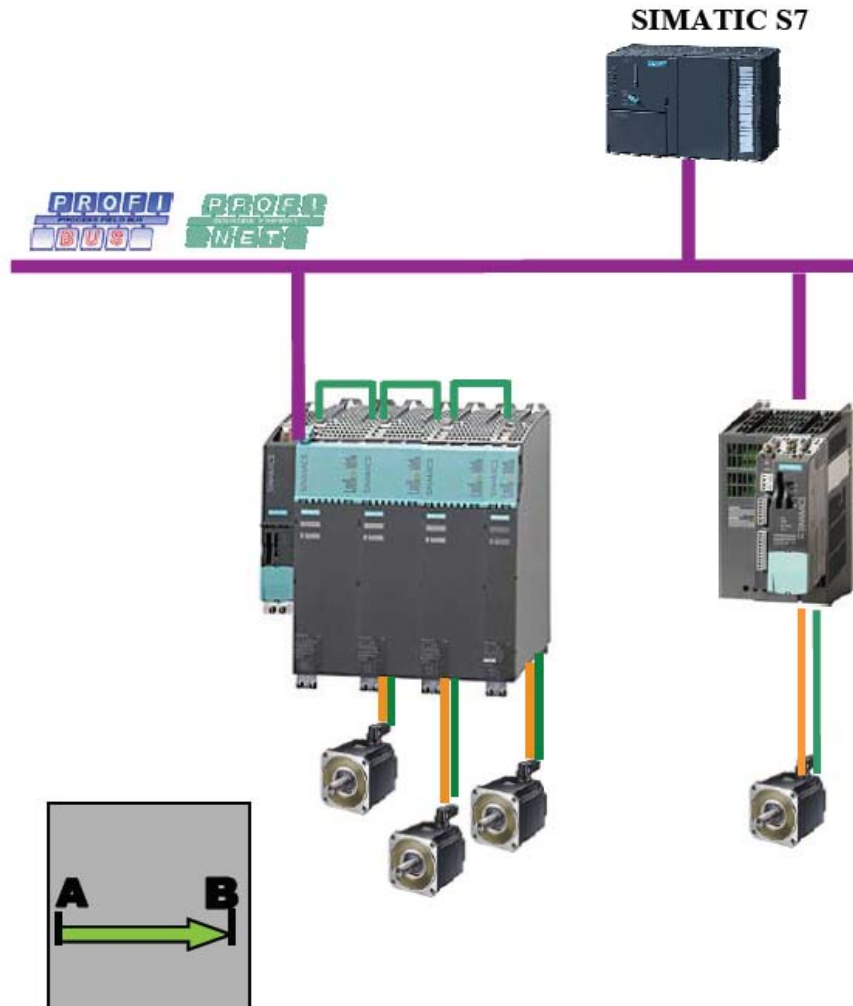


# Profibus Mapping for S120 APC EPOS FB120



**Basic Information****Qualified personnel**

In the sense of this documentation qualified personnel are those who are knowledgeable and qualified to mount / install, commission, operate and service/maintain the products which are being used. He or she must have the appropriate qualifications to carry-out these activities:

Trained and authorized to energize and de-energize, ground and tag circuits and equipment according to applicable safety standards.

Trained or instructed according to the latest safety standards in the care and use of the appropriate safety equipment.

Trained and certified in rendering first aid.

There is no explicit warning information in this documentation. However, reference is made to warning information and instructions in the Operating Instructions for the particular product.

**Objective of the application**

Training material is provided for the application in other material. This note serves as reference to programming and understanding the S7 communication to and from a Sinamics S120 drive using the S120 APC Speed Block.

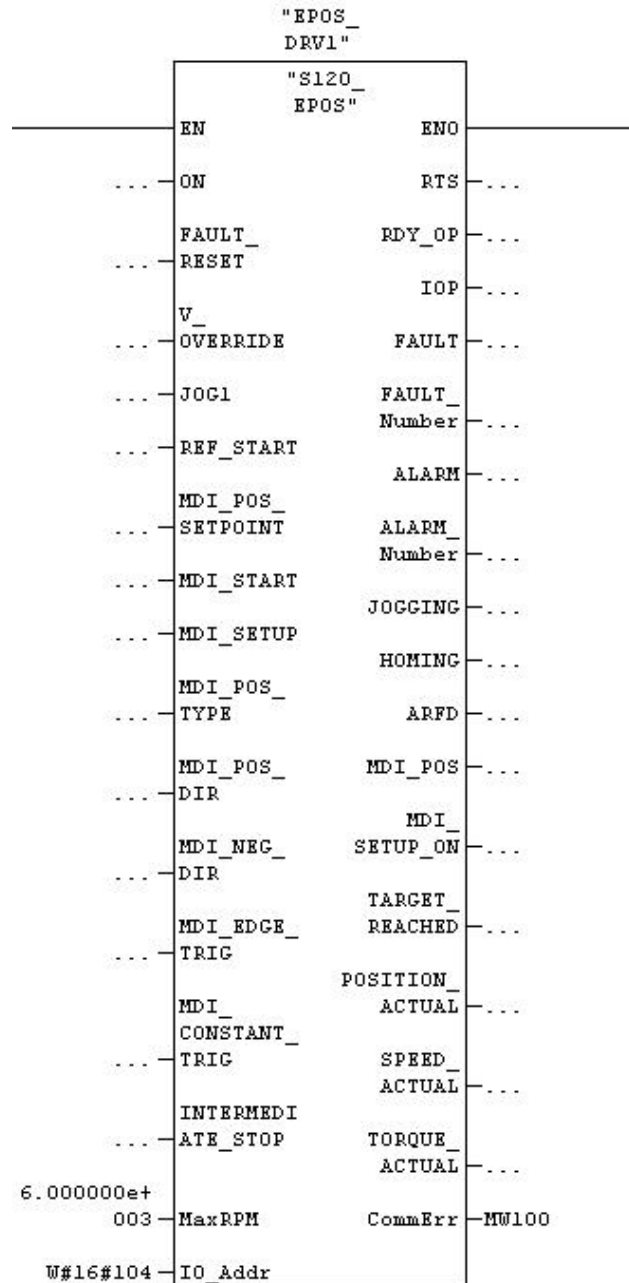
**Core contents of this application**

1. Introduction to S120 APC EPOS Function Block.
2. Explanation of the parameterization of the Function Block for ease of programming.
3. Profibus / Profinet Control and Status mapping to and from the S120 drive using the S120 APC EPOS Block.

## Block View of S120 APC EPOS

From the block view you see the most commonly used Inputs and outputs to the drive. The left side of the block has the commonly used inputs such as; ON, Fault Reset, and Velocity Override. The Right side contains commonly used feedback from the drive such as IOP (In Operation), RTS (Ready to Start), and Speed Actual. The left side contains normalization for motor RPM as well as commonly used commands to the drive. The speed normalization should be based on the maximum speed of the motor for the application. The starting peripheral address is on the bottom left side of the block. This is a hex value and can be found in decimal format in the hardware configuration of the S7 Hardware Configuration program. In this example the starting address for the drive was "260" so the address in the block is W#16#104.

Fig. 3.0 S120 APC EPOS Block View



## Instance Data Block of S120 APC EPOS

### Naming the Instance DB

Each instance DB used can be a specific name. This makes it easy to identify the axis symbolic name of bits and words when programming in S7. For example, the name of the block could be "Drive1" as in the example or it could be the Axis name – such as "Roughing Mill 1". This way all of the DB bits and words specific to this drive are automatically named in an easy to understand format.

### Common Drive Block Control Inputs

Table 4.0 (Block Inputs –Commonly used and Normalization)

Address	Declaration	Name	Type	Initial Value	Comment
0.0	In	ON	BOOL	False	1=Operation
0.1	In	FAULT_RESET	BOOL	False	Reset Fault Bit
2.0	In	V_OVERRIDE	INT.	0	Velocity Setting
6.0	In	JOG1	BOOL	False	Start JOG1
4.1	In	REF_START	BOOL	False	Start Referencing
6.0	In	MDI_POS_SETPOINT	DINT.	0	Position Setpoint
10.0	In	MDI_START	BOOL	False	MDI Positioning
10.1	In	MDI_SETUP	BOOL	False	MDI Setup Mode
10.2	In	MDI_POS_TYPE	BOOL	False	1 = ABS, 0 = Relative
10.3	In	MDI_POS_DIR	BOOL	False	For Positive Direction
10.4	In	MDI_NEG_DIR	BOOL	False	For Negative Direction
10.5	In	MDI_EDGE_TRIGGER	BOOL	False	Edge Trigger Move
10.6	In	MDI_CONSTANT_TRIG	BOOL	False	Constant Trigger
10.7	In	INTERMEDIATE_STOP	BOOL	False	0 = Intermediate Stop
12.0	In	Max_RPM	REAL	100	Enter Max RPM
16.0	In	IO_Addr	Word	W#16#0	Hex Address

### Common Drive Block Status Outputs

Note that CommErr is an integer value that can be used to diagnose communication problems with Profibus using SFC14 and SFC15. These SFCs are called by the Function Block. The most common error is that the input / output address on the block is not the same as the one in the Hardware Configuration in S7 Simatic Manager and subsequently the PLC.

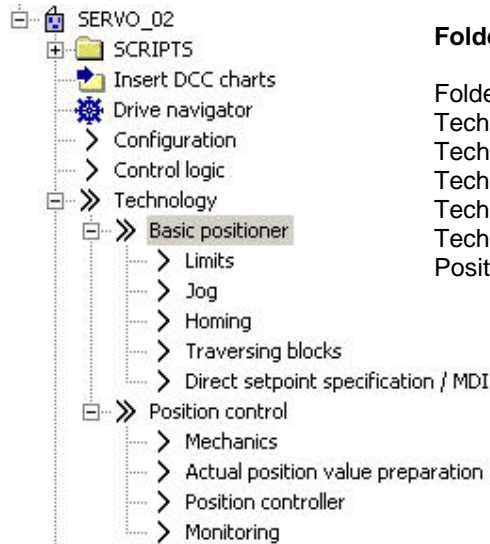
Table 4.1 (Block Outputs –Commonly used and Communication Error)

Address	Declaration	Name	Type	Initial Value	Comment
18.0	Out	RTS	BOOL	False	Ready to Start
18.1	Out	RDY_OP	BOOL	False	Ready for Oper.
18.2	Out	IOP	BOOL	False	In Operation
18.3	Out	FAULT	BOOL	False	Fault Present
20.0	Out	FAULT_Number	INT.	0	Fault Number
22.0	Out	ALARM	BOOL	False	Alarm Present
24.0	Out	ALARM_Number	INT.	0	Alarm Number
26.0	Out	JOGGING	BOOL	False	Jogging Active
26.1	Out	HOMING	BOOL	False	Homing Active
26.2	Out	ARFD	BOOL	False	Axis Referenced
26.3	Out	MDI_POS	BOOL	False	MDI Positioning
26.4	Out	MDI_SETUP_ON	BOOL	False	MDI Setup On
26.5	Out	TARGET_REACED	BOOL	False	Position Reached
28.0	Out	POSITION_ACTUAL	REAL	0.0	Actual Position
32.0	Out	SPEED_ACTUAL	REAL	0.0	Actual Speed
36.0	Out	TORQUE_ACTUAL	REAL	0.0	Actual Torque
40.0	Out	CommErr	INT.	0	Int. value of Error

## Telegram to the Drive using the S120\_APC\_Speed

This section shows the Bits and words sent to the Sinamics drive using the instance DB. This is the actual telegram to the drive. The commonly used bits in the previous section are internally mapped to the most used bits for convenience. Note that High and Low bytes are swapped when sending words to the drive. The order shown is as the telegram is received in the drive. Drive Folder refers to the section or folder under the Drive Object in the Program Starter or Scout.

### Drive Object Folder View



### Folder Locations & Definitions for Preceding Tables

Folder / Control Logic: **CL**  
 Technology / Basis Positioner / Limits: **Limits**  
 Technology / Basis Positioner / Jog: **Jog**  
 Technology / Basis Positioner / Homing: **Homing**  
 Technology / Basis Positioner / Direct Setpoint Specification / MDI: **MDI**  
 Technology / Basis Positioner / Traversing Blocks: **Traverse**  
 Position Control / Monitoring: **Monitoring**

### Word 1: Control Word 1

Control Word 1 is a basic drive Control word for enabling of operation to the drive and some basic motion commands. Included in the Control Word 1 are a fault reset bit, Jogging, and some permissive bits needed for motion.

Address	Drive Folder	Name	Type	Initial Value	Comment
63.0	CL	CW1.ON	BOOL	False	OFF1
63.1	CL	CW1.NoOff2	BOOL	True	OFF2
63.2	CL	CW1.NoOff3	BOOL	True	OFF3
63.3	CL	CW1.Enc	BOOL	True	Enable
63.4	MDI / Traverse	CW1.EntMStp	BOOL	False	1= No Intermediate Stop
63.5	MDI / Traverse	CW1.RejTask	BOOL	True	1 = No Reject Task
63.6		CW1.Spare6	BOOL	False	Spare
63.7	CL	CW1.AckFlt	BOOL	False	Acknowledge Fault
62.0	Jog	CW1.Jog1	BOOL	False	Run- Jog1 Speed
62.1	Jog	CW1.Jog2	BOOL	False	Run- Jog2 Speed
62.2	CL	CW1.LB	BOOL	False	PLC Control
62.3	CL	CW1.Spare11	BOOL	False	Spare
62.4	Jog	CW1.JogInc	BOOL	False	Incremental Jog
62.5		CW1.Spare13	BOOL	False	Spare
62.6	Limits	CW1.SftLimAct	BOOL	True	Software Limit active
62.7	Limits	CW1.StpCamAct	BOOL	True	Stop Cam Active

## Word 2: **Control Word 2**

Control word 2 is an additional Control Word with bits for Homing, MDI, and the Traverse Block Start Bit.

Address	Drive Folder	Name	Type	Initial Value	Comment
65.0	Homing	CW2.RefStart	BOOL	False	Start Homing
65.1	Homing	CW2.RefpSet	BOOL	False	Set Home (ABS enc.)
65.2	Homing	CW2.RefTyp	BOOL	False	1= On the Fly
65.3	Homing	CW2.RefStDi	BOOL	False	0 = Positive Start
65.4	Homing	CW2.RefInpS	BOOL	False	Select 1 or 2 meas. probe
65.5	Homing	CW2.RefEdge	BOOL	False	0 = Positive Edge
65.6		CW2.Spare6	BOOL	False	Spare
65.7		CW2.Spare7	BOOL	False	Spare
64.0	MDI	CW2.MDIStart	BOOL	False	MDI Move Enabled
64.1	MDI	CW2.MDISetup	BOOL	False	MDI Setup Mode
64.2	MDI	CW2.MDIPsType	BOOL	True	Pos. Type, 0 = Relative
64.3	MDI	CW2.MDIPos	BOOL	True	Pos. Direction Forward
64.4	MDI	CW2.MDINeg	BOOL	True	Pos. Direction Negative
64.5	MDI	CW2.MDIEdge	BOOL	True	Edge Transfer
64.6	MDI	CW2.MDITrTyp	BOOL	True	Continuous Transfer
64.7	Traverse	CW2.TrvStart	BOOL	True	Activate Traverse

## Word 3: **Traverse Bits**

Word 3 is the integer value needed for selecting a Traversing Block in the Traversing Blocks folder.

Address	Drive Folder	Name	Type	Initial Value	Comment
66.0	Traverse	Traverse_Bits	INT.	0	Traverse Bits Select

## Word 4: **Velocity Override**

Word 4 is Velocity Override and varies the fixed setpoint velocity for Jogging, MDI and Homing.

Address	Drive Folder	Name	Type	Initial Value	Comment
68.0	Homing / Jog / MDI / Traverse	VelOverride	INT.	0	Velocity Override for Positioning & Jogging

## Word 5 & 6: **Position Setpoint**

This is a double integer value and is used as the MDI position setpoint.

Address	Drive Folder	Name	Type	Initial Value	Comment
70.0	MDI	PosSetpoint	DINT.	0	Position Setpoint

## Word 7: **AccelSet**

This word is for scaling the Acceleration in MDI (Positioning / Setup).

Address	Drive Folder	Name	Type	Initial Value	Comment
74.0	MDI	AccelSet	INT.	0	Acceleration Override

### Word 8: **DecelSet**

This word is for scaling the Acceleration in MDI (Positioning / Setup).

Address	Drive Folder	Name	Type	Initial Value	Comment
76	MDI	DecelSet	INT.	0	De-Acceleration Override

### Word 9: **Spare**

This is a spare control word and is optional to the user.

Address	Drive Folder	Name	Type	Initial Value	Comment
78		Spare9	INT.	0	Spare

### Word 10: **Spare**

This is a spare control word and is optional to the user.

Address	Drive Folder	Name	Type	Initial Value	Comment
80		Spare10	INT.	0	Spare

### Telegram from the Drive using the S120\_APC\_Speed

This section shows the bits and words sent from the Sinamics drive to the instance DB. This is the actual telegram to the PLC. The bits used in the Common Block Output section are internally mapped to the most used bits for convenience. Note that High and low bytes are swapped when sending words to or from the drive. The order shown is as the telegram is sent from the drive. Drive Folder refers to the section or folder in under the Drive Object in the Program Starter or Scout. Most status bits can be found in this folder, but some other folders are mentioned as they are the origin for the status source.

### Word 1: **Status Word 1**

Status Word 1 is a basic drive Status word giving feedback on the status of enabling of operation and type of operation.

Address	Drive Folder	Name	Type	Initial Value	Comment
43.0	Control Logic	SW1.RTS	BOOL	False	Drive Ready to Start
43.1	Control Logic	SW1.RDY	BOOL	False	Drive Ready to Operate
43.2	Control Logic	SW1.IOP	BOOL	False	Drive In Operation
43.3	Control Logic	SW1.Fault	BOOL	False	Drive is Faulted
43.4	Control Logic	SW1.NoOff2Act	BOOL	False	1= Coast to Stop Inactive
43.5	Control Logic	SW1.NoOff3Act	BOOL	False	1= Quick Stop Inactive
43.6	Control Logic	SW1.PowInhibit	BOOL	False	Missing Enables
43.7	Control Logic	SW1.Alarm	BOOL	False	Drive has Alarm
42.0	Control Logic	SW1.Stndstill	BOOL	False	Speed at Zero
42.1	Control Logic	SW1.LB_CR	BOOL	False	Drive has PLC Life Bit
42.2	Jog	SW1.JogAct	BOOL	False	Jogging Active
42.3	Homing	SW1.refAct	BOOL	False	Referencing Active
42.4	Traverse	SW1.TrvBIAct	BOOL	False	Traverse Block Active
42.5	MDI	SW1.MDIPosAct	BOOL	False	MDI Positioning Active
42.6	MDI	SW1.MDISetAct	BOOL	False	MDI Setup Active
42.7	Homing	SW1.FlyRefAct	BOOL	False	Flying Reference Active

## Word 2: Status Word 2

Status Word 2 contains useful positioning feedback information from the Basic Positioner. Monitoring bits such as software limits, and direction indicators are covered. Some of these are common bits and found in all modes in the Basic Positioner – such as axis move FWD or BWD.

Address	Drive Folder	Name	Type	Initial Value	Comment
45.0	Homing	SW2.ARFD	BOOL	False	Axis is Referenced
45.1	Traversing	SW2.CmdAct	BOOL	False	Traversing Command
45.2	Monitoring	SW2.TargPos	BOOL	False	Target position Reached
45.3	Monitoring	SW2.NoFlwErr	BOOL	False	No Following Error
45.4	MDI / Traverse	SW2.SftSwMinAct	BOOL	False	Software Limit Minus Active
45.5	MDI / Traverse	SW2.SftSwPlusAct	BOOL	False	Software Limit Plus Active
45.6	All Pos. Modes diag.	SW2.StpCamMinAct	BOOL	False	Stop CAM Minus Active
45.7	All Pos. Modes diag.	SW2.StpCamPlsAct	BOOL	False	Stop CAM Plus Active
44.0	Traverse	SW2.AckTravBlk	BOOL	False	Traversing Block Active
44.1	Traverse	SW2.SetPStatic	BOOL	False	Setpoint Does not Change
44.2	All Pos. Modes	SW2.FWD	BOOL	False	Axis Moves Forward
44.3	All Pos. Modes	SW2.BWD	BOOL	False	Axis Moved Backward
44.4	All Pos. Modes	SW2.Accel	BOOL	False	Axis Accelerating
44.5	All Pos. Modes	SW2.Decel	BOOL	False	Axis De-accelerating
44.6	Traverse / MDI	SW2.PrntMrkOut	BOOL	False	Print Mark Outside Window
44.7	All Pos. Modes diag.	SW2.VelocityLimit	BOOL	False	Velocity Limit Active

## Word 2: Status Word 3

Bits contained in Status Word 3 pertain to Traversing Block Feedback and Cam Contactor Position ON bits.

Address	Drive Folder	Name	Type	Initial Value	Comment
47.0	r2670.0 List Man.	SW3.AckTrvBit0	BOOL	False	Block Select Bit 0 ON
47.1	r2670.1 List Man.	SW3.AckTrvBit1	BOOL	False	Block Select Bit 1 ON
47.2	r2670.2 List Man.	SW3.AckTrvBit2	BOOL	False	Block Select Bit 2 ON
47.3	r2670.3 List Man.	SW3.AckTrvBit3	BOOL	False	Block Select Bit 3 ON
47.4	r2670.4 List Man.	SW3.AckTrvBit4	BOOL	False	Block Select Bit 4 ON
47.5	r2670.5 List Man.	SW3.AckTrvBit5	BOOL	False	Block Select Bit 5 ON
47.6	Traverse	SW3.TrvOut1	BOOL	False	Output 1 Via Traverse Block
47.7	Traverse	SW3.TrvOut2	BOOL	False	Output 2 Via Traverse Block
46.0		SW3.Spare8	BOOL	False	
46.1		SW3.Spare9	BOOL	False	
46.2		SW3.Spare10	BOOL	False	
46.3		SW3.Spare11	BOOL	False	
46.4		SW3.Spare12	BOOL	False	
46.5	Traverse	SW3.TrckMode	BOOL	False	Track Mode is Active
46.6	Monitoring	SW3.PosSmCAM1	BOOL	False	Output CAM1 Position
46.7	Monitoring	SW3.PosSmCAM2	BOOL	False	Output CAM2 Position

## Word 4-5: Actual Speed

Word 4 and 5 are used for the Actual Speed of the drive's motor. Use Reference Parameter folder in Drive Configuration Folder to normalize this value – P2000.

Address	Drive Folder	Name	Type	Initial Value	Comment
48.0	Profibus	ActualSpeed	DINT.	0	Actual Speed



**Word 5-6: Actual Position**

Word 5 and 6 are Actual Position from the encoder use for positioning. For typical applications this is usually the motor encoder's position.

Address	Drive Folder	Name	Type	Initial Value	Comment
52.0	Profibus	ActPosition	DINT.	0	Actual Position

**Word 7: Actual Motor Torque**

Word 7 is Actual Torque of the drive's Motor. Use Reference Parameter folder in Drive Configuration Folder to normalize this value – P2003.

Address	Drive Folder	Name	Type	Initial Value	Comment
56.0	Profibus	ActTorque	INT.	0	Motor Torque

**Word 9: Drive Fault Number**

Word 9 shows any active Fault number from the drive.

Address	Drive Folder	Name	Type	Initial Value	Comment
58.0	Profibus	Fault	INT.	0	The Fault Number

**Word 10: Drive Alarm Number**

Word 10 contains any active Alarm number from the drive.

Address	Drive Folder	Name	Type	Initial Value	Comment
60.0	Profibus	Alarm	INT.	0	The Alarm Number