

SIMATIC

V1SL

Supplementary Description

Firmware for Siemens ASIC DPC31
DPV1

Version 1.0

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We have checked the contents of this manual for agreement with the hardware and software described. Since deviations cannot be ruled out, we cannot guarantee full agreement. However, the data in this manual is reviewed regularly and any necessary corrections are included in subsequent editions. Suggestions for improvement are welcomed.

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Technische Änderungen vorbehalten.

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1 Isochronous Mode

For closed loop control systems, a sync clock can be generated at the DP master as well as the DP slave after sending/receiving the last bit of the first 'global control message'.

1.1 DPC31

After the receipt of the last bit of a 'global control message', the DPC31 can generate a sync clock under a specific group. This sync clock (low-active pulse of 2 to 3 µsec) is read out on Port PB₂, and in addition, the interrupt 'GC_Clock' is generated.

1.2 Setting for pbc_open_device in V1SL

1.2.1 Detailed Info Structure of the PBC Driver

V1SL_STRUC_PBC_DETAIL (pbc_open_device()/V1SL_PBC_GET_PATH_INFO())		
SubStructure ac.dpc31		
Parameter	Type/Value	Description
c0_dx_tact_beat_out	Unsigned8 / OR logic of the following possible values: PBC_DPC31_DX_OUT PBC_DPC31_TACT_BEAT_OUT	Activation of HW signals triggered by the bus: <ul style="list-style-type: none"> • Not set: the C31 core in the PBC DPC31 controls HW port P_{B3} • Set: the receipt of new output data controls HW port P_{B3} • Not Set: the C31 core in the PBC DPC31 controls HW port P_{B2} • Set: the receipt of a special global control message (sync clock,...) controls HW port P_{B2}; in addition, the following element has to be filled in: <i>c0_tact_group</i>
c0_tact_group	Unsigned8	Group mask value of a global control message that the PBC DPC31 handles as sync clock.

c0_dx_tact_beat_out (DPC31)		
Symbolic Value	Numerical Value	Description
PBC_DPC31_DX_OUT	0x40	The receipt of new output data controls HW port P _{B3}
PBC_DPC31_TACT_BEAT_OUT	0x20	The receipt of a special global control message (sync clock, refer to ...) controls HW port P _{B2}

2 DATA-eXchange Broadcast (DXB)

2.1 General

A function is provided that makes exchanging data by one slave with other slaves possible.

2.2 Publisher Functionality

Publisher operation is activated if it is not explicitly switched off with V1SL. If the DPC31 is addressed with a special call service (DXB request), it responds under the broadcast address.

2.3 Subscriber Functionality

The subscriber (SC) functionality supported by V1SL builds on the capabilities provided by the PBC DPC31 on the HW side. These can be operated only in connection with the C0 FW, not independent of it. V1SL does not provide for subscriber operation of other PBCs. The PBC DPC31 supports the setup of lateral data communication connections on the part of PROFIBUS DP (service 'Set_DDB_Prm') and on the part of the user (via external input). However, both capabilities can not be used at the same time. When setting up the slave quantity frame (*v1sl_c0_add()*), the user has to specify the type he wants.

The lateral communication connections that the slave is to utilize are described in a so-called filter table. It is provided in detail below.

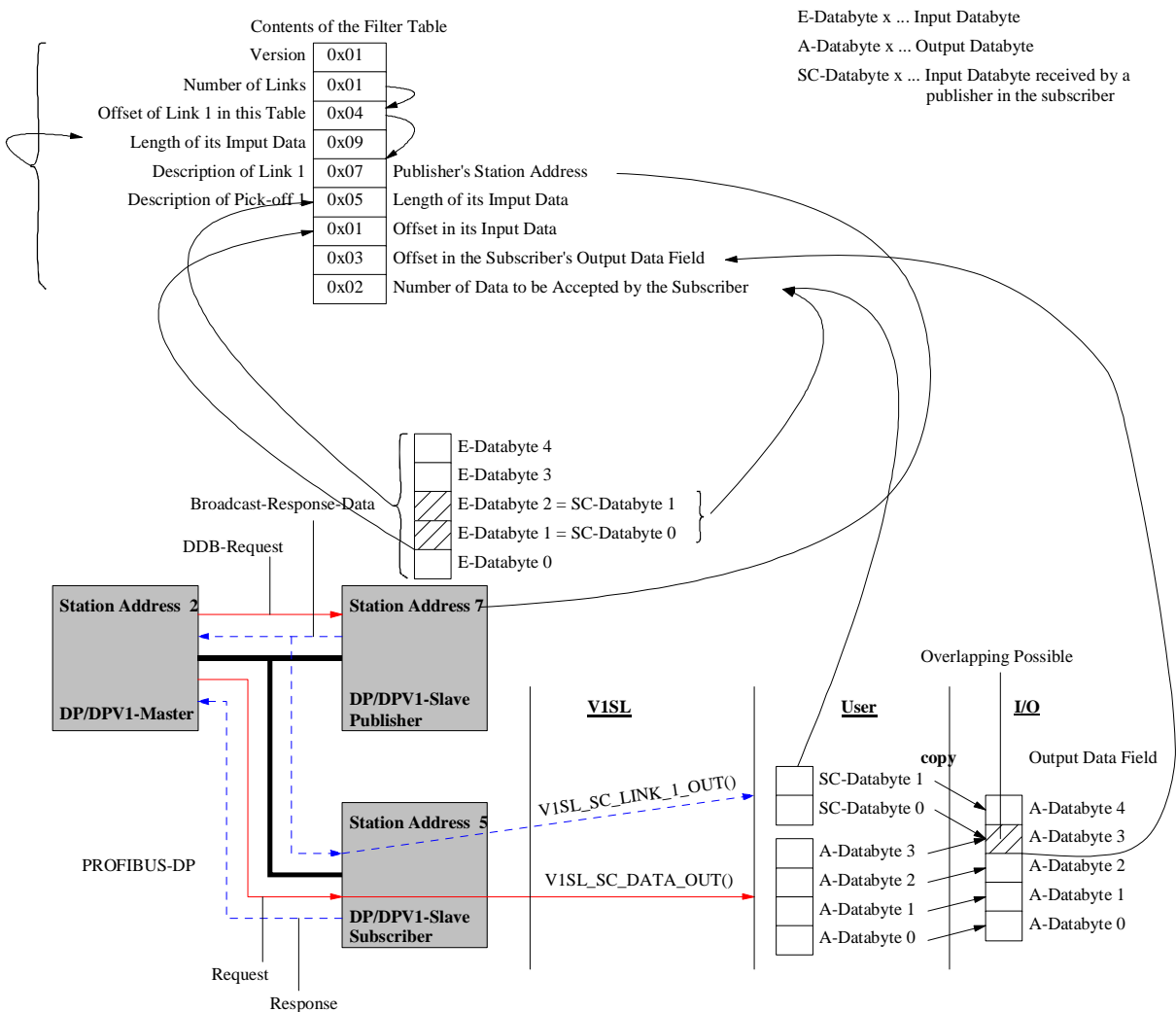
2.3.1 Description of Lateral Communication Connections

The filter table specifies which bus stations (publishers) are to listen in on (filter) which data. In addition, the table includes the information where the data of the publishers is to appear in the slave's output data area (mapping). The latter value is not used by V1SL. Table 1 below shows the structure of the filter table. The DPC31 can process lateral communication data from a maximum of $m = 8$ different bus stations. A lateral communication connection is also called a link.

Structure	Structure Element Description
Header (Start)	<ul style="list-style-type: none"> Version ID
	<ul style="list-style-type: none"> Number of links m
	<ul style="list-style-type: none"> Offset of the data for describing Link 1 in this filter table
	... Offsets of additional links ...
Header (End)	<ul style="list-style-type: none"> Offset of the data to describe Link m in this filter table
Link 1 (Start)	<ul style="list-style-type: none"> PROFIBUS address of Publisher 1
	<ul style="list-style-type: none"> Input data length of Publisher 1
Pick-Off 1 (Start)	<ul style="list-style-type: none"> Offset in the input data of Publisher 1 beginning with which it 'listens in on' the data.
	<ul style="list-style-type: none"> Destination offset of the data in the subscriber's output data area
Pick-Off 1 (End)	<ul style="list-style-type: none"> Length of the data that Publisher 1 'listens in on', starting with the offset in the input data.
...	... Data of additional pick-offs ...
Pick-Off i	<ul style="list-style-type: none"> Offset in the input data of Publisher 1 beginning with which it 'listens in on' the data.
	<ul style="list-style-type: none"> Destination offset of the data in the subscriber's output data area
Pick-Off n (End)	<ul style="list-style-type: none"> Length of the data that Publisher 1 'listens in on', starting with the offset in the input data ..
Link 1 (End)	
...	... Data of additional links including pick-offs ...
Link m (Start)	<ul style="list-style-type: none"> PROFIBUS source address of Publisher m

	<ul style="list-style-type: none"> • Input data length of Publisher m
Pick-Off 1 (Start)	<ul style="list-style-type: none"> • Offset in the input data of Publisher m beginning with which it 'listens in on' the data
Pick-Off 1 (End)	<ul style="list-style-type: none"> • Destination offset of the data in the subscriber's output data area
...	... Data of additional pick-offs ...
Pick-Off j (Start)	<ul style="list-style-type: none"> • Offset in the input data of Publisher m beginning with which it 'listens in on' the data
Pick-Off j (End)	<ul style="list-style-type: none"> • Destination offset of the data in the subscriber's output data area
Pick-Off n (End) Link m (End)	<ul style="list-style-type: none"> • Length of the data that Publisher m 'listens in on', starting with the offset in the input data.

Table 1: Structure of the SC Filter Table for Lateral Data Communication



2.3.1.1 Setting Up Lateral Data Communication with 'Set_DDB_Prm' Message

V1SL signals the receipt of a 'Set_DDB_Prm' message via the output macro `V1SL_SC_NEW_PRM()` exclusively in the DP state `V1SL_DP_STATE_NO_DATA_EX`. The User has to check the filter table sent with the message by the parameter assignment master regarding accuracy. For this, the User also uses the setpoint configuration data that the V1SL transfers to the User with `V1SL_CO_NEW_CFG()`.

After the User has checked the filter table, the User has to communicate the result of the check to V1SL by calling the function `v1sl_sc_set_filter_table()`. Depending on the result of the check, the slave responds as follows:

- **Check positive:** If the parameter assignment data and the setpoint configuring data was confirmed positive, the slave changes to the DP state `V1SL_DP_STATE_DATA_EX`. During this state change, receipt of the lateral communication data begins from the publishers specified in the filter table, if they transmit data.
- **Check negative:** In its diagnostic data, the slave sets the configuration error bit (`Cfg_Fault`) and returns to its unparameterized state.

In the DP state `V1SL_DP_STATE_DATA_EX`, 'Set_DDB_Prm' messages sent by the parameter assignment master lead to the reset of the slave, and thus to exiting the DP state `V1SL_DP_STATE_DATA_EX`. With each exit by the slave from the DP state `V1SL_DP_STATE_DATA_EX`, the lateral data communication in the slave stops. It can only be reactivated with a new valid 'Set_DDB_Prm' message from the parameter assignment master.

2.3.1.2 Setting Up Lateral Data Communication with Input on the User-Side

The user receives the filter table that describes the individual lateral communication connections to the publishers from a higher level instance (for example, from a configuring tool for automation systems via asynchronous transmission services). By calling the function `v1sl_sc_set_filter_table()`, the User can send this filter table to V1SL. Recording the lateral communication data is activated whenever the slave enters the DO state `V1SL_DP_STATE_DATA_EX`.

By the User inputting the filter table, it is possible to reset lateral communication connections that may already have been set up, or to deactivate them. For this, the User has to send to V1SL an additional filter table that describes the new lateral communication connections. This is also done by calling the function `v1sl_sc_set_filter_table()`. Whenever the slave exits the DP state `V1SL_DP_STATE_DATA_EX`, data traffic in the slave stops. When the slave returns to the DP state `V1SL_DP_STATE_DATA_EX`, lateral data traffic is reactivated with the last filter table sent by the User.

2.3.1.3 Receipt of Lateral Communication Data / Publisher Return or Failure

Lateral communication data can be received by the slave after the transfer of a filter table to V1SL, and only in the DP state `V1SL_DP_STATE_DATA_EX`. The user cyclically polls V1SL regarding the presence of new lateral communication data, using the input function `v1sl_sc_get_link_info()`. The User is informed of new data having arrived from which publishers, and receives the pointer to this data. In addition, it is indicated which publishers are active, and which have failed and are not supplying data.

2.3.1.4 Input Functions of SC at the User Interface

2.3.1.4.1 Confirmation/Transfer of a Lateral Communication Table

Prototype:

```
Unsigned8 v1sl_IFA_CODE_ATTR v1sl_sc_set_filter_table  
(V1SL_HUGE_UNSIGNED8_PTR ptr, Unsigned8 len)
```

By calling the function, the User activates a slave as subscriber. Lateral communication connections are initialized, using a transferred filter table.

The effect of the call, and the transfer parameters of the function depend on from where the User expects the filter table. The User has to specify the latter when the slave quantity frame is set up (*v1sl_c0_add()*).

If the User expects the filter table via a 'Set_DDB_Prm' message, and such a message is indicated (*V1SL_SC_NEW_PRM()*), the following has to be done:

- The User has to check the filter table included in the 'Set_DDB-Prm'
- If the lateral communication connections specified in the filter table correspond to the User's expectations, the pointer to the data of the 'Set_DDB Prm' message of the function *v1sl_sc_set_filter_table()* has to be transferred as parameter.

Note: As long as the User -if the check results are positive- has not transferred the filter table to the V1SL, the slave won't enter the *V1SL_DP_STATE_DATA_EX* state.

- If the filter table does not meet the User's expectations, a NIL pointer has to be transferred to the function *v1sl_sc_set_filter_table()*. The call parameter *len* is then of no significance.

If the User expects a filter table from a higher level instance, the following has to be done to activate the lateral communication connections:

- The User transfers the pointer (*ptr*) to a filter table and its length (*len*) the the V1SL.
- V1SL activates the lateral communication connections described in the filter table as the slave enters the DP state *V1SL_DP_STATE_DATA_EX*.
- If the User's requirements change regarding the lateral communication connections, the User can dynamically set up new lateral communication connections in any DP state by transferring the pointer to another filter table and its length.
- If the User no longer wants lateral communication connections, the V1SL has to be informed of this with the transfer parameter *len = 0*. The call parameter *ptr* is then of no significance.

Calling the function is possible only after the C0 slave quantity frame has been set up (input function *v1sl_c0_add()*).

Input Function		v1sl_sc_set_filter_table
Meaning		Confirmation/Transfer of a lateral communication filter table
Transfer:		
Parameters	Value Range	Meaning
<i>ptr</i>	NIL otherwise	Rejection of a filter table signalled via <i>V1SL_SC_NEW_PRM()</i> Description of the lateral communication connections: <ul style="list-style-type: none"> • When a filter table is signalled via <i>V1SL_SC_NEW_PRM()</i>, the pointer received has to be transferred here. • Otherwise, the User has to transfer the pointer to the filter table received by a higher level instance.
<i>len</i>	000 007..255	Length of the filter table: <ul style="list-style-type: none"> • Rejection of the filter table signalled via <i>V1SL_SC_NEW_PRM()</i> • Deletion of a filter table specified by the User • Length of the filter table
Return		
Value Range	Meaning	
V1SL_OK V1SL_ERR_SEQUENCE V1SL_ERR_PARAMETER	<ul style="list-style-type: none"> • Faultless execution • Communication channel not open, or quantity frame not set up • Filter table is faulty, or quantity frame is insufficient for setting up the data buffers for the lateral communication connections 	
Corresponding Output Macros		
V1SL_SC_NEW_PRM()		

2.3.1.4.2 Fetching a Pointer to the Link- and Output Data Buffers and their States

Prototype:

```
Unsigned8 V1SL_IFA_CODE_ATTR v1sl_sc_get_link_info (V1SL_IFA_LINK_INFO_PTR link)
```

By calling this function, the User can determine the current data buffers of the publishers assigned to the lateral communication links. In addition, the function provides information about the state of the data in these buffers, and the states of the individual publishers:

- A data buffer contains data that the User has not processed yet
- A publisher supplies lateral communication data for a link
- A publisher and therefore a link has failed

The service is processed synchronously; there is no explicit acknowledgement via an output macro.

When the User has fetched the link and output data buffers from the V1SL, and the slave then signals exiting the DP state *V1SL_DP_STATE_DATA_EX*, the User has to cancel access to the fetched buffers. Moreover, the User has to attempt to receive new link- and output data buffers from the slave. This method ensures the rearrangement of the exchange buffers in the V1SI, and prevents the User from accessing inconsistent data.

This function can be called when the C0 quantity frame is set up.

Input Function:		v1sl_sc_get_link_info
Meaning:	Fetch pointer to link- and output data buffers and their states	
Transfer		
Parameter	Value Range	Meaning
link	(refer to Item ...)	Pointer to a User data structure not preassigned. When returning from this function, the V1SL entered in this structure the current link- and output data buffers and their states.
Return:		
Value Range	Meaning	
V1SL_OK	• Faultless execution	
V1SL_ERR_SEQUENCE	• Communication channel not open, or quantity frame not set up	
Corresponding output macros		

2.3.1.4.2.1 SC-Link Data Info Structure and Pointers

V1SL_STRUC_LINK_INFO (v1sl_c0_get_link_info())		
Parameters	Type/Value	Description
link_ptr_0	V1SL_LL_UNSIGNED8_PTR	Pointer to Link 0 data buffer. It is valid only if in <i>link.state_bit_field</i> Bit 0 == 1. It is a new data buffer as against the last poll if <i>link.new_data_bit_field</i> Bit 0 == 1.
link_ptr_1	V1SL_LL_UNSIGNED8_PTR	...
link_ptr_2	V1SL_LL_UNSIGNED8_PTR	...
link_ptr_3	V1SL_LL_UNSIGNED8_PTR	...
link_ptr_4	V1SL_LL_UNSIGNED8_PTR	...
link_ptr_5	V1SL_LL_UNSIGNED8_PTR	...
link_ptr_6	V1SL_LL_UNSIGNED8_PTR	...

link_ptr_7	V1SL_LL_UNSIGNED8_PTR	Pointer to data buffer of Link 7. It is valid only if in in <i>as.sc_link.state_bit_field</i> Bit 7 == 1. It is a new data buffer as against the last poll if <i>as.sc_link.new_data_bit_field</i> Bit 7 == 1.
output_ptr	V1SL_LL_UNSIGNED8_PTR	Pointer to the output data of the parameter assignment master (refer to Item ...)
link_state	Unsigned8	Bit field that indicates whether a link or a publisher associated with a link is sending data (Bit x == 1) or not (Bit x == 0). Bit 0 → Link 0, ..., Bit 7 → Link 7
link_ptr_state	Unsigned8	Bit field that indicates whether the pointer to a link data buffer is new as against a previous poll (Bit x == 1) or not (Bit x == 0). Bit 0 → Link 0, ..., Bit 7 → Link 7
output_ptr_state	Unsigned8	State of the output buffer of the parameter assignment master and global control supplementary information (refer to Item ...)
Parameter Type	Value	Description
V1SL_IFA_LINK_INFO_PTR	V1SL_STRUC_LINK_INFO V1SL_IFA_DATA_ATTR *	Type of pointer to the link- and output data info structure

2.4 Setting for pbc_open_device in V1SL

2.4.1 Detail Info Structure of the PBC Driver

V1SL_STRUC_PBC_DETAIL (pbc_open_device()/V1SL_PBC_GET_PATH_INFO()) SubStructure as.dpc31		
Parameters	Type/Value	Description
c0_sub_funcnt	Unsigned8 / OR-logic of the following possible values (refer to ...) V1SL_SUB_FUNCNT_C0_NO_PUBLISHER V1SL_SUB_FUNCNT_SC_PRM_SAP	Switches off the publisher functionality Additional (for subscriber functionality) utilization of the 'DDB Prm SAP' (SAP 53) for receiving a filter table via this SAP Activate alarm acknowledgements (refer to Item):
sc_filter_table_len	Unsigned8 / 000 001..007 007..255	Maximum length of the filter table for lateral data communication (refer to Item): <ul style="list-style-type: none">Deactivates subscriber functionalityPermissible length; the following elements with the prefix <i>sc_</i> are of importance for filling outImpermissible length
sc_link_0_len	Unsigned8 / 000..244	Maximum length of the picked-off net data for Link 0

sc_link_1_len	Unsigned8 / 000..244	Maximum length of the picked-off net data for Link 1
sc_link_2_len	Unsigned8 / 000..244	Maximum length of the picked-off net data for Link 2
sc_link_3_len	Unsigned8 / 000..244	Maximum length of the picked-off net data for Link 3
sc_link_4_len	Unsigned8 / 000..244	Maximum length of the picked-off net data for Link 4
sc_link_5_len	Unsigned8 / 000..244	Maximum length of the picked-off net data for Link 5
sc_link_6_len	Unsigned8 / 000..244	Maximum length of the picked-off net data for Link 6
sc_link_7_len	Unsigned8 / 000..244	Maximum length of the picked-off net data for Link 7

2.5 Setting for v1sl_c0_add in V1SL

2.5.1 C0-Parameter Structure and Pointers

V1SL_STRUC_C0_PARAMETER_SET (v1sl_c0_add())		
Parameters	Type/Value	Description
c0_sub_components	Unsigned8 / V1SL_C0_SUB_COMPONENT S_SC	OR logic of different operating modes Utilization of the subscriber services desired by the User (this is possible only if the SC subFW is generated)
c0_sub_func	Unsigned8 / V1SL_SUB_FUNCT_C0_NO_P UBLISHER V1SL_SUB_FUNCT_SC_PRM _SAP	OR logic of different subfunctions Switches off the publisher functionality In the case of a subscriber slave, the filter table is received exclusively via SAP 53. As a prerequisite, the subscriber operation has to be activated with the assignment of sc_filter_table_len >= 7 .

2.5.1.1 Slave SubComponents

c0_sub_components (V1SL_STRUC_C0_PARAMETER_SET)		
Symbolic Value	Numerical Value	Description
V1SL_C0_SUB_COMPONENTS_SC	0x08	Utilization of the subscriber services desired by the User (possible only if the SC subFW is generated)

2.5.1.2 Slave SubFunctions

c0_sub_func (V1SL_SYS_PBC_DETAIL_PTR) (V1SL_STRUC_C0_PARAMETER_SET)		
Symbolic Value	Numerical Value	Description
V1SL_SUB_FUNCT_C0_NO_PUBLISHER	0x04	Switches off the publisher functionality

V1SI_SUB_FUNCT_SC_PRM_SAP	0x10	Sets up the SAP 53 for receiving the DDB PRM message
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3 Addresses

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4 Order Numbers

The DPC31 can be ordered locally from your Siemens contact person. Please use the following order numbers, arranged by quantities ordered:

Product	Order Number	Shipping Units	Quantity Units
ASIC DPC 31	6ES7 195-0BE01-0XA0	Small Package	5
	6ES7 195-0BE11-0XA0	Single Tray	60
	6ES7 195-0BE21-0XA0	Tray Box	300
	6ES7 195-0BE31-0XA0	17 Tray Boxes	5100
	6ES7 195-0BE41-0XA0	34 Tray Boxes	10200
FW DPV1 DPC 31	6ES7 195-2BB00-0XA0	Diskette	