

RS OEMax

CSD5 Servo Drive

Modbus Manual

Catalog Number(s): CSD5-xxBX1

Important User Information

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<p>IMPORTANT</p>	<p>Identifies information that is critical for successful application and understanding of the product.</p>
<p>ATTEN-</p> 	<p>Identifies information about practices or circumstances that can lead to personal injury or death, property damage, or economic loss. Attentions help you identify a hazard, avoid a hazard, and recognize the consequence.</p>
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Table of Contents

Important User Information	2
About This Publication.....	8
Who Should Use This Manual	8
Conventions Used in This Manual	8
Additional Resources	8
Modbus Protocol.....	9
MODBUS interface	9
MODBUS-RTU Protocol	9
Protocol Description	9
Frame	9
Data Model.....	10
Function Codes.....	10
Function Code 03(0x03)	11
Description	11
Example.....	11
Function Code 04(0x04)	11
Description	12
Example.....	12
Function Code 06(0x06)	12
Description	12
Example.....	13

Table of Contents

Function Code 16(0x10)	13
Description	13
Example.....	14
Exception Codes	14
Description	14
Example.....	16
Address Maps.....	16
Addressing Rule.....	16
Communication Parameter.....	17
Node Address (Ft-0.07).....	17
Baud Rate (Ft-0.09.N0)	17
Communication Format (Ft-0.09.N1).....	17
Communication Protocol (Ft-0.09.N2).....	18
Communication Method (Ft-0.09.N3).....	18
Input & Run Control Authority (Ft-0.32)	18
Standard Parameters.....	18
Group 0 - System Level ¹⁾	18
Group 1 - Gain Control ¹⁾	19
Group 2 - Speed Control ¹⁾	20
Group 3 - Position Control	21
Group 4 - Torque Control	21
Group 5 - Supplemental Drive Control	21
Indexing Parameters	22
Special Index Parameter	22
Save Flash Memory Parameter	30

Table of Contents

Monitoring Mode	30
Monitoring Parameter (Function Code 0x04)	30
Defined Monitoring Parameter	30
Display Parameter	30
Input Registers (Default = 0)	30
Undefined Monitoring Parameter	32
Output Function Status	32
Running Parameter (Function Code 0x06 or 0x10)	33
Procedure	33
Run Control Method	34
Run Parameter	34
Holding Registers (Default = 2000)	34
Jog Operation	35
Input Function Parameter (Function Code 0x03, 0x06, or 0x10)	35
Input Function Control	35
Holding Registers (Default = 3000)	35
Appendix A Standard Drive Parameters	39
Parameter Groupings	39
Parameter Descriptions	39
Group 0	39
Group 1	51
Group 2	61
Group 3	64
Group 4	67
Group 5	69
Appendix B Indexing Drive Parameters.....	75
Parameter Groupings	75

Table of Contents

Parameter Descriptions	75
Group 0 - Indexing System	75
Group 1 - Homing	77
Group 2 - Indexing Options	79

Appendix C Warnings and Fault Codes..... 82

Warnings	82
Fault Codes	82

Summary of Change

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

Manual Revision	Changes	Date
A	N/A	July 2011

About This Publication

This manual describes the host command set for end-user interface with a CSD5 Servo drive via serial communication. Use this manual for designing, programming, and troubleshooting host commands for serial communication with the CSD5 Servo drives.

Who Should Use This Manual

This manual is intended for engineers, programmers, or technicians directly involved in the installation, operation, programming, and field maintenance of a CSD5 Servo drive by using host mode commands.

If you do not have a basic understanding of the CSD5 Servo drive, contact your local RS Automation sales representative before using this product for the availability of training courses.

Conventions Used in This Manual

The conventions starting below are used throughout this manual.

- Bulleted lists such as this one provide information, not procedural steps
- Numbered lists provide sequential steps or hierarchical information

Additional Resources

These documents contain additional information concerning related RS Automation products.

Resource	Description
CSD5 Servo Drive Installation Instruction	Mounting and wiring instructions, and mounting dimensions.
CSD5 Servo Drive User Manual	Information on installing, configuring, starting up, and troubleshooting for your CSD5 servo drive system.
RSWare User Manual	Information on configuring and operating RSWare software with servo drives and motors.

You can view or download publications at <http://www.rsautomation.co.kr>.

To order paper copies of technical documentation, contact your local RS Automation Korea distributor or sales representative.

Modbus Protocol

This chapter defines the Modbus protocol as it applies to a CSD5 Servo drive.

MODBUS interface

As it is already mentioned, the CSD5 provides the two connectors with same Pin Map, which will support the easy daisy chain connection. The figure below shows the how the cascade connection is possible at 1:N.

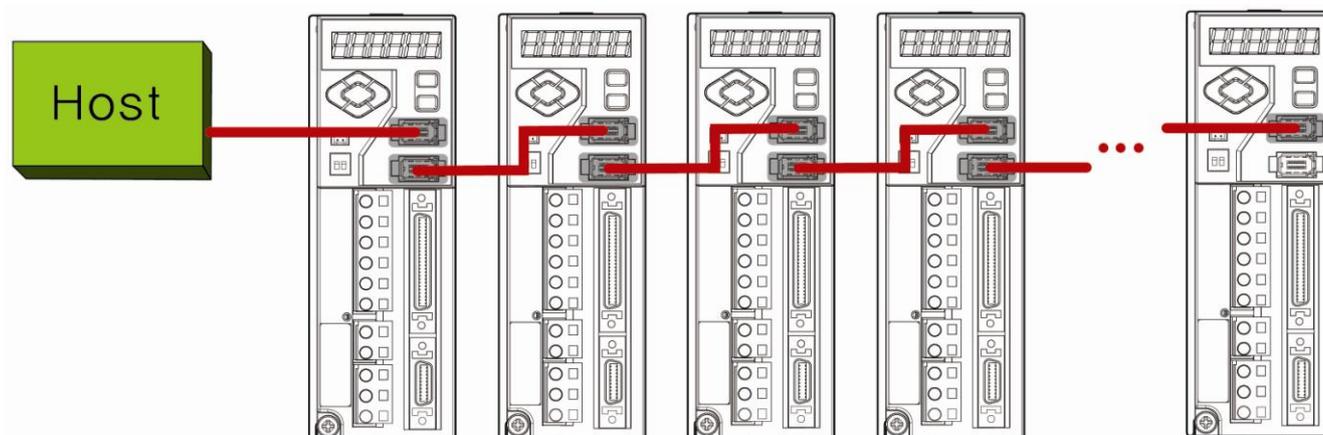


Figure 1 RS485 Multi-Drop Connection Diagram

When the above hardware wiring is configured, the RS485 1:N communication would be possible through general MODBUS-RTU protocol

MODBUS-RTU Protocol

Protocol Description

The CSD5 provides the parameter read/write, monitoring, I/O and custom Run function by the MODBUS protocol, which is originally developed by MODICON Company.

Frame

The basic MODBUS-RTU protocol of CSD5 has a frame structure as picture below.

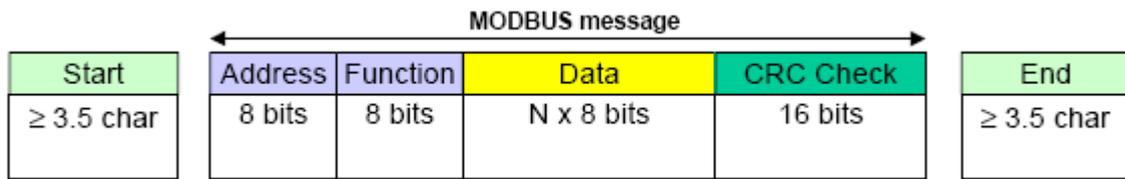


Figure 2 MODBUS Frame Structure

Field	Description
Start	Time Delimiter. It is used to differentiate between frames. If it is over 3.5 Char., it is considered as new frame.
Address	Slave Address. Each drive has unique address ID on the network.
Function	Function code. As function code, the proper register (word unit), which is defined as "MODBUS Memory Map, could be accessible (Read or Write). It also includes the function code on the Master frame error.
Data	Data is totally linked with CSD5 parameter group and mode (normal, monitoring, or run mode). It also includes the exception code on the Master frame error.
CRC Check	It will be calculated through the checksum check (Address to Data). With it, the frame error of communication is decided.
End	Time Delimiter. It is used to differentiate between frames. If it is over 3.5 Char., it is considered as next frame.

Data Model

The table below summarizes the data model of MODBUS-RTU on CSD5

Primary Tables	Object Type	Type of
Input Registers	16bit word	Read-Only
Holding Register	16bit word	Read-Write

The MODBUS application data has 1 word per address. Therefore all CSD5 parameter will have the MODBUS address more than 1.

The data section is distinguished as Read-Only (Default MODBUS Address: 30000) and Read & Write (Default MODBUS Address : 40000).

Function Codes

The register number of MODBUS devices may begin with 0 or 1. Because this is determined by the master of MODBUS, '1' must be added to the register number if necessary. The maximum number of parameters which can be read or written at the same time is the same as the number of MODBUS addresses which is, in turn, the same as the number of the parameters in each group. In other words, all the parameters in each group can be read or written all together.

Function Code	Description
03(0x03)	Read Holding Registers
04(0x04)	Read Input Registers
06(0x06)	Write Single Register
16(0x10)	Write Multiple Register

Function Code 03(0x03)

As a “Read Holding Register”, it could be used when the holding register of more than 1 address is read. If the parameters in a group are read, the all parameters of group could be readable by group unit (Multi-Read).

Description

I . Request

Function Code	1Byte	0x03
Starting Address	2Byte	0x0000 ~ 0xFFFF
Quantity of Registers	2Byte	1~Max Parameter of Group

II . Response

Function Code	1Byte	0x03
Byte Count	1Byte	$2 \times N^*$
Register Value	$N^* \times 2\text{Bytes}$	Value

$N^* = \text{Quantity of Registers}$

III. Error

Error Code	1Byte	0x83
------------	-------	------

Example

I . Request

Field Name	Value(Hex)
Function	03
Starting Address Hi	00
Starting Address Lo	6B
No. of Registers Hi	00
No. of Registers Lo	03

II . Response

Field Name	Value(Hex)
Function	03
Byte Count	06
Register Value Hi(108)	02
Register Value Lo(108)	2B
Register Value Hi(109)	00
Register Value Lo(109)	00
Register Value Hi(110)	00
Register Value Lo(110)	64

Function Code 04(0x04)

As “Read Input Register”, it could be used when the input register of more than 1 address is read.

Description

I . Request

Function Code	1Byte	0x04
Starting Address	2Byte	0x0000 ~ 0xFFFF
Quantity of Input Registers	2Byte	1 ~ 125(0x7D)

II . Response

Function Code	1Byte	0x04
Byte Count	1Byte	$2 \times N^*$
Register Value	$N^* \times 2\text{Bytes}$	Value

$N^* = \text{Quantity of Registers}$

III. Error

Error Code	1Byte	0x84
------------	-------	------

Example

I . Request

Field Name	Value(Hex)
Function	04
Starting Address Hi	00
Starting Address Lo	08
Quantity of Input Register Hi	00
Quantity of Input Register Lo	01

II . Response

Field Name	Value(Hex)
Function	04
Byte Count	02
Input Register 9 Hi	00
Input Register 9 Lo	0A

Function Code 06(0x06)

As “Write Single Register”, it could be used when a holding register is written.

Description

I . Request

Function Code	1Byte	0x06
Register Address	2Byte	0x0000 ~ 0xFFFF
Registers Value	2Byte	0x0000 ~ 0xFFFF

II . Response

Function Code	1Byte	0x06
Register Address	2Byte	0x0000 ~ 0xFFFF

Register Value	2Byte	0x0000 ~ 0xFFFF
----------------	-------	-----------------

III. Error

Error Code	1Byte	0x86
------------	-------	------

Example

I. Request

Field Name	Value(Hex)
Function	06
Register Address Hi	00
Register Address Lo	01
Register Value Hi	00
Register Value Lo	03

II. Response

Field Name	Value(Hex)
Function	06
Register Address Hi	00
Register Address Lo	01
Register Value Hi	00
Register Value Lo	03

Function Code 16(0x10)

As “Write Multiple Register”, it could be used when numerous holding register is written. Also the group of CSD5 parameter could be written by a group unit.

When try to write multiple register, user have to check parameter that give influence to other parameters.

Description

I. Request

Function Code	1Byte	0x03
Register Address	2Byte	0x0000 ~ 0xFFFF
Quantity of Registers	2Byte	1 ~ 125(0x7D)
Byte Count	1Byte	$2 \times N^*$
Register Value	$N^* \times 2\text{Bytes}$	Value

$N^* = \text{Quantity of Registers}$

II. Response

Function Code	1Byte	0x03
Starting Address	2Byte	0x0000 ~ 0xFFFF
Quantity of Registers	2Byte	1 ~ 123(0x7B)

III. Error

Error Code	1Byte	0x90
------------	-------	------

Example

I . Request

Field Name	Value(Hex)
Function	10
Starting Address Hi	00
Starting Address Lo	01
Quantity of Registers Hi	00
Quantity of Registers Lo	02
Byte Count	04
Register Value Hi	00
Register Value Lo	0A
Register Value Hi	01
Register Value Lo	02

II . Response

Field Name	Value(Hex)
Function	10
Starting Address Hi	00
Starting Address Lo	01
Quantity of Registers Hi	00
Quantity of Registers Lo	02

Exception Codes

This Protocol uses only a portion of exception codes in MODBUS specifications.

In case the Slave couldn't handle the Master's request, the Slave would return the "Exception Code". The each "Exception code" has a unique meaning on the Master's request.

Description

When the Master sends the request to Slave Device, the Slave could have four possible states as below.

I . Server receives the Client(Master)'s request without any communication error, and proceeds the following sequence. Then Server completes to returns the proper reply to Client.

II . Server couldn't receives the Client's request properly, thus doesn't precede the following sequence. Then Client would have a timeout fault.

III . Server receives the Client's request, but it doesn't reply any response due to the communication errors (parity, LRC, CRC, etc.). Then Client would have a timeout fault.

IV . Server receives the Client's request properly, but the proper following sequence is not defined. Then Client would get a Exception Code.

Among above four cases, the last event(case IV) describes the instance that the Exception Code would be returned. In that case, the two different data area which can be distinguished from the normal response will be possible.

- **Function Code Field:** In general, the Server just returns the requested FC (Function Code) to Client. However, In case of Exception code, Server will add the 0x80 to Client FC, and return it.
- **Data Field:** In general, the Server returns the appropriate data to Client. The data field contents will be versatile as to Client FC. However, In case of Exception code, the data field area will be equipped to the proper Exception code.

The table below summarizes the Exception Code that the CSD5 MODBUS-RTU can provide.

Exception Code	Name	Meaning
0x01	Illegal Function	The function code received in the query is not an allowable action for the slave.
0x02	Illegal Data Address	The data address received in the query is not an allowable address for the slave.
0x03	Illegal Data Value	*1The length of query data field is not valid for the slave.
0x06	Slave Device Busy	The slave is engaged in processing Run command. The master should retransmit the message later when the slave is free.
0x07	Illegal CRC Value	The CRC value received in the query is wrong value.
0x0C	Illegal Frame	The byte length of the Query Reception frame is out of the limit.
*20x0D	Illegal Sequence	The data sequence received in the query is not an allowable write command for the slave.
0x0E	Illegal Data Range	The range of query data field is not valid for the slave.
0x0F	Illegal Command	*3The slave is Run control and received not valid command.
0x10	Illegal Control	*4The slave is not network mode and received network control command.
0x1F	Servo Error Fail	When the slave is Servo Error condition, and receives "Servo ON" command from master.
0x21	Drive Type Fail	When drive type of the slave is Indexing, slave receives run command 03, 04.

*1: Exception Code 0x03 means the Illegal Data length. The Illegal Data Length means the improper data length. Exception Code 14(0x0E) is Illegal data Range. It means that data range exceeds the limit of minimum and maximum value.

*2: Exception Code 0x0D is generated that master dose access the 32bit data address with function code 06 or the only high or low address of 32bit data with function code 10.

*3: Exception Code 15(0x0F) is Illegal Command. It is occurred when received Run control can not be executed at the moment.

*4: The Exception Code 16(0x10) means "Illegal Control". It is occurred when network control mode is not set, but the drive was requested Run or I/O control command through network

At the CSD5 MODBUS-RTU, if the function code is “0x03”, “0x04”, and “0x10”, the exception code “0x03” means the “Illegal the number of requested data”.

Example

The example below is the case when the master requests the MODBUS address that was not defined at all

I . Request

Field Name	Value(Hex)
Function	01
Starting Address Hi	04
Starting Address Lo	A1
Quantity of Registers Hi	00
Quantity of Registers Lo	01

II . Response

Field Name	Value(Hex)
Function	81(01+80)
Exception Code	02

Address Maps

All Parameters (Ft-x.xx or Inxx.xx) allocated in MODBUS Address of one or two. The register number of MODBUS devices may begin with 0 or 1. Because this is determined by the master of MODBUS, '1' must be added to the register number if necessary.

The all Parameters, Monitoring, and Run of CSD5 servo is assigned to the MODBUS-RTU address. Besides the predefined function, additional functions are defined to the MODBUS address map.

The Group 0 ~ Group 5 of CSD5 includes two types of data, which are 16 bit and 32 bit. Since an address of MODBUS covers a word(16bit), each parameter could have 1 or 2 MODBUS address.

The table below shows the example that the two MODBUS address is used to a parameter.(But the address map of this table is not real, which is just used for the explanation)

Function Code	Parameter	MODBUS Address(dec)
03(0x03), 16(0x10)	Ft-[2][00]	40200(Ft-[2][00],Lo), 40201(Ft-[2][00],Hi)

Addressing Rule

If the parameter is 16 bit width, the corresponding combination of Word Data is applied via Big-Endian method. Whereas if the parameter is 32 bit width, the corresponding combination of Double Word Data is applied via Little-Endian method.(The address map of example below is not real, which is just used for the explanation)

The below explains the each method via example

<Little-Endian>

Ft-[x][yy] = 0x123405678(Double Word Data) & Address = 1000, 1001
Address # 1000 = 0x5678, Address # 1001 = 0x1234

<Big-Endian>

Ft-[x][yy] = 0x123405678(Double Word Data) & Address = 1000, 1001
Address # 1000 = 0x1234, Address # 1001 = 0x5678

If master does access the 32bit data address with function code 06, exception Code 0x0D is generated. Also if master does access the only high or low address of 32bit data with function code 10, exception Code 0x0D is generated.

Communication Parameter

The Ft-0.07 and Ft-0.09 is provided for communication setting.
In case of master write to Ft-0.09 of slave, slave change Ft-0.09 after it response by present value of communication setting. Applied time is about 50ms.

Node Address (Ft-0.07)

Protocol	Node Range
MODBUS-RTU	0 ~ 247

The actual possible address range for node(or servo) is from 1 to 247.
The Node Address 0 is reserved as the broadcast address. All slave nodes must recognize the broadcast address. When a broadcast request is sent on the serial bus, no response is returned from the slaves.

Baud Rate (Ft-0.09.N0)

The Ft-0.09.N0 is served for RS232 and RS485 baudrate.

Selection Value	Baudrate(bps)
0	9600
1	14400
2	19200
3	38400
4	56000
5	57600

Communication Format (Ft-0.09.N1)

Selection Value	Data Bit	Parity Bit	Stop Bit
0	8	N	1
1	8	E	1
2	8	O	1

3	8	N	2
4	8	E	2
5	8	O	2

Communication Protocol (Ft-0.09.N2)

Selection Value	Protocol
0	RSA-ASC II
1	MODBUS-RTU

With the above bit, the proprietary ASCII protocol of CSD5 and more general MODBUS-RTU can be selectable.

Communication Method (Ft-0.09.N3)

Selection Value	Method
0	RS232
1	RS485

With the above bit, the RS232 for 1:1 communication and the RS485 for multi-drop of CSD5 can be selectable.

Input & Run Control Authority (Ft-0.32)

Selection Value	Function
0x00	Digital Input Function control
0x01	MODBUS Input Function control
0x02	Digital Input Function control & Special Function control
0x10	MODBUS Run Function control
0x11	MODBUS Input & Run Function control
0x12	Run Function control & Special Function control

This parameter only determines the control of Input and Run mode. Although the “Built-in Control” is selected, the normal parameter Read/Write is always possible.

Standard Parameters

Group 0 - System Level ¹⁾

Group 0	
MODBUS Address	CSD5 Parameter
0	Ft-0.00
1	Ft-0.01[Lo]

2	Ft-0.01[Hi]
3	Ft-0.02
4	Ft-0.03
5	Ft-0.04
6	Ft-0.05
7	Ft-0.06
8	Ft-0.07
9	Ft-0.08
10	Ft-0.09
11	Ft-0.10
12	Ft-0.11
13	Ft-0.12
14	Ft-0.13
15	Ft-0.14
16	Ft-0.15
17	Ft-0.16
18	Ft-0.17
19	Ft-0.18
20	Ft-0.19
21	Ft-0.20
22	Ft-0.21
23	Ft-0.22
24	Ft-0.23
25	Ft-0.24
26	Ft-0.25
27	Ft-0.26
28	Ft-0.27
29	Ft-0.28
30	Ft-0.29
31	Ft-0.30
32	Ft-0.31
33	Ft-0.32
34~99	Reserved

1) Refer to Monitoring Parameter (Function Code 0x04) on [page 29](#) for more detailed information on this parameter.

Group 1 - Gain Control¹⁾

Group 1	
MODBUS Address	CSD5 Parameter
100	Ft-1.00
101	Ft-1.01
102	Ft-1.02
103	Ft-1.03
104	Ft-1.04
105	Ft-1.05
106	Ft-1.06
107	Ft-1.07
108	Ft-1.08
109	Ft-1.09
110	Ft-1.10
111	Ft-1.11

112	Ft-1.12
113	Ft-1.13
114	Ft-1.14
115	Ft-1.15
116	Ft-1.16
117	Ft-1.17
118	Ft-1.18
119	Ft-1.19
120	Ft-1.20
121	Ft-1.21
122	Ft-1.22
123	Ft-1.23
124	Ft-1.24
125	Ft-1.25
126	Ft-1.26
127	Ft-1.27
128	Ft-1.28
129	Ft-1.29
130	Ft-1.30
131	Ft-1.31
132	Ft-1.32
133	Ft-1.33
134	Ft-1.34
135	Ft-1.35
136	Ft-1.36
137	Ft-1.37
138	Ft-1.38
139	Ft-1.39
140	Ft-1.40
141	Ft-1.41
142	Ft-1.42
143~199	Reserved

1) Refer to Fault and Warning Status Parameter - Input Registers on [page 81](#) for more detailed information on this parameter.

Group 2 - Speed Control¹⁾

Group 2	
MODBUS Address	CSD5 Parameter
200	Ft-2.00
201	Ft-2.01
202	Ft-2.02[Lo]
203	Ft-2.02[Hi]
204	Ft-2.03[Lo]
205	Ft-2.03[Hi]
206	Ft-2.04
207	Ft-2.05
208	Ft-2.06
209	Ft-2.07
210	Ft-2.08
211	Ft-2.09
212	Ft-2.10

213	Ft-2.11
214	Ft-2.12
215	Ft-2.13
216~299	Reserved

1) Refer to Output Function Status Parameter on [page 32](#) for more detailed information on these parameters.

Group 3 - Position Control

Group 3	
MODBUS Address	CSD5 Parameter
300	Ft-3.00
301	Ft-3.01
302	Ft-3.02
303	Ft-3.03
304	Ft-3.04
305	Ft-3.05
306	Ft-3.06
307	Ft-3.07
308	Ft-3.08
309~399	Reserved

Group 4 - Torque Control

Group 4	
MODBUS Address	CSD5 Parameter
400	Ft-4.00
401	Ft-4.01
402	Ft-4.02
403	Ft-4.03
404	Ft-4.04
405	Ft-4.05
406	Ft-4.06
407~499	Reserved

Group 5 - Supplemental Drive Control

Group 5	
MODBUS Address	CSD5 Parameter
500	Ft-5.00
501	Ft-5.01
502	Ft-5.02
503	Ft-5.03
504	Ft-5.04
505	Ft-5.05
506	Ft-5.06
507	Ft-5.07
508	Ft-5.08

509	Ft-5.09
510	Ft-5.10[Lo]
511	Ft-5.10[Hi]
512	Ft-5.11
513	Ft-5.12
514	Ft-5.13
514	Ft-5.13[Lo]
515	Ft-5.13[Hi]
516	Ft-5.14[Lo]
517	Ft-5.14[Hi]
518	Ft-5.15[Lo]
519	Ft-5.15[Hi]
520	Ft-5.16[Lo]
521	Ft-5.16[Hi]
522~599	Reserved

The MODBUS address range of 600~4999 are reserved. (Except running and input Parameters)

- Running Parameter (Function Code 0x06 or 0x10) on [page 32](#) for MODBUS Addresses 2000~2016.
- Input Function Parameter (Function Code 0x03, 0x06, or 0x10) on [page 34](#) for MODBUS Addresses 3000~3002.

Indexing Parameters

Special Index Parameter

MODBUS Address	CSD5 Parameter
4000	Index 0 Distance Low
4001	Index 0 Distance High
4002	Index 0 Velocity
4003	Index 0 Decel Low
4004	Index 0 Decel High
4005	Index 0 Accel Low
4006	Index 0 Accel High
4007	Index 0 Dwell
4008	Index 0 Option
4009	Index 0 Next Index
4010~4999	Reserved

Group 0 – Indexing System	
MODBUS Address	CSD5 Parameter
5000	In00.00
5001	In00.01.Lo
5002	In00.01.Hi
5003	In00.02.Lo
5004	In00.02.Hi

5005	In00.03.Lo
5006	In00.03.Hi
5007	In00.04
5008	In00.05.Lo
5009	In00.05.Hi
5010	In00.06.Lo
5011	In00.06.Hi
5012-5399	Reserved

Group 1 - Homing

MODBUS Address	CSD5 Parameter
5200	In01.00
5201	In01.01
5202	In01.02
5203	In01.03
5204	In01.04.Lo
5205	In01.04.Hi
5206	In01.05.Lo
5207	In01.05.Hi
5208	In01.06
5209	In01.07.Lo
5210	In01.07.Hi
5211	In01.08.Lo
5212	In01.08.Hi
5213	In01.09
5214	In01.10
5215	In01.11
5216	In01.12.Lo
5217	In01.12.Hi
5218-5399	Reserved

Group 2 – Index Option

MODBUS Address	CSD5 Parameter	MODBUS Address	CSD5 Parameter
5400	In02.00	5432	In02.32
5401	In02.01	5433	In02.33
5402	In02.02	5434	In02.34
5403	In02.03	5435	In02.35
5404	In02.04	5436	In02.36
5405	In02.05	5437	In02.37
5406	In02.06	5438	In02.38
5407	In02.07	5439	In02.39
5408	In02.08	5440	In02.40
5409	In02.09	5441	In02.41
5410	In02.10	5442	In02.42
5411	In02.11	5443	In02.43
5412	In02.12	5444	In02.44
5413	In02.13	5445	In02.45
5414	In02.14	5446	In02.46
5415	In02.15	5447	In02.47
5416	In02.16	5448	In02.48
5417	In02.17	5449	In02.49
5418	In02.18	5450	In02.50
5419	In02.19	5451	In02.51

5420	In02.20	5452	In02.52
5421	In02.21	5453	In02.53
5422	In02.22	5454	In02.54
5423	In02.23	5455	In02.55
5424	In02.24	5456	In02.56
5425	In02.25	5457	In02.57
5426	In02.26	5458	In02.58
5427	In02.27	5459	In02.59
5428	In02.28	5460	In02.60
5429	In02.29	5461	In02.61
5430	In02.30	5462	In02.62
5431	In02.31	5463	In02.63
		5464~5799	Reserved

Group 4 – Index Position/Distance			
MODBUS Address	CSD5 Parameter	MODBUS Address	CSD5 Parameter
5800	In04.00.Lo	5864	In04.32.Lo
5801	In04.00.Hi	5865	In04.32. Hi
5802	In04.01.Lo	5866	In04.33.Lo
5803	In04.01.Hi	5867	In04.33. Hi
5804	In04.02.Lo	5868	In04.34.Lo
5805	In04.02.Hi	5869	In04.34. Hi
5806	In04.03.Lo	5870	In04.35.Lo
5807	In04.03.Hi	5871	In04.35. Hi
5808	In04.04.Lo	5872	In04.36.Lo
5809	In04.04.Hi	5873	In04.36. Hi
5810	In04.05.Lo	5874	In04.37.Lo
5811	In04.05.Hi	5875	In04.37. Hi
5812	In04.06.Lo	5876	In04.38.Lo
5813	In04.06.Hi	5877	In04.38. Hi
5814	In04.07.Lo	5878	In04.39.Lo
5815	In04.07.Hi	5879	In04.39. Hi
5816	In04.08.Lo	5880	In04.40.Lo
5817	In04.08.Hi	5881	In04.40. Hi
5818	In04.09.Lo	5882	In04.41.Lo
5819	In04.09.Hi	5883	In04.41. Hi
5820	In04.10.Lo	5884	In04.42.Lo
5821	In04.10.Hi	5885	In04.42. Hi
5822	In04.11.Lo	5886	In04.43.Lo
5823	In04.11.Hi	5887	In04.43. Hi
5824	In04.12.Lo	5888	In04.44.Lo
5825	In04.12.Hi	5889	In04.44. Hi
5826	In04.13.Lo	5890	In04.45.Lo
5827	In04.13.Hi	5891	In04.45. Hi
5828	In04.14.Lo	5892	In04.46.Lo
5829	In04.14.Hi	5893	In04.46. Hi
5830	In04.15.Lo	5894	In04.47.Lo
5831	In04.15.Hi	5895	In04.47. Hi
5832	In04.16.Lo	5896	In04.48.Lo
5833	In04.16. Hi	5897	In04.48. Hi
5834	In04.17.Lo	5898	In04.49.Lo
5835	In04.17. Hi	5899	In04.49. Hi
5836	In04.18.Lo	5900	In04.50.Lo
5837	In04.18. Hi	5901	In04.50. Hi

5838	In04.19.Lo	5902	In04.51.Lo
5839	In04.19.Hi	5903	In04.51.Hi
5840	In04.20.Lo	5904	In04.52.Lo
5841	In04.20.Hi	5905	In04.52.Hi
5842	In04.21.Lo	5906	In04.53.Lo
5843	In04.21.Hi	5907	In04.53.Hi
5844	In04.22.Lo	5908	In04.54.Lo
5845	In04.22.Hi	5909	In04.54.Hi
5846	In04.23.Lo	5910	In04.55.Lo
5847	In04.23.Hi	5911	In04.55.Hi
5848	In04.24.Lo	5912	In04.56.Lo
5849	In04.24.Hi	5913	In04.56.Hi
5850	In04.25.Lo	5914	In04.57.Lo
5851	In04.25.Hi	5915	In04.57.Hi
5852	In04.26.Lo	5916	In04.58.Lo
5853	In04.26.Hi	5917	In04.58.Hi
5854	In04.27.Lo	5918	In04.59.Lo
5855	In04.27.Hi	5919	In04.59.Hi
5856	In04.28.Lo	5920	In04.60.Lo
5857	In04.28.Hi	5921	In04.60.Hi
5858	In04.29.Lo	5922	In04.61.Lo
5859	In04.29.Hi	5923	In04.61.Hi
5860	In04.30.Lo	5924	In04.62.Lo
5861	In04.30.Hi	5925	In04.62.Hi
5862	In04.31.Lo	5926	In04.63.Lo
5863	In04.31.Hi	5927	In04.63.Hi
		5928-6399	Reserved

Group 7 – Index Dwell

MODBUS Address	CSD5 Parameter	MODBUS Address	CSD5 Parameter
6400	In07.00	6432	In07.32
6401	In07.01	6433	In07.33
6402	In07.02	6434	In07.34
6403	In07.03	6435	In07.35
6404	In07.04	6436	In07.36
6405	In07.05	6437	In07.37
6406	In07.06	6438	In07.38
6407	In07.07	6439	In07.39
6408	In07.08	6440	In07.40
6409	In07.09	6441	In07.41
6410	In07.10	6442	In07.42
6411	In07.11	6443	In07.43
6412	In07.12	6444	In07.44
6413	In07.13	6445	In07.45
6414	In07.14	6446	In07.46
6415	In07.15	6447	In07.47
6416	In07.16	6448	In07.48
6417	In07.17	6449	In07.49
6418	In07.18	6450	In07.50
6419	In07.19	6451	In07.51
6420	In07.20	6452	In07.52
6421	In07.21	6453	In07.53
6422	In07.22	6454	In07.54

6423	In07.23	6455	In07.55
6424	In07.24	6456	In07.56
6425	In07.25	6457	In07.57
6426	In07.26	6458	In07.58
6427	In07.27	6459	In07.59
6428	In07.28	6460	In07.60
6429	In07.29	6461	In07.61
6430	In07.30	6462	In07.62
6431	In07.31	6463	In07.63
		6464~6599	Reserved

Group 8 – Index Velocity

MODBUS Address	CSD5 Parameter	MODBUS Address	CSD5 Parameter
6600	In08.00	6632	In08.32
6601	In08.01	6633	In08.33
6602	In08.02	6634	In08.34
6603	In08.03	6635	In08.35
6604	In08.04	6636	In08.36
6605	In08.05	6637	In08.37
6606	In08.06	6638	In08.38
6607	In08.07	6639	In08.39
6608	In08.08	6640	In08.40
6609	In08.09	6641	In08.41
6610	In08.10	6642	In08.42
6611	In08.11	6643	In08.43
6612	In08.12	6644	In08.44
6613	In08.13	6645	In08.45
6614	In08.14	6646	In08.46
6615	In08.15	6647	In08.47
6616	In08.16	6648	In08.48
6617	In08.17	6649	In08.49
6618	In08.18	6650	In08.50
6619	In08.19	6651	In08.51
6620	In08.20	6652	In08.52
6621	In08.21	6653	In08.53
6622	In08.22	6654	In08.54
6623	In08.23	6655	In08.55
6624	In08.24	6656	In08.56
6625	In08.25	6657	In08.57
6626	In08.26	6658	In08.58
6627	In08.27	6659	In08.59
6628	In08.28	6660	In08.60
6629	In08.29	6661	In08.61
6630	In08.30	6662	In08.62
6631	In08.31	6663	In08.63
		6664~6999	Reserved

Group 10 – Index Acceleration

MODBUS Address	CSD5 Parameter	MODBUS Address	CSD5 Parameter
7000	In10.00.Lo	7064	In10.32.Lo
7001	In10.00.Hi	7065	In10.32. Hi
7002	In10.01.Lo	7066	In10.33.Lo
7003	In10.01.Hi	7067	In10.33. Hi
7004	In10.02.Lo	7068	In10.34.Lo

7005	ln10.02.Hi	7069	ln10.34. Hi
7006	ln10.03.Lo	7070	ln10.35.Lo
7007	ln10.03.Hi	7071	ln10.35. Hi
7008	ln10.04.Lo	7072	ln10.36.Lo
7009	ln10.04.Hi	7073	ln10.36. Hi
7010	ln10.05.Lo	7074	ln10.37.Lo
7011	ln10.05.Hi	7075	ln10.37. Hi
7012	ln10.06.Lo	7076	ln10.38.Lo
7013	ln10.06.Hi	7077	ln10.38. Hi
7014	ln10.07.Lo	7078	ln10.39.Lo
7015	ln10.07.Hi	7079	ln10.39. Hi
7016	ln10.08.Lo	7080	ln10.40.Lo
7017	ln10.08.Hi	7081	ln10.40. Hi
7018	ln10.09.Lo	7082	ln10.41.Lo
7019	ln10.09.Hi	7083	ln10.41. Hi
7020	ln10.10.Lo	7084	ln10.42.Lo
7021	ln10.10.Hi	7085	ln10.42. Hi
7022	ln10.11.Lo	7086	ln10.43.Lo
7023	ln10.11.Hi	7087	ln10.43. Hi
7024	ln10.12.Lo	7088	ln10.44.Lo
7025	ln10.12.Hi	7089	ln10.44. Hi
7026	ln10.13.Lo	7090	ln10.45.Lo
7027	ln10.13.Hi	7091	ln10.45. Hi
7028	ln10.14.Lo	7092	ln10.46.Lo
7029	ln10.14.Hi	7093	ln10.46. Hi
7030	ln10.15.Lo	7094	ln10.47.Lo
7031	ln10.15.Hi	7095	ln10.47. Hi
7032	ln10.16.Lo	7096	ln10.48.Lo
7033	ln10.16. Hi	7097	ln10.48. Hi
7034	ln10.17.Lo	7098	ln10.49.Lo
7035	ln10.17. Hi	7099	ln10.49. Hi
7036	ln10.18.Lo	7100	ln10.50.Lo
7037	ln10.18. Hi	7101	ln10.50. Hi
7038	ln10.19.Lo	7102	ln10.51.Lo
7039	ln10.19. Hi	7103	ln10.51. Hi
7040	ln10.20.Lo	7104	ln10.52.Lo
7041	ln10.20. Hi	7105	ln10.52. Hi
7042	ln10.21.Lo	7106	ln10.53.Lo
7043	ln10.21. Hi	7107	ln10.53. Hi
7044	ln10.22.Lo	7108	ln10.54.Lo
7045	ln10.22. Hi	7109	ln10.54. Hi
7046	ln10.23.Lo	7110	ln10.55.Lo
7047	ln10.23. Hi	7111	ln10.55. Hi
7048	ln10.24.Lo	7112	ln10.56.Lo
7049	ln10.24. Hi	7113	ln10.56. Hi
7050	ln10.25.Lo	7114	ln10.57.Lo
7051	ln10.25. Hi	7115	ln10.57. Hi
7052	ln10.26.Lo	7116	ln10.58.Lo
7053	ln10.26. Hi	7117	ln10.58. Hi
7054	ln10.27.Lo	7118	ln10.59.Lo
7055	ln10.27. Hi	7119	ln10.59. Hi
7056	ln10.28.Lo	7120	ln10.60.Lo
7057	ln10.28. Hi	7121	ln10.60. Hi
7058	ln10.29.Lo	7122	ln10.61.Lo

7059	In10.29. Hi	7123	In10.61. Hi
7060	In10.30.Lo	7124	In10.62.Lo
7061	In10.30. Hi	7125	In10.62. Hi
7062	In10.31.Lo	7126	In10.63.Lo
7063	In10.31. Hi	7127	In10.63. Hi
		7128-7199	Reserved

Group 11 – Index Deceleration			
MODBUS Address	CSD5 Parameter	MODBUS Address	CSD5 Parameter
7200	In11.00.Lo	7264	In11.32.Lo
7201	In11.00.Hi	7265	In11.32. Hi
7202	In11.01.Lo	7266	In11.33.Lo
7203	In11.01.Hi	7267	In11.33. Hi
7204	In11.02.Lo	7268	In11.34.Lo
7205	In11.02.Hi	7269	In11.34. Hi
7206	In11.03.Lo	7270	In11.35.Lo
7207	In11.03.Hi	7271	In11.35. Hi
7208	In11.04.Lo	7272	In11.36.Lo
7209	In11.04.Hi	7273	In11.36. Hi
7210	In11.05.Lo	7274	In11.37.Lo
7211	In11.05.Hi	7275	In11.37. Hi
7212	In11.06.Lo	7276	In11.38.Lo
7213	In11.06.Hi	7277	In11.38. Hi
7214	In11.07.Lo	7278	In11.39.Lo
7215	In11.07.Hi	7279	In11.39. Hi
7216	In11.08.Lo	7280	In11.40.Lo
7217	In11.08.Hi	7281	In11.40. Hi
7218	In11.09.Lo	7282	In11.41.Lo
7219	In11.09.Hi	7283	In11.41. Hi
7220	In11.10.Lo	7284	In11.42.Lo
7221	In11.10.Hi	7285	In11.42. Hi
7222	In11.11.Lo	7286	In11.43.Lo
7223	In11.11.Hi	7287	In11.43. Hi
7224	In11.12.Lo	7288	In11.44.Lo
7225	In11.12.Hi	7289	In11.44. Hi
7226	In11.13.Lo	7290	In11.45.Lo
7227	In11.13.Hi	7291	In11.45. Hi
7228	In11.14.Lo	7292	In11.46.Lo
7229	In11.14.Hi	7293	In11.46. Hi
7230	In11.15.Lo	7294	In11.47.Lo
7231	In11.15.Hi	7295	In11.47. Hi
7232	In11.16.Lo	7296	In11.48.Lo
7233	In11.16. Hi	7297	In11.48. Hi
7234	In11.17.Lo	7298	In11.49.Lo
7235	In11.17. Hi	7299	In11.49. Hi
7236	In11.18.Lo	7300	In11.50.Lo
7237	In11.18. Hi	7301	In11.50. Hi
7238	In11.19.Lo	7302	In11.51.Lo
7239	In11.19. Hi	7303	In11.51. Hi
7240	In11.20.Lo	7304	In11.52.Lo
7241	In11.20. Hi	7305	In11.52. Hi
7242	In11.21.Lo	7306	In11.53.Lo
7243	In11.21. Hi	7307	In11.53. Hi
7244	In11.22.Lo	7308	In11.54.Lo

7245	In11.22. Hi	7309	In11.54. Hi
7246	In11.23.Lo	7310	In11.55.Lo
7247	In11.23. Hi	7311	In11.55. Hi
7248	In11.24.Lo	7312	In11.56.Lo
7249	In11.24. Hi	7313	In11.56. Hi
7250	In11.25.Lo	7314	In11.57.Lo
7251	In11.25. Hi	7315	In11.57. Hi
7252	In11.26.Lo	7316	In11.58.Lo
7253	In11.26. Hi	7317	In11.58. Hi
7254	In11.27.Lo	7318	In11.59.Lo
7255	In11.27. Hi	7319	In11.59. Hi
7256	In11.28.Lo	7320	In11.60.Lo
7257	In11.28. Hi	7321	In11.60. Hi
7258	In11.29.Lo	7322	In11.61.Lo
7259	In11.29. Hi	7323	In11.61. Hi
7260	In11.30.Lo	7324	In11.62.Lo
7261	In11.30. Hi	7325	In11.62. Hi
7262	In11.31.Lo	7326	In11.63.Lo
7263	In11.31. Hi	7327	In11.63. Hi
		7328~7399	Reserved

Group 12 – Next Index

MODBUS Address	CSD5 Parameter	MODBUS Address	CSD5 Parameter
7400	In12.00	7432	In12.32
7401	In12.01	7433	In12.33
7402	In07.02	7434	In12.34
7403	In12.03	7435	In12.35
7404	In12.04	7436	In12.36
7405	In12.05	7437	In12.37
7406	In12.06	7438	In12.38
7407	In12.07	7439	In12.39
7408	In12.08	7440	In12.40
7409	In12.09	7441	In12.41
7410	In12.10	7442	In12.42
7411	In12.11	7443	In12.43
7412	In12.12	7444	In12.44
7413	In12.13	7445	In12.45
7414	In12.14	7446	In12.46
7415	In12.15	7447	In12.47
7416	In12.16	7448	In12.48
7417	In12.17	7449	In12.49
7418	In12.18	7450	In12.50
7419	In12.19	7451	In12.51
7420	In12.20	7452	In12.52
7421	In12.21	7453	In12.53
7422	In12.22	7454	In12.54
7423	In12.23	7455	In12.55
7424	In12.24	7456	In12.56
7425	In12.25	7457	In12.57
7426	In12.26	7458	In12.58
7427	In12.27	7459	In12.59
7428	In12.28	7460	In12.60
7429	In12.29	7461	In12.61

7430	In12.30	7462	In12.62
7431	In12.31	7463	In12.63
		7464~7599	Reserved

Save Flash Memory Parameter

When the Client (or Controller) generally tries to write a data by FC 0x06, it will be stored to the RAM(Only Standard & Index Parameter) area, which means it will be volatile. If the written data is stored to Non-volatile flash memory permanently, the Client should do the following sequence.

The Client should write the “1” to the dedicated address below. Then all RAM(Only Standard & Index Parameter)-resident parameter will be updated to the flash memory. Like other parameter write, the write to the address below should need the Function Code 0x06, 0x10. The permissible data on dedicated address below is only “1”. If the Client try to write other data except “1”, the server (CSD5) will return “Data Range Fail fault(0x0E)” The address, 9999, is Write-Only address. Therefore if the client try to read from it, the server(CSD5) will return the [Exception Code 02\(Address Fail\)](#). The important advice is the maximum allowable erase/program cycle of flash memory is 100,000cycles.

MODBUS Address	Data Range	Description
9999(dec)	1	Write data in Flash Memory

Monitoring Mode

Monitoring Parameter (Function Code 0x04)

The “Read or Multi-Read” of monitoring variables are possible through Function Code 04(Read Input Register). [Each address is readable by Block base \(Display Parameter Block\)](#).

Defined Monitoring Parameter

All display parameters (or variables) of CSD5 are mapped to Function Code “04” area, which has default address of 0x00.

Display Parameter

Input Registers (Default = 0)

MODBUS Address	Drive	Name	Unit
----------------	-------	------	------

0	dis-00	Velocity Feedback	rpm
1	dis-01	Velocity Command	rpm
2	dis-02	Velocity Error	rpm
3	dis-03	Torque Command	0.10%
4-5	dis-04	Position Feedback	counts
6-7	dis-05	Position Command	counts
8-9	dis-06	Position Error	counts
10	dis-07	Pulse Command Frequency	0.1pps
11	dis-08	Electrical Angle	0.1°
12	dis-09	Mechanical Angle	0.1°
13	dis-10	Regeneration Load Ratio	%
14	dis-11	DC-Link Voltage	V
15	dis-12	Multi-Turn Data	Turn number
16~17	dis-13	Offset in Velocity Command	0.1mV
18~19	dis-14	Torque Offset	0.1mV
20~24	dis-15	Input/Output Signal Status	
25~32	dis-16	Display Error History	8Alarm
33	dis-17	Display Software Version	1word
34~35	dis-18	Display Motor info	2word
36	dis-19	Analog Velocity Command Voltage	0.01V
37	dis-20	Analog Current Command Voltage	0.01V
38	dis-21	Drive Rated Output Power	1word
39~40	dis-22	Absolute Single Turn Data	
41~42	dis-23	Encoder Feedback Counter	counts

At the above list, the Input/Output Signal Status (Dis-15) means the physical status of input and output pins. It's expressed as hex format at the MODBUS data stream. That means the possible input or output per word is 4, and one hex data could have "0" or "1" as a physical status like picture below.

For the detail information on Dis-18, refer to the Servo Motor Manual. And for Display Error History (Dis-16), refer to C. Fault Codes.

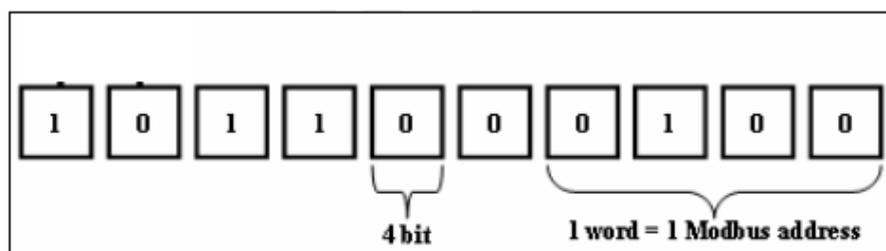


Figure 3 MODBUS I/O Signal Status Description

Address 20, 21 and 22 is physical status of input pins. However, communication input command don't apply to physical input pins. Therefore value of those address is always "0".

Address 23 and 24 is physical status of output pins.

< Address 23 >

Hex position	No.3	No.2	No.1	No.0
Function	Emergence Stop	Alarm 3	Alarm 2	Alarm 1
I/O pin number	10	39	38	37

< Address 24 >

Hex position	No.3	No.2	No.1	No.0
Function	S_Alarm	Output 1	Output 2	Output 3
I/O pin number	45(+), 46(-)	41(+), 42(-)	43(+), 44(-)	47(+), 48(-)

Physical status of output pin is set to "1" as operate output function of allocated channel.

Undefined Monitoring Parameter

For the function code 0x04, CSD5 MODBUS defines three kinds of parameter. One is the monitoring parameter as parameter. The another is fault & warning (refer to E. Warning Code) status and other is Output function status.

MODBUS Fault & Warning Status Parameter

Name	Modbus Address
Servo Fault Code	100
Servo Warning Code	101

The Output Function Status means the functional status, not physical status of output. If each function is mapped to the specific Modbus address and its function is enabled, then the assigned hex data would be set by "1". Otherwise, it would be normally "0".

The table below describes the output functions that can be monitored, and it also provides short explanation on each function.

Output Function Status

Output Functions	Description	Unit	Position [bits]	Active Value	MODBUS Address
/S_ALM	Alarm	Bit	[0]	0	200
/P-COM	Within position window	Bit	[1]	1	
/TG-ON	Up to speed	Bit	[2]	1	
BK	Brake control	Bit	[3]	1	
/V-COM	Within Speed window	Bit	[4]	1	
/A-VLD	Absolute position valid	Bit	[5]	1	
/RDY	Drive Ready	Bit	[6]	1	
/T-LMT	Current Limited	Bit	[7]	1	
/V-LMT	Velocity Limited	Bit	[8]	1	

/NEAR	Near position	Bit	[9]	1	201
/WARN	Warning	Bit	[10]	1	
Reserved		Bit	[11]	-	
Reserved		Bit	[12]	-	
/IMO	In Motion	Bit	[13]	1	
/I-DW	In Dwell	Bit	[14]	1	
/HOMC	Axis Homed	Bit	[15]	1	
/O_ISEL0	Index Select 0 Out	Bit	[0]	1	
/O_ISEL1	Index Select 1 Out	Bit	[1]	1	
/O_ISEL2	Index Select 2 Out	Bit	[2]	1	
/O_ISEL3	Index Select 3 Out	Bit	[3]	1	
/O_ISEL4	Index Select 4 Out	Bit	[4]	1	
/O_ISEL5	Index Select 5 Out	Bit	[5]	1	
/E_SEQU	End of Sequence	Bit	[6]	1	
Reserved		Bit	[7..15]	-	

Running Parameter (Function Code 0x06 or 0x10)

The Run Parameter at MODUBUS(Run Mode at built-in Jog) is dedicated to the specific MODBUS address section. Each Run Parameter is mapped to the unique MODBUS address. Besides, the data of Run Parameter mostly have never meant much. Only Run00 have an actual meaning. For this parameters, if the data value is over "0x11", the Range Error fault(Exception Code 0x0E) will be posted. Also Run parameters only are used with function Code 0x06 and 0x10.

Procedure

The overall sequence of Run parameter is as picture below. When the Client send the Request on Run and the Server receive the Request packet, the Server will first send the "Response" packet. Then execute the following sequence.

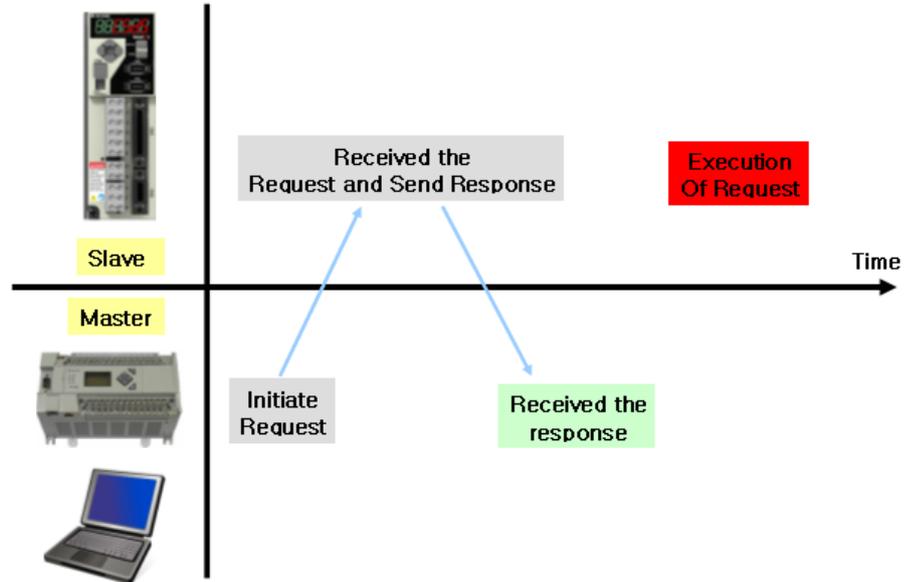


Figure 4 Run Procedure

A part of Run parameter function such as “Auto-Tuning”, needs a definite time to complete the requested work. Thus if the following Packet from Client is requested in the middle of function execution, the Server(servo) will return the Exception Code 06(Slave busy) to Client, which notify the Server is still busy.

“Flash Update”, “Alarm Reset” need to delay time for execution of run command. If drive is operating the command that “Flash Update”, or “Alarm Reset” is requested from master and master request another command more than two, Drive will return error response to master. But if it is requested once, drive executes the second command after first command finish.

Run Control Method

As it mentioned, the all most Run Parameter of CSD5 has one MODBUS address. Except special function, most of it could be accessed by Function code 0x06 or 0x10 write.

Run Parameter

Holding Registers (Default = 2000)

MODBUS Address	RUN	Name	Access Unit
2000	run-00	Jog Operation	1 byte
2001	run-01	Off-Line Auto Tuning	1 bit
2002	Reserved	-	-
2003	run-03	Auto Adjustment of Speed Command Offset	1 bit
2004	run-04	Auto Adjustment of Current Command Offset	1 bit

2005	Reserved	-	-
2006	Reserved	-	-
2007	Reserved	-	-
2008	run-08	Alarm Reset	1 bit
2009	Reserved	-	-
2010	run-10	Absolute Encoder Reset	1 bit
2011	run-11	2-Group Gain Storing	1 bit
2012	run-12	Parameter Initialization	1 bit
2013	Reserved	-	-
2014	Reserved	-	-
2015	Reserved	-	-
2016	run-16	Hardware Reset	1 bit

Data of run command must have only “1” except run-00.

Jog Operation

The Jog Operation via MODBUS is possible via Run00 parameter, which is MODBUS address of 0x2000 with FC 0x06 and 0x10. The Jog Speed is Ft-2.01 (Modbus Address: 201) like built-in Jog. If Jog is not on and drive receive direction CW or CCW or Jog off value, then drive response Exception Code 15 (command fail) to master.

Value	Function
0x00	Jog-On
0x01	Direction - CW
0x10	Direction - CCW
0x11	Jog-Off

Modbus Address	parameter	Function	Range(rpm)
201	Ft-2.01	Jog Velocity Command	0 ~ 6000

Input Function Parameter (Function Code 0x03, 0x06, or 0x10)

In the CSD5 MODBUS, almost Input function could be served through communication except several input. While the output function status is monitored by Function Code 0x04 (read only), the input function control is engaged by Function Code 0x06 and 0x10 which was already used in parameter write.

Input Function Control

Holding Registers (Default = 3000)

Modbus Address	Input Functions	Description	Unit	Position Bit
3000	/SV-ON	Drive Enable	1bit	[0]
	Reserved	-	-	[1]
	Reserved	-	-	[2]
	/P-CON	Integrator Inhibit	1bit	[3]
	/A-RST	Fault Reset	1bit	[4]
	/N-TL	Negative Current Limit	1bit	[5]
	/P-TL	Positive Current Limit	1bit	[6]
	/C-SEL	Operation Mode Override	1bit	[7]
	/C-DIR	Preset Direction	1bit	[8]
	/C-SP1	Preset Select 1	1bit	[9]
	/C-SP2	Preset Select 2	1bit	[10]
	/C-SP3	Preset Select 3	1bit	[11]
	/C-SP4	Preset Select 4	1bit	[12]
	/INHIB	Pause Follower	1bit	[13]
	/G-SEL	Alternate Gain Select	1bit	[14]
/PCLR	Position clear	1bit	[15]	
3001	/ABS-DT	Position Strobe	1bit	[0]
	/START	Motor Moving Enable	1bit	[1]
	/Z-CLP	Zero Speed Clamp Enable	1bit	[2]
	/GEAR	2nd Electronic Gear Bank Selection	1bit	[3]
	/R-ABS	Reset multi-turn data of Absolute Encoder	1bit	[4]
	Reserved	-	-	[5]
	/SHOME	Start Homing	1bit	[6]
	/STOP	Stop Indexing	1bit	[7]
	/PAUSE	Pause Indexing	1bit	[8]
	/I-SEL0	Index Select 0 Input	1bit	[9]
	/I-SEL1	Index Select 1 Input	1bit	[10]
	/I-SEL2	Index Select 2 Input	1bit	[11]
	/I-SEL3	Index Select 3 Input	1bit	[12]
	/I-SEL4	Index Select 4 Input	1bit	[13]
	/I-SEL5	Index Select 5 Input	1bit	[14]
/H_STOP	Stop Homing	1bit	[15]	
3002	/START_I	Start Index	1bit	[0]
	/BANK_SEL	Gain Bank Select	1bit	[1]
	/A-CL	Analog Current Limit	1bit	[2]
	/ABS-MD	Absolute Position Transfer Mode	1bit	[3]
	Reserved	-	-	[4]-[15]
3003	Index Start	Index Start Function	1bit	[0]
	Index Stop	Index Stop Function	1bit	[1]
	Home Start	Home Start Function	1bit	[2]
	Home Stop	Home Stop Function	1bit	[3]
	Reserved	-	-	[4]-[15]

For the Input control of CSD5, the two methods are supported. One is to use the real digital input signal from I/O connector. The other is to use the communication through MODBUS protocol. Among them, only one control method is possible at a time. (In order to control No.2 in Ft-0.09 must set “1”)

- WHEN THE DIGITAL INPUT (HARDWARE INPUT) FUNCTION CONTROL IS SELECTED AND THE MODBUS CONTROL IS TRIED.

: THE DRIVE WILL RETURN THE EXCEPTION CODE 16(ILLEGAL CONTROL), AND THE MODBUS COMMAND IS DISREGARDED

- When the MODBUS Input Function control is selected and the Digital input (Hardware Input) control is tried.

: Any Digital Input (Hardware Input) signal is disregarded.

For supporting the special index and home function with Digital Input(Hardware Input) Control, control No.0 in Ft-0.32 must be set “2”(which is “disable + special function).

Digital input (Hardware Input) control and special function can be used simultaneously, and the Digital Input (Hardware Input) operates first in case that Digital input and special function are inputted at the same time and Special function doesn't need clear procedure.

The operation of Special function is below table.

Function	Description
Start Index	Begins execution of the indexed motion command (0 - 63) specified in the Index Number parameter, above. Note: Absolute indexes cannot be executed until home has been defined.
Stop Index	Stops execution of the Indexing sequence.
Start Homing	Begins execution of the homing sequence as defined in the Homing window.
Stop Homing	Stops execution of the homing sequence.

The Definition of exception operating is as below case

Case1) No.0 in Ft-0.32 is “0” and Modbus control (3000 ~3003) is tried: The drive will return the Exception Code 16(Illegal Control), and the MODBUS command is disregarded

Case2) No.0 in Ft-0.32 is “1” and Modbus control (3000 ~3002) is tried and Digital input(Hardware Input)control is tried : Any Digital Input(Hardware Input)signal is disregarded.

Case3) No.0 in Ft-0.32 is “1” and Modbus control (3003) is tried and Digital input(Hardware Input)control is tried : The drive will return the Exception Code 15(Illegal Control), and the MODBUS command is disregarded and Any Digital Input(Hardware Input)signal is disregarded and

Case4) No.0 in Ft-0.32 is “2” and Modbus control (3000 ~3002) is tried: The drive will return the Exception Code 15(Illegal Control), and the MODBUS command is disregarded.

And If the stage of a drive is disable(servo off) Start Index, failure message(the Exception Code 15(Illegal Control) is returned as below case

Case1) When a drive is disable (servo off), if Start Index, Stop Index, Start Home, Stop Home Function is called,

Case2) When Index is executing, if Start Home, Stop Home Function is called

Case3) When Home is executing, if Start Index, Stop Index Function is called

The definition of Ft-0.32 is as below table

[Ft – 0.32]	I/O Control Authority	
Applicable Operating Mode	All	
Data Size:	2 digits	
Digits 0:	MODBUS Input Function Control	
RSWare Name:	MODBUS Input Function Control	
Range:	Value	Description
	0x0	Disable
	0x01	Enable
	0x02	Disable+ Special Function Enable
Default:	0	
When Enabled	Servo-Off -> Setting	

/P-OT(Positive Over-travel), /N-OT(Negative Over-travel) and /H-SENS is not controlled by Modbus command. It is only controlled by hardware input. If No.0 value of parameter Ft-0.10 is “0”(always servo-on) and Modbus address 3000 is set “1”, drive keep servo-on continuous, although drive power is off/on. To out of servo-on, drive must be made fault situation.

Appendix A Standard Drive Parameters

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

Descriptions of Indexing Drive Parameters begin on [page 74](#).

Parameter Groupings

Standard drive parameters are grouped into these drive settings.

- Group 0 - Basic drive system and I/O settings
- Group 1 - Gain and gain tuning settings
- Group 2 - Velocity control settings
- Group 3 - Position control settings
- Group 4 - Torque control settings
- Group 5 - Supplementary drive system and I/O settings

Parameter Descriptions

Parameter descriptions list the size of each parameter and the data options within the parameter.

Descriptions of Indexing Drive Parameters begin on [page 74](#).

Group 0

[Ft – 0.00]	Operations Mode	
RSWare Name:	Operation Modes (Main/Override)	
Range:	1~12	
Display(Value)	Normal operating mode	Override operating mode
F(1)	Follower	Follower
S(2)	Analog Velocity Input	Analog Velocity Input
C(3)	Analog Current Input	Analog Current Input
SF(4)	Analog Velocity Input	Follower
CF(5)	Analog Current Input	Follower
CS(6)	Analog Current Input	Analog Velocity Input
P(7)	Preset Velocity	Preset Velocity
PF(8)	Preset Velocity	Follower
PS(9)	Preset Velocity	Analog Velocity Input

PC(10)	Preset Velocity	Analog Current Input
D(11)	Reserved	Reserved
I(12)	Indexing	Indexing
Default:	1	
Applicable Operating Mode	All	
When Enabled	Servo-Off -> Setting -> After power cycle	

[Ft – 0.01]	Motor configuration	
Data Size:	4 digits	
RSWare Name:	Motor configuration	
Digits 0:	Encoder type	
Range:	Value	Description
	0x0~0xf	Each number define a corresponding encoder type : 9 line, 17bit serial, etc.
Digit 1~2:	Rated power	
Range:	Value	Description
	A5,01,02,04,08,10,15	50,100,200,400,800,1000,1500W
Digit 3~4:	Motor type	
Range:	Value	Description
	Motor type	Motor initial ID
Applicable Operating Mode	All	
When Enabled	Servo-Off -> Setting -> After power cycle	

[Ft – 0.02]	Selection of 4 Basic Mode	
Data Size:	4 digits	
Digits 0:	Fault and Disable Braking	
RSWare Name:	Stopping Functions: Fault and Disable Braking	
Range:	Value	Description
	0x0	Brake and hold
	0x1	Brake and release
	0x2	Free stop
	0x3	Free stop and hold
Default:	0	
Digit 1:	Over-travel stop method	
RSWare Name:	Stopping Functions: Over Travel Stop Method	
Range:	Value	Description
	0x0	Stop by change of mode to Normal Current. Set stopping current with Over travel Current limit parameter (Ft-4.05).
	0x1	Dynamic Brake
Default:	0	
Digit 2:	Motor Forward Dir	
RSWare Name:	Command Polarity	
Range:	Value	Description
	0x0	The command signal is not inverted so that a positive command value results in CW Rotation, (as viewed from shaft end).

	0x1	The command signal is inverted so that a positive command value results in CCW Rotation, (as viewed from shaft end).
Default:	0	
Digit 3:	Power input	
RSWare Name:	AC Line Loss Check	
Range:	Value	Description
	0x0	Enable. 50~400W drive: Enable single-phase open check 800~1.5kW drive : Enable 3-phase open check
	0x1	Disable
	0x2	Single-phase input
Default:	0	
Applicable Operating Mode	All	
When Enabled	Servo-Off -> Setting	

[Ft – 0.03]	Selection of Auto Tuning Function	
Data Size:	4 digits	
Digits 0:	Off-Line Tuning Mode	
RSWare Name:	Off-Line tuning mode	
Range:	Value	Description
	0x0	Inertia Moment Estimation
	0x1	Inertia Moment Estimation and Resonant Frequency Detection
	0x2	Resonance frequency Detection
Default:	1	
Digit 1:	Reserved	
Digit 2:	Autotuning Speed	
RSWare Name:	Autotuning Speed	
Range:	2-9	
Default:	7	
Units:	RPM*100	
Digit 3:	Dynamic tuning Response Speed	
RSWare Name:	Online Tuning Response	
Range:	Value	Description
	0x0	Off
	0x1	Slowest
	0x2	Slower
	0x3	Slow
	0x4	Medium-Slow
	0x5	Medium
	0x6	Medium-Fast
	0x7	Fast
	0x8	Faster
	0x9	Fastest
Default:	0	
Units:	-	

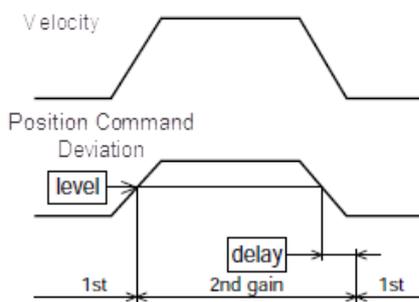
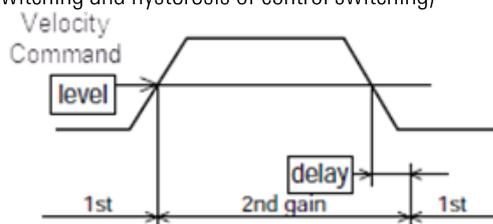
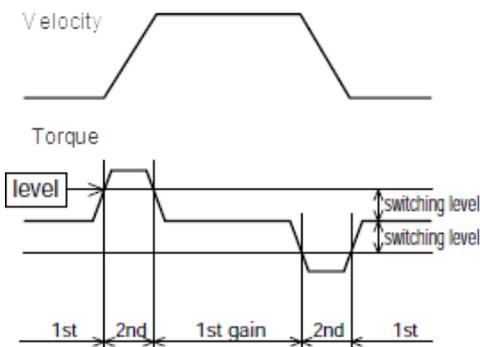
Applicable Operating Mode	All
When Enabled	Servo-Off -> Setting

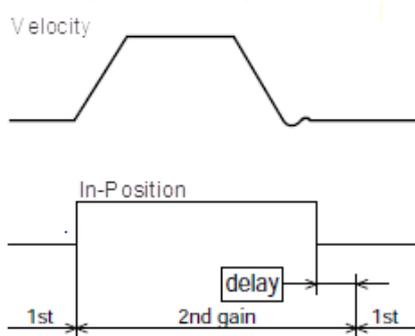
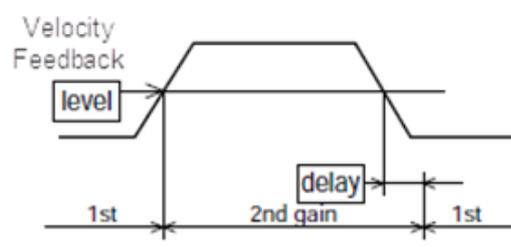
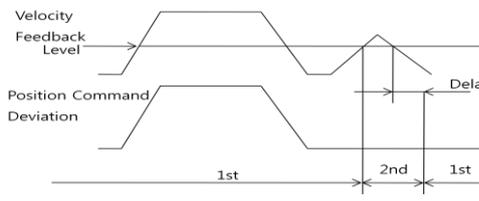
[Ft – 0.04]	Inertia Ratio
Description:	Load Inertia / Motor Inertia
RSWare Name:	Inertia Ratio
Range:	0~6000
Default:	100
Units:	(Load inertia/Motor inertia) * 100
When Enabled	Immediately

[Ft – 0.05]	Auxiliary function Selection 1	
Applicable Operating Mode	All	
Data Size:	4 digits	
Digits 0:	Encoder Backup Battery	
RSWare Name:	Encoder Backup Battery	
Range:	Value	Description
	0x0	Backup Battery Installed
	0x1	Backup Battery Not Installed
Default:	0	
Digit 1:	Velocity Observer	
RSWare Name:	Velocity Observer	
Range:	Value	Description
	0x0	Disable
	0x1	Enable
Default:	0	
Digit 2:	Alternative Gain Change Enable	
RSWare Name:	Gain Change Enable	
Range:	Value	Description
	0x0	Disable
	0x1	Enable
Default:	0x0	
Digit 3:	Emergency stop input	
Range:	Value	Description
	0x0	Disable
	0x1	Enable
Default:	0	
When Enabled	Servo-Off -> Setting -> After power cycle	

[Ft – 0.06]	Auxiliary function Selection 2	
Applicable Operating Mode	All	
Data Size:	3 digits	
Digit 0:	Reserved	
Digit 1:	Incremental Feedback Loss (Encoder Line Break Detection)	
RSWare Name:	Incremental Feedback Loss	
Range:	Value	Description

	0x0	Monitored
	0x1	Ignored
Default:	0	
Digit 2:	Mode of Gain Switching	
Range:	Value	Description
	0	Fixed to the 1st gain
	1	Fixed to 2nd gain
	2	2nd gain selection when the gain switching input is turned on.
	3	2nd gain selection when the torque command is larger than the setups (level of gain control switching and hysteresis of control switching)
	4	2nd gain selection when the command speed is larger than the setups (level of gain control switching and hysteresis of control switching)
	5	2nd gain selection when the positional deviation is larger than the setups (level of gain control switching and hysteresis of control switching)
6	2nd gain selection when more than one command pulse exist between 200usec.	



7	<p>2nd gain selection when the positional deviation counter value exceeds the setup of Positioning completer range</p> 								
8	<p>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.</p> 								
9	<p>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</p> 								
Default	0								
Digit 3:	Absolute Feedback Transfer Type								
RSWare Name:	Absolute Feedback Transfer Type								
Range:	<table border="1"> <thead> <tr> <th>Value</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>0x0</td> <td>Same as Command Polarity</td> </tr> <tr> <td>0x1</td> <td>Always CCW</td> </tr> <tr> <td>0x2</td> <td>Always CC</td> </tr> </tbody> </table>	Value	Description	0x0	Same as Command Polarity	0x1	Always CCW	0x2	Always CC
Value	Description								
0x0	Same as Command Polarity								
0x1	Always CCW								
0x2	Always CC								
Default	0								
When Enabled	Immediately								

[Ft – 0.07]	Drive Address
Applicable Operating Mode	All
RSWare Name:	Drive Address
Range:	1~247
Default:	1
When Enabled	Immediately

[Ft – 0.08]	Password
Applicable Operating Mode	
RSWare Name:	
Range:	
Default:	
When Enabled	

[Ft – 0.09]	Serial Port Configuration	
Applicable Operating Mode	All	
Data Size:	4 digits	
Digits 0:	Baud Rate	
RSWare Name:	Baud Rate	
Range:	Value	Description
	0x0	9600bps
	0x1	14400bps
	0x2	19200bps
	0x3	38400bps
	0x4	56000bps
	0x5	57600bps
Default:	0x5	
Digit 1:	Data bits, Parity, Stop bit	
RSWare Name:	Data bits, Parity, Stop bit	
Range:	Value	Description
	0x0	8, No, 1
	0x1	8, Even, 1
	0x2	8, Odd, 1
	0x3	8, No, 2
	0x4	8, Even, 2
	0x5	8, Odd, 2
Default:	0x0	
Digit 2:	Protocol	
RSWare Name:	Protocol	
Range:	Value	Description
	0x0	ASCII
	0x1	MODBUS-RTU
Default:	0	
Digit 3:	Communication Method	
RSWare Name:	Communication Method	
Range:	Value	Description
	0x0	RS232
	0x1	RS485
Default:	0	
When Enabled	Immediately	

[Ft – 0.10]	Allocation of Input Signals 1
-------------	-------------------------------

Range for all digits:	0-B, where 0 is Off, B is On and 1-A are digital inputs		
Data Size:	4 digits		
Digit	Description	Default	Unmapped IO Status
0	Drive Enable(SV-ON)	0x1	ON
1	Positive Over-travel(P-OT)	0xb	ON
2	Negative Over-travel(N-OT)	0xb	ON
3	Integrator Inhibit(P-CON)	0x4	OFF
Applicable Operating Mode	All		
When Enabled	Servo-Off -> Setting		

[Ft – 0.11]	Allocation of Input Signals 2		
Range for all digits:	0-B, where 0 is Off, B is On and 1-A are digital inputs		
Data Size:	4 digits		
Digit	Description	Default	Unmapped IO Status
0	Fault Reset(A-RST)	0x5	OFF
1	Negative Current Limit(N-TL)	0x6	OFF
2	Positive Current Limit(P-TL)	0x7	OFF
3	Operation Mode Override(C-SEL)	0x0	OFF
Applicable Operating Mode	All		
When Enabled	Servo-Off -> Setting		

[Ft – 0.12]	Allocation of Input Signals 3		
Range for all digits:	0-B, where 0 is Off, B is On and 1-A are digital inputs		
Data Size:	4 digits		
Digit	Description	Default	Unmapped IO Status
0	Preset Direction(C-DIR)	0x0	OFF
1	Preset Select 1(C-SP1)	0x0	OFF
2	Preset Select 2(C-SP2)	0x0	OFF
3	Preset Select 3(C-SP3)	0x0	OFF
Applicable Operating Mode	All		
When Enabled	Servo-Off -> Setting		

[Ft – 0.13]	Allocation of Input Signals 4		
Range for all digits:	0-B, where 0 is Off, B is On and 1-A are digital inputs		
Data Size:	4 digits		
Digit	Description	Default	Unmapped IO Status
0	Zero Speed Clamp Enable(Z-CLP)	0x0	OFF
1	Pause Follower(INHIBIT)	0x0	OFF
2	Alternate Gain Select(G-SEL)	0x0	OFF
3	Position clear(PCLR)	0x0	OFF
Applicable Operating Mode	All		
When Enabled	Servo-Off -> Setting-		

[Ft – 0.14]	Allocation of Input Signals 5		
Range for all digits:	0-B, where 0 is Off, B is On and 1-A are digital inputs		

Data Size:	4 digits		
Digit	Description	Default	Unmapped IO Status
0	Position Strobe(ABS-DT)	0x0	OFF
1	Motor Moving Enable (START).	0x0	OFF
2	Analog Speed Command Select (C-SP4)	0x0	OFF
3	2nd Electronic Gear Bank Selection(GEAR)	0x0	OFF
Applicable Operating Mode	All		
When Enabled	Servo-Off -> Setting		

[Ft – 0.15]	Allocation of Input Signals 6		
Data Size:	4 digits		
Digit	Description	Default	Unmapped IO Status
0	Reset multi-turn data of Absolute Encoder(R-ABS)	0x0	OFF
1	Gain Bank Select(BANK-SEL)	0x0	OFF
2	Analog Current Limit(A-CL)	0x0	OFF
3	Absolute Position Transfer Mode(ABS-MD)	0x0	OFF
Applicable Operating Mode	All		
When Enabled	Servo-Off -> Setting		

[Ft – 0.16]	Allocation of Input Signals 7		
Data Size:	4 digits		
Digit	Description	Default	Unmapped IO Status
0	Home Sensor(H-SENS)	0x0	OFF
1	Start Homing(SHOME)	0x0	OFF
2	Stop Indexing(STOP)	0x0	OFF
3	Pause Indexing(PAUSE)	0x0	OFF
Applicable Operating Mode	Indexing		
When Enabled	Servo-Off -> Setting		

[Ft – 0.17]	Allocation of Input Signals 8		
Data Size:	4 digits		
Digit	Description	Default	Unmapped IO Status
0	Index Select 0 Input(I-SEL0)	0x0	OFF
1	Index Select 1 Input(I-SEL1)	0x0	OFF
2	Index Select 2 Input(I-SEL2)	0x0	OFF
3	Index Select 3 Input(I-SEL3)	0x0	OFF
Applicable Operating Mode	Indexing		
When Enabled	Servo-Off -> Setting		

[Ft – 0.18]	Allocation of Input Signals 9		
Data Size:	4 digits		
Digit	Description	Default	Unmapped IO Status
0	Index Select 4 Input(I-SEL4)	0x0	OFF
1	Index Select 5 Input(I-SEL5)	0x0	OFF
2	Stop Homing(H-STOP)	0x0	OFF
3	Start Index(START-I)	0x0	OFF

Applicable Operating Mode	Indexing
When Enabled	Servo-Off -> Setting

[Ft – 0.19]	Allocation of Input Signals 10		
Data Size:	4 digits		
Digit	Description	Default	Unmapped IO Status
0	Reserved	0x0	OFF
1	Reserved	0x0	OFF
2	Reserved	0x0	OFF
3	Reserved	0x0	OFF
Applicable Operating Mode	Reserved		
When Enabled	Reserved		

[Ft – 0.20]	Allocation of Input Signals 11		
Data Size:	4 digits		
Digit	Description	Default	Unmapped IO Status
0	Reserved	0x0	OFF
1	Reserved	0x0	OFF
2	Reserved	0x0	OFF
3	Reserved	0x0	OFF
Applicable Operating Mode	Reserved		
When Enabled	Reserved		

[Ft – 0.21]	Allocation of Input Signals 12		
Data Size:	4 digits		
Digit	Description	Default	Unmapped IO Status
0	Reserved	0x0	OFF
1	Reserved	0x0	OFF
2	Reserved	0x0	OFF
3	Reserved	0x0	OFF
Applicable Operating Mode	Reserved		
When Enabled	Servo-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	10	9	8	7	6	5	4	3	2	1	Input Signal Off
CN1 Pin No.	On	28	27	26	9	8	7	6	5	4	3	

[Ft – 0.22]	Allocation of Output Signals 1	
Range for all digits:	0-3, where 0 is Off and 1-6 are digital outputs	
Data Size:	4 digits	
Digit	Description	Default
0	Within position window(P-COM)	0x1
1	Up to speed(TG-ON)	0x2

2	Brake control(BK)	0x3
3	Within Speed window(V-COM)	0x0
Applicable Mode	Operating Mode	All
When Enabled	Servo-Off -> Setting	

[Ft – 0.23]	Allocation of Output Signals 2	
Range for all digits:	0-3, where 0 is Off and 1-6 are digital outputs	
Data Size:	4 digits	
Digit	Description	Default
0	Current Limited(T-LMT)	0x0
1	Velocity Limited(V-LMT)	0x0
2	Near position(NEAR)	0x0
3	Warning(WARN)	0x0
Applicable Mode	Operating Mode	All
When Enabled	Servo-Off -> Setting	

[Ft – 0.24]	Allocation of Output Signals 3	
Range for all digits:	0-3, where 0 is Off and 1-6 are digital outputs	
Data Size:	4 digits	
Digit	Description	Default
0	Absolute position valid(A-VLD)	0x0
1	Ready	0x0
2	Reserved	0x0
3	Reserved	0x0
Applicable Mode	Operating Mode	All
When Enabled	Servo-Off -> Setting	

[Ft – 0.25]	Allocation of Output Signals 4	
Range for all digits:	0-3, where 0 is Off and 1-6 are digital outputs	
Data Size:	4 digits	
Digit	Description	Default
0	In Motion(IMO)	0x0
1	In Dwell(I-DW)	0x0
2	Axis Homed(HOMC)	0x0
3	Index Select 0 Out(O-ISEL0)	0x0
Applicable Mode	Operating Mode	Indexing
When Enabled	Servo-Off -> Setting	

[Ft – 0.26]	Allocation of Output Signals 5	
Range for all digits:	0-3, where 0 is Off and 1-6 are digital outputs	
Data Size:	4 digits	
Digit	Description	Default
0	Index Select 1 Out(O-ISEL1)	0x0
1	Index Select 2 Out(O-ISEL2)	0x0
2	Index Select 3 Out(O-ISEL3)	0x0
3	Index Select 4 Out(O-ISEL4)	0x0

Applicable Mode When Enabled	Operating Mode Indexing Servo-Off -> Setting	Other Details
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[Ft – 0.27]	Allocation of Output Signals 6	
Range for all digits:	0-3, where 0 is Off and 1-6 are digital outputs	
Data Size:	4 digits	
Digit	Description	Default
0	Index Select 5 Out(O-ISEL5)	0x0
1	End of Sequence(E-SEQU)	0x0
2	Reserved	0x0
3	Reserved	0x0
Applicable Mode When Enabled	Operating Mode Indexing Servo-Off -> Setting	

[Ft – 0.28]	Allocation of Output Signals 7	
Range for all digits:	0-3, where 0 is Off and 1-6 are digital outputs	
Data Size:	4 digits	
Digit	Description	Default
0	Reserved	0x0
1	Reserved	0x0
2	Reserved	0x0
3	Reserved	0x0
Applicable Mode When Enabled	Operating Mode Reserved	

[Ft – 0.29]	Allocation of Output Signals 8	
Range for all digits:	0-3, where 0 is Off and 1-6 are digital outputs	
Data Size:	4 digits	
Digit	Description	Default
0	Reserved	0x0
1	Reserved	0x0
2	Reserved	0x0
3	Reserved	0x0
Applicable Mode When Enabled	Operating Mode Reserved	

[Ft – 0.30]	Allocation of Output Signals 9	
Range for all digits:	0-3, where 0 is Off and 1-6 are digital outputs	
Data Size:	4 digits	
Digit	Description	Default
0	Reserved	0x0
1	Reserved	0x0
2	Reserved	0x0
3	Reserved	0x0
Applicable Mode When Enabled	Operating Mode Reserved	

[Ft – 0.31]	Allocation of Output Signals 10	
Range for all digits:	0-3, where 0 is Off and 1-6 are digital outputs	
Data Size:	4 digits	
Digit	Description	Default
0	Reserved	0x0
1	Reserved	0x0
2	Reserved	0x0
3	Reserved	0x0
Applicable Operating Mode	Reserved	
When Enabled	Reserved	

Setting Value	6	5	4	3	2	1	0
Input Channel No.	AL #3	AL #2	AL #1	DO #3	DO #2	DO #1	Input Signal Off
CN1 Pin No.	39,40	38,40	37,40	47,48	43,44	41,42	-

[Ft – 0.32]	I/O Control Authority	
Applicable Operating Mode	All	
Data Size:	2 digits	
Digits 0:	MODBUS Input Function Control	
RSWare Name:	MODBUS Input Function Control	
Range:	Value	Description
	0x0	Disable
	0x1	Enable
	0x2	Disable + Special Function Enable
Default:	0	
Digits 1:	MODBUS Run Function Control	
RSWare Name:	MODBUS Run Function Control	
Range:	Value	Description
	0x0	Disable
	0x1	Enable
Default:	0	
Applicable Operating Mode:	Modbus	
When Enabled	Servo-Off -> Setting	

Group 1

[Ft – 1.00]	Velocity Regulator Response level
RSWare Name:	Velocity Regulator Response level
Range:	1~150
Default:	50
Units:	%

Applicable Mode:	Operating	All
When Enabled		Immediately

[Ft – 1.01]		System Gain
RSWare Name:		System Gain
Description:		Represents overall Speed Control Loop Bandwidth.
Range:		10~500
Default:		50
Units:		Hz
Applicable Mode:	Operating	All
When Enabled		Immediately

[Ft – 1.02]		Velocity Regulator P Gain
RSWare Name:		Main Velocity Regulator Gains: P
Range:		0~10000
Default:		60
Units:		
Applicable Mode:	Operating	Follower, Analog Speed, Preset
When Enabled		Immediately

[Ft – 1.03]		Velocity Regulator I Gain
RSWare Name:		Main Velocity Regulator Gains: Integrator Gain
Range:		0~60000
Default:		26
Units:		
Applicable Mode:	Operating	Follower, Analog Speed, Preset
When Enabled		Immediately

[Ft – 1.04]		Velocity Regulator D gain
RSWare Name:		Main Velocity Regulator Gains: D
Range:		0~1000
Default:		0
Units:		
Applicable Mode:	Operating	Follower, Analog Velocity, Preset
When Enabled		Immediately

[Ft – 1.05]		Velocity Error Filter
RSWare Name:		Error Filter Bandwidth
Range:		0~2500
Default:		30
Units:		Hz
Applicable Mode:	Operating	Follower, Analog Velocity, Preset

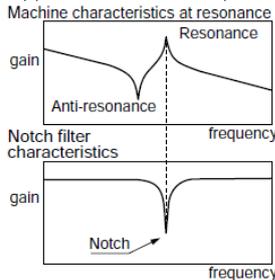
When Enabled	Immediately
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[Ft – 1.06]	Position Regulator Kp Gain
RSWare Name:	Main Position Regulator Gains: Kp
Range:	0~700
Default:	20
Units:	Hz
Applicable Operating Mode:	Follower
When Enabled	Immediately

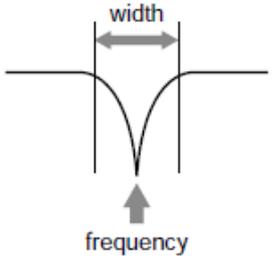
[Ft – 1.07]	Current Command Lowpass Filter Bandwidth
RSWare Name:	Main Current Regulator Gains: Low Pass Filter Bandwidth
Range:	0~10000
Default:	300
Units:	Hz
Applicable Operating Mode:	All
When Enabled	Immediately

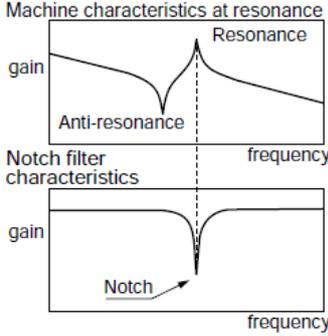
[Ft – 1.08]	Velocity Command Lowpass Filter Bandwidth
RSWare Name:	Main Velocity Regulator Gains: Low Pass Filter Bandwidth
Range:	0~10000
Default:	1000
Units:	Hz
Applicable Operating Mode:	Follower, Analog Speed, Preset
When Enabled	Immediately

[Ft – 1.09]	Position Command Lowpass Filter Bandwidth
RSWare Name:	Main Position Regulator Gains: Low Pass Filter Bandwidth
Range:	0~1000
Default:	0
Units:	Hz
Applicable Operating Mode:	Follower
When Enabled	Immediately

[Ft – 1.10]	1st Resonant Frequency Suppression Filter
RSWare Name:	Main Current Regulator Gains: 1 st Resonant Frequency Suppression Filter
Description:	<p>Suppresses Vibration by cutting off Current Command in assigned frequency band</p>  <p>The figure consists of two vertically aligned graphs. The top graph is titled 'Machine characteristics at resonance' and plots 'gain' on the y-axis against 'frequency' on the x-axis. It shows a curve with a sharp downward dip labeled 'Anti-resonance' and a sharp upward peak labeled 'Resonance'. The bottom graph is titled 'Notch filter characteristics' and also plots 'gain' on the y-axis against 'frequency' on the x-axis. It shows a curve that is flat at a high gain level, then drops sharply to a low gain level (a 'Notch') at the same frequency as the resonance peak in the top graph, and then returns to the high gain level.</p>

Range:	0~10000
Default:	10000
Units:	Hz
Applicable Mode:	Operating
When Enabled	Immediately

[Ft – 1.11]	1 st Resonant Frequency Suppression Filter Width
RSWare Name:	Main Current Regulator Gains: 1 st 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. 
Range:	0~20
Default:	10
Units:	
Applicable Mode:	Operating
When Enabled	Immediately

[Ft – 1.12]	2 nd Resonant Frequency Suppression Filter
RSWare Name:	2 nd Main Current Regulator Gains: 2 nd Resonant Frequency Suppression Filter
Description:	Suppresses Vibration by cutting off Current Command in assigned frequency band 
Range:	0~10000
Default:	10000
Units:	Hz
Applicable Mode:	Operating
When Enabled	Immediately

[Ft – 1.13]	2 nd Resonant Frequency Suppression Filter Width
RSWare Name:	Main Current Regulator Gains: 2 nd 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.

	<p>The diagram shows a resonance notch filter response. The horizontal axis is labeled 'frequency' with an upward-pointing arrow. The vertical axis represents amplitude. A downward-pointing arrow labeled 'Depth' indicates the magnitude of the notch. A horizontal double-headed arrow labeled 'width' indicates the bandwidth of the notch.</p>
Range:	0~20
Default:	10
Units:	
Applicable Operating Mode:	All
When Enabled	Immediately

[Ft – 1.14]	2 nd Resonant Frequency Suppression Filter Depth
RSWare Name:	Main Current Regulator Gains: 2 nd 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.
	<p>The diagram shows a resonance notch filter response. The horizontal axis is labeled 'frequency' with an upward-pointing arrow. The vertical axis represents amplitude. A downward-pointing arrow labeled 'Depth' indicates the magnitude of the notch. A horizontal double-headed arrow labeled 'width' indicates the bandwidth of the notch.</p>
Range:	0~100
Default:	100
Units:	
Applicable Operating Mode:	All
When Enabled	Immediately

[Ft – 1.15]	Position Regulator Kff gain
RSWare Name:	Main Position Regulator Gains: Kff
Range:	0~100
Default:	0
Units:	%
Applicable Operating Mode:	Follower
When Enabled	Immediately

[Ft – 1.16]	Position Regulator Kff bandwidth
RSWare Name:	Main Position Regulator Gains: Kff Low Pass Filter Bandwidth
Range:	0~2500
Default:	200
Units:	Hz

Applicable Mode:	Operating	Follower
When Enabled		Immediately

[Ft – 1.17]	Velocity Regulator I gain mode	
RSWare Name:	Main Velocity Regulator Gains: I Gain 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
	0x0	Do not use P/PI Mode Conversion.
	0x1	When Current Command exceeds Current Value in [Ft-1.18], Speed Controller is changed from PI Controller to P Controller.
	0x2	When Speed Command exceeds Speed Value in [Ft-1.18], Speed Controller is changed from PI Controller to P Controller.
	0x3	When Position error exceeds Position error Value in [Ft-1.18], Speed Controller is changed from PI Controller to P Controller.
	0x4	Automatically velocity controller is changed from PI Controller to P Controller.
Default:	0	
Applicable Mode:	Operating	ALL
When Enabled		Servo-Off -> Setting

[Ft – 1.18]	Velocity Regulator I gain disable threshold	
RSWare Name:	Main Velocity Regulator Gains: I Gain Disable Threshold	
Range:	0~3000	
Default:	100	
Units:	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 Mode:	Operating	Follower, Analog Velocity, Preset
When Enabled		Immediately

[Ft – 1.19]	Position Regulator High Error Output Offset	
RSWare Name:	Main Position Regulator Gains: High Error Output Offset	
Range:	0~450	
Default:	0	
Units:	Rotary: RPM, Linear: mm/sec	
Applicable Mode:	Operating	All
When Enabled		Immediately

[Ft – 1.20]	Position Regulator High Error Output Threshold	
RSWare Name:	Main Position Regulator Gains: High Error Output Threshold	
Range:	0~50000	

Default:	1000
Units:	Counts
Applicable Operating Mode:	All
When Enabled	Immediately

[Ft – 1.21]	Current Regulator Bandwidth Reduction Scale	
RSWare Name:	Main Current Regulator Gains: Gain	
Range:	Value	Description
	0x0	High bandwidth
	0x1	Medium bandwidth (0.6667 * high)
	0x2	Low bandwidth (0.3334 * high)
Default:	0x1	
Applicable Operating Mode:	All	
When Enabled	Immediately	

[Ft – 1.22]	On-line Vibration Mode	
Applicable Operating Mode	All	
Data Size:	1 digits	
Digits 0:	On-line Vibration Suppression Mode	
RSWare Name:	On-line Vibration Suppression Mode	
Range:	Value	Description
	0x0	Disable
	0x1	Normal and High Velocity Mode
	0x2	Slow Velocity Mode without initial value
Default:	0x0	
Digit 1:	On-line Vibration Suppression Gain	
RSWare Name:	On-line Vibration Suppression Gain	
Range:	Value	Description
	0x0	Low
	0x1	High
Default:	0x0	
When Enabled	Servo-Off -> Setting	

[Ft – 1.23]	Velocity Regulator Configuration	
Applicable Operating Mode	All	
Data Size:	1 digits	
Digits 0:	Velocity Command Filter on Follower	
RSWare Name:	Velocity Command Filter on Follower	
Range:	Value	Description
	0x0	Disable
	0x1	Enable
Default:	0x0	
When Enabled	Servo-Off -> Setting	

[Ft – 1.24]	Delay Time of Gain Switching
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RSWare Name:	Gain Switching: Delay Time of Gain Switching Set up delay time when returning 2 nd Gain and 1 st Gain while 1 st Gain and 2 nd Gain switching is operating
Range:	0~10000
Default:	0
Units:	x 200usec
Applicable Operating Mode:	Follower, Analog Velocity, Preset
When Enabled	Immediately

[Ft – 1.25]	Level of Gain Switching
RSWare Name:	Gain Switching: Level of Gain Switching Set up switching level while 1 st Gain and 2 nd Gain switching is operating
Range:	0~10000
Default:	0
Units:	
Applicable Operating Mode:	Follower, Analog Velocity, Preset
When Enabled	Immediately

[Ft – 1.26]	Hysteresis of Gain Switching
RSWare Name:	Gain Switching: Hysteresis of Gain Switching Set up hysteresis band while 1 st Gain and 2 nd Gain switching is operating
Range:	0~10000
Default:	0
Units:	
Applicable Operating Mode:	Follower, Analog Velocity, Preset
When Enabled	Immediately

[Ft – 1.27]	Position Gain Switching Time
RSWare Name:	Gain Switching: Level of Gain Switching Time Position P gain is changed step by step by switching time at gain switching while 1 st Gain and 2 nd Gain switching is operating
Range:	0~10000
Default:	0

Units:	x 200usec
Applicable Operating Mode:	Follower, Analog Velocity, Preset
When Enabled	Immediately

[Ft – 1.28]	2 nd Velocity Regulator P Gain
RSWare Name:	2 nd Regulator Gain: P
Range:	0-10000
Default:	60
Units:	
Applicable Operating Mode:	Follower, Analog Velocity, Preset
When Enabled	Immediately

[Ft – 1.29]	2 nd Velocity Regulator I Gain
RSWare Name:	2 nd Regulator Gain: Integrator Gain
Range:	0~60000
Default:	26
Units:	
Applicable Operating Mode:	Follower, Analog Velocity, Preset
When Enabled	Immediately

[Ft – 1.30]	2 nd Position Regulator Kp Gain
RSWare Name:	2 nd Regulator Gain: Kp
Range:	0~700
Default:	20
Units:	Hz
Applicable Operating Mode:	Position
When Enabled	Immediately

[Ft – 1.31]	2 nd Current Command Lowpass Filter Bandwidth
RSWare Name:	2 nd Regulator Gain: Low Pass Bandwidth(IReg)
Range:	0~10000
Default:	300
Units:	Hz
Applicable Operating Mode:	All
When Enabled	Immediately

[Ft – 1.32]	2 nd Velocity Command Lowpass Filter Bandwidth
RSWare Name:	2 nd Regulator Gain: Low Pass Bandwidth(VReg)
Range:	0~10000
Default:	1000
Units:	Hz
Applicable Operating Mode:	All
When Enabled	Immediately

[Ft – 1.33]	3 rd Velocity Regulator P Gain
RSWare Name:	3 rd Regulator Gain: P
Range:	0-10000
Default:	60
Units:	
Applicable Operating Mode:	Follower, Analog Velocity, Preset
When Enabled	Immediately

[Ft – 1.34]	3 rd Velocity Regulator I Gain
RSWare Name:	3 rd Regulator Gain: Integrator Gain
Range:	0~60000
Default:	26
Units:	
Applicable Operating Mode:	Follower, Analog Velocity, Preset
When Enabled	Immediately

[Ft – 1.35]	3 rd Position Regulator Kp Gain
RSWare Name:	3 rd Regulator Gain: Kp
Range:	0~700
Default:	20
Units:	Hz
Applicable Operating Mode:	Position
When Enabled	Immediately

[Ft – 1.36]	3 rd Current Command Lowpass Filter Bandwidth
RSWare Name:	3 rd Regulator Gain: Low Pass Bandwidth(IReg)
Range:	0~10000
Default:	300
Units:	Hz
Applicable Operating Mode:	All
When Enabled	Immediately

[Ft – 1.37]	3 rd Velocity Command Lowpass Filter Bandwidth
RSWare Name:	3 rd Regulator Gain: Low Pass Bandwidth(VReg)
Range:	0~10000
Default:	1000
Units:	Hz
Applicable Operating Mode:	All
When Enabled	Immediately

[Ft – 1.38]	4 th Velocity Regulator P Gain
RSWare Name:	4 th Regulator Gain: P

Range:	0-10000
Default:	60
Units:	
Applicable Mode:	Operating Follower, Analog Velocity, Preset
When Enabled	Immediately

[Ft – 1.39]	4 th Velocity Regulator I Gain
RSWare Name:	4 th Regulator Gain: Integrator Gain
Range:	0~60000
Default:	26
Units:	
Applicable Mode:	Operating Follower, Analog Velocity, Preset
When Enabled	Immediately

[Ft – 1.40]	4 th Position Regulator Kp Gain
RSWare Name:	4 th Regulator Gain: Kp
Range:	0~700
Default:	20
Units:	Hz
Applicable Mode:	Operating Position
When Enabled	Immediately

[Ft – 1.41]	4 th Current Command Lowpass Filter Bandwidth
RSWare Name:	4 th Regulator Gain: Low Pass Bandwidth(IReg)
Range:	0~10000
Default:	300
Units:	Hz
Applicable Mode:	Operating All
When Enabled	Immediately

[Ft – 1.42]	4 th Velocity Command Lowpass Filter Bandwidth
RSWare Name:	4 th Regulator Gain: Low Pass Bandwidth(VReg)
Range:	0~10000
Default:	1000
Units:	Hz
Applicable Mode:	Operating All
When Enabled	Immediately

Group 2

[Ft – 2.00]	Velocity Scale
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RSWare Name:	Velocity Scale
Range:	10.0~2000.0
Default:	500.0
Units:	RPM/V for rotary motors, mm/sec for linear motors
Applicable Operating Mode:	Analog Velocity
When Enabled	Servo-Off -> Setting

[Ft – 2.01]	Jog Velocity Command
RSWare Name:	Velocity Control Panel: Velocity Command
Range:	0~6000
Default:	50
Units:	RPM for rotary motors, mm/sec for linear motors
Applicable Operating Mode:	All
When Enabled	Immediately

[Ft – 2.02]	Acceleration
RSWare Name:	Acceleration Limits: Acceleration
Range:	1~2147483647
Default:	41667
Units:	$10^{-2} * \text{Rev}/\text{sec}^2$ for rotary, mm/sec^2 for linear
Applicable Operating Mode:	Analog Velocity Input, Preset Velocity
When Enabled	Immediately

[Ft – 2.03]	Deceleration
RSWare Name:	Acceleration Limits: Deceleration
Range:	1~2147483647
Default:	41667
Units:	$10^{-2} * \text{Rev}/\text{sec}^2$ for rotary, mm/sec^2 for linear
Applicable Operating Mode:	Analog Velocity Input, Preset Velocity
When Enabled	Immediately

[Ft – 2.04]	S-Curve Time
RSWare Name:	Acceleration Limits: S-Curve Time
Range:	0~5000
Default:	0
Units:	ms
Applicable Operating Mode:	All
When Enabled	Immediately

[Ft – 2.05]	Preset Velocity 1
RSWare Name:	Preset Velocity 1
Range:	-6000~6000
Default:	0
Units:	RPM for rotary motors, mm/sec for linear motors

Applicable Mode:	Operating	Preset
When Enabled		Immediately

[Ft – 2.06]		Preset Velocity 2
RSWare Name:		Preset Velocity 2
Range:		-6000~6000
Default:		0
Units:		RPM for rotary motors, mm/sec for linear motors
Applicable Mode:	Operating	Preset
When Enabled		Immediately

[Ft – 2.07]		Preset Velocity 3
RSWare Name:		Preset Velocity 3
Range:		-6000~6000
Default:		0
Units:		RPM for rotary motors, mm/sec for linear motors
Applicable Mode:	Operating	Preset
When Enabled		Immediately

[Ft – 2.08]		Preset Velocity 4
RSWare Name:		Preset Velocity 4
Range:		-6000~6000
Default:		0
Units:		RPM for rotary motors, mm/sec for linear motors
Applicable Mode:	Operating	Preset
When Enabled		Immediately

[Ft – 2.09]		Preset Velocity 5
RSWare Name:		Preset Velocity 5
Range:		-6000~6000
Default:		0
Units:		RPM for rotary motors, mm/sec for linear motors
Applicable Mode:	Operating	Preset
When Enabled		Immediately

[Ft – 2.10]		Preset Velocity 6
RSWare Name:		Preset Velocity 6
Range:		-6000~6000
Default:		0
Units:		RPM for rotary motors, mm/sec for linear motors
Applicable Mode:	Operating	Preset
When Enabled		Immediately

[Ft – 2.11]	Preset Velocity 7
RSWare Name:	Preset Velocity 7
Range:	-6000~6000
Default:	0
Units:	RPM for rotary motors, mm/sec for linear motors
Applicable Operating Mode:	Preset
When Enabled	Immediately

[Ft – 2.12]	Manual Velocity Limit
RSWare Name:	Manual Velocity limit
Range:	1~6000
Default:	5000
Units:	RPM for rotary motors, mm/sec for linear motors
Applicable Operating Mode:	Follower, Analog Velocity, Preset
When Enabled	Servo-Off -> Setting

[Ft – 2.13]	Velocity Limit Mode	
RSWare Name:	Velocity Limits: Velocity Limit Mode	
Range:	Value	Description
	0x0	Disabled
	0x1	Limited by (Ft-2.12).
	0x2	Limited by Analogue Speed Command Value (except Analog Speed Mode).
	0x3	Limited by lesser one between (Ft-2.12) and Analogue Speed Command.
Default:	0	
Applicable Operating Mode:	All	
When Enabled	Servo-Off -> Setting	

Group 3

[Ft – 3.00]	Follower	
Data Size:	4 digits	
Digit 0:	Command Type	
RSWare Name:	Command Type	
Range:	Value	Description
	0x0	Step Up/Step Down, Positive logic
	0x1	Step Up/Step Down, Negative logic
	0x2	Step/Direction, Positive Logic
	0x3	Step/Direction, Negative Logic
	0x4	Auxiliary Encoder, x1
	0x5	Auxiliary Encoder, x2
	0x6	Auxiliary Encoder, x4

Default:	0x0	
Note:	For Command types 0x4, 0x5, and 0x6: Motor Counts = Master Lines * MULT * (4 * Para3.01) / Para3.02 where MULT is 1, 2 or 4 for command types 0x4, 0x5 and 0x6 respectively.	
Applicable Operating Mode:	Follower	
Digit 1:	Controller Output Type	
RSWare Name:	Controller Output Type	
Range:	Value	Description
	0x0	Use Low speed Line Drive Output in Host Controller for isolated electrical connection. (900kHz Max)
	0x1	Use Open Collector in Host Controller. (250kHz Max)
	0x2	Use High Frequency Line Drive Output in Host Controller. (3MHz Max)
Default:	0x0	
Applicable Operating Mode:	Follower	
Digit 2:	Encoder Output Forward Direction	
RSWare Name:	Encoder Output Forward Direction	
Range:	Value	Description
	0x0	During Forward Rotation, Encoder Output Phase A have a lead of 90° over Phase B.
	0x1	During Forward Rotation, Encoder Output Phase B have a lead of 90° over Phase A.
Default:	0x0	
Applicable Operating Mode:	All	
Digit 3:	1 st Gear ratio change	
RSWare Name:	1 st Gear ratio change	
Range:	Value	Description
	0x0	Enable Only on Drive Disabled
	0x1	Always Enable
Default:	0x0	
Applicable Operating Mode:	Follower	
When Enabled	Servo-Off -> Setting	

[Ft – 3.01]	1 st Gear Ratio, Follower Counts	
RSWare Name:	1st Gear Ratio Numerator	
Range:	1~65535	
Default:	4	
Units:		
Applicable Operating Mode:	Follower	
When Enabled	Servo-Off -> Setting	

[Ft – 3.02]	1 st Gear Ratio, Master Counts	
RSWare Name:	1st Gear Ratio Denominator	

Range:	1~65535
Default:	1
Units:	
Applicable Operating Mode:	Follower
When Enabled	Servo-Off -> Setting

[Ft – 3.03]	Encoder Output Ratio, Output Counts
RSWare Name:	Output Ratio Numerator
Range:	1~32768
Default:	1
Units:	
Applicable Operating Mode:	All
When Enabled	Servo-Off -> Setting

[Ft – 3.04]	Encoder Output Ratio, Motor Counts
RSWare Name:	Output Ratio Numerator
Range:	1~32768
Default:	1
Units:	
Applicable Operating Mode:	All
When Enabled	Servo-Off -> Setting

[Ft – 3.05]	2nd Gear Ratio, Follower Counts
RSWare Name:	2nd Gear Ratio Numerator
Range:	1~65535
Default:	4
Units:	
Applicable Operating Mode:	Follower
When Enabled	Servo-Off -> Setting

[Ft – 3.06]	2 nd Gear Ratio, Master Counts
RSWare Name:	2nd Gear Ratio Denominator
Range:	1~65535
Default:	1
Units:	
Applicable Operating Mode:	Follower
When Enabled	Servo-Off -> Setting

[Ft – 3.07]	Reserved
RSWare Name:	-
Range:	-
Default:	-
Unit	-

Applicable Mode:	Operating	-
When Enabled		-

[Ft – 3.08]	Digital filter Cut-off Frequency	
Applicable Mode:	Operating	All
Data Size:	3 digits	
Digits 0:	Low Drive Input	
Range	Value	Description
	0x0 ~0x7	0 : 3MHz 1 : 1.75MHz 2 : 1.5MHz 3 : 1MHz 4 : 0.75MHz 5 : 0.625MHz 6 : 0.562MHz 7 : 0.525MHz
Default:	3	
Digits 0:	Open Collector Input	
	Value	Description
	0x0 ~0x7	0 : 3MHz 1 : 1.75MHz 2 : 1.5MHz 3 : 1MHz 4 : 0.75MHz 5 : 0.625MHz 6 : 0.562MHz 7 : 0.525MHz
Default:	7	
Digit 2:	High Frequency Line Drive Input	
	Value	Description
	0x0 ~0x7	0 : 3MHz 1 : 1.75MHz 2 : 1.5MHz 3 : 1MHz 4 : 0.75MHz 5 : 0.625MHz 6 : 0.562MHz 7 : 0.525MHz
Default:	0	
When Enabled	Servo-Off -> Setting	

Group 4

[Ft – 4.00]	Current Scale
RSWare Name:	Current Scale
Range:	0-1000
Default:	333
Units:	% of rated continuous current/V/10

Applicable Mode:	Operating	Analog Current Command, Dual Current Command
When Enabled		Servo-Off -> Setting

[Ft – 4.01]		Positive Internal Current Limit
RSWare Name:		Current Limits: Positive Internal
Range:		0~500
Default:		300
Units:		% of motor rated continuous current
Applicable Mode:	Operating	All
When Enabled		Immediately

[Ft – 4.02]		Negative Internal Current Limit
RSWare Name:		Current Limits: Negative Internal
Range:		0~500
Default:		300
Units:		% of motor rated continuous current
Applicable Mode:	Operating	All
When Enabled		Immediately

[Ft – 4.03]		Positive External Current Limit
RSWare Name:		Current Limits: Positive External
Range:		0~500
Default:		100
Units:		% of motor rated continuous current
Applicable Mode:	Operating	All
When Enabled		Immediately

[Ft – 4.04]		Negative External Current Limit
RSWare Name:		Current Limits: Negative External
Range:		0~500
Default:		100
Units:		% of motor rated continuous current
Applicable Mode:	Operating	All
When Enabled		Immediately

[Ft – 4.05]		Over-travel Current Limit
RSWare Name:		Stopping Functions: Maximum Stopping Current
Range:		0~500
Default:		300
Units:		% of motor rated continuous current
Applicable Mode:	Operating	All
When Enabled		Immediately

[Ft – 4.06]	Initial Current Bias
RSWare Name:	Initial Current Bias
Description:	Prevents the downturn of vertical load during initial operation.
Range:	-100~100
Default:	0
Units:	% of motor rated continuous current
Applicable Operating Mode:	All
When Enabled	Immediately

Group 5

[Ft – 5.00]	In Position Size
RSWare Name:	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
Default:	10
Units:	Counts
Applicable Operating Mode:	Follower
When Enabled	Immediately

[Ft – 5.01]	Reserved
RSWare Name:	Reserved
Description:	-
Range:	-
Default:	-
Units:	-
Applicable Operating Mode:	-
When Enabled	Immediately

[Ft – 5.02]	Near Position Size
RSWare Name:	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
Default:	20
Units:	Counts
Applicable Operating Mode:	Follower
When Enabled	Immediately

[Ft – 5.03]	Speed Window
RSWare Name:	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
Default:	10
Units:	RPM for rotary motors, mm/sec for linear motors
Applicable Operating Mode:	Follower, Analog Velocity Input, Preset Velocity
When Enabled	Immediately

[Ft – 5.04]	Up to speed
RSWare Name:	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
Default:	20
Units:	RPM for rotary motors, mm/sec for linear motors
Applicable Operating Mode:	All
When Enabled	Immediately

[Ft – 5.05]	Zero Clamp
RSWare Name:	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
Default:	0
Units:	RPM for rotary motors, mm/sec for linear motors
Applicable Operating Mode:	Analog Velocity
When Enabled	Immediately

[Ft – 5.06]	Brake Inactive Delay
RSWare Name:	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
Default:	0
Units:	ms
Applicable Operating Mode:	All
When Enabled	Servo-Off -> Setting

[Ft – 5.07]	Disable Delay
RSWare Name:	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
Default:	0
Units:	ms
Applicable Operating Mode:	All

When Enabled	Servo-Off -> Setting
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[Ft – 5.08]	Brake Active Delay
RSWare Name:	Digital Outputs: Brake Active Delay
Description:	Brake Active Delay is the time from when the drive is disabled to when the break starts operating.
Range:	0~10000
Default:	500
Units:	ms
Applicable Operating Mode:	All
When Enabled	Servo-Off -> Setting

[Ft – 5.09]	Disabled Braking Speed
RSWare Name:	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
Default:	100
Units:	RPM for rotary motors, mm/sec for linear motors
Applicable Operating Mode:	All
When Enabled	Servo-Off -> Setting

[Ft – 5.10]	Following Error Limit
RSWare Name:	Following Error Limit
Description:	A following error fault occurs when the difference between position command and actual position is greater than this parameter.
Range:	0~2,147,483,647
Default:	99999
Units:	Counts
Applicable Operating Mode:	Follower

[Ft – 5.11]	Reserved
RSWare Name:	Reserved
Description:	-
Range:	-
Default:	-
Units:	-
Applicable Operating Mode:	-
When Enabled	Immediately

[Ft – 5.12]	AC line loss fault delay
RSWare Name:	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

Default:	20
Units:	ms
Applicable Operating Mode:	All
When Enabled	Servo-Off -> Setting

[Ft – 5.13]	Analog Output CH1 Selection		
RSWare Name:	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)		
	Value	Description	Unit
	0	Velocity Feedback	Rpm
	1	Velocity Command	Rpm
	2	Velocity Error	Rpm
	3	Follower Position	Pulse
	4	Current Command	Pulse
	5	Master Position	Pulse
	6	Position Error	Pulse
	7	Position Command Count Frequency	Kpps
	8	Commutation Angle	°
	9	Mechanical Angle	°
	10	Shunt Power Limit Ratio	[%]
	11	Bus Voltage	V
	12	Absolute Rotations	-
	13	Velocity Command Offset	mV
	14	Current Command Offset	mV
	15	Reserved	-
	16	U Phase Current	A
	17	V Phase Current	A
	18	W Phase Current	A
	19	Motor Utilization	%
	20	Analog Command - Velocity	0.01V
	21	Analog Command - Current	0.01V
	22	Current Feedback	A
	23	Reserved	-
	24	Motor Feedback Position	Pulse
	25	Reserved	-
	26	Reserved	-
	27	Instantaneous Shunt Power	W
	28	Drive Utilization	%
Default:	0		
Applicable Operating Mode:	All		
When Enabled	Immediately		

[Ft – 5.14]	Analog Output CH2 Selection		
RSWare Name:	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)		

	Value	Description	Unit	Ft-5.16
	0	Velocity Feedback	Rpm	1 ~ 99999
	1	Velocity Command	Rpm	1 ~ 99999
	2	Velocity Error	Rpm	1 ~ 99999
	3	Follower Position	Pulse	0.001 ~ 99.999
	4	Current Command	Pulse	1 ~ 99999
	5	Master Position	Pulse	1 ~ 99999
	6	Position Error	Pulse	1 ~ 99999
	7	Position Command Count Frequency	Kpps	0.1 ~ 9999.9
	8	Commutation Angle	°	0.1 ~ 9999.9
	9	Mechanical Angle	°	0.1 ~ 9999.9
	10	Shunt Power Limit Ratio	[%]	1 ~ 99999
	11	Bus Voltage	V	1 ~ 99999
	12	Absolute Rotations	-	-
	13	Velocity Command Offset	mV	0.1 ~ 9999.9
	14	Current Command Offset	mV	0.1 ~ 9999.9
	15	Reserved	-	-
	16	U Phase Current	A	0.001 ~ 99.999
	17	V Phase Current	A	0.001 ~ 99.999
	18	W Phase Current	A	0.001 ~ 99.999
	19	Motor Utilization	%	1 ~ 99999
	20	Analog Command - Velocity	0.01V	0.01 ~ 999.99
	21	Analog Command - Current	0.01V	0.01 ~ 999.99
	22	Current Feedback	A	0.001 ~ 99.999
	23	Reserved	-	-
	24	Motor Feedback Position	Pulse	1 ~ 99999
	25	Reserved	-	-
	26	Reserved	-	-
	27	Instantaneous Shunt Power	W	1 ~ 99999
	28	Drive Utilization	%	1 ~ 99999
Default:	1			
Applicable Operating Mode:	All			
When Enabled	Immediately			

[Ft – 5.15]	Analog Output CH1 Scale
RSWare Name:	Analog Output 1: Scale
Description:	The amplitude of the channel 1 input signal to be displayed by the oscilloscope.
Range:	1 ~ 99999
Units:	Units depend on the channel selection.
Default:	500
Applicable Operating Mode:	All
When Enabled	Immediately

[Ft – 5.16]	Analog Output CH2 Scale
RSWare Name:	Analog Output 2: Scale
Description:	The amplitude of the channel 2 input signal to be displayed by the oscilloscope.
Range:	1 - 99999
Units:	Units depend on the channel selection.

Default:	500
Applicable Operating Mode:	All
When Enabled	Immediately

Appendix B Indexing Drive Parameters

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

Descriptions of Standard Drive Parameters begin on [page 38](#).

Parameter Groupings

Indexing drive parameters are grouped into these drive settings.

- Group 0 - Indexing drive system and I/O settings
- Group 1 - Homing controls
- Group 2 - Indexing operations
- Group 4 - Indexing position and distance setting
- Group 7 - Dwell settings
- Group 8 - Velocity settings
- Group 10 - Acceleration settings
- Group 11 - Deceleration settings
- Group 12 - Next Index settings

Parameter Descriptions

Parameter descriptions list the size of each parameter and the data options within the parameter.

Descriptions for Standard Drive Parameters begin on [page 38](#).

Group 0 - Indexing System

[IN00.00]		Auto Start Indexing			
RSWare Name		Auto Start Indexing			
Description:		When this field is set to "on", the drive will begin executing the selected index whenever the drive enables. <i>0-OFF</i> <i>1-ON</i>			
Range:	0~1	Default:	0	Units:	N/A
Access:	Set	Changeable Status:	Always	When Enabled:	Power Cycling
Applicable Operation Mode:		Indexing	MODBUS Address:	5000	

[IN00.01]		Abort Index Deceleration			
RSWare Name		Abort Index Decel			
Description:		The deceleration used to stop motion when the Stop Index input terminates an index move.			
Range:	1~2,147,483,647	Default:	6250	Units:	10 ² *Rev/sec ² for rotary, mm/sec ² for linear
Access:	Set	Changeable Status:	Always	When Enabled:	Always
Applicable Operation Mode:		Indexing	MODBUS Address:	5001~5002	

[IN00.02]		Positive Deceleration Distance			
RSWare Name		Positive Deceleration Distance			
Description:		The stopping distance used when the drive encounters a positive overtravel limit.			
Range:	0~2,147,483,647	Default:	0	Units:	Counts
Access:	Set	Changeable Status:	Always	When Enabled:	Always
Applicable Operation Mode:		Indexing	MODBUS Address:	5003 ~ 5004	

[IN00.03]		Negative Deceleration Distance			
RSWare Name		Negative Deceleration Distance			
Description:		The stopping distance used when the drive encounters a negative overtravel limit.			
Range:	0~2,147,483,647	Default:	0	Units:	Counts
Access:	Set	Changeable Status:	Always	When Enabled:	Always
Applicable Operation Mode:		Indexing	MODBUS Address:	5005 ~ 5006	

[IN00.04]		Enable Software Limits			
RSWare Name		Enable Software Limits			
Description:		Select: <i>0-Off</i> : Turns off software overtravel limit checking. <i>1-On</i> : 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	Default:	0	Units:	N/A
Access:	Set	Changeable Status:	Disable drive	When Enabled:	Disable drive
Applicable Operation Mode:		Indexing	MODBUS Address:	5007	

[IN00.05]		Positive Software Limit			
RSWare Name		Positive Software Limit			
Description:		If the motor feedback position is greater than this value, the drive has exceeded the software overtravel limit.			
Range:	-2,147,483,647 ~2,147,483,647	Default:	2,147,483,647	Units:	Counts
Access:	Set	Changeable Status:	Disable drive	When Enabled:	Disable drive
Applicable Operation Mode:		Indexing	MODBUS Address:	5008~5009	

[IN00.06]		Negative Software Limit			
RSWare Name		Negative Software Limit			
Description:		If the motor feedback position is less than this value, the drive has exceeded the software overtravel limit			
Range:	-2,147,483,647 ~2,147,483,647	Default:	-2,147,483,647	Units:	Counts
Access:	Set	Changeable Status:	Disable drive	When Enabled:	Disable drive

Applicable Operation Mode:	Indexing	MODBUS Address:	5010-5011
[IN00.07]	User Defined Distance Per Motor Revolution		
RSWare Name	User Defined Distance Per Motor Revolution		
Description:	This parameter is the user defined distance per motor 1 revolution in order to change the unit of indexing point distance.		
Range:	0~99,999	Default:	0
Access:	Set	Changeable Status:	Always
Units:	User Defined	When Enabled:	Power Cycling
Applicable Operation Mode:	Indexing	MODBUS Address:	5012

Group 1 - Homing

[IN01.00]	Homing Type		
RSWare Name	Homing Type		
Description:	Select the type of homing operation the drive will perform <i>0-Home to Present Position</i> <i>1-To Home sensor/Back to Marker (default)</i> <i>2-To Limit/Back to Marker</i> <i>3-To Home sensor/Fwd to Marker</i> <i>4-To Limit/Fwd to Marker</i> <i>5-Home to Current Value</i> <i>6-Home to Current Value/Back to Marker</i> <i>7-To Home sensor/Move/Fwd to Marker</i> <i>8-Home to Marker</i> <i>9-To Home Sensor</i> <i>10-To Limit Sensor</i>		
Range:	0~10	Default:	1
Access:	Set	Changeable Status:	Disable drive
Units:	N/A	When Enabled:	Disable drive
Applicable Operation Mode:	Indexing	MODBUS Address:	5200

[IN01.01]	Auto Start Homing on Enable		
RSWare Name	Auto Start Homing on Enable		
Description:	Causes the drive to begin the homing procedure automatically when the drive is enabled. <i>0-Active:</i> Automatically starts homing every time the drive is enabled. <i>1-Active After Reset Only:</i> automatically starts homing when a drive is enabled, if the drive has not already been homed <i>2-Inactive</i>		
Range:	0~2	Default:	2
Access:	Set	Changeable Status:	Always
Units:	N/A	When Enabled:	Power Cycling
Applicable Operation Mode:	Indexing	MODBUS Address:	5201

[IN01.02]	Homing Velocity		
RSWare Name	Homing Velocity		
Description:	The commanded velocity used during homing. The sign of this value (+/-) indicates the direction of motion during homing.		
Range:	-6,000~6,000	Default:	100
Access:	Set	Changeable Status:	Disable drive
Units:	RPM for rotary motors, mm/sec for linear motors	When Enabled:	Disable drive
Applicable Operation Mode:	Indexing	MODBUS Address:	5202

[IN01.03]		Creep Velocity			
RSWare Name		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:	0~6,000	Default:	20	Units:	RPM for rotary motors, mm/sec for linear motors
Access:	Set	Changeable Status:	Disable drive	When Enabled:	Disable drive
Applicable Operation Mode:	Indexing	MODBUS Address:	5203		

[IN01.04]		Homing Acceleration/Deceleration			
RSWare Name		Homing Acceleration/Deceleration			
Description:		The rate of acceleration and deceleration used during homing.			
Range:	1~2,147,483,647	Default:	6250	Units:	10 ² *Rev/sec ² for rotary, mm/sec ² for linear
Access:	Set	Changeable Status:	Disable drive	When Enabled:	Disable drive
Applicable Operation Mode:	Indexing	MODBUS Address:	5204 ~ 5205		

[IN01.05]		Offset Move Distance			
RSWare Name		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:	-2,147,483,647 ~2,147,483,647	Default:	0	Units:	Counts
Access:	Set	Changeable Status:	Disable drive	When Enabled:	Disable drive
Applicable Operation Mode:	Indexing	MODBUS Address:	5206 ~ 5207		

[IN01.06]		Home Sensor Polarity			
RSWare Name		Home Sensor Polarity			
Description:		Specifies the digital input state which indicates to the drive that the Home Sensor input is active: <i>0-Active-Going Transition</i> <i>1-Inactive-Going Transition</i>			
Range:	0~1	Default:	0	Units:	N/A
Access:	Set	Changeable Status:	Disable drive	When Enabled:	Disable drive
Applicable Operation Mode:	Indexing	MODBUS Address:	5208		

[IN01.07]		Home Position			
RSWare Name		Home Position			
Description:		The home position when a homing procedure is completed.			
Range:	-2,147,483,647 ~2,147,483,647	Default:	0	Units:	Counts
Access:	Set	Changeable Status:	Disable drive	When Enabled:	Disable drive
Applicable Operation Mode:	Indexing	MODBUS Address:	5209 ~ 5210		

[IN01.08]		Moving distance After Home Sensor			
RSWare Name		Moving distance After Home Sensor			
Description:		This value is distance that the drive ignores the marker inputs after the home sensor is detected.			
Range:	0~2,147,483,647	Default:	0	Units:	Counts
Access:	Set	Changeable Status:	Disable drive	When Enabled:	Disable drive

Applicable Operation Mode:	Indexing	MODBUS Address:	5211 ~ 5212
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[IN01.09]	Home Current				
RSWare Name	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:	1~250	Default:	100	Units:	%
Access:	Set	Changeable Status:	Disable drive	When Enabled:	Disable drive
Applicable Operation Mode:	Indexing	MODBUS Address:	5213		

[IN01.10]	Home Current Time				
RSWare Name	Home Current Time				
Description:	The time to when the torque feedback is more than the home current to when the drive detects stopper.				
Range:	0~1,000	Default:	0	Units:	ms
Access:	Set	Changeable Status:	Disable drive	When Enabled:	Disable drive
Applicable Operation Mode:	Indexing	MODBUS Address:	5214		

[IN01.11]	Homing Time Limit				
RSWare Name	Homing Time Limit				
Description:	Drive fault occurs when time for homing is over the homing time limit.				
Range:	0~65,535	Default:	60	Units:	sec
Access:	Set	Changeable Status:	Disable drive	When Enabled:	Disable drive
Applicable Operation Mode:	Indexing	MODBUS Address:	5215		

[IN01.12]	Stop Home Deceleration				
RSWare Name	Stop Home Decel				
Description:	The rate of drive deceleration used when homing is stopped.				
Range:	1~2,147,483,647	Default:	6250	Units:	10 ⁻² *Rev/sec ² for rotary, mm/sec ² for linear
Access:	Set	Changeable Status:	Disable drive	When Enabled:	Disable drive
Applicable Operation Mode:	Indexing	MODBUS Address:	5216 ~ 5217		

Group 2 - Indexing Options

[IN02.00~IN02.63]	Digit 0	Index 0~63 Type			
RSWare Name	Index 0~63 Option: Type				
Description:	<i>0-Absolute</i> : moves from its starting position to the specified Position, below. <i>1-Incremental</i> : 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	Default:	0	Units:	N/A
Access:	Set	Changeable Status:	Always	When Enabled:	Always
Applicable Operation Mode:	Indexing	MODBUS Address:	5400 ~ 5463		

[IN02.00~IN02.63]	Digit 1	Index 0~63 Action When Complete			
RSWare Name	Index 0~63 Option: Action When Complete				
Description:	The drive's action when the index has completed:				

						<p><i>0-Stop:</i> ends the execution of indexed move commands (default setting). <i>1-Start next index:</i> commands execution of the Next Index move without additional input, but after the scheduled Dwell. <i>2-Wait for Start:</i> commands execution of the Next Index move the next time the Start Index input becomes active.</p>
Range:	0~2	Default:	0	Units:	N/A	
Access:	Set	Changeable Status:	Always	When Enabled:	Always	
Applicable Operation Mode:	Indexing	MODBUS Address:	5400 ~ 5463			

Group 4 - Index Position/Distance

[IN04.00~IN04.63]						Index 0~63 Position/Distance
RSWare Name						Index 0~63 Position/Distance
Description:						<p><i>Position:</i> For Absolute mode moves, the fixed position to which the motor will travel. <i>Distance:</i> For Incremental and Registration mode moves, the relative distance the motor will travel.</p>
Range:	-2,147,483,647 ~2,147,483,647	Default:	0	Units:	Counts	
Access:	Set	Changeable Status:	Always	When Enabled:	Always	
Applicable Operation Mode:	Indexing	MODBUS Address:	5800 ~ 5927			

Group 7 - Index Dwell

[IN07.00~IN07.63]						Index 0~63 Dwell
RSWare Name						Index 0~63 Dwell
Description:						Milliseconds to remain at current position before executing
Range:	0~65,535	Default:	0	Units:	ms	
Access:	Set	Changeable Status:	Always	When Enabled:	Always	
Applicable Operation Mode:	Indexing	MODBUS Address:	6400 ~ 6463			

Group 8 - Index Velocity

[IN08.00~IN08.63]						Index 0~63 Velocity
RSWare Name						Index 0~63 Velocity
Description:						Maximum velocity while in motion.
Range:	0~6,000	Default:	750	Units:	RPM for rotary motors, mm/sec for linear motors	
Access:	Set	Changeable Status:	Always	When Enabled:	Always	
Applicable Operation Mode:	Indexing	MODBUS Address:	6600 ~ 6663			

Group 10 - Index Acceleration

[IN10.00~IN10.63]						Index 0~63 Acceleration
RSWare Name						Index 0~63 Acceleration
Description:						Maximum acceleration while in motion.
Range:	1~2,147,483,647	Default:	6250	Units:	10 ⁻² *Rev/sec ² for rotary, mm/sec ² for linear	
Access:	Set	Changeable Status:	Always	When Enabled:	Always	
Applicable Operation Mode:	Indexing	MODBUS Address:	7000 ~ 7127			

Group 11 - Index Deceleration

[IN11.00~IN11.63]						Index 0~63 Deceleration
RSWare Name						Index 0~63 Deceleration
Description:						Maximum deceleration while in motion

Range:	1~2,147,483,647	Default:	6250	Units:	10 ⁻² *Rev/sec ² for rotary, mm/sec ² for linear
Access:	Set	Changeable Status:	Always	When Enabled:	Always
Applicable Operation Mode:	Indexing	MODBUS Address:	7200 ~ 7327		

Group 12 - Index Next Index

[IN12.00~IN12.63]	Index 0~63 Next Index				
RSWare Name	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	Default:	0	Units:	N/A
Access:	Set	Changeable Status:	Always	When Enabled:	Always
Applicable Operation Mode:	Indexing	MODBUS Address:	7400 ~ 7464		

Appendix C Warnings and Fault Codes

This Appendix lists the Warnings and Fault Codes for CSD5 Servo drives.

Warnings

Warnings are drive abnormalities that allow motor control to continue. A three-digit text message is displayed using the last segments of the display.

Warning Number	Warning Characters	Description
0x01	bat	Absolute Encoder Battery Warning
0x02	CNT	Absolute Encoder Counter Overflow
0x04	Pre	Power Up Overspeed Warning
0x08	oCC	Over Current Command Warning
0x10	oSC	Over Speed Command Warning
0x20	PIIn	Digital IO Assignment Warning
0x40	CAP	Over Motor Rated Output Power Warning

Fault Codes

Faults are serious abnormalities that cause loss of motor control. The Status indicator alternates between a three-digit error code preceded by the letter E, and a five-digit text message. This error message repeats until the problem is cleared.

User Fault Code	Internal Fault code	Fault Characters	Fault Name
E.057	0x10	HWARE	PWM Hardware Fault
E.005	0x11	IPMFT	IPM Fault
E.079	0x12	SHTOC	Shunt Circuit Over current Fault
E.054	0x13	OFSET	Current Feedback Offset Fault
E.114	0x14	OVCUR	Motor Phase Over Current
E.101	0x20	CABLE	Motor Power Cable Open Fault
E.102	0x21	INSOL	Motor Instantaneous Current Overload Fault
E.004	0x22	MTROT	Motor Over temperature Fault
E.075	0x23	SHTOL	Shunt Over load Protection Fault
E.036	0x24	DRVOT	Drive Over temperature Fault
E.022	0x25	CONOL	Motor Continuous Current Overload Fault
E.023	0x27	DRVOL	Drive Overload Fault
E.103	0x28	MATCH	Motor Mismatch Fault
E.105	0x30	ENCTP	Encoder Type Mismatch Fault
E.030	0x31	ENCOP	Encoder Cable Open Fault
E.106	0x32	ENCCE	Encoder Communication Fault
E.083	0x33	ABSBE	Absolute Encoder Battery Fault
E.084	0x34	ABSOS	Absolute Encoder Overspeed
E.085	0x35	ABSCT	Absolute Multi-turn Count Fault

E.028	0x36	ENCDE	Encoder Data Range Fault
E.031	0x38	ENCPE	Encoder Data Parameter Fault
E.010	0x40	OVVTG	Bus Over voltage Fault
E.009	0x41	UDVTG	Bus Under voltage Fault
E.037	0x42	ACOFF	AC Line Loss Fault
E.018	0x50	OVSPD	Motor Over Speed Fault
E.019	0x51	POSER	Excess Position Error Fault
E.108	0x52	CDFRE	Position Command Frequency Fault
E.056	0x53	CPUFT	Watchdog Timeout Fault
E.112	0x54	ESTOP	Emergency Stop
E.024	0x55	ABSTO	Absolute Position Transfer Timeout Fault
E.107	0x60	SERCE	Serial Communication Fault
E.055	0x61	CHSUM	User Parameter Checksum Fault
E.058	0x62	RANGE	User Parameter Range Fault
E.053	0x63	PINIT	User Parameter Initialization Fault
E.113	0x64	IRANG	Indexing Position Range Overflow
E.060	0x70	DINIT	Drive Initialization Fault
E.100	0x71	SETUP	Drive Setup Fault
E.012	0x73	HFAIL	Home Search Failed
E.027	0x74	NOTHM	Axis Not Homed

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