

Converting S5 Programs from CPU944 to CPU945

General points to observe

- Some function blocks have been replaced by new commands
- FBs for analog value processing with floating-point parameters (XA, XE, OGR, UGR)
- New function blocks (IP, OP, basic functions, etc.)
- 32-bit ACCU
- Old storage modules cannot be implemented, new modules are Flash EPROMs (for current modules you need an operating system of at least release Z03 and STEP5 V6.6)
- Waiting loops created by operation runtimes will be faster
- Operating system functions are only available via OB250
- Storage configuration completely new through 20-bit addresses (except for I/O area)
- Operating system data remains unchanged
- Assembler blocks cannot be run in the CPU 945
- Absolute address accesses with LIR, TIR, TNB must be adapted
- Handling blocks are the same regarding interface and functionality
- DB1 contains additional parameter data records, above all for interface parameterization
- Connection of OPs not possible via AS511 protocol, apart from that adapted FBs are required
- S flags S0.0 to S4095.7 have been added to the flag area
- New “Mathematical Functions” program package available (SINUS, COSINUS, etc.)

What has to be changed?

Changes in Function Blocks

<i>CPU944</i>	<i>CPU945</i>
1. Integrated FBs:	
FB240 COD:B4	-> DEF
FB241 COD:16	-> DUF
FB242 MUL:16	-> xF
FB243 DIV:16	-> :F
FB250 RLG:AE	FB250 AE:460 (only AI460,GP format)
FB251 RLG:AA	FB251 RLG:AA (GP format)
2. Basic Functions Package:	
FB1 ADD:32	-> +D
FB2 SUB:32	-> -D
FB3 MUL:32	FB3 MUL:32 (for CPU945)
FB4 DIV:32	FB4 DIV:32 (for CPU945)
FB5, FB10-13, FB196/197	Same FB numbers (for CPU945)
FB21 COD:B8	-> DED
FB22 COD:32	-> DUD
FB30 AE:464	Integrated FB242 (ET100/200,GP format)
FB31 AE:460	Integrated FB250 (only AI460,GP format)
FB32 AE:463	Integrated FB241 (only AI463,GP format)
FB33 AE:466	Integrated FB243 (only AI466,GP format)
FB44 DB-COPY	Integrated OB182 (also OB183/184, only as of operating system Z02)
FB45 DB-COPY	
---	FB6 RAD:GP (GP root extractor)
---	FB38 SAVE (save scratch flag)
---	FB39 LOAD (load scratch flag)

3. Floating-point Mathematical Function Package:		
FB15	GP:FPGP	-> FDG
FB16	GP:GPF	-> GFD
FB17	GP:ADD	-> +G
FB18	GP:SUB	-> -G
FB19	GP:MUL	-> xG
FB20	GP:DIV	-> :G
FB21	GP:VGL	-> !=G, ><G, >G, >=G, <G, <=G

What has been added?

Additional basic functions

	OPERATION	OPERAND(S)
Binary link	A, AN, O, ON	S, D
Storage functions	S, R, =	S, D
Load/transfer functions	L, T	ID, QD, FD, DD, SD, SY, SW, QB, QW
Comparison functions	L !=D, ><D, >D, >=D, <D, <=D, !=G, ><G, >G, >=G, <G, <=G	DH, KG
Mathematical function	xF, :F, +G, -G, xG, :G	
Organizational function	DOU, DOC, CX, GX	

Additional extension functions

	OPERATION	OPERAND(S)
Bit test functions	TB, TBN, SU, RU	I, Q, F, RT
Load/transfer functions	L, T LRW, LRD, TRW, LRD	RT
Mathematical functions	+D, -D	
Register functions	LDI, TDI ADD MBR, ABR, MAS, MSA, MBA, MAB, MBS, MSB	A1, A2, BR, SA DH
Block transfer	TNW	
Jump function	JOS	
Shift functions	SSW, SSD, SLD, RLD RRD	
Conversion functions	CSD, DEF, DED, DUF, DUD, GFD, FDG	
Others	LIM, SIM	

New organization blocks

- OB 19 For call of a non-loaded block
- OB 26 Scantime exceeded
- OB 33 Time interrupt error
- OB 125 Generate STEP 5 block
- OB 160 Programmable time loop
- OB 182 Copy data area
- OB 183 Duplicated DX
- OB 184 Duplicate DB
- OB 190 Transfer flag byte-by-byte into DB
- OB 191 Transfer data byte-by-byte from DB into flag
- OB 192 Transfer flag word-by-word into DB
- OB 193 Transfer data word-by-word from DB into flag
- OB 220 Sign extension

Operating system service OB 250

- Activated functions in operating system
- Change specific parameters during cyclic operation
- Assigned function numbers in ACCU 1 - L
- Service-specific parameters in ACCU 2 and ACCU 1 - H

<i>Services</i>	<i>Function</i>
1	Activate time interrupt OB 6
2 ... 5	Set time interval for OB 10 ... OB 13
6	Change component image (control track)
7	Reduce the PIQ (process output image) transfer
8	Update component image
10 / 11	Create a DB or DX
12	New configuration of block address list
13 ... 18	I/O access without time-out error
19	Lock and release digital output
20 ... 23	Read and write DBA and DBL registers
24 / 25	Indexed call of DX and FX blocks
26	Remove block from block address list
27 / 28	Change block ID

<i>Error Messages (ACCU 1 - L)</i>	
0	No error
1	Invalid function number
2 ... 4	Reserved
5 ... FFFF	Service-specific error messages