220%	6.0s
240%	4.4s
260%	3.4s
280%	2.8s
300%	2.2s

■ **Chart of load and operating time (ECMAC31010□S)**



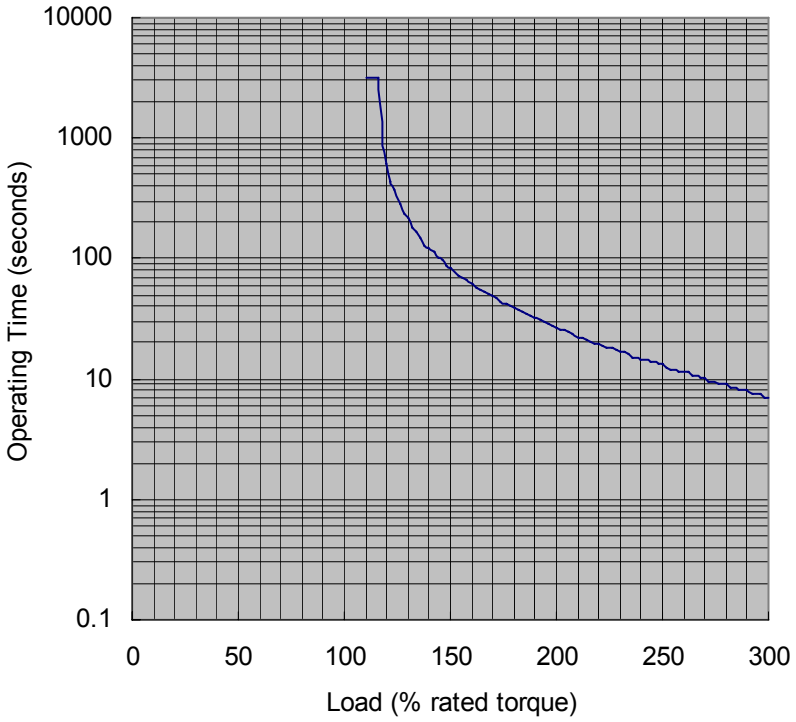
Load	Operating Time
120%	185.8s
140%	36.8s
160%	19.0s
180%	12.0s
200%	8.0s
220%	6.0s
240%	4.4s
260%	3.4s
280%	2.8s
300%	2.2s

■ **Chart of load and operating time (ECMAC31020□S)**



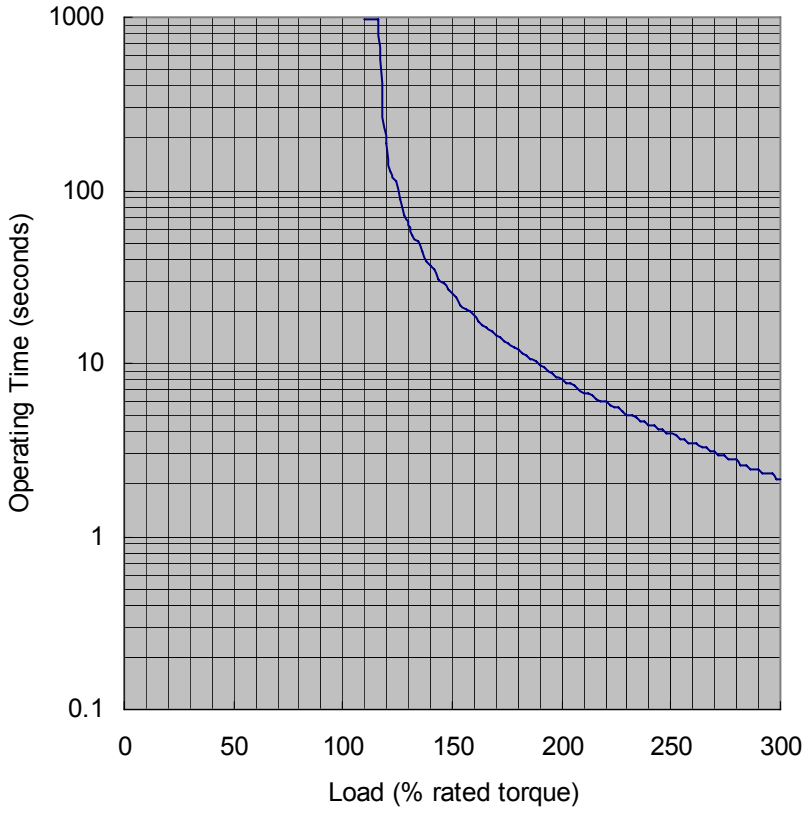
Load	Operating Time
120%	185.8s
140%	36.8s
160%	19.0s
180%	12.0s
200%	8.0s
220%	6.0s
240%	4.4s
260%	3.4s
280%	2.8s
300%	2.2s

■ **Chart of load and operating time (ECMAC31303□S)**



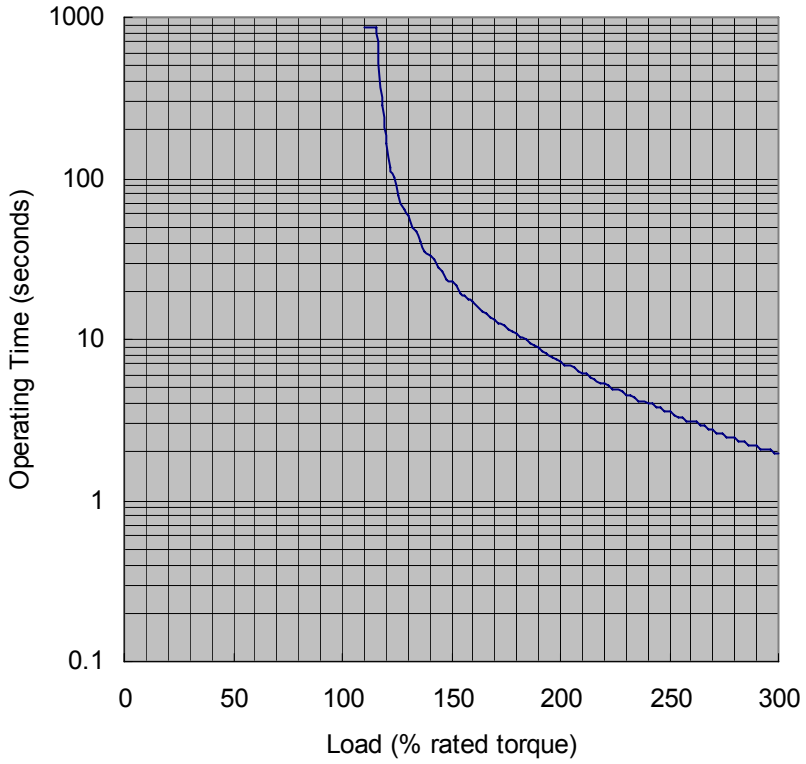
Load	Operating Time
120%	613.1s
140%	121.4s
160%	62.6s
180%	39.4s
200%	26.4s
220%	19.8s
240%	14.5s
260%	11.4s
280%	9.1s
300%	7.1s

■ **Chart of load and operating time (ECMAC31305□S)**



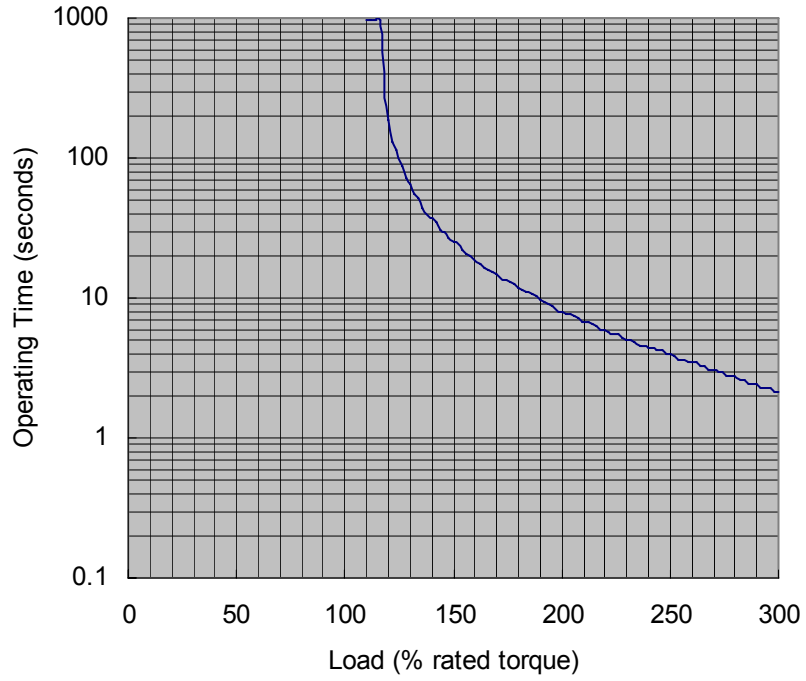
Load	Operating Time
120%	185.8s
140%	36.8s
160%	19.0s
180%	12.0s
200%	8.0s
220%	6.0s
240%	4.4s
260%	3.4s
280%	2.8s
300%	2.2s

■ Chart of load and operating time (ECMAC31306□S)



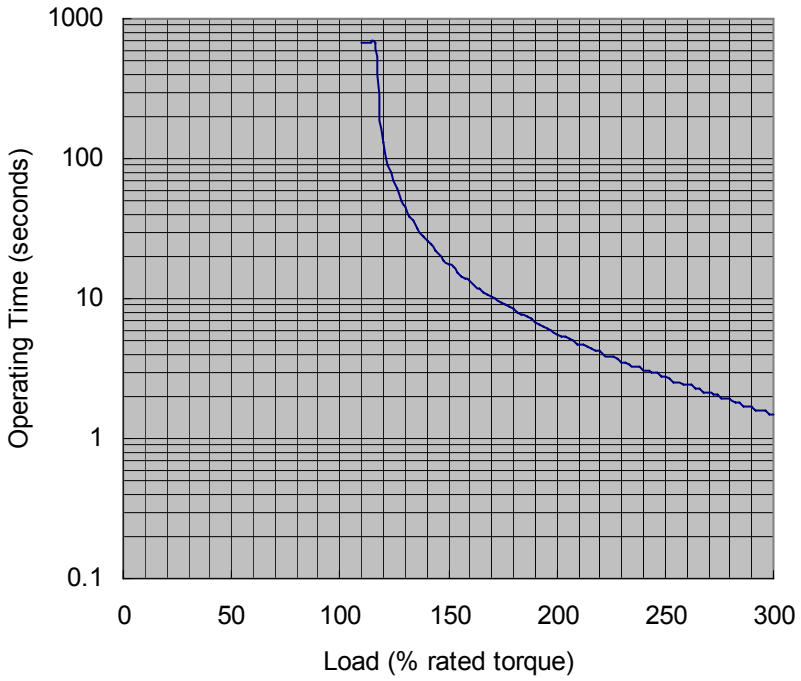
Load	Operating Time
120%	167.2s
140%	33.1s
160%	17.1s
180%	10.8s
200%	7.2s
220%	5.4s
240%	4.0s
260%	3.1s
280%	2.5s
300%	1.9s

■ Chart of load and operating time (ECMAC31309□S)



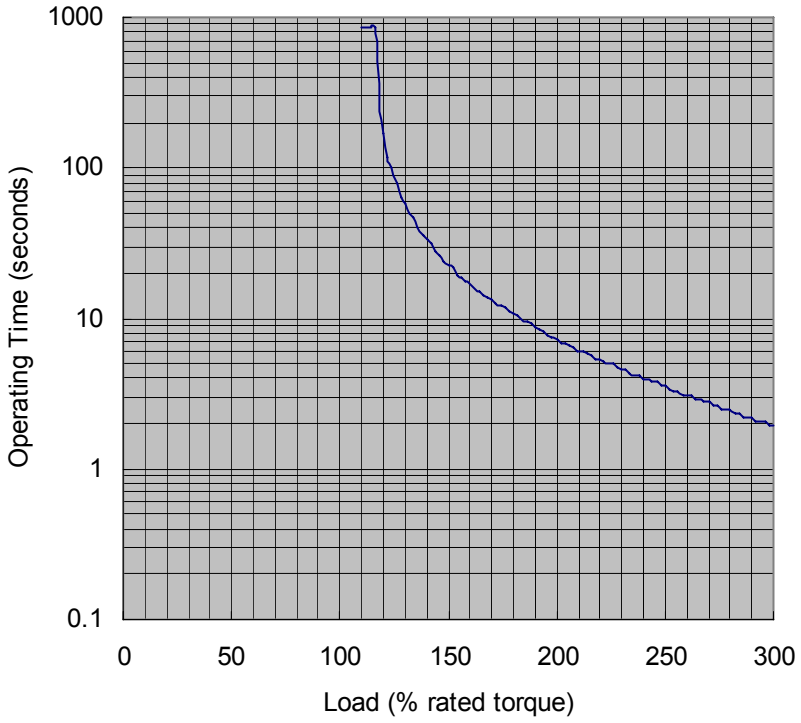
Load	Operating Time
120%	185.8s
140%	36.8s
160%	19.0s
180%	12.0s
200%	8.0s
220%	6.0s
240%	4.4s
260%	3.4s
280%	2.8s
300%	2.2s

■ **Chart of load and operating time (ECMAC31310☐S)**



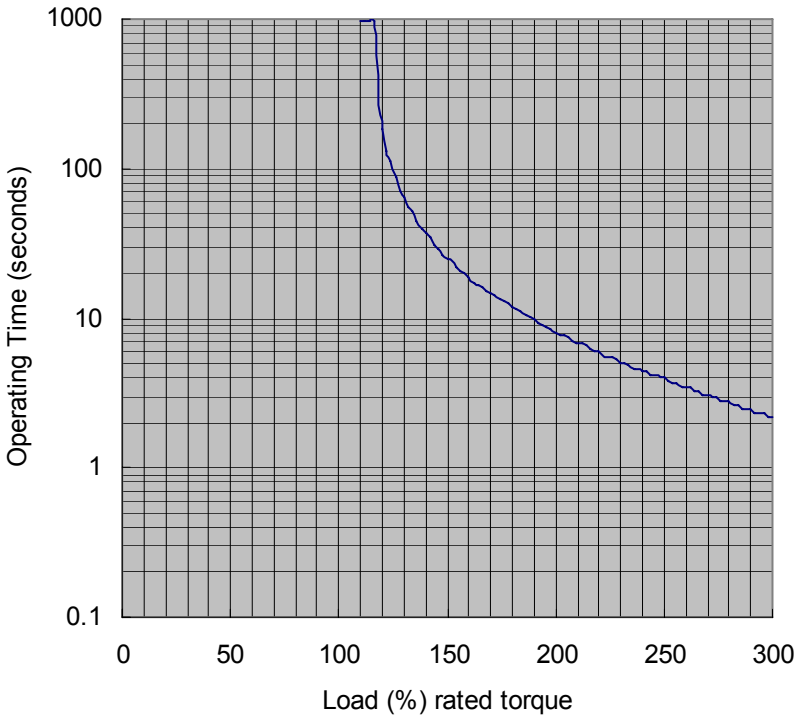
Load	Operating Time
120%	130.0s
140%	25.7s
160%	13.3s
180%	8.4s
200%	5.6s
220%	4.2s
240%	3.1s
260%	2.4s
280%	1.9s
300%	1.5s

■ **Chart of load and operating time (ECMAC31315☐S)**



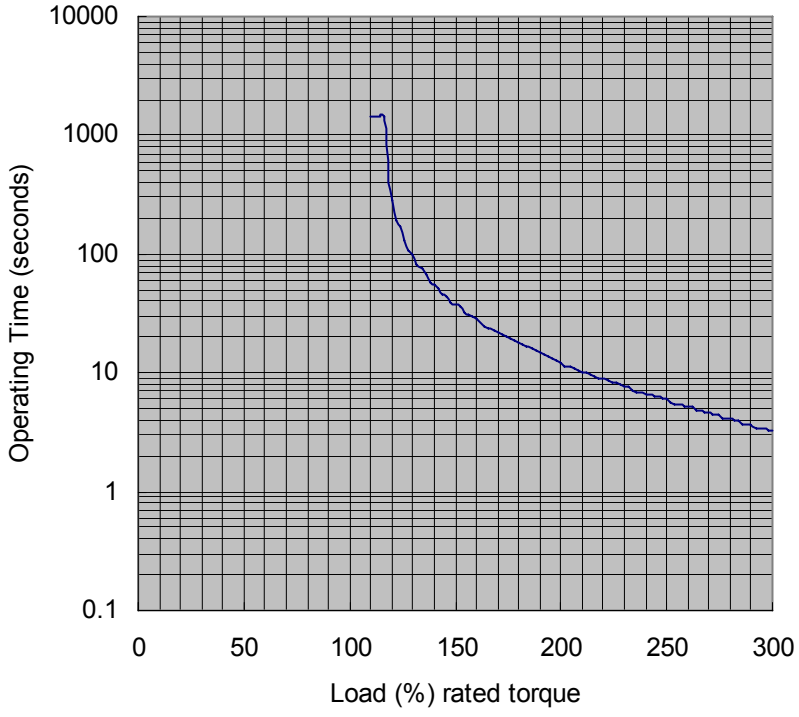
Load	Operating Time
120%	167.2s
140%	33.1s
160%	17.1s
180%	10.8s
200%	7.2s
220%	5.4s
240%	4.0s
260%	3.1s
280%	2.5s
300%	1.9s

■ Chart of load and operating time (ECMAC31320☐S)



Load	Operating Time
120%	185.78s
140%	36.78s
160%	18.98s
180%	11.95s
200%	8s
220%	5.99s
240%	4.39s
260%	3.44s
280%	2.76s
300%	2.15s

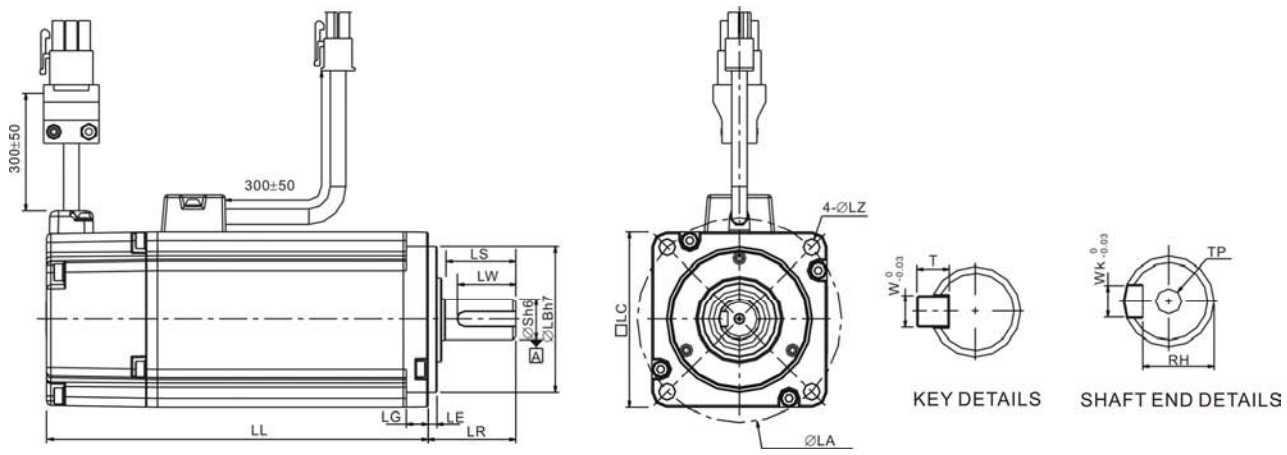
■ Chart of load and operating time (ECMAC31820☐S)



Load	Operating Time
120%	278.67s
140%	55.17s
160%	28.47s
180%	17.925s
200%	12s
220%	8.985s
240%	6.585s
260%	5.16s
280%	4.14s
300%	3.225s

11.6 Dimensions of Servo Motor

ECMA Series Motor Frame Size: 80mm and below Models

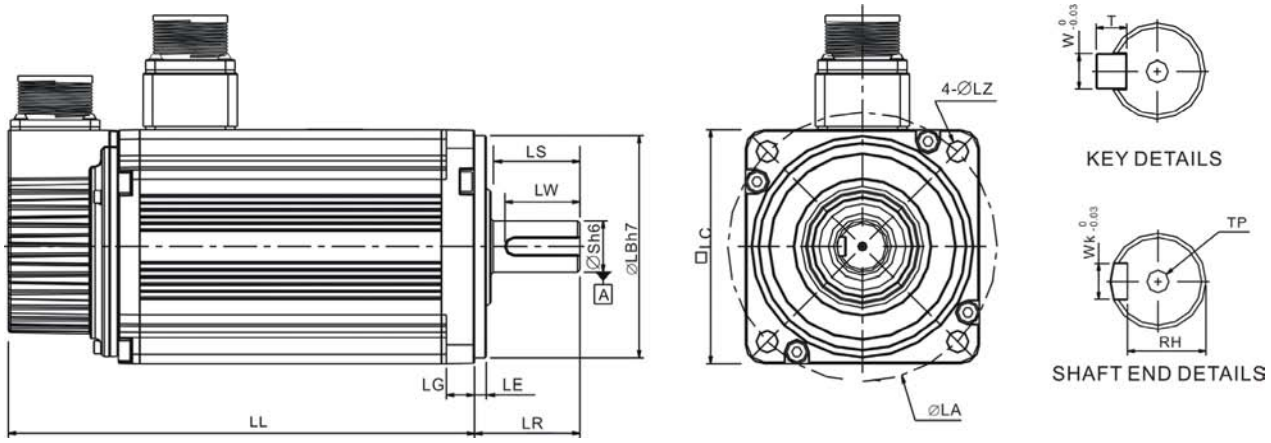


Model	C30401□S	C30602□S	C30604□S	C30804□7	C30807□S
LC	40	60	60	80	80
LZ	4.5	5.5	5.5	6.6	6.6
LA	46	70	70	90	90
S	8	14	14	14	19
LB	30	50	50	70	70
LL (without brake)	100.6	105.5	130.7	112.3	138.3
LL (with brake)	136.6	141.6	166.8	152.8	178
LS (without oil seal)	20	27	27	27	32
LS (with oil seal)	20	24	24	24.5	29.5
LR	25	30	30	30	35
LE	3	3	3	3	3
LG	5	7.5	7.5	8	8
LW	16	20	20	20	25
RH	6.2	11	11	11	15.5
WK	3	5	5	5	6
W	3	5	5	5	6
T	3	5	5	5	6
TP	M3xP0.5 Depth: 8mm	M4xP0.7 Depth: 15mm	M4xP0.7 Depth: 15mm	M4xP0.7 Depth: 15mm	M6xP1 Depth: 20mm

NOTE

1) Dimensions are in millimeters. Actual measured values are in metric units. Please use metric for precise measurements.
2) The boxes (□) in the model names are for optional configurations (brake, shaft type, oil seal). Please refer to Section 1.2 for model explanation.

ECMA Series Motor Frame Size: 100mm and above Models

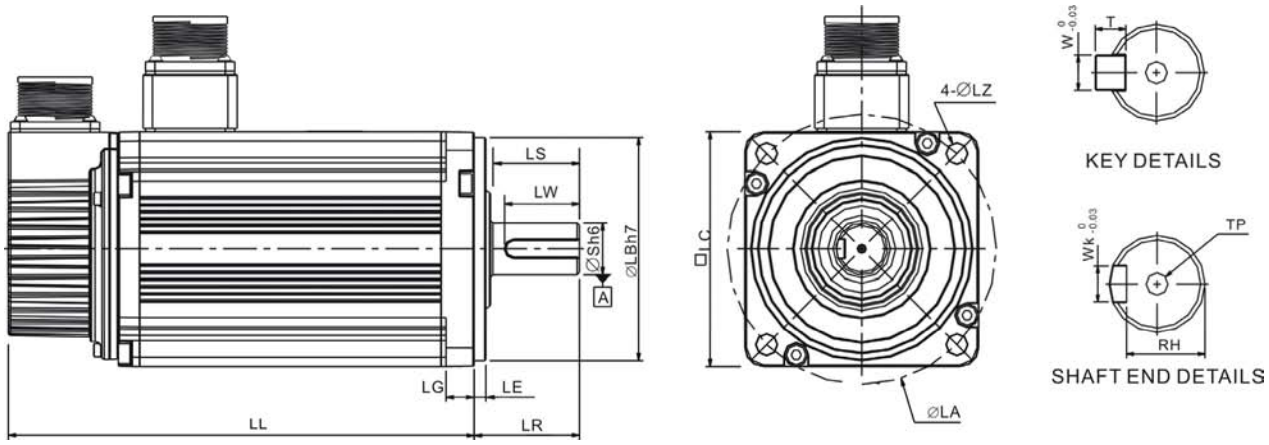


Model	G31303□S	E31305□S	G31306□S	G31309□S	C31010□S
LC	130	130	130	130	100
LZ	9	9	9	9	9
LA	145	145	145	145	115
S	22	22	22	22	22
LB	110	110	110	110	95
LL (without brake)	147.5	147.5	147.5	163.5	153.25
LL (with brake)	183.5	183.5	183.5	198	192.5
LS	47	47	47	47	37
LR	55	55	55	55	45
LE	6	6	6	6	5
LG	11.5	11.5	11.5	11.5	12
LW	36	36	36	36	32
RH	18	18	18	18	18
WK	8	8	8	8	8
W	8	8	8	8	8
T	7	7	7	7	7
TP	M3xP0.5 Depth: 8mm	M4xP0.7 Depth: 15mm	M4xP0.7 Depth: 15mm	M4xP0.7 Depth: 15mm	M6xP1 Depth: 20mm

NOTE

1) Dimensions are in millimeters. Actual measured values are in metric units. Please use metric for precise measurements.
2) The boxes (□) in the model names are for optional configurations (brake, shaft type, oil seal). Please refer to Section 1.2 for model explanation.

ECMA Series Motor Frame Size: 100mm and above Models



Model	E31310□S	E31315□S	C31020□S	E31320□S	E31820□S
LC	130	130	100	130	180
LZ	9	9	9	9	13.5
LA	145	145	115	145	200
S	22	22	22	22	35
LB	110	110	95	110	114.3
LL (without brake)	147.5	167.5	199	187.5	169
LL (with brake)	183.5	202	226	216	203.1
LS	47	47	37	47	73
LR	55	55	45	55	79
LE	6	6	5	6	4
LG	11.5	11.5	12	11.5	20
LW	36	36	32	36	63
RH	18	18	18	18	30
WK	8	8	8	8	10
W	8	8	8	8	10
T	7	7	7	7	8
TP	M3xP0.5 Depth: 8mm	M4xP0.7 Depth: 15mm	M4xP0.7 Depth: 15mm	M4xP0.7 Depth: 15mm	M6xP1 Depth: 20mm

NOTE

1) Dimensions are in millimeters. Actual measured values are in metric units. Please use metric for precise measurements.
2) The boxes (□) in the model names are for optional configurations (brake, shaft type, oil seal). Please refer to Section 1.2 for model explanation.

11.7 EMI Filters Selection

Item	Power	Servo Drive Model	EMI Filter Model
1	200W	ASD-B0221-A	16DRT1W3S (1-phase)
			10TDT1W4C (3-phase)
2	400W	ASD-B0421-A	16DRT1W3S (1-phase)
			10TDT1W4C (3-phase)
3	750W	ASD-B0721-A	16DRT1W3S (1-phase)
			10TDT1W4C (3-phase)
4	1000W	ASD-B1021-A	16DRT1W3S (1-phase)
			10TDT1W4C (3-phase)
5	1500W	ASD-B1521-A	16DRT1W3S (1-phase)
			10TDT1W4C (3-phase)
6	2000W	ASD-B2023-A	26TDT1W4C (3-phase)

efesotomasyon.com

Chapter 12 Application Examples

12.1 Connecting to DVP-EH PLC and DOP-A HMI

Application Example: Dual Mode (S-P Mode)

Purpose

Use Delta DVP-EH series PLC to output pulse command (Homing operation, JOG operation, forward and reverse operation, and speed control mode switching) and enable ASDA-B servo drive. Also, use Delta DOP-A series HMI to control ASDA-B servo drive and let the servo drive follow the commands from PLC to complete the positioning.

Explanation:

Programmable Logic Controller (hereinafter "PLC")

1. Delta DVP-EH series PLC is "Transistor Output" Model. The definition of output contacts is as follows:

   Y0: Pulse

   Y1: SIGN

   Y2: In speed control mode, parameter P1-09 is used to set speed 1 of internal speed command.

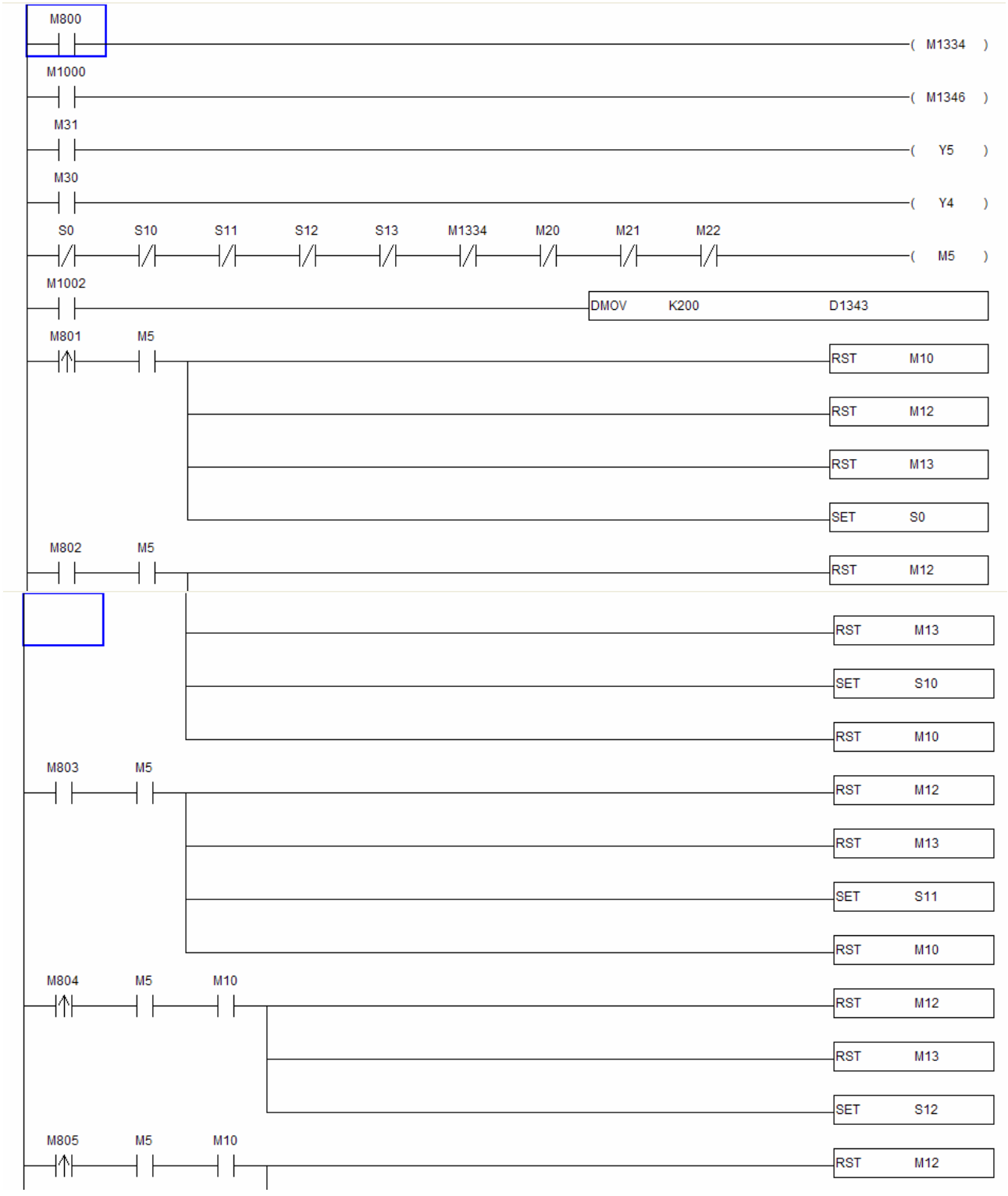
   Y3: In speed control mode, parameter P1-10 is used to set speed 2 of internal speed command.

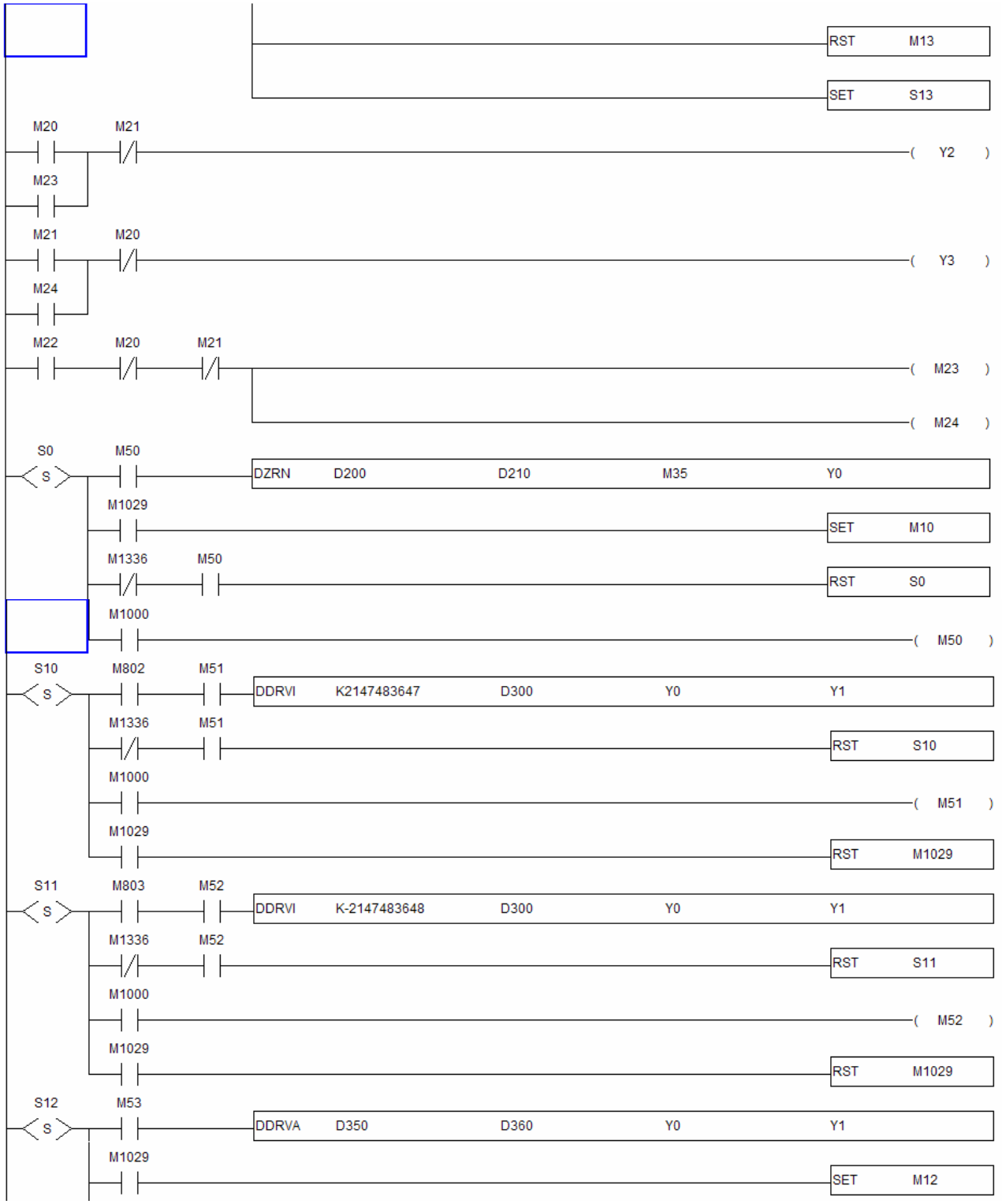
   Y4: S-P dual mode: When S-P signal is Off, it is speed mode. When S-P signal is On, it is position mode.

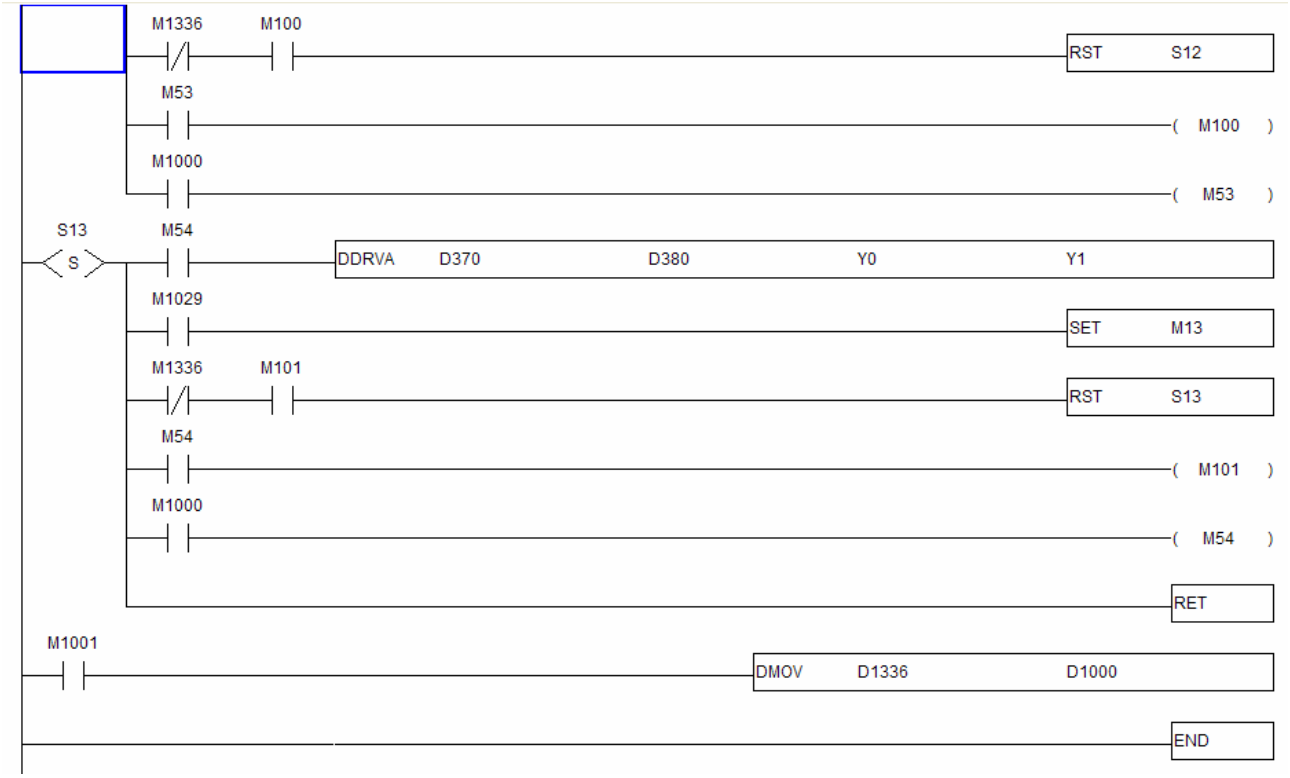
   Y5: Servo ON

2. Pulse command is open-collector signal.

PLC Program


M800
(M1334)
M1000
(M1346)
M31
(Y5)
M30
(Y4)
S0 S10 S11 S12 S13 M1334 M20 M21 M22
(M5)
M1002
DMOV K200 D1343
M801 M5
RST M10
RST M12
RST M13
SET S0
M802 M5
RST M12
RST M13
SET S10
RST M10
M803 M5
RST M12
RST M13
SET S11
RST M10
M804 M5 M10
RST M12
RST M13
SET S12
M805 M5 M10
RST M12


RST M13
SET S13
M20 M21 (Y2)
M23
M21 M20 (Y3)
M24
M22 M20 M21 (M23)
(M24)
S0 M50 DZRN D200 D210 M35 Y0
M1029 SET M10
M1336 M50 RST S0
M1000 (M50)
S10 M802 M51 DDRVI K2147483647 D300 Y0 Y1
M1336 M51 RST S10
M1000 (M51)
M1029 RST M1029
S11 M803 M52 DDRVI K-2147483648 D300 Y0 Y1
M1336 M52 RST S11
M1000 (M52)
M1029 RST M1029
S12 M53 DDRVA D350 D360 Y0 Y1
M1029 SET M12


M1336
M100
RST S12
M53
(M100)
M1000
(M53)
S13
S
M54
DDRVA D370 D380 Y0 Y1
M1029
SET M13
M1336
M101
RST S13
M54
(M101)
M1000
(M54)
RET
M1001
DMOV D1336 D1000
END

ASDA-B series Servo Drive

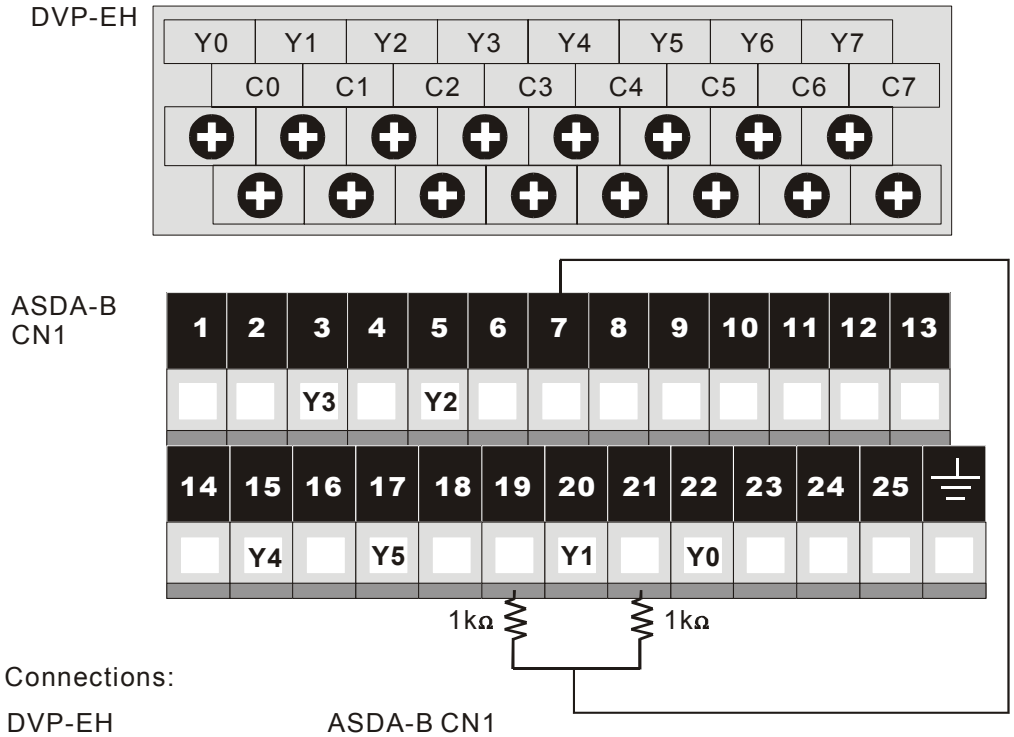
1. When using open-collector input, the max. allowable input pulse frequency is 200Kpps.

2. Parameter Settings:

   - Set P1-01=06 (S-T dual mode)
   - Set P1-09 ~ P1-11 (Internal speed command)
   - Set P1-36=1 (Accel /Decel S-curve)
   - Set P2-10=101 (DI1=Servo On)
   - Set P2-11=104 (DI2=CCLR)
   - Set P2-12=114 (DI3=SPD0)
   - Set P2-13=115 (DI4=SPD1)
   - Set P2-14=118 (DI5=S-P dual mode switching)
   - Set P2-32=1 (PDFF, the ratio of load inertia to servo motor inertia can be continuously adjusted.)

3. Communication format: Both DVP-EH series PLC and ASDA-B series servo drive have to use the same communication protocol setting.

Connections between DVP-EH series PLC and ASDA-B series Servo Drive

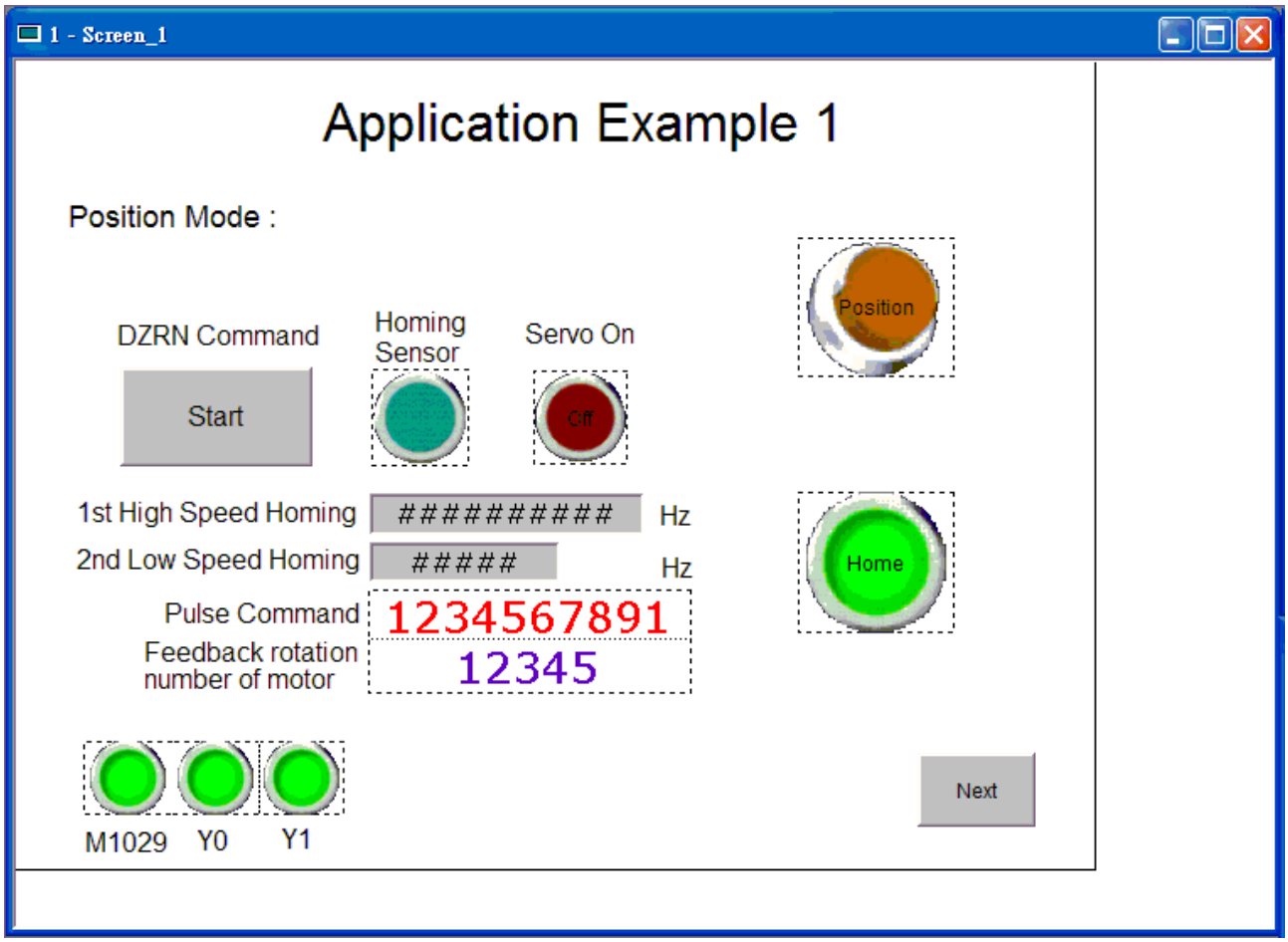


Connections:

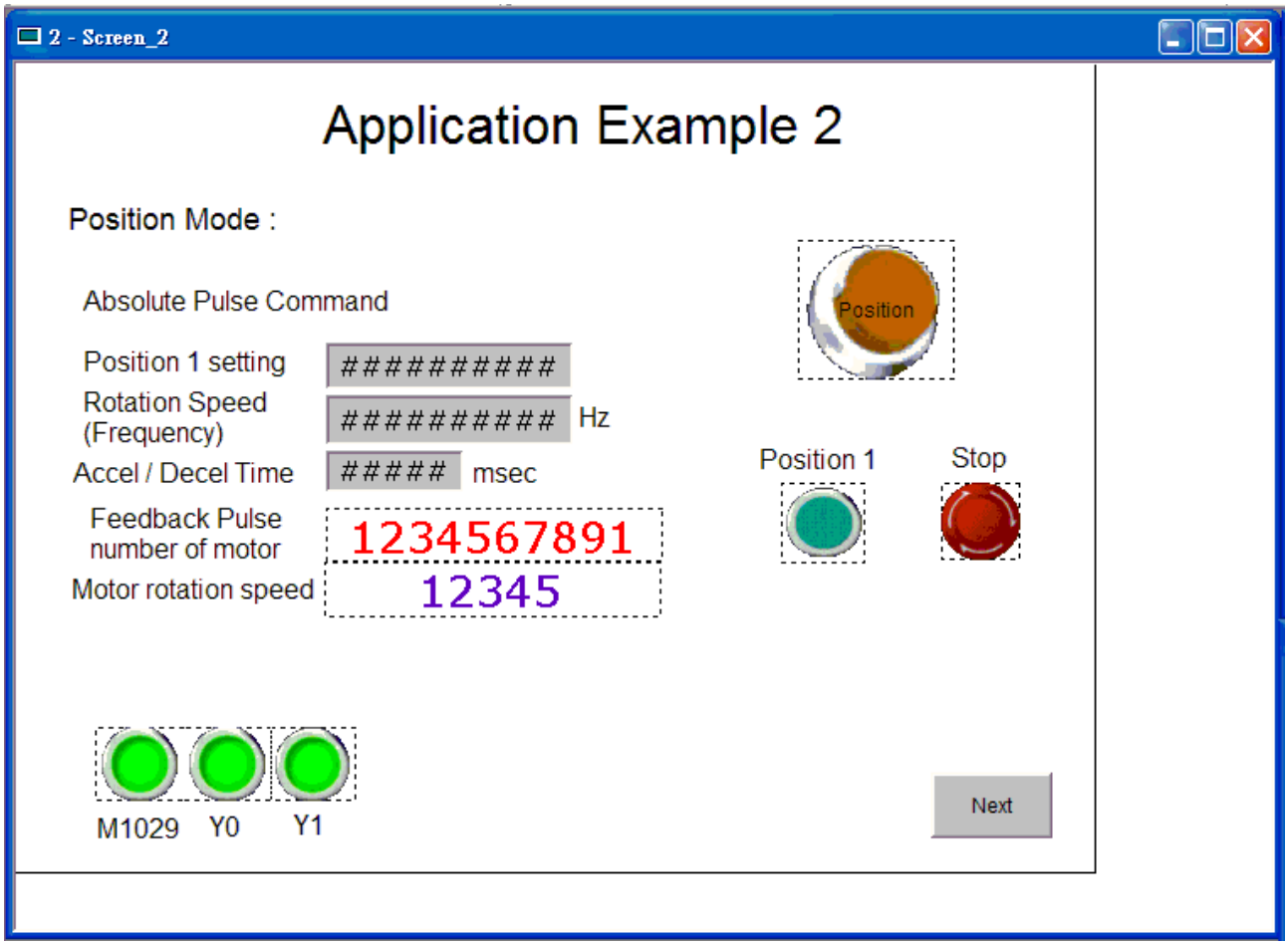
DVP-EH		ASDA-B CN1
Y0	● ——— ●	22
Y1	● ——— ●	20
Y2	● ——— ●	5
Y3	● ——— ●	3
Y4	● ——— ●	15
Y5	● ——— ●	17

HMI DOP-A HMI

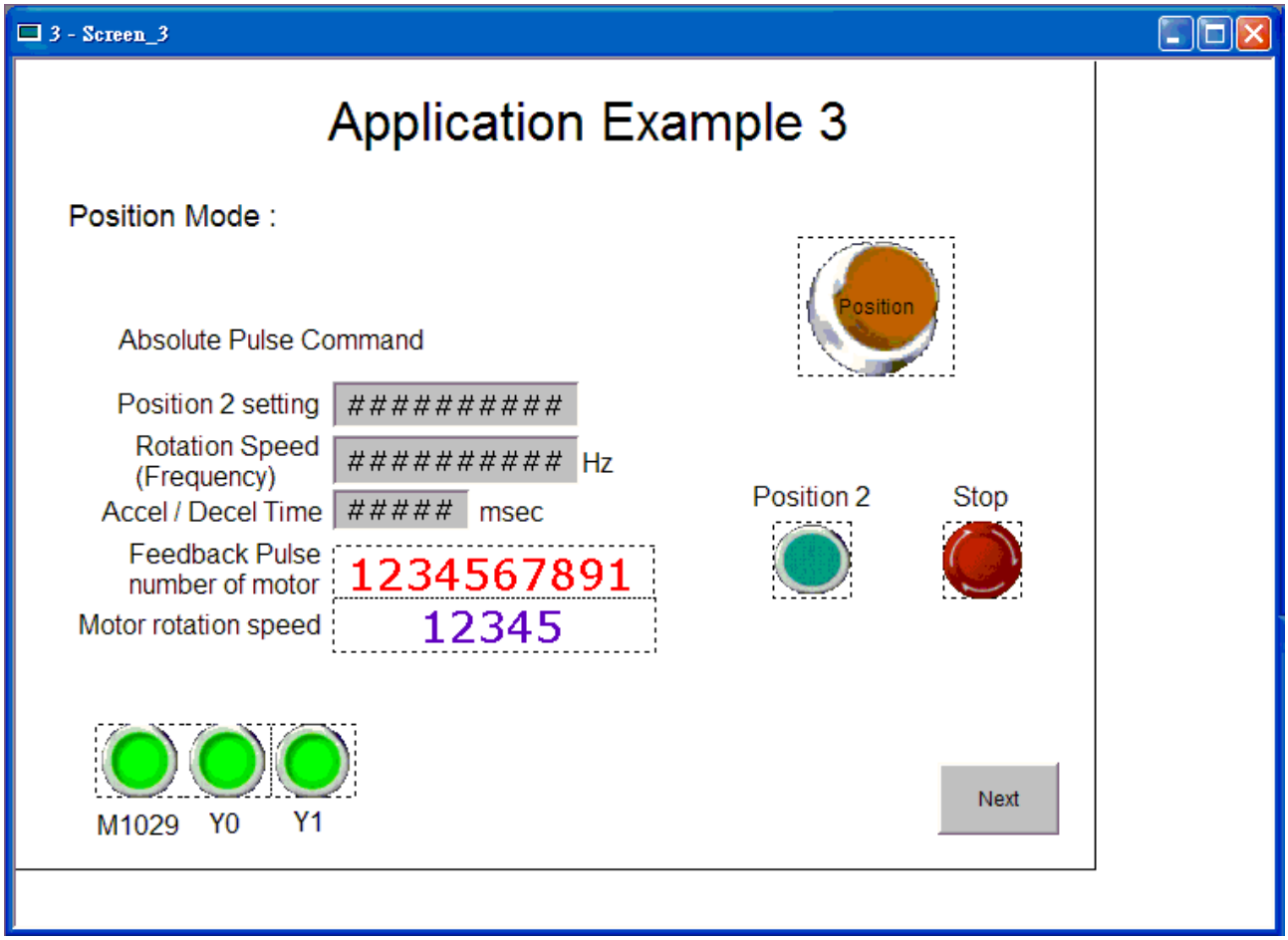
Program Screen (Homing Operation)



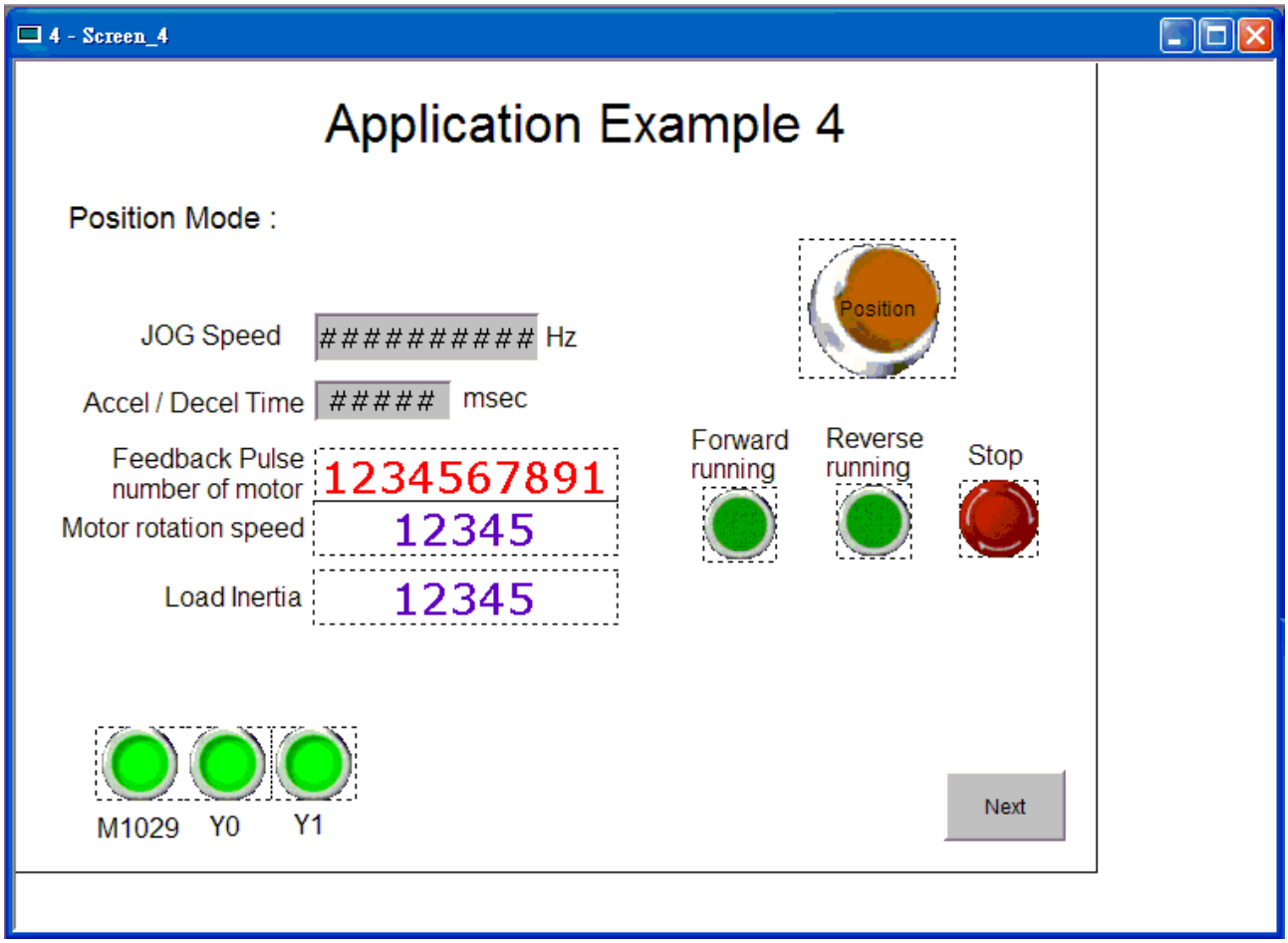
(Position Control 1)



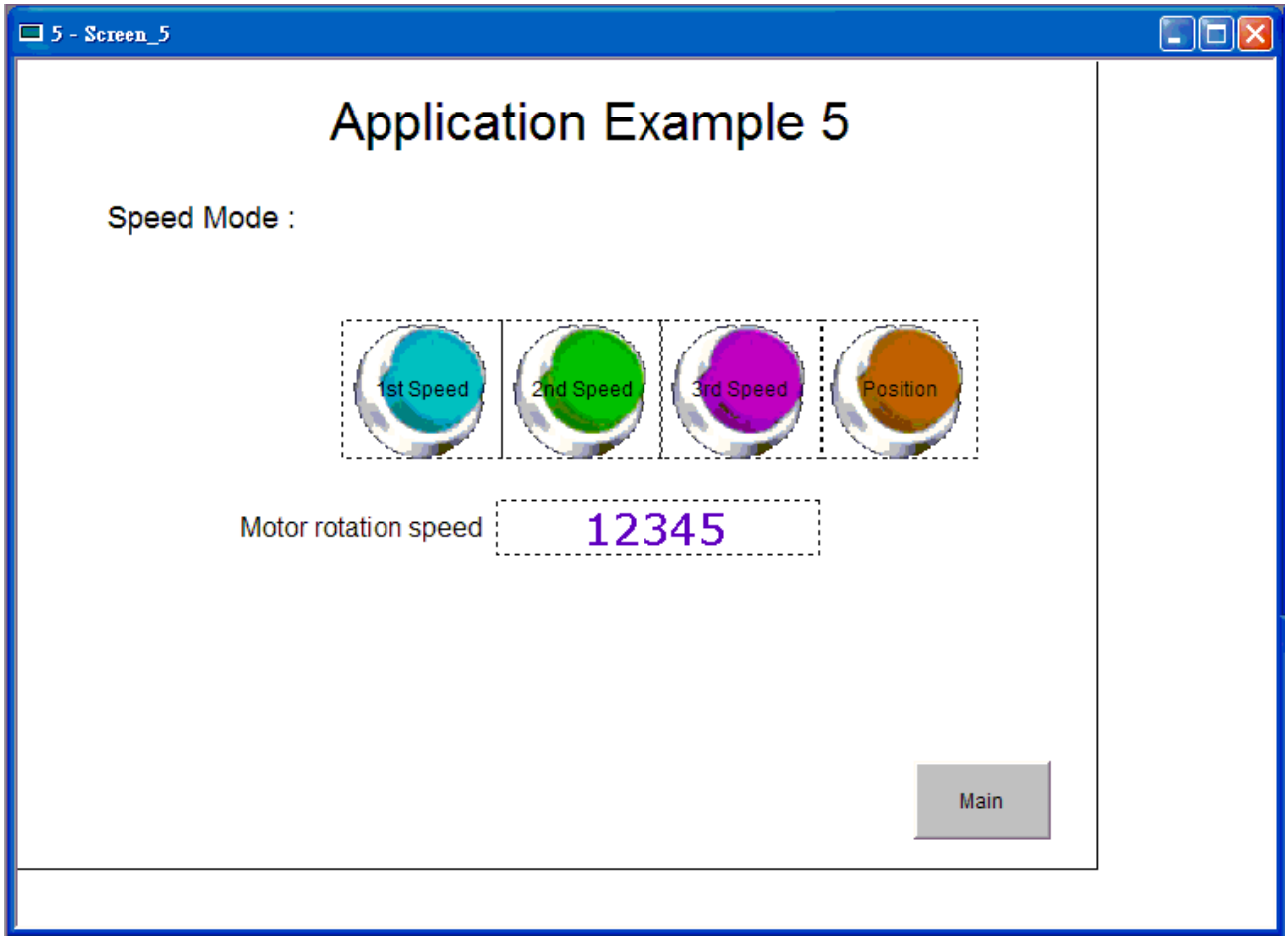
(Position Control 2)



(JOG Operation)



(Speed Control)



Operation

Ensure all wiring is connected correctly.

- Restart the servo drive (Apply the power to servo drive again).
- At this time, the SON LED (Servo On Indicator) will be lit to indicate that the servo drive is enabled, and normal display will show on the LCD display. If ALRM LED (Alarm Output Indicator) is lit or any fault message show on the LCD display, please refer to Chapter 10 “Troubleshooting” to remove the fault code and fault message.
- If there is no fault, press “Servo On” key on HMI screen and CMD LED will be red to indicate that the servo drive is enabled (Servo On status).
- Then, the users can use various functions on different HMI screens to control the servo drive and execute the functions of servo drive.
- Before operating in speed mode, the users need to switch to speed control mode on the first HMI screen.

12.2 Connecting to DVP-EH PLC and Delta TP04 Series

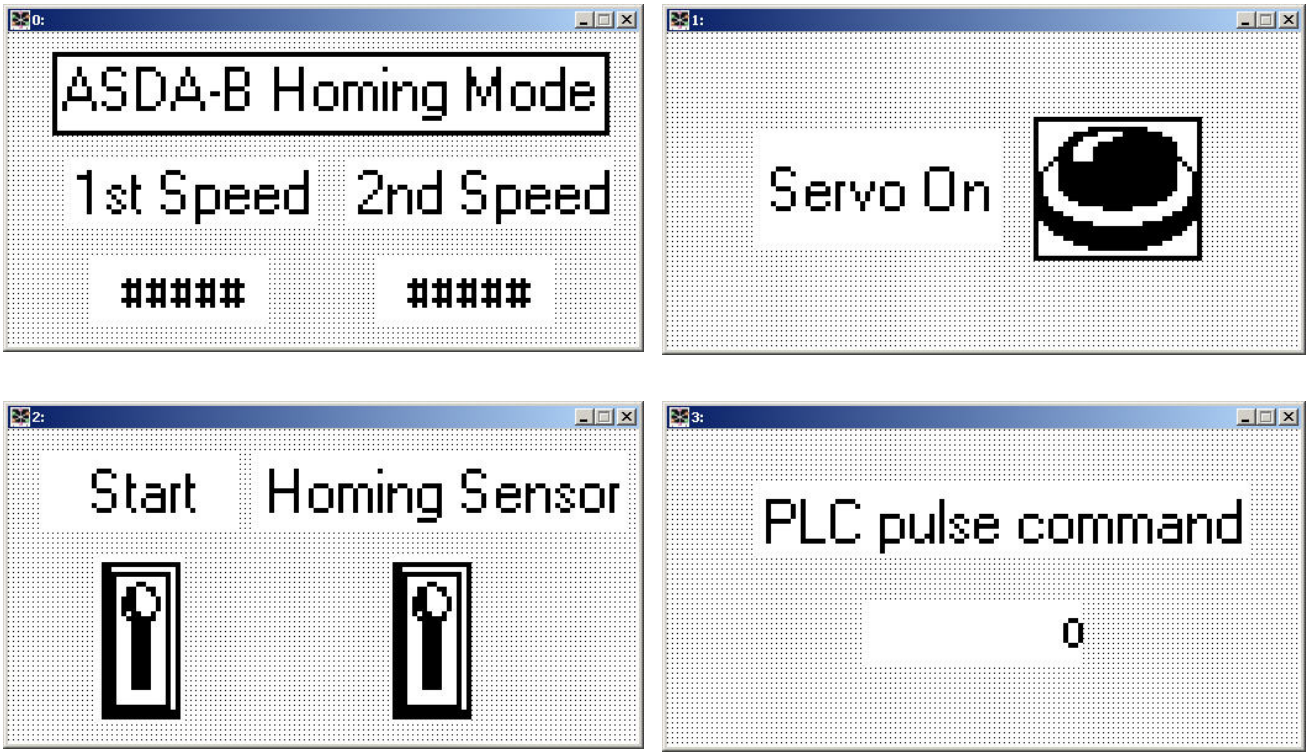
Application Example: Homing Operation

Purpose

Use Delta TP04 series operation panel interface as host (external) controller to control ASDA-B servo drive and let the servo drive follow the commands from PLC to complete the positioning.

Delta TP04 Series

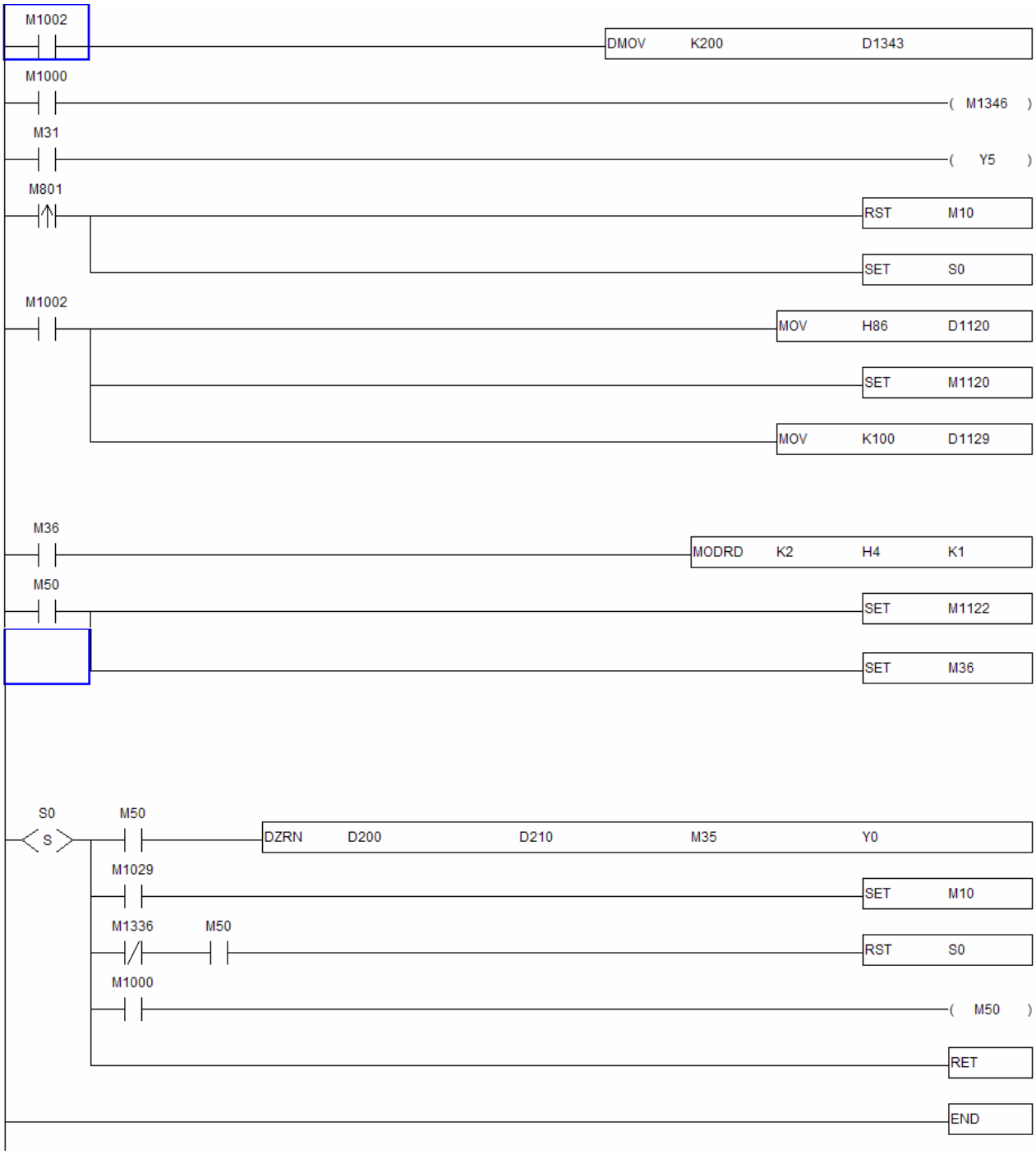
The editing screens by using TPEditor software is shown as follows:



Download the editing screens to TP04 series by using TP communication cable

Communication format: Both TP04 series operation panel interface and ASDA-B series servo drive have to adopt the same communication protocol setting.

Please notice that the users still have to use PLC ZRN (Zero-point return) command when executing this homing operation.


M1002
DMOV K200 D1343
M1000
(M1346)
M31
(Y5)
M801
RST M10
SET S0
M1002
MOV H86 D1120
SET M1120
MOV K100 D1129
M36
MODRD K2 H4 K1
M50
SET M1122
SET M36
S0
S
M50
DZRN D200 D210 M35 Y0
M1029
SET M10
M1336
M50
RST S0
M1000
(M50)
RET
END

ASDA-B series Servo Drive

Parameter Settings:

- P1-00 =0 (Position mode)
- P2-10 =101 (SON Servo ON, the default is DI1)
- P2-12 =104 (CCLR)
- P2-32 =1 (PDFF, the ratio of load inertia to servo motor inertia can be continuously adjusted.)

Communication Settings:

- Use RS-485 communication

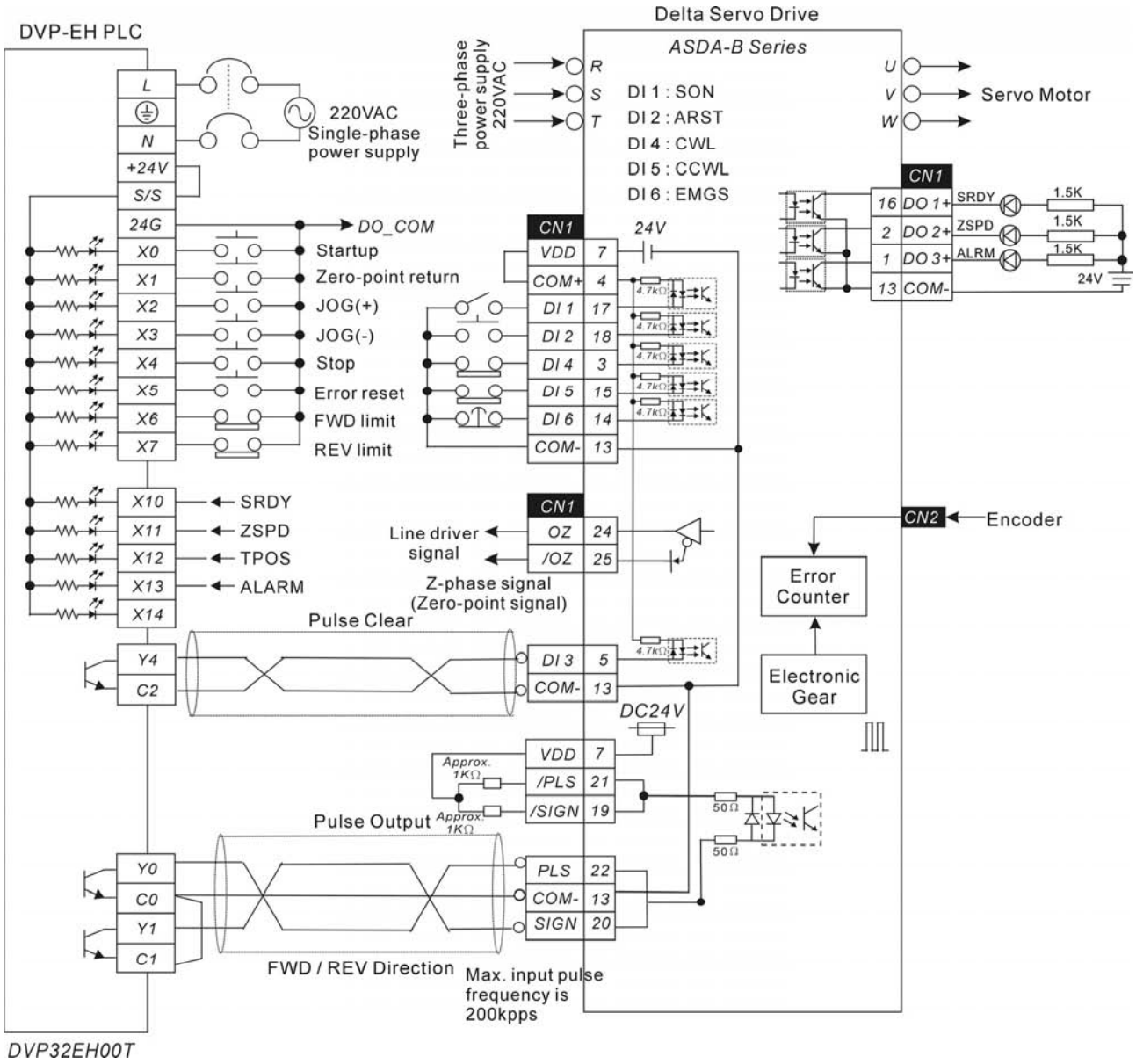
Operation

Ensure all wiring is connected correctly.

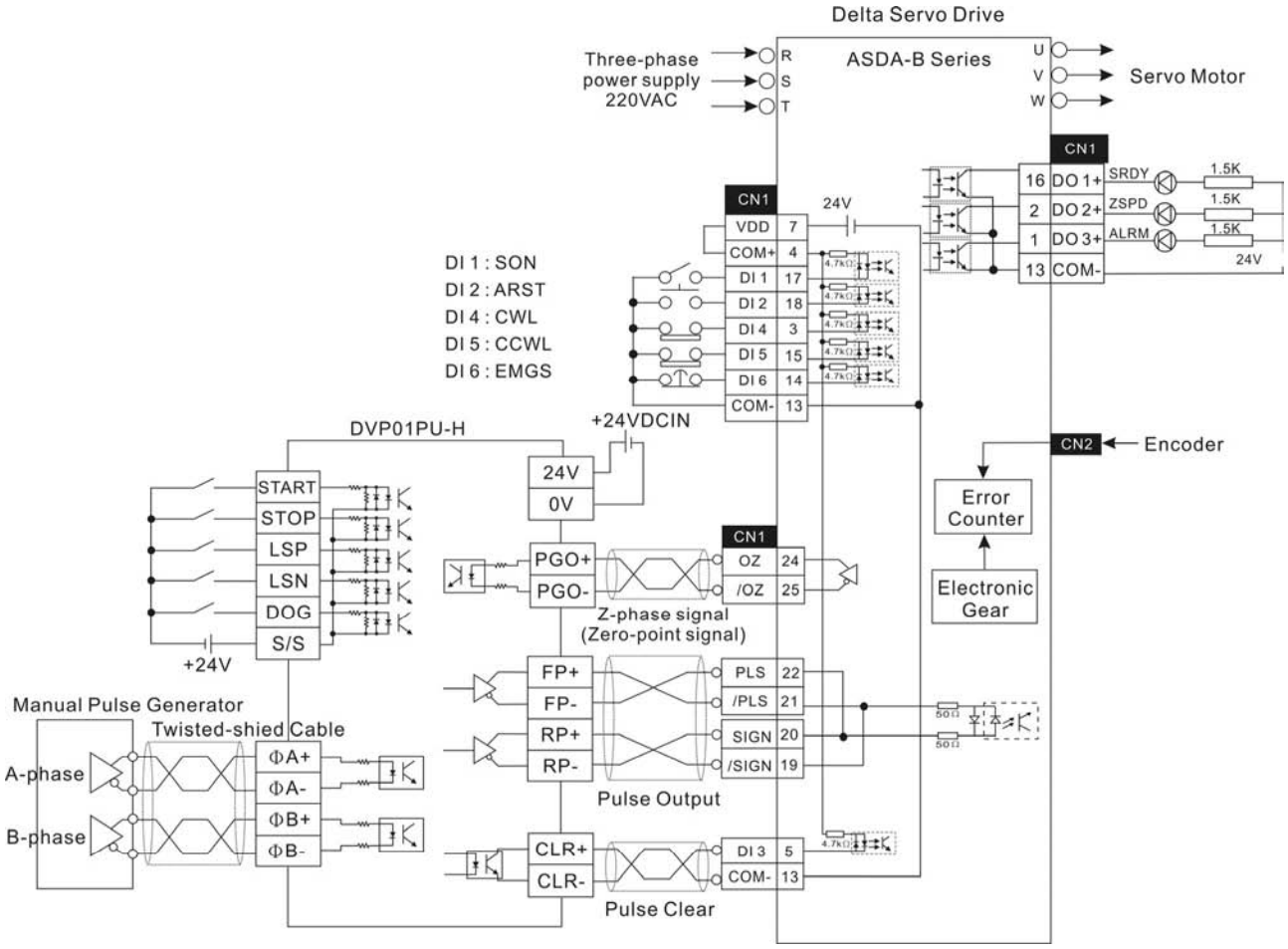
- Restart the servo drive (Apply the power to servo drive again).
- At this time, the SON LED (Servo On Indicator) will be lit to indicate that the servo drive is enabled, and normal display will show on the LCD display. If ALRM LED (Alarm Output Indicator) is lit or any fault message show on the LCD display, please refer to Chapter 10 “Troubleshooting” to remove the fault code and fault message.
- If there is no fault, set the speed of homing operation and the setting value of speed 2 on the first TP04 screen.
- Press “Servo On” key on the second TP04 screen and CMD LED will be red to indicate that the servo drive is enabled (Servo On status).
- Then, the users can use homing function on the third TP04 screen to control the servo drive.
- Finally, the users can observe the servo operation on the forth TP04 screen.

12.3 External Controller Connection Examples

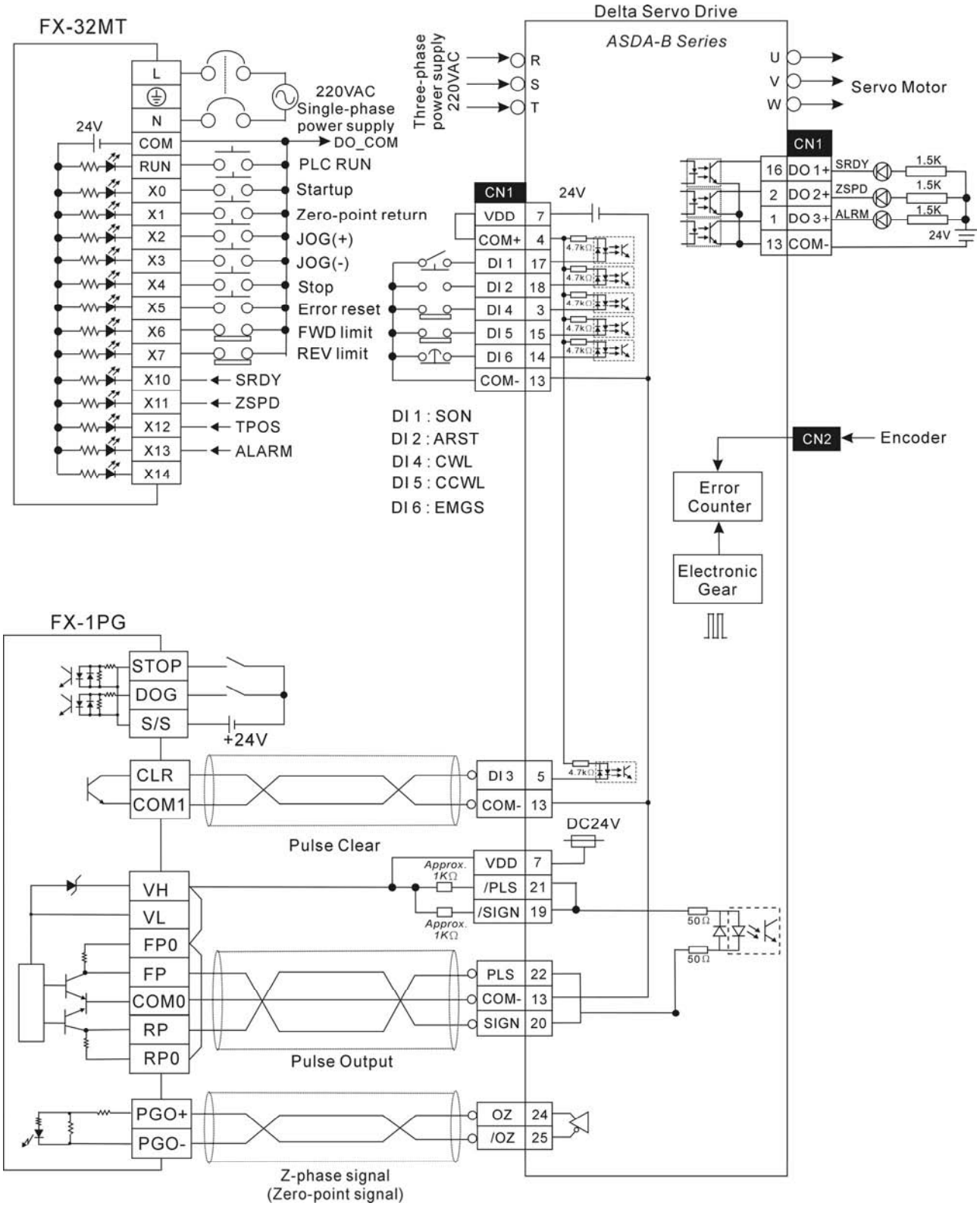
■ Connecting to Delta DVP-EH PLC



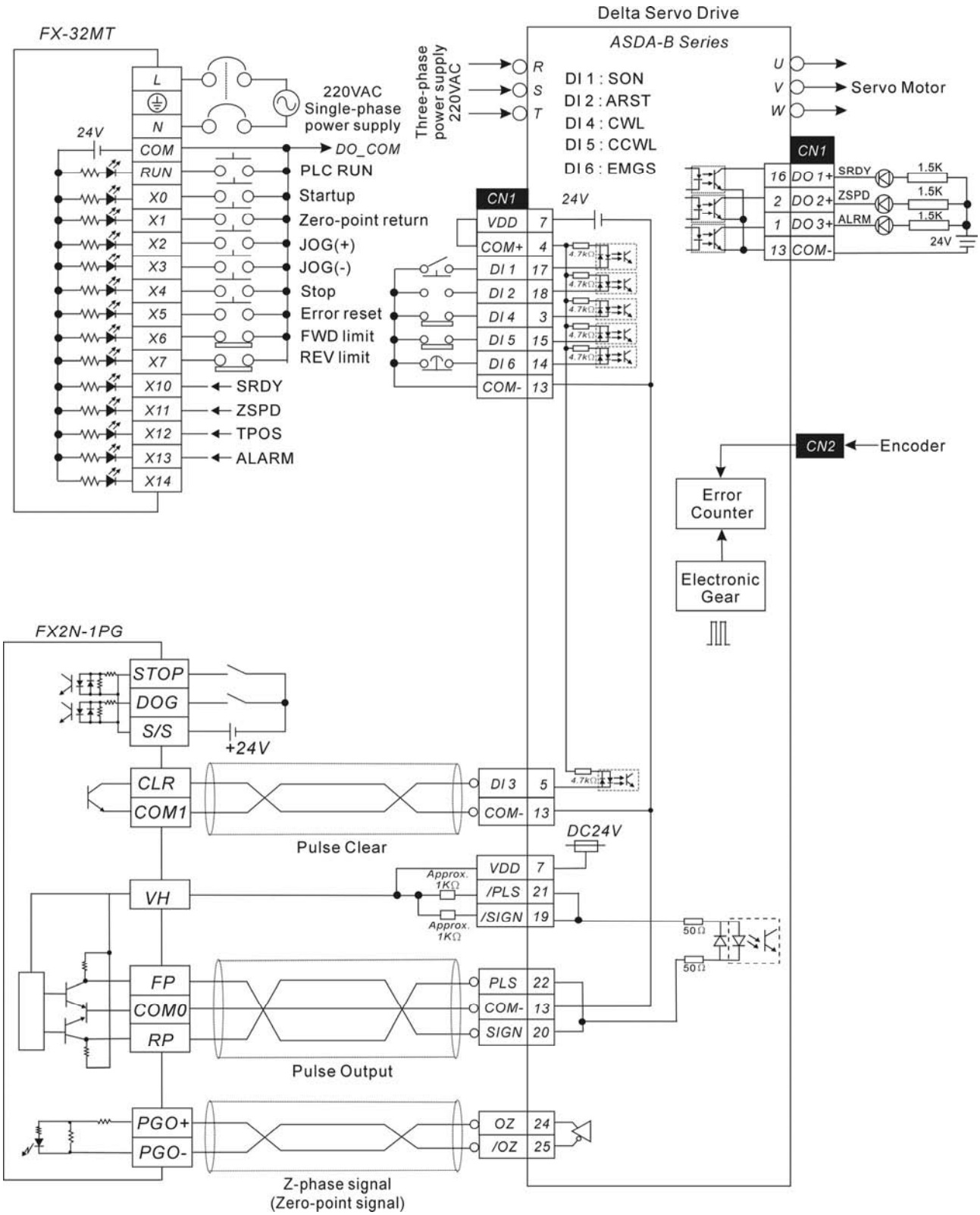
■ Connecting to Delta DVP-01PU



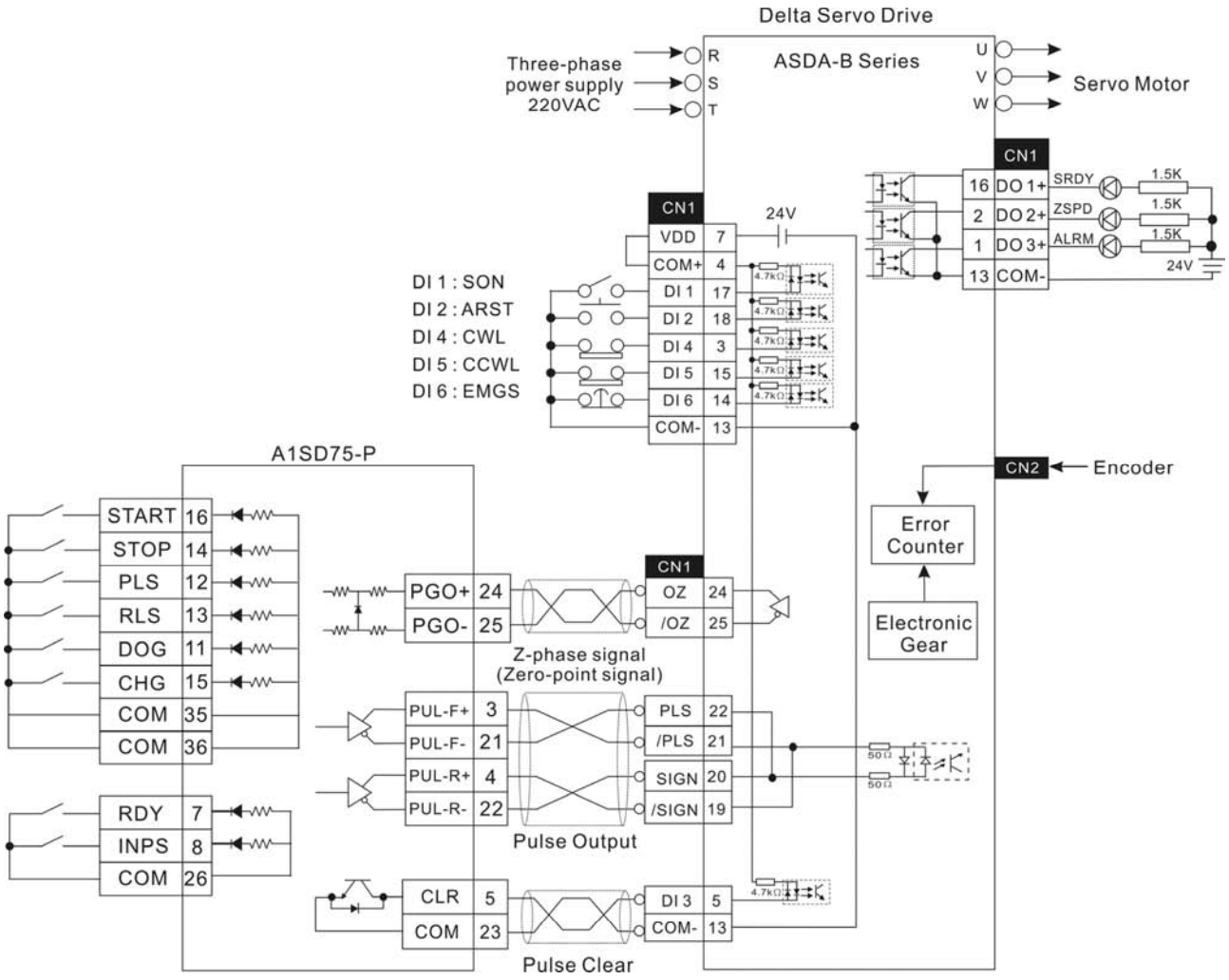
■ Connecting to Mitsubishi FX1PG



■ Connecting to Mitsubishi FX2N1PG



■ Connecting to Mitsubishi AD75



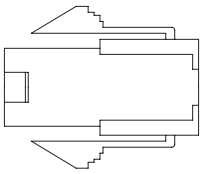
This page intentionally left blank.

efesotomasyon.com

Appendix A Accessories

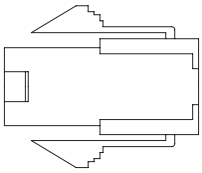
■ Power Connectors

Delta Part Number: ASDBCAPW0000



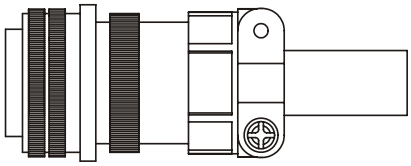
Title	Part No.	Manufacturer
Housing	C4201H00-2*2PA	JOWLE
Terminal	C4201TOP-2	JOWLE

Delta Part Number: ASDBCAPW0100



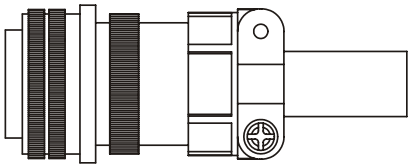
Title	Part No.	Manufacturer
Housing	C4201H00-2*3PA	JOWLE
Terminal	C4201TOP-2	JOWLE

Delta Part Number: ASD-CAPW1000



3106A-20-18S

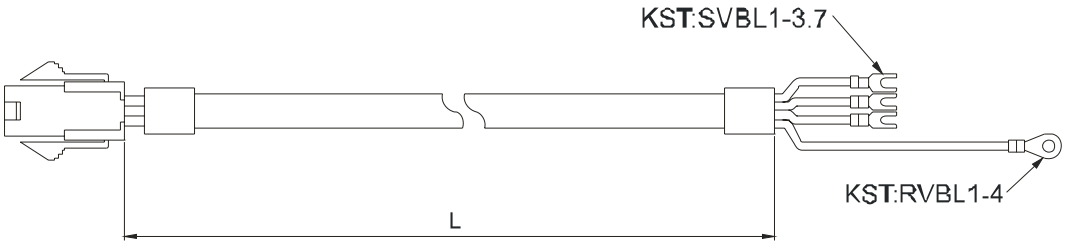
Delta Part Number: ASD-CAPW2000



3106A-24-11S

■ Power Cables

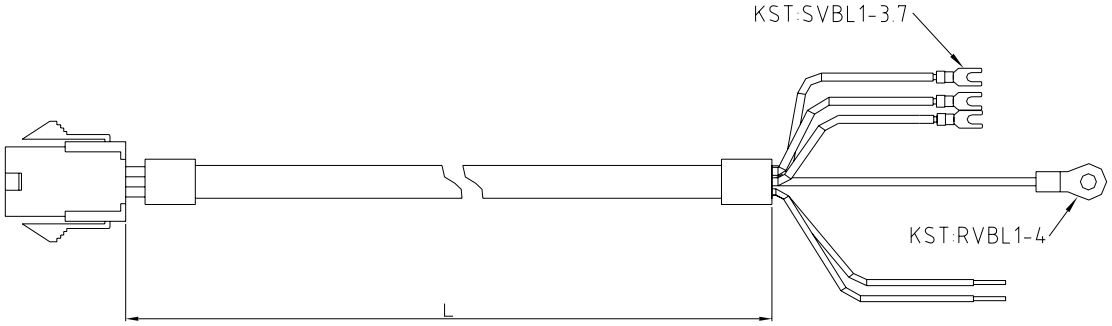
Delta Part Number: ASDBCAPW0203/0205



Title	Part No.	Manufacturer
Housing	C4201H00-2*2PA	JOWLE
Terminal	C4201TOP-2	JOWLE

Title	Part No.	L	
		mm	inch
1	ASDBCAPW0203	3000 ± 50	118 ± 2
2	ASDBCAPW0205	5000 ± 50	197 ± 2

Delta Part Number: ASDBCAPW0303/0305

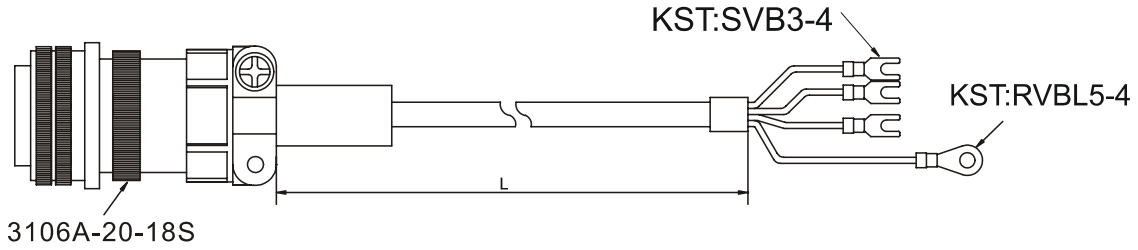


Title	Part No.	Manufacturer
Housing	C4201H00-2*3PA	JOWLE
Terminal	C4201TOP-2	JOWLE

Title	Part No.	L	
		mm	inch
1	ASDBCAPW0303	3000 ± 50	118 ± 2
2	ASDBCAPW0305	5000 ± 50	197 ± 2

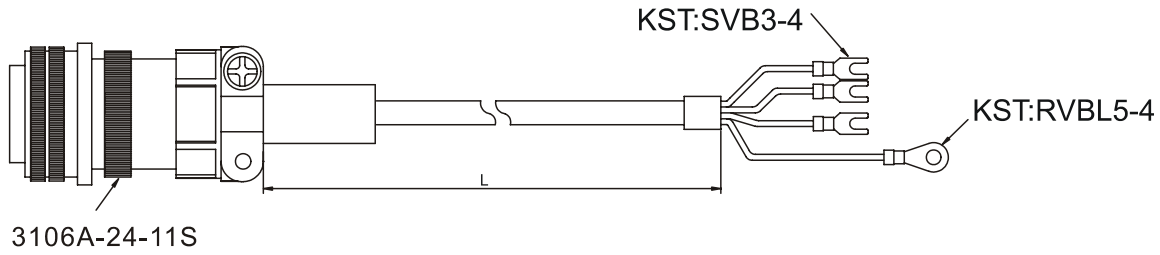
■ **Power Cables, cont.**

Delta Part Number: ASD-CAPW1203/1205



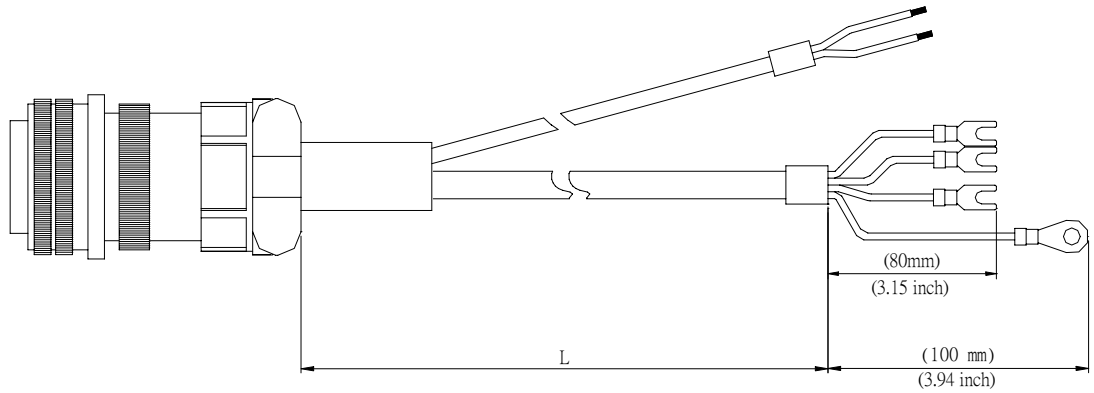
Title	Part No.	Straight	L	
			mm	inch
1	ASD-CAPW1203	3106A-20-18S	3000 ± 50	118 ± 2
2	ASD-CAPW1205	3106A-20-18S	5000 ± 50	197 ± 2

Delta Part Number: ASD-CAPW2203/2205



Title	Part No.	Straight	L	
			mm	inch
1	ASD-CAPW2203	3106A-24-18S	3000 ± 50	118 ± 2
2	ASD-CAPW2205	3106A-24-18S	5000 ± 50	197 ± 2

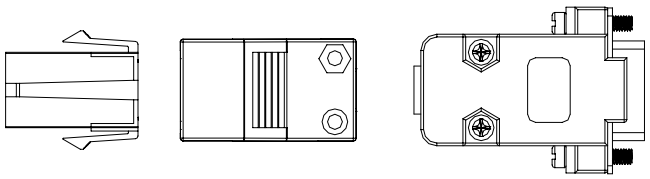
Delta Part Number: ASD-CAPW2303/2305



Title	Part No.	Straight	L	
			mm	inch
1	ASD-CAPW2303	3106A-24-11S	3000 ± 50	118 ± 2
2	ASD-CAPW2305	3106A-24-11S	5000 ± 50	197 ± 2

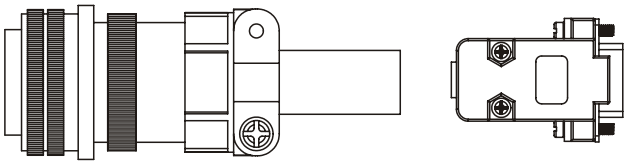
■ Encoder Connectors

Delta Part Number: ASDBCAEN0000



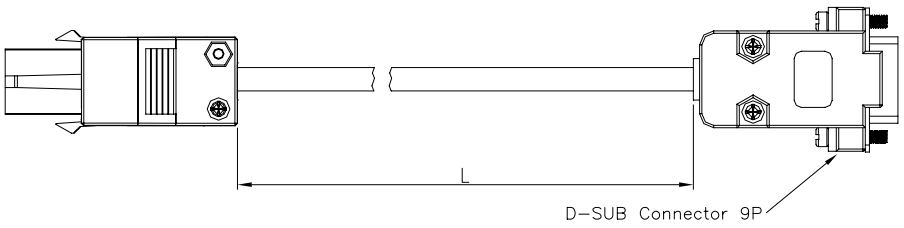
Title	Part No.	Manufacturer
Housing	AMP (1-172161-9)	AMP
Terminal	AMP (170359-3)	AMP
CLAMP	DELTA (34703237XX)	DELTA

Delta Part Number: ASDBCAEN1000



■ Encoder Cables

Delta Part Number: ASDBCAEN0003/0005

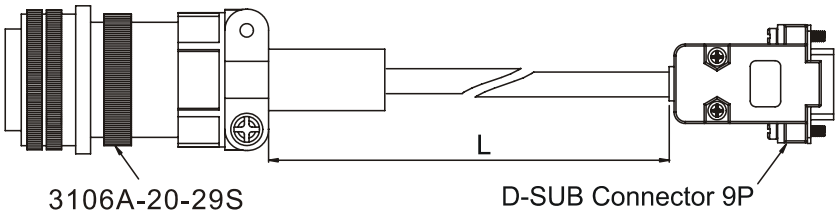


Title	Part No.	Manufacturer
Housing	AMP (1-172161-9)	AMP
Terminal	AMP (170359-3)	AMP
CLAMP	DELTA (34703237XX)	DELTA

Title	Part No.	L	
		mm	inch
1	ASDBCAEN0003	3000 ± 50	118 ± 2
2	ASDBCAEN0005	5000 ± 50	197 ± 2

■ **Encoder Cables, cont.**

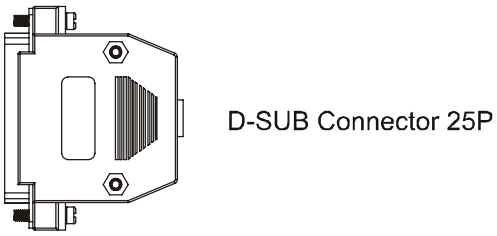
Delta Part Number: ASDBCAEN1003/1005



Title	Part No.	Straight	L	
			mm	inch
1	ASDBCAEN1003	3106A-20-29S	3000 ± 50	118 ± 2
2	ASDBCAEN1005	3106A-20-29S	5000 ± 50	197 ± 2

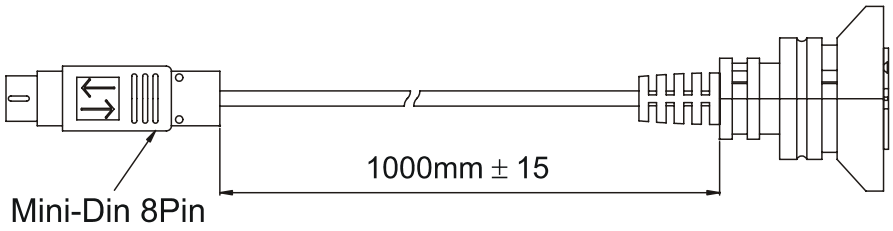
■ **I/O Signal Connector**

Delta Part Number: ASDBCNDS0025



■ **Communication Cables**

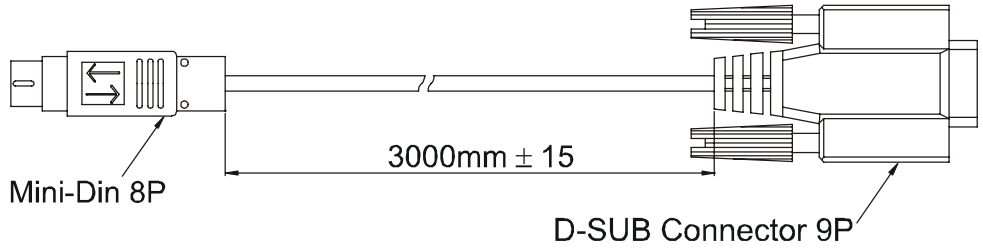
Delta Part Number: ASDBCADK0001 (for Keypad, connecting a ASDA-B servo drive to a Keypad)



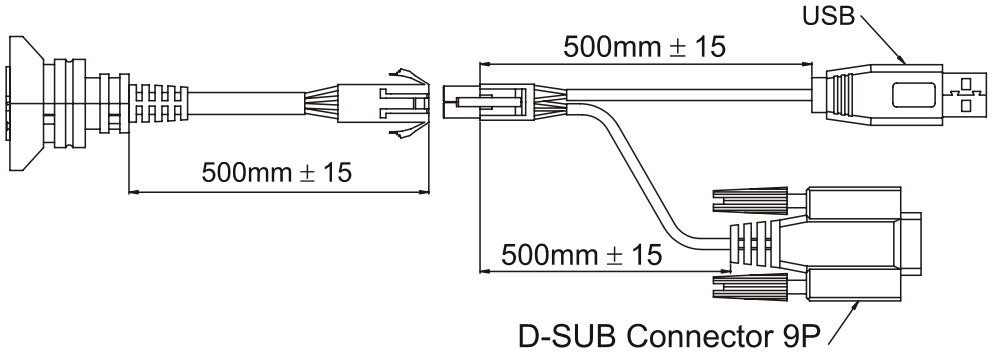
Title	Part No.	Manufacturer
Box Header	3071420300	DELTA
Cover	3140311100	DELTA
Housing	2541-K-14PD	JAWS
Terminal	2541-T-G	JAWS

■ Communication Cables, cont.

Delta Part Number: DVPACAB2A30 (for PC, connecting a ASDA-B servo drive to a PC)



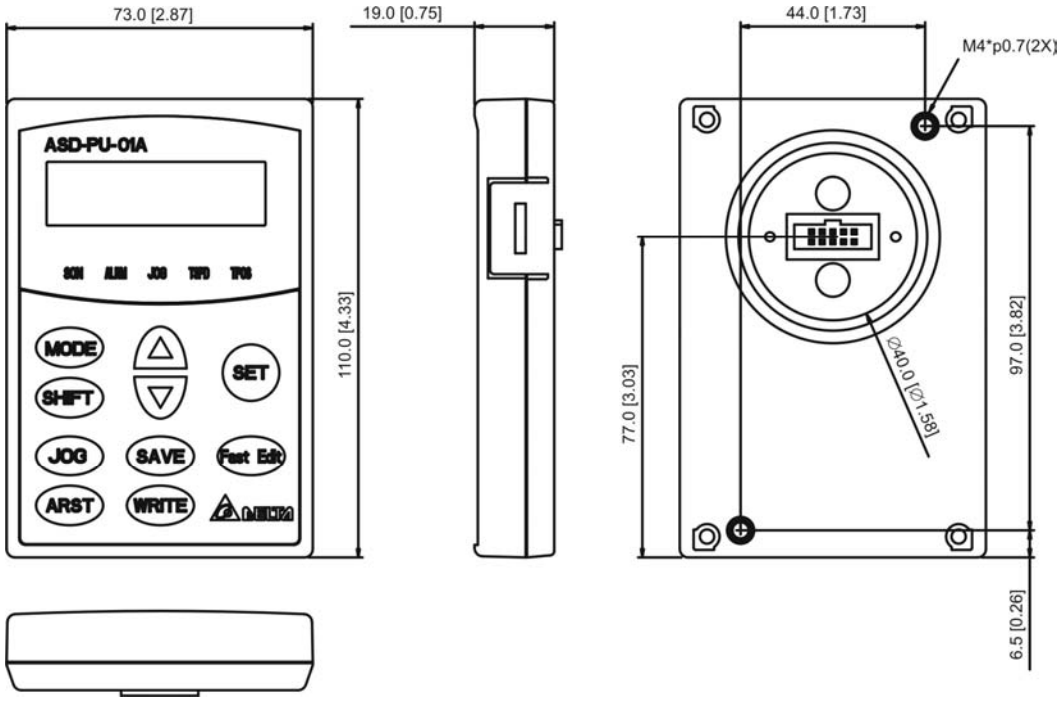
Delta Part Number: ASDBCACK0001 (for Keypad, connecting a PC to a Keypad)



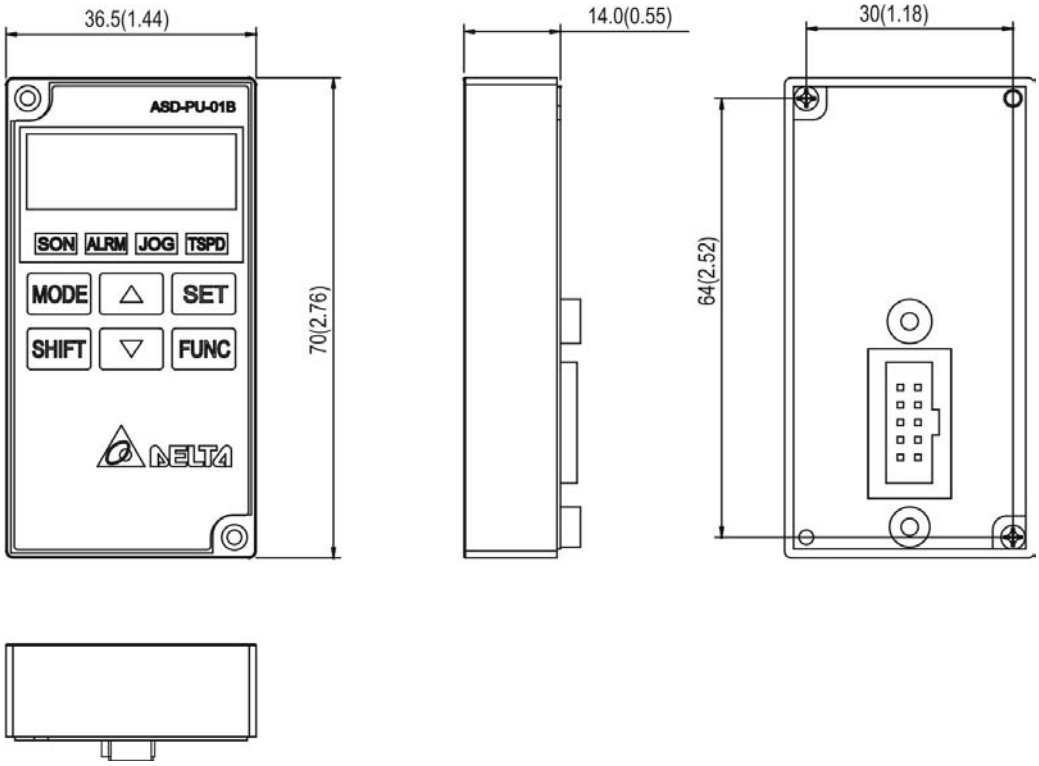
Title	Part No.	Manufacturer
Box Header	3071420300	DELTA
Cover	3140311100	DELTA
Housing	2541-K-14PD	JAWS
Terminal	2541-T-G	JAWS

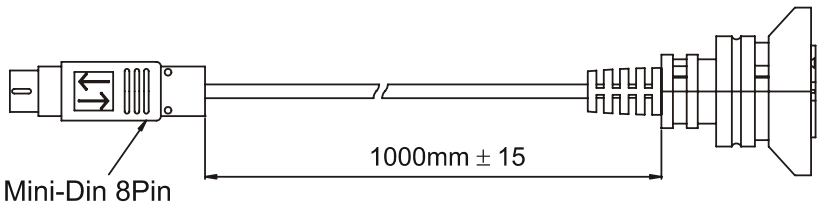
■ Keypad

Delta Part Number: ASD-PU-01A (including communication cable)



Delta Part Number: ASD-PU-01B (including communication cable)





Title	Part No.	Manufacturer
Box Header	3071420300	DELTA
Cover	3140311100	DELTA
Housing	2541-K-14PD	JAWS
Terminal	2541-T-G	JAWS

■ Servo Drive, Servo Motor and Accessories Combinations

100W Servo Drive and 100W Low Inertia Servo Motor

Servo Drive	ASD-A0121-AB			
Low inertia Servo Motor	ECMA-C30401□S			
Cable	Without Brake		With Brake	
	3M	5M	3M	5M
	Motor Power Cable ASDBCAPW0203	Motor Power Cable ASDBCAPW0205	-	-
	Encoder Cable ASDBCAEN0003	Encoder Cable ASDBCAEN0005	-	-
Connector	Power Connector ASDBCAPW0000			
	Encoder Connector ASDCAEN0000			

200W Servo Drive and 200W Low Inertia Servo Motor

Servo Drive	ASD-B0221-A			
Low inertia Servo Motor	ECMA-C30602□S			
Cable	Without Brake		With Brake	
	3M	5M	3M	5M
	Motor Power Cable ASDBCAPW0203	Motor Power Cable ASDBCAPW0205	Motor Power Cable ASDBCAPW0303	Motor Power Cable ASDBCAPW0305
	Encoder Cable ASDBCAEN0003	Encoder Cable ASDBCAEN0005	Encoder Cable ASDBCAEN0003	Encoder Cable ASDBCAEN0005
Connector	Power Connector ASDBCAPW0000		Power Connector ASDBCAPW0100	
	Encoder Connector ASDBCAEN0000			

400W Servo Drive and 400W Low Inertia Servo Motor

Servo Drive	ASD-B0421-A			
Low inertia Servo Motor	ECMA-C30604□S ECMA-C30804□7			
Cable	Without Brake		With Brake	
	3M	5M	3M	5M
	Motor Power Cable ASDBCAPW0203	Motor Power Cable ASDBCAPW0205	Motor Power Cable ASDBCAPW0303	Motor Power Cable ASDBCAPW0305
	Encoder Cable ASDBCAEN0003	Encoder Cable ASDBCAEN0005	Encoder Cable ASDBCAEN0003	Encoder Cable ASDBCAEN0005
Connector	Power Connector ASDBCAPW0000		Power Connector ASDBCAPW0100	
	Encoder Connector ASDBCAEN0000			

400W Servo Drive and 500W Medium Inertia Servo Motor

Medium inertia Servo Motor	ECMA-E31305□S			
Cable	Without Brake		With Brake	
	3M	5M	3M	5M
	Motor Power Cable ASD-CAPW1203	Motor Power Cable ASD-CAPW1205	Motor Power Cable ASD-CAPW1303	Motor Power Cable ASD-CAPW1305
	Encoder Cable ASDBCAEN1003	Encoder Cable ASDBCAEN1005	Encoder Cable ASDBCAEN1003	Encoder Cable ASDBCAEN1005
Connector	Power Connector ASD-CAPW1000			
	Encoder Connector ASDBCAEN1000			

400W Servo Drive and 300W High Inertia Servo Motor

Servo Drive	ASD-B0421-A			
High inertia Servo Motor	ECMA-G31303□S			
Cable	Without Brake		With Brake	
	3M	5M	3M	5M
	Motor Power Cable ASD-CAPW1203	Motor Power Cable ASD-CAPW1205	Motor Power Cable ASD-CAPW1303	Motor Power Cable ASD-CAPW1305
	Encoder Cable ASDBCAEN1003	Encoder Cable ASDBCAEN1005	Encoder Cable ASDBCAEN1003	Encoder Cable ASDBCAEN1005
Connector	Power Connector ASD-CAPW1000			
	Encoder Connector ASDBCAEN1000			

750W Servo Drive and 750W Low Inertia Servo Motor

Servo Drive	ASD-B0721-A			
Low inertia Servo Motor	ECMA-C30807□S			
Cable	Without Brake		With Brake	
	3M	5M	3M	5M
	Motor Power Cable ASDBCAPW0203	Motor Power Cable ASDBCAPW0205	Motor Power Cable ASDBCAPW0303	Motor Power Cable ASDBCAPW0305
	Encoder Cable ASDBCAEN0003	Encoder Cable ASDBCAEN0005	Encoder Cable ASDBCAEN0003	Encoder Cable ASDBCAEN0005
Connector	Power Connector ASDBCAPW0000		Power Connector ASDBCAPW0100	
	Encoder Connector ASDBCAEN0000			

750W Servo Drive and 600W High Inertia Servo Motor

Servo Drive	ASD-B0721-A			
High inertia Servo Motor	ECMA-G31306□S			
Cable	Without Brake		With Brake	
	3M	5M	3M	5M
	Motor Power Cable ASD-CAPW1203	Motor Power Cable ASD-CAPW1205	Motor Power Cable ASD-CAPW1303	Motor Power Cable ASD-CAPW1305
	Encoder Cable ASDBCAEN1003	Encoder Cable ASDBCAEN1005	Encoder Cable ASDBCAEN1003	Encoder Cable ASDBCAEN1005
Connector	Power Connector ASD-CAPW1000			
	Encoder Connector ASDBCAEN1000			

1kW Servo Drive and 1kW Low Inertia Servo Motor

Servo Drive	ASD-B1021-A			
Low inertia Servo Motor	ECMA-C31010□S			
Cable	Without Brake		With Brake	
	3M	5M	3M	5M
	Motor Power Cable ASD-CAPW1203	Motor Power Cable ASD-CAPW1205	Motor Power Cable ASD-CAPW1303	Motor Power Cable ASD-CAPW1305
	Encoder Cable ASDBCAEN1003	Encoder Cable ASDBCAEN1005	Encoder Cable ASDBCAEN1003	Encoder Cable ASDBCAEN1005
Connector	Power Connector ASDBCAPW1000			
	Encoder Connector ASDBCAEN1000			

1kW Servo Drive and 1kW Medium Inertia Servo Motor

Servo Drive	ASD-B1021-A			
Medium inertia Servo Motor	ECMA-E31310□S			
Cable	Without Brake		With Brake	
	3M	5M	3M	5M
	Motor Power Cable ASD-CAPW1203	Motor Power Cable ASD-CAPW1205	Motor Power Cable ASD-CAPW1303	Motor Power Cable ASD-CAPW1305
	Encoder Cable ASDBCAEN1003	Encoder Cable ASDBCAEN1005	Encoder Cable ASDBCAEN1003	Encoder Cable ASDBCAEN1005
Connector	Power Connector ASD-CAPW1000			
	Encoder Connector ASDBCAEN1000			

1kW Servo Drive and 900W High Inertia Servo Motor

Servo Drive	ASD-B1021-A			
High inertia Servo Motor	ECMA-G31309□S			
Cable	Without Brake		With Brake	
	3M	5M	3M	5M
	Motor Power Cable ASD-CAPW1203	Motor Power Cable ASD-CAPW1205	Motor Power Cable ASD-CAPW1303	Motor Power Cable ASD-CAPW1305
	Encoder Cable ASDBCAEN1003	Encoder Cable ASDBCAEN1005	Encoder Cable ASDBCAEN1003	Encoder Cable ASDBCAEN1005
Connector	Power Connector ASD-CAPW1000			
	Encoder Connector ASDBCAEN1000			

1.5kW Servo Drive and 1.5kW Medium Inertia Servo Motor

Servo Drive	ASD-B1521-A			
Medium inertia Servo Motor	ECMA-E31315□S			
Cable	Without Brake		With Brake	
	3M	5M	3M	5M
	Motor Power Cable ASD-CAPW1203	Motor Power Cable ASD-CAPW1205	Motor Power Cable ASD-CAPW1303	Motor Power Cable ASD-CAPW1305
	Encoder Cable ASDBCAEN1003	Encoder Cable ASDBCAEN1005	Encoder Cable ASDBCAEN1003	Encoder Cable ASDBCAEN1005
Connector	Power Connector ASD-CAPW1000			
	Encoder Connector ASDBCAEN1000			

2kW Servo Drive and 2kW Low Inertia Servo Motor

Servo Drive	ASD-B2023-A			
Low inertia Servo Motor	ECMA-C31020□S			
Cable	Without Brake		With Brake	
	3M	5M	3M	5M
	Motor Power Cable ASD-CAPW1203	Motor Power Cable ASD-CAPW1205	Motor Power Cable ASD-CAPW1303	Motor Power Cable ASD-CAPW1305
	Encoder Cable ASDBCAEN1003	Encoder Cable ASDBCAEN1005	Encoder Cable ASDBCAEN1003	Encoder Cable ASDBCAEN1005
Connector	Power Connector ASD-CAPW1000			
	Encoder Connector ASDBCAEN1000			

2kW Servo Drive and 2kW Medium Inertia Servo Motor

Servo Drive	ASD-B2023-A			
Medium inertia Servo Motor	ECMA-E31320□S			
Cable	Without Brake		With Brake	
	3M	5M	3M	5M
	Motor Power Cable ASD-CAPW1203	Motor Power Cable ASD-CAPW1205	Motor Power Cable ASD-CAPW1303	Motor Power Cable ASD-CAPW1305
	Encoder Cable ASDBCAEN1003	Encoder Cable ASDBCAEN1005	Encoder Cable ASDBCAEN1003	Encoder Cable ASDBCAEN1005
Connector	Power Connector ASD-CAPW1000			
	Encoder Connector ASDBCAEN1000			

2kW Servo Drive and 2kW Medium Inertia Servo Motor

Servo Drive	ASD-B2023-A			
Medium inertia Servo Motor	ECMA-E31820□S			
Cable	Without Brake		With Brake	
	3M	5M	3M	5M
	Motor Power Cable ASD-CAPW2203	Motor Power Cable ASD-CAPW2205	Motor Power Cable ASD-CAPW2303	Motor Power Cable ASD-CAPW2305
	Encoder Cable ASDBCAEN1003	Encoder Cable ASDBCAEN1005	Encoder Cable ASDBCAEN1003	Encoder Cable ASDBCAEN1005
Connector	Power Connector ASD-CAPW2000			
	Encoder Connector ASDBCAEN1000			

Other Accessories (Applicable for ASDA-B series all models)	
Description	Model Name
25Pin I/O signal connector (CN1)	ASDBCNDS0025
Communication cable, for Keypad, connecting a ASDA-B servo drive to a Keypad	ASDBCADK0001
Communication cable, for PC, connecting a ASDA-B servo drive to a PC	DVPACAB2A30
Communication cable, for Keypad, connecting a PC to a Keypad	ASDBCACK0001
Keypad	ASD-PU-01A ASD-PU-01B