

● **SIEMENS**



SINUMERIK 840
Software Versions 1/2
Function Macros

Planning Guide 03.92 Edition



SINUMERIK 840 Software Version 1/2 Function Macros

Planning Guide
Manufacturer Documentation

Valid for:

<i>Control Unit</i>	<i>Software Version</i>
SINUMERIK 840T	1/2
SINUMERIK 840M	1/2

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Printing history

Brief details of this edition and previous editions are listed below.

The status of each edition is shown by the code in the "Remarks" column.

Status code in "Remarks" column:

- A . . . New documentation
- B . . . Unrevised reprint with new Order No.
- C . . . Revised edition with new status.

If factual changes have been made on the page since the last edition, this is indicated by a new edition coding in the header on that page.

Edition	Order No.	Remarks
05.90	6ZB5 410-0FF02-0BA0	A
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Other functions not described in this documentation might be executable in the control. This does not, however, represent an obligation to supply such functions with a new control or when servicing.

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Preliminary Remarks

Notes for the reader

This manual is intended for the manufacturers of machine tools using SINUMERIK 840.

The SINUMERIK documentation is organized in four parts:

- General documentation
- User documentation
- Manufacturer documentation
- Service documentation

The manufacturer documentation for SINUMERIK 840 is divided into the following:

- Instruction Manual
- Interface
 - Part 1: Signals
 - Part 2: Connection Conditions
- Planning Guide PLC 135WB
- Function Macros
- Function Blocks PLC 135WB
 - Package 0: Basic Functions
 - Package 1: Tool Management
 - Package 4/5: Computer Link

Additional SINUMERIK publications are also available for all SINUMERIK controllers (e.g. publications on the universal interface, measuring cycles, CL 800 cycle language).

Please contact your Siemens regional office for details.

Technical comments

Function macros are function blocks which were written in assembly language and integrated into the system program.

These blocks can be called and parameterized by the user just like STEP 5 blocks. They are intended for time-critical functions and require a considerably shorter processing time than the equivalent STEP 5 blocks. The user should therefore make preferential use of these blocks.

When these blocks are output on the programmer *only* the block header is displayed.

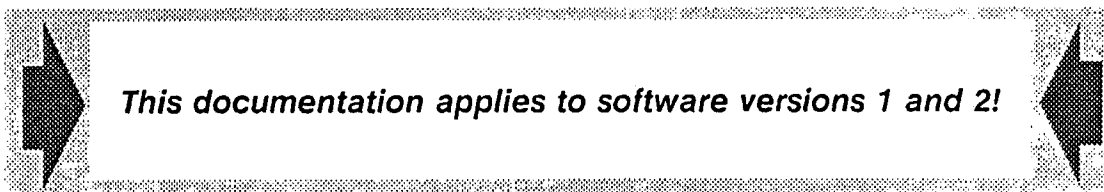
When the blocks are linked into the user program the following points must be observed:

- When a user program is being developed in ON-LINE mode (input into the PLC) these blocks can be called by other blocks. The corresponding parameter list appears on the programmer and is supplied with values by the user.

- When a user program is programmed on diskette any function macros which are called must also be on the diskette. For this, the individual macros are transferred from the PLC to a working disk. Only the block header with the parameter list is transferred.
- When this FB is called in the user program only the parameter list is supplied with values. When the whole user program is transferred to an EPROM these block headers must *not* be transferred with it.

Loading the PLC blocks:

- MC5 function blocks with the same FB number and a function macro cannot be transferred into the RAM module of the PLC 135 WB.
- Function macros are declared invalid if an FB with the same number is contained on an EPROM blown using the programmer and this EPROM is plugged into the PLC 135 WB.



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1 Definitions

1.1 Explanations of FB designations

FB call	Parameter	Type of parameter	Allowed actual operand	
	I Q	Input Output	BI Operand with bit address BY Operand with byte address W Operand with word address	
			I n.m Input Q n.m Output F n.m Flag	
			IB n Input byte QB n Output byte FB n Flag byte DL n Data byte left DR n Data byte right PB n I/O byte	
			IW n Input word QW n Output word FW n Flag word DW n Data word PW n I/O word	
	B	Block	Not applicable	DB n Data block FB n Function block PB n Program block SB n Sequence block
	T	Timer	Not applicable	T n No. of timer
	C	Counter	Not applicable	C n No. of counter
	D	Data	KM Binary pattern, 16 positions KY Two absolute values from 0 to 255 KH Hexadecimal number, max. of 4 positions KS Two alphanumeric characters KT Time (1.0 ... 999.3) KC Count (0 ... 999) KF Fixed-point number (- 32768 . + 32767) KB Byte	
	I, BI — I, BI —Q I, BI — /		Input signal, statically effective Input signal which is acknowledged by the FB Input signal whose leading edge is evaluated	
	\$I, ... — \$... — *... —		No. DW allowed as parameter Input signal which must be applied before the FB call Defined input signal which does not have to be applied, e.g. NC signal	
— Q, BI Q- Q, BI I- Q, BI \$... — *... — % 1 — %v1 —		Output signal, statically effective Output signal which must be acknowledged by the user Output signal for one cycle (pulse) Output signal on defined flag or data word which can be evaluated immediately after the FB Defined output signal, e.g. NC signal Error number ACCU 2 for system stop (STS); ACCU 1 FB number Additional specification of interface byte in high byte ACCU 2		

1.2 Overview of function macros

FB No.	FB designation	FB name
11	EINR-DB	Create data blocks
12	WDTRG	Retriggering the cycle time monitoring
52	BTR_8_16	Block transfer between 8-bit and 16-bit memories
60	FB BLOCK-TR	Block transfer
61	FB NCD-LESE	Read NC data
62	FB NCD-SCHR	Write NC data
63	PCD-LESE	FB No. reserved for SINUMERIK 880
64	PCD-SCHR	FB No. reserved for SINUMERIK 880
65	M→STACK	Transfer flag error → Flag stack
66	STACK→M	Flag stack → Transfer flags
67	T:RI→ACH	Transfer direction keys (840T) to axes
68	AP RUF	Aperiodic program call
69	G-DECOD	G functions decoding
70	T:NS→EAM	Transfer interface DB to I/Q/F
71	T:EAM→NS	Transfer I/Q/F to interface DB
72	T:NCK→DB	Transfer NC channel → DB channel
73	T:DB→NCK	Transfer DB channel → NC channel
74	T:SPI→DB	Transfer spindle → DB spindle
75	T:DB→SPI	Transfer DB spindle → spindle
76	T:ACH→DB	Transfer axis → DB axis
77	T:DB→ACH	Transfer DB axis → axis
78	T:MS→KN	Transfer machine control panel → NC channel
79	T:MS→ACH	Transfer machine control panel → DB axis (880M)
80		
81		
82		
83		
84		
85		
86		
87		
88	BA-LAMPE	Transfer mode → LEDs to machine control panel SIN 840
89	BAA-LESE	Read the block initial address
113	SUCH-WZ	Symmetrical tool search

1.3 Function macro runtimes, including return to the calling block (without runtime of JU/JC)

FB No. (with condition)	Runtime [μ s]
11 N = number of DB/DB L = number of DW per DB/DX	$N \cdot (72 \mu\text{s} + L \cdot 0.6 \mu\text{s}) + 70 \mu\text{s}$
12	38
60 L = number of DW	$0.5 \mu\text{s} \cdot L + 79 \mu\text{s}$
61/62 FB inactive (parameter LESE/SCHR = 0)	95
Pure FB runtimes first FB pass with entry in FIFO	160 ... 245
without processing from second FB pass onwards	125
in the data channel (interface signal "data transmission running" = 1)	
65	50
66	48
67	130 ... 170
69	100
70	125 ... 185
71	90 ... 160
72	205
73	215
74	110
75	120
76	125
77	105
78 Channel	135
Spindle	115
Channel + spindle	160
79	90
88	90
89	110

2 Data Sheets

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FB 62	NCD-SCHR	Write NC data	2-10
FB 65	M→STACK	Transfer flag into flag stack	2-23
FB 66	STACK→M	Flag stack into transfer flag area	2-24
FB 67	T: MS→ACH	Transfer signals machine control panel (direction keys 840T) → DB axes	2-26
FB 68	AP_RUF	Aperiodic user program call	2-28
FB 69	G-DEKOD	G function decoding	2-30
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FB 71	T: EAM→NS	Transfer I/ Q/ F to interface DB	2-34
FB 72	T: NCK→DB	Transfer NC channel → DB channel-specific signals	
FB 73	T: DB→NCK	Transfer DB channel-specific signals → NC channel	2-40
FB 74	T: SPI→DB	Transfer spindle →DB spindle-specific signals	
FB 75	T: DB→SPI	Transfer DB spindle-specific signals → spindle	2-42
FB 76	T: ACH→DB	Transfer axis- →DB axis-specific signals	
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FB 11 EINR-DB Create data blocks

1. Description

With the function block "Create data block", you can create data blocks for variable data in the user data segment of the PLC.

In the cold restart branch the function block EINR-DB generates the defined data block in the user data segment as long as the block is not already entered in the address list and an appropriate data word number ($DWNR \leq 2042$) is defined.

The transfer flags (FW 246, FW 248, FW 250) are evaluated if parameter part AN = 0.

The PLC branches into the stop loop if one of the following parameter errors occurs.

- DWNR (data word number) > 2042 or < 0
- Data block No. > 255
- Data block No. = 0,2,3,4 (only for data block type DB)
- Data block type illegal (not "DB" or "DX")
- No longer sufficient RAM in the PLC
- Data block already exists in the PLC with a different length

A detailed error identification is stored in the ACCU2 (ACCU1: block number). The default contents of the data block created are zeros.

Note:

The data blocks for the basic program (interface data blocks) are automatically created on a cold restart.

2. Block data

Library No.:

FBs to be loaded: none

DBs to be loaded: none

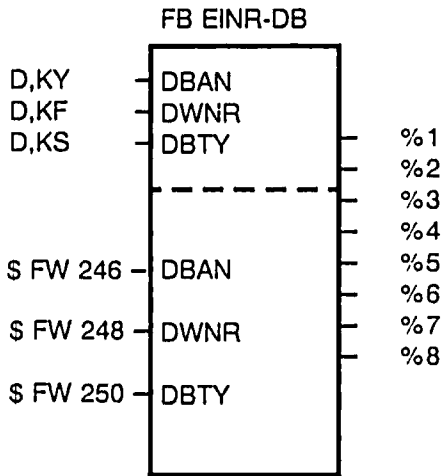
Type of FB call: conditional or unconditional (JC FB11 or JU FB 11)

DBs to be input: none

Error messages:

- %1 DB 2, 3, 4 already created in the KOPSEG
- %2 DB No. is greater than 255
- %3 DWNR (data word number) specified less than 0
- %4 Length of the DB to be created is not equal to the length of the DB already in the PLC
- %5 Memory in the PLC no longer sufficient
- %6 DWNR (data word number) greater than 2042
- %7 DB0 cannot be created
- %8 Data block type not equal to DB or DX

3. Call



4. Signal description

DBAN Numbers and quantity of data blocks to be created.

Special case:

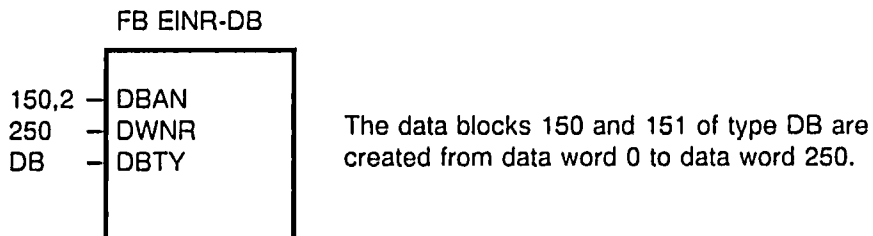
If the parameter part AN is defined as zero, the function block can be parameterized via FW 246, 248, 250. The FWs are supplied with the required values in the program immediately before the FB call.

High byte : DB number
Low byte : quantity of data blocks (at least 1)

DWNR Address of the last data word of the DB to be created

DBTY Data block type DB = DB
 DX = DX

5. Example



FB 12 WDTRG Retriggering of the cycle time monitoring (from software version 2)

1. Description

The cycle time monitoring function is used to check for errors in the running of the PLC program. The monitoring counter is triggered cyclically by the PLC's operating system and therefore only restarts after the maximum cycle time of 300 ms. Function block FB 12 gives the user a way of retriggering the time monitoring of the PLC at any time to continue up to 300 ms. FB 12 can be called twice within a PLC cycle. FB 12 can also be called by OB 20 on startup.

2. Block data

Library No.:

DBs to be loaded: none

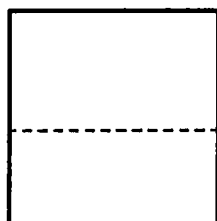
Type of FB call: conditional or unconditional

DBs to be input: none

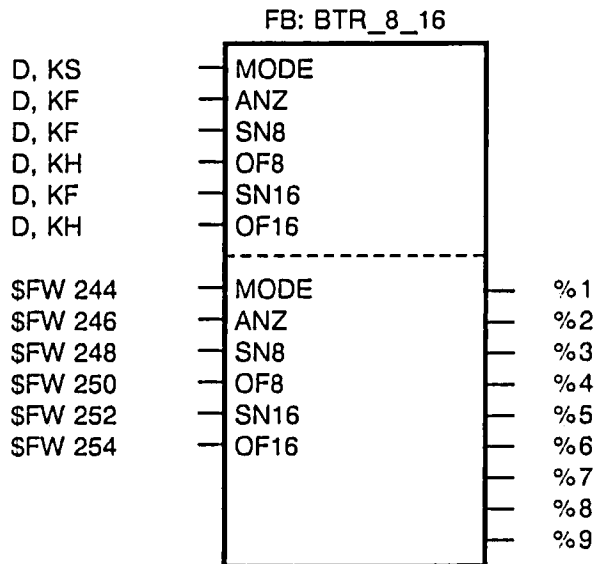
Error messages: PLC stop with error code 0C1H the third time FB 12 is called within a PLC cycle.

3. Block call

FB: WDTRG



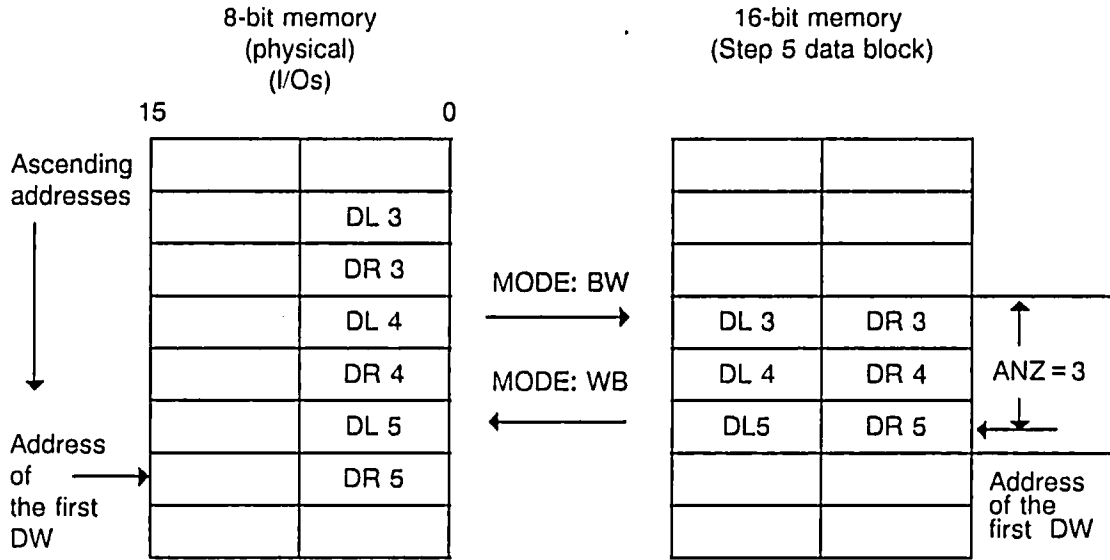
3. Block call



4. Signal description

MODE	KS	BW: Data transfer from 8-bit to 16-bit memory (e.g. data transfer from I/O) WB: Data transfer from 16-bit to 8-bit memory (e.g. data transfer from I/O) 00: The contents of flag words FW 244 to FW 254 are used for the parameter.
ANZ	KF	Number of words to be transferred: (equals number of words in the 16-bit memory), $0 \leq ANZ \leq 127$
SN8	KF	Segment number of the 8-bit memory, $1 \leq SN8 \leq 13$
OF8	KH	Offset (in words) of the first data word in the 8-bit memory, $OF8 \leq 7FFFH$
SN16	KF	Segment number of the 16-bit memory, $1 \leq Q_SN \leq 13$
OF16	KH	Offset (in words) of the first data word in the 16-bit memory, $OF16 \leq 7FFFH$

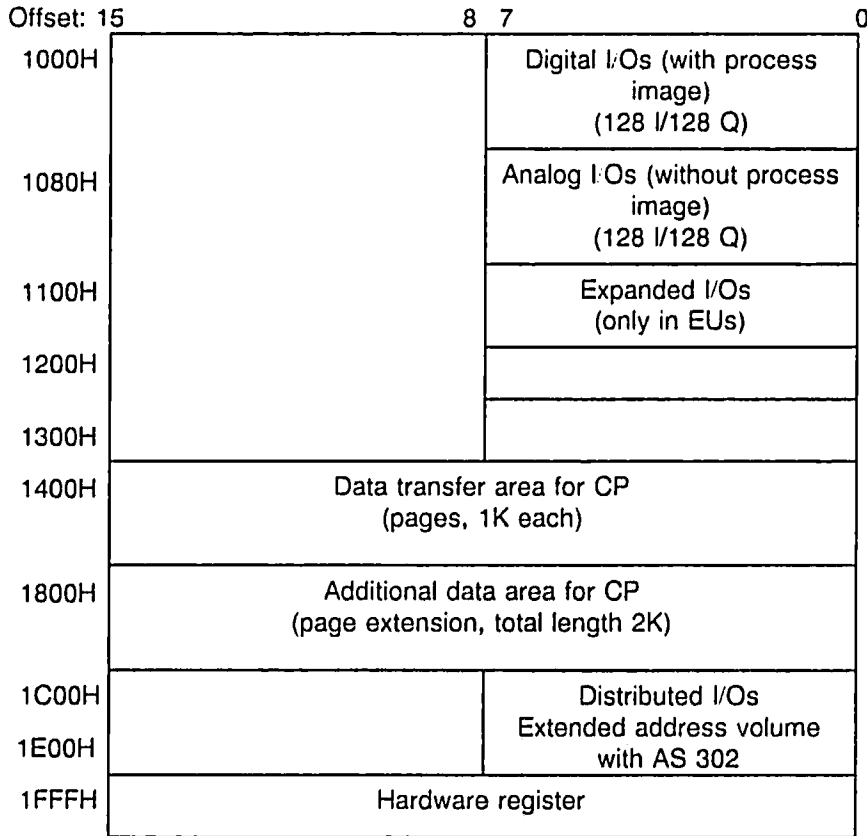
5. Overview of data transfer



6. Address space allocation for I/Os

Central I/Os: Segment number: 13
 Offset: 0000H to 07FH (in words)

Distributed I/Os: Segment number: 4
 (16-bit link) Offset: see diagram below:
 Offset: in words



FB 60 BLOCK-TR Block transfer

1. Description

Function block BLOCK-TR copies the defined number of data words from a source data block in RAM or on EPROM to a target data block in RAM.

You can select the beginning of the block to be copied in the source DB and the initial data word in the target DB.

A check is made to see

- the source DB/DX of the required length is in the PLC.
- the target DB/DX of the required length is in the PLC
- the target DB/DX is in the RAM
- the number of data words to be transferred is > 0 and ≤ 2043
- data block type of source and target (DB and DX are permissible)

On an error PLC goes into the stop loop. A detailed error identification is stored in ACCU 2 (ACCU 1 = block number). If a zero is assigned to parameter "DBYZ", flag words 250 to 254 are scanned.

(Parameterization: 0,1 or 1,0 or 0,0).

2. Block data

Library No.:

FBs to be loaded: none

DBs to be loaded: none

Type of FB call: conditional or unconditional (JC FB 60 or JU FB 60)

DBs to be input: none

Error messages: %1 Maximum number of DWs to be transferred is 2043

%2 Number of DWs to be transferred = 0

%3 Source DB/DX missing

%4 Target DB/DX missing

%5 Target DB/DX is too short

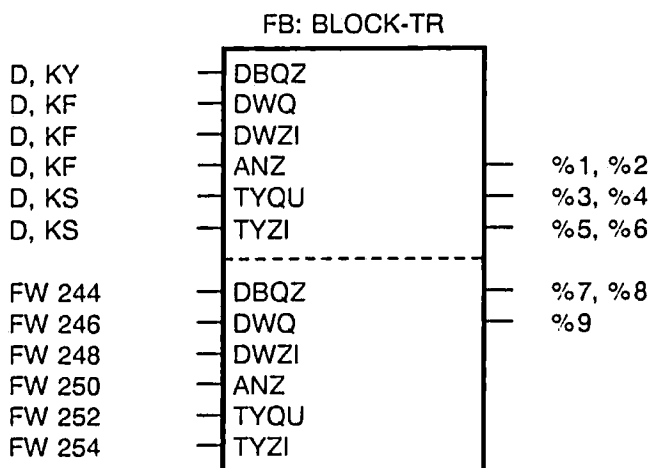
%6 Target DB/DX in the EPROM

%7 Source DB/DX is too short

%8 Parameter TYQU incorrect

%9 Parameter TYZI incorrect

3. Block call



4. Signal description

DBQZ Number of the source and target DBs

High byte : source DB/DX
Low byte : target DB/DX

DWQ Number of the 1st data word in the source DB/DX from which copying is to take place

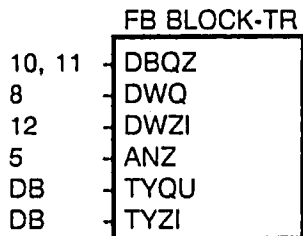
DWZI Number of the 1st data word in the target DB/DX to which copying is to take place

ANZ Number of data words to be copied

TYQU Type of the source DB

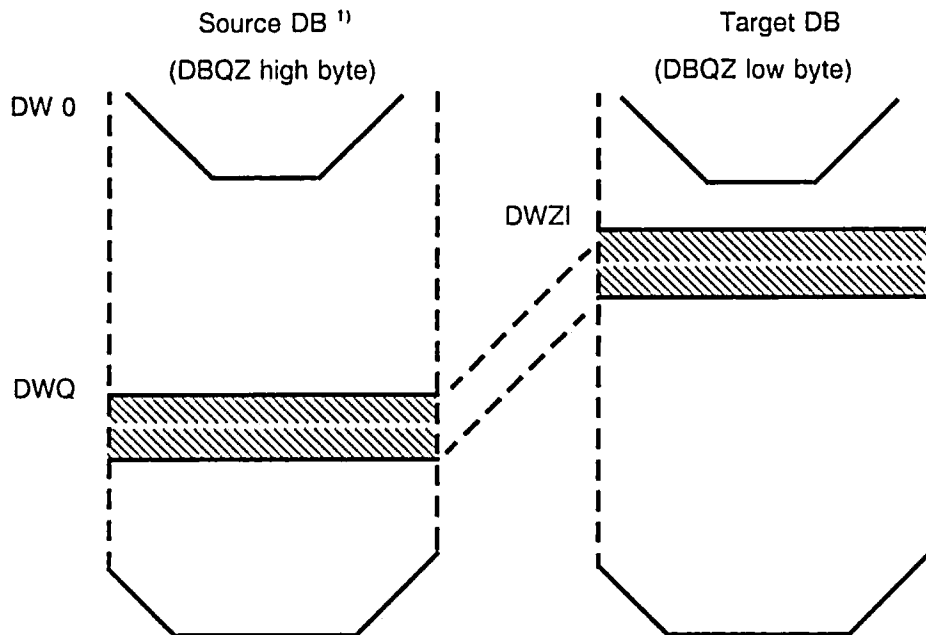
TYZI Type of the target DB DB = DB data block
DX = DX data block

5. Example



5 data words in DB 10 starting from DW 8 are transferred as a block to DB 11, starting at DW 12.

6. Schematic of data transfer



1) The data block "source" can be in RAM or on EPROM

FB 61 NCD-LESE Read NC data **FB 62 NCD-SCHR Write NC data**

1. Description

With function blocks FB 61 and FB 62 NC you can read data from the PLC or write it to the PLC.

The data source in the NC or PLC and the data target in the PLC or NC must be communicated to the function blocks via parameter. A byte in the interface in DB 36 must be assigned to the function blocks via the parameter NSBY. This byte indicates the current status of data transfer. The function of NC/PLC data transfer is described in detail in Section 7.

2. Block data

Library No.:

FBs to be loaded: none

DBs to be loaded: none

Type of FB call: conditional or unconditional

DBs to be input: none

Error messages: ACCU1 (FB No.) = 61 or 62

ACCU2 high byte = Number of the interface byte, i.e. the number of the job causing the error

ACCU2 low byte = detailed error code:

0: Number of data words > 1 impermissible

1: Interface byte impermissible

2: Addressed data word missing, DB/DX missing or DB No..DX No. in link RAM or FW No. impermissible

3: Data type impermissible

4: Parameter ANZ¹⁾ ≤ 0 or > 128

5: Read impermissible/write impermissible

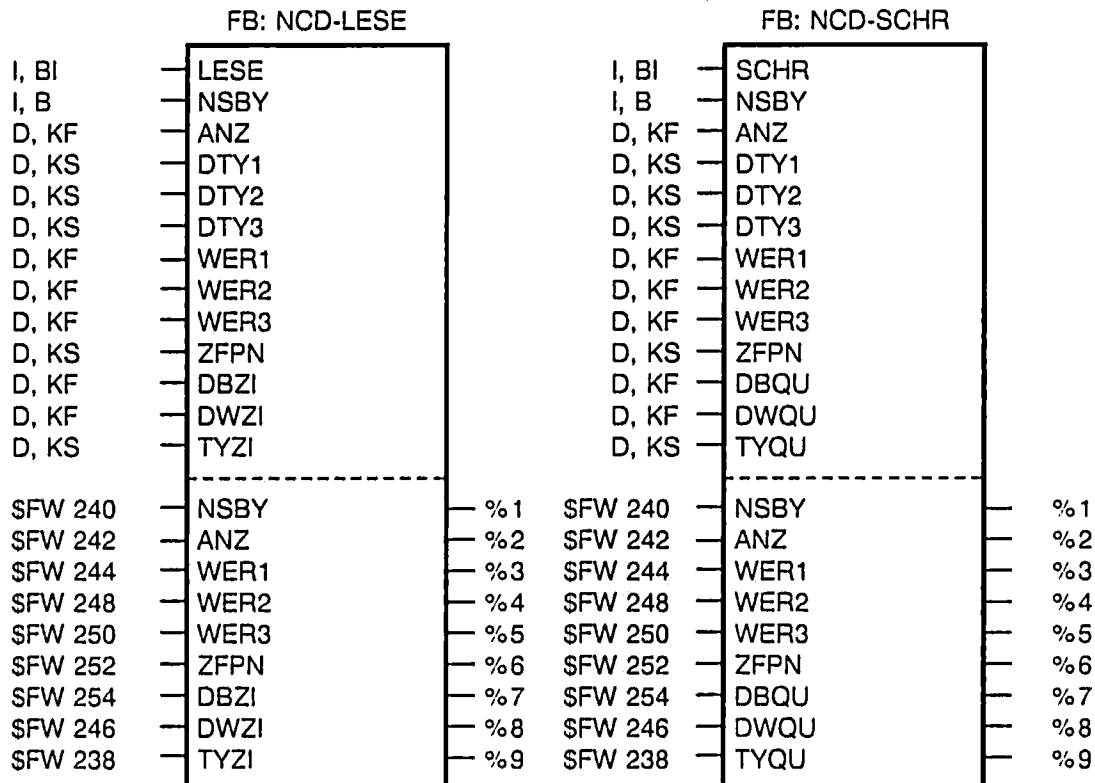
6: Number format impermissible

7: Value 3 of ZOA or ZOFA not equal to 0 or 1

8: Type of the data target or data source is impermissible in the PLC

¹⁾ see special cases under parameter ANZ

3. Block call



4. Signal description

LESE Command for data transmission

SCHR With the signal LESE or SCHR = 1 the parameters are transferred to the FIFO (job buffer).

On an unconditional block call the signal "LESE" or "SCHR" must be reset at the end of transfer by the user .

On a conditional block call it must be set to "1" (F 0.1). (see also pulse diagrams).

Activation of data transfer is only possible if the signal DATA TRANSFER ASSIGNED of the parameterized interface byte (NSBY) is carrying a zero signal.

NSBY A byte in the interface (DB 36) must be assigned to the function block. This byte indicates the current status data transfer.

Special case:

For parameterization via variables see the following overview.

Note:

If the byte DL 32 (= number 65) is specified as the interface byte the job which is thus declared is processed "interrupt-controlled", i.e. the job is inserted between the jobs which are already in the job buffer. If the job number is 65 and ANZ > 1 the interrupt* job is processed **completely**.

* In SINUMERIK control documentation interrupts are known as alarms.

ANZ Quantity of data words to be transferred
If more than one word is transferred ($ANZ > 1$), the source and the target address are incremented. If, for example, a no longer existing data word is addressed, the PLC goes into STOP with error % 2.
Note that a different number of data words is required per value transferred depending on parameter ZFPN.

Special cases:

If $ANZ = 0$ or $ANZ = 128$ the parameters NSBY, ANZ, WER1 to WER3, ZFPN, DBZI/DBQU and ZIEL/QUEL are supplied with values via flag words. The difference between $ANZ = 0$ and $ANZ = 128$ is shown in the overview of parameterization via variables.

DTY1 2-6 ASCII characters; mnemonics as used for CL800

DTY3 The values must be input from DTY1.

Caution:

Missing characters must be filled with a blank;
see table, Section 7.

ZFPN Number format PLC/NC
For overview of number format PLC/NC, see Section 6

DBZI/DBQU Number of the target/source DB or DX
(is not used with TYZI/TYQU = FW)

DWZI/DWQU Data word number with TYZI/TYQU = DB or DX
Byte number if TYZI/TYQU = FW

TYZI/TYQU Type of data target or data source
DB = DB
DX = DX
FW = Flag word

Caution:

- The number of bytes required according to parameter ZFPN must be observed.
- If, for example, a 16-bit word must be transferred to the NC and the number formats are F0-FF, the value to be transferred must be written to the parameterized **word k + 1** on data transfer.
The parameterized word k must be loaded with 0 (see Section 6).

5. Overview of parameterization via variables

In parameterization via variables the values must be written to the flagwords in the same format as required for direct parameterization on the FB.

Example:

If the parameter ZFPN is to be assigned the value F1, you must program the following:

```
.  
. .  
L KSF1  
T FW252  
. .
```

Exception:

The parameter NSBY can be supplied with values in two ways.

- If ANZ = 0, the number of the interface byte must be entered in **FY 241** (see overview in Section 1.5, interface description).

No. interface byte		Byte number
1	≙	DLO
2	≙	DRO
.		.
.		.
.		.
64	≙	DR31
65 (interrupt* control)	≙	DL32

Example:

If the DL 15 is to be used as the NSBY you must program the following:

```

:
L   KB31
T   FY 241
:

```

- If ANZ = 128, the operation code ¹⁾ with parameters of L DL xx or L DR xy must be entered in **FW 240**. This type of parameterization is especially suitable if, for example, the FB 61 is to be called as a subroutine of a function block; if the parameter NSBY was declared in data format "I/BY" in the calling FB. The programmer places the correct code in the parameter list when the calling FB is parameterized so that it can be passed on to FB 61/FB 62 with the instruction sequence:

```

LW = ABCD      is a parameter (type: I/BY) of the higher-level FB
T   FW 240
:

```

Example of operation code:

No. interface byte	Byte No.	Operation code (hex)
.		
.		
.		
31	DL15	220F
32	DR15	2A0F

* In SINUMERIK control documentation interrupts are known as alarms

Example:

FB 140 SPRM-A BIB. = 14050

SEGMENT 1

```

NAME      : STAZ
DECL     : DB      I/Q/D/B/T/C : B
DECL     : K       I/Q/D/B/T/C : I           BI/BY/W/D : BI
DECL     : BEAR   I/Q/D/B/T/C : I           BI/BY/W/D : B
DECL     : ZEAB   I/Q/D/B/T/C : Q           BI/BY/W/D : B
DECL     : FEHL   I/Q/D/B/T/C : Q           BI/BY/W/D : B
DECL     : T/M    I/Q/D/B/T/C : I           BI/BY/W/D : B
DECL     : SOSP   I/Q/D/B/T/C : I           BI/BY/W/D : B
DECL     : AADR   I/Q/D/B/T/C : I           BI/BY/W/D : B
DECL     : IST    I/Q/D/B/T/C : I           BI/BY/W/D : B
DECL     : NSBY   I/Q/D/B/T/C : I           BI/BY/W/D : B
DECL     : P-NR   I/Q/D/B/T/C : D   KM/KH/KY/KS/KT·KC.KG/ : KF
:
: L       KS DB           Data type target
: T       FW 238
: LW      = DB           PARAMETERIZATION
: T       FW 254 ! ZIEL, DB No.  FB 61 COMMAND TOS
                               (read tool offset)

: L       KB40           !
: T       FW 246 ! ZIEL, DW No.
: L       KS F5           !
: T       FW 252 ! ZFPN

: LW      = NSBY !           The operation code of the parameter
                               "NSBY" from the higher-level FB 140 is
                               stored in FW 240.

: T       FY 240 ! NSBY
: L       KB1            !
: T       FW 242 ! ANZ
: LW      = P No.       !
: T       FW250 ! WER3
: L       DR 54         !
: T       FW 244 ! WER1
: L       DR 51         !
: T       FW 248 ! WER2
: JC      FB 61
NAME     :NCD  LESE
LESE    :      F0.1
NSBY    :      FY242 (every other address permissible)
ANZ     :      KF + 128
DTY1    :      KSTO
DTY2    :      KSS
DTY3    :      KS
WER1    :      KF + 0
WER2    :      KF + 0
WER3    :      KF + 0
ZFPN    :      KS00
DBZI    :      KFO
DWZI    :      KFO
TYZI    :      KS
  
```


6. Overview of number formats NC/PLC

With the parameter ZFPN "number format" the format of the numbers is converted on data transfer to the PLC. The permissible number formats for every data type are shown in the table of data types. The following number formats are possible in the PLC.

BI	Bit pattern	
Format:	DL	DR
DWn		
MWn		
	unassigned 1 0 1 1 1 0 1 0	

Example:

R100 = 10111010

If individual figures are in R parameter # 1 or 2, the error "error format" is output.

Special case of date/time

DW n / FW n	Day of week	Day
DW n + 1 / FW n + 2	Month	Year
DW n + 2 / FW n + 4	Hours	Minutes
DW n + 3 / FW n + 6	Seconds	1/100 seconds

All values are transferred in binary format. The parameter ZFPN is always "BI". Four data or flag words are transferred per job.

BO BCD number with sign and comma

:
B9
BG

Format:

	DL		DR		
DW n / FW n	unassig.	SG: 1	8		SG = 0 pos.
DW n + 1 / FW n + 2	7	6	5	4	SG = 1 neg.
DW n + 2 / FW n + 4	E	3	2	1	

Example:

R100 = - 87654.321
Parameter ZFPN = B4

Note:

The first letter of the parameter (here B) specifies that the data source or the data target in the PLC is a BCD value. The second value (here 4) states that the BCD number is stored in the PLC with 3 places (FB 61).

On PLC → NC (FB 62) this determines where the decimal point is to be in the NC regardless of where the decimal point is in the PLC.

If the value 1234.56 is in the data words in the PLC, the number 1234.5 is entered in R100 on transfer PLC → R100 (ZFPN is parameterized with B2)

The following table shows an overview of the possible parameters:

ZFPN	Meaning
B0 F0	Value without dec. point (e.g. 1234)
B1 F1	Value with dec. point (e.g. 1234.)
B2 F2	1 place after the decimal point
B3 F3	2 places after the decimal point
B4 F4	3 places after the decimal point
B5 F5	4 places after the decimal point
B6 F6	5 places after the decimal point
B7 F7	6 places after the decimal point
B8 F8	7 places after the decimal point
B9 F9	8 places after the decimal point
FA	Linear position value ¹⁾
FB	Rotary position value ¹⁾
FC	Feed value linear ¹⁾
FD	Feed value rotary ¹⁾
FE	Feed value revolution ¹⁾
FF	Speed value ¹⁾
BG	Value as stored
BI	Bit pattern

FO Fixed-point number with 32 bits
 :
 FF

Format:

DW n / FW n	31	16
DW n + 1 / FW n + 2	15	0

Example:

If ZFPN = F4, R100 = 1234.567 will lead to PLC data 1234567; i.e. unlike with BCD the decimal point disappears (FB 61). On PLC to NC data transfer (FB 62) it is specified where the decimal point is to be stored in the NC.

PLC data = 121457 ZFPN = F2 leads to NC data 12145.7.

¹⁾ With these number formats and depending on the input system (set in machine data) only **the position of the decimal point within the dimensionless R parameter value is defined. No check is made for upper limits.**

Examples of transfer with various dimension identifiers:

	R par. (NC)	Number format	DW (PLC)
A)	100.700	—— F4 ——>	SG 100700
B)	100.700	—— F2 ——>	SG 1007
C)	100.7	—— F4 ——>	SG 100700
D)	1234.500	—— BG ——>	SG 1234E500
E)		←—— B9 ——	SG 1234E500
			not possible *error number format*
F)	.12345678	←—— B9 ——	SG E12345678
G)	.50000000	←—— B9 ——	SG 50000000
H)	100.7	—— B4 ——>	SG 100E700
I)	100.7	—— BG ——>	SG 100E7
J)	.12345678	—— B3 ——>	SG E12
K)	.12345678	—— BG ——>	SG E1234567
L)	4000	—— BG ——>	4000
M)	4000	—— B4 ——>	4000E000
N)	1.1234	—— B9 ——>	
			error number format
O)	.1234	—— B9 ——>	SG E12340000
P)	20	—— B0 ——>	20
Q)	20	←—— B0 ——	20

7. Table for data transfer NC <--> PLC data words/flags

Function description	Data type (DTY1-DTY3)	Limit value	Value (WER1 - WER3)	Number format (ZFPN) FB 61 *1	Number format (ZFP) FB 62 *1	Max. value of the parameter ANZ *2
Machine data						
Machine data NC	MDN < address >	0...4999	1	B0,F0 (*3)	B0,F0 (*3)	80
Machine data NC bytes	MDNBY < address >	5000...9999	1	BI	BI	80
Machine data cycles channel-specific	MDZ < chan. No. > < address >	1...4 0...449	1 2	B0,F0 (*3)	B0,F0 (*3)	80
Machine data cycles central	MDZ < chan. No. > < address >	0 1000...4149	1 2	B0,F0 (*3)	B0,F0 (*3)	80
Machine data cycles bytes, channel-specific	MDZBY < chan. No. > < address >	1-4 800...949	1 2	BI	BI	80
Machine data cycles bytes, central	MDZBY < chan. No. > < address >	0 7000...8049	1 2	BI	BI	80
Setting data						
Setting data NC	SEN < address >	0...4999	1	B0,F0 (*3)	B0,F0 (*3)	80
Setting data NC bytes	SENBYS < address >	5000...9999	1	BI	BI	80
Setting data cycles	SEZ < chan. No. > < address >	1...4 0...499	1 2	B0,F0 (*3)	B0,F0 (*3)	80
Setting data cycles bytes	SEZBY < chan. No. > < address >	1...4 800...949	1 2	BI	BI	80
Input buffer parameter						
Input buffer	EZSPAR < address >	0...9999	1	B0-B9, BG F0-FF	B0-B9, BG F0-FF	80
PLC number						
Selected PLC number	PCNR			B0,F0	B0,F0	1
Tool offsets						
Tool offset	TOS < TO area >	0 - 15	1	B0-B9, F0-F9	B0-B9, F0-F9	
	< D No., >	1 - 409	2	BG,BI	BG,BI	
	< P No. >	0 - 15	3			16
Tool offset additive	TOAD < TO area >	0 - 15	1		B0-B9, F0-F9	
	< D No., >	1 - 409	2		BG, BI	
	< P No. >	0 - 15	3			16

*1 If no number format is specified, no data transfer can be carried out by the FB.

*2 If a data type has more than one parameter value (WER1-WER3), the parameter ANZ is on the same line as the parameter value which is incremented.

A number of parameters value > 1 is only possible under the following conditions:

- Data block in the NC available **closed**
- PLC source or target address available with sufficient length:
 - for B0-B9/BG three words per value
 - for F0-FF two words per value
 - for BI one word per value

*3 Input/output is carried out according to the format of the machine setting data.

Function description	Data type (DTY1-DTY3)	Limit value	Value (WER1-WER3)	Number formats (ZFPN) FB 61 *1	Number formats (ZFPN) FB 62 *1	Max. val. of the parameter ANZ *2
Zero offsets						
Settable zero offset (G54 - G57) course/fine	ZOA <group> < axis No. > < c/f >	1 - 4 1 - 12 0/1	1 2 3	B0-B9, F0-F9 BG	B0-B9, F0-F9 BG	1
Programmable zero offset (G58, G59)	ZOPR <group> < axis No. >	1 - 2 1 - 12	1 2	B0-B9, F0-F9 BG	B0-B9, F0-F9 BG	1
Settable zero offset additive write only course/fine	ZOFA <group> < axis No. > < c/f >	1 - 4 1 - 12 0/1	1 2 3		B0-B9, F0-F9 BG	1
External zero offset from the PLC	ZOE < axis No. >	1 - 12	1	B0-B9, F0-F9 BG	B0-B9, F0-F9 BG	1
External zero offset from the PLC additive	ZOEA < axis No. >	1 - 12	1		B0-B9, F0-F9 BG	1
DRF offset	ZOD < axis No. >	1 - 12	1	B0-B9, BG,F0	B0-B9, BG,F0	
PRESET offset	ZOPS < axis No. >	1 - 12	1	B0-B9,BG,F0	B0-B9, BG,F0	1
Sum offset	ZOS < axis No. >	1 - 12	1	B0-B9, BG,F0		1
Actual values						
Axis actual position workpiece related	ACPW < axis No. >	1 - 12	1	B0-B9/BG F0		1
Axis actual position machine related	ACPM < axis No. >	1 - 12	1	B0-B9/BG F0		1
Programmed setpoints						
Leadscrew position	PRSP < chan. No. >	1...4	1	B0...B9, BG, F0...F9		1
Actual spindle position (from software version 2)	SPIPOS < spi. No. >	1...4	1	B0...B9, BG, F0...F9		4
Programmed path feed	PRBF < chan. No. > < lin/ref >	1...4 0,1	1 2	B0, F0		1
Programmed cutting rate	PRVC < cha n. No. >	1 ... 4	1	B0, F0		1

*1 If no number format is specified, no data transfer can be carried out by the FB.

*2 If a data type has more than one parameter value (WER1-WER3), the parameter ANZ is on the same line as the parameter value which is incremented.

A number of parameters value > 1 is only possible under the following conditions:

- Data block in the NC available closed
- PLC source or target address available with sufficient length:
 - for B0-B9/BG three words per value
 - for F0-FF two words per value
 - for BI one word per value

*3 The value is transferred in the way it is defined internally according to the NC machine data for input resolutions.

*4 If ANZ = 1 three data are supplied when the program counter is read out:

- on level 0: Program type (0 = no program selected, 1 = main program, 2 = subroutine).
Program number, block number
- from level 1: Subroutine number, path number, block number

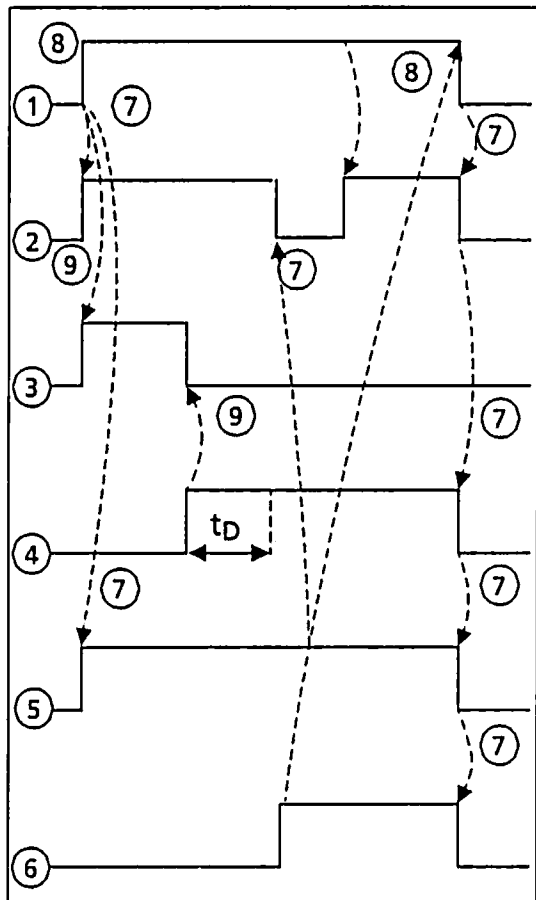
*5 The number of the main program or subroutine is in the parameter "source".

Function description	Data type (DTY1-DTY3)	Limit value	Value (WER1- WER3)	Number format (ZFPN) FB 61 *1	Number format (ZFPN) FB 62 *1	Max. val. of the pa- rameter ANZ *2
External setpoints						
External path feed	EXBF < chan. No. > < lin/ref >	1 - 4 0/1	1 2	B0, F0	B0 ,F0	1
Program data						
Program counter for current block	PP < chan. No. > < level >	1 - 4 0 - 3	1 2	B0, F0		1 *4
Program lengths						
Main program length (from software version 2)	HPLGNC < progr. No. >	0...999 9	1	B0, F0		127
Subroutine length (from software version 2)	UPLGNC < progr. No. >	0...999	1	B0, F0		127
Program selection						
Selection of an NC program	INITMP < chan. No. >	1 - 4	1		B0, F0	1 *5
Selection of an NC subroutine	INITSP < chan. No. >	1 - 4	1		B0, F0	1 *5
R parameters						
R parameters NC channel	RPNC < chan. No. > < paramet. >	1 - 4 0 - 499	1 2	B0-B9, F0-FF BG, BI	B0-B9, F0-FF BG, BI	128
R parameters central	RPNC < chan. No. > < paramet. >	0 900 - 999	1 2	B0-B9, F0-FF BG, BI	B0-B9, F0-FF BG, BI	80
Interrupt * numbers						
NC interrupts*	NCAL			B0, F0		80
Free memory area						
Free NC part program mem.	FRSPNC			B0, F0		1
Date and time (from software version 2)	DATUHR			B1	B1	1 *6

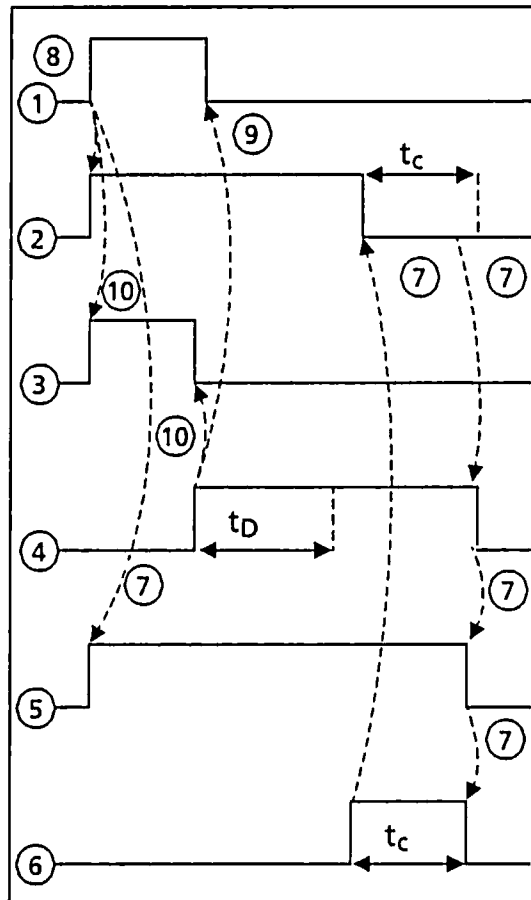
- *1 If no number format is specified, no data transfer can be carried out by the FB.
- *2 If a data type has more than one parameter value (WER1-WER3), the parameter ANZ is on the same line as the parameter value which is incremented.
 A number of parameters value > 1 is only possible under the following conditions:
 - Data block in the NC available **closed**
 - PLC source or target address available with sufficient length:
 for B0-B9.BG three words per value
 for F0-FF two words per value
 for BI one word per value
- *3 The value is transferred in the way it is defined internally according to the NC machine data for input resolutions.
- *4 If ANZ = 1 three data are supplied when the program counter is read out:
 - on level 0: Program type (0 = no program selected, 1 = main program, 2 = subroutine).
 Program number, block number
 - from level 1: Subroutine number, path number, block number
- *5 The number of the main program or subroutine is in the parameter "source".
- *6 For the dateltime, four data words are always read/written with ANZ = 1. The date and time must be set and initiated at least once after installation by entering valid data using FB 62.

Pulse diagram of the interface signals

8a Unconditional block call



8b Conditional block call



- 1 : READ/WRITE
- 2 : DATA TRANSFER REQUESTED
- 3 : FIFO FULL
- 4 : DATA TRANSFER BUSY
- 5 : DATA TRANSFER ASSIGNED
- 6 : DATA TRANSFER ENDED + possible ERROR
- 7 : Signal change by FB
- 8 : Signal change by user
- 9 : Signal change by FB; not if FIFO is not yet full
- t_D : Internal interface reserved by data transfer

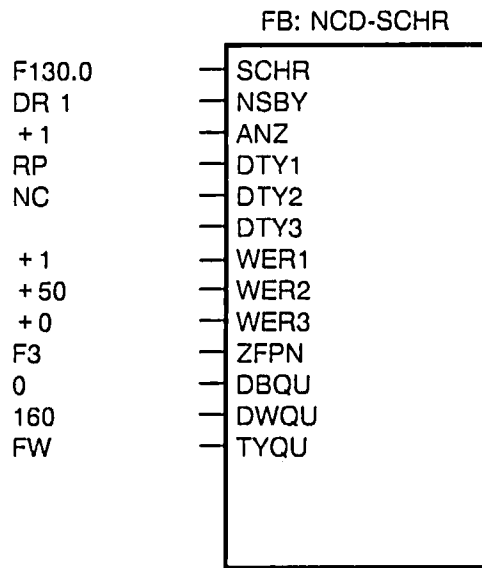
- 1 : READ/WRITE
- 2 : DATA TRANSFER REQUESTED
- 3 : FIFO FULL
- 4 : DATA TRANSFER BUSY
- 5 : DATA TRANSFER ASSIGNED
- 6 : DATA TRANSFER ENDED + possible ERROR
- 7 : Signal change by FB
- 8 : Signal change by user
- 9 : User no longer calling block
- 10 : Signal change by FB; not if FIFO is not yet full
- t_C : PLC cycle time
- t_D : Internal interface reserved by data transfer

9. Example of parameterization for FB 62

Transfer of the R parameter 50 to channel 1 from FW 160, FW 162

Number format PLC: Fixed-point

Number format NC: 2 places after the decimal point



FB 65 M→STACK

Transfer flags into flag stack

1. Description

Using function block FB 65 the flag area FY 224 - FY 255 can be saved to the flag stack if necessary. In this way intermediate results and transfer flags are protected from overwriting if, for example, a function block calls another function block which works with the same flag area. FB 65 can only be used together with FB 66.

2. Block data

Library No.:

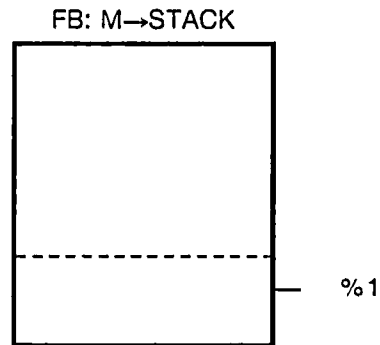
FBs to be loaded: none

Type of FB call: conditional, unconditional

DBs to be input: none

Error messages: %1 Stack pointer overflow on flag entry

3. Block call



4. Signal description

The flag stack can take up to 288 bytes. This means that the flag area 224 - 255 can be saved 9 times.

FB 66 STACK→M Flag stack into transfer flag area

1. Description

Function block FB 66 writes the flag area FY 224 - FY 255 back to its original location after FB 65 has transferred to the flag stack. This guarantees that the function block currently running is supplied with its correct values.

FB 66 can only be used together with FB 65.

2. Block data

Library No.:

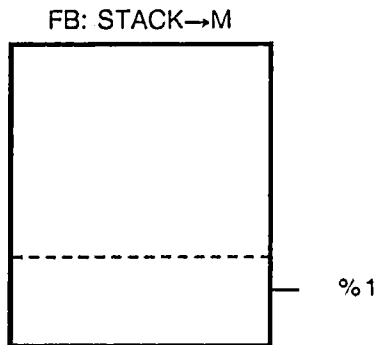
FBs to be loaded: none

Type of FB call: conditional, unconditional

DBs to be input: none

Error messages: %1 Stack violation on reading out flag

3. Block call



(Blank page)

Transfer signals machine control panel (direction keys 840 T) →DB axes

FB 67 T: MS →ACH Transfer signals machine control panel (direction keys 840 T) →DB axes

1. Description

Function block FB 67 transfers the signals of the direction keys and the rapid override key on the SINUMERIK 840T to the interface of the axes (DB 32).

Precondition:

The transfer must be enabled via PLC machine data (PLC I: 6016, 6017)

2. Block data

Library No.:

FBs to be loaded: none

DBs to be loaded: none

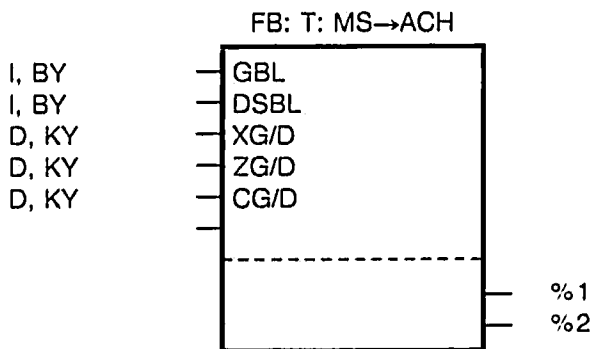
Type of FB call: conditional or unconditional

DBs to be input: none

Error messages: %1 PLC machine data "signals from/to axis" not set

% 2 Axis number > 12

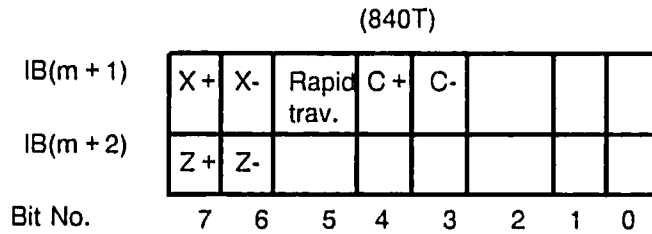
3. Block call



4. Signal Description

GBL Address of basic key group

PLC IB/FY, on which the direction keys and the rapid override key are stored.
 Byte address 0: Basic key group not available
 The position of the signals must correspond to the assignment of the standard machine control panel (840T)



DSBL Must be assigned byte address 0

XG/D G: Number of the X axis; number = 0 : Axis not available

D: always = 0

ZG/D G: Number of the Z axis; number = 0 : Axis not available

D: always = 0

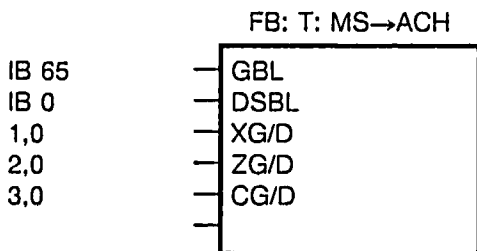
CG/D G: Number of the C axis; number = 0 : Axis not available

D: always = 0

5. Example

Machine control panel basic key group SIN 840T on a machine with 3 axes:

Axis 1, 2, 3 : Basic key group



FB 68 AP__RUF Aperiodic user program call

1. Description

The user determines the delay (WZ) with which the user program is to be processed once within the OB4 by parameterization when the function block is called. The definable delay values must be within the range 0 to 32767 ms.

It is important to note that FB 68 can only be called conditionally, i.e. depending on a signal. Static signals are therefore unsuitable, because the FB would be called again cyclically if the signal was still present. Using an edge evaluation and call via the pulse flag the above requirement can be fulfilled (see example).

2. Block data

Library No.:

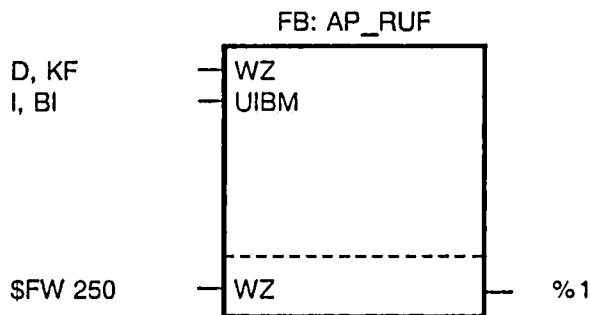
FBs to be loaded: none

Type of FB call: conditional

DBs to be input: none

Error messages: %1 Parameter WZ (delay) < 0

3. Block call



4. Signal Description

WZ Delay value with which the user program is to be started.
($0 \leq WZ \leq 32767\text{ms}$)

UEBM Indirect supply of parameters to the FB via FW 250 if UEBM = 1.

5. Programming example (direct parameterization)

for calling OB4 which is to be processed once.

```

OB1
: A I 1.0
: AN F 200.0 Edge flag
: = F 200.1 Pulse flag
: A F 200.1
: S F 200.0
: UN I 1.0
: R F 200.0
: A F 200.1
: JC FB68 : Call OB4
Name : AP-RUF
WZ : KF 10000
UEBM : F0.0
:
:
: BE

```

FB 69 G-DEKOD G function decoding

1. Description

The G function decoding block decodes in groups the G functions present per channel. The user thus has a facility for determining all present G functions. The function block must be called once per channel and per group to be decoded. A precondition for application of the function block is that the channel-specific NC MD "G function to PLC" is set (540, * = Channel number + 1).

2. Block data

Library No.:

FBs to be loaded: none

DBs to be loaded: none

Type of the FB call: absolute

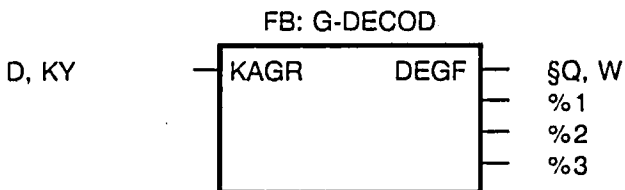
DBs to be input: none

Error messages: %1 Channel number impermissible

%2 Group incorrect

%3 PLC MD signal from/to, or signals from NC channel not set

3. Block call



4. Signal Description

KAGR Channel number and group of G function to be decoded:

High byte : NC channel number (1-4)

Low byte : group to be decoded (1-24)
(see table)

DEGF Flag word in which the decoded signals are stored according to the table.
Only **one** bit can be set per group.

5. Table

NC MD for reset pos- ition	Value in R parameter (0 = no G function active)																	
	G group for CL800	G group for FB69	High byte									Low byte						
			15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
108*	0	1.				G13	G12	G06	G35	G34	G33	G03	G02	G11	G10	M/T	G00	
	1	2.															1) G09	
110*	2	3.												G16	G19	T	M	
	3	4.													G42	G41	M/T	G40
	4	5.																G53
112*	5	6.												G57	G56	G55	M/T	G54
	6	7.									G74	G92	G59	1) G58	1) G26	1) G25	1) G04	
114*	7	8.												G62	T	G64	G63	M
	8	9														G71	G70	
	9	10.						G89	G88	G87	G86	G85	G84	G83	G82	G81	M/T	G80
	10	11												G68	G91	M/T	G90	
118*	11	12.												G97	G96	T	M	
	12	13.							1) G111	1) G110	1) G48	1) G348	1) G248	1) G148	1) G347	1) G247	1) G147	
	13	14.															G51	M/T
120*	14	15.						G159	G158	G157	G156	G155	G154	G153	G152	G151	M/T	G150

For continuation of the table see next page.

1) Modal
FB 69 ignores G group 19. The G functions printed bold indicate reset positions

Continuation of the table from page 2-31

NC MD for reset pos- ition	Value in R parameter (0 = no G function active)																	
	G group for CL800	G group for FB69	High byte								Low byte							
			15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
	15	16.															G131	G130
	16	17.															G231	G230
	17	18.															G331	G330
	18	19.												G934	G933	G932	G931	G930
	19	20.																
	20	21.																
	21	22.																G175

1) *Modal*
FB 69 ignores G group 19 The G functions printed bold indicate reset positions

6. Example

G functions G 00, G 01, G 02, G 03 are to be decoded from channel 1 in order to initiate program branching in the PLC.

```
      :  
      :  
      : JU FB 69  
NAME  : G-DEKOD  
KAGR  : KY 1,1      Channel 1, Group 1  
DEGR  : FW220  
      :  
      :  
      : A  F 221.1   G00  
      : JC PBx      User program for rapid traverse  
      :  
      :  
      : A  F 221.2   G01  
      : JC PBy      User program for linear interpolation  
      :  
      :  
      : A  F 221.6   G03  
      : JC PBz      User program for circular interpolation
```

FB 70 T: NS→EAM Transfer interface DB to I/Q/F
FB 71 T: EAM→NS Transfer I/Q/F to interface DB

1. Description

The several interface signals of the System 850 cannot be stored completely in the I/Q/F area. The interface is therefore subdivided over several function-specific data blocks. With many interface signals, bit-oriented evaluation is required.

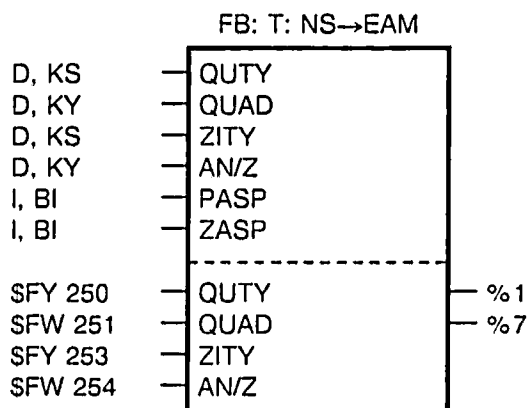
Function blocks FB 70/FB 71 allow the user to fill the I/Q/F area reserved for dynamic utilization with the signals stored in DBs, to process them in the user program where applicable and to transfer the modified signals back to the interface DBs.

2. Block data

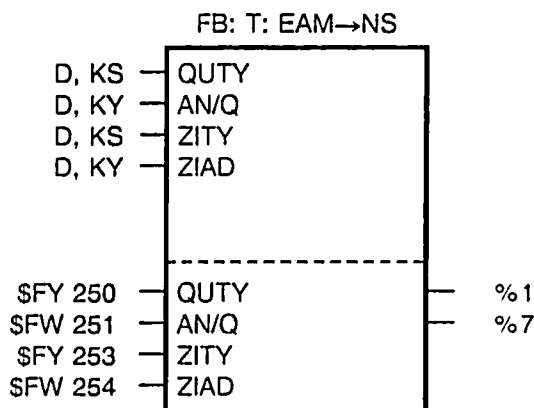
Library No.: FB 70, FB 71
 FBs to be loaded: none
 DBs to be loaded: none
 Type of the FB call: unconditional
 DBs to be input: none
 Error messages: ACCU1 (FB No.) = 70 or 71;
 ACCU2 detailed error number (%1 - %7)
 %1: Source or target type incorrect (impermissible ASCII character)
 %2: Source DB not available in the PLC
 %3: Parameter limits violated
 %4: Source or target DB too short
 %5: Parameter limits of the M area violated
 (number of DWs too great)
 %6: Lower limit of the input or output process image violated
 %7: Impermissible source or target parameter type (not I, Q, F)

3. Block call

FB 70



FB71



4. Signal description for FB 70

QUTY Type of data source (enter right-aligned)

D : Selectable DB

A : Axis-specific signals (DB 32)

K : Channel-specific signals (DB 10 - 13)

S : Spindle-specific signals (DB 31)

M : M functions (DB 30)

B : Messages (DB 58)

V : Variable setting of parameters via FW 250 - FY 254.

The direct setting of parameters QUTY, QUAD, ZITY, AN/Z is not evaluated.

QUAD Number of source address

Permissible values with QUTY

D : 1,0 - 255, 255

high byte: DB number (1 - 255)

low byte : DW number (0 - 255)

X : 0,0 ... 255, 255

A : 0,1 ... 0,12 (1st axis number)

K : 0,1 ... 0,4 (channel number)

S : 0,1 ... 0,4 (1st spindle number)

M : 0,0 ... 0,62 (DW number in DB 30)

B : 0,0 ... 0,15 (DW number in DB 58)

Note:

With A and S parameters, the signals of **two or more** axes or spindles can be transferred.

ZITY Type of target variables

I : Inputs

Q : Outputs

F : Flags

AN/Z Number of DWs and target byte number

High byte : number of data words to be transferred

Low byte : address of the I/Q/F byte from which the data will be entered

Permissible values for flags, inputs, outputs

F : 25 - 223

I : 64¹⁾ - 127

Q : 64¹⁾ - 127

**PASP/
ZASP** Data transfer is protected against interruption by a higher-priority processing level by a semaphore. This is always necessary when an interface area (I/Q/F) can be processed both cyclically and interrupt*-controlled or time-controlled.

Note:

If PASP or ZASP = 1, then FB 71 must be called first after FB 70 before FB 70 can be called again!

¹⁾ Depending on the following machine data:

MD11: Erase limit for input process image

MD12: Erase limit for output process image

* In SINUMERIK control documentation interrupts are known as alarms

5. Signal description for FB 71

QUTY Data source

I : Inputs
Q : Outputs
F : Flags

AN/Q Number of the DWs and source byte number

High byte : number of **words** to be transferred (max. 128)

Low byte : address of first byte to be transferred.

Permissible values for flags, inputs, outputs

Number of the source address

F : 0 ... 255
I : 64¹⁾ ... 127
Q : 64¹⁾ ... 127

ZITY Type of data target

S : Spindle-specific signals (DB 31)
D : Data block (selectable)
X : Selectable DX
A : Axis-specific signals (DB 32)
K : Channel-specific signals (DB 10 ... 13)
M : M functions (DB 30)
B : Messages (DB 58)
V : Variable setting of parameters via FY 250 ... FY 254.
The direct setting of parameters QUTY, AN-Q, ZITY, ZIAD is not evaluated.

Note:

With parameters A and S the signals of **two or more** axes or spindles can be transferred.

ZIAD Number of destination address

Permissible values with ZITY

D : 1,0 ... 255,255
 High byte: DB number (0 ... 255)
 Low byte: DW number (0 ... 255)
X : 0,0 ... 255, 255
A : 0,1 ... 0,12 (1st axis number)
K : 0,1 ... 0,4 (channel number)
S : 0,1 ... 0,4 (relative DB address, 1st spindle number)
M : 0,0 ... 0,62 (DW number in DB 30)
B : 0,0 ... 0,15 (DW number in DB 58)

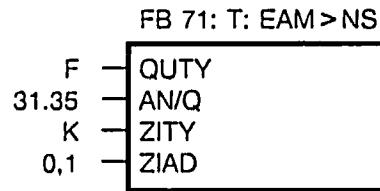
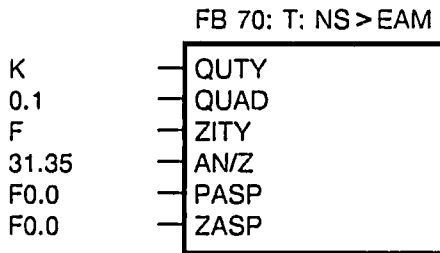
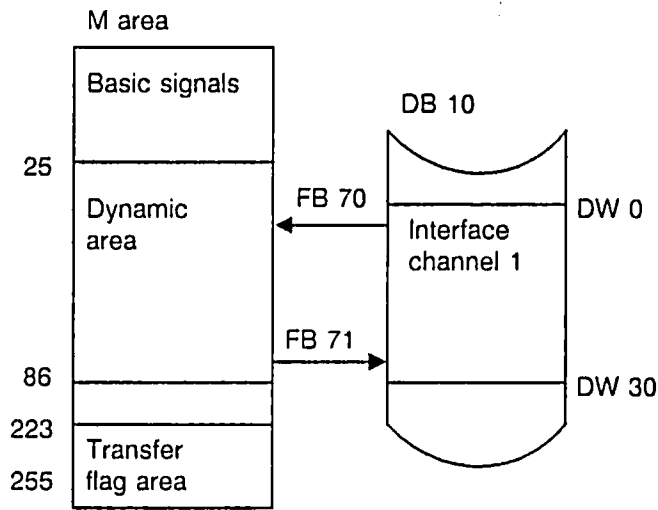
¹⁾ Depending on the following machine data:

MD11: Erase limit for input process image

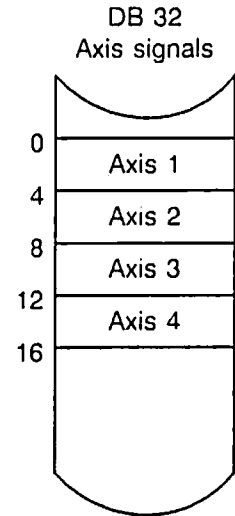
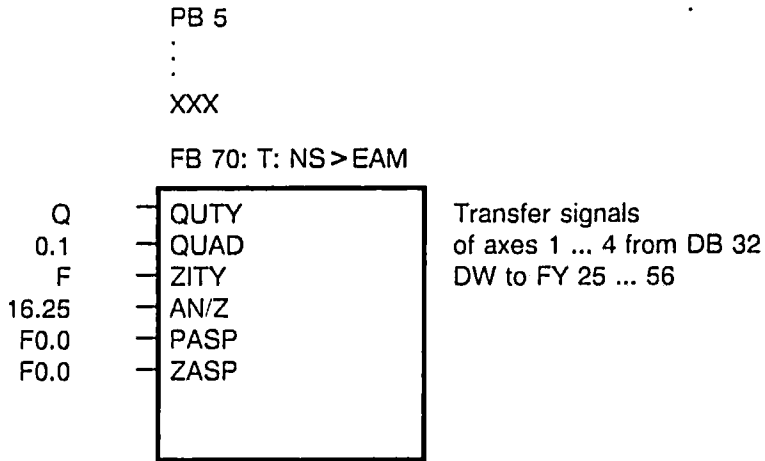
MD12: Erase limit for output process image

6. Examples

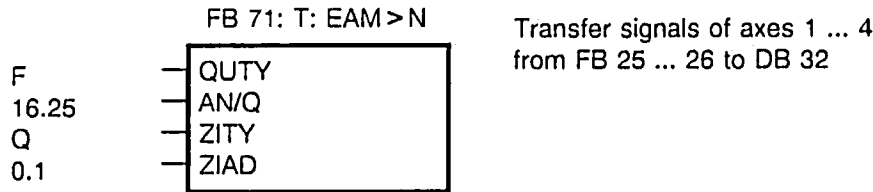
- Transfer DB channel 1



• Transfer signals axes 1...4



XXX
 A I 3.0 = F 27.4 * DECELERATION REFERENCE POINT APPROACH Axis 1
 A I 3.1 = F 35.4 * DECELERATION REFERENCE POINT APPROACH Axis 2
 ⋮
 XXX



05.90

FB 70 T: NS →EAM Transfer interface DB to I/Q/F
FB 71 T: EAM →NS Transfer I/Q/F to interface DB

(blank page)

FB 72 T: NCK→DB Transfer NC channel→DB channel-specific signals
FB 73 T: DB→NCK Transfer DB channel-specific signals→NC channel

1. Description

Function blocks FB 72/FB 73 implement the data transfer between the internal NC-PLC interface and the channel-specific interface DB (DB 10 - 13). FB 72/FB 73 then need only to be used if the interface signals must be updated in **addition** to the basic program, to shorten response times.

To prevent the transfer from being rejected, the transfer must also have been enabled for the basic program via PLC machine data.
(PLC I: MD 6000)

Note:

If interface signals of a channel are cyclically (OB 1) copied into I/Q/F by means of FB 70/FB71, and if the same interface signals are to be written into the internal interface, e.g. interrupt*-controlled via FB 73, then the interrupt* disable for the corresponding interrupt* level must be selected via FB 70. Whilst the interface signals from DBs are duplicated in the flag area, they must **not** be transferred interrupt*-controlled from the DB to the internal interface; they would be corrupted by the changed "flag image" on recopying into the interface DB.

2. Block data

Library No.:

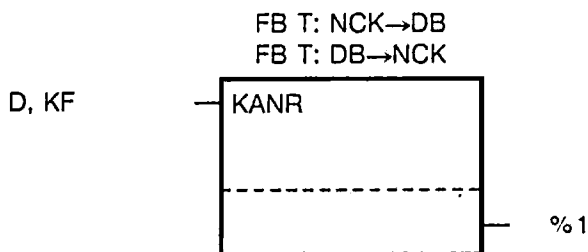
FBs to be loaded: none

Type of FB call: unconditional or conditional

DBs to be input: none

Error descriptions: %1: Channel address impermissible

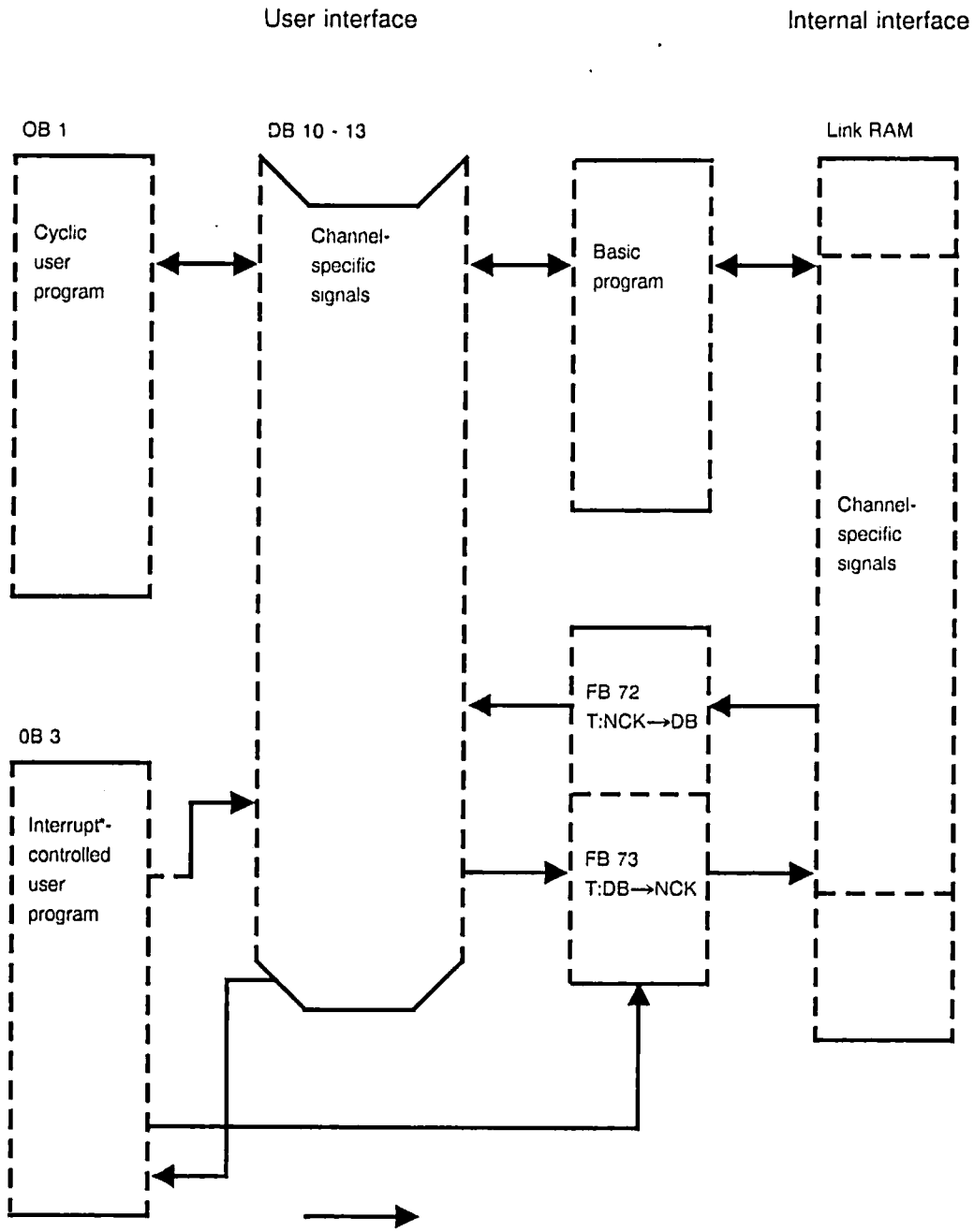
3. Error messages FB 72/ FB 73



4. Signal description FB 72 / FB 73

KANR Address of NC channel (1 - 4) of which the signals are to be transferred.

* In SINUMERIK control documentation interrupts are known as alarms.



* In SINUMERIK control documentation interrupts are known as alarms.

FB 74 T: SPI →DB Transfer spindle →DB spindle-specific signals FB 75 T: DB →SPI Transfer DB spindle-specific signals →spindle

1. Description

Function blocks FB 74/FB 75 implement the data transfer between the internal NC-PLC interface and the channel-specific interface DB (DB 31). FB 74/FB 75 then need only be used if the interface signals must be updated **in addition** to the basic program, to shorten response times.

To prevent the transfer from being rejected, the transfer must also have been enabled for the basic program via PLC machine data.
(PLC I: MD 6012)

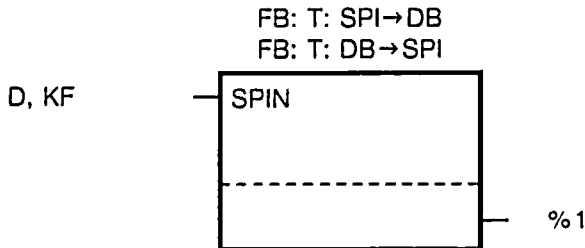
Note:

If interface signals of a channel are cyclically (OB 1) copied into I/Q/F by means of FB 70/FB 71, and if the same interface signals are to be written into the internal interface, e.g. interrupt*-controlled via FB 75, then the interrupt* disable for the corresponding interrupt* level must be selected via FB 70. Whilst the interface signals from DBs are duplicated in the flag area, they must **not** be transferred interrupt*-controlled from the DB to the internal interface; they would be corrupted by the changed "flag image" on recopying into the interface DB.

2. Block data

Library No.:	FB 74, FB 75
FBs to be loaded:	none
DBs to be loaded:	none
Type of FB call:	conditional or unconditional
DBs to be input:	none
Error descriptions:	%1: Spindle address impermissible

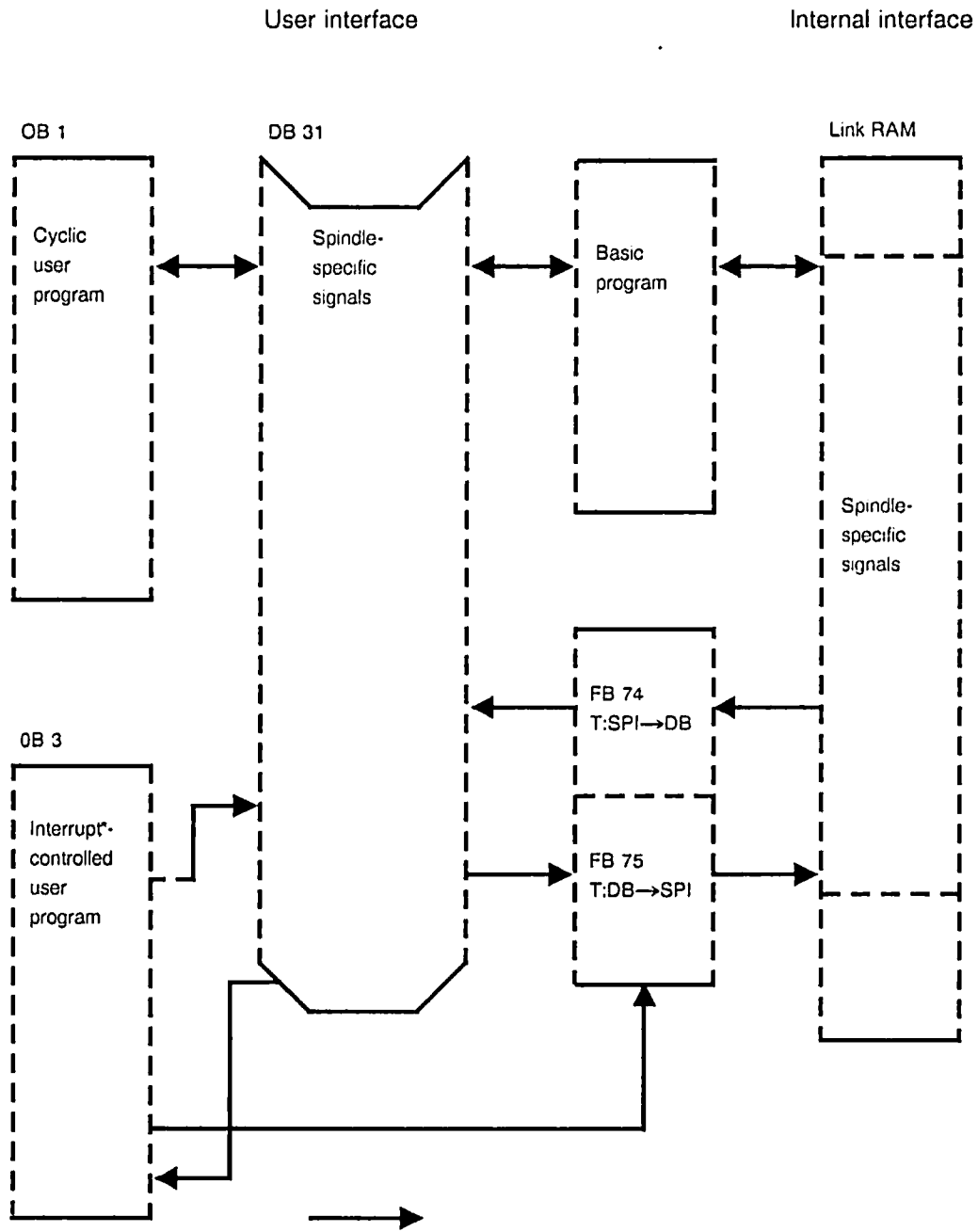
3. Error messages FB 74 / FB 75



4. FB 74 / FB 75 signal description

SPIN Address of spindle (1 - 4) of which the signals are to be transferred

* In SINUMERIK control documentation interrupts are known as alarms.



* In SINUMERIK control documentation interrupts are known as alarms.

FB 76 T: ACH→DB Transfer axis→DB axis-specific signals
FB 77 T: DB→ACH Transfer DB axis-specific signals→axis

1. Description

Function blocks FB 76/FB 77 implement the data transfer between the internal NC-PLC interface and the channel-specific interface DB (DB 32). FB 76/FB 77 then need only be used if the interface signals must be updated **in addition** to the basic program, to shorten response times.

To prevent the transfer from being rejected, the transfer must also have been enabled for the basic program via PLC machine data (PLC I: MD 6016).

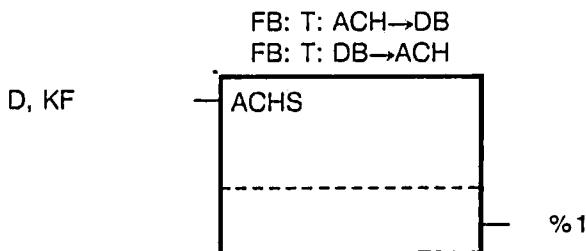
Note:

If interface signals of a channel are cyclically (OB 1) copied into I/Q/F by means of FB 70/FB 71, and if the same interface signals are to be written into the internal interface, e.g. interrupt*-controlled via FB 77, then the interrupt* disable for the corresponding interrupt* level must be selected via FB 70. Whilst the interface signals from the DB to the internal interface: they must **not** be transferred interrupt*-controlled from the DB to the internal interface; they would be corrupted by the changed "flag image" on recopying into the interface DB.

2. Block data

Library number: FB 76, FB 77
FBs to be loaded: none
DBs to be loaded: none
Type of FB call: conditional or unconditional
DBs to be input: none
Error descriptions: %1: Axis address impermissible

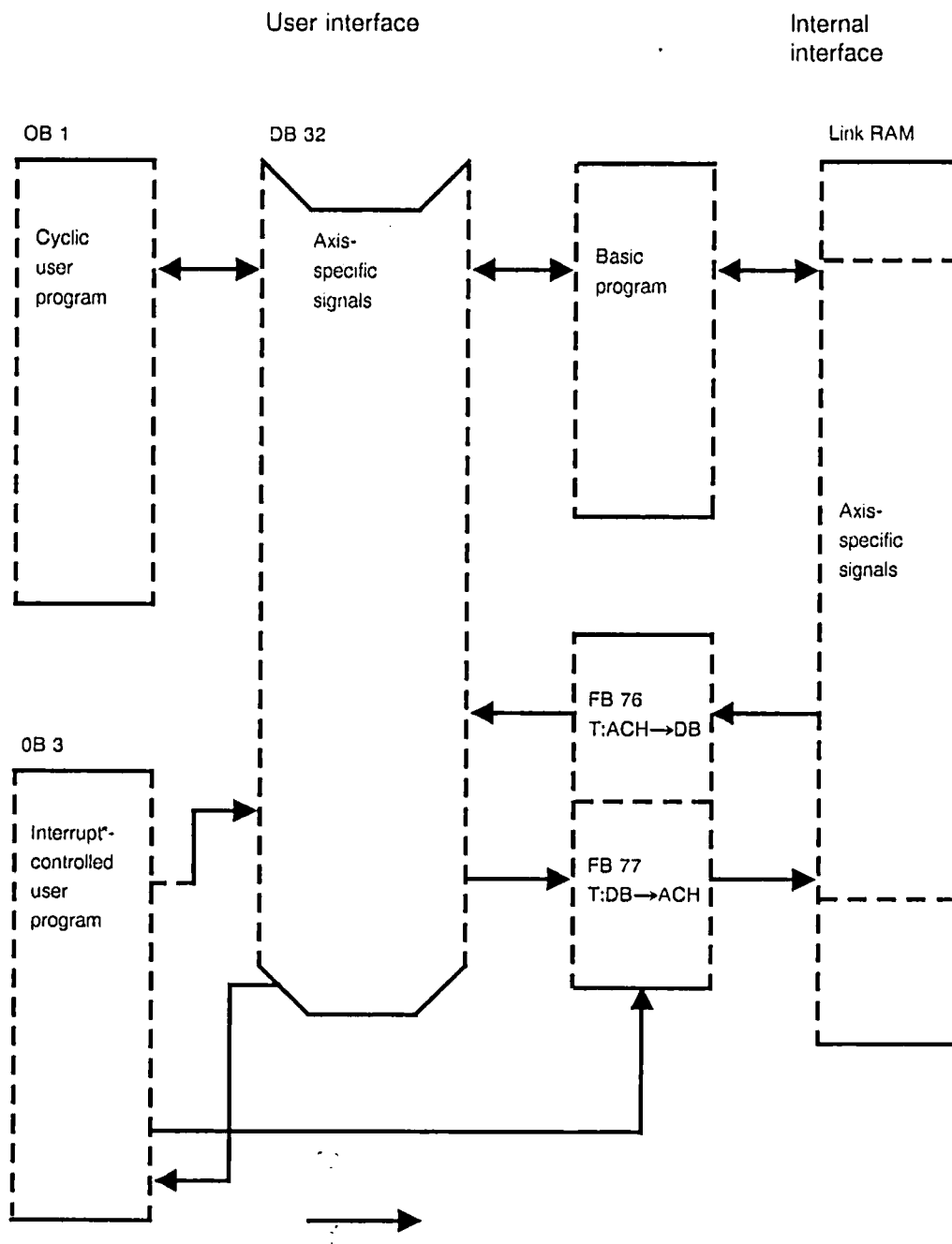
3. Error messages FB 76 / FB 77



4. FB 76 / FB 77 signal description

ACHS Address of axis (1...12) of which the signals are to be transferred.

* In SINUMERIK control documentation interrupts are known as alarms.



* In SINUMERIK control documentation interrupts are known as alarms.

FB 78 T: MS →KN
Transfer machine control panel softkey
functions →channels/spindles

1. Description

The function block reads the softkey selections from the interface for "signals from NC channel" (DB 10 - 13) and the signals of the SIN 840 machine control panel (basic key group IBm - IBm + 3) and transfers them to the interface for "signals to NC channel" (DB 10 - 13) and the interface for "signals to spindle" (DB 31).

Precondition: The transfer must have been enabled by PLC-MD.

Channels: PLC I: 6000 Spindles : PLC I: 6012

The individual signals are as follows:
 Softkey selections:

- Rapid traverse override
- EXT (processing from external)
- DRF (differential resolver function)
- M01 active
- Dry run feed
- DEC single block
- Delete block
- Search forwards
- Search backwards
- Block search

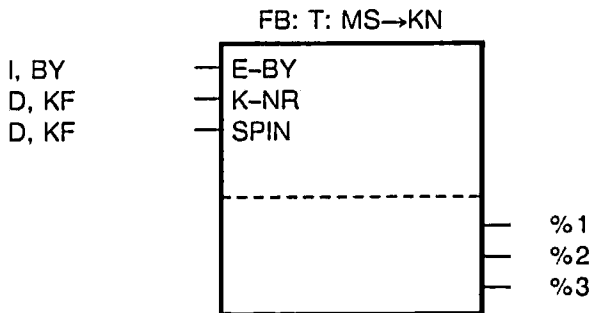
- Machine control panel signals to NC channel:
- Mode selection switch
 - Feedrate override switch
 - Single block
 - Key switch in DB 48
 - Reset
 - NC Stop
 - NC Start

- to spindle:
- Spindle override switch

2. Block data

Library No.:
 FBs to be loaded: none
 DBs to be loaded: none
 Type of FB call: conditional or unconditional
 DBs to be input: none
 Error descriptions: %1: PLC machine data "signals from/to channel" not set
 %2: PLC machine data "signals from/to spindle" not set
 %3: Parameterized channel number > 4 or spindle number > 4

3. Error messages



4. Signal description

E-BY First byte of machine control panel signals. The order of address assignment of the Interface Description Part 2. (Section 4.5) is mandatory.

K-NR Number of NC channel (1 - 4) to which the signals are to be transferred.

SPIN Number of spindle (1 - 4) to which the signals are to be transferred.
SPIN = 0: No transfer to spindle

5. Example

- Transfer without changing signals in NC Channel 3

```

      : JU    FB 78
NAME  : T:MS>KN
E-BY  : IB 64
K-NR  :      3
SPIN  :      0
      : BE
  
```

- Transfer with previous gating of signals and/or different address assignments of SIN 840 standard machine control panel.

```

      : L    IW 64
      : T    FW100
      : L    IW 66
      : T    FW102
      : AN   -Automatic mode
      : JC   = FB
      : L    IB 64
      : SRW  4
      : SLW  4
      : L    KB11
      : OW
      : T    FB100
FB     : JU    FB 78
NAME  : T:MS>KN
E-BY  : FY100
K-NR  :      1
SPIN  :      0
      : BE
  
```

Auto mode
preset by PLC

- Transfer in NC Channel 2 and to Spindle 1 with subsequent gating of signals

```

      : JU    FB 78
NAME  : T:MS>KN
E-BY  : IB 64
K-NR  :      2
SPIN  :      1
  
```

```

      : C    DB 11
      : AN   -Key switch
      : U    -Single block
      : JC   = SPER
      : JU   = WEIT
SPER  : RU   D 0.14
WEIT  :
      :
      : BE
  
```

Single block only
active with
key switch open

FB 79 T: MS →ACH Transfer machine control panel signals (direction keys 840M) →DB axes

1. Description

The function block transfers the signals of the direction keys and of the rapid override key depending on the axis selected to the interface for the axes (DB 32).

12 axis selection switches, one pair of direction keys and one rapid override key can be connected.

Precondition:

The transfer must be enabled via PLC machine data

PLC I: 6016, 6017

2. Block data

Library No.:

FBs to be loaded: none

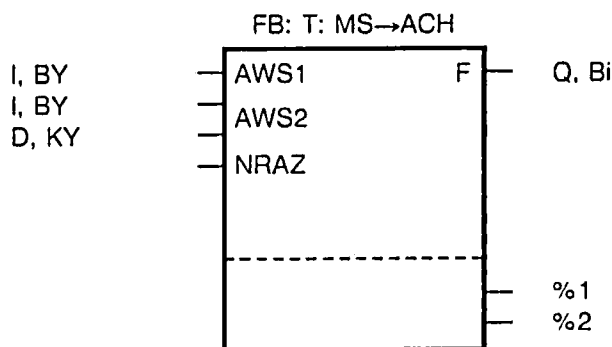
DBs to be loaded: none

Type of FB call: conditional or unconditional

DBs to be input: none

Error messages: %1 PLC machine data "signals from/to axis" not set
 %2 Number of parameterized axes > 12

3. Error messages



4. Signal description

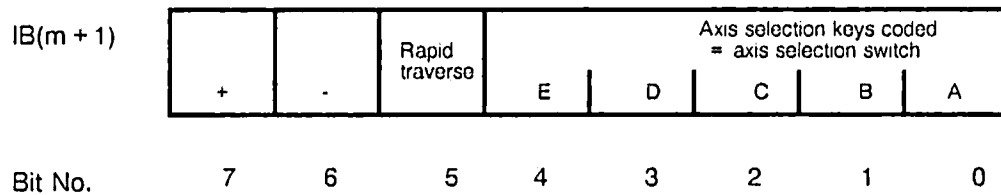
AWS1 Address, axis selection switch

PLC IB/FY at which the direction keys, rapid override and axis selection switch are stored.

Byte address 0 signifies: Axis selection switch not present

The arrangement of signals must comply with the assignments of the standard machine control panel.

AWS2 Always preset IB0

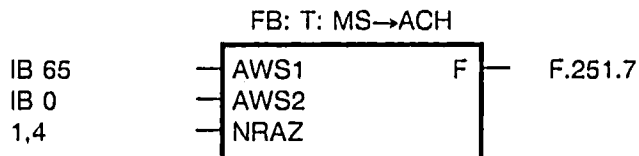


NRAZ High byte: Number of axis to which the first axis selection key corresponds
Low byte: Number of axes (= assigned axis selection keys). The axis numbers must be present in ascending order.

F Output is set, if code 0 is present at input of programmed axis selection switch (axis selector switch defect).

5. Example

Basic module of machine control panel SIN 840 M on a machine for four axes.



FB 88 BA-LAMPE Transfer mode LEDs → machine control panel SIN 840

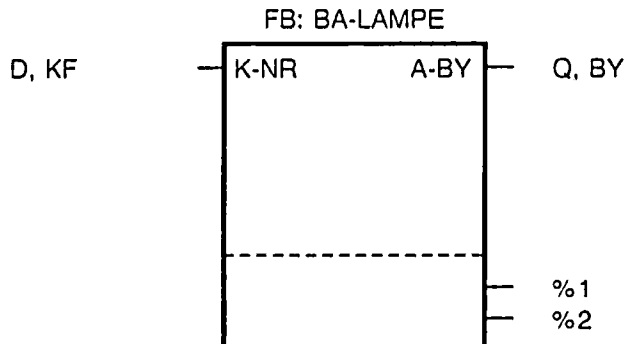
1. Description

The function block transfers the mode from the channel data block into the output image for control of the LEDs on the SIN 840 machine control panel.

2. Block data

Library Number:
FBs to be loaded: none
DBs to be loaded: none
Type of FB call: conditional or unconditional
DBs to be input: none
Error messages: %1: PLC machine data "signals from/to channel" not set
%2: Parameterized channel number >4

3. Block call



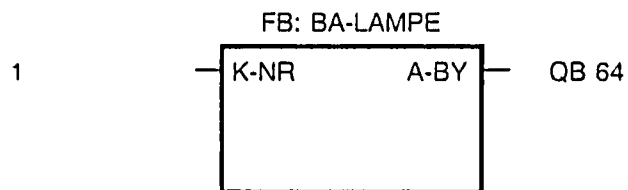
4. Signal description

K-NR Number of the NC channel (1 ... 4), from which the signals are to be transferred.

A-BY First output byte of the machine control panel signals. The order of the address assignment of the interface signal is mandatory.

5. Example

The modes from channel 1 are transferred to the output image for control of the LEDs on the machine control panel SIN 840. The first output byte of the machine control panel must be QB 64.



FB 89 BAA-LESE Read the block initial address

1. Description

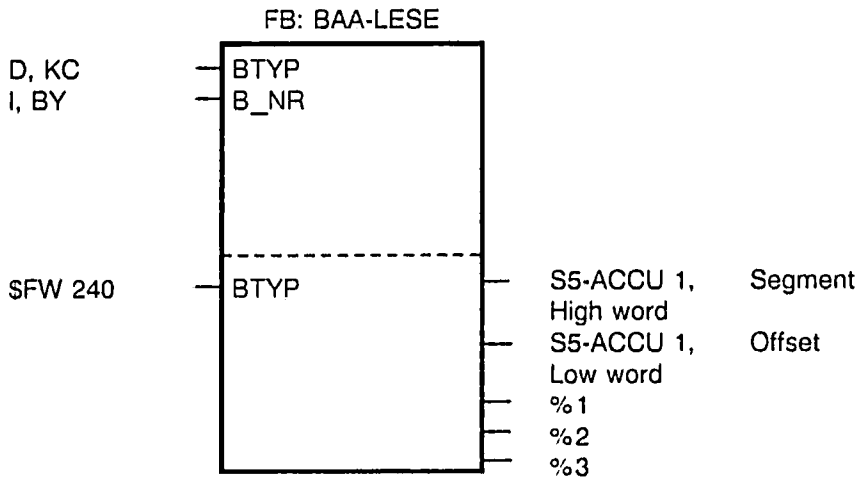
Using function block FB 89 the initial address of a block defined by the input parameter is placed in the ACCU.
The segment address of the required block is stored in ACCU 1, high word, the offset of the initial address in ACCU 1, low word.

If the block is not available, the PLC enters the value FFFF in ACCU 1.

2. Block data

Library Number:
FBs to be loaded: none
Type of FB call: conditional or unconditional
DBs to be input: none
Error messages: %1: Unknown designation of the block type
 %2: Address list not available
 %3: Address list not sufficient

3. Block call



4. Signal description

BTYP Block type
 DB = Data block
 SB = Sequence block
 PB = Program block
 OB = Organisation block
 FB = Function block
 DX = Data block of class DX
 FX = Function block of class FX

Special case:

If the parameter BTYP is preset with 2 "blanks", the BTYP must be set via flag word 240.

B-NR Block number

5. Example

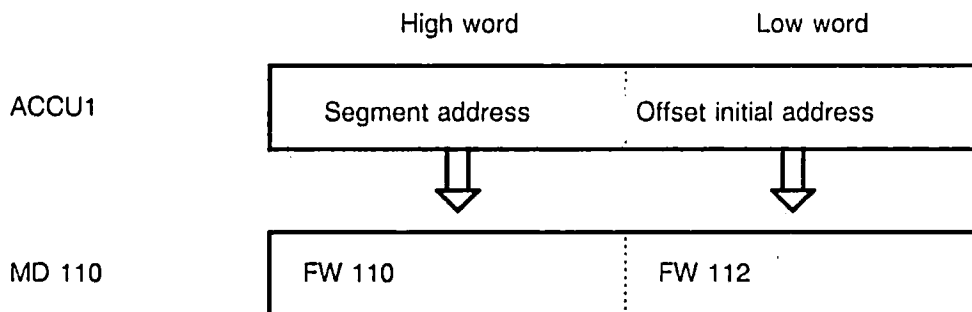
Read the block initial address of the data block (DB 255):

```

:
: L   KB255          DECLARE BLOCK NO.
: T   FY250
: JU  FB89
NAME : BAA-LESE
BTYP :   KCDB          Declare BLOCK TYPE
B-NR :   FY250
: T   MD110          (Transfer flag double word)
:
: BE

```

The block (FB 89) places the data required for a memory access in ACCU 1 as follows:



The user thus obtains the initial address of DB 255 in MD 110 (i.e. the initial address of DY 0).

With other block types (PB, SB etc.) the initial address of the 1st STEP 5 statement is output.

FB 113 SUCH: WZ Symmetrical tool search

1. Description

This block searches the tool table defined over several flag bytes for a search term which can be predefined. Search terms which are larger than one word must be stored parallel in several data blocks.

The search can be carried out in several stages, as per call only up to 50 data words of a data block can be searched for identity with a predefined search term located in DW 1 using a mask located in DW 0.

If the search term was not found after the first search (up to 50 DW) this is indicated in binary flags.

Two cases may occur:

- the whole of the specified area was searched → F247.0 = 1
F247.1 = 0
F247.7 = 0
- only part of the specified area was searched → F247.0 = 0
F247.1 = 0
F247.7 = 1

Depending on the value of F 247.7, FB 113 can then be called again either in the same PLC cycle or in the following cycle.

The current actual position of the search is stored internally.

The FB 113 may not be used for another search term in the meantime because this would erase the internal store.

If a search is interrupted the difference between the search beginning (DIST) and the point of interruption is stored in parameters "DIFF". To continue the search the continuation point is calculated from the difference (DIFF) and the parameter "DIST".

- the search term was found → F247.0 = 0
F247.1 = 1
F247.7 = 0

Note:

This FB is used in conjunction with the tool selection (FB 111 or FB 112) as a search routine.

DBs of tool management must be located in the user data segment. Before the first call of FB 113, FY 247 must be preset with 0.

2. Block data

Library Number:

FBs to be loaded:

Type of FB call: conditional or unconditional

DBs to be entered: DBs of the tool table

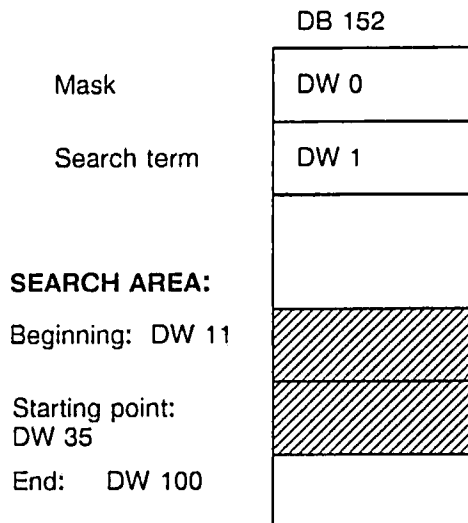
5. Example:

FB 113 searches the tool table for magazine or turret assignment for a predefinable search term. The table (e.g. DB 152) must have been set up.
(Term & mask = search term)

```

      : C      DB 152
      : L      KB 152
      : T      FY 242      - Data block number
      : L      KS DB      - Data block type DB
      : T      FW 254
      : L      KB 1
      : T      FY 243      - Number of data words of a search term
      : L      KB 11      - Beginning of search area
      : T      FW 248
      : L      KB 100
      : T      FW 250      - End of search area
      : L      KB 35      - Actual position
      : T      FW 252
      : L      KB 0
      : T      FY 247
NAME  : JU      FB113
      : SUCH:    WZ
      :
      : A F 247.7      - Only part of the search area has been searched:
                       another 50 data words will be searched.

NAME  : JC      FB 113
      : SUCH:    WZ
      :
  
```



Siemens AG

AUT V250
Postfach 48 48
W-8500 Nuremberg 1
Federal Republic of Germany

Suggestions

Corrections

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Siemens AG
Automation Group
Automation Systems
for Machine Tools, Robots
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P.O. Box 48 48, W-8500 Nuremberg 1
Federal Republic of Germany

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