RS OEMax

CSD5 Servo Drive

Index Manual

Catalog Number(s): CSD5_xxBX1

RS Reliable & Smart Automation

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WARNING 	Identifies information about practices or circumstances that can cause an explosion in a hazardous environment, which may lead to personal injury or death, property damage, or economic loss.
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WARNING 	Labels may be located on or inside the equipment, for example, a drive or motor, to alert people that dangerous voltage may be present.
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Summary of Change

You will see change bars to the left or right of a paragraph throughout this manual to help you quickly indentify revisions.

Manual Revision	Changes	Date
A	N/A	June 2011

Preface

Read this preface to familiarize yourself with the rest of the manual.

About This Publication

This manual provides detailed information for the indexing of the CSD5 Servo Drive.

Who Should Use this Manual

This manual is intended for engineers or technicians directly involved in the installation and wiring of the CSD5 Servo Drive, and programmers directly involved in the operation, field maintenance, and integration of the CSD5 Servo Drive.

If you do not have a basic understanding of the CSD5 Servo Drive, contact your local RS Automation Co., Ltd. sales representative before using this product, for information on available training courses.

Additional Resources

The following documents contain additional information concerning related CSD5 servo drive products.

For	Read This Document
Information on the installation of your CSD5 servo drive	CSD5 Servo Drive Installation Instructions
Information about the operation of your CSD5 Servo Drive	CSD5 Servo DriveUser Manual

You can view or download publications at http://www.oemax.co.kr or http://www.rsautomation.co.kr To order paper copies of technical documentation, contact your local RS Automation distributor or sales representative.

Overview

Introduction

Use this chapter to briefly understand the idea of indexing of a servo drive. This chapter also describes the elements for indexing, such as position unit and acceleration, etc.

What is indexing

Servo drive is a device to control a servo motor with a pulse train or an analog signal coming from an external controller, which is responsible for the control of physical dimensions such as displacement, speed or torque. It means that a servo drive is an actuator but not a controller, just implementing the control with a command from the external controller.

An external controller determines a position, speed or torque depending on control scheme, usually based on the feedback from a servo drive. However, some applications do not require feedback-based command from the controller , but a servo drive just follows a pre-defined sequence from the controller. Especially, indexing requirement is much simpler in such applications. They just need a movement with an accurate position information regardless of other control inputs.

Now, the CSD5 Servo Drive provides a simple indexing for one axis, not requiring any command from a controller, but providing programmed position control. It is quite simple function. Given an index in a parameter, then the CSD5 Servo Drive starts indexing. Since any other external device is not required, the system configuration would be so simple and implemented very fast.

The CSD5 Servo Drive has a special routine to provide indexing. Indexing starts to work when the control mode is set to Indexing. The CSD5 Servo Drive is able to support 8 indexes with each different speed and provide various travel modes over 8 indexes. The operation can be paused or aborted

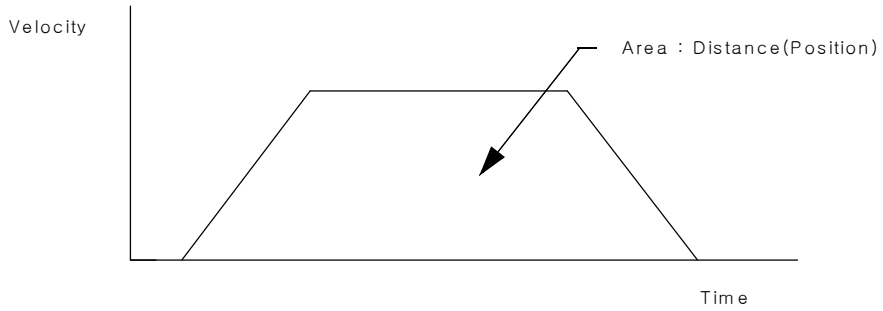
by I/O signals. Also, the CSD3 Plus Servo Drive provides various homing modes.

Indexing Function

The CSD5 servo drive indexing supports 64 indexes. The position counter for indexing uses 32bit singed long type. Its range is -2,147,483,648 ~ 2,147,483,647. Therefore, the indexing of absolute type is available within this range. If the absolute indexing is operated in the position exceeding this range, a fault is generated.

Index Elements

In order to make a movement, it is necessary to define four elements: a position (where to move), a velocity (how fast it moves), acceleration time and deceleration time to reach the speed and make a stop. The position is defined as a number of pulses or μm, and either in the incremental or in the absolute coordinate. Up to 8 index data can be programmed. The CSD5 supports only trapezoidal velocity profile. The S-curve is not available.



Indexing Types

There are two kinds of coordinate systems to express position. In the absolute coordinate system, all the Indexes are expressed based on one reference location, called as Home or Origin. In the incremental coordinate system, a position is defined with a relative distance from its previous position.

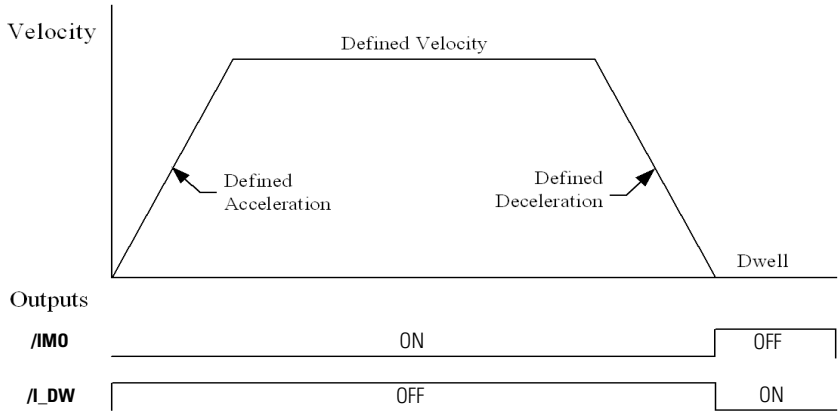
A user can select either option in the 1st digit of IN02.00~63 (absolute and incremental). When this value is 0, the coordinate system is absolute and When this value is 1, the coordinate system is incremental.

TIP A 7-Seg. digits increase from right to left.

Absolute

The move from its starting position to the specified Position: absolute coordinate base.

The axis must be homed before the drive can execute an absolute index.



Incremental

The moves from its starting position the specified Distance.

Position/Distance

Position

For Absolute mode moves, the fixed position to which the motor will travel.

Distance

For Incremental moves, the relative distance the motor will travel.

A user can enter total 64 Position/Distance for 64 indexes. For the Index 0 to the Index 63, use IN04.00~63 to enter its Position/Distance. The input range is -2,147,483,647~2,147,483,647 and its unit is Counts.

TIP The CSD5 servo drive supports only pulse unit coordinate systems. The other coordinate systems are not available. But a user can use "User Defined Distance Per Motor Revolution" from Firmware Vresion 1.20

And the CSD5 servo drive uses 4 multiplier counts in index mode.

Velocity, Acceleration, Deceleration

Velocity

Maximum velocity during an index move.

Enter velocity for each movement into the velocity parameter of IN08.00~63. The input range is 0~6000 and its unit is rpm. The default value is 750.

TIP Refer to the A-52 page "Index Velocity" for the velocity parameter.

TIP The velocity input range is 0~6000 but maximum velocity must be lower than motor's maximum velocity.

Acceleration

Maximum acceleration during an index move.

A user can enter total 64 acceleration for 64 indexes. Enter acceleration for each movement into the acceleration parameter of IN10.00~63. The input range is 1~2,147,483,647 and its unit is 10^{-2}rev/sec. The default value is 6250. The Acceleration slope is calculated by velocity, resolution and distance as shown below.

Acceleration calculation for rotary motor

Acceleration parameter unit : rev/sec^2

Acceleration (Counts/sec^2) = (acceleration parameter value × 0.01) (rev/sec^2) × 4 × resolution(Counts/rev)

Acceleration calculation for linear motor

Acceleration parameter unit : mm/sec^2

Acceleration(Counts/sec^2) = acceleration parameter value (rev/sec^2) × 4 × lines per meter(Counts/m) × (m/1000mm)

TIP Refer to the A-53 page "Index Acceleration" for the Acceleration parameter.

Deceleration

Maximum deceleration during an index move.

A user can enter total 64 deceleration for 64 indexes. Enter deceleration for each movement into the deceleration parameter of IN11.00~63. The input range is 1~2,147,483,647 and its unit is 10^2rev/sec. The default value is 6250. The deceleration slope is calculated by the same to calculate acceleration slope.

TIP Refer to the A-53 page "Index Deceleration" for the Deceleration parameter.

TIP 'Enable' means a status that it's using or can use I/O signal and 'Disable' means a status that it's not using or can not use I/O signal

Wiring

Introduction

This chapter describes the information on wiring connected to the servo drive and control mode for indexing.

For indexing, the CSD5 servo drive uses general servo parameters, position data, travel mode and I/O signals. Since general servo parameters are also used for Indexing, refer to The CSD5 Servo Drive User Manual (The CSD5-UM001) for more information about parameters related to general servo operations.

Control Mode Setting

Control Mode Type

As in the table below, there are 5 kinds of basic control modes and 6 kinds of associated control modes. Combinational control mode cannot be used by combining more than 3 types. Make sure to combine two types only. The table below shows the control mode types.

Table 2.1 Control Mode Type

	Display	**Description**
Basic control Mode		Position mode
		Speed mode
		Torque mode
		Multi-step mode
		Index mode

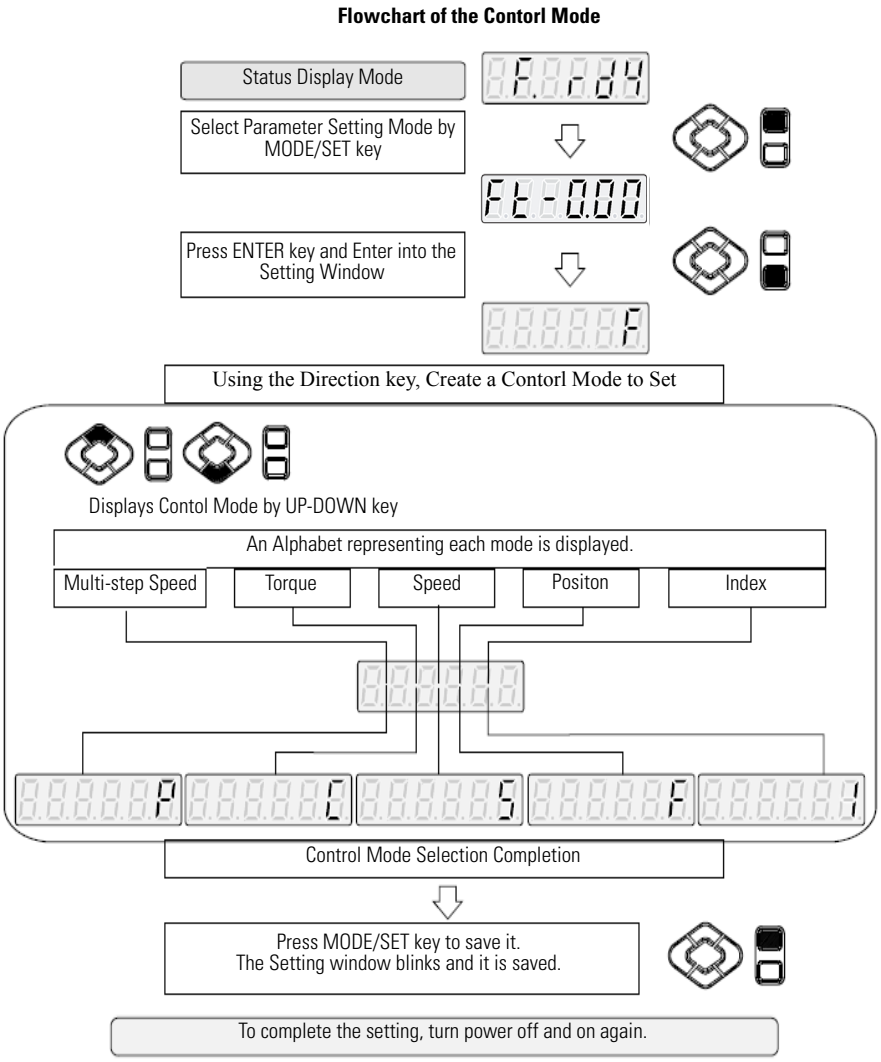
Table 2.1 Control Mode Type

	Display	Description
Associated control Mode		Speed + position mode
		Torque + speed mode
		Torque+ position mode
		Multi-step speed + position mode
		Multi-step speed + speed mode
		Multi-step speed + torque mode

Control Mode Setting Method

Describes control mode setting method focusing on the key button manipulation.

Apply the power and set it as shown in the flowchart below.



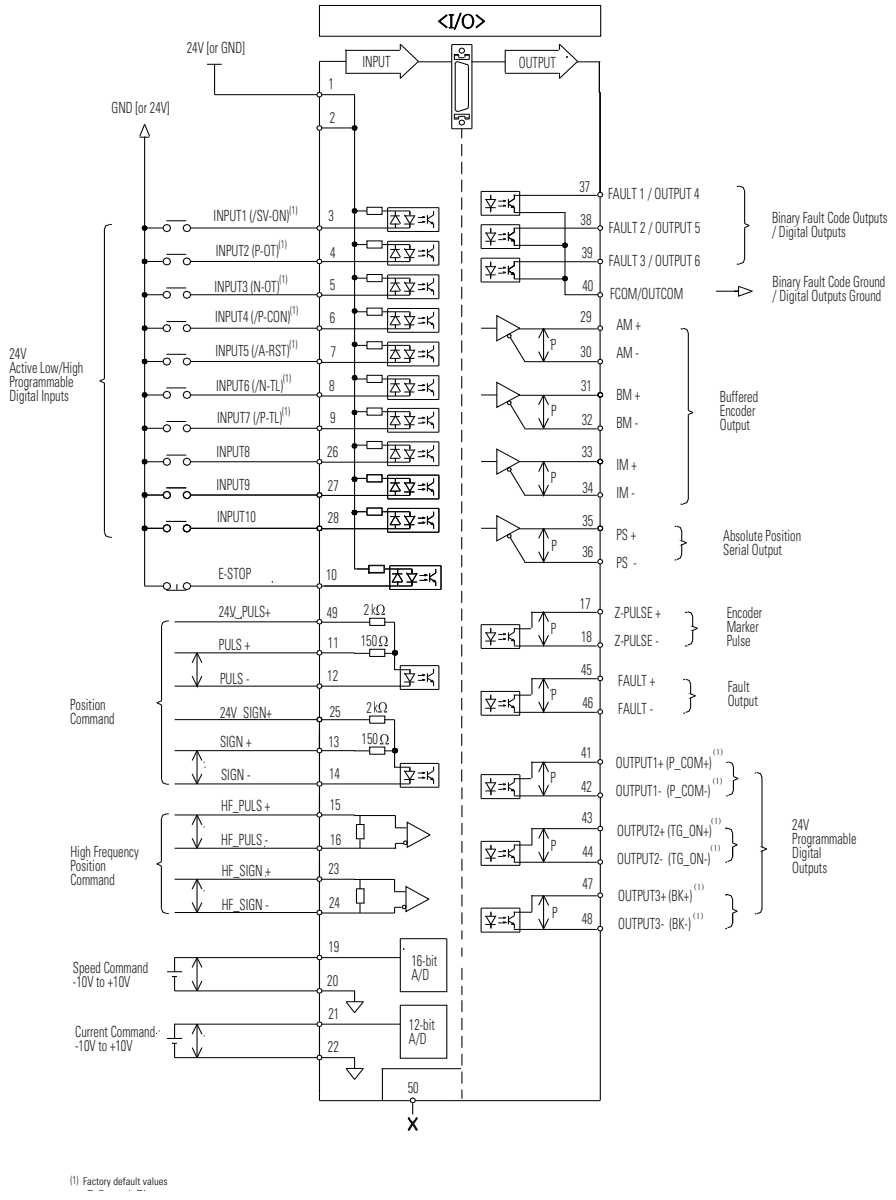
Black key button represents that it is pressed.

I/O Signal (I/O)

A user can configure I/O signals in the CSD5 servo drive.

I/O Connection Diagram

This is the circuit diagram of a connector for I/O signal. It is divided into input on the left and output on the right.



ON, OFF signal as per high/low level can change in input because photocoupler is possible for two-way wiring. But the signal turns ON at low level in output.

Table 2.2 (I/O) Pin Arrangement for host controller connections

Pin	Symbol	Description
1	+24V IN	External 24 [V] input for contact point input
2	+24V IN	External 24 [V] input for contact point input
3	INPUT1	Digital input 1(/SV-ON)[1]
4	INPUT2	Digital input 2(P-OT)[1]
5	INPUT3	Digital input 3(N-OT)[1]
6	INPUT4	Digital input 4(/P-CON)[1]
7	INPUT5	Digital input 5(/A-RST)[1]
8	INPUT6	Digital input 6(/N-TL)[1]
9	INPUT7	Digital input 7(/P-TL)[1]
10	ESTOP	ESTOP(Default: Disable)
11	PLUS+	Position command pulse input+
12	PLUS-	Position command pulse input-
13	SIGN+	Position command sign input+
14	SIGN-	Position command sign input-
15	HF_PULS+	High frequency position command pulse input+
16	HF_PULS-	High frequency position command pulse input-
17	Z-PULSE+	Encoder Z-pulse output (Open collector)
18	Z-PULSE-	Encoder Z-pulse output (Open collector)
19	VCMD+	Speed command input+
20	VCMD-	Speed command input-
21	ICMD+	Current command input+
22	ICMD-	Current command input-
23	HF_SIGN+	High speed position command sign input+
24	HF_SIGN-	High speed position command sign input-
25	24V_SIGN+	Open collector sign input + for 24 [V] level

Pin	Symbol	Description
26	INPUT8	Digital input 8
27	INPUT9	Digital input 9
28	INPUT10	Digital input 10
29	AM+	Encoder signal output A+
30	AM-	Encoder signal output A-
31	BM+	Encoder signal output B+
32	BM-	Encoder signal output B-
33	IM+	Encoder signal output Z+
34	IM-	Encoder signal output Z-
35	PS+	Absolute Encoder Position data output+
36	PS-	Absolute Encoder Position data output-
37	FAULT1/OUTPUT4	Alarm code output 1/Digital output 4
38	FAULT2/OUTPUT5	Alarm code output 2/Digital output 5
39	FAULT3/OUTPUT6	Alarm code output 3/Digital output 6
40	FCOM/OUTCOM	Alarm code/Output ground
41	OUTPUT1+	Digital output 1+(P_COM+)[1]
42	OUTPUT1-	Digital output 1-(P_COM-)[1]
43	OUTPUT2+	Digital output 2+(TG_ON+)[1]
44	OUTPUT2-	Digital output 2-(TG_ON-)[1]
45	FAULT+	Alarm generation signal output+
46	FAULT-	Alarm generation signal output-
47	OUTPUT3+	Digital output 3+(BK+)[1]
48	OUTPUT3-	Digital output 3-(BK-)[1]
49	24V_PULS+	Open collector pulse input + for 24 [V] level
50	NC	Not Available

[1] Factory default values

I/O Signals

I/O Signals are actual control signals for Indexing, i.e. starting a movement and making a stop. Once all index data is set up, I/O signals control indexing.

I/O Signal Configuration

A user can configure I/O signals in the CSD3 servo drive.

Index paraneters can set Modbus because all index parameters had mapped Modbus address. The table below added Modbus Address. Refer to the CSD5 Servo Drive Modbus Manual for more information

Digital Input signals

Table 2.3 I/O Sequence Input Signal

Type	Description	Mode	Modbus Address [Position]
</SV-ON> Servo-ON	When the servo is set to ON, voltage is applied to the servo motor; when it is set to OFF, voltage is cut off.	All	3000 [0]
</A-RST> Alarm Reset	It disables the Servo's Alarm.	All	3000 [4]
</G-SEL> Gain Group Conversion	Use 2-group gain where it is set to ON and use current gain where it is set to OFF. It converts gain of 2 groups.	All	3000 [14]
</P-TL> Forward Torque Limit	When it is set to ON, limit the forward torque by the set value [Ft-4.03].	All	3000 [6]
</N-TL> Reverse Torque Limit	When it is set to ON, limit the reverse torque by the set value [Ft-4.04].	All	3000 [5]
<P-OT> Prohibit Forward Rotation	It prohibits the motor from rotating forward when the load device reaches the limit of the available section.	All	N/A
<N-OT> Prohibit Reverse Rotation	It prohibits the motor from rotating reversely when the load device reaches the limit of the available section.	All	
</P-CON> P Control Conversion	It converts the Seed Controller from PI type controller to P type controller. It is used to suppress the overshoot of the excessive response and complete a faster response.	F, S, P, I	3000 [3]
</C-SEL> Control Mode Conversion	It is used to convert Control Mode when using it as Combination Control Mode.	Combinational Control Mode Only	3000 [7]
</C-DIR> </C-SP1> </C-SP2> </C-SP3> </C-SP4> Contact Speed Command	At the Contact Speed Control Mode, these input combinations decide the rotation direction of the motor </C-DIR> and the rotation speed </ C-SP1 ~ /C-SP4>. The rotation speed for </ C-SP1~/C-SP3> input is set in [Ft-2.05~Ft-2.11]. The analogue speed command voltage decides the rotation speed for </C-SP4>. </C-DIR> is used to change the motor rotation direction in Speed Control Mode.	P	3000 [8, 9, 10, 11, 12]
</Z-CLP> Zero Clamp	Ignores the input value in the Speed Control when the command value is lower than the value set in the Speed Zero Clamp Level [Ft-5.05].	S	3001 [2]
</INHIB> Inhibit Pulse Command	Inhibits the position command pulse where it is ON.	F	3000 [13]
</ABS-DT> Absolute Encoder Data Transmission	When it is set to ON, transmits the absolute encoder data to a higher level through AM, BM signals.	F, I	3001 [0]
</PCLR> Position Error Clear	Clears position command, position feedback, and position error.	F, I	3000 [15]
</START> Start	Set to start or stop the motor rotation by using the contact signal in Speed/Contact Speed Control Mode.	S, P	3001 [1]

Table 2.3 I/O Sequence Input Signal

Type	Description	Mode	Modbus Address [Position]
</GEAR> Electronic Gear Rate Shift	In the Position Control Mode, use the 2nd electronic gear parameter [<:fc 2>Ft<:/fc>-3.05]and [Ft-3.06] where it is ON, use the basic electronic gear parameter [Ft-3.01]and [Ft-3.02] where it is OFF. It shifts between two electronic gear ratios.	F	3001 [3]
</R_ABS> Absolute Encoder Multi-rotation Data Reset	Reset the multi-rotation data of the absolute motor.	All	3001 [4]
</BANK_SEL> Gain Bank Select	Uses the 3rd and the 4th Gain Bank when it is set to ON.	All	3002 [1]
</A-CL> Analog Torque Limit	Current Limit Function is activated by the analogue torque command input values when it is set to ON.	S, P	3002 [2]
</H_SENS> Home Sensor	When activated, the sensor indicates the Return to Home sequence that is detected.	I	N/A
</SHOME> Start Homing	When activated, the system starts returning to home.	I	3001 [6]
</PAUSE> Index Pause	When activated, it decelerates until stop and pause the index sequence. It decides whether to stop or to continue the motion by constantly monitoring the input status.	I	3001 [8]
</STOP> Index Stop	When activated, index movement ends.	I	3001 [7]
</I_SEL0> Index Selection 0 Input </I_SEL1> Index Selection 1 Input </I_SEL2> Index Selection 2 Input </I_SEL3> Index Selection 3 Input </I_SEL4> Index Selection 4 Input </I_SEL5> Index Selection 5 Input	Used for the combinations to allocate indexes.	I	3001 [9, 10, 11, 12, 13, 14]
</H_STOP> Homing Stop	Stops Homing operation when it is set to ON.	I	3001 [15]
</START_I> Start Indexing	Starts Indexing when it is set to ON.	I	3002 [0]
</ABS-MD> Absolute Position Data Transfer Mode	Absolute Data transfered to host contoller by photo coupler output which output Fault Code when it is set to ON.	F	3002 [3]

Digital Output signals

Table 2.4 I/O Sequence Output Signal

Type	Description	Mode	Modbus Address [Position]
</S_ALM> Alarm	Outputs when Servo Alarm sets off.	All	200 [0]
</P-COM (+, -)> Position Completion Detection	Turns to ON, when the position error is within the set value of the position completion range [Ft-5.00].	F, I	200 [1]
</NEAR (+, -)> Position Proximity Detection	Turns to ON, when the position error is within the set value of the position completion range [Ft-5.02].	F, I	200 [9]

Table 2.4 I/O Sequence Output Signal

Type	Description	Mode	Modbus Address [Position]
</V-COM (+, -)> Speed Match Detection	Turns to ON when the deviation between the speed command and the motor rotation speed is within the set value of the speed match decision range [Ft-5.03].	F, S, P, I	200 [4]
</TG-ON (+, -)> Rotation Detection	Turns to ON when the motor is rotating above the set value of the rotation detection level [Ft-5.04].	All	200 [2]
</T-LMT (+, -)> Torque Limit Detection	Turns to ON when torque reaches the set value of the torque limit.	All	200 [7]
</V-LMT (+, -)> Speed Limit Detection	Turns to ON when speed reaches the set value of the speed limit.	All	200 [8]
<BK (+, -)> Brake Control	It is the signal for the brake control installed inside or outside of the servo motor.	All	200 [3]
</A_VLD> Absolute Position Valid	Turns to ON when the absolute position data is valid while using the absolute motor.	All	200 [5]
</RDY> Drive Ready	Means getting the operation ready while in the Servo-OFF status.	All	200 [6]
</WARN (+, -)> Warning	Turns to ON when a Servo warning is detected.	All	200 [10]
</HOMC (+, -)> Axis Homing	When activated, it shows the completion of the Homing operation.	I	200 [15]
</IMO (+, -)> In Motion	Turns to ON when in motion.	I	200 [13]
</I_DW> In Dwell	When activated, it indicates that the motor is on the hold position in the index movement and on stand-by for the dwell time assigned.	I	200 [14]
</O_ISEL0> Index Selection 0 Output </O_ISEL1> Index Selection 1 Output </O_ISEL2> Index Selection 2 Output </O_ISEL3> Index Selection 3 Output </O_ISEL4> Index Selection 4 Output </O_ISEL5> Index Selection 5 Output	Used to output the index number in use in the selected indexing operation.	I	201 [0, 1, 2, 3, 4, 5]
</E_SEQU> Sequence Operation Completion	Turns to ON when the index movement is complete.	I	201 [6]

Fault Code Output

Table 2.5 Alarm Code Output Signal

Signal Name	Symbol	Function	Mode	Modbus Address [Position]
Alarm code	FAULT1/OUTPUT4 (Alarm1/Digital output 4) FAULT2/OUTPUT5 FAULT3/OUTPUT6	Upon servo alarm generation, it outputs the types of the servo alarm with the 3-bit. Maximum rating of open collector: DC 30 [V], 20 [mA]	All	23 [0x0000] AL1, AL2, AL3 from right

I/O Settings

Input Signal Allocation Method

Refer to the table below to allocate to I/O pin by searching the function that is suitable for your condition. As shown in the table below, the related function is already allocated to the sequence input parameter and its position in the setting window and it means that you use the related function as setting certain value among‘1 to 9’, A except ‘0’ to the setting position.

For example, if you want to put certain function to I/O No. 5 pin, you can find the related parameter of that signal and the position in the setting window according to the table below and enter ‘3’ as the setting value.

Enter ‘0’ when the function of input signal is not used. If you want to make input signal ‘ON’ all the time regardless of the wiring, set as ‘b’.

Table 2.6 I/O Input Signal Allocation

Setting Value	**b**	**A**	**9**	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**0**
Input Channel No.	Always valid	INPUT# 10	INPUT# 9	INPUT# 8	INPUT# 7	INPUT# 6	INPUT# 5	INPUT# 4	INPUT# 3	INPUT# 2	INPUT# 1	Always invalid
I/O Pin No.		28	27	26	9	8	7	6	5	4	3	

The following table is to arrange the parameter for each function and 7-segment number position in the setting window. Set so that the related parameter of each signal and the number position in the setting window is not in the wrong.

Table 2.7 7-Segment Number Position of Input Signal Parameter

Parameter	7-Segment Position			
	3	2	1	0
	</P-CON> Initial value: 4	<N-OT> Initial value: b	<P-OT> Initial value: b	</SV-ON> Initial value: 1
	</C-SEL>	</P-TL> Initial value: 7	</N-TL> Initial value: 6	</A-RST> Initial value: 5
	</C-SP3>	</C-SP2>	</C-SP1>	</C-DIR>
	</PCLR>	</G-SEL>	</INHIBIT>	</Z-CLP>
	</GEAR>	</C-SP4>	</START>	</ABS-DT>
	</ABS-MD>	</A-CL>	</BANK_SEL>	</R_ABS>

Table 2.7 7-Segment Number Position of Input Signal Parameter

Ft-0.16	</PAUSE>	</STOP>	</SHOME>	</H_SENS>
Ft-0.17	</I_SEL3>	</I_SEL2>	</I_SEL1>	</I_SEL0>
Ft-0.18	</START_I>	</H_STOP>	</I_SEL5>	</I_SEL4>

TIP If you want to make input signal 'ON' all the time regardless of the wiring, set as 'b'. You can make /SV-ON, P-OT, N-OT signals 'ON' all the time regardless of the wiring, set as 'b'.

The table below is the example to allocate sequence input signal.

Example			
Ft-0.10 7	Enter '7' in the 3rd position in setting window of the parameter [Ft-0.01]. This value is set to use </P-CON> function. It means that the I/O INPUT#7 pin is used as an input pin.		
Applicable Mode	All	Other Details	Drive Disable>Configure>Completed

Output Signal Allocation Method

Refer to the table below to allocate to I/O pin after searching the function that is suitable for your condition.

Set the setting value as '0' when the output of the related signal is not used.

Sequence output is displayed when situation that is meets the condition of each ouput in drive was produced.

Table 2.8 I/O Output Signal Allocation

Setting Value	6	5	4	3	2	1	0
Input Channel No.	OUTPUT #6	OUTPUT #5	OUTPUT #4	OUTPUT #3	OUTPUT #2	OUTPUT #1	Always invalid
I/O Pin No.	39.40	38.40	37.40	47, 48	43, 44	41, 42	

The following table is to arrange the parameter for each function and 7-segment number position in the setting window. Set so that the related parameter of each signal and the number position in the setting window is not in the wrong.

Table 2.9 7-Segment Number Position of Output Signal Parameter

Parameter	7-Segment Position			
	3	2	1	0
	</V-COM>	</BK> Initial value: 3	</TG-ON> Initial value: 2	</P-COM> Initial value:: 1
	</WARN>	</NEAR>	</V-LMT>	</T-LMT>
	Reserved	Reserved	</RDY>	</A_VLD>
	</O_ISEL0>	</HOMC>	</I_DW>	</IMO>
	</O_ISEL4>	</O_ISEL3>	</O_ISEL2>	</O_ISEL1>
	Reserved	Reserved	</E_SEQU>	</O_ISEL5>

The table below is the example to allocate sequence output signal.

Example	
	Set ‘3’ in the 3st position in setting window of the parameter [Ft-0.23]. It is set to use </WARN> function and it means that we will use I/O No. Output#47,48 pin as output pin.

Applicable Mode	All	Other Details	Drive Disable>Configure>Completed

Operator

Introduction

This chapter introduces the operator mounted on the servo drive.

Operator Instructions of the Parameter Setting

Operator

Name and Function of Each Part

The servo drive has a built-in operator for various status displays, parameter setting, operation command, and monitoring.

- Displays various contents with six 7-segment LED display.
- Provides all key manipulation function without a separate external operator.

The following figure shows the front side of the operator on the servo drive.

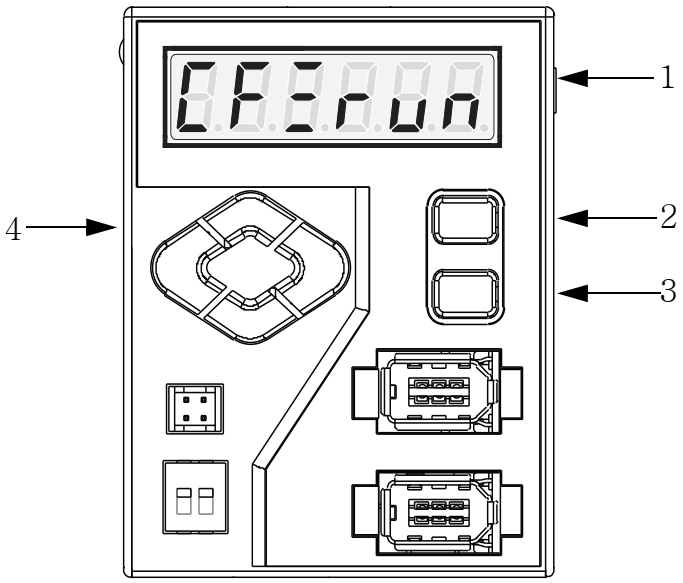
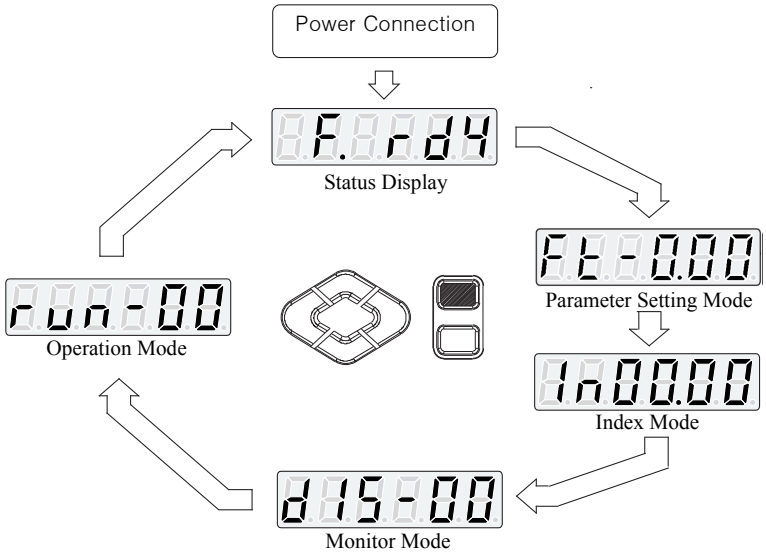


Table 3.1 Name and Function of Each Part

No.	Name	Function
1	7-Segment LED Display	Displays the status with 6-digit 7-segment LED display, sets parameter, commands operation and displays monitoring.
2	MODE/SET Key	Enters display mode shift and parameter setting value.
3	ENTER Key	Enters into each window after changes the display mode. Completes setting and exits from it.
4	Top, Bottom, Left/Right Key	Moves the digit of 7-segment LED display and functions as the UP/DOWN of the number.

Structure of the Entire Mode

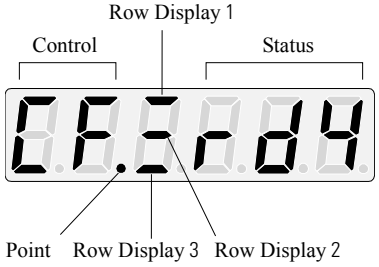
As shown in the figure below, the servo drive is divided into 5 types of control modes:



The mode displayed after the power ON is the status display mode. Mode is changed whenever the MODE/SET key is pressed.

Status Display Mode

The figure below is an example of display for the description of the status mode.



Parameter Setting Mode

The Parameter sets and saves various functions to make drive suitable for equipment. There is a parameter that can be always set regardless of the status of the drive, and those that must be in certain status of the drive when setting them.

Monitor Mode

Displays several numerical data generated as the motor is controlled by the drive. The contents of the monitor mode can be checked regardless of the status of the drive.

Operation Mode

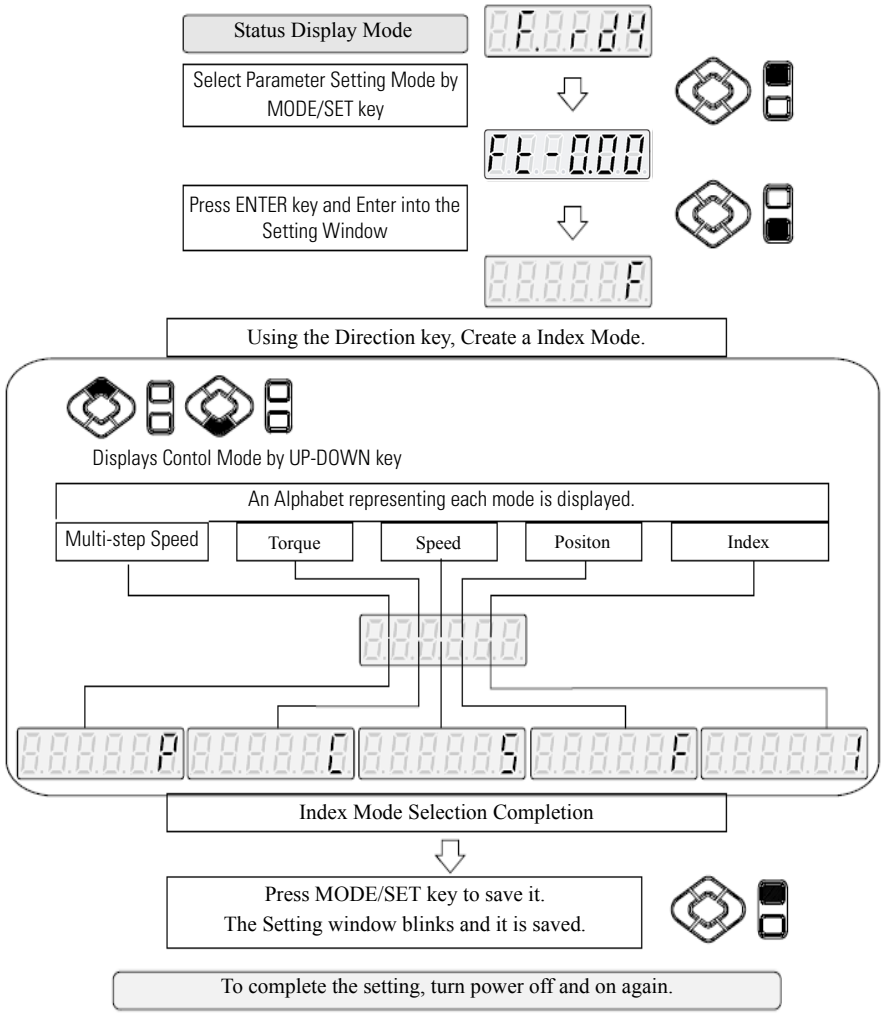
The motor can be run in operation mode. Each item provides a special function, which can be used. Just as in the parameter setting mode, there is a status where the operation is possible/impossible according to the status of the servo drive, during the use of the operation mode.

Index Mode Setting

Describes index mode setting method focusing on the key button manipulation.

Apply the power and set it as shown in the flowchart below.

Flowchart of the Index Mode Setting

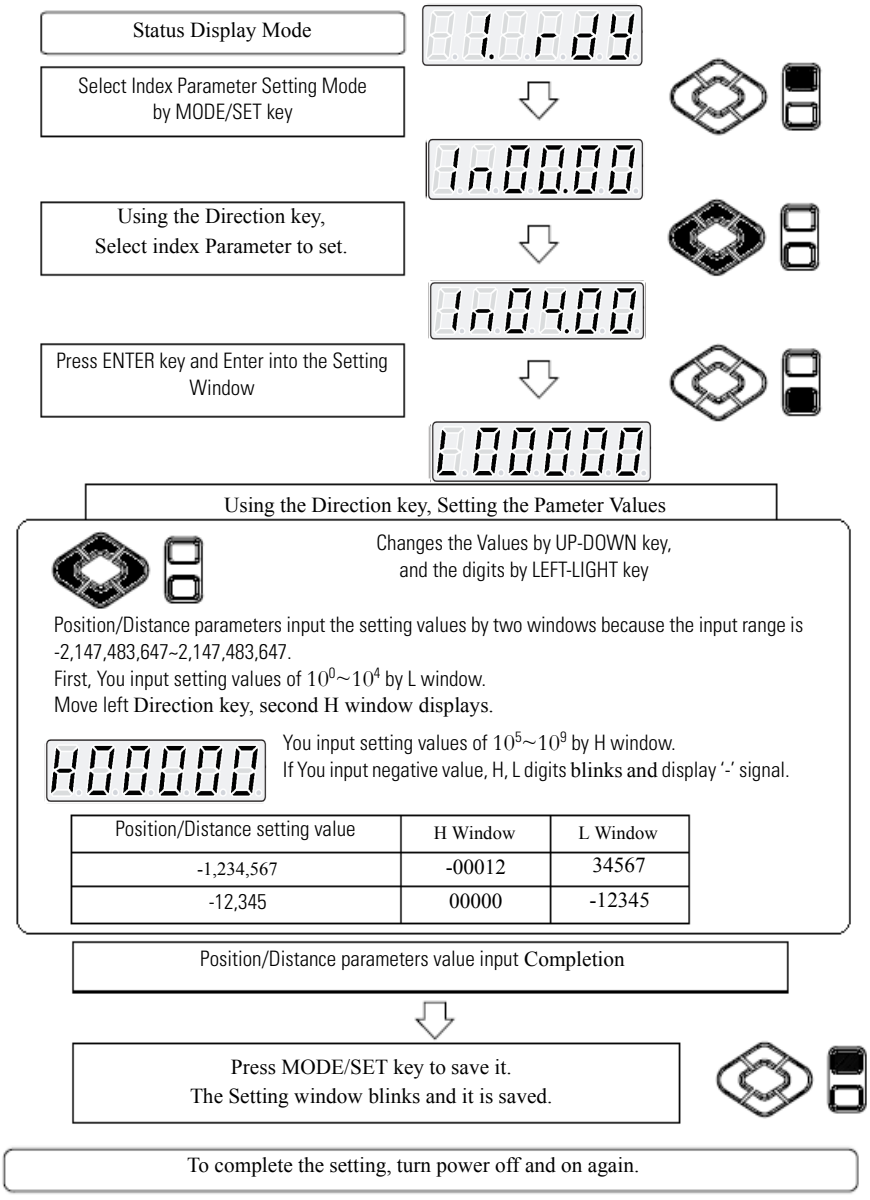


Index Parameter Setting

Describes index parameter setting method focusing on the key button manipulation.

The flowchart below is the example to set Position/Distance parameters value.

Flowchart of the Index Parameter Setting



Position/Distance setting value	H Window	L Window
-1,234,567	-00012	34567
-12,345	00000	-12345

Setting input value is same for IN04.00~63.

The other groups(Dwell, Velocity, Accelerate, Decelerate, Next Index etc.) can set input value as the same way.

Indexing

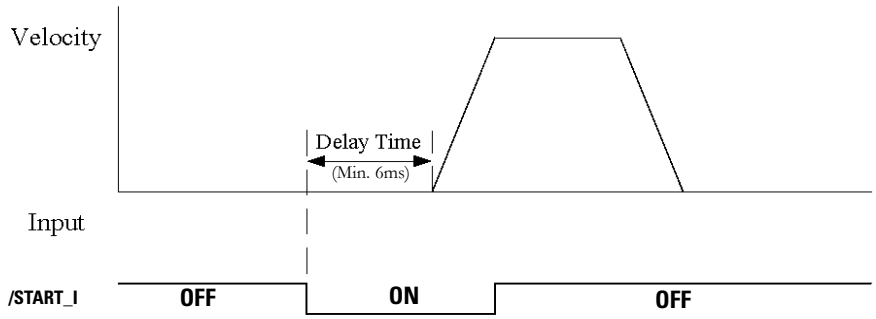
Introduction

This chapter describes index operation of the CSD5 servo drive.

Description of I/O Signal

Digital Input

The sampling time for digital inputs is two milliseconds in CSD5 servo drive. When the drive read inputs a signal, the drive checks the signal for three times per two milliseconds. If signal states are same for three times, the drive applies the signal state to the control system. It means that the CSD5 servo drive has a delay time for six milliseconds at least from detected a signal input to apply the signal state to the control system.



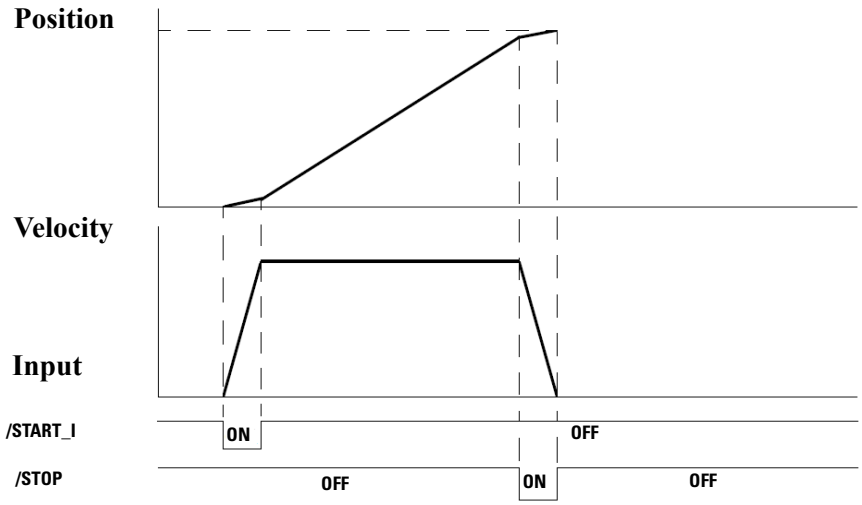
</START_I>

</START_I> signal uses the start command for indexing.

When the CSD5 servo drive is under homing or indexing, this signal input is ignored.

</STOP>

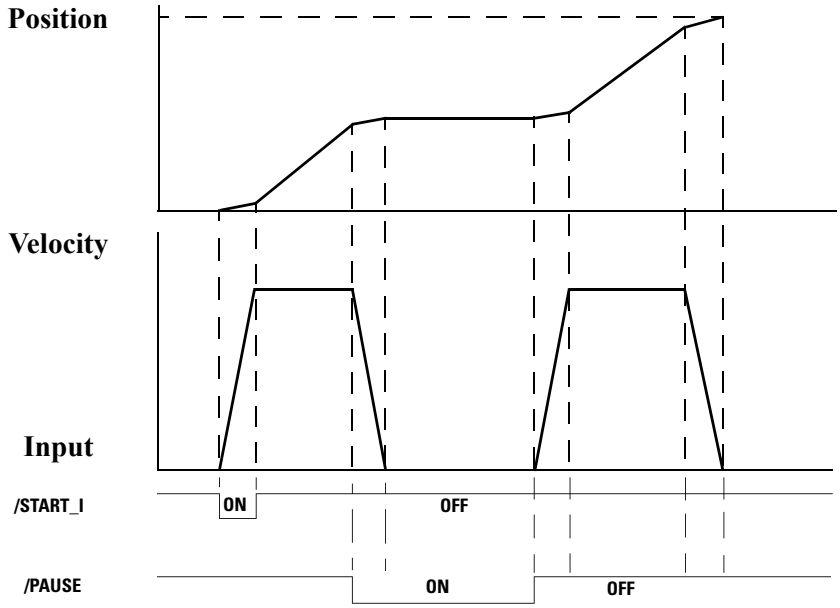
</STOP> signal is a input signal to cancel indexing. When this signal turns on during indexing, the motor starts to decelerate and stop.
</STOP> function is enabled at the active going edge of the </STOP> input.



</PAUSE>

</PAUSE> signal is a pause signal. When the </PAUSE> turns on during indexing, the motor starts to decelerate and stops. The state of the </PAUSE> input is continuously monitored to determine if the motion should be stopped or if it may continue.

The acceleration/deceleration slope uses the abort index deceleration value during the Pause operation.



</SHOME>

</SHOME> is an input signal to start Homing. The homing is begun when the falling edge of the </SHOME> signal is occurred. Any starting signal in the middle of homing process is ignored.

</H_STOP>

</H_STOP> is an input signal to cancel Homing. When this signal turns on during homing, the motor starts to decelerated and stops. </H_STOP> function is enabled at the falling edge of </H_STOP> input.

</I_SEL0~5>

</I_SEL0~5> are selection signals to define an index among 64 indexes in the index table. In the selective position travel mode, the CSD5 servo drive determines the index by using the combination of these signals at the falling edge of the START signal. </I_SEL0~5> signals are valid only when the signals maintain their status for at least 4ms before the falling edge of START signal and at least for 8 msec after the falling edge of START signal. If </I_SEL0~5> signals are detected during motion, they are ignored.

Digital Output

</IMO>

</IMO> is In Motion signal. An active state indicates an index move is active and the motor is moving.

</P-COM>

</P-COM> is Position Complete signal.
When the position error has been less than the in position size, the within position window signal turns on.

</HOMC>

</HOMC> is Axis Homed signal. When the homing procedure involved the home offset moving is complete, the axis homed signal turns on. When the fault related encoder is generated or the motor moves beyond the index position range or the motor forward direction is changed in power on state, this signal becomes inactive.

</E_SEQU>

</E_SEQU> is End of Sequence signal.
An active state indicates all iterations of the index move have been completed.

</I-DW>

</I-DW> is In Dwell signal.
An active state indicates the motor is holding position in an index move and waiting for the commanded dwell time. Any starting signal in the middle of </I-DW> is ignored.

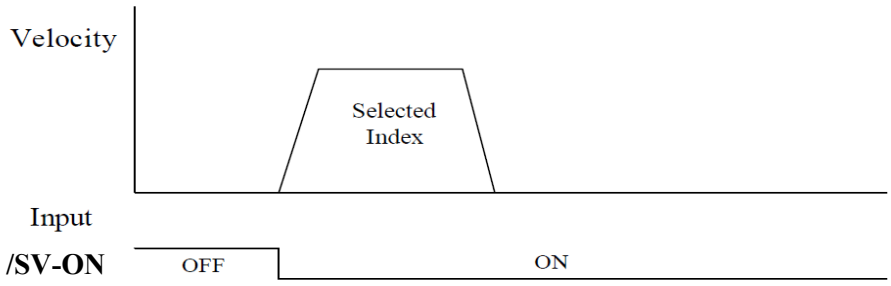
</O_ISEL0~5>

The drive outputs the executing index number in motion. If the motor stops, the drive outputs previously the completed index number. From 0 to 5, 6 signals repeats ON and OFF, and shows one index combination out of 64 indexes.

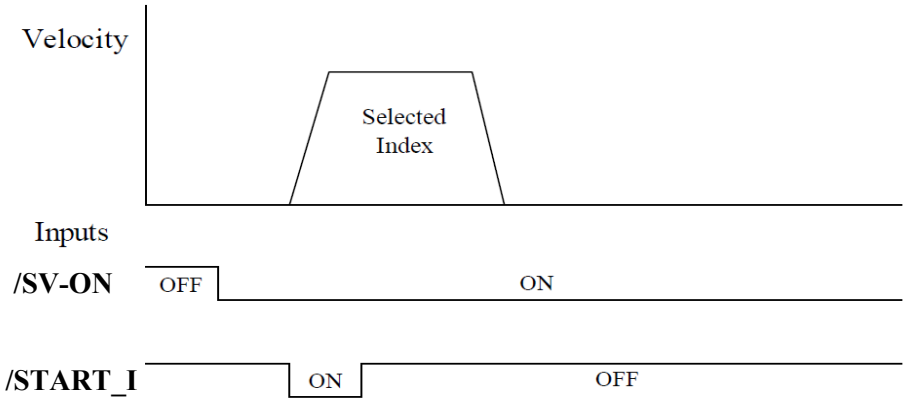
Auto Starting Index

If the auto starting indexing turns on, an indexing move starts at when the drive is enabled. Using this function, the drive can start an indexing without an input signal as motor moving enable.

Auto Starting Indexing : ON



Auto Starting Indexing : OFF

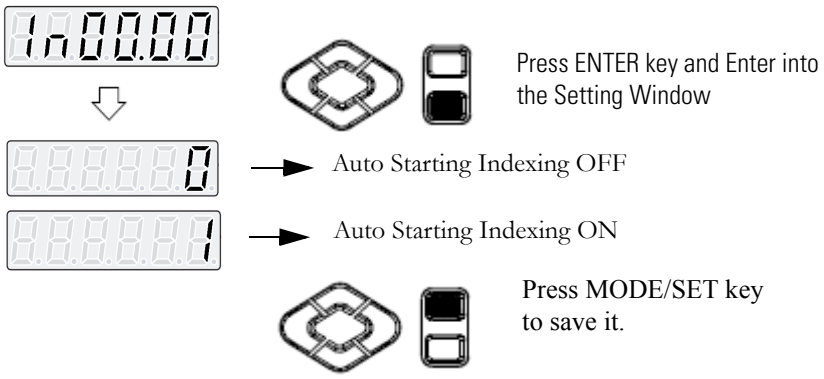


If the Auto Starting Indexing and Auto Starting Homing are set simultaneously, the drive operates like the following table.

Auto Starting Homing	**Auto Starting Indexing**	**Motion Sequence** (Drive Enable inputs When an Axis is not homed)	**Motion Sequence** (Drive Enable inputs When an Axis is homed)
Active	ON	Homing → Indexing	Homing → Indexing
Active after drive reset only	ON	Homing → Indexing	Indexing

The Auto Starting Indexing can set IN00.00. As the value of setting window, 0 is OFF and 1 is ON. The Auto Starting Indexing setting value You can change always the Auto Starting Indexing setting value. But the setting is applied after Power Off & On.

For Example)



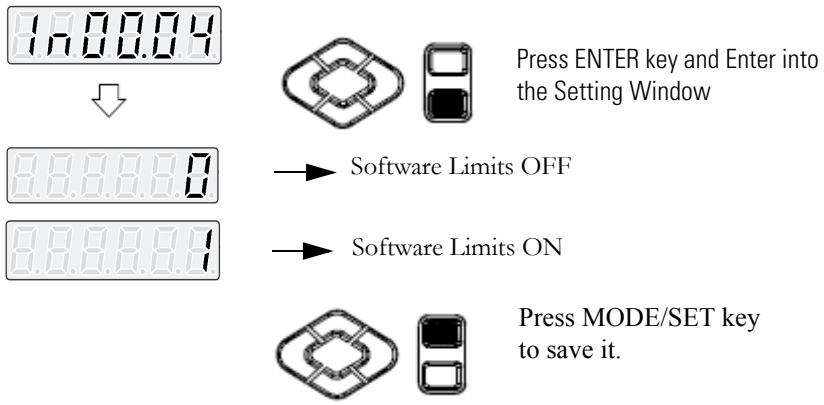
S/W Limit

Software Overtravel

If the motor position feedback is over the software overtravel range, the drive operates the software overtravel limit. The software overtravel does not operate unless the drive was previously homed.

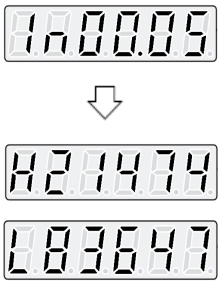
Enable Software Limits : If Enable Software Limits is set to on, the drive turns on soft overtravel checking. Enable Software Limits can set IN00.00. As the value of setting window, 0 is OFF and 1 is ON. You can change this setting value only Servo-Off status.

For Example)



Positive Software Limit : If the motor feedback position is greater than this value, the drive has exceeded the software overtravel limit. This value can set IN00.05 and change only Servo-Off. status. The input range is -2,147,483,647~2,147,483,647 and the default value is 2,147,483,647.

For Example)



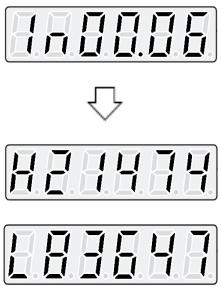
Press ENTER key and Enter into the Setting Window

The default value is 2,147,483,647. Using the Direction key, Input the Setting Values.

Press MODE/SET key to save it.

Negative Software Limit : If the motor feedback position is less than this value, the drive has exceeded the software overtravel limit. This value can set IN00.06 and change only Servo-Off. status. The input range is -2,147,483,647~2,147,483,647 and the default value is -2,147,483,647.

For Example)



Press ENTER key and Enter into the Setting Window

The default value is -2,147,483,647. H digits blinks and display '-' signal. Using the Direction key, Input the Setting Values.

Press MODE/SET key to save it.

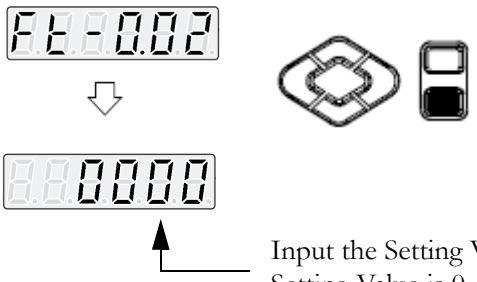
Overtravel Stopping Method

The Overtravel Stopping Method can be set in the Digit 1 of Ft-0.02. If the value of the Digit 1 of Ft-0.02 is '0', the Overtravel Stopping Method is 'Current Stop'. In case of indexing mode, the Overtravel Stopping Method is 'Decelerating and Stop' with same parameter value.

Digit 1 of Ft-0.02	Actions for Physical & Soft Limits in Indexing
0	Current Stop(Decelerating and Stop)
1	Dynamic Brake

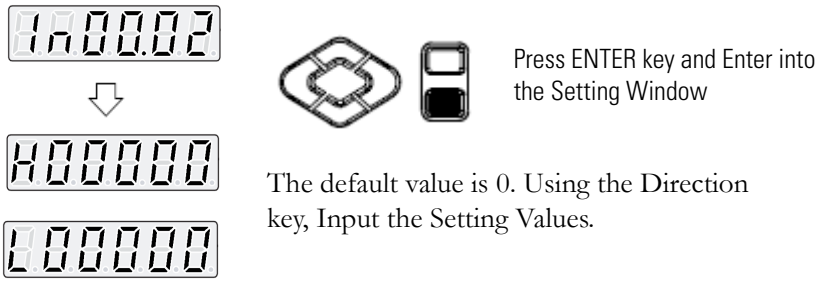
Deceleration Slope = *Current Velocity* ^{2} */(2* × Overtravel Deceleration Distance*)*

For Example)



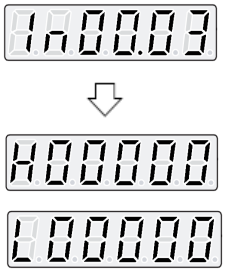
Positive Decel Distanec : The stopping distance is used when the drive encounters a positive overtravel limit. Overtravel limit is the setting value to stop the motor when overtravel occured. This value can set IN00.02. The input range is 0~2,147,483,647 and the default value is 0.

For Example)



Negative Decel Distance : The stopping distance is used when the drive encounters a negative overtravel limit. This is also the setting value to stop the motor when overtravel occured. The input range is 0~2,147,483,647 and the default value is 0.

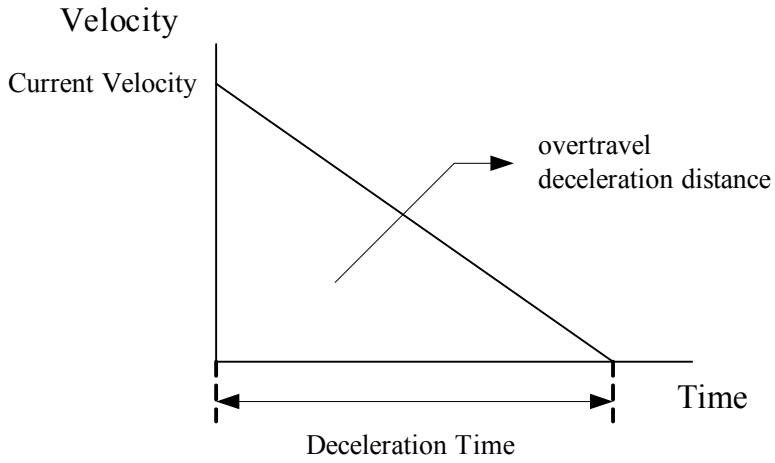
For Example)



Press ENTER key and Enter into the Setting Window

The default value is 0. Using the Direction key, Input the Setting Values.

Press MODE/SET key to save it.



Current Velocity :counts/sec

Deceleration Time : sec

Overtravel Deceleration Distance : counts

Deceleration Slope : counts/sec^2

Overtravel Deceleration Distance = 1/2 × Current Velocity × Deceleration Time

Deceleration Time = 2 × Overtravel Deceleration Distance / Current Velocity

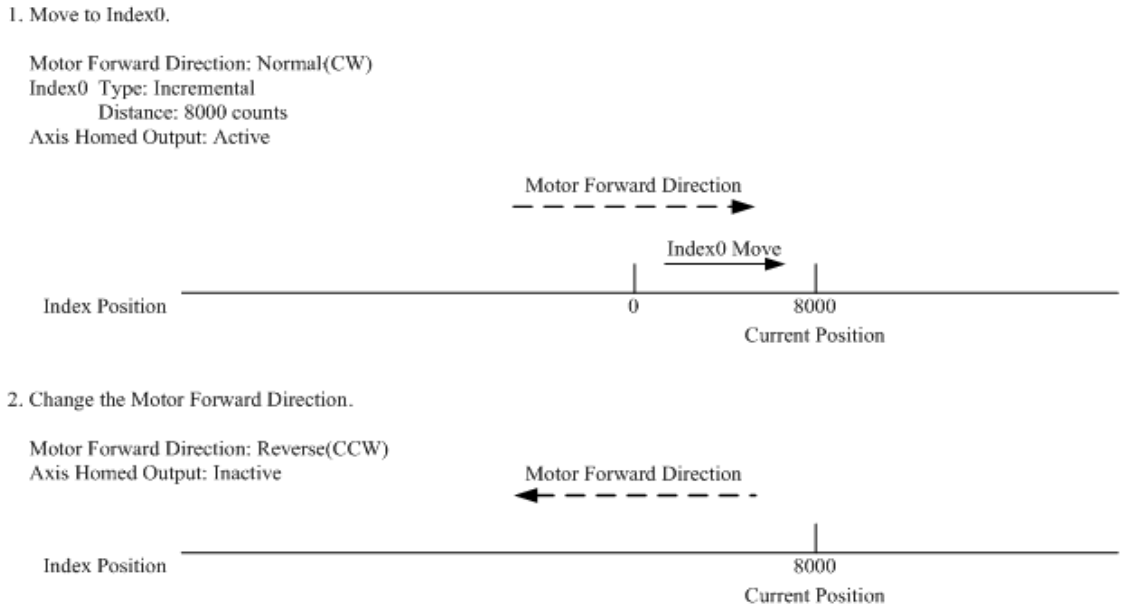
Deceleration Slope = delta velocity / delta time = Current Velocity / Deceleration Time

= Current Velocity ^{2} */ (2 × Overtravel Deceleration Distance)*

Motor Forward Direction

A change for the Motor Forward Direction is possible in the drive disable. When changing the Motor Forward Direction, the index position feedback value maintains the existing value.

The axis homed signal is became the inactive state if the motor direction is changed. The Motor Forward Direction can set Ft-0.02N2. The Motor Forward Direction is CW when the Setting Value is 0. The Motor Forward Direction is CCW when the Setting Value is 1.



TIP When the homing procedure involved the home offset moving is complete, the axis homed signal turns on. When the fault related encoder is generated or the motor moves beyond the index position range or the motor forward direction is changed in power on state, this signal becomes inactive.

Homing

Homing Methods

The CSD5 servo drive supports the following homing methods.

- Axis must be homed before the drive executes an absolute index.
- If Axis homed with 17bit serial absolute motor, the drive maintains home after power cycling.
- A start homing command is ignored when the homing or index is already in progress.
- The drive loses home if the drive detects faults related to encoder.

For a proper homing operation, the following parameters need to be set.

- Homing Type(IN01.00), the distnace to Home(IN01.02)
- Automatic Homing when activated(IN01.01)
- Homing Velocity(IN01.02)
- Creep Velocity(IN01.03)
- Homing Offset(IN01.05)
- Moving Distance Sensor after Homing(IN01.08)
- Home Current(IN01.09)
- Home Current Time(IN01.10)

When an incremental motor is used, the position feedback is set to 0 when the homing operation is complete. (when Offset is 0).

ATTENTION

The alarm goes off when a user tries indexing while the homing operation is incomplete. (i.e., HOMC (Axis Homing) is not activated). Refer to the Index E-30 page Axis not homed for more information about Fault .

ATTENTION

When an aboluste motor is used, the position feedback is set to 0 even when the Homing is complete and the multi-rotation data of the absolute encoder is not reset. The multi-rotation data of an abolute motor is not automatically reset. It can be reset only by a user.

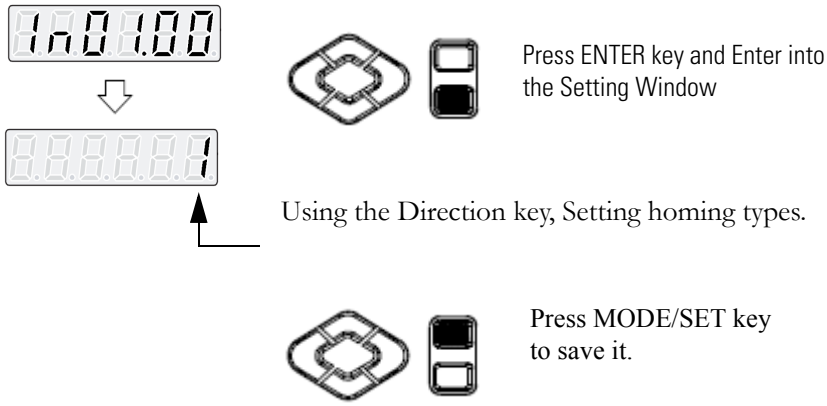
ATTENTION

A homing type that uses a sensor for homing does not complete a homing if the homing starts outside the sensor.

Homing types

The Index supports 11 homing types by using homing sensor, limit (+)/(-) sensor, stopper and marker. Homing types can set IN01.00 and the setting is applied after Power Off & On.

For Example)



TIP Marker is 'Z' phase or 'C' phase. This is the signal to output the same position every motor's revolution.

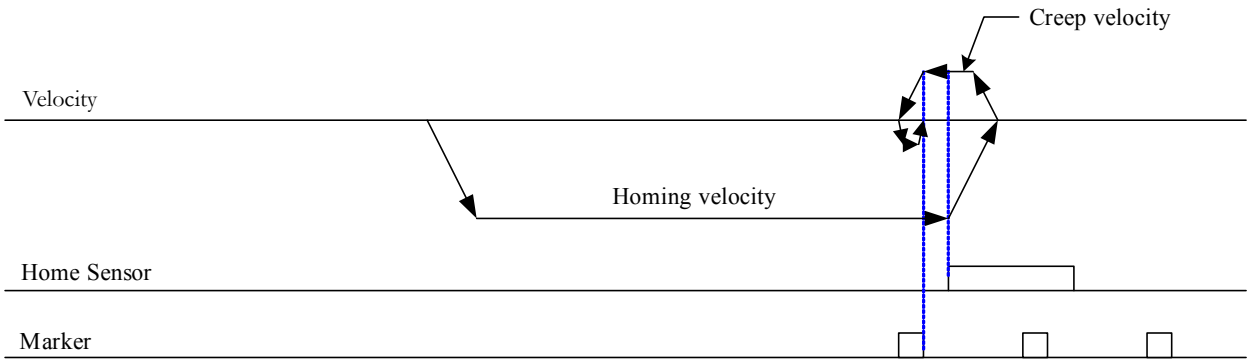
Homing Type 0 : Home to Present Position

Homing type 0 does not allow home searching. If you set the automatic start homing to 0 when you activate IN01.01, CDS5 Servo Drive defines the current position as home when the drive is activated. If you set the automatic start homing to 1 when you activate IN01.01, SHOM's position is set as home.

Homing Type 1 : To Home sensor/Back to Marker

Homing Type 1 defines home by using the home sensor and markers.

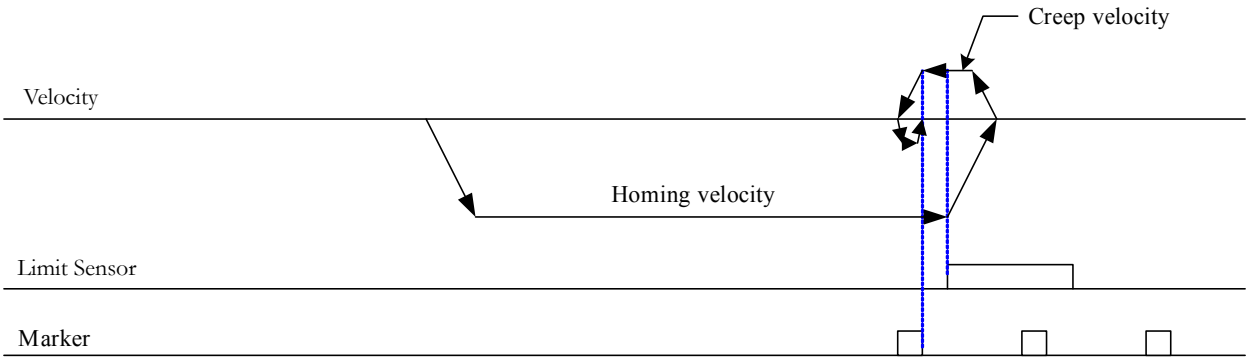
When the home searching begins, the motor moves to homing direction (IN01.01) with homing velocity (IN01.02) until detecting the homing sensor. At this point, the motor decelerates and stops; it starts moving reversly with the creep velocity (IN01.03). When it hits the first marker after losing the signal input from the home sensor, the deceleration stops, and it returns to the position where it detected the active-going edge of the first marker.



Homing Type 2 : To Limit/Back to Marker

Homing Type 2 uses the limit sensor (+) or (-) and markers.

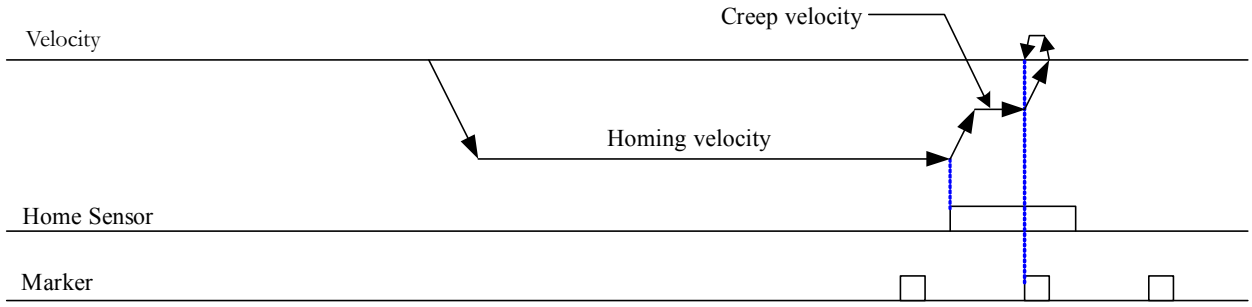
Only the limit sensor installed in the homing direction is used, and the hardware limit fault is deactivated. Operating principles are same as Homing Type 1. The only difference is that it uses the limit sensor instead of the home sensor.



Homing Type 3 : To Home sensor/Fwd to Marker

Similar to the Homing Type 1, the Homing Type 3 also uses the homing sensor and markers to define Home. However, the mechanism is different.

When the home sensor is detected, the speed decelerates to the creep velocity and maintains until the active-going edge is detected. After it decelerates again and stops, it moves reversly to the position where the active-going edge was detected.



Homing Type 4 : To Limit/Fwd to Marker

Similar to Homing Type 2, Homing Type 4 uses the limit sensor (+) or (-) and markers. Only the limit sensor in the home direction is used, and hardware Limit Fault is deactivated. Operating principles are same as Homing Type 3. The only difference is that it uses the limit sensor instead of the home sensor.

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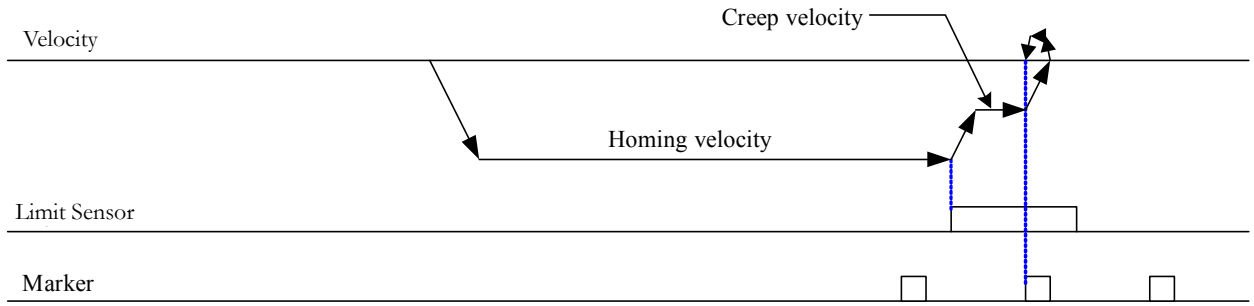
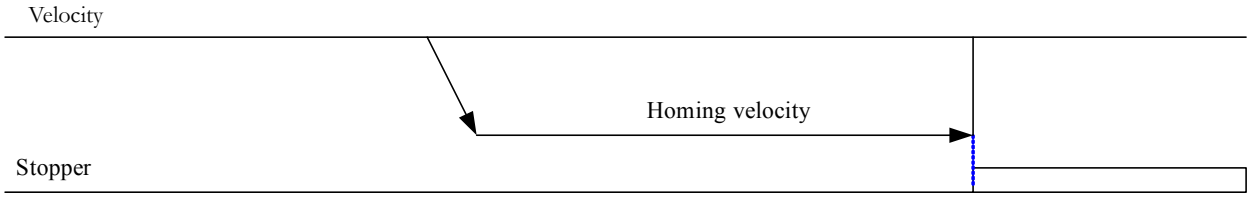


Homing Type 5 : Home to Current Value

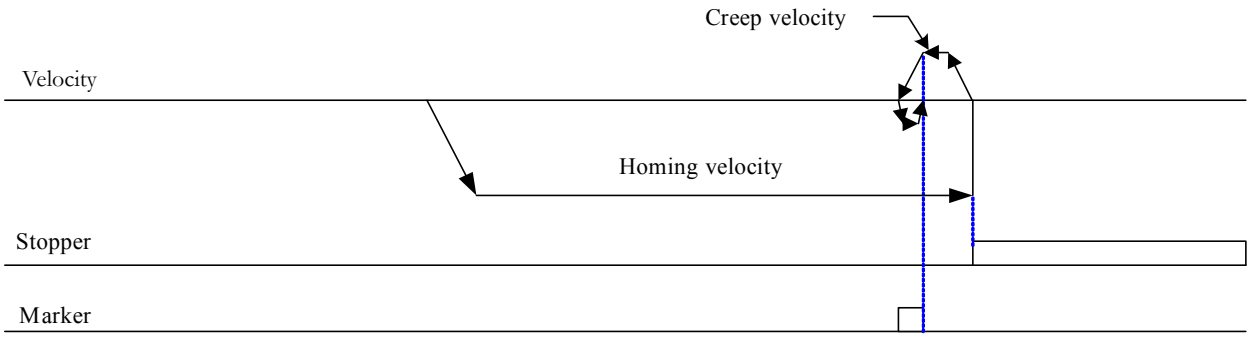
The Homing Type 5 performs a mechanical stop by using the stopper.

Once the home searching begins, it moves in the homing direction with the homing velocity (IN01.02). When the current is maintained higher than the current of the home current time, it stops; Home is defined where it stops. The home current is defined in the parameter IN01.09.



Homing Type 6 : Home to Current Value/Back to Marker

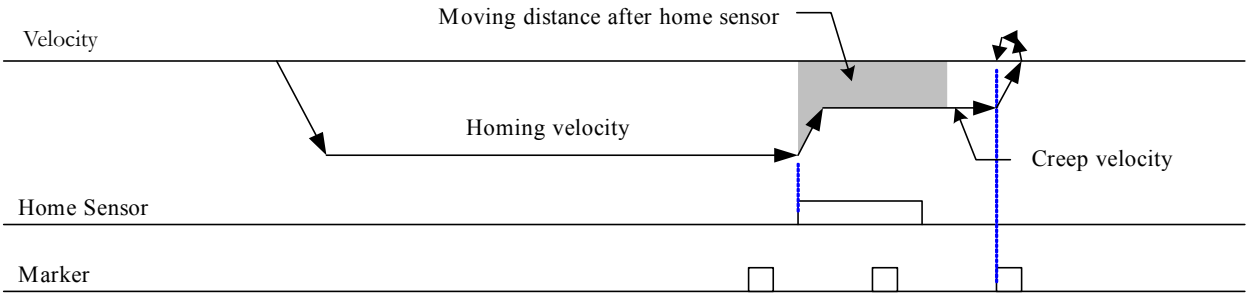
The operation is similar to that of the Homing Type 5, but in this mode, it moves reversly until it detects the falling edge of a marker when the current maintains higher than the current of the home current time. After detecting the active-going edge of a marker, it stops after decelerating. Then, it returns to the position where it detected the active-going edge of the first marker.



Homing Type 7 : To Home sensor/Move/Fwd to Marker

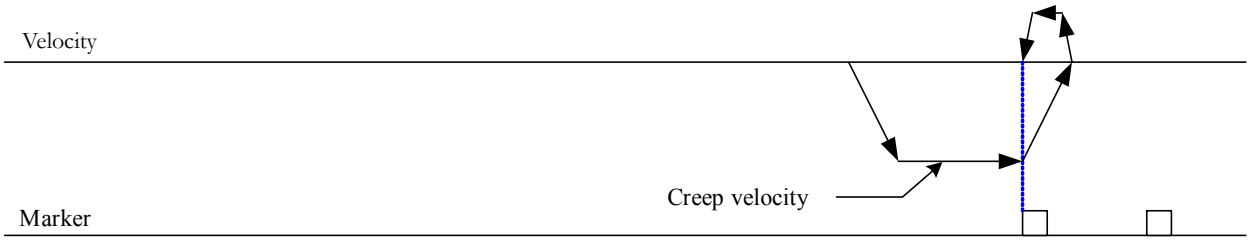
Similar to the Homing Type 3, the Homing Type 7 uses the home sensor and moving distance, after home sensoring and marking.

When the distance between the home sensor and a marker is minuscule, it might not detect the first marker. To prevent this from happening, there is one more parameter in this mode to define the minimum moving distance to detect the marker. The minimum moving distance is defined in the parameter IN01.10 as time. After detecting the home input, speed decelerates to the 2nd homing velocity and is maintained until the active-going edge of a marker is detected. The active-going edge of the marker is set as home.



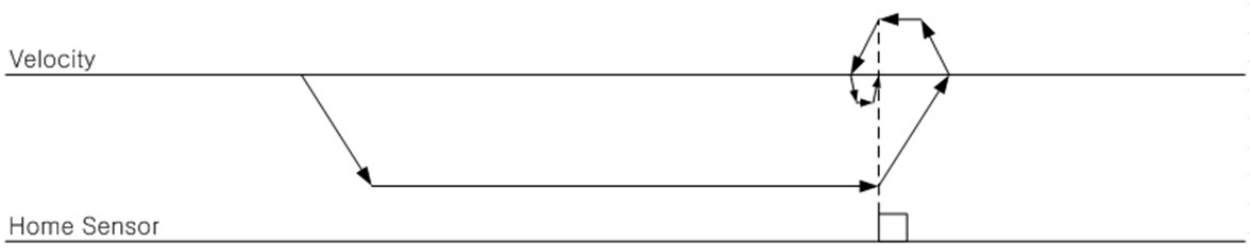
Homing Type 8 : Home to Marker

The Home Type 8 uses only markers. In this mode, additional sensors such as home sensor or limit (+) or (-) are not required. Once the home searching begins, it moves in the homing direction with the creep velocity. When it detects a marker, it decelerates and stops. It moves to the position where the active-going edge of a marker was detected and sets this position as Home.



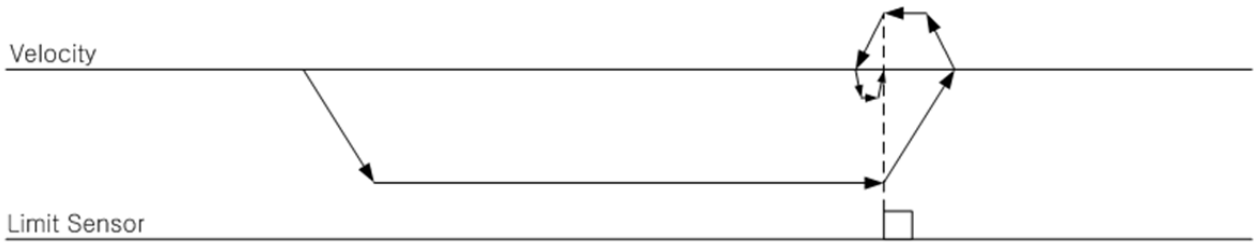
Homing Type 9: To Home sensor

Homing Type 9 defines home by using the home sensor only. When the home searching begins, the motor moves to homing direction (IN01.02) with homing velocity (IN01.02) until detecting the homing sensor. When it detects home sensor, it decelerates and stop, then it moves in the reverse direction with creep velocity (IN01.03). It returns to the position where it detected the home sensor signal.



Homing Type 10: To Limit sensor

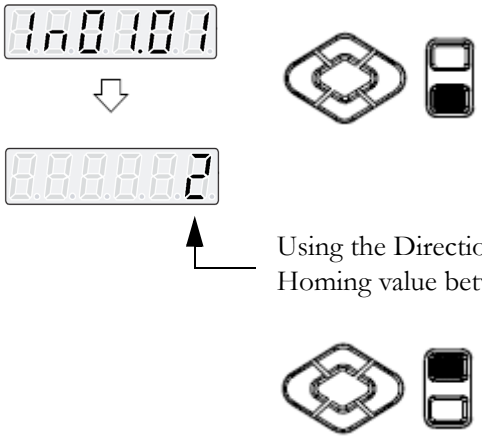
Homing Type 9 defines home by using the limit sensor only. When the home searching begins, the motor moves to homing direction (IN01.02) with homing velocity (IN01.02) until detecting the limit sensor. When it detects home sensor, it decelerates and stop, then it moves in the reverse direction with creep velocity (IN01.03). It returns to the position where it detected the limit sensor signal.



Auto Starting Homing on Enable

The drive starts the homing procedure automatically when the drive is enabled. Auto Starting Homing can set IN01.01 and the setting is applied after Power Off & On.

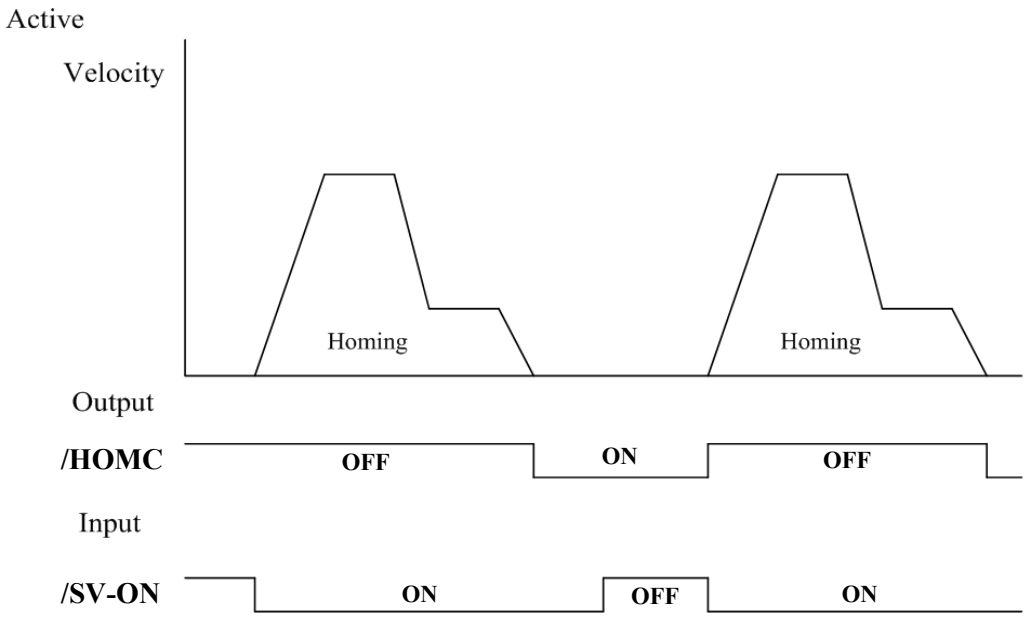
For Example)



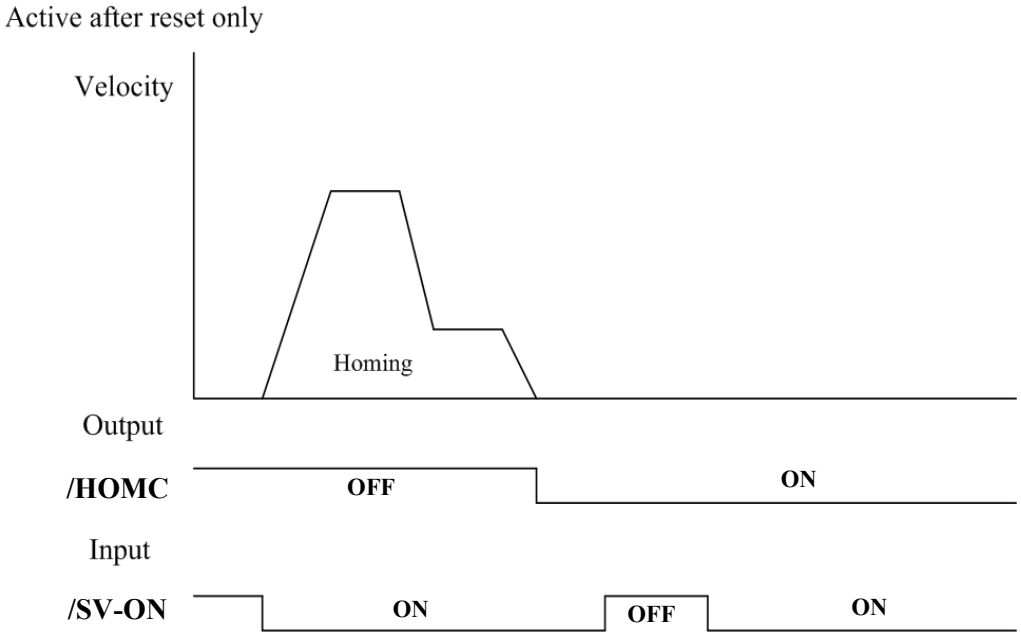
If the Auto Starting Indexing and Auto Starting Homing are set simultaneously, the drive operates like the following table.

Auto Starting Homing	**Auto Starting Indexing**	**Motion Sequence** (Drive Enable inputs When an Axis is not homed)	**Motion Sequence** (Drive Enable inputs When an Axis is homed)
Active	ON	Homing → Indexing	Homing → Indexing
Active after drive reset only	ON	Homing → Indexing	Indexing

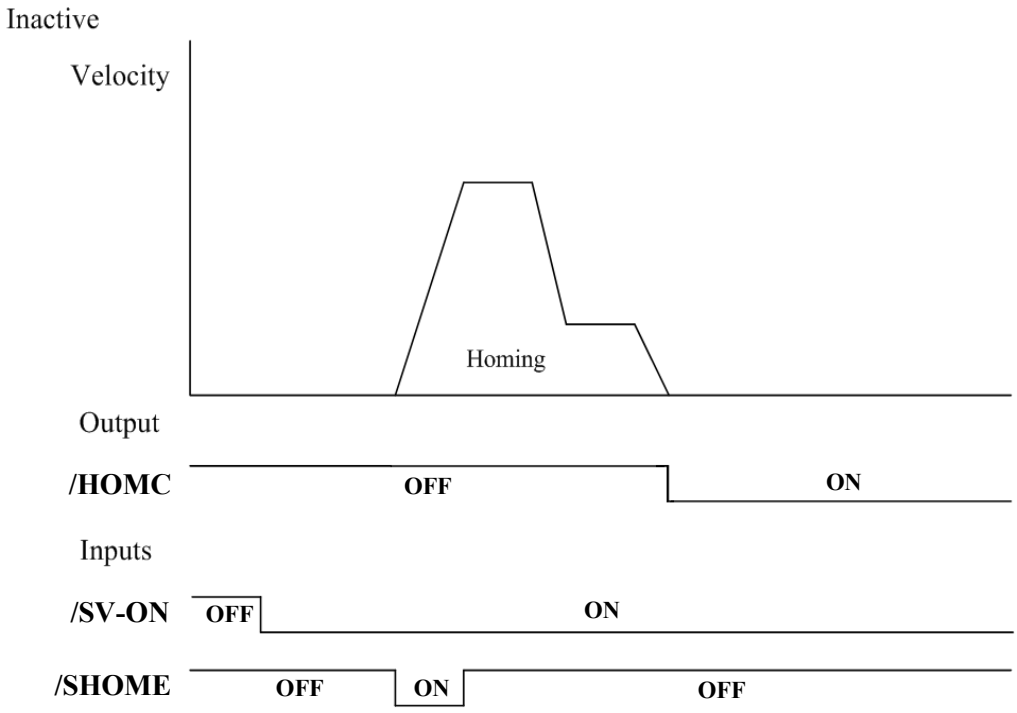
Active[Setting value: 0] : Automatically starts homing every time the drive is enabled.



Active after drive reset only[Setting value: 1] : Automatically starts homing when a drive is enabled, if the drive has not already been homed



Inactive [Setting value: 2] : Starts homing when drives is inputted Stare Homing.

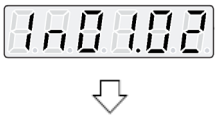


Homing Velocity

Homing velocity is using velocity during an index homing. A +/- sign of this value means a move direction during an index homing.

Homing velocity can set IN01.02. The input range is -6000~6000 and the default value is 100. You can change this setting value only Servo-Off. status.

For Example)



Press ENTER key and Enter into the Setting Window

Using the Direction key, Setting value between -6000~6000.

Press MODE/SET key to save it.

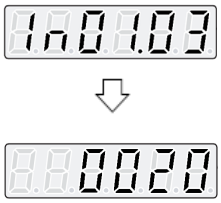
TIP A +/- sign of homing velocity means a move direction during an index homing. A homing is Positive direction when it's '+' sign and negative direction when it's '-' sign.

Creep Velocity

For the To Sensor, then Back to Marker Homing Type, the velocity used for all remaining homing motion after the motor decelerates to a stop when it finds the sensor edge. This velocity uses all of the other homing types.

Creep velocity can set IN01.03 and the input range is -6000~6000. The default value is 100 and its unit is rpm.. You can change this setting value only Servo-Off status.

For Example)



Press ENTER key and Enter into the Setting Window

Using the Direction key, Setting value between 0~6000.

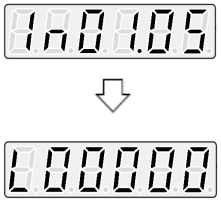
Press MODE/SET key to save it.

Home Offset Move

The home offset move means the moving distance after the homing procedure specified homing methods is complete. A user can use this option to set up an origin which is different from the origin defined in the homing operation.

The position where the motor stops after the moving for the home offset move is complete is the new home. The home offset move is not applicable for the 17-bit Absolute Motor. The Offset Move Distance is set up in the IN01.05. Its range is -2,147,483,647~2,147,483,649 and the default value is 0. Its unit is counts and it can change this setting value only Servo-Off. status.

For Example)



Press ENTER key and Enter into the Setting Window

Using the Direction key, Setting values between -2,147,483,647~2,147,483,647.

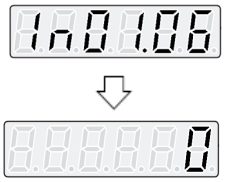
Press MODE/SET key to save it.

Home Sensor Polarity

This function is to choose the active state of home sensor input; Inactive to active transition and Active to inactive transition.

This value is set up in the IN01.06. Home sensor is enable when the input value is set 0 and it is disable when the input value is set 1. It can change this setting value only Servo-Off. status.

For Example)



Press ENTER key and Enter into the Setting Window

Using the Direction key, Setting values 0 or 1.

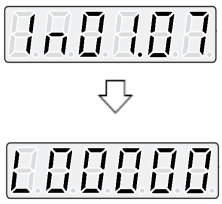
Press MODE/SET key to save it.

Home Position

This value is used as the home position at the completion of a homing procedure. If this value is 1000, the index position is 1000 when the moving for the home offset is complete.

The HomePosition is set up in the IN01.07. Its range is -2,147,483,647~2,147,483,649 and the default value is 0. Its unit iscounts and it can change this setting value only Servo-Off. status.

For Example)



Press ENTER key and Enter into the Setting Window

Using the Direction key, Setting values between -2,147,483,647~2,147,483,647.

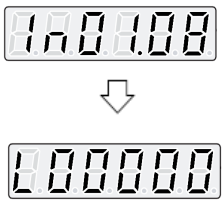
Press MODE/SET key to save it.

Moving Distance After Home Sensor

When Homing Mode 7 is selected, markers which appear between the active going edge of the home sensor and the end position of Moving distance After Home Sensor are all ignored.

Moving distance After Home Sensor is set up in IN01.08. Its range is 0~2,147,483,649 and the default value is 0. It can change this setting value only Servo-Off. status.

For Example)



Press ENTER key and Enter into the Setting Window

Using the Direction key, Setting values between -2,147,483,647~2,147,483,647.

Press MODE/SET key to save it.

Home Current, Home Current time

When Homing Mode 5 or 6 is used for Homing, the system judges it actually hits the Stopper if the torque higher than the Home Current is maintained for the Home Current time.

The Home Current is set up in IN01.09, about 0~250% of its rated torque. The default value is 100. Home Current time is set up in IN01.10. It can be

0~1000 msec. Its default is '0'. It can change this setting value only Servo-Off. status.

For Example)

Press ENTER key and Enter into the Setting Window

Using the Direction key, Setting values between 1~250.

Press MODE/SET key to save it.

For Example)

Press ENTER key and Enter into the Setting Window

Using the Direction key, Setting values between 0~1000.

Press MODE/SET key to save it.

Index Option

The CSD5 servo drive can store 64 indexes and provide 3 types of option modes for the 64 indexes. The three types are Stop, Start next Index, and Wait for Start. Except the Selective position option, 64 indexes are pre-defined in a memory.

ATTENTION

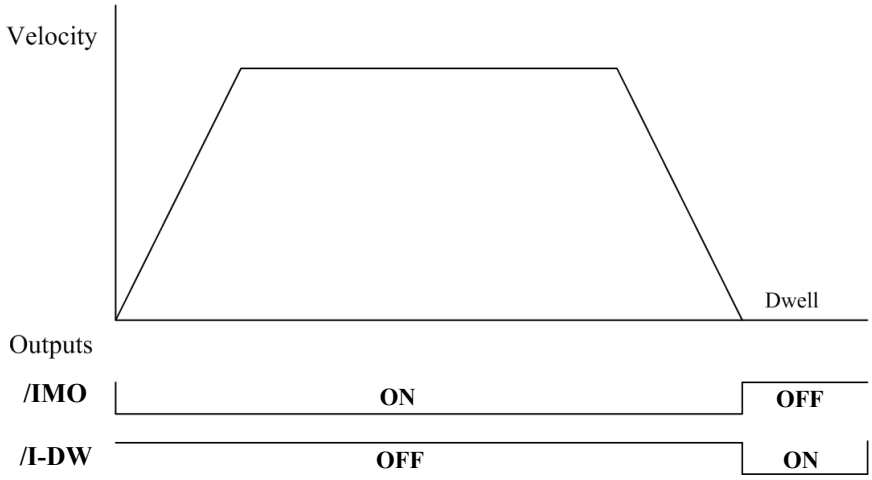
The alarm goes off when a user tries indexing while the homing operation is incomplete. (i.e., HOMC (Axis Homing) is not activated). Refer to the Index E-30 page Axis not homed for more information about Fault .

Action When Complete

The indexing action when the index has completed is defined to be one of the below options.

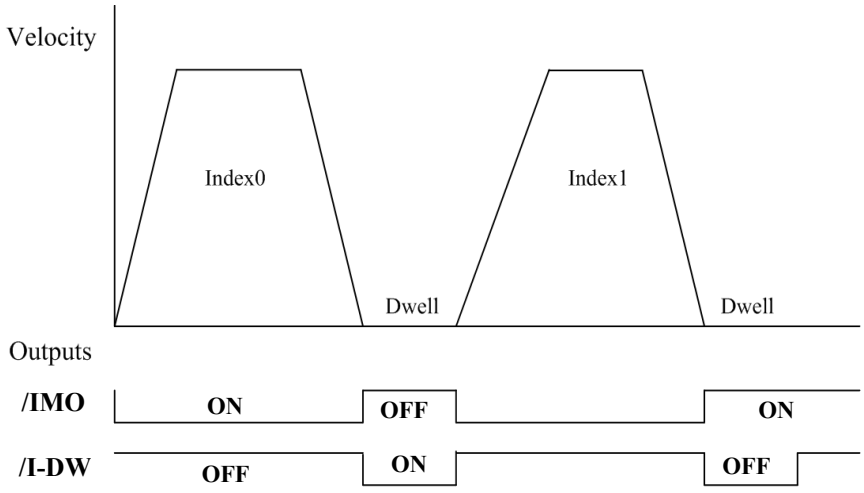
Stop [Setting Value: 0]

This action ends the execution of indexed move commands (default).



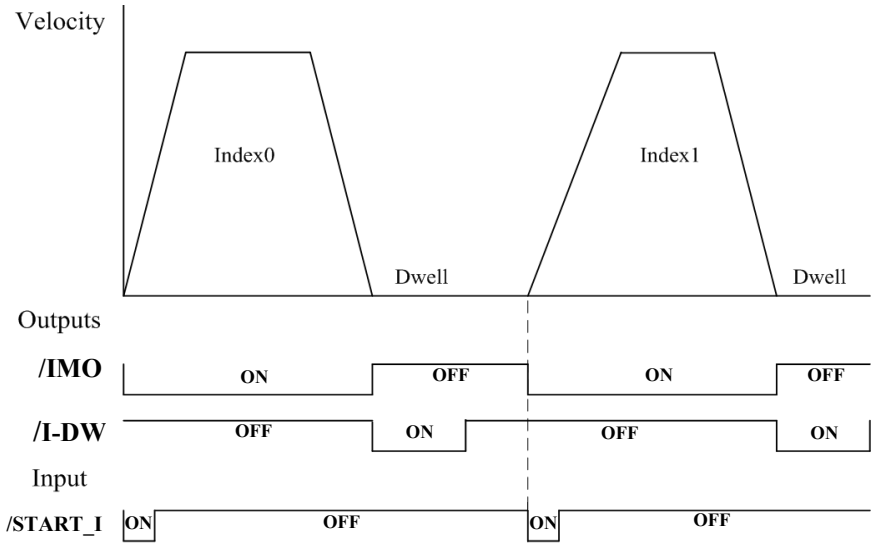
Start Next Index [Setting Value: 1]

Only one START signal is required to move over all the Indexes. This action commands execution of the next index move without additional input, but after the scheduled dwell. The duration of stop at each index depends on the Dwell time defined in the index data. IMO is active when the movement starts and maintains the state until the last index.



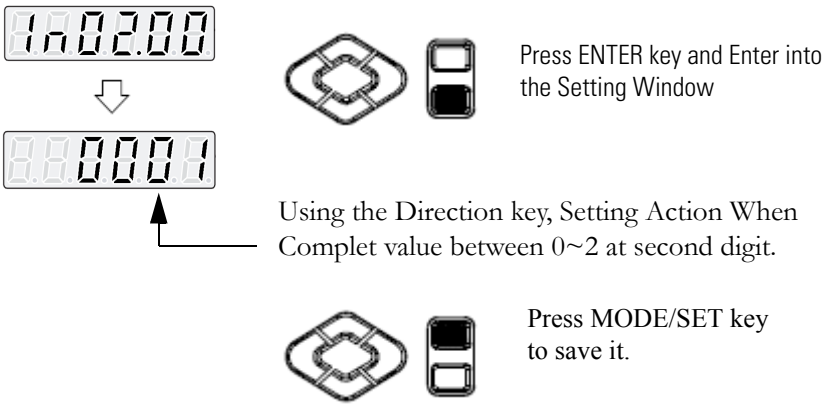
Wait for Start [Setting Value: 2]

In this mode, whenever there is the START signal, it moves to the next index, not like the Start Next Index where only one START signal is required to move over all the Indexes. Whenever it arrives at each position, the IMO signal is turned OFF.



Action When Complete is set up in IN02.00~63N1.

For Example)



Next Index

The number (0 - 63) of the next indexed move to execute when Action When Complete is not set to "Stop".

Next Index is set up in IN12.00~63.

For Example)

Press ENTER key and Enter into the Setting Window

Using the Direction key, Setting value between 0~63.

Press MODE/SET key to save it.

Dwell Time

The dwell is the time when the drive holds position after the motor position feedback reached the target position.

After the drive spends dwell, the drive waits commands or executes the next index. The dwell function operates with all indexing (all index types and all options of 'action when complete').

Dwell is set up in IN07.00~63. Its range is 0~65,535 and its default is '0'.

For Example)

Press ENTER key and Enter into the Setting Window

Using the Direction key, Setting value between 0~65,535.

Press MODE/SET key to save it.

Run Function

The CSD3 servo drive supports total 13 Run functions, i.e. Run-00~Run-12. Run-02, Run-05~07, Run-09 are not supported in the Indexing, but Run-00~01, Run-03~04, Run-08, Run-10~12 provide the same functions in the Indexing.

The Description of each Run function is shown below.

Function	Description
run-00	Jog Operation
run-01	Off-Line Auto Tuning
run-03	Auto Adjustment of Speed Command Offset
run-04	Auto Adjustment of CurrentCommand Offset
run-08	Alarm Reset
run-10	Absolute Encoder Reset
run-11	2-Group Gain Storing
run-12	Parameter Initialization

Monitoring Modes for Indexing

The monitor modes help a user conveniently check Indexing Position Feedback and Indexing Position Command.

-dis-04 : Indexing Position Feedback

-dis-05 : Indexing Position Command

Tuning

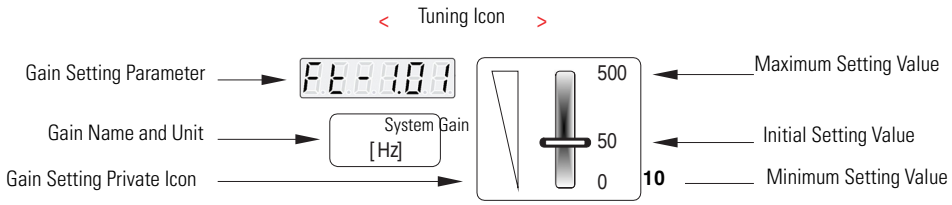
Introduction

This chapter explains the servo drive setting that can achieve its optimum performance to satisfy different load system as controlling servo motor.

Tuning by Gain Setting

Mark Description

The following icon is used for tuning.



Gain Introduction

As the audio system has equalizer to adjust the audio quality, the drive also requires adjustment to achieve the optimum performance for each load. Equalizer adjustment is not essential for the audio system, but the adjustment is important fact that is directly connected to performance for servo drive.

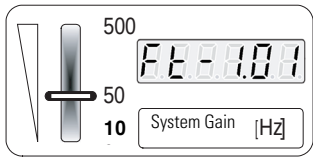
You should adjust servo drive to satisfy load condition in order to achieve optimum performance for each control.

In addition, the adjustment made to the motor that is connected to drive, to achieve the optimum performance through gain setting, is called Tuning.

Servo Drive Gain

What kind of drive gains are there that acts like equalizers of audio system Parameter group 1 has gain setting parameter for tuning and it is classified as follows.

System Gain



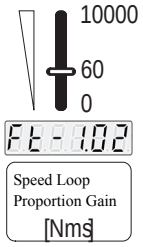
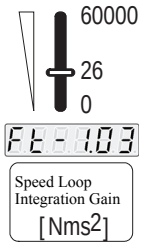
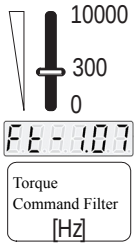
It is the same as the Bandwidth of overall speed control loop of the servo drive.

It can adjust five basic gains at the same time.

IMPORTANT In case of CSD5 servo drive, the system gain is limited to 10Hz at its minimum to guarantee a proper level of motion characteristics when speed response level [Ft- 1.00] is set too low. For more information about speed response level, refer to 6-8 page "Speed Response Level [Ft-1.00]".

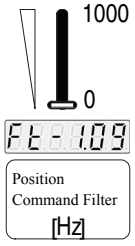
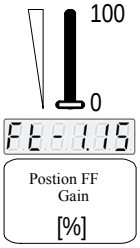
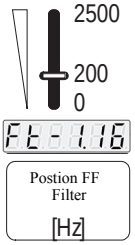
Basic Gain

They are five fundamental gains for tuning.

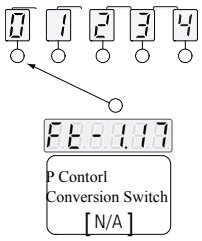
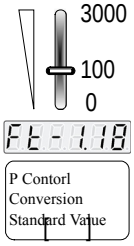
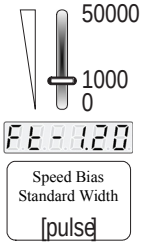
Applicable Gain

They are four gains that with separate functions.

Others

They are four parameters with supplementary function that is required for tuning.

As mentioned above, gains in parameter group 1 and 13 parameters related to gain are explained and the details refer to user manual.

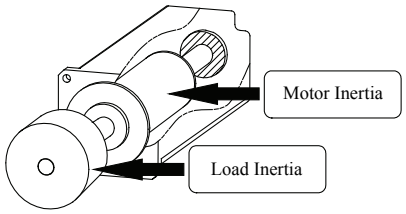
Parameter That is Most Important for Tuning, Inertia Ratio

The parameter that is considered to make motor, that is connected to servo drive achieve the optimum performance in tuning, is the inertia ratio setting parameter. First of all, you should understand that inertia ratio and gain settings are interlocked, and refer to the explanation hereinafter.

Inertia Ratio

What is Inertia Ratio?

The following figure explains the inertia ratio.



It shows the ratio of load inertia compared to the motor (rotor) inertia.

If the motor (rotor) inertia is 3 [gfcms²] and the load inertia is 30 [gfcms²], the inertia ratio is 10 [times]. For the motor inertia table, refer to the motor specification in the appendix.

Setting Unit

Setting value of Inertia Ratio uses the unit, [times]. For example, if the motor inertia is same as the load inertia, the Inertia Ratio is 1 [time] and the setting value is 1.00.

The setting value of the Inertia Ratio is determined by the following formula.

$$\text{Inertia Ratio} = \frac{\text{Load Inertia}}{\text{Motor Rotor Inertia}}$$

Setting Parameter

Set the Inertia Ratio to the following parameter.

Parameter	
Parameter Name	Inertia Ratio
Descirption	It can be automatically set by off-line auto tuning function in the page 7-44 "Off-Line Auto Tuning (run-01)".
Setting Value	0.00~60.00
Initial Value	1.00

Unit	Times
Applicable Mode	All
Others	Setting > End

.

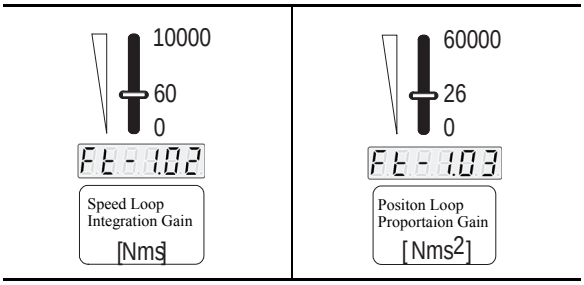
IMPORTANT Based on the motor type and the rated output, the maximum allowed inertia ratio is as below. When the allowed inertia ratio exceeds the maximum, you cannot expect a fast response.

Motor	Capacity	Maximum Allowble Inertia Rotation
CSMT/R	less 100 [W]	30 [Times]
RSMQ/Z	less 1 [kW]	20 [Times]
	1 [kW]	10 [Times]
RSMS/D/H/F/K/L	All	10 [Times]

Inertia Ratio and Gain

If the Inertia Ratio is adjusted by certain reason, it automatically changes the following two basic gains at the same time with the adjustment. Therefore, the Inertia Ratio setting means gain setting, so that you should be careful when adjusting or setting the Inertia Ratio.

Two basic gains that are changed according to the adjustment of Inertia Ratio.



Gain Setting Configuration

This chapter explains the overall configuration (Position, Speed, and Torque) related to the gain setting.

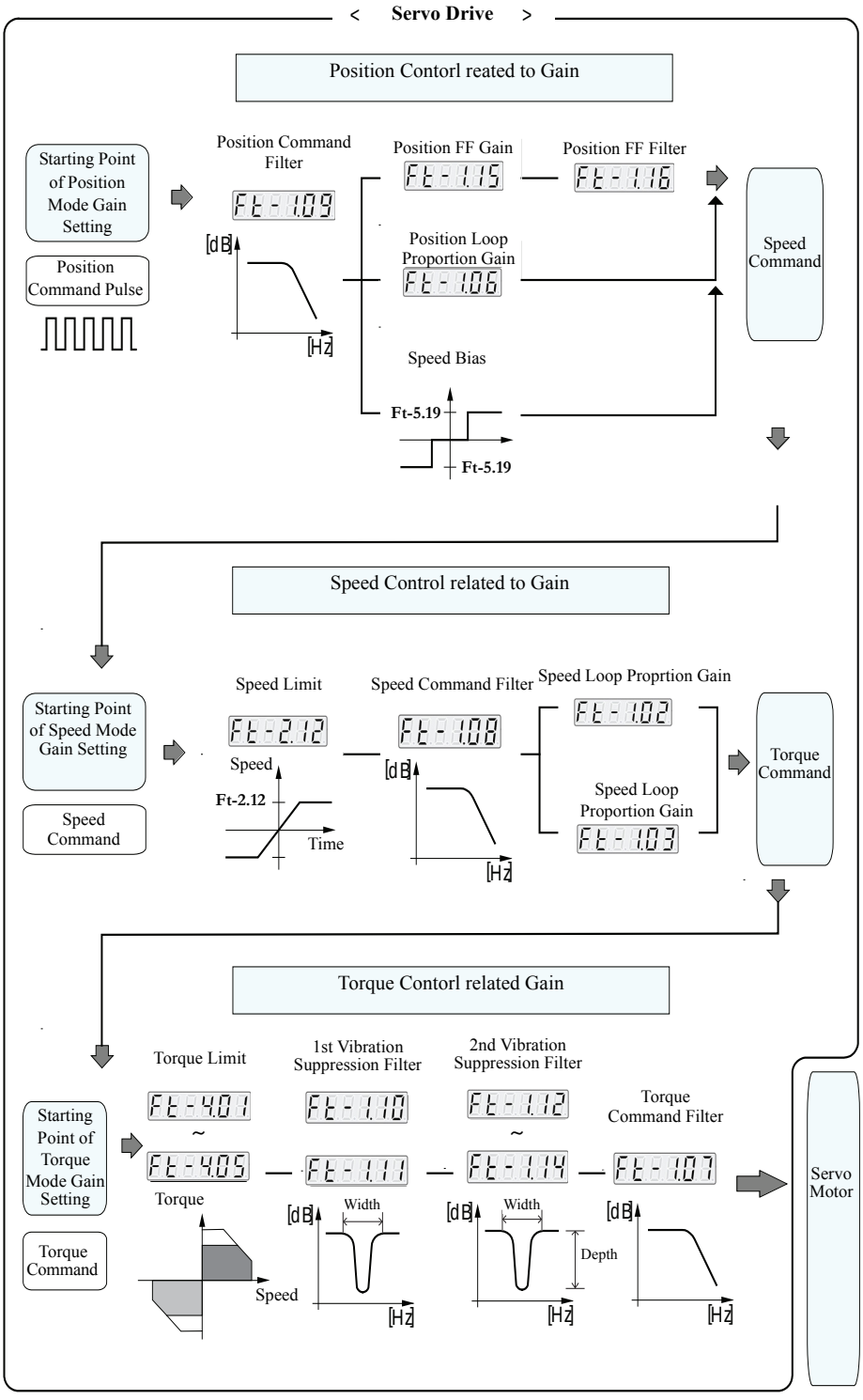
The following diagram will help you understand the gain configuration related

to position, speed and torque.

Starting point for position mode gain setting	Position mode using the position pulse command of host controller includes all gains related to speed and torque from starting point to the servo motor as shown in the figure below. Servo drive first generates the speed command using the position command of the host controller, speed command generates the torque command and finally, it transfers the torque command to the servo motor. Therefore, when you use the position mode, the gain can be set properly. If gain related to position control is set properly but the gain related to torque or speed is not set properly, the optimum tuning cannot be achieved.
Starting point for speed mode gain setting	Speed mode using speed command of the host controller includes all gains related to torque from starting point to the servo motor as shown in the figure below. Servo drive first generates torque command using speed command of the host controller and finally, it transfers the torque command to the servo motor. Therefore, when you use the speed mode, the gains related to speed and torque can be set properly. If gain related to speed control is set properly but gain related to torque is not set properly, the optimum tuning cannot be achieved.
Starting point for torque mode gain setting	Torque mode using torque command of host controller includes all gains related to torque from starting point to servo motor as shown in the figure below. You can adjust gains related to torque in torque mode.

TIP If gains related to position are set in the condition that response quality is not sufficiently guaranteed through gain settings related to speed control, system becomes unstable. Therefore, firstly you should sufficiently secure the response quality of speed control loop to make the response quality of whole position control system good.

Gain Diagram releated to Position, Speed and Torque



Auto Gain Setting

Auto Tuning

There are two functions, which automatically detects the load status inside servo drive.

- Off-line auto-tuning
- On-line auto-tuning

Off-line Auto Tuning

Tuning Function

Two basic gains are automatically set based on the detected data.

Tuning Mode

There are inertial identification mode, inertia identification and resonance frequency detection mode, and resonance frequency detection mode.

The operation mode of run-01 is set by the Auto tuning Mode Setting [Ft-0.03] N0 [Ft-0.03] N0 = 2 (Resonance Frequency Detection). This is a function that looks for only the resonance frequency of the system in a stationary position unlike the inertia moment identification function. This function is for the users who are interested in finding only the resonance frequency, unlike [Ft-0.03] N0 = 1(inertia identification and resonance frequency detection). However, as this function also requires the system's inertia for an accurate operation, it can be useful when the vibration suppression filter needs to be corrected once more by feeling the vibration after performing [Ft-0.03] N0 = 0 (inertia moment identification) or [Ft-0.03] N0= 1 (inertia moment identification and resonance frequency detection).

Operation (Tuning) Method

For Operation method for off-line auto tuning, refer to Off-line Auto Tuning Operation (run-01) on page 7-44 page “Off-line Auto Tuning Operation (run-01)”.

Speed Response Level [Ft-1.00]

This is used to automatically set an initial system gain by determining available max. bandwidth based on the inertia ratio which is obtained from (run-01).

After auto tuning, max. bandwidth is determined, and the system gain [Ft-1.01] is determined by [Ft-1.00].

Parameter	
Parameter Name	Speed response level
Description	Define max. system gain % recommended by a system based on inertia measured from auto tuning
Setting Value	1 ~ 150
Initial Value	50
Unit	%
Applicable Mode	All
Others	Setting > End

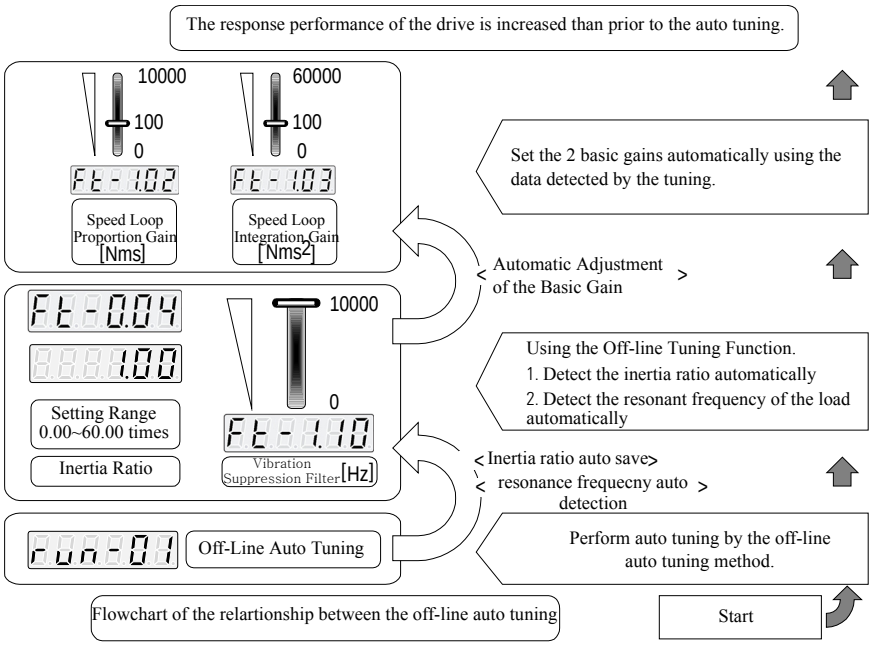
This parameter defines max. system gain [%] recommended by a system after execution of "Nertia Identification". or 'nertia identification and resonance frequency' according to [Ft-0.03.N0] setting. For example, if 'max. available frequency' of a system is '100 [Hz]' after auto tuning, its system gain [Ft-1.01] is set to '50Hz' according to its default value.

'Max. Available Frequency' is determined based on estimated inertia and also system characteristics. Therefore, its default value is 50 [%] and the related gain values are automatially set to appropriate values when it is changed, and the related Gain Values are automatically set to appropriate values when it is changed. However, system gain [Ft-1.01] is limited to 10 [Hz] at its minimum to guarantee a proper level of motion characteristics when speed response level [Ft-1.00] is set too low.

Explanation of the Relationship Flow between Off-line Auto Tuning and Gain

When you run off-line auto tuning, drive automatically Inertia Ratio [Ft-0.04] of load system and automatically set two basic gains as being suitable for Inertia Ratio. Therefore, it is recognized that the response quality of servomotor is improved at the same time.

In addition, load system sometimes does resonant (vibration) in the specific frequency range because of vibration noise. For those situations, it intercepts vibration of load system using resonant frequency that is automatically detected by auto tuning. Resonant frequency of load system becomes the setting value for resonance suppression filter [Ft-1.10] and if you know the exact resonant frequency of the load, you can set it directly.



TIP Only as operating off-line auto tuning, you can prevent resonant noise caused by resonant frequency of load system and three basic gains.

Off-line auto tuning automatically sets Inertia Ratio [Ft-0.04] and resonant suppression filter [Ft-1.07], but when you know exactly each value, you can directly set.

However, if the value set directly is not accurate, the response quality is degraded and becomes the reason of resonant noise. Therefore, be careful when setting it directly.

On-line Auto Tuning

Overview

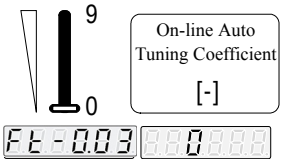
On-line Auto Tuning is used when load is continuously changed during the operation. It continuously changes the gain value according to load state in order to maintain the regular response quality of system even though load state is changed.

Precautions

Do not use On-line Auto Tuning for the cases below if possible, and we recommend using the Off-line Auto Tuning or manual gain setting.

- When fine or large change is made to the Inertia ratio during the load operation.
- If Inertia ratio is changed in two types during load operation, you do not need to change. In this case, refer to the 6-36 page "</G-SEL> Function".
- When big torque does not occur during load operation because acceleration/deceleration time is long or maximum rotation speed or torque limit is set low.

On-line Auto Tuning Coefficient Setting

Coefficient	
Coefficient Name	Speed response level
Description	If this value is not ‘0’. use on-line auto tuing function. The higher you set the value, the more delicately it responses to load change and respond quickly.
Applicable Mode	All
Others	Servo-OFF > Setting > End

If load is quickly changed, you need to set the On-line Auto Tuning coefficient high, but it can be momentarily unstable in the load environment that the vibration is large. So, pay extra caution.

If the response quality of control loop is decreased during On-line Auto Tuning, increase the value of system gain [Ft-1.01] and if noise or vibration occurs, reduce that value.

On-line Vibration Suppression

Select Online Vibration Suppression Mode.

Three modes can be selected on the first 7 segment: Disable, Normal and High Speed Mode, and Slow Speed Mode without Initial Value.

Also, the second 7 segment supports Online Vibration Suppression Gain function.

On-line Vibration Suppression Mode Selection

- Ft-1.22.N0 = 0

Operates based on the value of the fixed vibration suppression filter in Ft-1.10 which is previously set by the offline tuning, and the online function does not work.

- Ft-1.22.N0 = 1

It is a function to suppress the vibration online in the most general motion conditions. However, for the online function to work properly, an initial offline tuning is necessary. The inertia ratio set by offline is essential for the maximum result of the online vibration suppression. Once the online function starts by this mode, the existing value of [Ft-1.10] becomes meaningless.

IMPORTANT The suggested online function can adversely affect when the load condition is too great with a high strength or in no load status. It is strongly advised not to use this function and operate in Off-line Tuning Mode (its parameter setting value is 0 in [Ft-0.03]) for a better result in those cases.

Generally, the suggested load condition brings a good result when using a belt or a belt-incorporated system.

- Ft-1.22.N0 = 2

This function is used to detect the resonance frequency while in general motion when no proper value exists in [Ft-1.10] because only the inertia ratio was identified without measuring the resonance frequency in the initial offline tuning stage.

IMPORTANT To use this function, it is extremely important that the system gain [Ft-1.01] should be set low between 10 ~15 [Hz], and the maximum speed for the motion should be lower than 100 [rpm].

Once the above conditions are met, while in general motion, and check what value [Ft-1.10] changes to. If the system cannot identify an appropriate resonance frequency, [Ft-1.10] does not change its initial value (10000).

Once the value is changed, it is difficult to increase the speed higher than 100 [rpm], but the gain can be increased within the bounds of the system; in that case [Ft-1.10] can change again.

Even if it changes to a certain value, when the [Ft-1.22] N0 is changed to another mode, the value of [Ft-1.10] that was measured online returns to the initial value, which was set in the Disable online Vibration Suppression mode in case [Ft-1.22] N0 is "0". That is because, the defined value of [Ft-1.22] N0 on "2"(Slow Speed mode without initial value) might not have the generality since it is a value guaranteed only in the low-speed operation mode. However, if a user decides that the device is always operated in the low-speed mode and wants to keep the value permanently, he can reset Ft-1.22.N0 = 0 and write the value measured online from [Ft-1.22] N0 "2" again onto Ft-1.10 then, the value is stored in the memory of the drive for good.

If only resonance (or vibration) frequency is needed, execution of [run-01] (offline auto tuning) after setting "[Ft-0.03] N0 =2 (Resonance Frequency Detection)" enables the normal operation after locating the vibration frequency.

The advantage of this function is that all the operation conditions are in the low-speed range mentioned above (within 100 [rpm]); in case the gain is also relatively low, the operation can be continued while adjusting for the optimum [Ft-1.10].

IMPORTANT This function is available only when both the gain and the operation speed (within 100 rpm) are low.

Online Vibration Suppression Gain Setting

As mentioned above "[Ft-1.22] N0 = 1" is the most suitable online function to be used in general. However, this function may be vulnerable depending on the load condition. Such an example is when the structure is complicated with many belts connected. Initial value "[Ft-1.22] N1 = 0"can be applicable in most cases; if there is a functional problem, set [Ft-1.22] N1 value to "1" so the online vibration suppression gain could increase, and use the higher value of [Ft-1.07](Torque command filter) than 1000 [Hz] to get a good result.

In the meantime "[Ft-1.22] N1" affects only when "[Ft-1.22] N0 = 1".

Application

Introduction

This chapter describes settings to operate the servo motor by indexing once again. And describes indexing in order after basic settings.

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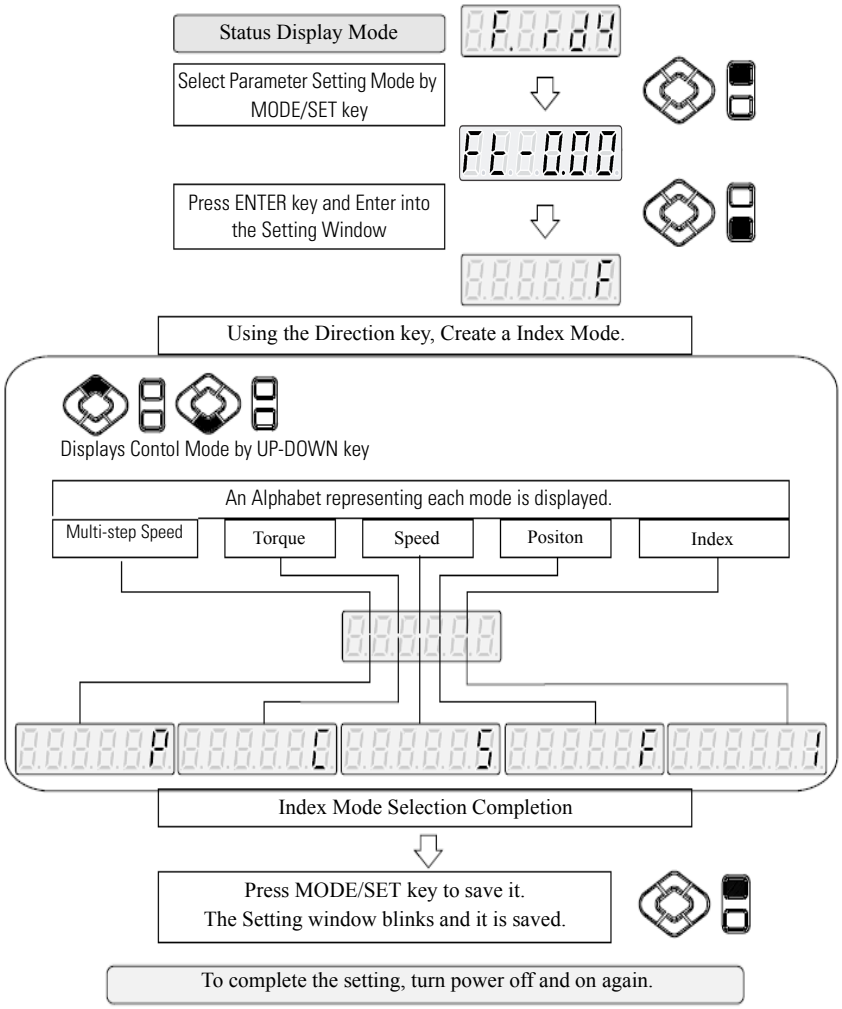
Basic Setting of the Servo Drive

A user has to set basic parameters to operate servo drive by indexing. This chapter describes to set the standard Parameters. For more detail information, please refer to " CSD5 Servo Drive User Manual".

Index Mode Setting

The control Mode is set up in Ft-0.00. Describes index mode setting method focusing on the key button manipulation. Apply the power and set it as shown in the flowchart below.

Flowchart of the Index Mode Setting



Servo Motor Setting

Motor setting should be done from the parameters [Ft-0.01]. For numerical data related to the installation of the servo motor, please refer to CSD5 Servo Drive User Manual.

Basic Mode Setting

Fault and Disable Braking, Overtravel stop method, Motor Forward Dir., Power Input is set up in Ft-0.02.

	**Selection of 4 Basic Mode**	
Digit 0	Fault and Disable Braking	
Range	Value	Description
	0	Keep DB after DB stop
	1	DB is released after DB stop
	2	Stop Free run (operation) without DB stop
	3	Keep DB after stop Free run
Initial Value	0	
Digit 1	Overtravel stop method	
Range	Value	Description
	0	Stop by normal torque contorl during overtravel. At this monent,can contorl torque by setting overtravel torque linit [Ft-4.05].
	1	Stop by the method set at the DB stop method selection in [Ft-0.02] when overtravel occurs.
Initial Value	0	
Digit 2	Motor Forward Dir.	
Range	Value	Description
	0	The command signal is not inverted so that a positive command value results in CW Rotation, (as viewed from shaft end).
	1	The command signal is inverted so that a positive command value results in CCW Rotation, (as viewed from shaft end).
Initial Value	0	
Digit 3	Power Input	
Range	Value	Description
	0	Check input power 50~400W Servo Drive: Enable single-phase open check 800~1.5kW Servo Drive: 3-phase open check
	1	Do not check the input power
	2	Single-phase input
Initial Value	0	

A. Select Parameter Setting Mode(Ft-0.00) by MODE/SET key.

B. Using the Direction key, move to Ft-0.02.

C. Press ENTER key and enter into the Setting Window.

D. Fault and Disable Braking, Overtravel stop method, Motor Forward Dir. and Power Input are set up in Ft-0.02, refer to the table above.

E. To complete the setting, press MODE/SET key to save it.

F. Press ENTER key and go out the Setting Window.

Supplementary Function Setting

In Position Size and Near Position Size are set up in Ft-5.00, Ft-5.02.

	**In Position Size**
Description	If position error < In Position Size for 1 ms and the In Position Size output signal is assigned, the In Position output is turned ON.
Range	0~2500
Initial Value	10
Unit	pulse
	**Near Position Size**
Description	If position error < Near Position Size and the Near Position output signal is assigned, the Near Position output is turned ON.
Range	0~2500
Initial Value	20
Unit	pulse

A. Select Parameter Setting Mode(Ft-0.00) by MODE/SET key.

B. Using the Direction key, move to Ft-5.00.

C. Press ENTER key and enter into the Setting Window.

D. In Position Size is set up in Ft-5.00, refer to the table above.

E. To complete the setting, press MODE/SET key to save it.

F. Press ENTER key and go out the Setting Window.

G. Near Position Size is set up in Ft-5.02 as the same way.

Basic Setting for Indexing

A user has to set up the basic parameter for indexing after setting the basic parameter of the servo drive. This chapter describes to set the Parameters for the index system.

Auto Starting Indexing

If the auto starting indexing turns on, an indexing move starts at when the drive is enabled. Using this function, the drive can start an indexing without an input signal as motor moving enable.

Auto Start Indexing is set up in IN00.00. Auto Start Indexing is set up, refer to the table below.

	**Auto Start Indexing**
Description	When this field is set to "on", the drive will begin executing the selected index whenever the drive enables. 0-OFF 1-ON
Range	0~1
Initial Value	0

A. Select Index Setting Mode(IN00.00) by MODE/SET key.

B. Using the Direction key, move to IN00.00.

C. Press ENTER key and enter into the Setting Window.

D. Set up a Auto Start Indexing, refer to the table above.

E. To complete the setting, press MODE/SET key to save it.

F. Press ENTER key and go out the Setting Window.

Abort Index Deceleration

A user can set up the deceleration used to stop motion when the Stop Index input terminates an index move. Abort Index Deceleration is set up in IN00.01.

	**Abort Index Deceleration**
Description	The deceleration used to stop motion when the Stop Index input terminates an index move.
Range	0~2147483647
Initial Value	6250

A. Select Index Setting Mode(IN00.00) by MODE/SET key.

B. Using the Direction key, move to IN00.01.

C. Press ENTER key and enter into the Setting Window.

D. Set up a Abort Index Deceleration, refer to the table above.

E. To complete the setting, press MODE/SET key to save it.

F. Press ENTER key and go out the Setting Window.

Positive/Negative Deceleration Distance

A user can set up the stopping distance used when the drive encounters a positive/negative overtravel limit. Positive/Negative Deceleration Distance is set up in IN00.02~03.

	**Positive Deceleration Distance**
Description	The stopping distance used when the drive encounters a positive overtravel limit.
Range	0~2147483647
Initial Value	0
	**Negative Deceleration Distance**
Description	The stopping distance used when the drive encounters a negative overtravel limit.
Range	0~2147483647
Initial Value	0

A. Select Index Setting Mode(IN00.00) by MODE/SET key.

B. Using the Direction key, move to IN00.02.

C. Press ENTER key and enter into the Setting Window.

D. Set up a Positive Deceleration Distance, refer to the table above.

E. To complete the setting, press MODE/SET key to save it.

F. Press ENTER key and go out the Setting Window.

G. Negative Deceleration Distance is set up in IN00.03 as the same way.

S/W Limit

If the motor position feedback is over the software overtravel range, CSD5 servo drive operates the software overtravel limit. The parameters for Software Limit are set up in IN00.04~06 IN00.04~06.

	**Enable Software Limits**
Description	Select: *0-OFF*: Turns off software overtravel limit checking *1-ON*: Causes the drive to compare the motor feedback position to the Positive and Negative Software Limits, below, to determine if the drive has exceeded an overtravel limit.
Range	0~1
Initial Value	0
	**Positive Software Limit**
Description	If the motor feedback position is greater than this value, the drive has exceeded the software overtravel limit.
Range	-2147483647~2147483647
Initial Value	2147483647
	**Negative S/W Limit**
Description	If the motor feedback position is less than this value, the drive has exceeded the software overtravel limit.
Range	-2147483647~2147483647
Initial Value	-2147483647

A. Select Index Setting Mode(IN00.00) by MODE/SET key.

B. Using the Direction key, move to IN00.04.

C. Press ENTER key and enter into the Setting Window.

D. Set up a Enable Software Limit, refer to the table above.

E. To complete the setting, press MODE/SET key to save it.

F. Press ENTER key and go out the Setting Window.

G. Positive/Negative Software Limit is set up in IN00.05~06 as the same way.

User Defined Distance

A user intuitively can set up the Index Position/Distance by a user defined the unit and distance per motor revolution of the load. User Defined Distance Per Motor Revolution is set up in IN00.07. Default 0 mean to use count unit, not use User Defined distance.

	**User Defined Distance Per Motor Revolution**
Description	Define user defined distance per motor revolution.
Range	0~99999
Initial Value	0

A. Select Index Setting Mode(IN00.00) by MODE/SET key.

B. Using the Direction key, move to IN00.07.

C. Press ENTER key and enter into the Setting Window.

D. Set up a User Defined Distance Per Motor Revolution, refer to the table above.

E. To complete the setting, press MODE/SET key to save it.

F. Press ENTER key and go out the Setting Window.

Homing Setting

Axis must be homed before the drive executes an absolute index. This chapter describes to set the Parameters for the homing.

Homing Type

CSD5 Servo Drive supports 11 homing types. Homing types can set IN01.00 and the setting is applied after Power Off & On.

	**Homing Type**
Description	Select the type of homing operation the drive will perform. 0-Home to Present Position 1-To Home sensor/Back to Marker 2-To Limit/Back to Marker 3-To Home sensor/Fwd to Marker 4-To Limit/Fwd to Marker 5-Home to Current Value 6-Home to Current Value/Back to Marker 7-To Home sensor/Move/Back to Marker 8-Home to Marker 9-To Home sensor 10-To Limit sensor
Range	0~10
Initial Value	1

A. Select Index Setting Mode(IN00.00) by MODE/SET key.

B. Using the Direction key, move to IN01.00.

C. Press ENTER key and enter into the Setting Window.

D. Set up a Homing Type, refer to the table above.

E. To complete the setting, press MODE/SET key to save it.

F. Press ENTER key and go out the Setting Window.

Auto Start Homing

The drive starts the homing procedure automatically when the drive is enabled. Auto Starting Homing can set IN01.01 and the setting is applied after Power Off & On.

	**Auto Start Homing on Enable**

Description	Causes the drive to begin the homing procedure automatically when the drive is enabled. 0 - Active: Automatically starts homing every time the drive is enabled. *1* - Active After Reset Only: automatically starts homing when a drive is enabled, if the drive has not already been homed. 2 - Inactive
Range	0~2
Initial Value	2

A. Select Index Setting Mode(IN00.00) by MODE/SET key.

B. Using the Direction key, move to IN01.01.

C. Press ENTER key and enter into the Setting Window.

D. Set up a Auto Starting Homing, refer to the table above.

E. To complete the setting, press MODE/SET key to save it.

F. Press ENTER key and go out the Setting Window.

If the Auto Starting Indexing and Auto Starting Homing are set simultaneously, the drive operates like the following table.

Auto Starting Homing	**Auto Starting Indexing**	**Motion Sequence** (Drive Enable inputs When an Axis is not homed)	**Motion Sequence** (Drive Enable inputs When an Axis is homed)
Active	ON	Homing → Indexing	Homing → Indexing
Active after drive reset only	ON	Homing → Indexing	Indexing

Homing Velocity

Homing velocity is using velocity during an index homing. A +/- sign of this value means a move direction during an index homing. For the To Sensor, then Back to Marker Homing Type, creep velocity used for all remaining homing motion after the motor decelerates to a stop when it finds the sensor edge. This velocity uses all of the other homing types.

	**Homing Velocity**
Description	The commanded velocity used during homing. The sign of this value (+/-) indicates the direction of motion during homing.
Range	-6000~6000
Initial Value	100

	**Creep Velocity**
Description	For the To Sensor, then Back to Marker Homing Type, the velocity used for all remaining homing motion after the motor decelerates to a stop when it finds the sensor edge.
Range	0~6000
Initial Value	20

A. Select Index Setting Mode(IN00.00) by MODE/SET key.

B. Using the Direction key, move to IN01.02.

C. Press ENTER key and enter into the Setting Window.

D. Set up a Homing Velocity, refer to the table above.

E. To complete the setting, press MODE/SET key to save it.

F. Press ENTER key and go out the Setting Window.

G. Creep velocity is set up in IN01.03 as the same way.

Homing Acceleration/Deceleration

A user can set up the rate of acceleration and deceleration used during homing.

	**Homing Acceleration/Deceleration**
Description	The rate of acceleration and deceleration used during homing.
Range	1~2147483647
Initial Value	6250

A. Select Index Setting Mode(IN00.00) by MODE/SET key.

B. Using the Direction key, move to IN01.04.

C. Press ENTER key and enter into the Setting Window.

D. Set up a Homing Acceleration/Deceleration, refer to the table above.

E. To complete the setting, press MODE/SET key to save it.

F. Press ENTER key and go out the Setting Window.

Home Offset Move

The home offset move means the moving distance after the homing procedure specified homing methods is complete. A user can use this option to set up an origin which is different from the origin defined in the homing operation. The position where the motor stops after the moving for the home offset move is complete is the new home.

The home offset move is not applicable for the 17-bit Absolute Motor. The Offset Move Distance is set up in the IN01.05.

	**Offset Move Distance**
Description	The distance the motor position will be from the marker edge (or sensor edge for Sensor only Homing Type) after the homing sequence is complete.
Range	-2147483647~2147483647
Initial Value	0

A. Select Index Setting Mode(IN00.00) by MODE/SET key.

B. Using the Direction key, move to IN01.05.

C. Press ENTER key and enter into the Setting Window.

D. Set up a Offste Move Distance, refer to the table above.

E. To complete the setting, press MODE/SET key to save it.

F. Press ENTER key and go out the Setting Window.

Home Sensor Polarity

This function is to choose the active state of home sensor input; Inactive to active transition and Active to inactive transition. This value is set up in the IN01.06. Home sensor is enable when the input value is set 0 and it is disable when the input value is set 1.

	**Home Sensor Polarity**
Description	0-NORMAL CLOSE 1-NORMAL OPEN
Range	0~1
Initial Value	0

A. Select Index Setting Mode(IN00.00) by MODE/SET key.

B. Using the Direction key, move to IN01.06.

C. Press ENTER key and enter into the Setting Window.

D. Set up a Home Sensor Polarity, refer to the table above.

E. To complete the setting, press MODE/SET key to save it.

F. Press ENTER key and go out the Setting Window.

Home Position

This value is used as the home position at the completion of a homing procedure. If this value is 1000, the index position is 1000 when the moving for the home offset is complete.

	**Home Position**
Description	The home position when a homing procedure is completed.
Range	-2147483647~2147483647
Initial Value	0

A. Select Index Setting Mode(IN00.00) by MODE/SET key.

B. Using the Direction key, move to IN01.07.

C. Press ENTER key and enter into the Setting Window.

D. Set up a Home Position, refer to the table above.

E. To complete the setting, press MODE/SET key to save it.

F. Press ENTER key and go out the Setting Window.

Moving Distance After Home Sensor

When Homing Mode 7 is selected, markers which appear between the active going edge of the home sensor and the end position of Moving distance After Home Sensor are all ignored. Moving distance After Home Sensor is set up in

IN01.08. Its range is 0~2,147,483,649 and the default value is 0. It can change this setting value only Servo-Off. status.

	**Moving distance After Home Sensor**
Description	This value is distance that the drive ignores the marker inputs after the home sensor is detected.
Range	0~2147483647
Initial Value	0

A. Select Index Setting Mode(IN00.00) by MODE/SET key.

B. Using the Direction key, move to IN01.08.

C. Press ENTER key and enter into the Setting Window.

D. Set up a Moving distance After Home Sensor, refer to the table above.

E. To complete the setting, press MODE/SET key to save it.

F. Press ENTER key and go out the Setting Window.

Home Current, Home Current time

When Homing Mode 5 or 6 is used for Homing, the system judges it actually hits the Stopper if the torque higher than the Home Current is maintained for the Home Current time.

The Home Current is set up in IN01.09, about 0~250% of its rated torque. The default value is 100. Home Current time is set up in IN01.10. It can be 0~1000 msec. Its default is '0'. It can change this setting value only Servo-Off. status.

	**Home Current**
Description	Specifies the torque feedback at which the drive stops moving the motor at the Homing Velocity. Unit : Percentages of a motor rating torque
Range	0~250
Initial Value	100
	**Home Current Time**
Description	The time to when the torque feedback is more than the home current to when the drive detects stopper.
Range	0~1000

Initial Value	0

A. Select Index Setting Mode(IN00.00) by MODE/SET key.

B. Using the Direction key, move to IN01.09.

C. Press ENTER key and enter into the Setting Window.

D. Set up a Home Current, refer to the table above.

E. To complete the setting, press MODE/SET key to save it.

F. Press ENTER key and go out the Setting Window.

G. Home Current Time is set up in IN01.10 as the same way.

Homing Time Limit

Axis must be homed before the drive executes an absolute index. A user can limit the homing time against to be late the homing. Drive fault occurs when time for homing is over the homing time limit.

	**Homing Time Limit**
Description	Drive fault occurs when time for homing is over the homing time limit.
Range	0~65535
Initial Value	60

A. Select Index Setting Mode(IN00.00) by MODE/SET key.

B. Using the Direction key, move to IN01.11.

C. Press ENTER key and enter into the Setting Window.

D. Set up a Homing Time Limit, refer to the table above.

E. To complete the setting, press MODE/SET key to save it.

F. Press ENTER key and go out the Setting Window.

Stop Homing Deceleration

A user can set up the deceleration used to stop motion when the Stop Homing input terminates an index homing.

	**Stop Home Deceleration**
Description	The rate of drive deceleration used when homing is stopped.
Range	1~2147483647
Initial Value	6250

A. Select Index Setting Mode(IN00.00) by MODE/SET key.

B. Using the Direction key, move to IN01.12.

C. Press ENTER key and enter into the Setting Window.

D. Set up a Stop Homing Deceleration, refer to the table above.

E. To complete the setting, press MODE/SET key to save it.

F. Press ENTER key and go out the Setting Window.

Indexing Setting

Start setup for Indexing after ending the basic setting for the indexing and the homing.

Indexing Types

CSD5 servo drive is two kinds of coordinate systems to express position. In the absolute coordinate system, all the Indexes are expressed based on one reference location, called as Home or Origin. Axis must be homed before the drive executes an absolute index. In the incremental coordinate system, a position is defined with a relative distance from its previous position.

A user can select either option in the 1st digit of IN02.00~63 (absolute and incremental). When this value is 0, the coordinate system is absolute and When this value is 1, the coordinate system is incremental.

	Digit 0	**Index 0~63 Type**

Description	Index 0 ~63 Setup Mode: 0-Absolute: moves from its starting position to the specified Position, below. 1-Incremental: moves from its starting position the specified Distance, below. Note: The axis must be homed before the drive can execute any index.
Range	0~1
Initial Value	0

A. Select Index Setting Mode(IN00.00) by MODE/SET key.

B. Using the Direction key, move to IN02.00.

C. Press ENTER key and enter into the Setting Window.

D. Set up a Index Type, refer to the table above.

E. To complete the setting, press MODE/SET key to save it.

F. Press ENTER key and go out the Setting Window.

Index Action When Complete

The CSD5 servo drive can store 64 indexes and provide 3 types of option modes for the 64 indexes. The three types are Stop, Start next Index, and Wait for Start. Except the Selective position option, 64 indexes are pre-defined in a memory.

The indexing action when the index has completed is defined to be one of the below options.

	Digit 1	**Index 0~63 Action When Complete**
Description	0: Stop: ends the execution of indexed move commands (default setting). 1: Start next index: commands execution of the Next Index move without additional input, but after the scheduled Dwell. 2: Wait for Start: commands execution of the Next Index move the next time the Start Index input becomes active.	
Range	0~2	
Initial Value	0	

A. Select Index Setting Mode(IN00.00) by MODE/SET key.

B. Using the Direction key, move to IN02.00.

C. Press ENTER key and enter into the Setting Window.

D. Set up a Index Action When Complete in N1, refer to the table above.

E. To complete the setting, press MODE/SET key to save it.

F. Press ENTER key and go out the Setting Window.

Index Position/Distance

Enter the position or distance to move for the indexing. For Absolute mode moves, the fixed position to which the motor will travel. For Incremental moves, the relative distance the motor will travel.

	**Index 0~63 Position/Distance**
Description	• Position : For Absolute mode moves, the fixed position to which the motor will travel. • Distance : For Incremental and Registration mode moves, the relative distance the motor will travel.
Range	-2147483647~2147483647
Initial Value	0

A. Select Index Setting Mode(IN00.00) by MODE/SET key.

B. Using the Direction key, move to IN04.00.

C. Press ENTER key and enter into the Setting Window.

D. Set up a Index Position/Distance, refer to the table above.

E. To complete the setting, press MODE/SET key to save it.

F. Press ENTER key and go out the Setting Window.

G. Index Position/Distance is set up in IN04.01~63 as the same way.

Index Dwell Time

The dwell is the time when the drive holds position after the motor position feedback reached the target position.

After the drive spends dwell, the drive waits commands or executes the next index. The dwell function operates with all indexing (all index types and all options of 'action when complete').

Dwell is set up in IN07.00~63. Its range is 0~65,535 and its default is ‘0’.

	**Index 0~63 Dwell**
Description	Milliseconds to remain at current position before exec.
Range	0~65535
Initial Value	0

A. Select Index Setting Mode(IN00.00) by MODE/SET key.

B. Using the Direction key, move to IN07.00.

C. Press ENTER key and enter into the Setting Window.

D. Set up a Index Dwell, refer to the table above.

E. To complete the setting, press MODE/SET key to save it.

F. Press ENTER key and go out the Setting Window.

G. Index Dwell is set up in IN07.01~63 as the same way.

Index Velocity

Maximum velocity during an index move.

Enter velocity for each movement into the velocity parameter of IN08.00~63. The input range is 0~6000 and its unit is rpm. The default value is 750.

	**Index 0~63 Velocity**
Description	Maximum velocity while in motion.
Range	0~6000
Initial Value	750

A. Select Index Setting Mode(IN00.00) by MODE/SET key.

B. Using the Direction key, move to IN08.00.

C. Press ENTER key and enter into the Setting Window.

D. Set up a Index Velocity, refer to the table above.

E. To complete the setting, press MODE/SET key to save it.

F. Press ENTER key and go out the Setting Window.

G. Index Velocity is set up in IN08.01~63 as the same way.

Index Acceleration

Maximum acceleration during an index move. A user can enter total 64 acceleration for 64 indexes. Enter acceleration for each movement into the acceleration parameter of IN10.00~63. The input range is 1~2,147,483,647 and its unit is 10^{-2}rev/sec. The default value is 6250.

	**Index 0~63 Acceleration**
Description	Maximum acceleration while in motion.
Range	1~2147483647
Initial Value	6250

A. Select Index Setting Mode(IN00.00) by MODE/SET key.

B. Using the Direction key, move to IN10.00.

C. Press ENTER key and enter into the Setting Window.

D. Set up a Index Acceleration, refer to the table above.

E. To complete the setting, press MODE/SET key to save it.

F. Press ENTER key and go out the Setting Window.

G. Index Acceleration is set up in IN10.01~63 as the same way.

Index Deceleration

Maximum deceleration during an index move. A user can enter total 64 deceleration for 64 indexes. Enter deceleration for each movement into the deceleration parameter of IN11.00~63. The input range is 1~2,147,483,647 and its unit is 10^{-2}rev/sec. The default value is 6250.

	**Index 0~63 Deceleration**
Description	Maximum deceleration while in motion.
Range	1~2147483647
Initial Value	6250

A. Select Index Setting Mode(IN00.00) by MODE/SET key.

B. Using the Direction key, move to IN11.00.

C. Press ENTER key and enter into the Setting Window.

D. Set up a Index Deceleration, refer to the table above.

E. To complete the setting, press MODE/SET key to save it.

F. Press ENTER key and go out the Setting Window.

G. Index Deceleration is set up in IN11.01~63 as the same way.

Next Index

"The number (0 - 63) of the next indexed move to execute when Action When Complete is not set to "Stop". Next Index is set up in IN12.00~63.

	**Index 0~63 Next Index**
Description	The number (0 - 63) of the next indexed move to execute when Action When Complete is not set to "Stop".
Range	0~63
Initial Value	0

A. Select Index Setting Mode(IN00.00) by MODE/SET key.

B. Using the Direction key, move to IN12.00.

C. Press ENTER key and enter into the Setting Window.

D. Set up a Next Index, refer to the table above.

E. To complete the setting, press MODE/SET key to save it.

F. Press ENTER key and go out the Setting Window.

G. Next Index is set up in IN12.01~63 as the same way.

Index Operation

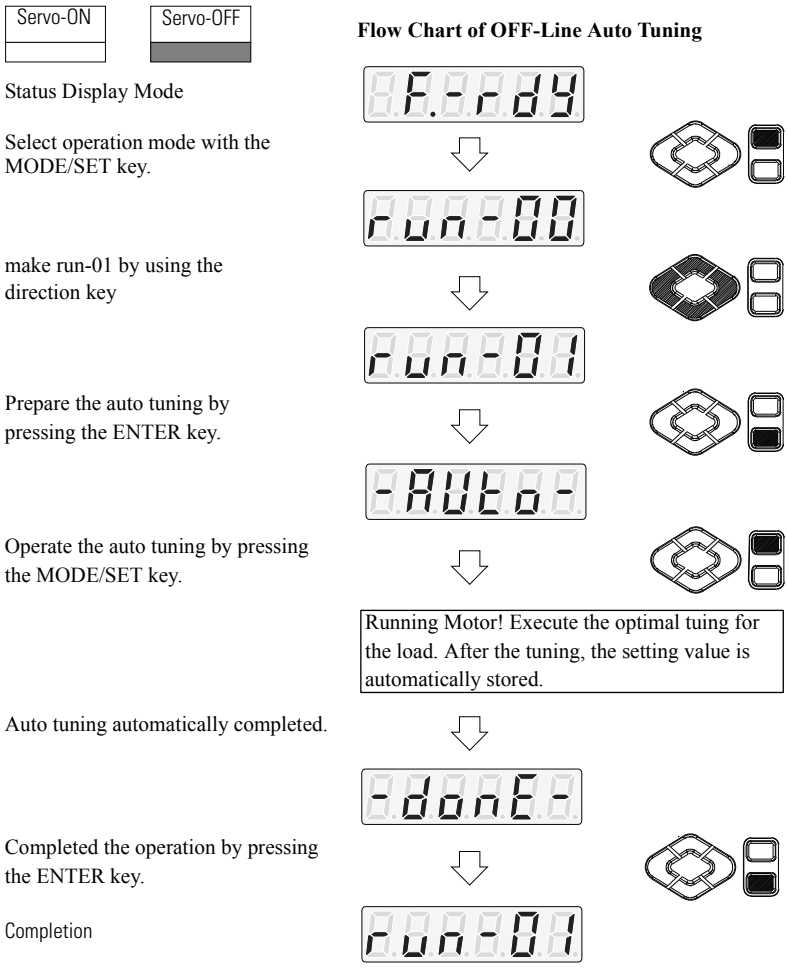
Start Indexing after ending the setting for the indexing.

Tuning

Start Off-line Auto Tuning when the drive is servo-off. Off-line Auto Tuning operate in run-01.

How to Operate

Refer to the below flow chart to operate.



Servo-ON

Servo-ON signal should be applied to the drive. If the servo-ON signal is not applied after the power application, it is same as the servo driver and motor being separated completely. This is a ready status to run the motor.

Homing

Axis must be homed before the drive executes an absolute index. 'Auto Starting Homing on Enable' turns on, an index homing starts at when the drive is enabled. If 'Auto Starting Homing on Enable' turns off, an index homing completes as entering the start homing signal. The stop homing is a

signal to cancel homing. A stop or start indexing command is ignored when the homing is already in progress.

Start Index

Start index operation after homing. If the auto starting indexing turns on, an indexing move starts at when the drive is enabled. If the auto starting indexing turns off, enter the start index signal.

a user can stop to move by 'Stop', 'Pause' signal during index move. When the stop signal turns on during indexing, the motor starts to decelerate and stop. When the pause signal turns on during indexing, the motor starts to decelerate and stops and wait next signal. The pause signal input is continuously monitored to determine if the motion should be stopped or if it may continue.

If the Action When Complete is set the Wait for Start, whenever there is the START signal, it moves to the next index. When the CSD5 servo drive is under homing or indexing, this signal input is ignored. Any starting signal in the middle of In Dwell is ignored.

Inspection and Protection

Introduction

In this chapter, the inspection and the protective function of servo drive are described.

Inspection Function

It describes the basic inspection, abnormality diagnosis and how to take action of servo motor and drive. Also, it describes the protection function of drive and action to take in times of alarm occurs as well as any action to take in times of breakdown following the alarm code.

Inspection of Motor

Motor does not have a brush that causes mechanically abrasive part. A simple inspection is sufficient as follow. By considering the use environment, determine the appropriate inspection time.

Table 7.1 Motor Inspection

Item	Period	Inspection and Repair	Action
Vibration and Noise	Daily Check	Determine with Sense and Hearing	It shall not be larger than normal times
Presence of Eternal Foreign Substance	In Occurrence	Cleaning with Vacuum Cleaner	
Insulation Resistance	1 Year	Measure with Insulation resistance meter 500 [V] 10 [MΩ]	Inquiry to the company if the measuring value is 10 [M Ω] or less
Oil Seal	5000 Hours	Oil Seal Replacement	Only for motor that has oil seal
Overall Inspection	20000 Hours (5 Years)	Inquiry to the Company	Disassembly and worn-out part replacement

CAUTION

In the event of disassemble the servo motor for repair or inspection; a care shall be taken for A/S not available.

Inspection of Drive

Servo drive is equipped with electronic circuit. The dust and foreign substance may cause the breakdown or malfunction that the dust shall be cleaned and tighten the nuts on a regular basis (1-year).

Table 7.2 Servo Drive Inspection

Item	Period	Inspection and Repair	Action
Cleaning of Main Body and Board	Once or more per year	Do not have dust or oil	Clean with compressed air or fabric
Socket, Connector, Nut	Once or more per year	Do not allow loosening of\ socket, connector, nut and others	Do not allow loosening
Abnormal Part on Main Body and Board	Once or more per year	There is no discoloration by heat, damage or open circuit	Inquiry to the company

CAUTION

In the event of disassemble the servo drive for repair or inspection; a care shall be taken for A/S not available.

Part Inspection

The part below may have mechanical abrasion or material degradation. A regular inspection is needed for prevention and preservation.

The life of parts is as below if the ambient temperature annual average is 30 [℃], load rate is less then 80 [%], and operation rate is less than 20 hours/day.

Table 7.3 Servo Dirve's parts life

Part	Use Period
Capacitor	3 Yeas
Cable	3 Yeas (based on flexible cable)
Power Device	3 Yeas
Regeneration Resister	2 Yeas
Dynamic Break Resister	2 Yeas
Fan	2 Yeas
Cooling Fan	4 - 5 Yeas
Fuse	10 Yeas

Protection Function

It describes the equipped protection function and actions taken in times of abnormal operation in order to protect the servo drive and load system. The protection function is classified into two types depending on the importance.

- Servo warning: It displays a minimal abnormality that does not require the suspension of operation when occurred.
- Servo alarm: It displays the very serious abnormality that requires the suspension of operation when occurred.

It is classified depending on the importance, but when an abnormality occurs, remove the cause immediately and use the servo drive in normal condition.

Servo Warning

There is a servo warning that displays a minimal abnormality as the protection function by the self-diagnosis.

Servo Warning Indication

It displays the mark that is applicable to a warning through the Status Display Mode.

The warning is displayed on the 3 digit of 7-segment as shown on the left. The character displayed the normal operation status does not flicker, but once the abnormality applicable for servo warning is sensed, the applicable character is displayed and flickers.

Servo Warning Types

Servo drive displays the warning characters for the following 7 situations.

Indicator	Cause	Action
CnE Absolute Encoder Counter Overflow	In the event the Q Type Absolute Encoder is rotated forward or reverses over 32768 revolutions, it is displayed.	Reset the Absolute Encoder.
bAt Low Voltage of Absolute Encoder Battery	It occurs when the voltage of battery or external power supply of absolute encoder is 3.2 [V] or less.	Replace the battery or external power supply to make sure.[1]
PrE Abnormal Initial Status of Absolute Encoder	During the drive motor for moving the control power has been applied.	After making sure that the motor stops turning off the control power.
oCC Over (external) Current Command	Analog current scale setting Inadequate.	Check if the scale constant is suitable for range of the analog signal.
	The system does not support the motion profile.	• Check the speed loop tuning. • Check the capacity of the system.
	Current limit setting is inappropriate.	Check if the current limit lower than the current limited capacity of the system.
oSC Over(external) Speed Command	Analog current scale setting inadequate.	Check if the scale constant is suitable for range of the analog signal.
	The system does not support the motion profile.	• Check the position loop tuning. • Check the capacity of the system.
PIn Allocation Error of Sequence Input and Output	Digital input or output of the allocation is inappropriate.	• When working in the preset mode, check if it is allocated for preset. • When working in the normal / override mode, check if it is allocated for override function.
CAP Over Motor Capacity	It occurs when motor power is set higher than the drive rated output.	Use a motor suitable to the drive or set the torque limit below the drive capacity.

1 When replacing a battery, absolute position is lost. Homing may be required.

Servo Alarm

For protection function by the self-diagnosis, there is the servo alarm that displays the important errors.

Table 7.4 Servo Alarm Types

Alarm Code	Text Message	Cause	Action
E.004	E.MtrOt	Occurs when the motor overheat switch trips by the following causes. ∞ High ambient temperature surrounding the motor ∞ Excessive current	• Operate within the continuous torque rating (not exceeding) according to the ambient temperature. • Lower the ambient temperature or increase the motor cooling.
Motor overheating		Motor wiring error	• Check the wiring of the motor.
		Unsuitable motor selection	• Check if the motor selected is suitable.
E.005	E.IPMFt	Motor cable shorted	• Check if the motor power cable and the connector are not shorted.
IPM Error		Occurs when the winding wire of the motor is shorted internally.	• . Disconnect the motor power cable from the motor. If the motor will not be rotated by hand, a replacement may be needed.
		Occurs when exceeding the continuous power rating while operating.	• Check if the ambient temperature is too high. • Operate within the continuous power rating. • Decrease the acceleration rate.
		Occurs when an unsuitable IPM output, short circuit or over current exist in the drive.	• Check the wiring connections that go from U, V, and W motor terminals to the DC BUS after disconnecting the power and the motor. If the connections are normal, check the wires between terminals or have the drive repaired.
E.009	E.UdLtG	AC line/AC power input is low.	• Check the voltage level of the incoming AC power. • Check the noise pulse of the AC power or for a voltage drop. • Install an Uninterruptible Power Supply (UPS) to the AC input.
BUS Low Voltage		Attempted to activate the drive without turning on the main power.	• Before activating the drive, turn on the main power.
E.010	E.OuLtG	Occurs when the power regeneration is excessive. That is, the drive generates an error to protect itself from the overload when its main power supply regenerates excessive peak energy while the motor is run by the external mechanical power.	• Check the regenerative circuit. • Adjust the motion profile and keep the regeneration resistance within the limit. • Replace the regenerative transistor. • Replace the drive.
BUS Over Voltage		Excessive AC input voltage	• Confirm the input value.
E.012	E.HFAIL	Homing is incomplete within the time assigned in Homing Time Limit (IN-01.11).	• Increase the time assigned in Homing Time Limit (IN-01.11). • Set the value other than '0' in Homing Speed (IN-01.02) and Creep Speed (IN-01.03). • Check for an obstruction in homing. • Check the homing related parameter setting and mechanical parts.
Home Searching Failed			

Table 7.4 Servo Alarm Types

Alarm Code	Text Message	Cause	Action
E.0018	E.ouSPd Motor Over Speed	Motor speed exceeds the maximum.	• Check the wiring of the encoder. • Retune the drive system. • Check the input gain of the torque or the external speed command.
E.0019	E.PoSEr Over the Position Error Limit	Occurs when the position error exceeds the allowed value..	• Increase the Following Error Limit value. • Check the position loop tuning.
E.0022	E.Conol Motor Continuous Current Overload	Occurs when the internal filter that protects the motor from overheating trips.	• Decrease the acceleration rate. • Decrease the duty cycle (ON/OFF) of the motion assigned. • Increase the time for the motion allowed. • Use a drive or motor with bigger capacity. • Check the tuning.
E.0023	E.drUoL Drive Overload	Occurs when the drive average current exceeding the rated capacity is needed for the motion application.	• Decrease the acceleration rate. • Decrease the duty cycle (ON/OFF) of the motion assigned. • Increase the time for the motion allowed. • Use a drive or motor with bigger capacity. • Check the tuning.
E.0024	E.AbSto Absolute Position Transfer Timeout	/ABS-DT input is not turned on within 5s from Absolute Position Transfer Ready-On during Absolute Position Transfer Mode using photo coupler output.	• Verify the sequential timing of Absolute Position Transfer Ready & /ABS-DT, Absolute Position Transfer Mode input. • Verify continuity of I/O cable and connector.
		/ABS-DT input is not turned off within 5s from Absolute Position Transfer Ready-Off during Absolute Position Transfer Mode using photo coupler output.	
		Absolute Position Transfer Mode input is not turned off within 5s after absolute data transfer completion.	
E.0027	E.notHM Homing Incomplete	Occurs when an axis didn't return to home before the drive can operate an absolute coordinate index.	• Increase the time defined Homing Time Limit(IN-01.11). • Check for an obstruction in homing.
E.0028	E.EnCdE Encoder Date Range Error	Occurs when the encoder is not properly programmed.	• Replace the motor.
		Occurs when the memory of the encoder is damaged.	
E.0030	E.EnCoP Encoder Cable Open	Occurs when the communication with the interactive encoder cannot be established.	• Check the motor selected. • Check whether the motor supports an auto • detection. • Check the wiring of the encoder.
		Hall Error	
E.0031	E.EnCPE Encoder Date Parameter Error	Occurs when the encoder is not properly programmed.	• Replace the motor.
		Occurs when the memory of the encoder is damaged.	

Table 7.4 Servo Alarm Types

Alarm Code	Text Message	Cause	Action
E.036	E.drubt Drive Overheating	Occurs when the drive overheats.	• Check if the cooling pan is working (only applicable to CSD5_08BX1, CSD5_10BX1 and CSD5_15BX1). • Check the tuning. • Decrease the acceleration rate. • Decrease the duty cycle (ON/OFF) of the motion assigned. • Increase the time for the motion allowed. • Use a drive or motor with bigger capacity.
E.037	E.ACoFF AC line Loss	Occurs when the power is low.	• Increase the instant outage compensation time.
		Attempted to activate the drive without turning on the main power.	• Before activating the drive, turn on the main power.
		A phase is not connected.	• Disconnect the power and check all mechanical connections.
		The alarm delay parameter is set too short.	• Increase the Alarm delay parameter value.
E.053	E.PInIt User Parameter Initialization Error	An error exists in the parameter saved in the memory.	• Initialize the parameter. • Reset the values of the drive to the factory.
E.054	E.oFSEt Current Feedback Offset	Defective Hardware	• Replace the drive.
E.055	E.CHSUM User Parameter Checksum Error	Checksum Error	• Check the parameter and reset. • Reset the values of the drive to the factory settings.
E.056	E.CPUFt Watchdog Timeout	Excessive System Noise	• Check the wiring and the installation method.
		Defective Hardware	• Replace the drive.
E.057	E.HWArE PWM Hardware Error	Defective Hardware	• Contact your nearest dealer.
E.058	E.rAnGE User Parameter Range Error	Parameter range is invalid.	• Input the parameter within the range. • Reset the values of the drive to the factory settings.
E.060	E.dInIt Drive Initialization Error	Hardware Error	• Replace the drive.
E.075	E.SHtoL Regenerative Overload Protection	Exceeds the value allowed by the voltage of the regeneration resistance.	• Adjust the motion profile and keep the • regeneration resistance within the limit.
		Regeneration resistance is separated or damaged.	• Check the connection of the regeneration • resistance. • Check the values of the regeneration • resistance.
E.079	E.SHtoC Regenerative Over current Protection	The regenerative current exceeds the allowable instant value.	• Check if the regeneration resistance is shorted or damaged. • Check if the overload energy is excessive while decelerating.

Table 7.4 Servo Alarm Types

Alarm Code	Text Message	Cause	Action
E.083	E.AbSbE Regenerative Over current Protection	The constant of the encoder backup battery is set as 'installed,' but the battery is not installed.	• Set the constant of the encoder backup battery as 'not installed.'
		The battery voltage is detected under 2.7 [V] DC.	• Check the battery voltage and the connections. • Replace the battery.
E.084	E.AbSoS Absolute Encoder Over Speed	The encoder rotates mechanically at high speed while turning off the drive, when it is powered by the battery.	• Remove the motor from the system. • Turn off and on the drive and reset the • Warning.
E.085	E.AbSEt Absolute Encoder Multi-turn Count Error	Noise from Encoder	• Turn off and on the drive and reset the • Warning.
		Defective Encoder	• Replace the motor.
E.100	E.SEtUP Drive Setting	The drive operation mode and the motor selection are not compatible.	• Change the operation mode and/or motor • selection, and reset the drive.
E.101	E.CAbLE Motor Power Cable Open	The motor cable is not connected.	• Check the power connection between the • motor and the drive.
E.102	E.InSOL Motor continuous current overload	The motion profile requires peak current for a lengthy time.	• Check the wiring of the motor. • Adjust the acceleration/deceleration time. • Check if the motor selected is suitable.
		There is a defect in the current feedback detection.	• Check the phase current.
E.103	E.MAtCH Motor Mismatch Fault	The dynamic control current of the selected motor exceeds double the value of the drive peak current rating.	• Install a different motor.
E.105	E.EnCtP Encoder Type Mismatch	The motor encoder signal does not match the drive configuration.	• Check the motor selected.
		Defective Encoder	• Replace the motor.
E.106	E.EnCCE Encoder Communication Error	The wiring between the drive and the encoder is cut off or problematic. Or encoder signals are interrupted by the EMI (noise).	• Check the wiring of the encoder. • Contact your nearest dealer.
E.107	E.SErCE Serial Communication Error	Communication error between the host and the drive (noise)	• Check the serial communication cable. • Check the noise of the serial communication interface.
E.108	E.CdFrE Position Command Frequency Error	The input frequency value exceeds that limit.	• Check if the hardware type selected in the drive matches the physical hardware. • Change from an open collector to a line drive. • Decrease the speed command. • Manipulate the gear.
E.112	E.ESTOP Emergency Stop	Emergency Stop (E-STOP) is detected.	• Remove the emergency stop condition.. • Erase E-STOP signal.
E.113	E.IrAnG Index Position Range Overflow	The constant of the index position deviate the range.	• Use a value in the range between -2,147,483,647 ~ +2,147,483,647.

Table 7.4 Servo Alarm Types

Alarm Code	Text Message	Cause	Action
E.11400	E.oCUr Motor Phase Over current	• When the error occurs while turning on the power, there is a problem in the control or main power circuit. • When this error occurs while in operation, over current exists. (Current that is 300 [%] over the rated current is supplied to the motor at more than 250 [ms]).	• Check the wiring and the power. • Check the power and set or adjust the acceleration/deceleration time.

Parameter List

Introduction

Parameters control CSD5 Servo drive operations. They are grouped by the type of drive, Standard or Indexing, and the settings they define.

Standrad Parameter List

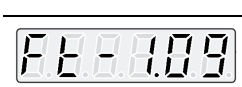
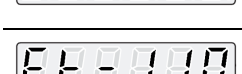
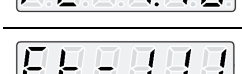
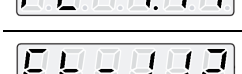
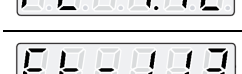
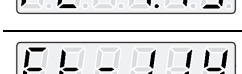
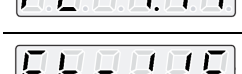
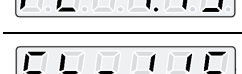
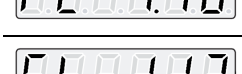
Standard Group 0

No.	Name	Modbus Address	Digit No.	Range	Init.	Note
	Operation Mode	0000	N/A	1~12(F~I)	1(F)	-
	Motor Configuration	0001,0002	N/A			
	Encoder Type		0	0x0~0xF	0x1(9 Line)	-
	Rated Power		1~2	A5,01,02,04, 08,10,15	04(400W)	Power
	Motor Type		3~4		0x11(CSMT)	Motor ID
	Selection of 4 Basic Mode	0003	N/A			Bit Field
	Fault and Disable Braking		0	0~3	0(Brake and Hold)	-
	Over Travel stop method		1	0~1	0(Current control)	1: Dynamic Brake
	Command Polarity		2	0~1	0(Normal)	1: Inverted
	AC Lime Loss Check		3	0~2	0(Enable)	-
	Selection of Auto Tuning Function	0004	N/A			Bit Field
	Off-line Tuning Mode		0	0~2	1(Inertia Moment and RFD)	-
	Auto Tuning Speed		2	2~9	7(700 [rpm])	Value*100 [rpm]

Ft-0.04	Inertia Ratio	0005	N/A	0~6000	100	Value/100
Ft-0.05	Auxiliary Funtion Selection 1	0006	N/A			Bit Field
	Encoder Backup Battery		0	0~1	0(Installed)	-
	Selection of Speed Observer		1	0~1	0(Disabled)	-
	Gain Change Enable		2	0~1	0(Disabled)	-
	Emergency Stop Input		3	0~1	0(Disabled)	-
Ft-0.06	Auxiliary Function Selection 2	0007	N/A			Bit Field
	Automatic Motor Identification		0	0~1	1(Enable)	-
	Incremental Feedback Loss		1	0~1	0(Monitored)	-
	Mode of Gain Change		2	0~9	0	-
	Absolute Feedback Conversion		3	0~2	0	
Ft-0.07	Drive Address	0008	N/A	1~247	1	-
Ft-0.08	Password	0009	N/A	0~9999	0	-
Ft-0.09	Serial Port Configuration	0010	N/A			Bit Field
	RS-232,485 Communication Speed (Baud rate)		0	0~5	5(57600 [bps])	-
	Data bits, Parity, Stop bit		1	0~5	0(88bits, No parity, 1 stop)	-
	Protocol		2	0~1	0(ASCII)	-
	Communication Method		3	0~1	0(RS232)/1(RS485)	-
Ft-0.10	Allocation of Input Signal 1	0011	0x0000~0xabbb	-	0x4bb1	Bit Field
Ft-0.11	Allocation of Input Signal 2	0012	0x0000~0xaaaa	-	0x0765	Bit Field
Ft-0.12	Allocation of Input Signal 3	0013	0x0000~0xaaaa	-	0x0000	Bit Field
Ft-0.13	Allocation of Input Signal 4	0014	0x0000~0xaaaa	-	0x0000	Bit Field
Ft-0.14	Allocation of Input Signal 5	0015	0x0000~0xaaaa	-	0x0000	Bit Field
Ft-0.15	Allocation of Input Signal 6	0016	0x0000~0xaaaa	-	0x0000	Bit Field
Ft-0.16	Allocation of Input Signal 7	0017	0x0000~0xaaaa	-	0x0000	Bit Field

	Allocation of Input Signal 8	0018	0x0000~0xaaaa	-	0x0000	Bit Field
	Allocation of Input Signal 9	0019	0x0000~0xaaaa	-	0x0000	Bit Field
	Reserved	0020	-	-	-	-
	Reserved	0021	-	-	-	-
	Reserved	0022	-	-	-	-
	Allocation of Output Signal 1	0023	0x0000~0x6666	-	0x0321	Bit Field
	Allocation of Output Signal 2	0024	0x0000~0x6666	-	0x0000	Bit Field
	Allocation of Output Signal 3	0025	0x0000~0x0066	-	0x0000	Bit Field
	Allocation of Output Signal 4	0026	0x0000~0x6666	-	0x0000	Bit Field
	Allocation of Output Signal 5	0027	0x0000~0x6666	-	0x0000	Bit Field
	Allocation of Output Signal 6	0028	0x0000~0x0066	-	0x0000	Bit Field
	Reserved	0029	-	-	-	-
	Reserved	0030	-	-	-	-
	Reserved	0031	-	-	-	-
	Reserved	0032	-	-	-	-
	I/O Control Authority	0033	0x00~0x12	-	0x00	Bit Field

Standard Group 1

No.	Name	Modbus Address	Digit No.	Range	Init.	Note
	Speed Regulator Response Level	0100	N/A	1~150	50	[%]
	System Gain	0101	N/A	10~500	50	[Hz]
	Velocity Regulator P Gain	0102	N/A	0~10000	60	-
	Velocity Regulator I Gain	0103	N/A	0~60000	26	-
	Velocity Regulator D Gain	0104	N/A	0~1000	0	-
	Velocity Error Filter	0105	N/A	0~2500	30	[Hz]
	Position Regulator Kp Gain	0106	N/A	0~700	20	[Hz]
	Current Command Lowpass Filter Bandwidth	0107	N/A	0~10000	300	[Hz]
	Velocity Command Lowpass Filter Bandwidth	0108	N/A	0~10000	1000	[Hz]
	Position Command Lowpass Filter Bandwidth	0109	N/A	0~1000	0	[Hz]
	1st Resonant Frequency Suppression Filter	0110	N/A	0~10000	10000	[Hz]
	1st Resonant Frequency Suppression Filter Width	0111	N/A	1~20	10	-
	2nd Resonant Frequency Suppression Filter	0112	N/A	0~10000	10000	[Hz]
	2nd Resonant Frequency Suppression Filter Width	0113	N/A	1~20	10	-
	2nd Resonant Frequency Suppression Filter Depth	0114	N/A	0~100	100	-
	Position Regulator Kff Gain	0115	N/A	0~100	0	%
	Position Regulator Kff Bandwidth	0116	N/A	0~2500	200	[Hz]
	Velocity Regulator I Gain mode	0117	N/A	0~4	0 (PI Mode)	Bit Field

Ft-1.18	Velocity Regulator I Gain disable threshold	0118	N/A	0~3000	100	-
Ft-1.19	Position Regulator High Error Output Offset	0119	N/A	0~450	0	[rpm] or [mm/ sec]
Ft-1.20	Position Regulator High Error Output Threshold	0120	N/A	0~50000	1000	pulse
Ft-1.21	Current Regulator Bandwidth	0121	N/A	0~2	1	Bit Field
Ft-1.22	On-line Vibration Mode	0122	N/A	-	-	-
	On-line Vibration Suppression Mode		0	0~2	0 (Disable)	-
	On-line Vibration Suppression Gain		1	0~1	0 (Low)	-
Ft-1.23	Velocity Command Filter on Follower	0123	1	0~1	0 (Disable)	Bit Field
Ft-1.24	Delay Time of Gain Switching	0124	N/A	0~10000	0	-
Ft-1.25	Level of Gain Switching	0125	N/A	0~10000	0	-
Ft-1.26	Hysteresis of Gain Switching	0126	N/A	0~10000	0	-
Ft-1.27	Position Gain Switching Time	0127	N/A	0~10000	0	-
Ft-1.28	2nd Velocity Regulator P Gain	0128	N/A	0~10000	60	-
Ft-1.29	2nd Velocity Regulator I Gain	0129	N/A	0~60000	26	-
Ft-1.30	2nd Position Regulator Kp Gain	0130	N/A	0~700	20	[Hz]
Ft-1.31	2nd Current Command Lowpass Filter Bandwidth	0131	N/A	0~10000	300	[Hz]
Ft-1.32	2nd Velocity Command Lowpass Filter Bandwidth	0132	N/A	0~10000	1000	[Hz]
Ft-1.33	3rd Velocity Regulator P Gain	0133	N/A	0~10000	60	-
Ft-1.34	3rd Velocity Regulator I Gain	0134	N/A	0~60000	26	-
Ft-1.35	3rd Position Regulator Kp Gain	0135	N/A	0~700	20	[Hz]

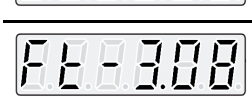
	3rd Current Command Lowpass Filter Bandwidth	0136	N/A	0~10000	300	[Hz]
	3rd Velocity Command Lowpass Filter Bandwidth	0137	N/A	0~10000	1000	[Hz]
	4th Velocity Regulator P Gain	0138	N/A	0~10000	60	-
	4th Velocity Regulator I Gain	0139	N/A	0~60000	26	-
	4th Position Regulator Kp Gain	0140	N/A	0~700	20	[Hz]
	4th Current Command Lowpass Filter Bandwidth	0141	N/A	0~10000	300	[Hz]
	4th Velocity Command Lowpass Filter Bandwidth	0142	N/A	0~10000	1000	[Hz]

Standard Group 2

No.	Name	Modbus Address	Digit No.	Range	Init.	Note
	Velocity Scale	0200	N/A	10.0~2000.0	500.0	[rpm/V] or [mm/sec/V]
	Jog Velocity Command	0201	N/A	0~6000	50	[rpm] or [mm/sec]
	Acceleration	0202, 0203	N/A	1~2147483647	41667	10^{-2}xRev/sec^2, or mm/sec^2
	Deceleration	0204, 0205	N/A	1~2147483647	41667	10^{-2}xRev/sec^2, or mm/sec^2
	S-Curve Time	0206	N/A	0~5000	0	[ms]
	Preset Velocity 1	0207	N/A	-6000~6000	0	[rpm] or [mm/sec]
	Preset Velocity 2	0208	N/A	-6000~6000	0	[rpm] or [mm/sec]
	Preset Velocity 3	0209	N/A	-6000~6000	0	[rpm] or [mm/sec]
	Preset Velocity 4	0210	N/A	-6000~6000	0	[rpm] or [mm/sec]

	Preset Velocity 5	0211	N/A	-6000~6000	0	[rpm] or [mm/sec]
	Preset Velocity 6	0212	N/A	-6000~6000	0	[rpm] or [mm/sec]
	Preset Velocity 7	0213	N/A	-6000~6000	0	[rpm] or [mm/sec]
	Manual Velocity Limit	0214	N/A	1~6000	5000	[rpm] or [mm/sec]
	Velocity Limit Mode	0215	N/A	0~3	0	Bit Field

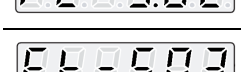
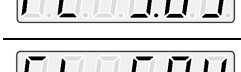
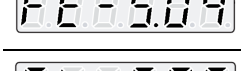
Standard Group 3

No.	Name	Modbus Address	Digit No.	Range	Init.	Note
	Command Type	0300	0	0~6	0 (Step Up/Step Down)	-
	Controller Output Type		1	0~2	0 (Line Drive)	-
	Encoder Output Forward Direction		2	0~1	0 (A lead B at Fwd Dir)	-
	1st Gear Ratio Change		3	0~1	0 (Enable Only on Disabled)	-
	1st Gear Ratio, Follower count (Numerator)	0301	N/A	1~65535	4	-
	1st Gear Ratio, Master count (Denominator)	0302	N/A	1~65535	1	-
	Encoder Output Ratio, Output (Denominator)	0303	N/A	1~32768	1	-
	Encoder Output Ratio, Motor (Numerator)	0304	N/A	1~32768	1	-
	2nd Gear Ratio, Follower count	0305	N/A	1~65535	4	-
	2nd Gear Ratio, Master count	0306	N/A	1~65535	1	-
	Reserved	0307	-	-	-	-
	Digital Filter Cutoff Frequency	0308		N/A	-	Bit Field
	Line Drive		0	0~7	3 (1.00MHz)	-
	Open Collector		1	0~7	7 (0.525MHz)	-
	High Frequency Line Drive		2	0~7	0 (3.000MHz)	-

Standard Group 4

No.	Name	Modbus Address	Digit No.	Range	Init.	Note
	Current Scale	0400	N/A	0~1000	333	[%] of motor rated/[V]
	Positive Internal Current Limit	0401	N/A	0~500	300	[%] of motor rated
	Negative Internal Current Limit	0402	N/A	0~500	300	[%] of motor rated
	Positive External Current Limit	0403	N/A	0~500	100	[%] of motor rated
	Negative External Current Limit	0404	N/A	0~500	100	[%] of motor rated
	Over Travel Current Limit	0405	N/A	0~500	300	[%] of motor rated
	Initial Current Bias	0406	N/A	-100~100	0	[%] of motor rated

Standard Group 5

No.	Name	Modbus Address	Digit No.	Range	Init.	Note
	In Position Size	0500	N/A	0~2500	10	pulse
	Reserved	0501	N/A	-	-	-
	Near Position Size	0502	N/A	0~2500	20	pulse
	Speed Window	0503	N/A	0~1000	10	pulse
	Up to Speed	0504	N/A	0~5000	20	pulse
	Zero Clamp	0505	N/A	0~5000	0	[rpm]
	Brake Inactive Delay	0506	N/A	0~10000	0	[ms]
	Disable Delay	0507	N/A	0~10000	0	[ms]
	Brake Active Delay	0508	N/A	0~10000	500	[ms]
	Disabled Braking Speed	0509	N/A	0~1000	100	[rpm]

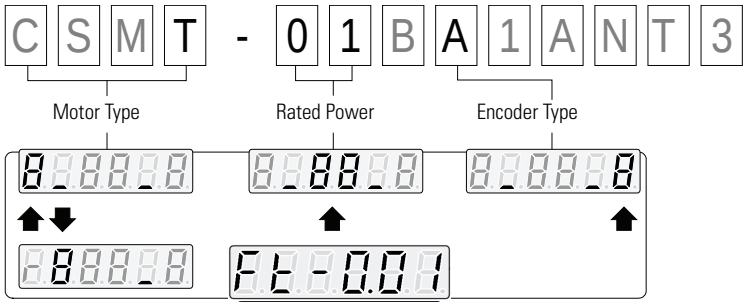
Ft-5.10	Following Error Limit	0510, 0511	N/A	0~2147483647	99999	pulse
Ft-5.11	Reserved	0512	N/A	-	-	-
Ft-5.12	AC Line Loss Fault Delay	0513	N/A	20~1000	20	[ms]
Ft-5.13	Analog Output CH1 Selection	0514, 0515	N/A	0~28	0 (Velocity Feedback)	-
Ft-5.14	Analog Output CH2 Selection	0516, 0517	N/A	0~28	1 (Velocity Command)	-
Ft-5.15	Analog Output CH1 Scale	0518, 0519	N/A	1~99999	500	Depend on [Ft-5.13]
Ft-5.16	Analog Output CH2 Scale	0520, 0521	N/A	1~99999	500	Depend on [Ft-5.14]

Standrad Parameter Description

Standard Group 0

Ft-0.00	**Operations Mode** RSWare : Drive - Operation Modes (Main/Override)	
Description	Set control mode (Optional)	
Display (Value)	Operating Mode	RSWare Name
F(1)	Position Control Mode	Follower/None
S(2)	Speed Contorl Mode	Analog Velocity Input/ None
C(3)	Torque Contorl Mode	Analog Current Input/ None
SF(4)	Speed+Position Contorl Mode	Analog Velocity Input/ Follower
CF(5)	Torque+Speed Contorl Mode	Analog Velocity Current/ Follower
CS(6)	Torque+Speed Contorl Mode	Analog Current Input/Analog Velocity Input
P(7)	Multi-Step Speed + Speed Contorl Mode	Preset Velocity / None
PF(8)	Multi-Step Speed + Position Contorl Mode	Preset Velocity / Follower
PS(9)	Multi-Step Speed + Torque Control Mode	Preset Velocity/ Analog Velocity Input
PC(10)	Multi-Step Speed + Torque Contorl Mode	Preset Velocity/ Analog Current Input
I(12)	Indexing	Indexing Input/ None

Initial Value	1(F)
Applicable Operating Mode	All
When Enabled	Servo-Off > Setting > After Power Cycle

Ft-0.01	**Motor Configuration** RSWare : Drive - Motor - Motor Model
Applicable Operating Mode	All
Description	Set motor type
Setting Value	• Set items such as motor type, motor rated output, and encoder type. • Check out model name attached motor nameplate. • With Up/Down direction key, Alphabet and Mumbers of item are displayed. Example displays of model attached motor nameplate is as follow. Fill correct information in corresponding position according to following picture. 

Ft-0.02	**Selection of 4 Basic Mode**		
Applicable Operating Mode	All		
Data Size	4 digits		
Digit 0	Fault and Disable Braking RSWare : Drive - Stopping Functions - Fault and Disable Braking		
Range	Value	Description	RSWare Name
	0	Keep DB after DB stop	Brake and hold
	1	DB is released after DB stop	Brake and release
	2	Stop Free run (operation) without DB stop	Free Stop
	3	Keep DB after stop Free run	Free Stop and hold
Initial Value	0		
Digit 1	Overtravel stop method RSWare : Drive - Stopping Functions - Overtravel Stop Method		
Range	Value	Description	RSWare Name
	0	Stop by normal torque contorl during overtravel. At this monent,can contorl torque by setting overtravel torque linit [Ft-4.05].	Current Control
	1	Stop by the method set at the DB stop method selection in [Ft-0.02] when overtravel occurs.	Dynamic Brake

Initial Value	0		
Digit 2	Motor Forward Dir. RSWare : Drive - Command Polarity		
Range	Value	Description	RSWare Name
	0	The command signal is not inverted so that a positive command value results in CW Rotation, (as viewed from shaft end).	Normal
	1	The command signal is inverted so that a positive command value results in CCW Rotation, (as viewed from shaft end).	Inverted
Initial Value	0		
Digit 3	Power Input RSWare : Drive - AC Line Loss Check		
Range	Value	Description	RSWare Name
	0	Check input power 50~400W Servo Drive: Enable single-phase open check 800~1.5kW Servo Drive: 3-phase open check	Enable
	1	Do not check the input power	Disable
	2	Single-phase input	Single phase input
Initial Value	0		

	**Selection of Auto Tuning Function**		
Applicable Operating Mode	All		
Data Size	4 digits		
Digit 0	Off-Line Tuning Mode RSWare : Drive - Tuning - Autotuning - Off-Line Tuning Mode		
Range	Value	Descirption	RSWare Name
	0	Inertia Moment Estimation	Inertia Moment Estimation
	1	Inertia Moment Estimation and Resonant Frequency Detection	Inertia Moment Estimation and Resonant Frequency Detection
	2	Resonance frequency Detection	Resonant Frequency Detection
Initial Value	1		
Digit 1	Reserved		
Digit 2	Autotuning Speed RSWare : Drive - Tuning - Autotuning - Autotuning Speed		
Range	Value	Description	
	2-9	The larger the setting value, the higher speed.	
Initial Value	7		
Unit	Setting value* 100 [rpm]		
Digit 3	Dynamic Tuning Response RSWare: Online Tuning Response		
Range	Value	Description	
	0	Off	
	1	Slowest	

	2	Slowest
	3	Slow
	4	Medium-Slow
	5	Medium
	6	Medium-Fast
	7	Fast
	8	Faster
	9	Faster
Initial Value	0	
When Enabled	Servo-Off > Setting	

	**Inertia Ratio** RSWare : Drive - Motor - Inertia Ratio
Description	Inertial Ratio shows Load Inertia to Motor
Range	0 ~ 6,000
Initial Value	100
Unit	(Load inertia/Motor inertia) / 100
When Enabled	Immediately

	**Auxiliary Function Selection 1**		
Applicable Operation Mode	All		
Data Size	4 digits		
Digit 0	Encoder Backup Battery RSWare : Drive - Encoder - Encoder Backup Battery		
Range	Value	Description	
	0	Backup Battery Installed	
	1	Backup Battery Not Installed	
Initial Value	0		
Digit 1	Velocity Observer RSWare : Drive - Auxiliary Function Selection 1 - Velocity Observer		
Range	Value	Description	RSWare Name
	0	Disable	Disable
	1	Enable	Enable
Initial Value	0		
Digit 2	Gain Change Enable RSWare : Drive - Tuning - Gain Change Enable		

Range	Value	Description	RSWare Name
	0	Disable	Disable
	1	Enable	Enable
Initial Value	0		
Digit 3	Emergency Stop Input RSWare : Drive - Auxiliary Function Selection 1 - Emergency Stop Input		
Range	Value	Description	RSWare Name
	0	Disable	Disable
	1	Enable	Enable
Initial Value	0		
When Enabled	Servo-Off > Setting > After power cycle		

	**Auxiliary function Selection 2**
Applicable Operation Mode	All
Data Size	2 digits
Digit 0	Automatic Motor Identification RSWare : Drive - Auto Motor Iden
Range	Value: 0 — Description: Disabled — RSWare Name: Disable Value: 1 — Description: Enabled — RSWare Name: Enable
Initial Value	1
Digit 1	Incremental Feedback Loss RSWare : Drive - Encoder - Incremental Feedback Loss
Range	Value: 0 — Description: Monitored — RSWare Name: Monitored Value: 1 — Description: Ignored — RSWare Name: Ignored
Initial Value	0
Digit 2	Mode of Gain Switching RSWare : Drive - Tuning - Mode of Gain Switching

Range	Value	Description	RSWare Name
	0	Fixed to the 1st gain.	1st Gain Fix
	1	Fixed to 2nd gain.	2nd Gain Fix
	2	2nd gain selection when the gain switching input is turned on.	Digital Input (G-SEL)
	3	2nd gain selection when the toque command is larger than the setups (level of gain control switching and hysteresis of control switching).	Torque Command
	4	2nd gain selection when the command speed is larger than the setups (level of gain control switching and hysteresis of control switching).	Velocity Command
	5	2nd gain selection when the positional deviation is larger than the setups (level of gain control switching and hysteresis of control switching).	Position Error
	6	2nd gain selection when more than one command pulse exists between 200usec.	Position Command
	7	2nd gain selection when the positional deviation counter value exceeds the setup of Positioning completer range.	In-Position
	8	2nd gain selection when the motor actual speed exceeds the setup (level of gain control switching and hysteresis of control switching). Switches to the 2nd gain while the position command exists.	Velocity
	9	Switches to the 1st gain when no-position command status lasts for the setup of delay time of gain switching [x 200usec] and the speed falls slower than the setups of gain control switching level and hysteresis of control switching.	Position command and Speed
Initial Value	0		
Digit 3	Absolute Feedback Transfer Type RSWare : Drive - Absolute Feedback Transfer Type		
Range	Value	Description	RSWare Name
	0	Same as Command Polarity	Same as Command Polarity
	1	Always CCW	Always CCW
	2	Always CW	Always CW
Initial Value	0		
When Enabled	Immediately		

	**Drive Address** RSWare : Drive - Communications - Drive Address
Applicable Operating Mode	All
Range	1-247
Initial Value	1

When Enabled	Immediately

	**Password**
Applicable Operating Mode	
Range	
Initial Value	
When Enabled	

	**Serial Port Configuration** RSWare : Drive - Communications		
Applicable Operating Mode	All		
Data Size	4 digits		
Digit 0	RS-232C, RS-485 Baud Rate RSWare : Drive - Communications - Baudrate		
Range	Value	Descriptions	RSWare Name
	0	9600bps	9600bps
	1	14400bps	14400bps
	2	19200bps	19200bps
	3	38400bps	38400bps
	4	56000bps	56000bps
	5	57600bps	57600bps
Initial Value	5		
Digit 1	Data bits, Parity, Stop bit RSWare : Drive - Communications - Frame Format		
Range	Value	Description	RSWare Name
	0	8, No, 1	8 Data, No Parity, 1 Stop bit
	1	8, Even, 1	8 Data, Even Parity, 1 Stop bit
	2	8, Odd, 1	8 Data, Odd Parity, 1 Stop bit
	3	8, No, 2	8 Data, No Parity, 2 Stop bit
	4	8, Even, 2	8 Data, Even Parity, 2 Stop bit
	5	8, Odd, 2	8 Data, Odd Parity, 2 Stop bit
Initial Value	0		
Digit 2	Protocol RSWare : Drive - Communications - Protocol		
Range	Value	Description	RSWare Name
	0	ASCII	ASCII
	1	MODBUS-RTU	MODBUS-RTU
Initial Value	0		

Digit 3	Communication Method		
Range	Value	Description	RSWare Name
	0	RS232	RS232
	1	RS485	RS485
Initial Value	0		
When Enabled	Immediately		

	**Allocation of Input Signals 1** RSWare : Drive - Digital Inputs			
Rage for All Digits	0-B, Where 0 is Off, B is On, and 1-A are digital input			
Data Size	4 digits			
Digit	Description	Init.	Unmapped IO Status	RSWare Parameter
0	Drive Enable (/SV-ON)	1	ON	Drive Enable
1	Positive Over-travel (P-OT)	b	ON	Overtravel - Positive
2	Negative Over-travel (N-OT)	b	ON	Overtravel - Negative
3	Integrator Inhibit (/P-CON)	4	OFF	Integrator Inhibit
Applicable Operating Mode	All			
When Enabled	Seveo Off > Setting			

	**Allocation of Input Signals 2** RSWare : Drive - Digital Inputs			
Range for All Digits	0-B, Where 0 is Off, B is On, and 1-A are digital input			
Data Size	4 digits			
Digit	Description	Init.	Unmapped IO Status	RSWare Name
0	Fault Reset (/A-RST)	5	OFF	Fault Reset
1	Negative Current Limit (/N-TL)	6	OFF	Current Limit - Negative
2	Positive Current Limit (/P-TL)	7	OFF	Current Limit - Positive
3	Operation Mode Override (/C-SEL)	0	OFF	Operation Mode Override
Applicable Operating Mode	All			
When Enabled	Seveo Off > Setting			

	**Allocation of Input Signals 3** RSWare : Drive - Digital Inputs
Range for All Digits	0-B, Where 0 is Off, B is On, and 1-A are digital input

Data Size	4 digits			
Digit	Description	Init.	Unmapped IO Status	RSWare Name
0	Preset Direction (/C-DIR)	0	OFF	Preset Direction
1	Preset Select 1 (/C-SP1)	0	OFF	Preset Select 1
2	Preset Select 2 (/C-SP2)	0	OFF	Preset Select 2
3	Preset Select 3 (/C-SP3)	0	OFF	Preset Select 3
Applicable Operating Mode	All			
When Enabled	Seveo Off > Setting			

	**Allocation of Input Signals 4** RSWare : Drive - Digital Inputs			
Range for All Digits	0-B, Where 0 is Off, B is On, and 1-A are digital input			
Data Size	4 digits			
Digit	Description	Init.	Unmapped IO Status	RSWare Name
0	Zero Speed Clamp Enable (/Z-CLP)	0	OFF	Zero Speed Clamp Enable
1	Pause Follower (/INHIBIT)	0	OFF	Pause Follower
2	Alternate Gain Select (/G-SEL)	0	OFF	Alternate Gain Select
3	Position clear (/PCLR)	0	OFF	Position Clear
Applicable Operating Mode	All			
When Enabled	Seveo Off > Setting			

	**Allocation of Input Signals 5** RSWare : Drive - Digital Inputs			
Range for All Digits	0-B, Where 0 is Off, B is On, and 1-A are digital input			
Data Size	4 digits			
Digit	Description	Init.	Unmapped IO Status	RSWare Name
0	Position Strobe (/ABS-DT)	0	OFF	Position Strobe
1	Start (/START)	0	OFF	Motor Moving Enable
2	Analog Speed Command Select 4 (/C-SP4)	0	OFF	Analog Speed Command Enable
3	2nd Electronic Gear Bank Selection (/ GEAR)	0	OFF	2nd Electronic Gear Bank Selection
Applicable Operating Mode	All			
When Enabled	Seveo Off > Setting			

	**Allocation of Input Signals 6** RSWare : Drive - Digital Inputs			
Data Size	4 digits			
Digit	Description	Init.	Unmapped IO Status	RSWare Name
0	Reset multi-turn data of Absolute Encoder (/R-ABS)	0	OFF	Reset Multiturn Data
1	Gain Bank Select (/BANK_SEL)	0	OFF	Gain Bank Select
2	Analog Current Limit (/A-CL)	0	OFF	Analog Current Limit
3	Absolute Position Data Transfer Mode (/ABS-MD)	0	OFF	Absolute Position Transfer Mode
Applicable Operating Mode	All			
When Enabled	Seveo Off > Setting			

	**Allocation of Input Signals 7** RSWare : Drive - Digital Inputs			
Data Size	4 digits			
Digit	Description	Init.	Unmapped IO Status	RSWare Name
0	Home Sensor (/H_SENS)	0	OFF	Home Sensor
1	Start Homing (/SHOME)	0	OFF	Start Homing
2	Stop Indexing (/STOP)	0	OFF	Stop Indexing
3	Pause Indexing (/PAUSE)	0	OFF	Pause Indexing
Applicable Operating Mode	I			
When Enabled	Seveo Off > Setting			

	**Allocation of Input Signals 8** RSWare : Drive - Digital Inputs			
Data Size	4 digits			
Digit	Description	Init.	Unmapped IO Status	RSWare Name
0	Index Select 0 Input (/I_SEL0)	0	OFF	Indexing Select 0 Input
1	Index Select 1 Input (/I_SEL1)	0	OFF	Indexing Select 1 Input
2	Index Select 2 Input (/I_SEL2)	0	OFF	Indexing Select 2 Input

3	Index Select 3 Input (/I_SEL3)	0	OFF	Indexing Select 3 Input
Applicable Operating Mode	I			
When Enabled	Seveo Off > Setting			

	**Allocation of Input Signals 9** RSWare : Drive - Digital Inputs			
Data Size	4 digits			
Digit	Description	Init.	Unmapped IO Status	RSWare Name
0	Index Select 4 Input (/I_SEL4)	0	OFF	Indexing Select 4 Input
1	Index Select 5 Input (/I_SEL5)	0	OFF	Indexing Select 5 Input
2	Stop Homing (/H_STOP)	0	OFF	Stop Homing
3	Start Indexing (/START_I)	0	OFF	Start Index
Applicable Operating Mode	I			
When Enabled	Seveo Off > Setting			

	**Allocation of Input Signals 10** RSWare : Drive - Digital Inputs		
Data Size	4 digit		
Digit	Description	Init.	Unmapped IO Status
0	Reserved	0	OFF
1	Reserved	0	OFF
2	Reserved	0	OFF
3	Reserved	0	OFF
Applicable Operating Mode	Reserved		
When Enabled	Reserved		

	**Allocation of Input Signals 11**		
Data Size	4 digit		
Digit	Description	Init.	Unmapped IO Status
0	Reserved	0	OFF
1	Reserved	0	OFF
2	Reserved	0	OFF

3	Reserved	0	OFF
Applicable Operating Mode	Indexing		
When Enabled	Reserved		

	**Allocation of Input Signals 12**		
Data Size	4 digit		
Digit	Description	Init.	Unmapped IO Status
0	Reserved	0	OFF
1	Reserved	0	OFF
2	Reserved	0	OFF
3	Reserved	0	OFF
Applicable Operating Mode	Reserved		
When Enabled	Seveo Off > Setting		

Setting Value (Ft-0.10~21)	B	A	9	8	7	6	5	4	3	2	1	0
Input Channel No.	Input Signal On	10	9	8	7	6	5	4	3	2	1	Input Signal Off
I/O Pin No.		28	27	26	9	8	7	6	5	4	3	

	**Allocation of Output Signals 1** RSWare : Drive - Digital Outputs		
Range for All Digits	0-3, Where 0 is Off, and 1-6 are digital output		
Data Size	4 digits		
Digit	Description	Init.	RSWare Name
0	Within Position Window (/P-COM)	1	Within Position Window
1	Up to Speed (/TG-ON)	2	Up to Speed
2	Brake Contorl (BK)	3	Brake
3	Within Speed Window (/V-COM)	0	Within Speed Window
Applicable Operating Mode	All		
When Enabled	Servo Off > Setting		

	**Allocation of Output Signals 2** RSWare : Drive - Digital Outputs

Range for All Digits	0-3, Where 0 is Off, and 1-6 are digital output		
Data Size	4 digits		
Digit	Description	Init.	RSWare Name
0	Current Limited (/T-LMT)	0	Current Limited
1	Velocity Limited (/V-LMT)	0	Velocity Limited
2	Within Near Window (/NEAR)	0	Within Near Window
3	Warning (/WARN)	0	Warning
Applicable Operating Mode	All		
When Enabled	Servo Off > Setting		

	**Allocation of Output Signals 3** RSWare : Drive - Digital Outputs		
Range for All Digits	0-3, Where 0 is Off, and 1-6 are digital output		
Data Size	4 digits		
Digit	Description	Init.	RSWare Name
0	Absolute Position Valid (/A-VLD)	0	Absolute Position Valid
1	Servo drive ready (/RDY)	0	Ready
2	Reserved	0	
3	Reserved	0	
Applicable Operating Mode	All		
When Enabled	Servo Off > Setting		

	**Allocation of Output Signals 4** RSWare : Drive - Digital Outputs		
Range for All Digits	0-3, Where 0 is Off, and 1-6 are digital output		
Data Size	4 digits		
Digit	Description	Init.	RSWare Name
0	In Motion (/IMO)	0	In Motion
1	In Dwell (/I-DW)	0	In Dwell
2	Axis Homed (/HOMC)	0	Axis Homed
3	Index Select 0 Out (/O_ISEL0)	0	Index Select 0 Out
Applicable Operating Mode	I		
When Enabled	Servo Off > Setting		

	**Allocation of Output Signals 5** RSWare : Drive - Digital Outputs		
Range for All Digits	0-3, Where 0 is Off, and 1-6 are digital output		
Data Size	4 digits		
Digit	Description	Init.	RSWare Name
0	Index Select 1 Out (/O_ISEL1)	0	Index Select 1 Out
1	Index Select 2 Out (/O_ISEL2)	0	Index Select 2 Out
2	Index Select 3 Out (/O_ISEL3)	0	Index Select 3 Out
3	Index Select 4 Out (/O_ISEL4)	0	Index Select 4 Out
Applicable Operating Mode	I		
When Enabled	Servo Off > Setting		

	**Allocation of Output Signals 6** RSWare : Drive - Digital Outputs		
Range for All Digits	0-3, Where 0 is Off, and 1-6 are digital output		
Data Size	4 digits		
Digit	Description	Init.	RSWare Name
0	Index Select 5 Out (/O_ISEL5)	0	Index Select 5 Out
1	End of Sequence (/E_SEQU)	0	End of Sequence
2	Reserved	0	
3	Reserved	0	
Applicable Operating Mode	I		
When Enabled	Servo Off > Setting		

	**Allocation of Output Signals 7** RSWare : Drive - Digital Outputs	
Digit	Description	Init.
0	Reserved	0
1	Reserved	0
2	Reserved	0
3	Reserved	0
Applicable Operating Mode	Reserved	
When Enabled	Reserved	

	**Allocation of Output Signals 8** RSWare : Drive - Digital Outputs	
Range for All Digits	0-3, Where 0 is Off, and 1-6 are digital output	
Data Size	4 digits	
Digit	Description	Init.
0	Reserved	0
1	Reserved	0
2	Reserved	0
3	Reserved	0
Applicable Operating Mode	Reserved	
When Enabled	Reserved	

	**Allocation of Output Signals 9** RSWare : Drive - Digital Outputs	
Range for All Digits	0-3, Where 0 is Off, and 1-6 are digital output	
Data Size	4 digits	
Digit	Description	Init.
0	Reserved	0
1	Reserved	0
2	Reserved	0
3	Reserved	0
Applicable Operating Mode	Reserved	
When Enabled	Reserved	

	**Allocation of Output Signals 10** RSWare : Drive - Digital Outputs	
Range for All Digits	0-3, Where 0 is Off, and 1-6 are digital output	
Data Size	4 digits	
Digit	Description	Init.
0	Reserved	0
1	Reserved	0
2	Reserved	0
3	Reserved	0
Applicable Operating Mode	Reserved	
When Enabled	Reserved	

	**I/O Contorl**	
Description	Run & Input Control Selection It is used for selection of run-xx or Input function using Modbus. Input function on Hardware cannot be used in case that the input function is used by Modbus with this parameter. Run function cannot be used by key pad, similarly, if the run function is used by Modbus. 0x00 - Not use both Run and Input function by Modbus 0x01 - Use Input function only 0x10 - Use run function only 0x11 - Use both Run and Input function by Modbus 0x12 - Use Run nput , Input function and Special Function by Modbus	
Data Size	2 digits	
Digit 0	Drive -Communications-MODBUS Input Function Control RSWare: MODBUS Input Function Control	
Range	Value	RSWare Name
	0x0	Disable
	0x1	Enable
	0x11	Disable + Special Function
Unit	-	
Initial Value	0	
Digit 1	MODBUS Run Function Control RSWare: Drive -Communications-MODBUS Run Function Control	
Range	Value	RSWare Name
	0x0	Disable
	0x10	Enable
Initial Value	0	
Applicable Operation Mode	All	
When Enabled	Servo Off > Setting	

Standard Group 1

	**Velocity Regulator Response level** RSWare : Drive - Tuning - Velocity Regulator Response Level
Description	Set system gain in proportion to speed response level automatically by referring the estimated inertia ratio after auto tuning.
Range	1~150
Initial Value	50
Unit	[%]
Applicable Operating Mode	All
When Enabled	Immediately

	**System Gain** RSWare : Drive - Tuning - System Gain
Description	• A higher value results in higher position/speed/torque related gain values and higher responsiveness. (However, excessive values can result in noise and vibrations) • Conversely, lower values result in smaller gain and lower responsiveness; however, the whole system's stability is increased. • Refers to the bandwidth of the entire speed control loop. • When this value is changed, the gain values [Ft-1.02], [Ft-1.03], [Ft-1.06],[Ft-1.07], [Ft-1.08] are set automatically according to the control mode while referring to the inertia ratio parameter [Ft-0.04]. • The lower limit is 10 [Hz].
Range	10~500
Initial Value	50
Unit	[Hz]
Applicable Operating Mode	All
When Enabled	Immediately

	**Speed Regulator P Gain** RSWare : Drive - Tuning - Main Velocity Regulator Gains - P
Description	• Parameter which determines the responsiveness of speed control. • Value changed simultaneously with change of inertia ratio [Ft-0.04] or system gain [Ft-1.01].
Range	0~10000
Initial Value	60
Unit	-
Applicable Operating Mode	F, S, P
When Enabled	Immediately

	**Speed Regulator I Gain** RSWare : Drive - Tuning - Main Velocity Regulator Gains - Integrator Gain
Description	• Removes steady state speed tolerance. • Overshoot in speed response can occur if set value is too large. • Value changed by change in inertia ratio [Ft-0.04] or system gain [Ft-1.00].
Range	0~60000
Initial Value	26
Unit	-
Applicable Operating Mode	F, S, P
When Enabled	Immediately

	**Speed Regulator D gain** RSWare : Drive - Tuning - Main Velocity Regulator Gains - D
Description	The larger the setting value, the higher speed. Excessive values can result in noise and vibration.
Range	0~1000
Initial Value	0
Unit	-
Applicable Operating Mode	F, S, P
When Enabled	Immediately

	**Speed Error Filter** RSWare : Drive - Tuning - Main Velocity Regulator Gains - Error Filter Bandwidth
Description	Suppresses high frequency components of speed tolerance.
Unit	0~2500
Initial Value	30
Unit	[Hz]
Applicable Operating Mode	F, S, P
When Enabled	Immediately

	**Position Regulator Kp Gain** RSWare : Drive - Tuning - Main Position Regulator Gains - Kp
Description	• Parameter which determines the responsiveness of position control. • Change set value according to rigidity of load. • Value changed according to system gain [Ft-1.01].
Unit	0~700

Initial Value	20
Unit	[Hz]
Applicable Operating Mode	F
When Enabled	Immediately

	**Current Command Low pass Filter Bandwidth** RSWare : Drive - Tuning - Main Current Regulator Gains - Low Pass Filter Bandwidth
Description	• Suppresses high frequency components of torque command. • Value changed according to system gain [Ft-1.01].
Unit	0~10000
Initial Value	300
Unit	Hz
Applicable Operating Mode	All
When Enabled	Immediately

	**Speed Command Low pass Filter Bandwidth** RSWare : Drive - Tuning - Main Velocity Regulator Gains - Low Pass Filter Bandwidth
Description	• Sets low pass cutoff frequency of speed command to suppress high frequency components. • Value changed according to system gain [Ft-1.01].
Unit	0~10000
Initial Value	1000
Unit	Hz
Applicable Operating Mode	F, S, P
When Enabled	Immediately

	**Position Command Low pass Filter Bandwidth** RSWare : Drive - Tuning - Main Position Regulator Gains - Low Pass Filter Bandwidth
Description	Sets low pass cutoff frequency of speed command to suppress high frequency components.
Unit	0~1000
Initial Value	0
Unit	[Hz]
Applicable Operating Mode	F
When Enabled	Immediately

	**1st Resonant Frequency Suppression Filter** RSWare : Drive - Tuning - Main Current Regulator Gains - 1st Resonant Frequency Suppression Filter
Description	Suppresses Vibration by cutting off Current Command in assigned frequency band.
Unit	0~10000
Initial Value	10000
Unit	[Hz]
Applicable Operating Mode	All
When Enabled	Immediately

	**1st Resonant Frequency Suppression Filter Width** RSWare : Drive - Tuning - Main Current Regulator Gains - 1st Resonant Frequency Suppression Filter Width
Description	Set up the notch width of the 1st resonance suppressing filter in 20 steps. Higher the setup, larger the notch width you can obtain.
Unit	1~20
Initial Value	10
Unit	-
Applicable Operating Mode	All
When Enabled	Immediately

	**2nd Resonant Frequency Suppression Filter** RSWare : Drive - Tuning - Main Current Regulator Gains - 2nd Resonant Frequency Suppression Filter
Description	Suppresses Vibration by cutting off Current Command in assigned frequency band.
Unit	0~10000
Initial Value	10000
Unit	[Hz]
Applicable Operating Mode	All
When Enabled	Immediately

	**2nd Resonant Frequency Suppression Filter Width** RSWare : Drive - Tuning - Main Current Regulator Gains - 2nd Resonant Frequency Suppression Filter Width

Description	Set up the notch width of 2nd resonance suppressing filter in 20 steps. Higher the setup, larger the notch width you can obtain.
Unit	1~20
Initial Value	10
Unit	-
Applicable Operating Mode	All
When Enabled	Immediately

	**2nd Resonant Frequency Suppression Filter Depth** RSWare : Drive - Tuning - Main Current Regulator Gains - 2nd Resonant Frequency Suppression Filter Depth
Description	Set up the 2nd notch depth of the resonance suppressing filter. Higher the setup, shallower the notch depth and smaller the phase delay you can obtain.
Unit	0~100
Initial Value	100
Unit	-
Applicable Operating Mode	All
When Enabled	Immediately

	**Position Regulator Kff Gain** RSWare : Drive - Tuning - Main Position Regulator Gains - Kff
Description	• Larger values result in faster position completion and smaller position tolerances at transient response condition. • Value can differ according to load's type or rigidity; too large values result in vibration.
Unit	0~100
Initial Value	0
Unit	[%]
Applicable Operating Mode	F
When Enabled	Immediately

	**Position Regulator Kff Bandwidth** RSWare : Drive - Tuning - Main Position Regulator Gains - Kff Low Pass Filter Bandwidth
Description	• Valid if position FF gain [Ft-1.15] is not '0'. • If a value other than '0' set for [Ft-1.15] results in overshoot or vibration, set this value to '0'.
Unit	0~2500
Initial Value	200
Unit	[Hz]
Applicable Operating Mode	F

When Enabled	Immediately

	**Velocity Regulator I Gain Mode** RSWare : Drive - Tuning - Main Velocity Regulator Gains - Integrator Mode		
Description	During transient response, Speed Response Overshoot can be suppressed by speed controller change from Proportion Integration (PI) Controller into Proportion (P) Controller. It reduces Position completion time during Position Control.		
Range	Value	Description	RSWare Name
	0	Do not use P/PI Mode Conversion.	Always On
	1	When Current Command exceeds Current Value in [Ft-1.18], Speed Controller is changed from PI Controller to P Controller.	High Current Disable
	2	When Speed Command exceeds Speed Value in [Ft-1.18], Speed Controller is changed from PI Controller to P Controller.	Velocity Command Disable
	3	When Position error exceeds Position error Value in [Ft-1.18], Speed Controller is changed from PI Controller to P Controller.	Position Error Disable
	4	Automatically velocity controller is changed from PI Controller to P Controller.	Automatic Disable
Initial Value	0		
Applicable Operating Mode	All		
When Enabled	Servo Off > Setting		

	**Speed Regulator I Gain Disable Threshold** RSWare : Drive - Tuning - Integrator Hold Threshold
Description	If the speed torque command or the position tolerance exceeds the value set in this parameter, the speed controller changes from PI type to P type.
Range	0~3000
Initial Value	100
Unit	If [Ft-1.17] = 1, units are [%] of rated continuous current If [Ft-1.17] = 2, units are [RPM] for rotary motors units are [mm/sec] for linear motors If [Ft-1.17] = 3, units are Counts
Applicable Operating Mode	F, S, P
When Enabled	Immediately

	**Position Regulator High Error Output Offset** RSWare : Drive - Tuning - Main Position Regulator Gains - High Error Output Offset
Description	In order to shorten the position decision time, if the position tolerance is larger than the value of [Ft-1.20], a speed bias equal to the value set here is applied.
Range	0~450
Initial Value	0
Unit	Rotary: [RPM], Linear: [mm/sec]

Applicable Operating Mode	All
When Enabled	Immediately

	**Position Regulator High Error Output Threshold** RSWare : Drive - Tuning - Main Position Regulator Gains - High Error Output Threshold
Description	[Ft-1.19] Speed bias value Position error standard value input to the speed controller.
Range	0~50000
Initial Value	1000
Unit	pulse
Applicable Operating Mode	All
When Enabled	Immediately

	**Current Regulator Bandwidth Reduction Scale** RSWare : Drive - Tuning - Main Current Regulator Gains - Gain		
Description	Current control bandwidth		
Range	Value	Description	RSWare Name
	0	High bandwidth	High
	1	Medium bandwidth (0.6667 * high)	Medium
	2	Low bandwidth (0.3334 * high)	Low
Initial Value	1		
Applicable Operating Mode	All		
When Enabled	Immediately		

	**On-line Vibration Mode** RSWare : Drive - Tuning - Autotuning - On-Line Vibration Suppression Mode		
Data Size	1 digit		
Digit 0	On-line Vibration Suppression Mode RSWare : Drive - Tuning - Autotuning - On-Line Vibration Suppression Mode		
Range	Value	Description	RSWare Name
	0	Disable	Disable
	1	Normal Velocity Mode without Initial Value	Normal and High Velocity
	2	Slow Velocity Mode without Initial Value (below 100 [rpm])	Slow Velocity without Initial Value
Initial Value	0		

Digit 1	On-line Vibration Suppression Gain RSWare : Drive - Tuning - Autotuning - On-Line Vibration Suppression Gain		
Range	Value	Description	RSWare Name
	0	Low	Low
	1	High	High
Initial Value	0		
Applicable Operating Mode	All		
When Enabled	Servo Off > Setting		

	Velocity Regulator Configuration RSWare : Drive - Tuning - Velocity Regulator Configuration - Velocity Command Filter on Follower		
Description	Select whether to use a filter on the speed command value in Position Contorl Mode.		
Range	Value	Description	RSWare Name
	0	Disable	Disable
	1	Enable	Enable
Initial Value	0		
Applicable Operating Mode	All		
When Enabled	Servo Off > Setting		

	Delay Time of Gain Switching RSWare : Drive - Tuning - Gain Switching - Delay Time of Gain Switching
Description	When gain value is switched from Second gain to first gain, you can set delay time.
Range	0~10000
Initial Value	0
Unit	0.2[ms]
Applicable Operating Mode	F, S, P
When Enabled	Immediately

	Level of Gain Switching RSWare : Drive - Tuning - Gain Switching - Level of Gain Switching
Description	Set standard value for gain switching. The setting value is for Gain Switching Mode ([Ft-0.06]N1).
Range	0~10000
Initial Value	0
Unit	-
Applicable Operating Mode	F, S, P

When Enabled	Immediately

	**Hysteresis of Gain Switching** RSWare : Drive - Tuning - Gain Switching - Hysteresis of Gain Switching
Description	Operates Hysteresis based on operation level when gain switching. The setting value is for Gain Switching Mode ([Ft-0.06]N10).
Range	0~10000
Initial Value	0
Unit	-
Applicable Operating Mode	F, S, P
When Enabled	Immediately

	**Position Gain Switching Time** RSWare : Drive - Tuning - Gain Switching - Position Gain Switching Time
Description	Adjust as Position Gain Switching Time step by step when switching gain value from first gain to second gain.
Range	0~10000
Initial Value	0
Unit	0.2 [ms]
Applicable Operating Mode	F, S, P
When Enabled	Immediately

	**2nd Velocity Regulator P Gain** RSWare : Drive - Tuning - 2nd Regulator Gains - P
Description	Parameter which determines the responsiveness of speed control.
Range	0~10000
Initial Value	60
Unit	-
Applicable Operating Mode	F, S, P
When Enabled	Immediately

	**2nd Velocity Regulator I Gain** RSWare : Drive - Tuning - 2nd Regulator Gains - Integrator Gain
Description	• Removes steady state speed tolerance. • Overshoot in speed response can occur if set value is too large.
Range	0~60000
Initial Value	26

Unit	-
Applicable Operating Mode	F, S, P
When Enabled	Immediately

	**2nd Position Regulator Kp Gain** RSWare : Drive - Tuning - 2nd Regulator Gains - Kp
Description	• Parameter which determines the responsiveness of position control. • Change set value according to rigidity of load.
Range	0~700
Initial Value	20
Unit	[Hz]
Applicable Operating Mode	F
When Enabled	Immediately

	**2nd Current Command Low pass Filter Bandwidth** RSWare : Drive - Tuning - 2nd Regulator Gains - Lowpass Filter Bandwidth (IReg)
Description	Suppresses high frequency components of torque command.
Range	0~10000
Initial Value	300
Unit	[Hz]
Applicable Operating Mode	All
When Enabled	Immediately

	**2nd Velocity Command Low pass Filter Bandwidth** RSWare : Drive - Tuning - 2nd Regulator Gains - Lowpass Filter Bandwidth (VReg)
Description	Sets low pass cutoff frequency of speed command to suppress high frequency components.
Range	0~10000
Initial Value	1000
Unit	[Hz]
Applicable Operating Mode	All
When Enabled	Immediately

	**3rd Velocity Regulator P Gain** RSWare : Drive - Tuning - 3rd Regulator Gains - P

Description	Parameter which determines the responsiveness of speed control.
Range	0~10000
Initial Value	60
Unit	-
Applicable Operating Mode	F, S, P
When Enabled	Immediately

	**3rd Velocity Regulator I Gain** RSWare : Drive - Tuning - 3rd Regulator Gains - Integrator Gain
Description	• Removes steady state speed tolerance. • Overshoot in speed response can occur if set value is too large.
Range	0~60000
Initial Value	26
Unit	-
Applicable Operating Mode	F, S, P
When Enabled	Immediately

	**3rd Position Regulator Kp Gain** RSWare : Drive - Tuning - 3rd Regulator Gains - Kp
Description	• Parameter which determines the responsiveness of position control. • Change set value according to rigidity of load.
Range	0~700
Initial Value	20
Unit	[Hz]
Applicable Operating Mode	F
When Enabled	Immediately

	**3rd Current Command Low pass Filter Bandwidth** RSWare : Drive - Tuning - 3rd Regulator Gains - Lowpass Filter Bandwidth (IReg)
Description	Suppresses high frequency components of torque command.
Range	0~10000
Initial Value	300
Unit	[Hz]
Applicable Operating Mode	All
When Enabled	Immediately

	**3rd Velocity Command Low pass Filter Bandwidth** RSWare : Drive - Tuning - 3rd Regulator Gains - Lowpass Filter Bandwidth (VReg)
Description	Sets low pass cutoff frequency of speed command to suppress high frequency components.
Range	0~10000
Initial Value	1000
Unit	[Hz]
Applicable Operating Mode	All
When Enabled	Immediately

	**4th Velocity Regulator P Gain** RSWare : Drive - Tuning - 4th Regulator Gains - P
Description	Parameter which determines the responsiveness of speed control.
Range	0~10000
Initial Value	60
Unit	-
Applicable Operating Mode	F, S, P
When Enabled	Immediately

	**4th Velocity Regulator I Gain** RSWare : Drive - Tuning - 4th Regulator Gains - Integrator Gain
Description	• Removes steady state speed tolerance. • Overshoot in speed response can occur if set value is too large.
Range	0~60000
Initial Value	26
Unit	-
Applicable Operating Mode	F, S, P
When Enabled	Immediately

	**4th Position Regulator Kp Gain** RSWare : Drive - Tuning - 4th Regulator Gains - Kp
Description	• Parameter which determines the responsiveness of position control. • Change set value according to rigidity of load.
Range	0~700
Initial Value	20

Unit	[Hz]
Applicable Operating Mode	F
When Enabled	Immediately

	**4th Current Command Low pass Filter Bandwidth** RSWare : Drive - Tuning - 4th Regulator Gains - Lowpass Filter Bandwidth (IReg)
Description	Suppresses high frequency components of torque command.
Range	0~10000
Initial Value	300
Unit	[Hz]
Applicable Operating Mode	All
When Enabled	Immediately

	**4th Velocity Command Low pass Filter Bandwidth** RSWare : Drive - Tuning - 4th Regulator Gains - Lowpass Filter Bandwidth (VReg)
Description	Sets low pass cutoff frequency of speed command to suppress high frequency components.
Range	0~10000
Initial Value	1000
Unit	[Hz]
Applicable Operating Mode	All
When Enabled	Immediately

Standard Group 2

	**Velocity Scale** RSWare : Drive - Mode Configuration - Analog- Velocity Scale
Description	• Sets the speed command value[rpm] for the analog speed command input pin (Pin 19,20 of I/O). • Speed command [rpm] = Ft-2.00 [rpm/V] × Input Voltage [V]
Range	10.0~2000.0
Initial Value	500.0
Unit	Rotary Motor: [rpm/V], Linear Motor: [mm/sec/V]
Applicable Operating Mode	S
When Enabled	Servo Off > Setting

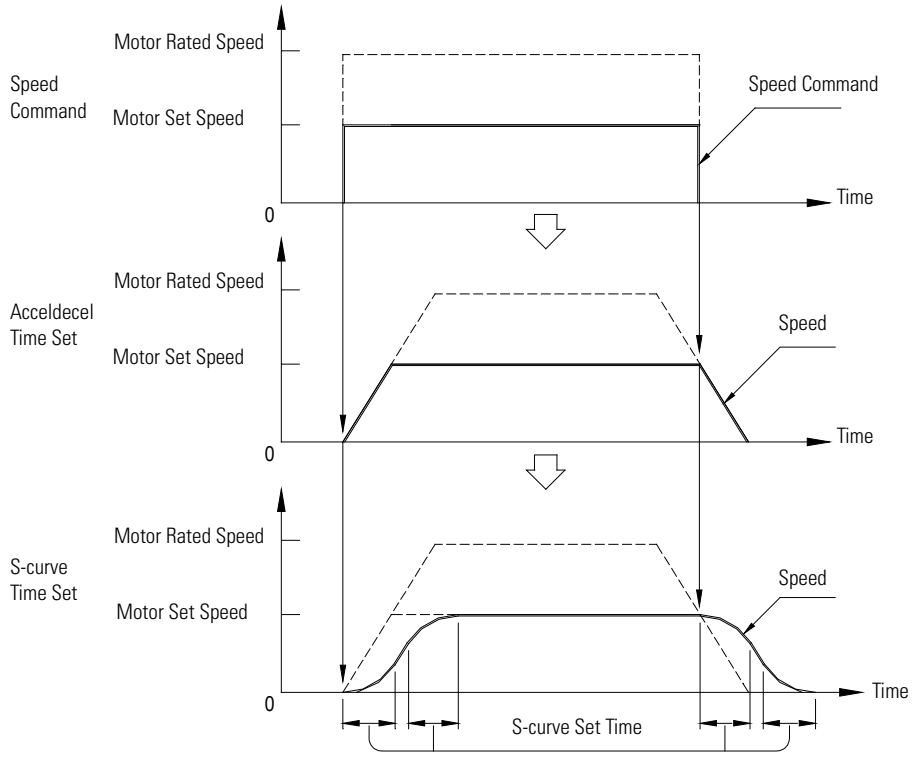
	**Jog Velocity Command** RSWare : Drive - (Right Side)Velocity Control Panel - Velocity Command
Description	Sets speed for jog operation using (run-00).
Range	0~6000
Initial Value	50
Unit	Rotary Motor: [rpm], Linear Motor: [mm/sec]
Applicable Operating Mode	All
When Enabled	Immediately

	**Acceleration** RSWare : Drive - Acceleration Limits - Acceleration
Description	Acceleration means slope of the Speed Profile.
Range	1~2147483647
Initial Value	41667
Unit	Rotary Motor: [10^{-2}xRev/sec^2], Linear Motor: [mm/sec^2]
Applicable Operating Mode	S, P
When Enabled	Immediately

	**Deceleration** RSWare : Drive - Acceleration Limits - Deceleration
Description	Deceleration means slope of the Speed Profile.
Range	1~2147483647
Initial Value	41667
Unit	Rotary Motor: [10^{-2}xRev/sec^2], Linear Motor: [mm/sec^2]
Applicable Operating Mode	S, P
When Enabled	Immediately

FE-204	**S-Curve Time** RSWare : Drive - Acceleration Limits - S-Curve Time

- S-operation time set for smooth operation.
- Applied only when acceleration/deceleration time have been set. If value is set to '0', S-operation is not performed; if a value other than '0' is set, S-operation is performed on acceleration/ deceleration.



Range	0~5,000
Initial Value	0
Unit	[ms]
Applicable Operating Mode	All
When Enabled	Immediately

FE-205	**Preset Velocity 1** RSWare : Drive - Mode Configuration - Preset - Preset Velocity 1
Description	• Sets each contact speed commands for contact speed control mode. • The operation speed should be entered in advance into the relevant parameters </C-SP1>, </C-SP2>, </C-SP3>. • According to combination of the sequence input signals </C-SP1>, </C-SP2>, </C-SP3>, operation at preset speed is possible. • In addition, sequence input signal </C-DIR> is used to change the rotation direction of each speed command. • To reduce impact of speed change, set the acceleration/deceleration time to a sufficient value which should not interfere with system responsiveness.

Range	-6000~6000
Initial Value	0
Unit	Rotary Motor: [rpm], Linear Motor: [mm/sec]
Applicable Operating Mode	P
When Enabled	Immediately

Contact Speed	**Speed Set Parameter**	**</C-SP3>**	**</C-SP2>**	**</C-SP1>**
Halt Command	0 (rpm)	0	0	0
Speed Command 1		0	0	1
Speed Command 2		0	1	0
Speed Command 3		0	1	1
Speed Command 4		1	0	0
Speed Command 5		1	0	1
Speed Command 6		1	1	0
Speed Command 7		1	1	1

	**Preset Velocity 2** RSWare : Drive - Mode Configuration - Preset - Preset Velocity 2
Description	Refer to description of [Ft-2.05]
Range	-6000~6000
Initial Value	0
Unit	Rotary Motor: [rpm], Linear Motor: [mm/sec]
Applicable Operating Mode	P
When Enabled	Immediately

	**Preset Velocity 3** RSWare : Drive - Mode Configuration - Preset - Preset Velocity 3
Description	Refer to description of [Ft-2.05]
Range	-6000~6000
Initial Value	0
Unit	Rotary Motor: [rpm], Linear Motor: [mm/sec]

Applicable Operating Mode	P
When Enabled	Immediately

	**Preset Velocity 4** RSWare : Drive - Mode Configuration - Preset - Preset Velocity 4
Description	Refer to description of [Ft-2.05]
Range	-6000~6000
Initial Value	0
Unit	Rotary Motor: [rpm], Linear Motor: [mm/sec]
Applicable Operating Mode	P
When Enabled	Immediately

	**Preset Velocity 5** RSWare : Drive - Mode Configuration - Preset - Preset Velocity 5
Description	Refer to description of [Ft-2.05]
Range	-6000~6000
Initial Value	0
Unit	Rotary Motor: [rpm], Linear Motor: [mm/sec]
Applicable Operating Mode	P
When Enabled	Immediately

	**Preset Velocity 6** RSWare : Drive - Mode Configuration - Preset - Preset Velocity 6
Description	Refer to description of [Ft-2.05]
Range	-6000~6000
Initial Value	0
Unit	Rotary Motor: [rpm], Linear Motor: [mm/sec]
Applicable Operating Mode	P
When Enabled	Immediately

	**Preset Velocity 7** RSWare : Drive - Mode Configuration - Preset - Preset Velocity 7
Description	Refer to description of [Ft-2.05]
Range	-6000~6000
Initial Value	0
Unit	Rotary Motor: [rpm], Linear Motor: [mm/sec]
Applicable Operating Mode	P
When Enabled	Immediately

Ft-2.12	**Manual Velocity Limit** RSWare : Drive - Velocity Limits - Manual Velocity limit
Description	• Limits the operation speed to below this set value in all control modes. • There are two methods of speed limitation: limitation thorough this value and limitation through speed command of upper level controller. Configure by referring to speed limit method selection of [Ft-2.13]. • In addition, in torque control mode, the mode is changed automatically to speed control mode if motor speed exceeds this value; speed control is performed using limit speed command. • If the analog speed command exceeds motor's maximum speed, the excessive speed command warning "OSC" is issued. • If excessive speed command warning is issued, the speed command is automatically reduced to the motor's maximum speed.
Range	1~6000
Initial Value	5000
Unit	Rotary Motor: [rpm], Linear Motor: [mm/sec]
Applicable Operating Mode	F, S, P
When Enabled	Servo Off > Setting

Ft-2.13	**Velocity Limit Mode** RSWare : Drive - Velocity Limits - Velocity Limit Mode		
Description	Select velocity limit mode.		
Range	Value	Description	RSWare Name
	0	Disabled	Disabled
	1	Limit by [Ft-2.12].	Manual Limit
	2	Limited by Analogue Speed Command Value (except Analog Speed Mode).	Analog Input
	3	Limited by lesser one between [Ft-2.12] and Analogue Speed Command.	Manual and Analog
Initial Value	0		
Applicable Operating Mode	All		
When Enabled	Servo Off > Setting		

Standard Group 3

Ft-3.00	**Follower** RSWare : Drive - Mode Configuration - Follower
Data Size	4 digits
Ditig 0	Command Type RSWare : Drive - Mode Configuration - Follower - Command Type

Range	Value	Description	RSWare Name
	0	Step Up/Step Down, Positive logic	Step Up/Step Down. Positive Logic
	1	Step Up/Step Down, Negative logic	Step Up/Step Down. Negative Logic
	2	Step/Direction, Positive Logic	Step/Direction. Positive Logic
	3	Step/Direction, Negative Logic	Step/Direction. Negative Logic
	4	A phase+B phase, x1	Auxiliary Encoder. x1
	5	A phase+B phase, x2	Auxiliary Encoder. x2
	6	A phase+B phase, x4	Auxiliary Encoder. x4
Initial Value	0		
Applicable Operating Mode	Follower		
Digit 1	Controller Output Type RSWare : Drive - Mode Configuration - Follower - Controller Output Type		
Range	Value	Descriptison	RSWare Name
	0	Use Low speed Line Drive Output in Host Controller for isolated electrical connection (Max.900 [kHz])	Line Drive
	1	Use Open Collector in Host Controlle (Max. 250 [kHz])	Open Collector
	2	Use High Frequency Line Drive Output in Host Controller (Max. 3 [MHz])	High Speed Line Drive
Initial Value	0		
Applicable Operating Mode	Follower		
Digit 2	Encoder Output Forward Direction RSWare : Drive - Encoders - Encoder Output Forward Direction		
Range	Value	Description	RSWare Name
	0	During Forward Rotation, Encoder Output Phase A have a lead of 90° over Phase B.	A Leads B
	1	During Forward Rotation, Encoder Output Phase B have a lead of 90° over Phase A.	B Leads A
Initial Value	0		
Applicable Operating Mode	All		
Digit 3	1st Gear ratio change RSWare : Drive - Mode Configuration - Follower - 1st Gear Ratio Change		
Range	Value	Description	RSWare Name
	0	Enable Only on Drive Disabled	Enable Only on Drive Disabled
	1	Always Enable	Always Enable
Initial Value	0		
Applicable Operating Mode	F		
When Enabled	Servo Off > Setting		

1st Gear Ratio, Follower Counts

RSWare : Drive - Mode Configuration - Follower - 1st Gear Ratio (Second number)

Description	• Numerator of Electronic gear. • By using the electronic gear function, the amount of motor rotation pr input command pulse can be set arbitrarily. • The following relationship has to be satisfied "No. of pulses per 1 motor rotation × Reduction ratio × 4 ≥ [Ft-3.02]". • Maximum resolution = 1 / ([No. of pulses per 1 motor rotation] × [Reduction ratio] × 4)
Range	1~65535
Initial Value	4
Unit	-
Applicable Operating Mode	F
When Enabled	Servo Off > Setting

	**1st Gear Ratio, Master Counts** RSWare : Drive - Mode Configuration - Follower - 1st Gear Ratio (First Nmuber)
Description	Denominator of Electronic gear.
Range	1~65535
Initial Value	1
Unit	
Applicable Operating Mode	F
When Enabled	Servo Off > Setting

	**Encoder Output Ratio, Output Counts (Denominator)** RSWare : Drive - Encoders - Output Ratio (First Number)
Description	• Numerator of Position output pulse adjustment. • Sets the number of pulses to be output through the servo drive's encoder signal output (EA+, EA-, EB+, EB-) for one motor rotation. • [At [Ft-3.03], the numerator of the encoder's output divider ratio is entered. Generally, the number of pulses to be output at 1 motor rotation is entered. • At [Ft-3.04], the denominator of the encoder's output divider ratio is entered. Generally, the number of pulses output from the encoder connected to the motor for 1 rotation is entered. • For the encoder output division ratio, the relationship [Ft-3.03] ≤ [Ft-3.04] has to be satisfied. • For the No. of output pulses per rotation to the higher level controller: ([Ft-3.03]/[Ft-3.04]) × output pulses per rotation = Output to higher level controller
Range	1~32768
Initial Value	1
Unit	
Applicable Operating Mode	All
When Enabled	Servo Off > Setting

	**Encoder Output Ratio, Motor Counts (Numerator)** RSWare : Drive - Encoders - Output Ratio (Last Number)
Description	Denominator of Position output pulse adjustment.
Range	1~32768
Initial Value	1
Unit	-
Applicable Operating Mode	All
When Enabled	Servo Off > Setting

	**2nd Gear Ratio, Follower Counts** RSWare : Drive - Mode Configuration - Follower - 2nd Gear Ratio (Second Number)
Description	• Numerator of 2nd Gear Ratio. • By using the electronic gear function, the amount of motor rotation pr input command pulse can be set arbitrarily. • The following relationship has to be satisfied "No. of pulses per 1 motor rotation × Reduction ratio × 4 ≥ [Ft-3.02]". • Maximum resolution=1/ ([No.of pulses per 1 motor rotation] x [Reduction ratio] x 4)
Range	1~65535
Initial Value	4
Unit	-
Applicable Operating Mode	F
When Enabled	Servo Off > Setting

	**2nd Gear Ratio, Master Counts** RSWare : Drive - Mode Configuration - Follower - 2nd Gear Ratio (First Number)
Description	Denominator of 2nd Gear Ratio.
Range	1~65535
Initial Value	1
Unit	-
Applicable Operating Mode	F
When Enabled	Servo Off > Setting

	Reserved
Parameter	Reserved
Description	Reserved

Range	Reserved
Initial Value	Reserved
Unit	Reserved
Applicable Operating Mode	Reserved

	**Digital Filter Cut-off Frequency** RSWare : Drive - Mode Configuration - Follower - Digital Filter Cut-off Frequency		
Digit 0	Low Drive Input RSWare : Drive - Mode Configuration - Follower - Digital Filter Cut-off Frequency - Low Speed Line Driver Input		
Range	Value	Description	RSWare Name
	0	3.000 MHz	3.000
	1	1.750 MHz	1.750
	2	1.500 MHz	1.500
	3	1.000 MHz	1.000
	4	0.750 MHz	0.750
	5	0.625 MHz	0.625
	6	0.562 MHz	0.562
	7	0.525 MHz	0.525
Initial Value	3		
Applicable Operating Mode	F		
Digit 1	Open Collector Input RSWare : Drive - Mode Configuration - Follower - Digital Filter Cut-off Frequency - Open Collector Input		
Range	Value	Description	RSWare Name
	0	3.000 MHz	3.000
	1	1.750 MHz	1.750
	2	1.500 MHz	1.500
	3	1.000 MHz	1.000
	4	0.750 MHz	0.750
	5	0.625 MHz	0.625
	6	0.562 MHz	0.562
	7	0.525 MHz	0.525
Initial Value	7		
Applicable Operating Mode	F		
Digit 2	High Frequency Line Drive Input RSWare : Drive - Mode Configuration - Follower - Digital Filter Cut-off Frequency - High Speed Line Driver Input		

Range	Value	Description	RSWare Name
	0	3.000 MHz	3.000
	1	1.750 MHz	1.750
	2	1.500 MHz	1.500
	3	1.000 MHz	1.000
	4	0.750 MHz	0.750
	5	0.625 MHz	0.625
	6	0.562 MHz	0.562
	7	0.525 MHz	0.525
Initial Value	0		
Applicable Operating Mode	F		
When Enabled	Servo Off > Setting		

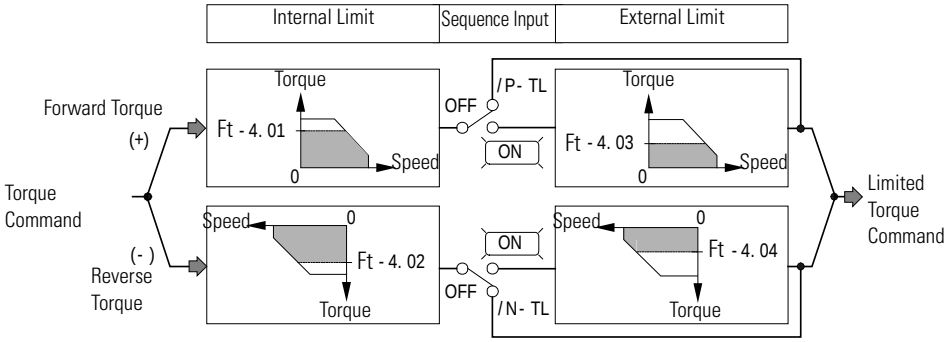
Standard Group 4

	**Current Scale** RSWare : Drive - Mode Configuration - Analog - Current Scale
Description	• Set the speed command value[%] for 1[V] on the analog torque command input pin(pin 21,22 of I/O). • Torque command[%] = [Ft-4.00] [%/V] x input voltage [V]
Range	0-1000
Initial Value	333
Unit	[%] of rated continuous current/V/10
Applicable Operating Mode	C
When Enabled	Servo Off > Setting

	**Positive Internal Current Limit** RSWare : Drive - Current Limits - Positive Internal
Description	Limits forward and reverse direction torque on motor separately. (internally limited)
Range	0~500
Initial Value	300
Unit	[%] of motor rated continuous current
Applicable Operating Mode	All
When Enabled	Immediately

	**Negative Internal Current Limit** RSWare : Drive - Current Limits - Negative Internal
Description	Limits reverse direction torque on motor. (Internally limited)

Range	0~500
Initial Value	300
Unit	[%] of motor rated continuous current
Applicable Operating Mode	All
When Enabled	Immediately

Ft-4.03	**Positive External Current Limit** RSWare : Drive - Current Limits - Positive External
Description	• The torque imposed on the motor is internally limited automatically by the values set on [Ft-4.01], [Ft-4.02]. Additionally, it is also limited by the values set on [Ft-4.03], [Ft-4.04] when external </P-TL>,</N-TL> signals are input through sequence input. • The torque limit according to internal limit [Ft-4.01] and [Ft-4.01] takes precedence to external torque limit </P-TL> and </N-TL> signals. 
Range	0~500
Initial Value	100
Unit	[%] of motor rated continuous current
Applicable Operating Mode	All
When Enabled	Immediately

Ft-4.04	**Negative External Current Limit** RSWare : Drive - Current Limits - Negative External
Description	Refer to description of [Ft-4.03]
Range	0~500
Initial Value	100
Unit	[%] of motor rated continuous current
Applicable Operating Mode	All
When Enabled	Immediately

Ft-4.05	**Over-travel Current Limit** RSWare : Drive - Stopping Functions - Maximum Stopping Current

Description	• Limits the torque imposed on the motor if the motor is halted by overtravel (<P-OT>,<N-OT>) input signal during rotation. • Unlike external and internal torque limit, the torque limit value for overtravel input is same for forward and reverse direction.
Range	0~500
Initial Value	300
Unit	[%] of motor rated continuous current
Applicable Operating Mode	All
When Enabled	Immediately

	**Initial Current Bias** RSWare : Drive - Initial Current Bias
Description	Initial torque value applied when the servo drive activated. This is to keep vertical axis load.
Range	-100~100
Initial Value	0
Unit	[%] of motor rated continuous current
Applicable Operating Mode	All
When Enabled	Immediately

Standard Group 5

	**In Position Size** RSWare : Drive - Position Functions - In Position Size
Description	If position error < In Position Size for 1 ms and the In Position Size output signal is assigned, the In Position output is turned ON.
Range	0~2500
Initial Value	10
Unit	pulse
Applicable Operating Mode	F
When Enabled	Immediately

	Reserved
Parameter	Reserved
Description	Reserved
Range	Reserved
Initial Value	Reserved
Unit	Reserved
Applicable Operating Mode	Reserved

	**Near Position Size** RSWare : Drive - Position Functions - Near Position Size
Description	If position error < Near Position Size and the Near Position output signal is assigned, the Near Position output is turned ON.
Range	0~2500
Initial Value	20
Unit	pulse
Applicable Operating Mode	F
When Enabled	Immediately

	**Speed Window** RSWare : Drive - Speed Functions - Speed Window
Description	If the speed error < Speed Window for 10 ms and the Within Speed Window output signal is assigned, then the Within Speed Window output is turned ON.
Range	0-1000
Initial Value	10
Unit	Rotary Motor: [rpm], Linear Motor: [mm/sec]
Applicable Operating Mode	F, S, P
When Enabled	Immediately

	**Up to speed** RSWare : Drive - Speed Functions - Up to Speed
Description	If the motor speed > Up to Speed and the Up to Speed output signal is assigned, then the Up to Speed output is turned ON.
Range	1~5000
Initial Value	20
Unit	Rotary Motor: [rpm], Linear Motor: [mm/sec]
Applicable Operating Mode	All
When Enabled	Immediately

	**Zero Clamp** RSWare : Drive - Speed Functions - Zero Clamp
Description	If the Analog Speed Command < Zero Clamp, then the analog speed command is ignored and the motor command speed is set to zero.
Range	0~5000
Initial Value	0
Unit	Rotary Motor: [rpm], Linear Motor: [mm/sec]
Applicable Operating Mode	S
When Enabled	Immediately

	**Brake Inactive Delay** RSWare : Drive - Digital Outputs - Brake Inactive Delay
Description	Brake Inactive delay is the time from when the drive is enabled to when the brake is released.
Range	0~10000
Initial Value	0
Unit	[ms]
Applicable Operating Mode	All
When Enabled	Servo Off > Setting

	**Disable Delay** RSWare : Drive - Stopping Functions - Disable Delay
Description	Disable Delay is the time from when Drive Disable command is received to when the Drive Disable command is actually executed.
Range	0~10000
Initial Value	0
Unit	[ms]
Applicable Operating Mode	All
When Enabled	Servo Off > Setting

	**Brake Active Delay** RSWare : Drive - Digital Outputs - Brake Active Delay
Description	The Braking Application Speed is the feedback speed below which the motor break is engaged, after disabling the drive.
Range	0~10000
Initial Value	500
Unit	[ms]
Applicable Operating Mode	All
When Enabled	Servo Off > Setting

	**Disabled Braking Speed** RSWare : Drive - Stopping Functions - Braking Application Speed
Description	The Braking Application Speed is the feedback speed below which the motor break is engaged, after disabling the drive.
Range	0~1000
Initial Value	100
Unit	Rotary Motor: [rpm], Linear Motor: [mm/sec]
Applicable Operating Mode	All
When Enabled	Servo Off > Setting

	**Following Error Limit** RSWare : Drive - Faults - Following Error Limit
Description	A following error fault occurs when the difference between position command and actual position is greater than this parameter.
Range	0~2147483647
Initial Value	99999
Unit	pulse
Applicable Operating Mode	F

	**AC Line Loss Fault Delay** RSWare : Drive - Faults - AC Line Loss Fault Delay
Description	The AC Line Loss Fault is inhibited for this amount of time, when a loss of AC power is detected.
Range	20~1000
Initial Value	20
Unit	ms
Applicable Operating Mode	All
When Enabled	Servo Off > Setting

	**Analog Output CH1 Selection** RSWare : Drive - Analog Outputs - Analog Output 1 - Signal
Description	The drive signal assigned to channel 1 from the Channel Setup dialog box in the Oscilloscope window.
Range	0~28 (Except 15, 23, 25, 26)
Initial Value	0
Applicable Operating Mode	All
When Enabled	Immediately

	**Analog Output CH2 Selection** RSWare : Drive - Analog Outputs - Analog Output 2 - Signal
Description	The drive signal assigned to channel 2 from the Channel Setup dialog box in the Oscilloscope window.
Range	0~28 (Except 15, 23, 25, 26)
Initial Value	1
Applicable Operating Mode	All
When Enabled	Immediately

	**Analog Output CH1 Scale** RSWare : Drive - Analog Outputs - Analog Output 1 - Scale

Description	The amplitude of the channel 1 input signal to be displayed by the oscilloscope.
Range	1 - 99999
Unit	Units depend on the channel selection.
Initial Value	500
Applicable Operating Mode	All
When Enabled	Immediately

	**Analog Output CH2 Scale** RSWare : Drive - Analog Outputs - Analog Output 2 - Scale
Description	The amplitude of the channel 2 input signal to be displayed by the oscilloscope.
Range	1 - 99999
Unit	Units depend on the channel selection.
Initial Value	500
Applicable Operating Mode	All
When Enabled	Immediately

Index Parameter List

Indexing Group 0 - Indexing System

No.	Name	Modubus Address	Digit No.	Range	Init.	Note
	Auto Start Indexing	5000	N/A	0~1	0	-
	Abort Index Deceleration	5001, 5002	N/A	1~2147483647	6250	Rotary Motor: [10^{-2}xRev/sec^2], Linear Motor: [mm/sec^2]
	Positive Deceleration Distance	5003, 5004	N/A	0~2147483647	0	pulse
	Negative Deceleration Distance	5005, 5006	N/A	0~2147483647	0	pulse
	Enable Software Limits	5007	N/A	0~1	0	-
	Positive Software Limit	5008, 5009	N/A	- 2147483647 ~2147483647	2147483647	pulse
	Negative Software Limit	5010, 5011	N/A	- 2147483647 ~2147483647	- 2147483647	pulse

Indexing Group 1 - Homing

No.	Name	Modubus Address	Digit No.	Range	Init.	Note
	Homing Type	5200	N/A	0~8	1	-
	Auto Start Homing on Enable	5201	N/A	0~2	2	-
	Homing Velocity	5202	N/A	-6000~6000	100	Rotary Motor: [rpm], Linear Motor: [mm/sec]
	Creep Velocity	5203	N/A	0~6000	20	Rotary Motor: [rpm], Linear Motor: [mm/sec]
	Homing Acceleration/ Deceleration	5204, 5205	N/A	1~2147483647	6250	Rotary Motor: [10^{-2}xRev/sec^2], Linear Motor: [mm/sec^2]
	Offset Move Distance	5206, 5207	N/A	- 2147483647 ~2147483647	0	pulse
	Home Sensor Polarity	5208	N/A	0~1	0	-
	Home Position	5209, 5210	N/A	- 2147483647 ~2147483647	0	pulse
	Moving distance After Home Sensor	5211, 5212	N/A	0~2147483647	0	pulse
	Home Current	5213	N/A	1~250	100	[%]
	Home Current Time	5214	N/A	0~1000	0	[ms]
	Homing Time Limit	5215	N/A	0~65535	60	[sec]
	Stop Home Deceleration	5216, 5217	N/A	1~2147483647	6250	Rotary Motor: [10^{-2}xRev/sec^2], Linear Motor: [mm/sec^2]

Indexing Group 2- Index Option

No.	Name	Modubus Address	Digit No.	Range	Init.	Note
	Index 0 Option	5400	0	0: Absolute 1: Incremental	0	-
			1	0: Stop 1: Start next index 2: Wait for Start	0	-
			2...3	Reserved		

1n02.01	Index 1 Option	5401	0	0: Absolute 1: Incremental	0	-
			1	0: Stop 1: Start next index 2: Wait for Start	0	-
			2...3	Reserved		
:	:	:	:	:	:	:
1n0263	Index63 Option	5463	0	0: Absolute 1: Incremental	0	-
			1	0: Stop 1: Start next index 2: Wait for Start	0	-
			2...3	Reserved		

Indexing Gorup 4 - Index Position/Distance

No.	Name	Modubus Address	Digit No.	Range	Init.	Note
1n04.00	Index 0 Position/ Distance	5800, 5801	N/A	- 2147483647 ~2147483647	0	pulse
1n04.01	Index 1 Position/ Distance	5802, 5803	N/A	- 2147483647 ~2147483647	0	pulse
:	:	:	:	:	:	:
1n0463	Index 63 Position/ Distance	5926, 5927	N/A	- 2147483647 ~2147483647	0	pulse

Indexing Group 7 - Index Dwell

No.	Name	Modubus Address	Digit No.	Range	Init.	Note
1n07.00	Index 0 Dwell	6400	N/A	0~65535	0	ms
1n07.01	Index 1 Dwell	6401	N/A	0~65535	0	ms
:	:	:	:	:	:	:

1n07.63	Index 63 Dwell	6463	N/A	0~65535	0	ms

Indexing Gorup 8 - Index Velocity

No.	Name	Modubus Address	Digit No.	Range	Init.	Note
1n08.00	Index 0 Velocity	6600	N/A	0~6000	750	Rotary Motor: [rpm], Linear Motor: [mm/sec]
1n08.01	Index 1 Velocity	6601	N/A	0~6000	750	Rotary Motor: [rpm], Linear Motor: [mm/sec]
:	:	:	:	:	:	:
1n08.63	Index 63 Velocity	6663	N/A	0~6000	750	Rotary Motor: [rpm], Linear Motor: [mm/sec]

Indexing Group 10 - Index Acceleration

No.	Name	Modubus Address	Digit No.	Range	Init.	Note
1n10.00	Index 0 Acceleration	7000, 7001	N/A	1~2147483647	6250	Rotary Motor: [10^{-2}xRev/sec^2], Linear Motor: [mm/sec^2]
1n10.01	Index 1 Acceleration	7002, 7003	N/A	1~2147483647	6250	Rotary Motor: [10^{-2}xRev/sec^2], Linear Motor: [mm/sec^2]
:	:	:	:	:	:	:
1n10.63	Index 63 Acceleration	7126, 7127	N/A	1~2147483647	6250	Rotary Motor: [10^{-2}xRev/sec^2], Linear Motor: [mm/sec^2]

Indexing Gorup 11 - Index Deceleration

No.	Name	Modubus Address	Digit No.	Range	Init.	Note
1n11.00	Index 0 Deceleration	7200, 7201	N/A	1~2147483647	6250	Rotary Motor: [10^{-2}xRev/sec^2], Linear Motor: [mm/sec^2]

	Index 1 Deceleration	7202, 7203	N/A	1~2147483647	6250	Rotary Motor: [10^{-2}xRev/sec^2], Linear Motor: [mm/sec^2]
:	:	:	:	:	:	:
	Index 63 Deceleration	7326, 7327	N/A	1~2147483647	6250	Rotary Motor: [10^{-2}xRev/sec^2], Linear Motor: [mm/sec^2]

Indexing Gorup 12 - Index Next Index

No.	Name	Modubus Address	Digit No.	Range	Init.	Note
	Index 0 Next Index	7400	N/A	0~63	0	-
	Index 1 Next Index	7401	N/A	0~63	0	-
:	:	:	:	:	:	:
	Index 63 Next Index	7463	N/A	0~63	0	-

Index Parameter Description

Indexing Parameter Gorup 0 - Indexing System

	**Auto Start Indexing** RSWare : Drive - Mode Configuration- Indexing - Auto Start Indexing				
Description	When this field is set to "on", the drive will begin executing the selected index whenever the drive enables. *0-Off* *1-On*				
Range	0~1	Initial Value	0	Unit	N/A
Modbus Address	5000	Changeable Status	Always	When Enabled	Power Cycling
Applicable Operation Mode	I	-			

1n00.01	**Abort Index Deceleration** RSWare : Drive - Mode Configuration- Indexing - Abort Index Decel				
Description	The deceleration used to stop motion when the Stop Index input terminates an index move.				
Range	0~2147483647	Initial Value	6250	Unit	Rotary Motor: [10^{-2}xRev/sec^2], Linear Motor: [mm/sec^2]
Modbus Address	5001	Changeable Status	Always	When Enabled	Always
Applicable Operation Mode	I	-			

1n00.02	**Positive Deceleration Distance** RSWare : Drive - Mode Configuration- Indexing - Positive Deceleration Distance				
Description	The stopping distance used when the drive encounters a positive overtravel limit.				
Range	0~2147483647	Initial Value	0	Unit	pulse
Modbus Address	5003, 5004	Changeable Status	Always	When Enabled	Always
Applicable Operation Mode	I	-			

1n00.03	**Negative Deceleration Distance** RSWare : Drive - Mode Configuration- Indexing - Negative Deceleration Distance				
Description	The stopping distance used when the drive encounters a negative overtravel limit.				
Range	0~2147483647	Initial Value	0	Unit	pulse
Modbus Address	5005, 5006	Changeable Status	Always	When Enabled	Always
Applicable Operation Mode	I	-			

1n00.04	**Enable Software Limits** RSWare : Drive - Mode Configuration- Indexing - Enable Software Limits				
Description	Select: *0-Off*: Turns off software overtravel limit checking *1-On*: Causes the drive to compare the motor feedback position to the Positive and Negative Software Limits, below, to determine if the drive has exceeded an overtravel limit.				
Range	0~1	Initial Value	0	Unit	N/A
Modbus Address	5007	Changeable Status	Servo-OFF	When Enabled	Disable Drive
Applicable Operation Mode	I	-			

1n00.05	**Positive Software Limit** RSWare : Drive - Mode Configuration- Indexing - Positive Software Limit				
Description	If the motor feedback position is greater than this value, the drive has exceeded the software overtravel limit.				
Range	-2147483647~2147483647	Initial Value	2,147,483,647	Unit	pulse

Modbus Address	5008, 5009	Changeable Status	Servo-OFF	When Enabled	Disable Drive
Applicable Operation Mode	I	-			

Negative S/W Limit

RSWare : Drive - Mode Configuration- Indexing - Negative Software Limit

Description	If the motor feedback position is less than this value, the drive has exceeded the software overtravel limit.				
Range	-2147483647~2147483647	Initial Value	- 2,147,483,647	Unit	pulse
Modbus Address	5010, 5011	Changeable Status	Servo-OFF	When Enabled	Disable Drive
Applicable Operation Mode	I	-			

User Defined Distance Per Motor Revolution

RSWare : Drive - Mode Configuration- Indexing - User Defined Distance Per Motor Revolution

Description	Define user defined distance per motor revolution.				
Range	0~99999	Initial Value	0	Unit	User Defined
Modbus Address	5012	Changeable Status	Always	When Enabled	Disable Drive
Applicable Operation Mode	I	-			

Indexing Parameter Garoup 1 - Homing

Homing Type

RSWare : Drive - Mode Configuration- Homing - Homing Type

Description	Select the type of homing operation the drive will perform. 0-Home to Present Position 1-To Home sensor/Back to Marker 2-To Limit/Back to Marker 3-To Home sensor/Fwd to Marker 4- To Limit/Fwd to Marker 5- Home to Current Value 6-Home to Current Value/Back to Marker 7-To Home sensor/Move/Back to Marker 8-Home to Marker 9- To Home Sensor 10-To Limit Sensor				
Range	0~10	Initial Value	1	Unit	N/A
Modbus Address	5200	Changeable Status	Servo-OFF	When Enabled	Disable Drive
Applicable Operation Mode	I	-			

Auto Start Homing on Enable

RSWare : Drive - Mode Configuration- Homing - Auto Start Homing on Enable

Description	Causes the drive to begin the homing procedure automatically when the drive is enabled. 0 - Active: Automatically starts homing every time the drive is enabled. 1 - Active After Reset Only: automatically starts homing when a drive is enabled, if the drive has not already been homed. 2 - Inactive				
Range	0~2	Initial Value	2	Unit	N/A
Modbus Address	5201	Changeable Status	Always	When Enabled	Power Cycling
Applicable Operation Mode	I	-			

Homing Velocity

RSWare : Drive - Mode Configuration- Homing - Homing Velocity

Description	The commanded velocity used during homing. The sign of this value (+/-) indicates the direction of motion during homing.				
Range	-6000~6000	Initial Value	100	Unit	Rotary Motor: [rpm], Linear Motor: [mm/sec]
Modbus Address	5202	Changeable Status	Servo-OFF	When Enabled	Disable drive
Applicable Operation Mode	I	-			

Creep Velocity

RSWare : Drive - Mode Configuration- Homing - Creep Velocity

Description	For the To Sensor, then Back to Marker Homing Type, the velocity used for all remaining homing motion after the motor decelerates to a stop when it finds the sensor edge.				
Range	0~6000	Initial Value	20	Unit	Rotary Motor: [rpm], Linear Motor: [mm/sec]
Modbus Address	5203	Changeable Status	Servo-OFF	When Enabled	Disable drive
Applicable Operation Mode	I	-			

Homing Acceleration/Deceleration

RSWare : Drive - Mode Configuration- Homing - Homing Accel/Decel

Description	The rate of acceleration and deceleration used during homing.				
Range	1~2147483647	Initial Value	6250	Unit	Rotary Motor: [10^{-2}xRev/sec^2], Linear Motor: [mm/sec^2]
Modbus Address	5204, 5205	Changeable Status	Servo-OFF	When Enabled	Disable drive
Applicable Operation Mode	I	-			

Offset Move Distance

RSWare : Drive - Mode Configuration- Homing - Offset Move Distance

Description	The distance the motor position will be from the marker edge (or sensor edge for Sensor only Homing Type) after the homing sequence is complete.				
Range	-2147483647~2147483647	Initial Value	0	Unit	pulse
Modbus Address	5206, 5207	Changeable Status	Servo-OFF	When Enabled	Disable drive
Applicable Operation Mode	I	-			

Home Sensor Polarity

RSWare : Drive - Mode Configuration- Homing - Home Sensor Polarity

Description	0-NORMAL CLOSE 1-NORMAL OPEN				
Range	0~1	Initial Value	0	Unit	N/A
Modbus Address	5208	Changeable Status	Servo-OFF	When Enabled	Disable drive
Applicable Operation Mode	I	-			

Home Position

RSWare : Drive - Mode Configuration- Homing - Home Position

Description	The home position when a homing procedure is completed.				
Range	-2147483647~2147483647	Initial Value	0	Unit	pulse
Modbus Address	5209, 5210	Changeable Status	Servo-OFF	When Enabled	Disable drive
Applicable Operation Mode	I	-			

Moving distance After Home Sensor

RSWare : Drive - Mode Configuration- Homing - Moving Distance After Home Sensor

Description	This value is distance that the drive ignores the marker inputs after the home sensor is detected.				
Range	0~2147483647	Initial Value	0	Unit	pulse
Modbus Address	5211, 5212	Changeable Status	Servo-OFF	When Enabled	Disable drive
Applicable Operation Mode	I	-			

Home Current

RSWare : Drive - Mode Configuration - Homing - Home Current

Description	Specifies the torque feedback at which the drive stops moving the motor at the Homing Velocity. Unit : Percentages of a motor rating torque				
Range	0~250	Initial Value	100	Unit	[%]
Modbus Address	5213	Changeable Status	Servo-OFF	When Enabled	Disable drive
Applicable Operation Mode	I	-			

Home Current Time

RSWare : Drive - Mode Configuration- Homing - Home Current Time

Description	The time to when the torque feedback is more than the home current to when the drive detects stopper.				
Range	0~1000	Initial Value	0	Unit	[ms]
Modbus Address	5214	Changeable Status	Servo-OFF	When Enabled	Disable drive
Applicable Operation Mode	I	-			

Homing Time Limit

RSWRSWare : Drive - Mode Configuration- Homing - Homing Timeout

Description	Drive fault occurs when time for homing is over the homing time limit.				
Range	0~65535	Initial Value	60	Unit	[Sec]
Modbus Address	5215	Changeable Status	Servo-OFF	When Enabled	Disable drive

Applicable Operation Mode	I	-

1n01.12	**Stop Home Deceleration** RSWare : Drive - Mode Configuration- Homing - Stop Home decel				
Description	The rate of drive deceleration used when homing is stopped.				
Range	1~2147483647	Initial Value	6250	Unit	Rotary Motor: [10^{-2}xRev/sec^2], Linear Motor: [mm/sec^2]
Modbus Address	5216, 5217	Changeable Status	Servo-OFF	When Enabled	Disable drive
Applicable Operation Mode	I	-			

Indexing Parameter Group 2 - Indexing Options

1n02.00	Digit 0	**Index 0~63 Type** RSWare : Drive - Mode Configuration- Indexing - Index 0 ~63 Setup - Mode			
Description	Index 0 ~63 Setup Mode: 0-Absolute: moves from its starting position to the specified Position, below.. 1-Incremental: moves from its starting position the specified Distance, below. Note: The axis must be homed before the drive can execute any index.				
Range	0~1	Initial Value	0	Unit	N/A
Modbus Address	5400, 5463	Changeable Status	Always	When Enabled	Always
Applicable Operation Mode	I	-			

1n02.00	Digit 1	**Index 0~63 Action When Complete** RSWare : Drive - Mode Configuration- Indexing - Index 0 ~63 Setup - Action When Complete			
Description	0: Stop: ends the execution of indexed move commands (default setting). 1: Start next index: commands execution of the Next Index move without additional input, but after the scheduled Dwell. 2: Wait for Start: commands execution of the Next Index move the next time the Start Index input becomes active.				
Range	0~2	Initial Value	0	Unit	N/A
Modbus Address	5400, 5463	Changeable Status	Always	When Enabled	Always
Applicable Operation Mode	I	-			

Indexing Parameter Group 4 - Index Position/Distance

1n04.00	**Index 0~63 Position/Distance** RSWare : Drive - Mode Configuration- Indexing - Index 0 ~63 Setup - Distance or Position

Description	• Position : For Absolute mode moves, the fixed position to which the motor will travel. • Distance : For Incremental and Registration mode moves, the relative distance the motor will travel.				
Range	-2147483647~2147483647	Initial Value	0	Unit	pulse
Modbus Address	5800 ~ 5927	Changeable Status	Always	When Enabled	Always
Applicable Operation Mode	I	-			

Indexing Parameter Group 7 - Index Dwell

	**Index 0~63 Dwell** RSWare : Drive - Mode Configuration- Indexing - Index 0 ~63 Setup - Dwell				
Description	Milliseconds to remain at current position before exec.				
Range	0~65535	Initial Value	0	Unit	[ms]
Modbus Address	6400 ~ 6463	Changeable Status	Always	When Enabled	Always
Applicable Operation Mode	I	-			

Indexing Parameter Group 8 - Index Velocity

	**Index 0~63 Velocity** RSWare : Drive - Mode Configuration- Indexing - Index 0 ~63 Setup - Velocity				
Description	Maximum velocity while in motion.				
Range	0~6000	Initial Value	750	Unit	Rotary Motor: [rpm], Linear Motor: [mm/sec]
Modbus Address	6600 ~ 6663	Changeable Status	Always	When Enabled	Always
Applicable Operation Mode	I	-			

Indexing Parameter Group 10 - Index Acceleration

	**Index 0~63 Acceleration** RSWare : Drive - Mode Configuration- Indexing - Index 0 ~63 Setup - Acceleration				
Description	Maximum acceleration while in motion.				
Range	1~2147483647	Initial Value	6250	Unit	Rotary Motor: [10^{-2}xRev/sec^2], Linear Motor: [mm/sec^2]
Modbus Address	7000 ~ 7127	Changeable Status	Always	When Enabled	Always
Applicable Operation Mode	I	-			

Indexing Parameter Group 11 - Index Deceleration

1n.11.00	**Index 0~63 Deceleration** RSWare : Drive - Mode Configuration- Indexing - Index 0 ~63 Setup - Deceleration				
Description	Maximum deceleration while in motion.				
Range	1~2147483647	Initial Value	6250	Unit	Rotary Motor: [10^{-2}xRev/sec^2], Linear Motor: [mm/sec^2]
Modbus Address	7200 ~ 7327	Changeable Status	Always	When Enabled	Always
Applicable Operation Mode	I	-			

Indexing Parameter Group 12 - Index Next Index

1n.12.00	**Index 0~63 Next Index** RSWare : Drive - Mode Configuration- Indexing - Index 0 ~63 Setup -Next Index				
Description	The number (0 - 63) of the next indexed move to execute when Action When Complete is not set to "Stop".				
Range	0~63	Initial Value	0	Unit	N/A
Modbus Address	7400 ~ 7463	Changeable Status	Always	When Enabled	Always
Applicable Operation Mode	I	-			

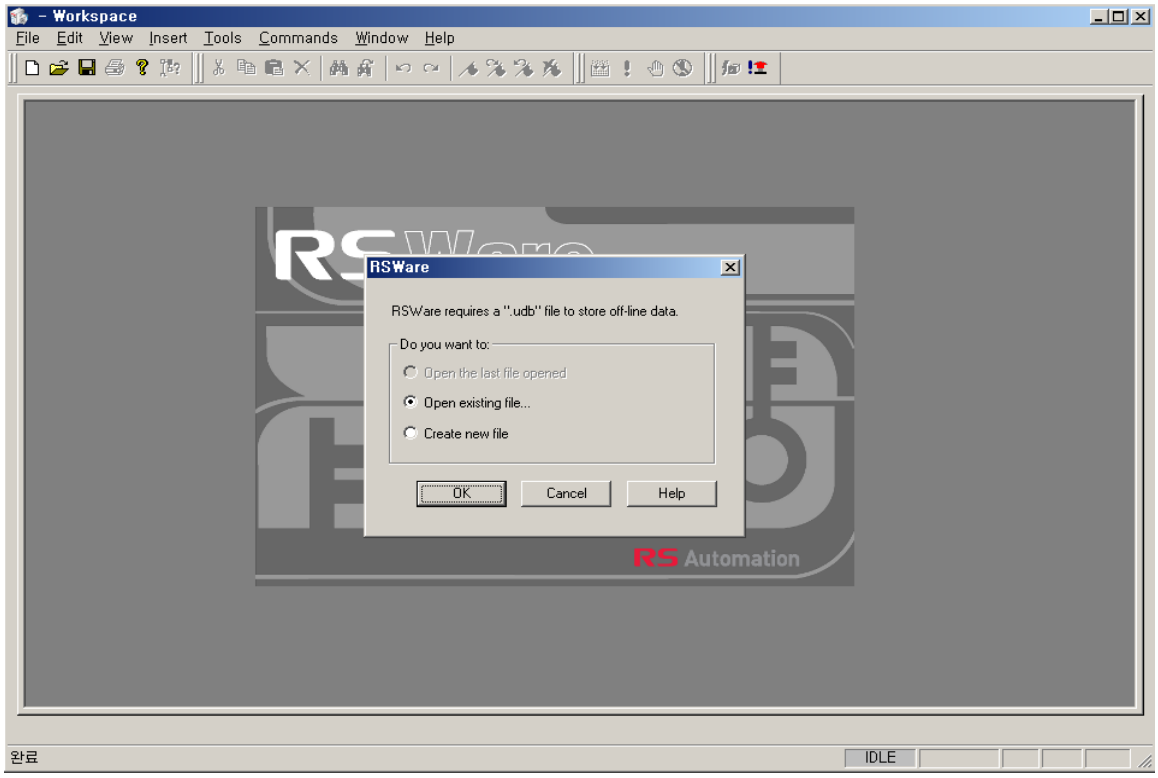
RSWare

Introduction

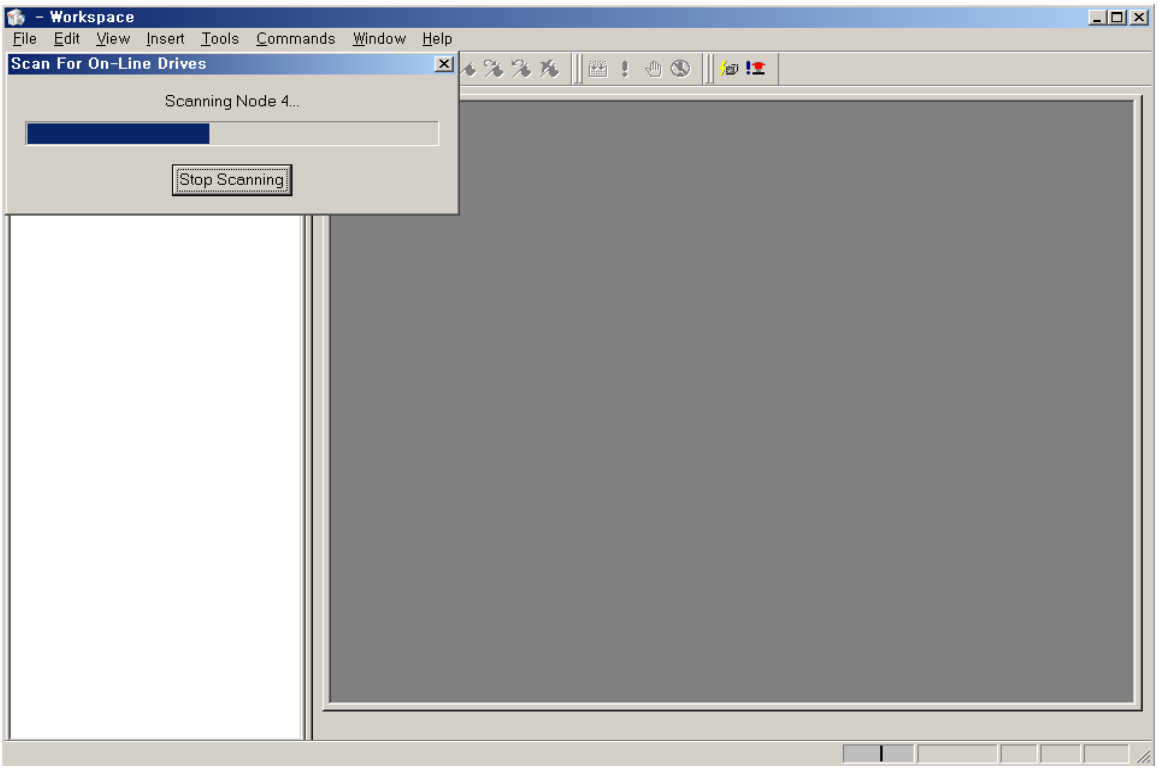
RSWare is external control program to operate CSD5 servo drive. This chapter explains simply to operate CSD5 servo drive by RSWare.

RSWare

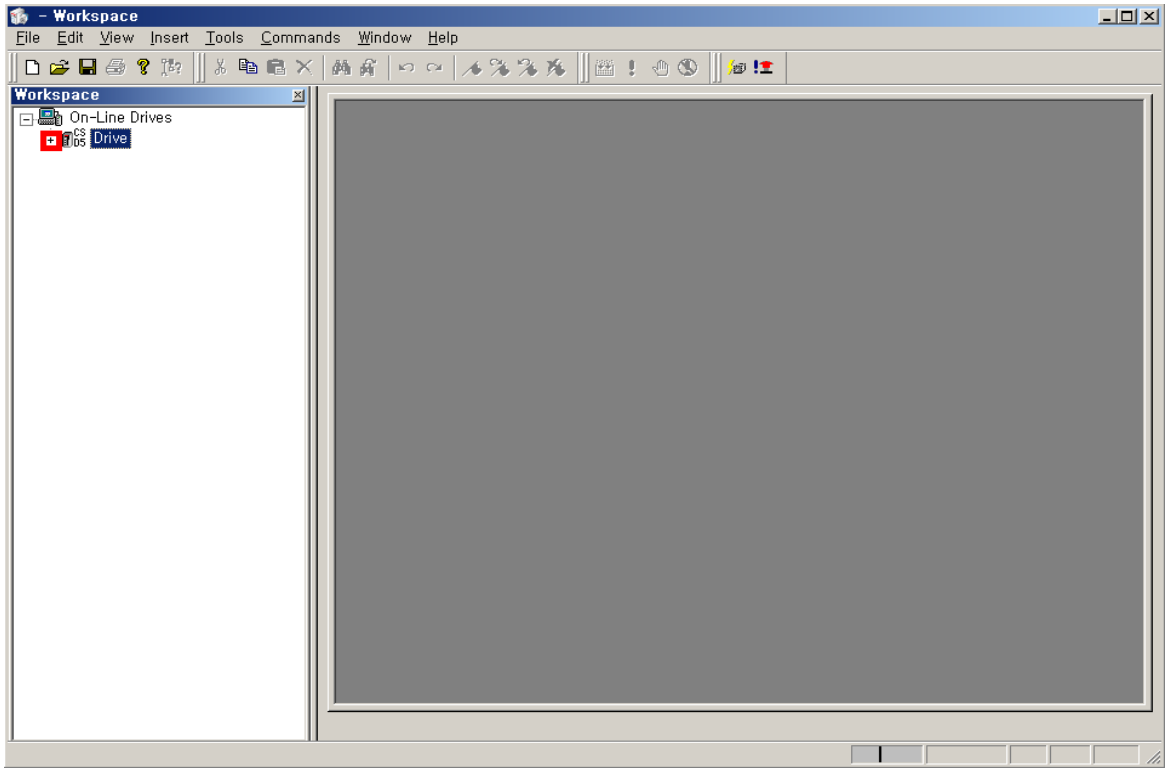
First, install the RSWare on the PC and connect the CSD5 servo drive. Check the wiring of the cables.



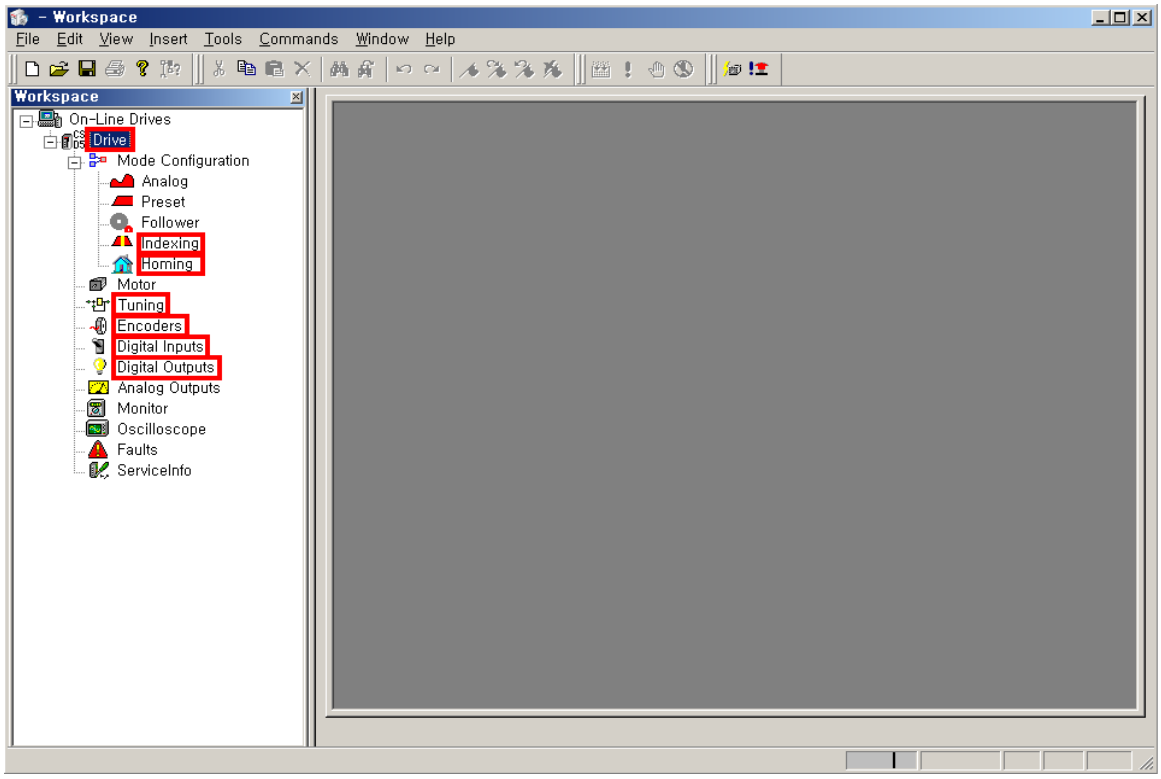
The monitor is displayed the screen above when executing the RSWare. Select the option(Open existing file or Create new file) and click the “OK”. If You want to ignore and pass to the next, click the “Cancel”.



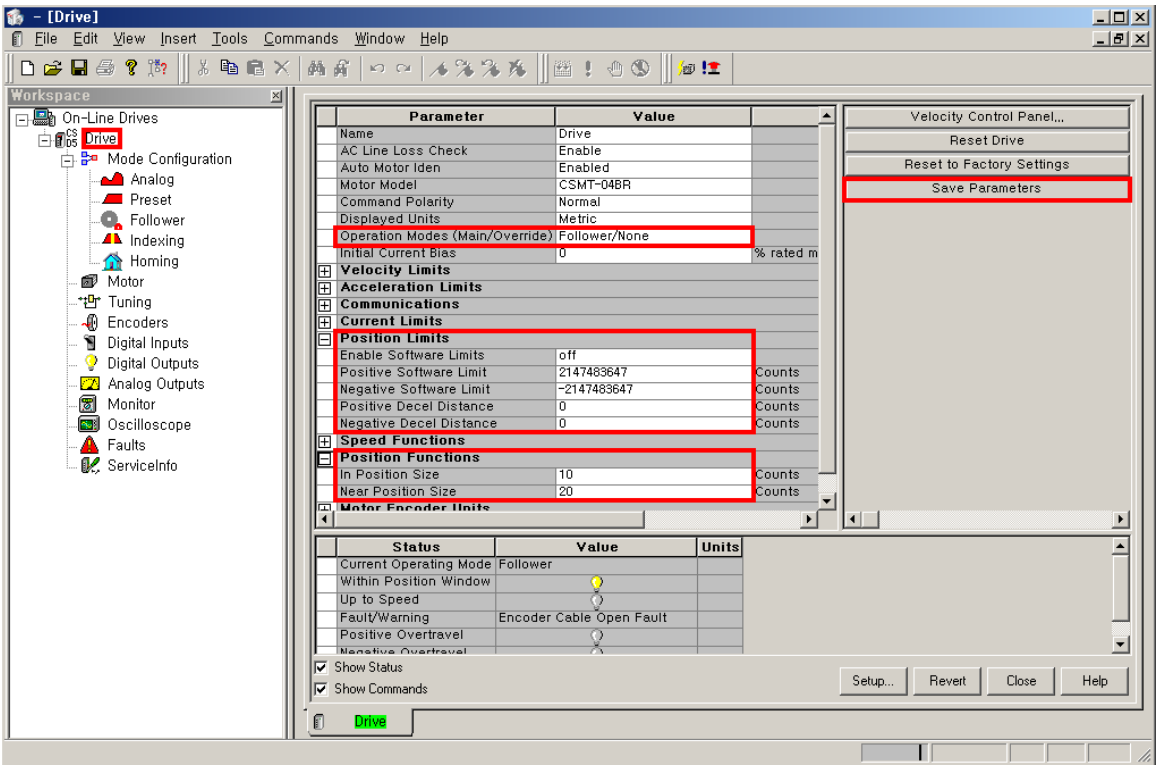
It is displayed the drive on the Workspace by scanning when You click the "OK".



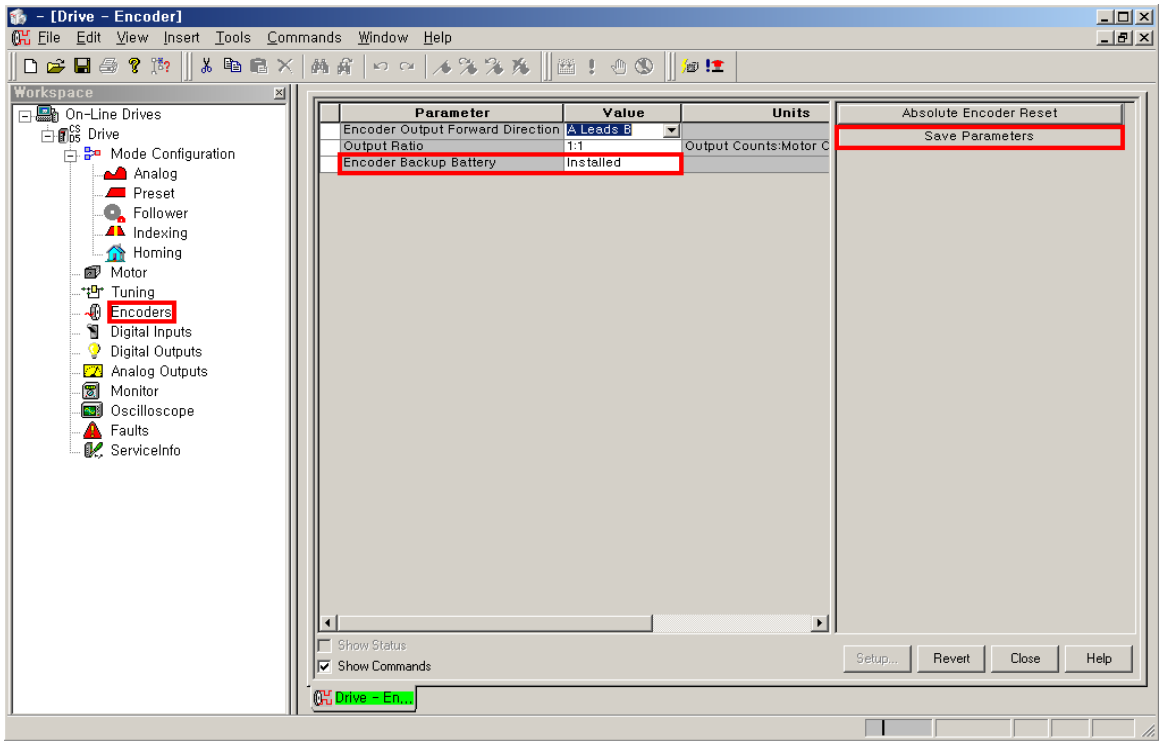
Click the + mark on the left of the Drive.



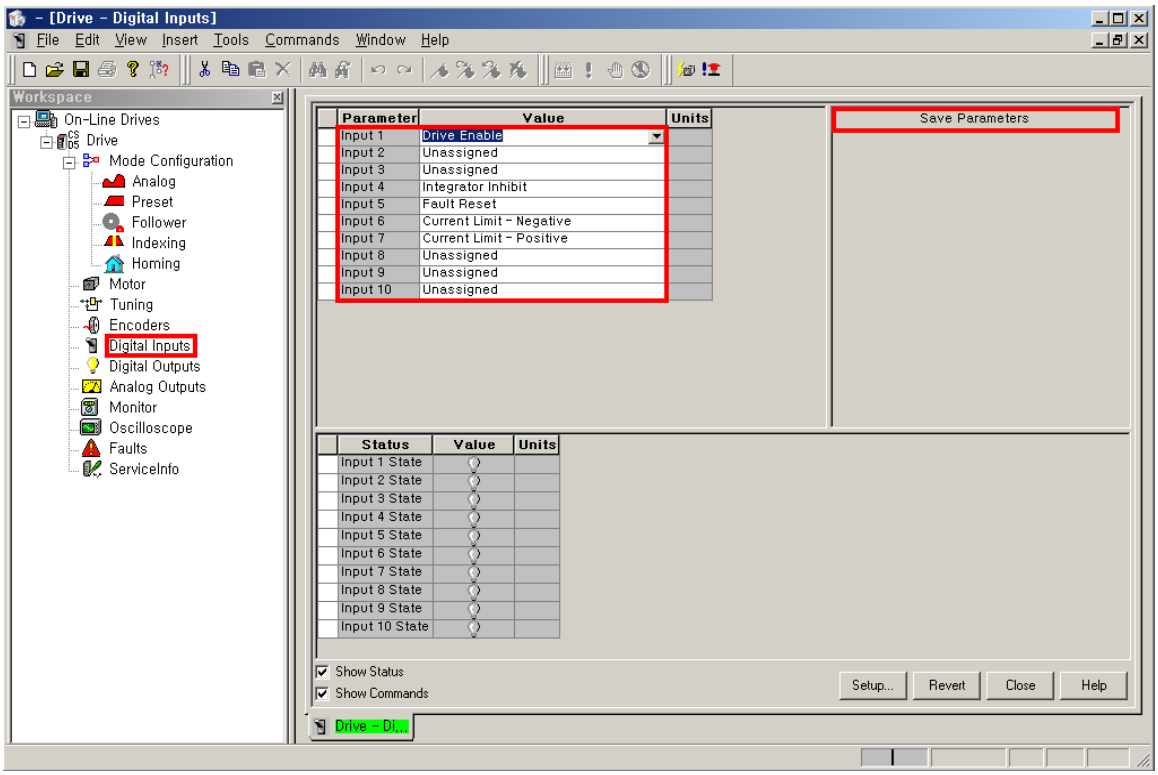
It is displayed the menu related to index. Double-click the Drive.



The monitor is displayed the screen above when double-clicking the Drive. A user can set the basic values of indexing like Control Mode of CSD5 servo drive, S/W Limit, and In Position Size. etc. Save the setting to click the Save Parameter button on the right of the screen after the setting is completed. As the other windows, Save the setting to click the Save Parameter button after the setting is completed.

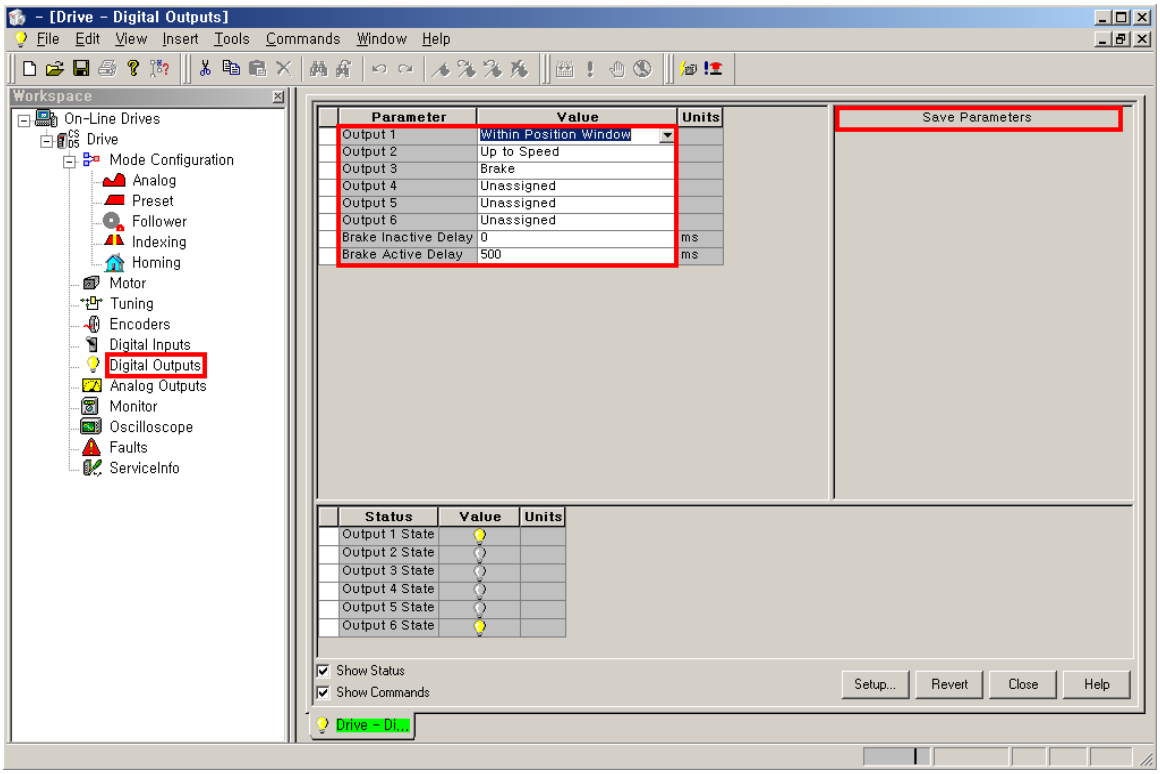


The monitor is displayed the screen above when double-clicking the Encoders of the Workspace. In here, a user can set the values related to Encoder. Set the Encoder Backup Battery.



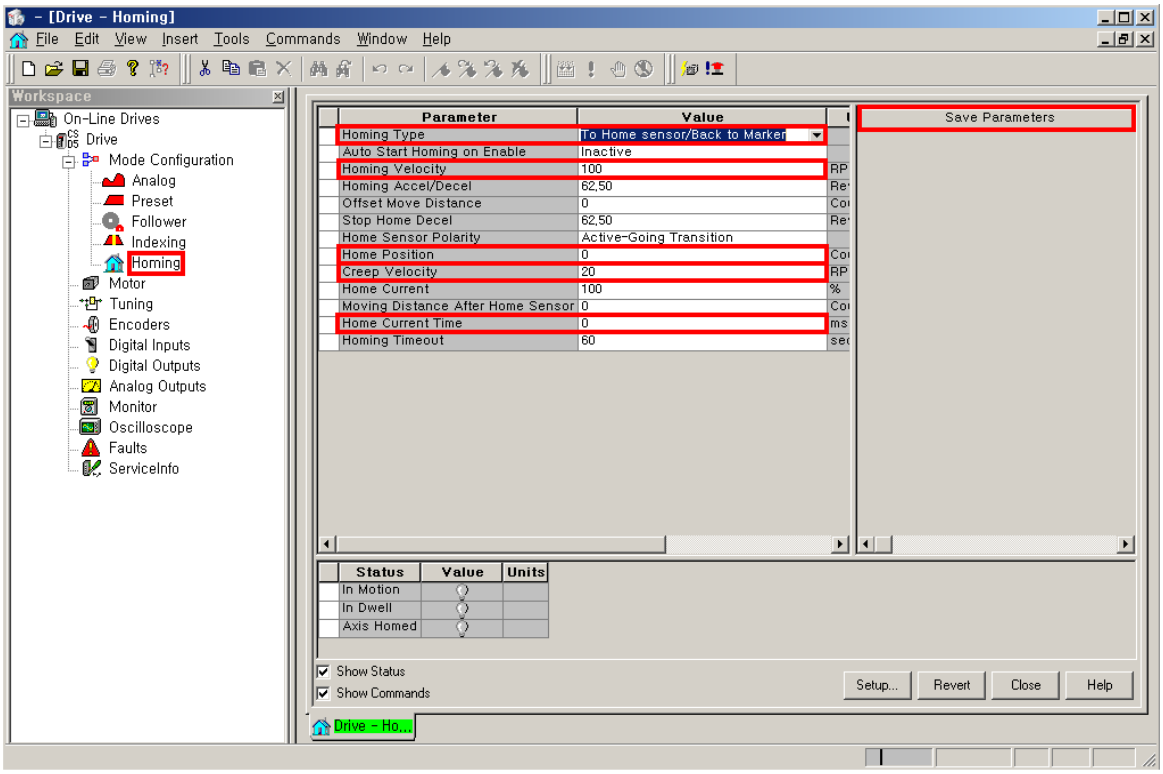
The monitor is displayed the screen above when double-clicking the Digital Inputs of the Workspace. In here, a user can set the values related to Digital Input signal.

Set the Digital Input values in the respective pin.



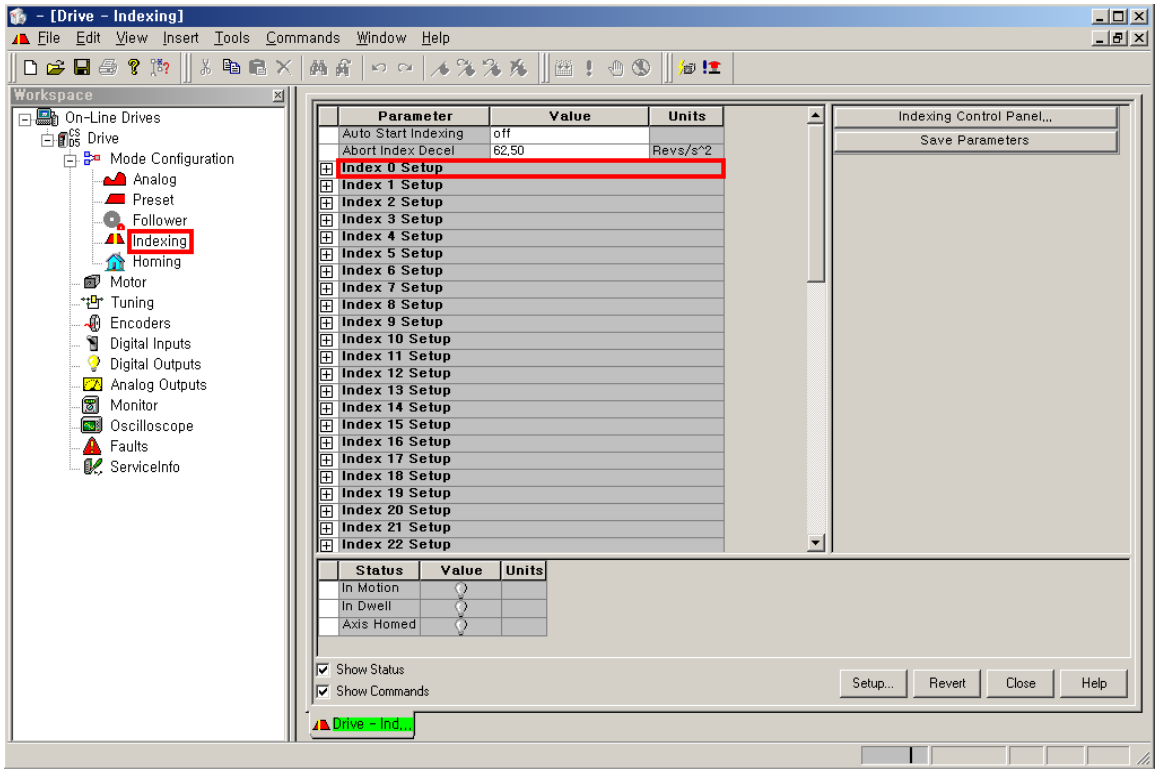
The monitor is displayed the screen above when double-clicking the Digital Outputs of the Workspace. In here, a user can set the values related to Digital Output signal.

Set the Digital Output values in the respective pin.

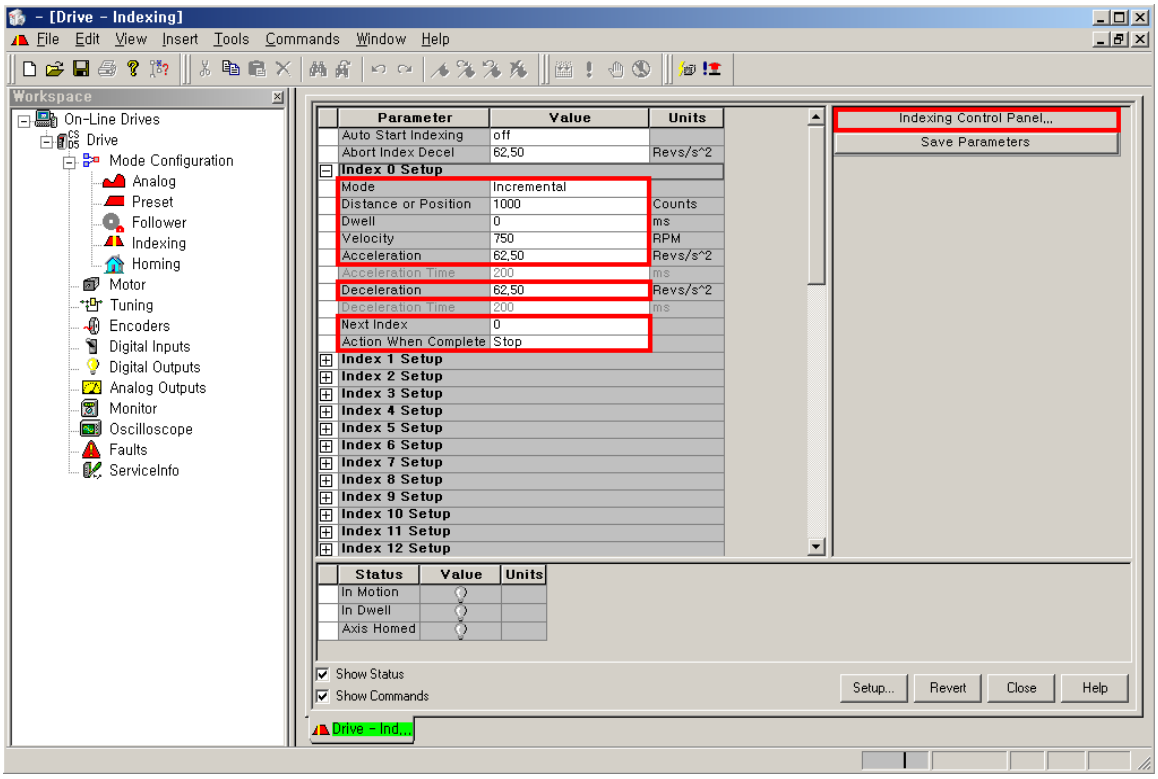


The monitor is displayed the screen above when double-clicking the Homing of the Workspace. In here, a user can set the values related to Homing.

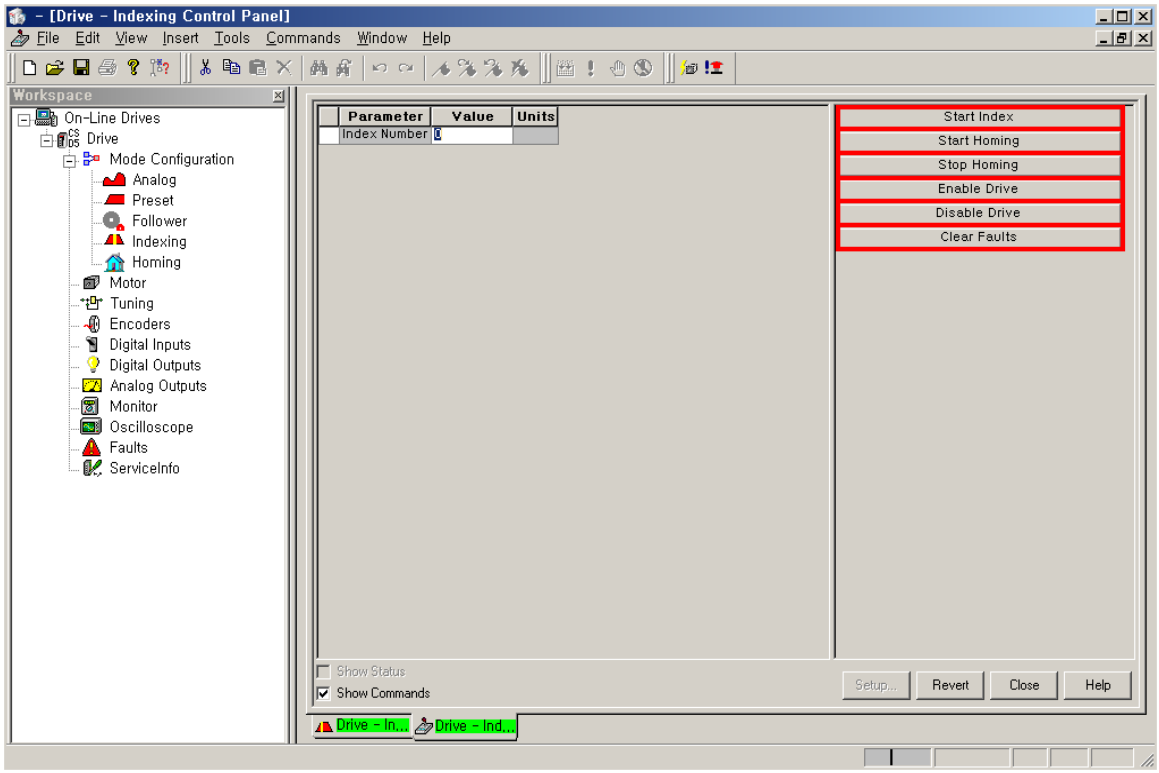
At the screen above, click the respective values and enter Homing Type, Homing Velocity, Creep Velocity, Home Current and Home Current Time.



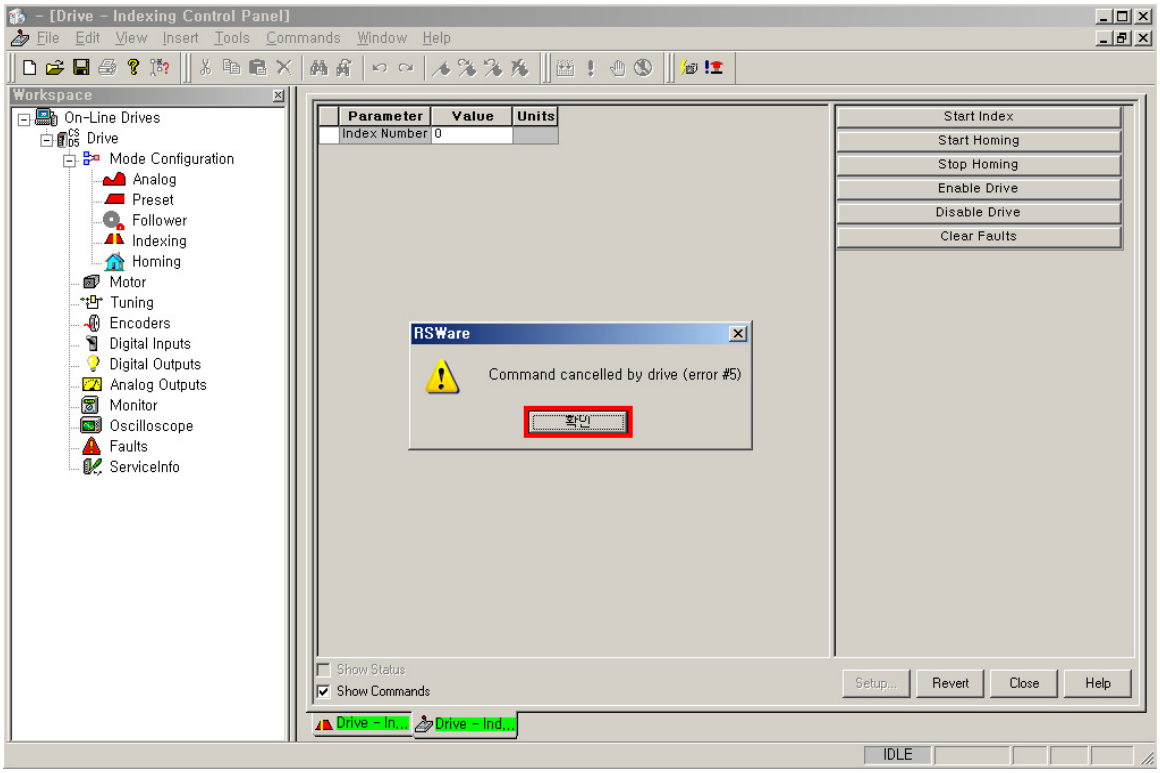
Double-clicking the Indexing of the Workspace. Click the respective index No. and enter the values related to indexing.



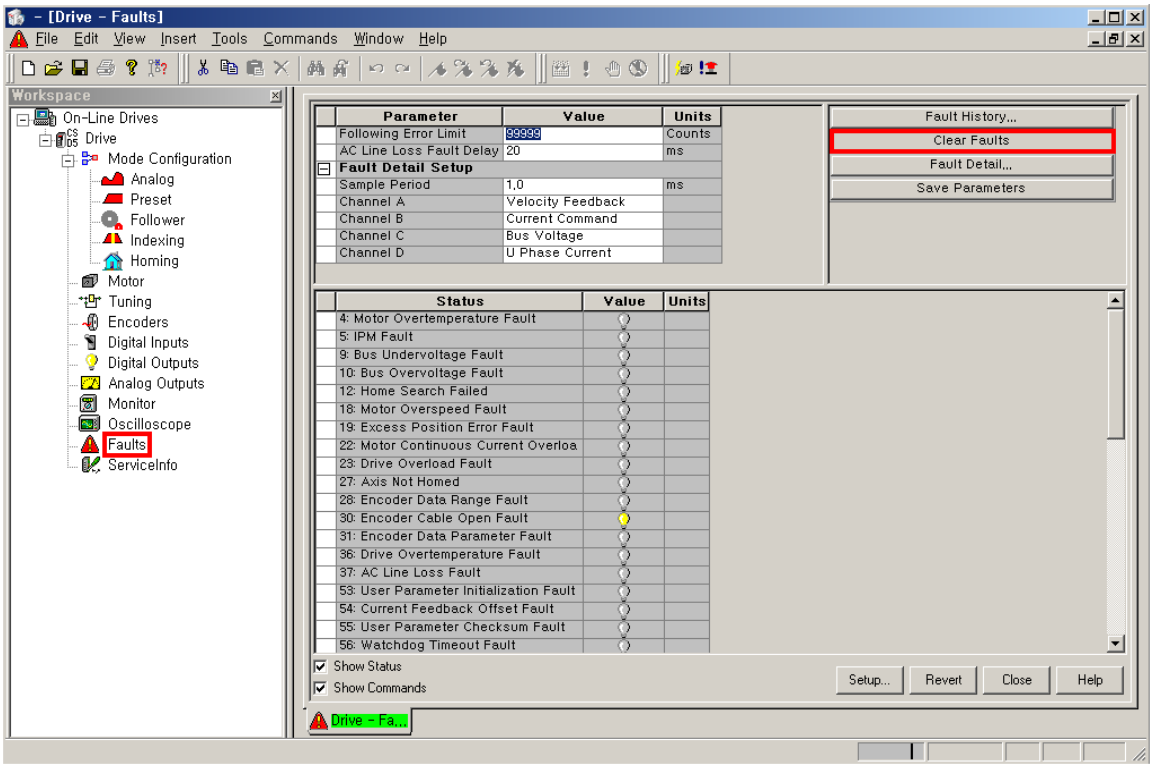
Click the respective index No. and enter Index Mode, Position/Distance, Velocity, Acceleration, Deceleration, Next Index, and Action When complete. After completing the setting, open the control window to click “Indexing Control Panel” button on the right of the screen.



Click the Enable Drive button on the right of the screen to be Servo-ON. In Servo-ON status, click the Start Homing button to start homing. When completing the homing, click Start Index button to start indexing. After completing the indexing, click Disable Drive button to be Servo-OFF.



The alarm goes off when a user tries indexing while the homing operation is incomplete as the same above. Check the message and start the indexing again.



A user can check the contents of the faults to double-click the Faults of the Workspace.

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