MP2000 Quick Reference Guide

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MP2000 Memory Map

5.5 MB Stores ladder drawings, Local registers and special tables

Register Memory (Battery Backup)

S (Global) SW0000-1023	C (Global)	M (Global) (MW00000-65535)	
System information and status (read only)	**C**onstant, Read only registers.	General **M**ulti-Purpose read/write registers	DECIMAL
Example: Flicker relays, Calendar, Scan time setting, error codes, ect.	*Data that end user can change in MPE720 without needing to access the drawings.*	**User Free: MW00000-29999** Convention: *Axis#1:MW100-199, Axis#2:MW200-299*	
Fixed Parameters (for each axis) Written to in Module Configuration	*Example:* *Mechanical system specifications* (pulley ratios, encoder counts per load rev)	***Function Block RDA: MW30000-65535** *Axis#1:MW30100. Offset=200 per axis* *Master-Slave: MW56000. Offset=50 per M-S Pair*	
Define axis units, motor specs. Cannot be written by ladder Changes usually require power cycle	*Reference:*	*Reference: RDA Spreadsheet* ** If using motion function blocks.*	

I (Input) IW0000-FFFF	O (Output) OW0000-FFFF	
general purpose & motion data (Read only by application program)	general purpose &motion data (Read/Write by application program)	HEXADECIMAL
Physical Inputs: IW0000-7FFF	**Physical Outputs: OW0000-7FFF**	
Convention: IW0410+ for Local I/O modules IW0010+ for M-LINK I/O modules	Convention: OW0410+ for Local I/O Modules OW0010+ for M-LINK I/O modules	
Axis (Motion) Input: IW8000-807F (Module#1, Axis#1)	**Axis (Motion) Output: OW8000-807F** (Module#1, Axis#1)	
"motion monitoring" Offset 80h per axis 800h per module	"motion setting" Offset 80h per axis 800h per module	
Example: IB8000<u>0</u> = controller ready	*Example: OB8000<u>0</u> = turn servo on*	
Reference: Basic Module User Man 7.2.3	Reference: Basic Module User Man 7.2.2	

Program Memory (Overwritten from FLASH at power up)

D (Local Registers)*
Used as general purpose read/write in the defined **D**rawing only.

Suggested Convention:	Bits:	DW00000-00008	(DB000000~DB00008F)
	One-Shot	DW00009	(DB000090~DB00009F)
	Word Operations:	DW00010-00025	(16-bit integers)
	Accumulators:	DW00026	(16-bit Integer accumulator)
		DW00027	(16-bit Logic [Hexadecimal] Accumulator)
		DL00028	(32-bit Long Accumulator)
		DF00030	(32-bit Floating point Accumulator)
	Long & Float	DW00032-00098*	(32-bit Integers, 32-bit Floating Point)
	F.B. Work Register:	DW00100-00320*	(Bits, integers, floats as defined in Function Block)

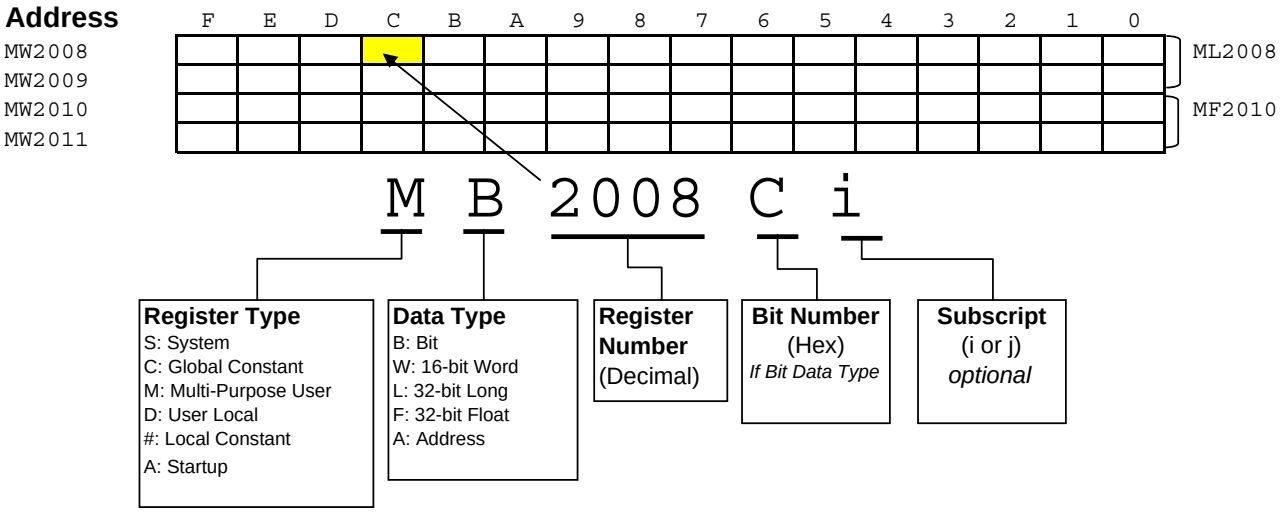
*Default is 32 D-registers per drawing. R-click drawing in File Manager - increase to 320 when using Function Blocks.
Reference:

# ("Sharps") #W00000-16383	Module Configuration	DECIMAL
Local Constants. General purpose, read-only by the specifed Drawing they are defined in.	Each hardware module on the rack has several configuration files. This data is stored in program memory.	
Set up via a table in the "properties" dialog box for each drawing. Rarely Used	New project requires setting Module Configuration first. Select from File Manager under Definition Folder"	

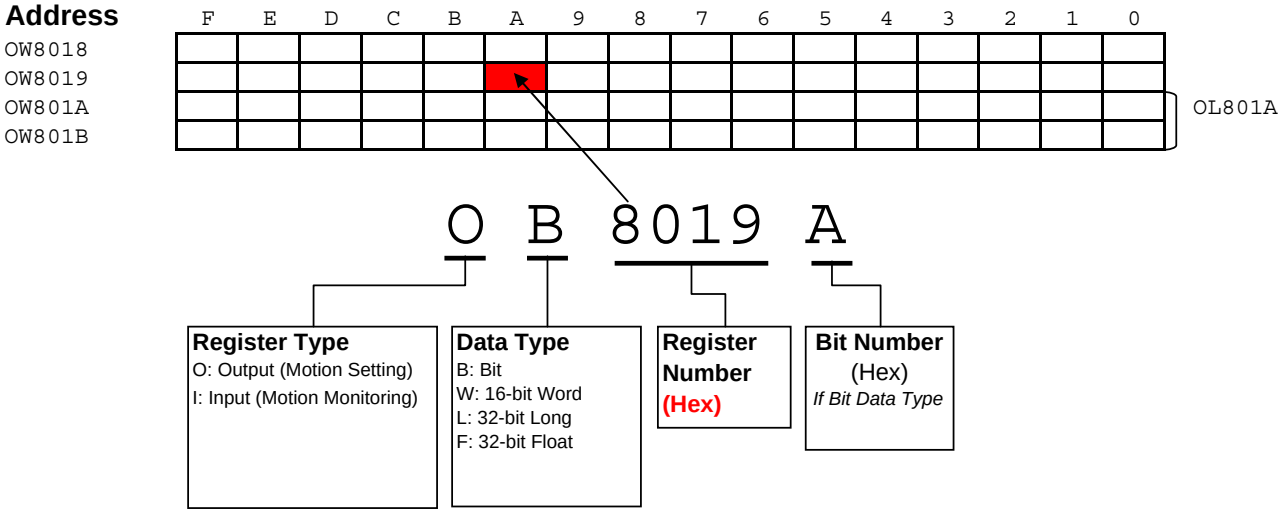
Drawings:	H, L, A, I
H (High Scan)	Use for all code that runs motion related functions
L (Low Scan)	Use for code that runs HMI, or user operated switches, lights, etc
A (Startup)	Use for drawings that should automatically run once at controller power up.
I (Interrupt)	Use to run a special interrupt routine after receiving a local input defined as a dedicated "Interrupt."
F (Function)	Use as a ladder element with custom inputs and outputs

MP2000 Register Addressing

All registers except Input and Output : S, C, M, D, #, A



Input and Output Registers



Global Memory (M) Register Allocation Map

Local

Register Range	Description
MB000000 – MB000999	Machine Operation Interlocks General Usage (Aux control, indicators, valves, etc)
MB00099A	Undefined -- Input Bit [Use as placeholder]
MB00099B	Undefined -- Output Bit [Use as placeholder]
MB00099F	Undefined -- General Bit [Use as placeholder]
MW00100 – MW06499	Axis Related Axis # 1 - 64
MW06500 – MW07996	Integer Operations (Single & Double) MW0xxxx; ML0xxxx
MW07997	Undefined -- Input Word [Use as placeholder]
MW07998	Undefined -- Output Word [Use as placeholder]
MW07999	Undefined -- General Word [Use as placeholder]
MW08000 – MW08999	Float (Real) Operations MF0xxxx
MW09000 – MW09999	SPARE (User Free)
MW10000 – MW14999	HMI Communications; Memobus Offset= 15000 (Bit, Word, Long, Float)
MW15000 – MW29999	Optional (Extended HMI, CAM, Recipe, etc.) (Bit, Word, Long, Float)
MW30000 – MW30099	SPARE
MW30100 – MW55699	Function Block RDA Axis # 1-128
MW55700 – MW55999	SPARE
MW56000 – MW62249	Function Block Master-Slave (CAM/GEAR) Pair # 1-128
MW62250 – MW65534	SPARE

General purpose usage, if Yaskawa Motion Function Block set is not used.

Axis Related Overview

Map

Register Range	Description
MW00100 MW00199	Axis #1
MW00200 MW00299	Axis # 2
MW00300 MW00399	Axis # 3
MW00400 MW00499	Axis # 4
MW00500 MW00599	Axis # 5
MW00600 MW00699	Axis # 6
MW00700 MW00799	Axis # 7
MW00800 MW00899	Axis # 8
MW00900 MW00999	Axis # 9
MW01000 MW01099	Axis # 10
	. . .
MW06400 MW06499	Axis # 64

Axis Detail Allocation Map

Axis

Enter Axis Number to determine Corresponding register range (64 Maximum Axes) -->	Axis	Leading Address
	1	00100

Register Range	Description
MW00100	Axis Bit Operation
MW00109	
MW00110	Axis Operation MW0xxxx; ML0xxxx; MF0xxxx; MB0xxxxx
MW00199	

Axis Bit Detail Allocation Map

Axis

1 <--Axis # (From Axis Detail Tab)

160 Bits (10 Words) allocated for each Axis [Note: Addresses Update by Changing Axis # on Axis Detail Tab]

	Address	Description	Address	Description	Address	Description	Address	Description
MW00100	MB001000	Axis Normal	MB001010	Automatic Production Reference	MB001020		MB001030	
	MB001001	Servo On Reference	MB001011	Automatic Production	MB001021		MB001031	
	MB001002		MB001012		MB001022		MB001032	
	MB001003		MB001013		MB001023		MB001033	
	MB001004		MB001014		MB001024		MB001034	
	MB001005	Jog Forward Interlock	MB001015		MB001025		MB001035	
	MB001006	Jog Reverse Interlock	MB001016		MB001026		MB001036	
	MB001007	Jog Forward Reference	MB001017		MB001027		MB001037	
	MB001008	Jog Reverse Reference	MB001018		MB001028		MB001038	
	MB001009	Jogging	MB001019		MB001029		MB001039	
	MB00100A	Homing In Progress	MB00101A		MB00102A		MB00103A	
	MB00100B	Homing Completed Detection	MB00101B		MB00102B		MB00103B	
	MB00100C	Homing Completed Latch	MB00101C		MB00102C		MB00103C	
	MB00100D		MB00101D		MB00102D		MB00103D	
	MB00100E		MB00101E	Axis Running	MB00102E		MB00103E	
	MB00100F		MB00101F	Zero Speed	MB00102F		MB00103F	
MW00104	MB001040		MB001050		MB001060		MB001070	
	MB001041		MB001051		MB001061		MB001071	
	MB001042		MB001052		MB001062		MB001072	
	MB001043		MB001053		MB001063		MB001073	
	MB001044		MB001054		MB001064		MB001074	
	MB001045		MB001055		MB001065		MB001075	
	MB001046		MB001056		MB001066		MB001076	
	MB001047		MB001057		MB001067		MB001077	
	MB001048		MB001058		MB001068		MB001078	
	MB001049		MB001059		MB001069		MB001079	
	MB00104A		MB00105A		MB00106A		MB00107A	
	MB00104B		MB00105B		MB00106B		MB00107B	
	MB00104C		MB00105C		MB00106C		MB00107C	
	MB00104D		MB00105D		MB00106D		MB00107D	
	MB00104E		MB00105E		MB00106E		MB00107E	
	MB00104F		MB00105F		MB00106F		MB00107F	
MW00108	MB001080		MB001090					
	MB001081		MB001091					
	MB001082		MB001092					
	MB001083		MB001093					
	MB001084		MB001094					
	MB001085		MB001095					
	MB001086		MB001096					
	MB001087		MB001097					
	MB001088		MB001098					
	MB001089		MB001099					
	MB00108A		MB00109A					
	MB00108B		MB00109B					
	MB00108C		MB00109C					
	MB00108D		MB00109D					
	MB00108E		MB00109E					
	MB00108F		MB00109F					

Notes:

Axis Detail Allocation Map

Axis

1 <--Axis # (From Axis Detail Tab)

Register Range	Description
ML00110	Gear Ratio (motor revolution) [N]
ML00112	Gear Ratio (load revolution) [N]
ML00114	Motor rated speed [RPM]
ML00116	
ML00118	
ML00120	
ML00122	
ML00124	
ML00126	
ML00128	Jog Speed [Ref Units]
ML00130	Homing Approach Speed [Ref Units]
ML00130	Homing Creep Speed [Ref Units]
ML00134	
ML00136	
ML00138	
ML00140	
ML00142	
ML00144	
ML00146	
ML00148	
MW00150 MW00199	User Specific Axis (Word, Long, Float) Operation

Local Memory (D) Register Allocation Map

Map

Register Range	Description
DW00000 – DW00008	Bit Operations DB000000 - DB00008F
DW00009	One Shot Pulses DB000090 - DB00009F
DW00010 – DW00019	Integer Operations General and/or Timer
DW00020 – DW00025	Optional (Word, Long, Float)
DW00026	Word (Integer) Accumulator DW00026
DW00027	Logic (Integer) Accumulator DW00027
DW00028 – DW00029	Long (Integer) Accumulator DL00028
DW00030 – DW00031	Long (Float) Accumulator DF00032

Note: Default is 32 D-registers per drawing. Edit drawing properties to increase when using Function Blocks. (Increasing this allocation reduces available program [Ladder & Motion] memory.)

DW00032 – DW00099	SPARE
DW00100 – DW16384	Function Block Word Registers

MP2000 Startup Procedure

☐ All equipment must be properly wired and installed.

Step	Instruction	Detail
1	Power OFF	Prepare for first Power ON
2	Set M-LINK address	MP2000 base unit is node 0, so set rotary switch 1-F
3	Turn On CONFIG and INIT dipswitches	Prepare to erase all RAM (not FLASH) and self-configure hardware. *Module configuration file is created in controller. Tuning parameters are copied from Servopack to controller (Ch 11)*
4	Power ON	Wait for "All Green" lights on Servopacks and Controller. *Takes about 15sec.*
5	Set all dipswitches OFF (left)	The configuration is now termporarily stored in program RAM and should not be self-configured again at next power up.
6	Start MotionWorks Ver 6	Connect Serial Cable JEPMC-W5311-03B
7	Make New Project	File - New Project. Select **Controller Type** at bottom. Long filenames ok. *Future changes are automatically saved to this project. This project is the default for transfers.*
8	Go Online	Online - Communications Settings. Choose "Serial(Com1)" and click "Connection". *Green animated bar with project file name appears on top when connected.*
9	SERVOPACK Default Set Procedure	**Optional Procedure** below: When the servopack is not brand new, use the procedure below to restore default parameter settings
10	Set Up Axes	Select "Variable" tab on lower right. Expand Axis Variable folder and define number of axes and text name for each axis. *Subfolders for axis variables will appear. Group definition file is created*
11	Transfer System Configuration to computer	Online - Read From Controller. Click "Individual" and under System Configuration check only "System Definition" and "Module Configuration". Click Start. *The system configuration applied directly to the controller by the CNFG dipswitch is now saved to the project file.*
12	Save to Flash and Cycle Power	Online - Save to Flash. Click "Start", CPU_STOP (wait for flash save), ok, Yes to run controller. Then cycle power. *The current controller configuration needs to be saved to flash, otherwise it will be overwritten at power up by whatever was last saved to flash. Cycle power for servopack parameter changes to take effect.*

SERVOPACK Default Set Procedure

*(Optional Procedure) When servopack is not brand new, use this procedure to restore default parameter settings**

Step	Instruction	Detail
1	Open Servopack Module Configuration	Under the blue "Setup" tab, click "Module configuration". Engineering Manager opens in a new application window.
		Highlight Controller Slot 00 (MP2300). In the Module Details section, double-click slot 3 (or R-click - Open Slot). The "SVB Definition" window appears
2	Save **servopack** defaults for each axis	In the SVB Definition window, Select SERVOPACK tab
		Choose the Axis number from the pull-down list (top left)
		Under Edit menu, choose Default Set. Click OK and Save
		Repeat for each axis as necessary
3	Save **Setup Parameters** defaults for each axis *(to keep servo gains from reverting back)*	In the SVB Definition window, Select Setup Parameters tab
		Choose the Axis number from the pull-down list (top left)
		Under Edit menu, choose Default Set. Click OK and Save
		Repeat for each axis as necessary

** The Default Set of Servopack parameters is not exactly the same as the set of parameters produced by self-configuration (CNFG dipswitch). See CH11 of the User Manual for details.*

Reset Absolute Encoder Alarm (A.81)

If the battery is disconnected from the absolute encoder, alarm A.81 is produced. Be sure all cables are securely connected. Then set the following variables for the affected axis using the watch page (View - Watch - Watch1).

1	Clear Alarm	Set Alarm.Clear (OB8000F) = 1, then 0
2	Reset Absolute Encoder	Set Command.SetValue (OW8008) = 0, then 22, then 0
3	Clear Alarm Again	Set Alarm.Clear (OB8000F) = 1, then 0

** The servo must be off. See Chapter 7.2.21 of the User Manual for more details*

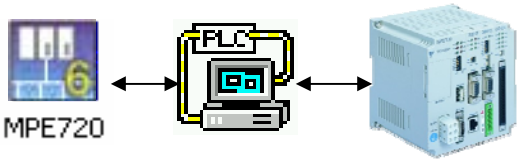
Serial & Ethernet Connection Procedure (To MPE720 Ver.6)

Serial Connection

Instruction	Step	Detail
Define the PC's Serial port as a valid way to communicate via MPE720 	1	Connect serial cable from MP2300 port 1 to PC's COM port.
	2	Select Menu: Online, Com Setting, choose serial port, Connection
	3	Open Communication manager from system tray
	4	Double click a "logical port number", choose "serial" and click "Detail"
	5	Choose desired "physical port" number that the serial cable is connected to on the PC.
	6	Save communication manager and minimize or close it

Ethernet Connection

MW/MPE720 communicates to the MP2300's 218IF-01 Ethernet module through the Communication Manager program. All 3 must be configured to log on online over Ethernet.



☐ **Be sure the 218-IF TEST and INIT dipswitches are both off (left)**

Instruction	Step	Detail
Give the 218IFmodule an IP address 	1	Open project and go online via serial port (CP-217)
	2	Under the Setup tab, choose Module Configuration
	3	Highlight the column of 218IF-01 slot
	4	In the Module Details section, double-click slot 2 (or R-click - Open Slot)
	5	Enter the **Controller's IP address** and save. *(The table at the bottom of the screen is for other Ethernet devices controlled by the MP2000)*
	6	Save configuration, close window, save and save to flash 
	7	Cycle unit power so that IP address is updated. *Be sure all dipswitches are off on both the base unit and the 218IF-01 to avoid overwriting the flash save upon power up*
Define the PC's Ethernet port as a valid way to communicate via MP2300 	1	Online - Disconnection. Save to flash if needed.
	2	Open Communication Manager (from windows system tray, near clock)
	3	Double click a blank logical port number to open the settings
	4	Choose CP-218, click detail
	5	Select the **PC's IP address.**
	6	Turn "Default" Off
	7	Click "OK" twice, save, and close communication manager
Tell MW/MPE720 to connect via Ethernet 	1	Online - Communication Settings
	2	Choose the port labeled "Ethernet". Computer's IP address that you just defined in Communication Manager will display. Click "Detail" and type the IP address of the MP2000.
	3	Click "Connection" and go online. Unblock any Windows Security Alerts.

NOTES:
It is assumed that a valid IP address has been acquired from the network administrator.
To connect directly, use a crossover cable and configure your PC to use a static IP address.
As noted on the 218IF module, the network must be 10mbps, or switchable from 100mbps to 10mbps.
If a 218IF error does not go away after power is cycled, turn on the 218IF INIT dipswitch and cycle power.

Basic Set of Registers for Register-Based Programming

Assume Module(Circuit) #1, Axis #1. Add 800h per circuit, 80h per axis.

Motion Setting Registers (OWxxxx)

Name	Word	Bit	[Unit] / Note	Reference
Servo On	OB8000	0		
Alarm Clear	OB8000	F		
Speed ("Feed" Speed)	OL8010		[10^3 R.U./minute (by default)] Select Speed Units in OW8003.0-3	
Motion Command Code	OW8008		1=Position, 3=Home, 7=Jog, 8=Step	
Position Reference	OL801C		[R.U.] Default R.U. is encoder count	
Abs/Inc Position Mode	OB8009	5	1=Abs, 0=Inc (default)	
Step Distance	OL8004		[R.U.] Default R.U. is encoder count	
Direction (Step,Jog)	OB8009	2	0=Fwd, 1=Rev	
Acceleration	OL8036		[ms to rated speed (FP34)] Select Acceleration Units in OW8003.4-7	
Deceleration	OL8038		[ms to rated speed (FP34)] Select Deceleration Units in OW8003.4-7	

Motion Monitoring Registers (I Wxxxx)

Name	Word	Bit	[Unit] / Note	Reference
Servo Alarm	IL8004		=0 when no alarm. Each bit represents different alarm	
Servo Warning	IL8002		=0 when no warning Each bit represents different warning	
Mtn Cmd Code confirm	IW8008			
Main Power On	IB802C	4		
Servo Ready	IB8000	3		
Servo On Confirm	IB8000 IB802C	1 3		
Feedback Position	IL8016		[counts or Reference Units]	
Feedback Speed	IL8040			
Positioning Complete	IB800C	1		

Terminology used on this page
"**R.U.**": Minimum increment of motion. By default 1 R.U. = 1 Count. Used fixed parameters to change.
"**Count**": **post**-quadrature encoder count
"**Pulse**": **pre**-quadrature encoder pulse

Motion Command Code

Indexing Example

Move from position 5000 to position 8000, assuming the following for module (circuit) #1, Axis #1

ILC008=5000	Current position is 5000
ILC022=0	No alarms
IBC0013=1	Servo is ON

Solution using **STEP**		
	OL8044=3000	Step Distance 3000
1	OB80092=0	Direction Forward
	OL8010>=0	Set Feed Speed
2	OW8008=8	MtnCmdCd starts motion

Solution using **POSITION** (INCremental)		
	OL801C=0	Initial position 0
1	OB80095=1	Incremental Positioning Mode
	OL8010>=0	Set Feed Speed
2	OW8008=1	MtnCmdCd defines initial position
3	OLC012=3000	Position reference incremented starts motion

Solution using **POSITION** (ABSolute)		
	OB80095=0	Absolute Positioning Mode
1	OL8010>=0	Set Feed Speed
	OL801C=8000	Position Reference to Absolute position
2	OW8008=1	MtnCmdCd starts Motion

Function Block Startup Procedure

☐ First complete the MP2000 Startup Procedure

New Function Block Project

Step	Instruction	Detail
1	Go Offline	Online - Disconnection. Flash Save optional.
2	Open Official Function Block Project File	IN A NEW WINDOW, Open the official Function Block project file, EC.MCD.06.056 by doubleclicking on it in Windows Explorer. Choose "Not Connect" if prompted.
3	Copy/Paste Function Blocks to Project	R-click the Function folder and Copy. Navigate back to original project file, R-click Function folder and Paste. Click OK to accept all function blocks. *You can also drag the folder from one project file to another.*
4	Write Function blocks to Controller	Under the blue Transfer tab, select "Write Into Controller". Select "Individual" and check only the function programs. Click Start. Takes 1 minute over serial connection.
5	Save to Flash	Save to flash happens automatically
6	Go Online	Online - Communications Settings. Choose "Serial(Com1)" or "Ethernet" and click "Connection". Green animated bar appears on top when connected.
7	Cycle Power	Cycle power is needed for initialization drawings (A drawings) to run

Open Existing Function Block Project

Step	Instruction	Detail
1	Open Function Block Project File	Open the official Function Block project file, EC.MCD.05.056 IN A NEW WINDOW by doubleclicking on it in Windows Explorer. Choose "Not Connect" if prompted.
2	Transfer Module Configuration from Controller	Under the blue Transfer tab, select Read From Controller and connect. Click the "Individual" button, Check and select "System Configuration", and check only "Module Configuration". Then click Start.
3	Go Online	Online - Communications Settings. Choose a logical port and click "Connection". Green animated bar appears on top when connected.
4	Transfer Everything to Controller	Under the blue Transfer tab, select "Write Into Controller". Click the "Individual" button. Select "System Configuration" and "Program". Then click Start. Click "Yes" to start and stop controllerwhen prompted.
5	Set Up Axes	Expand Axis Variable folder and define number of axes and text name for each axis.
6	Save to Flash	Online - Save To Flash
8	Cycle Power	Cycle power is needed for initialization drawings (A drawings) to run

Function Block Troubleshooting

Step 1:	Look at the blocks as they are running
	Is the ladder program running, or does it show " --- " below the registers?
	Does the execute bit turn on?
	Does the error bit or done bit turn on?
	If there are any status output bits, what is the state while running and what does the state mean?

Step 2:	Check Common Problems
	Overlapped work registers
	Input data out of range or of wrong data type
	Same input executing more than one block
	Same output bit used in more than one block
	Another drawing is running at the same time with the same block

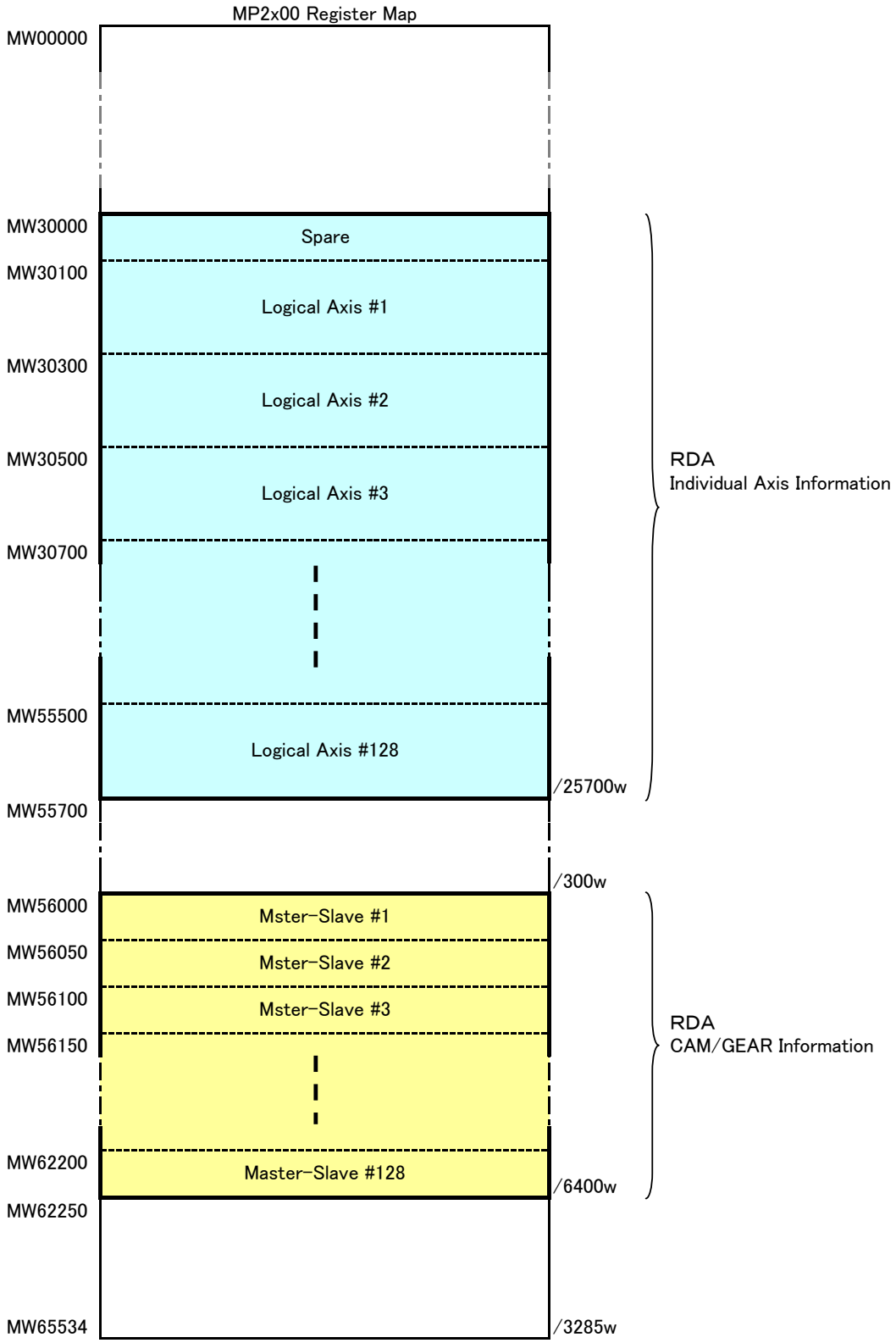
Step 3:	Work Register Troubleshooting
	If you know which block has an error, monitor the work registers as described in “Block Fault Condition” using the Watch window
	The Function Block field "[A]DataxxW defines the starting address for the work registers. For example if the field contains DA150, and the work register fault bit is listed as AB00003, then look at DB1503

Step 4:	RDA Troubleshooting
	Monitor register MW30181 for general troubleshooting information.
	Based on the result of MW30181, monitor registers MW30170 through MW30180
	Use the RDA register map for information on each each bit.
	Offset is 200 words per axis. RDA assumes Axis 1.

CAM Function Block Troubleshooting Checklist

1	Is the servo ON?
2	Is the RAWDATA value counting up/down in MOD_ENG?
3	Is MODDATA modulating?
4	Is MS-PAIR set to the same value on both MOD_ENG and CAM
5	Is TBLTYPE and TBLADDRS set to the correct location?
6	Is the cam table data visible at this address?
7	Is CAM enabled and engaged?
8	Is CAM running without errors?
9	What is the cam state?
10	Has MODDATA passed through the ENGAGPOS?
11	Has the scaling been set in ML56xx8 either directly or by using the CAMSCALE function block?
12	Did the Startup drawings (A) run? Save to flash and cycle power
13	Be sure no other drawings are running

Reserved Data Area



Function Block Specification / Reserved Data Area Access 1／4

RDA#	Datas Name	M-Register	Detail
–	Switch or Command	ML30100	RDA#003,#026,#027,#029,#035
001	Ratio Tech Unit Denom	MW30102	Conversion from technical units to increments: denominator
002	Ratio Tech Unit Nom	MW30103	Conversion from technical units to increments: nominator
003	Feedback Polarity	MB301000	Feedback from position sensor. direction 1 = positive
004	Scale Factor	MW30104	–
005	Movement Type	MW30105	0: Rotary; 1: Linear
006	Position Period	ML30106	Length of Period for rotational systems. [count]
007	Set Position	ML30108	Commanded position. [count]
008	Act Position	ML30110	Actual position. [count]
009	Max Velocity	ML30112	Maximum velocity. [count/sec]
010	Set Velocity	ML30114	Commanded velocity. [count/sec]
011	Act Velocity	ML30116	Actual acceleration. [count/sec2
012	Set Acceleration	ML30118	Commanded acceleration. [count/sec2]
013	Act Acceleration	ML30120	Actual acceleration. [count/sec2]
014	Max Acceleration	ML30122	Maximum acceleration. [count/sec2]
015	Set Deceleration	ML30124	Commanded deceleration. [count/sec2]
016	Act Deceleration	ML30126	Actual deceleration. [count/sec2]
017	Max Deceleration	ML30128	Maximum deceleration. [count/sec2]
018	Set S-Curve Filter	ML30130	Commanded S-Curve Filter [ms] (S curve time)
019	Act S-Curve Filter	ML30132	Actual S-Curve Filter [ms] (S curve time)
020	Max S-Curve Filter	ML30134	Maximum S-Curve filter [ms] (S curve time)
021	Act Torque	ML30136	Actual Torque [0.01% of rated torque]
022	Max Torque	ML30138	Maximum Torque [0.01% of rated torque]
023	Limit Torque	ML30140	Maximum user defined Torque [0.01% of rated torque]
024	SW Limit Positive	ML30142	Position software limit switch in positive direction.
025	SW Limit Negative	ML30144	Position software limit switch in negative direction
026	SW Limit Enable	MB301001	Enable Software end switches
027	HW Limit Enable	MB301002	Enable / disable hardware end switch (to be used after overtravel)
028	Capt Position	ML30146	Capture position [count]
029	Capture Occured	MB301003	Capture signal occurred (reset with writing)
030	Ramp Shape	MW30148	Shape of Acc/Dec profile. 0 = Trapezoid; 1 = S-Shape; rest supplier dependent
031	Axis State	MW30149	State of the Axis 0 = reserved for power off situation 1 = ErrorStopped Motion 2 = Stopped Motion 3 = Standstill 4 = Discrete motion 5 = Continuous motion
032	Factor P	–	P-factor of position loop [0.1/s]
033	Factor I	–	I-factor of position loop [ms]
034	Factor D	–	D-factor of position loop
035	Regulator Off	MB301004	TRUE= regulator off

Function Block Specification / Reserved Data Area Access　2／4

RDA#	Datas Name		M-Register	Detail		Remarks
–	–		MW30150			
–	–		MW30151			
–	–		ML30152			
–	–		ML30154			
–	–		ML30156			
–	–		MW30158			
–	–		MW30159			
–	–		ML30160			
–	–		MW30162			
–	–		MW30163			
–	–		ML30164			
–	–		ML30166			
–	–		ML30168			
1000	RDA Status		MW30170	bit0		
1001		Abort		bit1	Stop Axis Motion	
1002		Command Bit		bit2	One Scan Pulse of Motion Block Execution	
1003		Accele rating		bit3	Accele rating	
1004		Decele rating		bit4	Decele rating	
1005		Steady		bit5	Steady	
1006				bit6		
1007		Stopping		bit7	Stopping	
1008		CCW command		bit8	CCW command	
1009		CW command		bit9	CW command	
1010				bitA		
1011				bitB		
1012				bitC		
1013				bitD		
1014				bitE		
1015				bitF		
1016			MW30171	bit0		
～				～		
1031				bitF		
1032	–		MW30172			
1033	Motor Rated Speed		MW30173	[rpm]		
1034	Encoder Resolution		ML30174	Postquaditure value [pulse/rev]		
1035	Factor FF		ML30176	Feed Forward Gain for Positioning, CAM, Gear [1000=100%]		
1036	Servo Enable Type		MW30177	bit0	Servo ON	
				bit1	Positive Enabled	
				bit2	Negative Enabled	
				bit3	–	
1037	Move State		MW30178	Move Type 0 = Stop 1 = Jog 2 = Move Relative 3 = Move Absolute 4 = Move Addtive 5 = Home 6 = Latch Target 7 = Gear 8 = CAM		
1038	Block Running		MW30179	Indicates number of block last ran.		
1039	Run Status		MW30180	bit0	Running	
				bit1	Faulted	
				bit2	Aborted	
				bit3	–	
1040	Error ID 1		MW30181	bit0	No Home Switch	
				bit1	Over Travel	
				bit2	Time Out	
				bit3	Value to Great	
				bit4	Direction Not Allowed	
				bit5	Pos Error	
				bit6	No Motor Power	
				bit7	Servo Alarm	
				bit8	Clear Pending Error	
				bit9	Track Fail	
				bitA	RDA Error	
				bitB	Error Stop	
				bitC	Table Error	
				bitD	Servo Off	
				bitE	–	
				bitF	–	
1041	Error ID 2		MW30182	Spare		
1042	–		MW30183			
1043	–		ML30184			
1044	Module Number		MW30186	Module Nummber		
1045	Axis Number		MW30187	Axis Nummber		
–	–		MW30188			
–	–		MW30189			
–	–		ML30190			
–	–		MW30192			
–	–		MW30193			
–	–		ML30194			
–	–		MW30196			
–	–		MW30197			
–	–		MW30198			
–	–		MW30199			

Function Block Specification / Reserved Data Area Access 3／4

RDA#	Datas Name	M-Register	Detail	Remarks
–	Run Status-1	MW30200	IW8000 – Run Status (IWC000)	
–	Run Status-2	MW30201	IW800C – Position Status (IWC000)	
–	Servo Status	MW30202	IW802C – Servo Status (IWC001)	
–		MW30203	– (ILC002)	
–	Target Position	ML30204	IL8010 – Target Position (ILC002)	
–	Latched Position	ML30206	IL8018 – Latched Position (ILC006)	
–	Actual Position	ML30208	IL8016 – Acutal Position (ILC008)	
–	Command Status	MW30210	IW8009 – Motion Command Status (IWC015)	
–	Command Response	MW30211	IW8008 – Motion Command Response (IWC014)	
–	Alarms	ML30212	IL8004 – Alarm (ILC022)	
–	Warning	ML30214	IL8002 – Warning	
–	Servo Alarm Code	MW30216	IW802D – Servo Alarm Code (IWC024)	
–	Servo DI Monitor	MW30217	IW802E – Servo DI Monitor (IWC025)	
–	Speed Ref. Monitor	ML30218	IL8020 – Speed Reference Monitor (ILC026)	
–	Feedback Speed	ML30220	IL8040 – Feedback Speed Monitor	
–	Run Mode	MW30240	OW8000 – Run Mode (OWC000)	
–	Run Command-1	MW30241	OW8003 – Filter, User Unit	
–	Run Command-2	MW30242	OW8004 – Latch Signal Selection	
–	Run Command-3	MW30243	OW8005 – Zero point return INPUT Siganal	
–		ML30244	–	
–	Accel Time	ML30246	OL8036 – Acceleration time (OWC00C)	
–	Decel Time	ML30248	OL8038 – Deceleration time (OWC00D)	
–	Speed Reference	ML30250	OL8010 – Speed Reference (OLC022)	
–	Position Reference	ML30252	OL801C – Position Reference (OLC012)	
–	Position Offset	ML30254	OL8048 – Position Offset (OLC006)	
–	Ext. Travel Distance	ML30256	OL8046 – External travel distance for latch target (OLC024)	
–	Filter Time	MW30258	OW803A – Filter Time (OWC014)	
–	Motion Command Code	MW30259	OW8008 – Motion Command Code (OWC020)	
–	Motion Command Bits	MW30260	OW8009 – Motion Command Control Bits (OWC021)	
–	ZRN Mode	MW30261	OW803C – Zero point return method	
–	Approch Speed	ML30262	OL803E – Approch Speed	
–	Creap Speed	ML30264	OL8040 – Creap Speed	
–	Zrn. Travel Distance	ML30266	OL8042 – Zrn travel distance	
1200	Buf0 Abs Pos -L	ML30280	Buf0 -Absolute Position at Power OFF (Lower 2word)	
1201	Buf0 Abs Pos -U	ML30282	Buf0 -Absolute Position at Power OFF (Upper 2word)	
1202	Buf0 Mod Pos -L	ML30284	Buf0 -Modularized Position at Power OFF (Lower 2word)	
1203	Buf0 Mod Pos -U	ML30286	Buf0 -Modularized Position at Power OFF (Upper 2word)	
1204	Buf1 Abs Pos -L	ML30288	Buf1 -Absolute Position at Power OFF (Lower 2word)	
1205	Buf1 Abs Pos -U	ML30290	Buf1 -Absolute Position at Power OFF (Upper 2word)	
1206	Buf1 Mod Pos -L	ML30292	Buf1 -Modularized Position at Power OFF (Lower 2word)	
1207	Buf1 Mod Pos -U	ML30294	Buf1 -Modularized Position at Power OFF (Upper 2word)	

Function Block Specification / Reserved Data Area Access 4／4

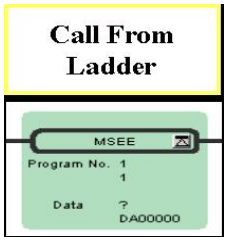
RDA#	Datas Name		M-Register	Detail	
1057	–		–		
1058	–		–		
1059	–		–		
1060	CAM Status	CAM Type	MW56000	bit0	OFF:Return ON:One way
1061		Positive Cyc End		bit1	On when CAM Master position, includes CAM-Shift, rolled over in positive direction.
1062		Negative Cyc End		bit2	On when CAM Master position, includes CAM-Shift, rolled over in Negative direction.
1063				bit3	
1064				bit4	
1065				bit5	
1066				bit6	
1067				bit7	
1068				bit8	
1069				bit9	
1070				bitA	
1071				bitB	
1072				bitC	
1073				bitD	
1074				bitE	
1075				bitF	
1076			MW56001	bit0	
～				～	
1091				bitF	
1092	CAM Status		MW56002	bit0	Disengaged
				bit1	Waiting to Engage
				bit2	CAMing is Locked
				bit3	Waiting to Disengage
				bit4	–
1093	TABLE Size		MW56003	Cam Table Size	
1094	CAMshift		ML56004	Absolute CAM Shift amount [count]	
1095	SLAVE offset		ML56006	Absolute Offset amount [count]	
1096	CAM Scale		ML56008	Absolute Acale amount [0.01%]	
1097	Machine Cycle		ML56010	Machine Cycle [count]	
1098	Data Counter		ML56012	Raw master data for master-slave pair [count]	
1099	ModData		ML56014	Modulated master data for master/slave pair. [count]	
1100	M-S Block		ML56016	???	
1101	–		–		
1102	–		–		
1103	–		–		
1104	–		–		
1105	GEAR state		MW56020	bit0	Disengaged
				bit1	Accelerating
				bit2	Gearing is locked and synched
				bit3	Decelerating
				bit4	–

Motion Program Startup Procedure

First complete the MP2000 Startup Procedure

Motion Program

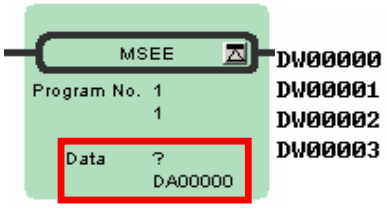
Step	Instruction	Detail
1	Start a new Motion Program	In the Program window on the left, click the Motion tab. Expand the folders, and R-click Main Program. Select New. Give it a name and click OK.
2	Things to know before a Motion Program is started	There are no commands for SERVO ON or JOG in the Motion Programming Language. These steps are to be accomplished in Ladder.
3	Write Motion Program	First line must be 'MPM001' and last line must be 'END;'. Instructions terminate with semicolon. Comments enclosed in quotes ("comment"). Refer to Motion Programming User Manual (SIEZ-C887-1.3) for extensive details on each command.
4	Save Motion Program	Use save icon.



Call From Ladder

Step	Instruction	Detail
1	Use the MSEE instruction	MSEE is located under the "Motion" group under the Ladder Instruction tab It can only be used in an H-drawing. Define a starting address for the four 16-bit work registers in the Data field. Often DA00000 is used defining DW00000 through DW00003, but be sure to use M or D registers that are not used elsewhere.
2	Rules before starting	All axes in the group must have: 1) Servo On, 2) Motion Command Code =0 and not continually updated to 0, 3) No other motion program in same group runnin, in alarm, or paused, 4) SERVOPACK self-writing function disabled - FixedParameter 1 bit A=1.
3	Start the motion program	Bit 0 of the second word defined in the Data field (DB000010 in the above example) must go high for the motion program to start. See Motion Program Work Registers in this QRG for more information.
4	Rules while running	Ladder code must not manipulate Motion Command Code, unless motion language is not using the Motion Command Code register the time, and proper interlocks are used to flag the ladder code

Motion Program Work Registers for MSEE instruction



F	E	D	C	B	A	9	8	7	6	5	4	3	2	1	0	
																1st work register
																2nd work register
																3rd work register
																4th work register

1st Work Register

OUTPUT (Motion Program Status)

DW00000

Bit	Name	Description
DB000000	Program Running	ON while running
DB000001	Program Paused	ON while paused
DB000002	program stopped with program stop request	ON when stopped
DB000004	Program in Debug (Single Block) Mode	ON during debug via ladder (registers)
DB000008	Program Alarm	ON when Motion Program Alarm has occurred
DB000009	Stopped at Break Point	
DB00000B	Program Debugging Mode	ON during Windows (EWS) debug mode
DB00000D	Start request signal history	ON during request
DB00000E	Program Duplication Error	ON when another Motion Program in the same group has started while this program is running
DB00000F	Program Number Limit Error	ON when the number of steps in program exceeded maximum

The "Data" field of the MSEE instruction defines the address for the output and input registers of the motion program.

Ex: DA00000 means that DW00000 through DW00003 will be used.

2nd Work Register

INPUT (Motion Program Control Signals)

DW00001

Bit	Name	Description
DB000010	Program Start Request	ON with rising edge. (if it CAN start it will, otherwise alarm)
DB000011	Program Pause Request	ON will pause motion blocks
DB000012	Program Stop Request	ON will stop all group motion and exit the Motion Program
DB000013	Program Debug Mode Select	"Single block mode". ON will force debugging mode
DB000014	Program Debug Start	"Single Block Mode" start. ON (transition) debug block by block
DB000015	Program alarm Reset	ON will clear the program alarm (stop program before issuing alarm reset)
DB000016	Program Continuous Operation Start Request	ON will cause program to ….
DB000018	Block Skip 1 Operation	ON will cause the program to skip an interpolated motion block if the SKP ss1 instruction was used instead of MVS
DB000019	Block Skip 2 Operation	ON will cause the program to skip an interpolated motion block if the SKP ss2 instruction was used instead of MVS
DB00001D	System Work Number Setting	ON Sets system work register number with 4th word of MSEE work register
DB00001E	Interpolation Override Setting	ON activates the interpolation override speed with the 3rd MSEE work register

3rd Work Register

INTERPOLATION OVERRIDE (Speed)

DW00002 The speed set in this register [0.01% of FMX] will override the interpolation speed set in the motion program (F & IFP commands) when bit E of the 2nd word of the MSEE work register is ON

4th Work Register

SYSTEM WORK REGISTER

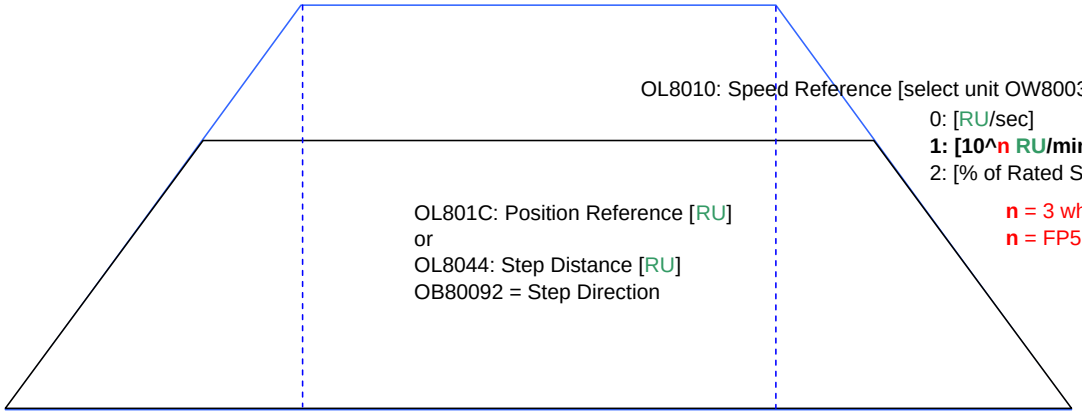
DW00003 The system work register number in this register will be used when bit D of the 2nd word of the MSEE work register is ON. Otherwise the system work register number will be automatically defined by the system and may be different each time.

Reference Units (User Units)

KEY
* RU = "reference unit" = "user unit" - fraction of the measurement system
* FP = Fixed Parameter
* MCC = Motion Command Code (OWxx08)
* Register Values given for Circuit#1, Axis#1
* **Bold type** represents default setting

NOTES:
* Register Addresses assume Circuit#1, Axis#1
* Default Positioning units are [encoder pulses (post quad)]
* Default Speed Reference units are [1000 pulses/min]
* Default Accel/Decel units are [ms to rated motor rpm]
* Default FP1.A=1 autmatically transfers accel/decel to servopack
* MPE720 5.31B "Units" in module configuration do not update
* Basic Module User Manual (SIEPC88070003B) lists incorrect unit defaults

FP34: Rated Speed [RPM] **(Default 3000)**



OL8010: Speed Reference [select unit OW8003.0-3] **(Default 3000)**
0: [RU/sec]
1: [10^n RU/min]
2: [% of Rated Speed (FP34)]

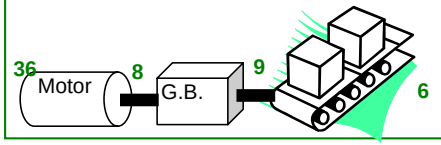
n = 3 when FP4=0 (pulse)
n = FP5 when FP4<>0

OL801C: Position Reference [RU]
or
OL8044: Step Distance [RU]
OB80092 = Step Direction

RU = FP4 *10^-**n**

FP4 = RU Measurement System
0: Pulse (post quad)
1: mm
2: deg
3: inch
4: micron

If PULSE is not chosen for the measurement system use the following parameters to define the relationship between PULSE and RU.
FP36: Encoder Pulses (post quad) per motor rev
FP8: Motor Revs into gearbox
FP9: Machine Shaft Revs out of gearbox
FP6: RU per Machine Shaft Revolution



Servopack Pn80B: Acceleration Rate
[10,000 RU/sec^2] **(Default 65535)**

FP1.A=1
Update at power up or when changed

Use MCC=10 to change Acceleration when FP1.A=0

OL8036: Acceleration [select unit OW8003.4-7] **(Default 0)**
0: [RU/sec^2]
1: [ms to Rated Speed (FP34)]

Servopack Pn80E: Deceleration Rate
[10,000 RU/sec^2] **(Default 65535)**

Use MCC=11 to change Deceleration when FP1.A=0

FP1.A=1
Update at power up or when changed

OL8038: Deceleration [select unit OW8003.4-7] **(Default 0)**
0: [RU/sec^2]
1: [ms to Rated Speed (FP34)]

OL8036/OL8038 =0 sets servopack acceleration/deceleration rate to 65535[10,000 RU/sec^2], independent of unit selected in OW8003.4-7

For an "Infinite Length" Axis
** Rotary Table*
** Conveyor*
FP1 bit0: Set axis type to "Infinite Length"
FP10: Set R.U. per rotation. This will be 360 degrees (converted to R.U.) for a rotary table.

Recommended Tuning Practice

Tune Servopack using any preferred tools and methods available	
	Digital Operator – Rigidity Fn001, etc
	SigmaWin (Serial Communication not officially supported with SGDH+NS115)
	Tuning Function Block
	Register / Parameter Manipulation in Module Configuration
	MotionWorks SCOPE tool

Save the Servopack parameters to the Project, Servopack Flash, and MP2000 Flash	
	SVB module configuration SERVOPACK tab, use"Edit" menu, and choose “Copy Current Value” to update servopack parameters to project. Repeat for each axis.
	SVB module configuration SERVOPACK tab, use the SAVE button to save these current
	Save project and save to flash.

Adjust the tuning register defaults that are written from the controller to Servopack at power-up	
	In SVB module configuration "Setting Parameters" tab, Manually set all five OWxxxx tuning registers to match the ServoPack parameters

Tuning Parameter (Variable)	MP2000	ServoPack
Gain.PositionLoop	OWxx2E	Pn102
Gain.SpeedLoop	OWxx2F	Pn100
Gain.PositionFeedForward	OWxx30	Pn109
Gain.PositionIntegration	OWxx32	Pn11F
Gain.SpeedIntegration	OWxx34	Pn101
Torque Reference Filter	-	Pn401
Notch Filter	-	Pn409

The tuning parameter values (OWxxxx) in the MP2000 write to the ServoPack at POWER-UP and whenever they are CHANGED

(1) Are written to by Servopack Pn value at Automatic Self-Configuration
(2) Write to the Servopack Pn at power-up*
(3) Write to the Servopack Pn whenever they are changed*

** When Fixed Parameter #1 bit A =0* *(Default=0: automatic updating enabled)*

See Ch 11.3.1

Write the tuning parameters (and all parameters) in the program	
	Use the L20.xx drawings according to Best Practice

Terminology Synonyms and Definitions

Parameter	Register
Reference Unit (R.U.)	Command Unit
User Unit	Base unit such as mm, inch, degree.
Module #	Circuit #
MotionWorks	MPE720
Motion Command	Motion Command Code
Motion Programming	Motion Language (Structured Text)

Register Offsets

	Offset	Start	Note
Per Axis	80h	IW8000 / OW8000	
Per Module / Circuit	800h	IW8000 / OW8000	
Function Block per axis	200	MW30100	
Function Block Master-Slave	50	MW56000	