

BALLUFF

Software- Description

BIS VU-

Function Block S7-1200/1500



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1 INTRODUCTION

This function block is an example for the communication with a C / VL / VM and VU read/write head. The module can also be used for communication with IO-Link read/write heads or BIS M/C/L-60xx processor units. The example is free of charge. Please test carefully if the FB is suitable for your application!

This function block allows a communication between a **BIS V-6102-Cxxx** and **BIS V-6108-Cxxx**, **BIS M-4xx**, **BIS C-60xx**, **BIS M-60xx**, **BIS L-60xx** processor unit and a Simatic® S7-1200/1500 PLC.

The following commandos are supported:

- Read data carrier (USER-data)
- Write data carrier (USER-data)
- Store Auto Read start address
- Type and serial number
- Copy data between data carrier
- Initialize CRC_16 data check
- Write constant value to data carrier
- Read data carrier (DSFID)
- Write data carrier (USER-data)

ATTENTION

Please test carefully if the used commandos are supported by the BIS V processor and the read/write head! When using VU read heads, a maximum of one data carrier may be located in the active range of the antenna.

1 INTRODUCTION

1.1 General Data

Function block name:	BIS_V_CLM_COM
Instance data block:	(an own instance data block has to be setup for each antenna or r/w head)
Invoked blocks:	SFB4 TON
Reserved memory bits:	none
Reserved Timers:	none
Reserved Counters:	none
I/O length:	16 - 254 byte
Invoke:	absolute
Device compatibility:	Siemens Simatic® S7 1200/1500
Software version:	TIA Portal V13 SP1

1.2 Recommendations of FB invoke

The function block should be called only once for each read/write head. Multiple calls of the function lock at the same time are not allowed.

If the function block is conditionally called and the calling condition is false before FB sets it Ready output, the "Init" input has to be set.

If the PLC restarts the Init input has to be set for one cycle. FB parameters could be attached dynamic if necessary.

Commands with 3 byte addressing are available for BIS VM data carriers with a memory size over 32kByte.

2 COMMISSIONING

2.1 DB parameter for non-optimized block access

The data blocks for send and receive data are created non-optimized. The maximum read/write length of the FB is 65,534 byte. The FB inputs **DB_Send** and **DB_Receive** are used. The data blocks for send and receive data have to setup according the FB input parameters **Offset_DBSend**, **Offset_DBReceive**, **EPC_DB_OFFSET**, **Data_Length** and in suitable length for the used commands. The data blocks DBSend, DBReceive and DB_MultiEPC may not created with the attribute "optimized block access".

ATTENTION

Recommended access. If the not optimized block access is used, the FB inputs **DB_Send** and **DB_Receive** are used. The FB-Inputs **DB_SendOpt** and **DB_ReceiveOpt** are not used and have to be connected with any "Dummy" variable. All data types except Array of Byte may be used! Structured datatypes may be used for the RFID data.

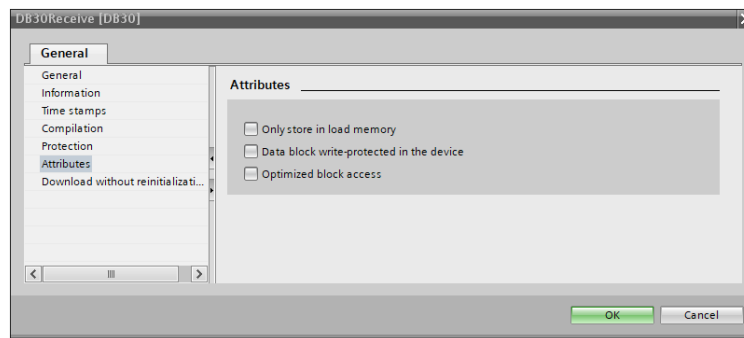


Fig.

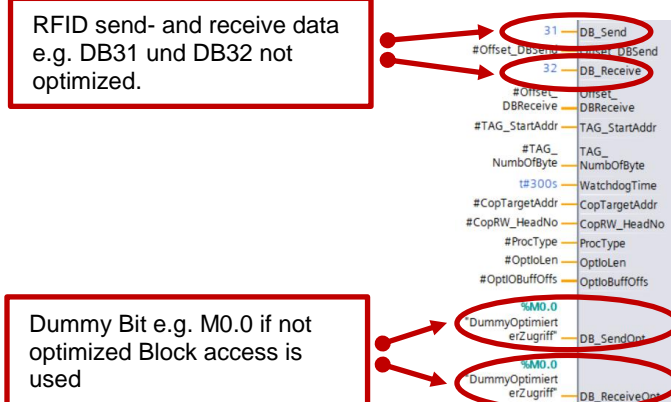


Fig. TIA-Portal: Function block instance call with access to not optimized data blocks.

2 COMMISSIONING

2.2 DB Parameter for optimized block access

The data blocks for send and receive data are created optimized. Only the data type Array of Byte may be used for the RFID send and receive data. The maximum read/write length of the FB is 65,534 byte. The FB inputs **DB_SendOpt** and **DB_ReceiveOpt** are used. The data blocks for send and receive data have to be setup according to the FB input parameters **Offset_DBSend**, **Offset_DBReceive**, **EPC_DB_OFFSET**, **Data_Length** and in suitable length for the used commands. The data blocks DBSend, DBReceive may be created with the attribute "optimized block access".

ATTENTION

Only recommended if optimized block access have to be used. If the optimized block access is used, the FB inputs **DB_SendOpt** and **DB_ReceiveOpt** are used. The FB-Inputs **DB_Send** and **DB_Recive** are not used and do not have to be connected. Only the data type array of Byte is possible!

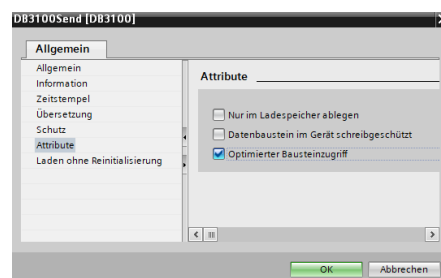


Fig.

The data block inputs for non-optimized access do not need to be connected.

Data blocks with the data elements Array of Byte for optimized access.

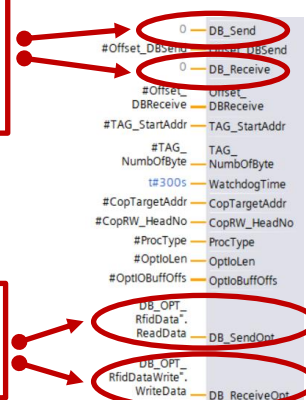


Fig. TIA-Portal: Function block instance call with access to optimized data blocks.

2 COMMISSIONING

2.3 Device parameter for BIS V-6102-Cxxx und BIS V-6108-Cxxx

Same values for the parameters **Dynamic Mode** and the hardware identifier (**HW_LADDR**) have to be set in HW configuration and for FB call!

Device Parameter:

Device parameter slot 0

Global diagnostic	disable	=	Not active
	enable	=	Permit the module's diagnostic messages
HMI read only	disable	=	Device settings via display enabled
	enable	=	Device settings via display disabled
LEDs off	disable	=	LEDs on
	enable	=	LEDs at the processor of after 30min
IO-Link Port Function	NO input	=	Input as normally open contact
	NC input	=	Input as normally closed contact
	Output	=	Output function
	IO-Link	=	IO-Link function
IO-Link Safe State	0, 1, Last value	=	Save state of IO-Link Outputs

2 COMMISSIONING

RFID Head Parameter:

CRC	disable	=	Not active
	enable	=	The CRC check is a procedure for determining a check value for data in order to be able to recognize data transmission errors.
Not available for BIS VU heads.			
Dynamic Mode	disable	=	Dynamic mode deactivated. Error number 01 _{hex} is applied if job is started without tag.
	enable	=	The processor unit accepts the job and stores it regardless of whether a tag is in the active zone or not. If the tag enters the active zone the stored job is run.
Type and Serial Number	disable	=	First bytes of data carrier are displayed.
	enable	=	the type of the read/write head and serial number are displayed when CP occurs.
Slow Tag Detection	disable	=	Default, fast tag detection.
	enable	=	The antenna is switched on for tag detection only every 200ms.
Low Antenna Power	disable	=	Default, high antenna power.
	enable	=	Transmitting power is reduced for the read/write head.
Head LEDs Off	disable	=	Head LEDs are on.
	enable	=	The LEDs are switched off on the respective read/write head.
UID Compare Count	1..7	=	This parameter indicates how often the 5-byte ID count of a BIS L-1__-03 tag is imported and compared before the tag is shown as identified.
Tag Type	All Tag...	=	Default, all tag types are detected.

More information concerning the parameters is available in the BIS V- manual.

2.4 Device parameter for BIS M-4008 compact processor unit

RFID Head Parameter

CRC	disable	=	Not active
	enable	=	The CRC check is a procedure for determining a check value for data in order to be able to recognize transmission errors. If the CRC check is activated, an error message is sent when a CRC error is detected.
Dynamic Mode	disable	=	Dynamic mode deactivated. Error number 01 _{hex} is applied if job is started without tag.
	enable	=	The processor unit accepts the job and stores it regardless of whether a tag is in the active zone or not. If the tag enters the active zone the stored job is run.

2 COMMISSIONING

Type and Serial Number	disable	=	First bytes of data carrier are displayed.
	enable	=	the type of the read/write head and serial number are displayed when CP occurs.
Slow Tag Detection	disable	=	Default, fast tag detection.
	enable	=	The antenna is switched on for tag detection only every 200ms.

More information concerning the parameters is available in the BIS M- manual.

2.5 Device parameter für BIS M-4xx compact processor unit

CRC	0	=	Not active
Index 40 _{hex} Subindex 1 _{hex}	1	=	The CRC check is a procedure for determining a check value for data in order to be able to recognize transmission errors. If the CRC check is activated, an error message is sent when a CRC error is detected.
Dynamic Mode	0	=	Dynamic mode deactivated. Error number 01 _{hex} is applied if job is started without tag.
Index 40 _{hex} Subindex 2 _{hex}	1	=	The processor unit accepts the job and stores it regardless of whether a tag is in the active zone or not. If the tag enters the active zone the stored job is run.
Action tag Present	0	=	No Action
	1	=	Send UID immediately (default setting)
Index 40 _{hex} Subindex 3 _{hex}	7	=	Immediately send 8 bytes of data beginning at a set address (parameter "Autoread start address")
Start address for autoread low byte	0..255		Observe data-carrier specifications.
Index 40 _{hex} Subindex 4 _{hex}			
Start address for autoread high-byte	0..255		Observe data-carrier specifications.
Index 40 _{hex} Subindex 5 _{hex}			
Used data-carrier rtyp	00	=	All
	FE _{hex}	=	BIS M1__-01
	FF _{hex}	=	BIS M1__-02
Index 40 _{hex} Subindex 6 _{hex}			

More information concerning the parameters is available in the BIS M- manual.

3 CONFIGURATION OF PROCESS DATA COMMUNICATION

3.1 General

The data exchange between processor unit and function block takes place via cyclic process data communication. The function block determines the input and output addresses of the processor unit via the hardware identifier of the corresponding slot of the processor unit. The type of the processor unit must be configured at the FB input **ProcType** to differentiate between the BIS device variants.

3.2 Configuration of a BIS V-6108 processor unit / BIS M-4008 compact processor unit

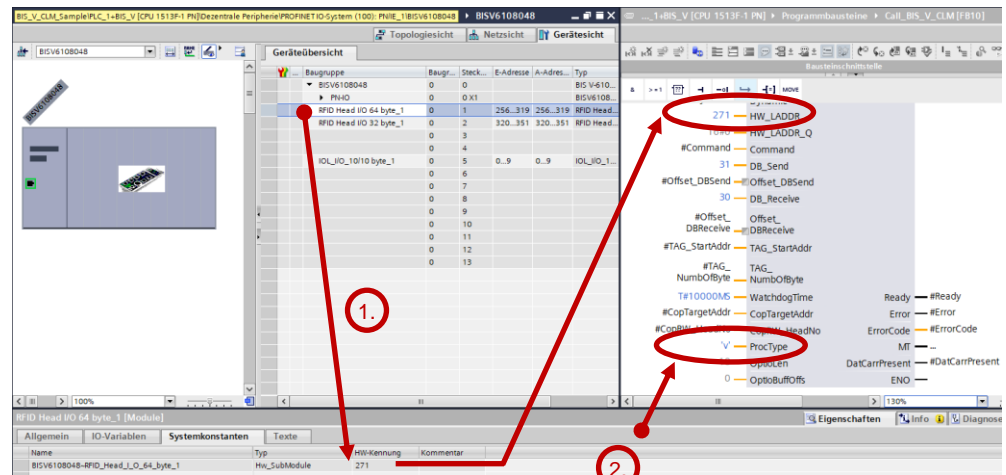


Fig. TIA-Portal: Devices & Networks, Properties RFID I/O Moduls and call of function block. 1. Hardware identifier e.g. 271, 2. ProcType: 'V'. This procedure shall also apply to BIS M-4008, ProcType: shall also remain BIS 'V'.

3.3 Configuration of a BIS M-4xx-045/072-xx1 IO Link processor unit

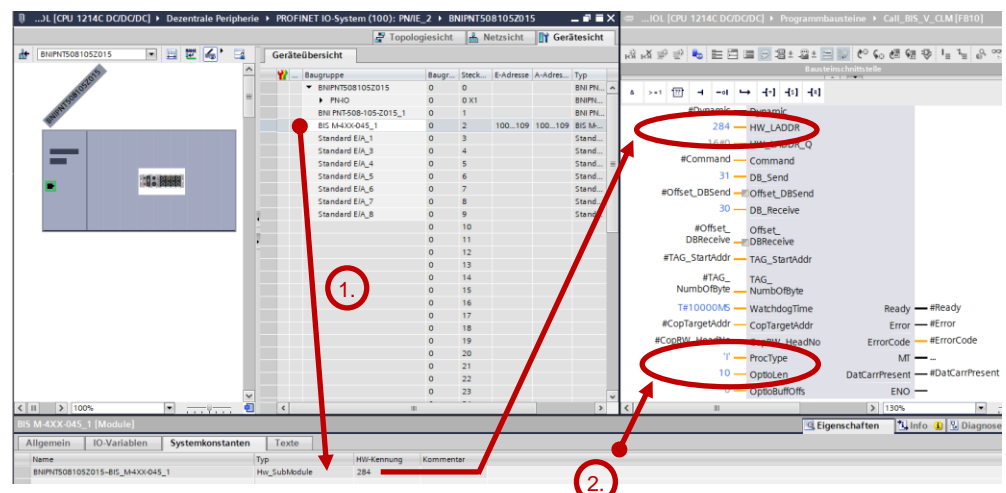


Fig. TIA-Portal: Devices & Networks, Properties IO-Link I/O Moduls and call of function block. 1. Hardware identifier e.g. 284, 2. ProcType: 'I', OptIOLen:10. For a M-4xx-072-xx1 processor unit is OptIOLen:32

3 CONFIGURATION OF PROCESS DATA COMMUNICATION

3.4 Configuration of a BIS M-60xx processor unit

The following illustrations describes the access to the second read head of a BIS M-60xx processor unit. This procedure must also be used for a BIS C-60xx or BIS L-60xx processor unit. The data of both read/write heads of a BIS M-60xx are displayed in the same slot. The limit is set with the value BufferHead1.

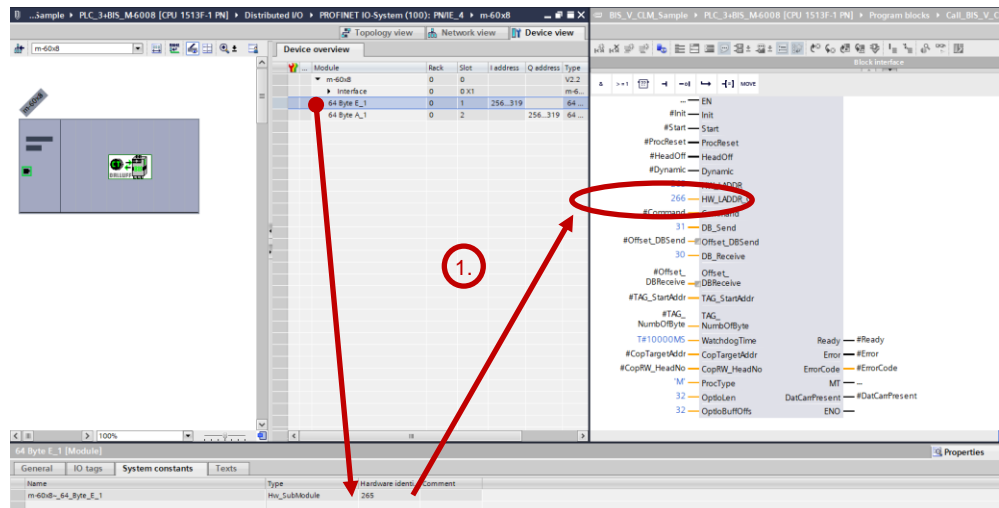


Fig. TIA-Portal: Devices & Networks, Properties BIS I modul and call of function block. 1. Hardware identifier e.g. 265.

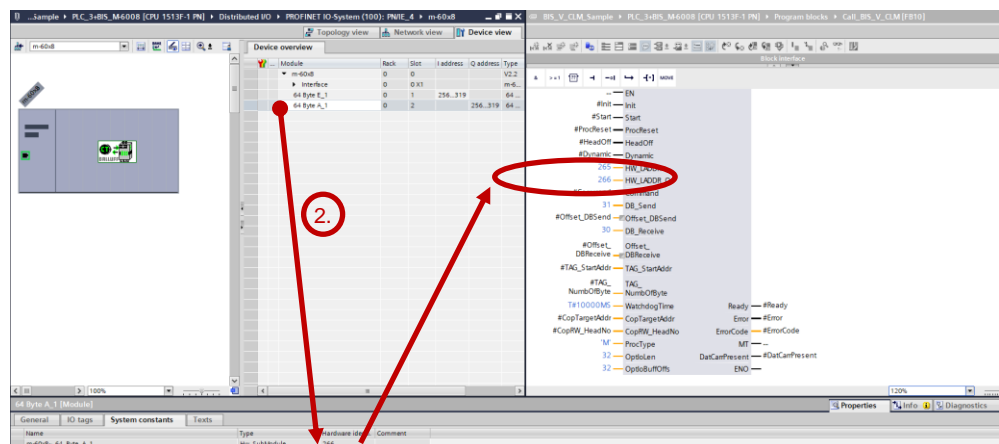


Fig. TIA-Portal: Devices & Networks, Properties BIS O modul and call of function block. 2. Hardware identifier e.g. 266

Function Block description for BIS V, BIS C, BIS M, BIS L,

3 CONFIGURATION OF PROCESS DATA COMMUNICATION

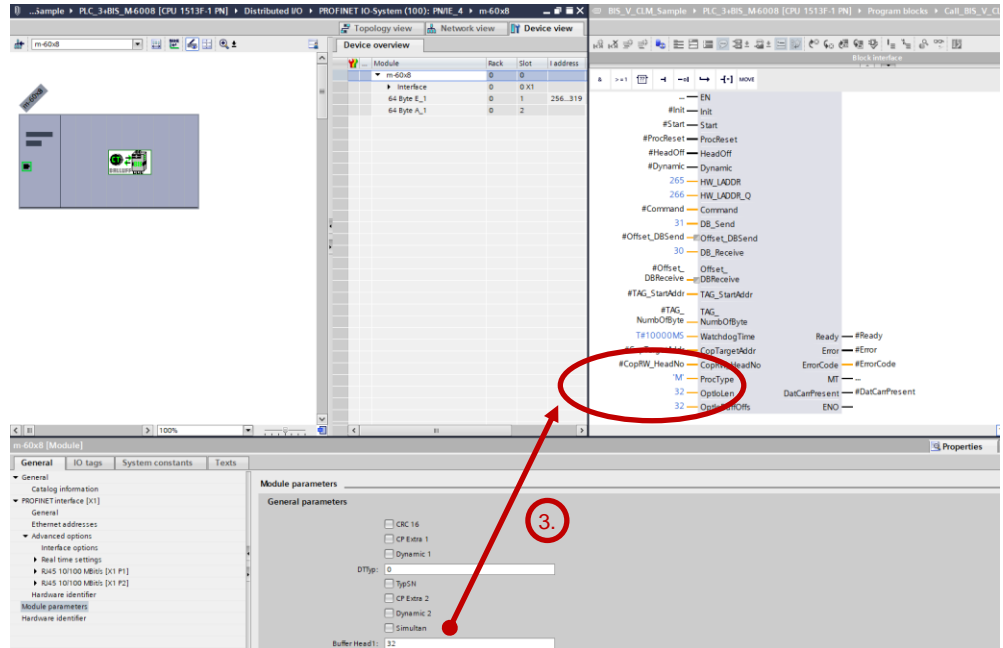
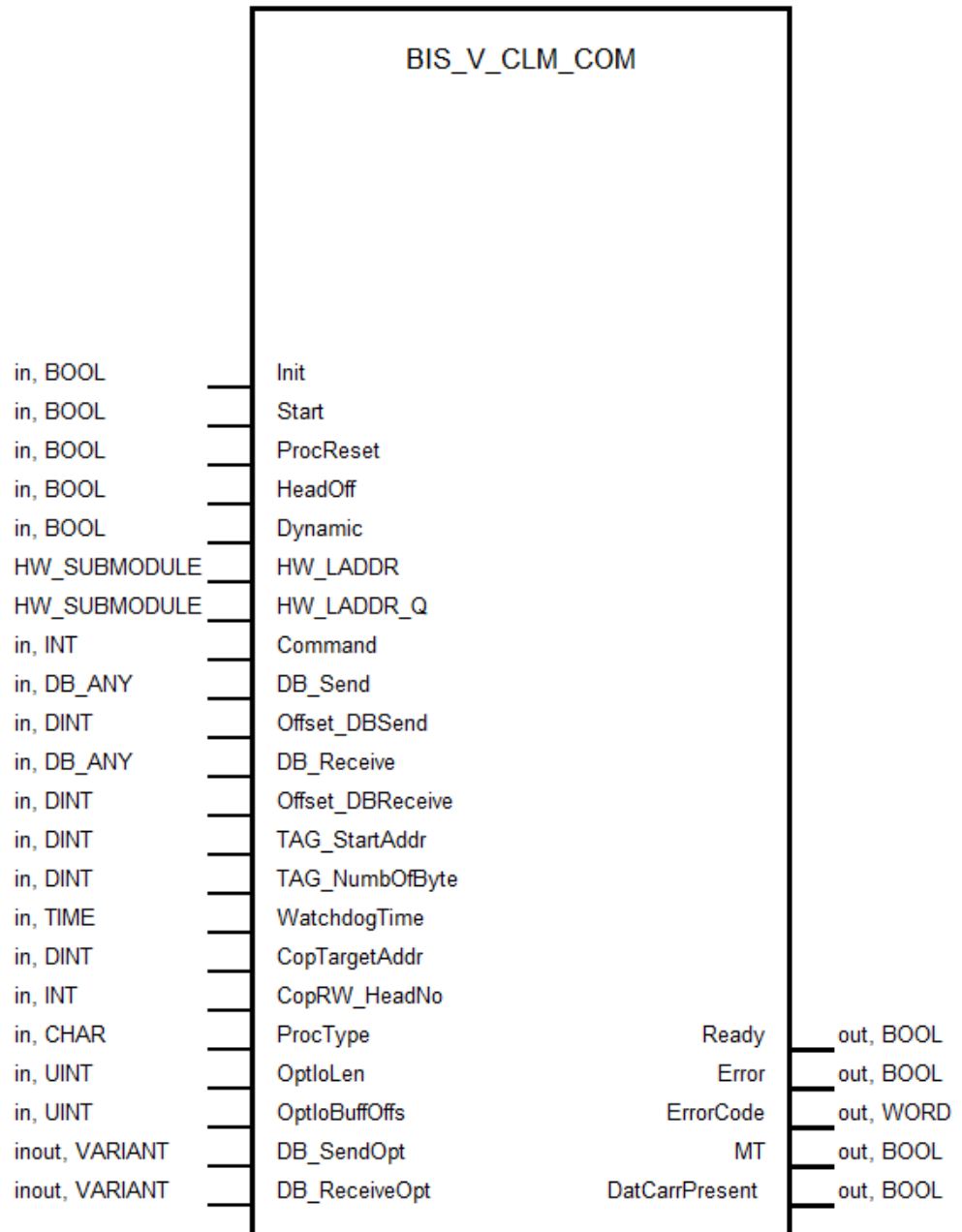


Fig. TIA-Portal: Devices & Networks, Properties of BIS M head module. Length for buffer 1 = 32 bytes results a length for buffer 2 = 32 bytes. Setting on function block 3. ProcType 'M'. Optional IO length 32 bytes, optional buffer offset 32 bytes.

4 FB PARAMETER DESCRIPTION

4.1 FB illustration S7-1200/1500



4 FB PARAMETER DESCRIPTION

4.2 Input parameter

Init	Function block initialization Must be set for one cycle each time the PLC is restarted. Static variables, control bits and upcoming commandos are reset. The function is done when Ready is set again.
Start	Start function Start = 1 starts a job. This signal must be set until the Ready output goes to 0. The function is done when Ready or Error is set again.
ProcReset	Reset function block and r/w head ProcReset = 1 sets the function block and ground state r/w head. The signal must be set until the Ready parameter goes to false. The function is done when Ready is set again. The processor unit needs a few seconds for a reset sequence!
HeadOff	Head power is switched off
Dynamic	Activation or deactivation of the WatchdogTime for dynamic mode Dynamic = 0: Watchdog Timer is on Dynamic = 1: Watchdog Timer is off If the Dynamic Mode is used, the watchdog timer has to be disabled.
DatCarSel	Additional parameter for commando 47 hex. 53 hex ; 54 hex ; 55 hex. Data carrier selection All = 0 / Selected = 1.
HW_LADDR	Hardware identifier of RFID module. The I/O area is determined by the hardware identifier. The hardware identifier is shown in the properties of RFID module.

64 Byte E_1 [Module]			
General IO tags System constants Texts			
Name	Type	Hardware identi.	Comment
m-60x8-64_Byte_E_1	Hw_SubModule	265	

(Figure TIA-Portal: Devices & networks, properties of RFID I/O module)

HW_LADDR_Q	Optional input, only used for devices with separate input and output modules. Hardware - Identification of the RFID output module. The output range of the RFID module is addressed via the hardware identifier in the hardware configuration. The hardware identification is displayed in the properties of the RFID A module.
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64 Byte A_1 [Module]			
General IO tags System constants Texts			
Name	Type	Hardware identi.	Comment
m-60x8-64_Byte_A_1	Hw_SubModule	266	

(Figure TIA-Portal: Devices & networks, properties of RFID O module)

Command	Job type Command = 01 hex: Read data carrier (USER-data), 2 Byte Command = 02 hex: Write data carrier (USER-data), 2 Byte Command = 07 hex: Store Auto Read start address, 2 Byte Command = 09 hex: Type and serial number, 2 Byte Command = 11 hex: Copy data between data carrier, 2 Byte Command = 12 hex: Initialize CRC_16 data check, 2 Byte
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4 FB PARAMETER DESCRIPTION

	Command = 32 _{hex} : Write constant value to data carrier, 2 Byte
	Command = 13 _{hex} : Read DSFID of a data carrier
	Command = 14 _{hex} : Write DSFID of a data carrier
	Command = 81 _{hex} : Read data carrier (USER-data), 3 Byte
	Command = 82 _{hex} : Write data carrier (USER-data), 3 Byte
	Command = 87 _{hex} : Store Auto Read start address, 3Byte
	Command = 91 _{hex} : Copy data between data carrier, 3 Byte
	Command = 92 _{hex} : Initialize CRC_16 data check, 3 Byte
	Command = B2 _{hex} : Write constant value to data carrier, 3 Byte
DB_Send	Data block for non- optimized write data. Access is via data block number or the symbolic data block name.
Offset_DBSend	Start address for write data in the data block
DB_Receive	Data block for non- optimized read data. Access is via data block number or the symbolic data block name.
Offset_DBReceive	Start address of read data in the data block
TAG_StartAddr	Read/Write start address in the data carrier.
TAG_NumbOfByte	Length in the code tag for read or write procedures. For the jobs 1 _{hex} (read), 2 _{hex} (write), 12 _{hex} write constant value, length have to be set there.
WatchdogTime	Monitoring timer for commands
CopTargetAddr	Copy data carrier. Start address target data carrier
CopRW_HeadNo	Copy data carrier. Number of read/write head that target data carrier is in front of
ProcType	Type of used processor unit: V = BIS V-6102, BIS V-6108, BIS M-4008 processor unit C = BIS C-60x2 oder BIS C-60x8 processor unit L = BIS L-60x2 oder BIS L-60x8 processor unit M = BIS M-60x2 oder BIS M-60x8 processor unit I = BIS M-4xx-xxx-001 IO-Link compact processor unit K = BIS M-4xx-xxx-401 IO-Link compact processor unit IO-Link Auswerteeinheit an Siemens IO-Link Master: X = BIS M-4xx-xxx-001 IO-Link compact processor unit Y = BIS M-4xx-xxx-401 IO-Link compact processor unit
OptIOLen	Optional input for the IO buffer length. Used with BIS C, L, M and IO-Link evaluation units. The specified length of process data are read from the processor unit.
OptIOBuffOffs	Optional input for the IO buffer offset. From the specified value, the data are read/written from the process data area of the processor unit. Used with BIS C, L, M to access the 2nd buffer. Used when multiple read/write heads use the same RFID module/slot.
DB_SendOpt	Data block with data element for optimized write data. The access takes place over the entire data element of the type Array of Byte.
DB_RecieveOpt	Data block with data element for optimized read data. The access takes place over the entire data element of the type Array of Byte..

4 FB PARAMETER DESCRIPTION

4.3 Output parameter

Ready	Job completed This bit is set when the job was completed. This output will be reset by a rising edge of Start or Reset input.
Error	Job completed with error This bit is set if the job was completed with an error and is reset with a rising edge at Reset or Start input.
ErrorCode	If the Error bit is set, the error number will be displayed here as hex value.
MT	Notification Multiple Tags are detected, more than one data carrier in range of antenna.
DatCarrPresent	Data carrier present / data valid. This bit is only true when a tag is activated from processor. Notice for VU R/W heads: After the Carrier follow-up time the bit will Change to false, even a tag is in the active range of the antenna.

4.4 Internal FB Parameters

C_Cttp	Datenträgertyp für C System. 0 = 32 Byte Blockgröße (BIS C-1__-02, -03, -04, -05) 1 = 64 Byte Blockgröße (BIS C-1__-10, -11, -12)
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ATTENTION°

The internal parameters are located in the static variables of the function block and in the corresponding instance data block. If required and exclusively used with a C processor unit, the default value can be set to TRUE for activation. Alternatively, the value can be changed by direct addressing from the user program, <InstanceDBName>;. C_Cttp.

4.5 General error codes

Error No.	Meaning	Effect	Remedy
00 _{hex}	No error		
01 _{hex}	No data carrier in range of antenna	depends on parameter Dynamic. Not relevant in dynamic mode	Check distance between code tag and read/write head
02 _{hex}	Read error	Command canceled. Processor- and FB go to base state	Check distance between code tag and read/write head
03 _{hex}	Read canceled because data carrier was removed	Command canceled. Processor- and FB go to base state	Check distance between code tag and read/write head. and read/write head. For dynamic mode: Check velocity

4 FB PARAMETER DESCRIPTION

Error No.	Meaning	Effect	Remedy
04 _{hex}	Write error	Command canceled. Processor- and FB go to base state Command Caution: Some data may have already been written to the code tag	Check distance between code tag and read/write head
05 _{hex}	Write canceled because data carrier was removed	Command canceled. Processor- and FB go to base state Command Caution: Some data may have already been written to the code tag	Check distance between code tag and read/write head. and read/write head. For dynamic mode: Check velocity
07 _{hex}	Wrong command identifier (Job) or number of bytes for read/write command is 0	Processor- and FB go to base state	Check parameter settings
09 _{hex}	Cable break on selected read/write head, r/w head not connected or r/w head defective	Command canceled. Processor- and FB go to base state	Check r/w head
0D	Communication to the R/W head disrupted	Command canceled. Processor- and FB go to base state	Check r/w head
0E _{hex}	CRC for the read data and CRC for the data carrier do not agree	Command canceled. Processor- and FB go to base state	Check data carrier
0F _{hex}	Bit headers are not equal	Processor and FB go to base state	Check programming and content of bitheaders, I/O addresses correct.
20 _{hex}	Address assignment of the read/write job is outside the memory range of the data carrier	Processor and FB go to base state	Check programming
21 _{hex}	This function is not possible for this data carrier	Processor and FB go to base state	Check data carrier
30 _{hex}	License key incorrect	Processor and FB go to base state	Check program parameters
31 _{hex}	Invalid parameter set	Processor and FB go to base state	Check program parameters
32 _{hex}	Password required	Processor and FB go to base state	Set password

4 FB PARAMETER DESCRIPTION

Error No.	Meaning	Effect	Remedy
33 _{hex}	Password invalid	Processor and FB go to base state	Set correct password
34 _{hex}	Memory area is locked	Processor and FB go to base state	Unlock Memory or tag permlocked
35 _{hex}	Value range of the parameter incorrect	Processor and FB go to base state	Check program parameters
36 _{hex}	Data Carrier selection error	Processor and FB go to base state	Select data carrier, restart commando

This error list is corresponding to the status codes in user's manual.

4.6 FB internal error codes

Error No.	Meaning	Effect	Remedy
80 _{hex}	Monitoring time expired	Processor and FB go to base state	Check programming
81 _{hex}	Undefined command	Processor and FB go to base state	Check programming
82 _{hex}	Wrong Index for select EPC commando	Processor and FB go to base state	Check programming Limit between 1 and 25
83 _{hex}	EPC length exceeds the limit	Command canceled. Processor and FB go to base state	Restart processor
84 _{hex}	EPC length exceeds the limit	Command canceled. Processor and FB go to base state	Check programming, Limit 65,534 byte
50 _{hex}	No connection to RFID module	Processor and FB go to base state	Check hardware configuration and Profinet - connection. Initialize FB again
51 _{hex}	Data could not be read from RFID module	Processor and FB go to base state	Check hardware configuration and Profinet - connection. Initialize FB again
52 _{hex}	Data could not be write to RFID module	Processor and FB go to base state	Check hardware configuration and Profinet - connection. Initialize FB again
53 _{hex}	FB Internal Error	Processor and FB go to base state	Check hardware configuration and Profinet - connection, check length of DB_Send/ DB_Receive initialize FB again

4 FB PARAMETER DESCRIPTION

4.7 Description of commandos

The commandos are selected by a hexadecimal value at the “**Command**” input. With a rising edge at “**Start**” input the commando is executed. After successful execution the “**Ready**” Output is true and “**Error**” is false.

Read data carrier 1 or 81_{hex}:

Data carrier is read from “**TAG_StartAddr_ParN**”. The amount of data is defined by the parameter “**TAG_NumbOfByte_ParB**”. The data are stored in “**DB_Receive**”. The byte offset is defined by the parameter “**Offset_DBReceive**”.

Write data carrier 2 or 82_{hex}:

The data are read out of “**DB_Send**” and written to carrier at the byte “**TAG_StartAddress_ParN**”. The amount of data is defined by the parameter “**TAG_NumbOfByte_ParB**”.

Store start address for “Auto Read” function 7 or 87_{hex}:

The “Auto Read” start address is stored in the processor EEPROM. The “Auto Read” start address is defined by the parameter “**TAG_StartAddress_ParN**”.

Type and serial number 09_{hex}:

Read the read/write head type, data carrier type and UID of data carrier in the field. The dates are stored in “**DB_Receive**”. The ReadByte [0] contains the UID length information, ReadByte [1] contains the head type, ReadByte [2] contains the data carrier type, ReadByte [3..n] contains the UID. The amount of bytes stored in ReadByte[0] are transferred to data-block.

Copy data between data carrier 11 or 91_{hex}:

Data carrier is read from “**TAG_StartAddress_ParN**”. The amount of data is defined by the parameter “**TAG_NumbOfByte_ParB**”. The data are copied too the r/w head selected with FB input “**CopRW_HeadNo**”. The data are moved to the target data carrier, starting at “**CopTargetAddr**”.

Initialize CRC 16 data check 12 or 92_{hex}:

The data are read out of “**DB_Send**” and written to carrier at the byte “**TAG_StartAddress**” with CRC_16 checksum. The amount of data is defined by the parameter “**TAG_NumbOfByte**”. Parameter CRC must be selected for data carrier initialization, otherwise the command behaves the same as 02_{hex} write data carrier.

Write constant value to data carrier 32 or B2_{hex}:

Constant values are written to data carrier the parameter for start byte on tag is “**TAG_StartAddress**”. The amount of constant values is defined by the parameter “**TAG_NumbOfByte**”. The data byte for constant value is read from “**DB_Send**”.

Read DSFID 13_{hex}:

Read Data Structure Format Identifier of a data carrier in the field. The data is stored in the “**DB_Receive**”. The ReadByte [0] contains the DSFID of the data carrier.

Write DSFID 14_{hex}:

Write Data Structure Format Identifier of a data carrier in the field. The data is taken from the “**DB_Send**”. The SendByte [0] contains the DSFID of the data carrier. The length is one byte.

Please refer to BIS V-61 or BIS VU manual for further information.**

5 DIACLAIMER OF LIABILITY

This demo function block is free of charge and is a universal application example. This demo function block shall help program and configure PLC applications and shall provide possible solutions.

The user is not entitled to claim for warranty, error correction and updates. In particular there is excluded any claims against Balluff GmbH for damages that might result from the use of this demo program. Excluded from this limitation of liability shall be (a) those damages that are based on injury to life, limb or health, (b) a liability according to the Produkthaftungs-gesetz (German Product Liability Law) and (c) cases of willful intent.

Please check if the function block is intended for your application before adapting it in plants and machineries.

By using the S7 sample, made available free of charge you accept the limitation of warranty and liability!

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Valid from function block version 1.0 • F19; Subject to change.