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Industrial Solutions and Services

PCS 7 Driver Block Siprotec UM6x

Driver Block for
SIMATIC S7-400 / PCS7 V6
connected with
**SIEMENS SIPROTEC4
Multifunction Protection relay**
over Profibus DP with Y-Switch

IT Plant Solutions

Further information:

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1. Software-Requirements and use conditions

The library requires **SIMATIC STEP7 V5**.
The blocks are executable in the CPU S7-41X.

A license is necessary for the use of the driver library.

To use the blocks, you will need a license for each CPU.

The necessary GSD file is delivered by Siemens.

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2. Solution principle

Redundant mode with Y-Link

The devices SIPROTEC 4 (7UM6x) are connected with the Y-Link device to SIMATIC S7 H.
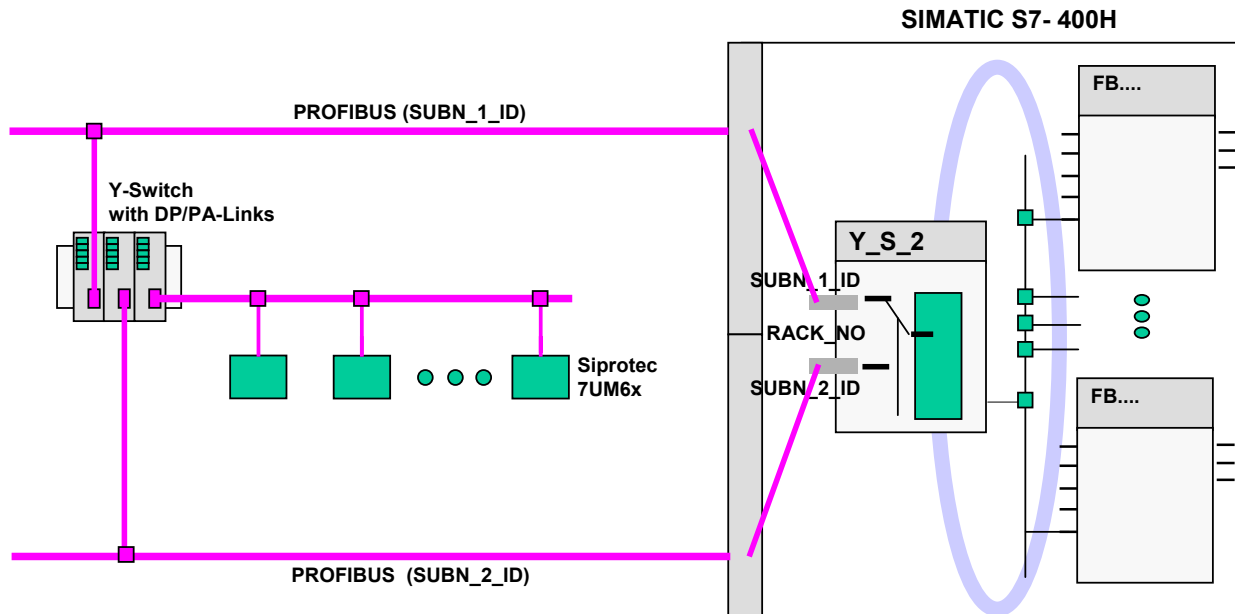
The hardware needed for the Y-link system is listed in the following table.

Component	Amount	Reference number
PS 407 10A	2	6ES7 307-1BA00-0AA0
SIMATIC DP/PA Link IM 157	2	6ES7 157-0AA82-0XA0
Y-COUPLER	1	6ES7 197-1LB00-0XA0
Bus module BM IM 157/ IM157	1	6ES7 195-7HD80-0XA0
Bus module Y-Coupler	1	6ES7 654-7HY00-0XA0

This documentation concerns SIPROTEC4-Devices:

Device 7UM6x	Firmware As of Version	PROFIBUS-DP communication module as of Version
7UM61	4.0	01.03.01
7UM62	4.10	02.00.05.

3. Installation

3.1.   Step 7 block library

The block is supplied as archived Step 7 library with the file name **Lib_PCS7_SIP-UM6x_V22_[Y2].zip** (xx: version).
The library is retrieved over the SIMATIC MANAGER. As target directory the catalogue **SIEMENS\STEP7\S7libs** is indicated.

After the installation the driver blocks are available in the block library **SIP_UM6x_Y2_Vxx**.

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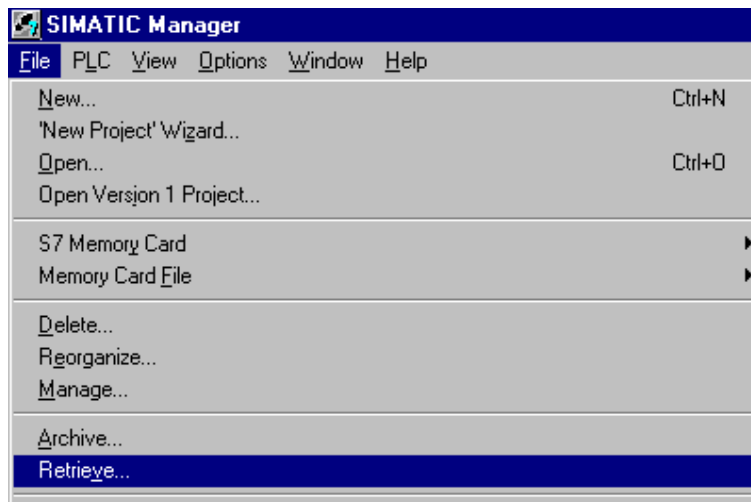
3.2. SIMATIC MANAGER – Hardware Config

3.2.1. GSD-File

You receive the actual necessary GSD file with the device from Siemens, or over the PNO (Profibus Nutzer Organisation).

Copy the GSD-File **siem80a1.gsd** in the Step7-directory **S7data\Gsd.**
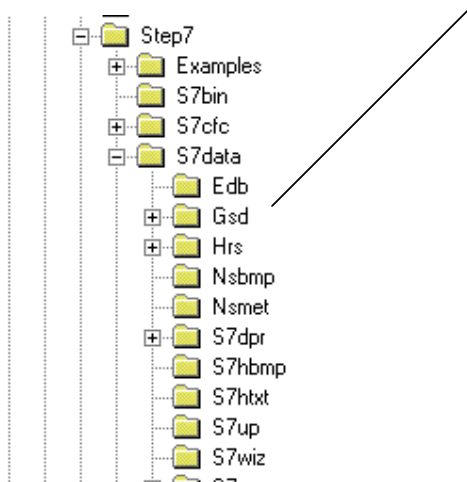
In order to insert the device in the SIMATIC Hardware catalogue (Profibus-DP) in SIMATIC - Manager (Hardware Config), you have to activate in the menu „options" the following:

<p align="center">**'Options → Update Catalog'**</p>
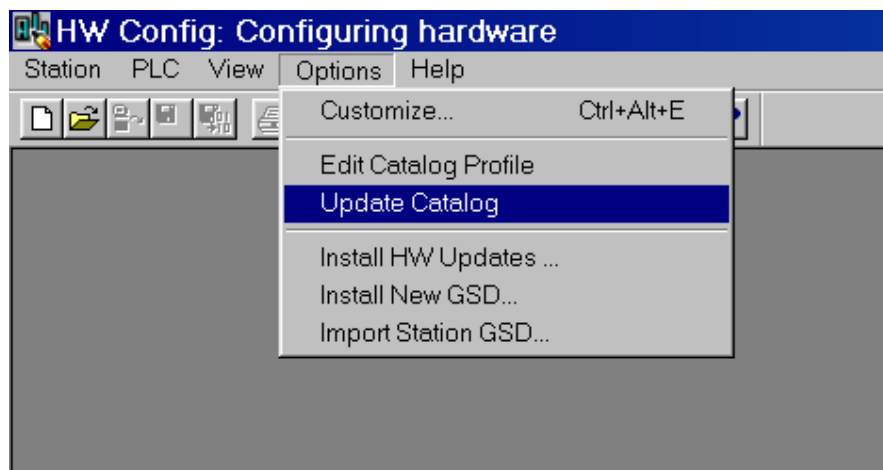
3.2.2. Hardware catalog

To configure the Hardware you have to select the DP slave Siprotec from the folder Siprotec.
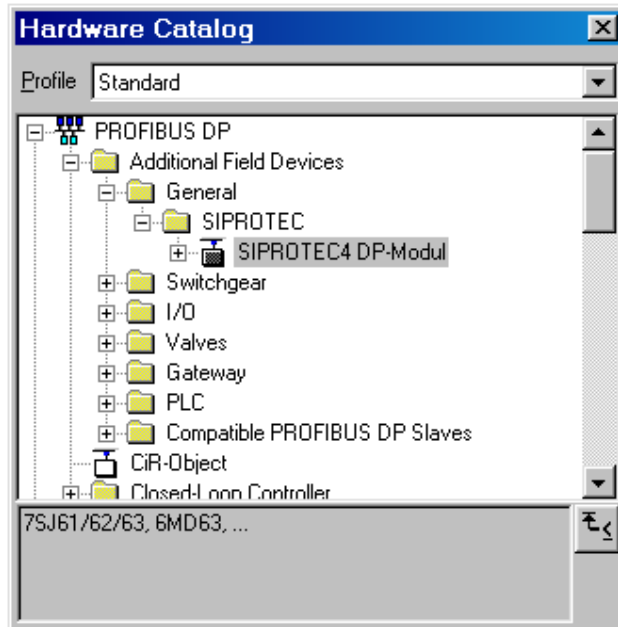
For a redundant system you also need to use the DP/PA link IM 157 with the identification number given previously.
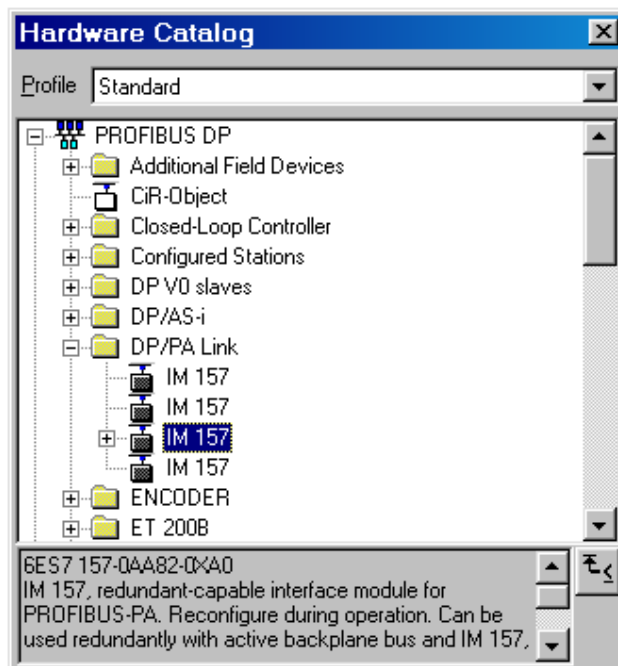
3.2.3. Hardware Configuration

<u>**Stand-alone CPU:**</u>
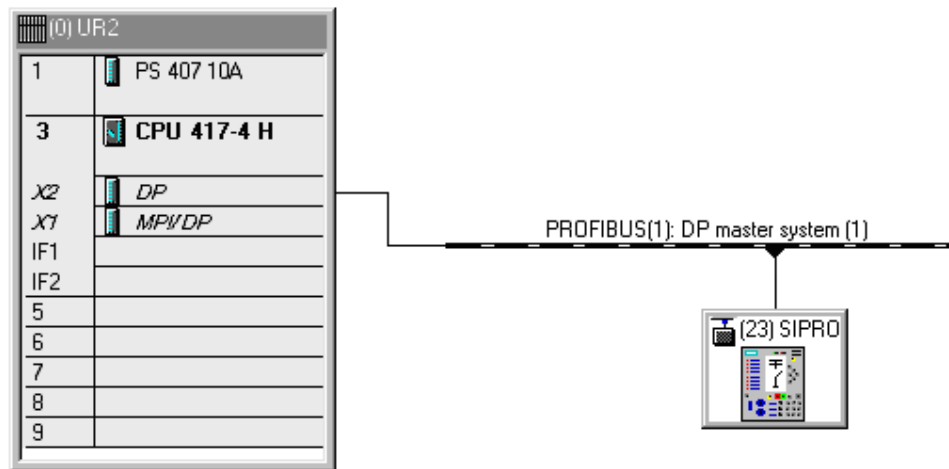
HW configuration with one Siprotec device

<u>**Redundant System:**</u>
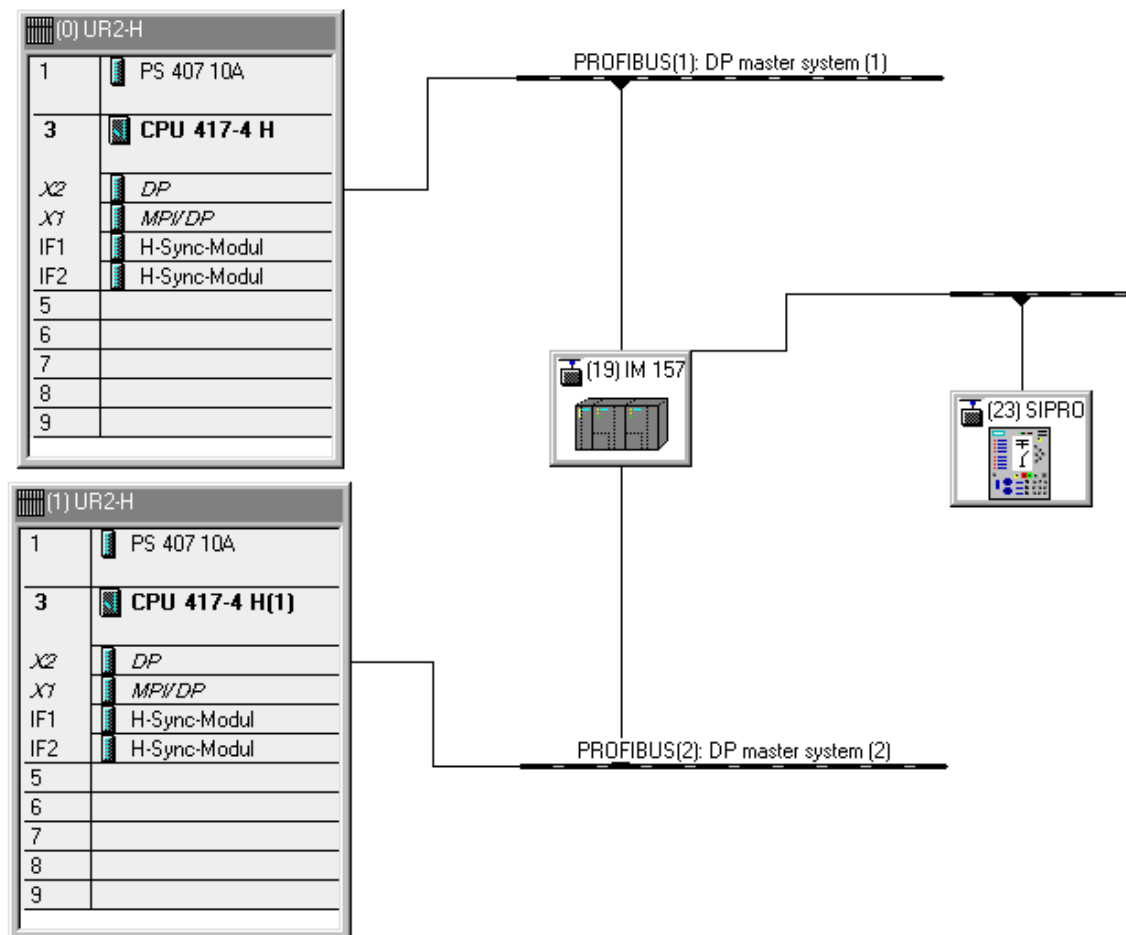
Siprotec device with an H-System

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The Profibus DP/PA Link must be configured as DP Master system:
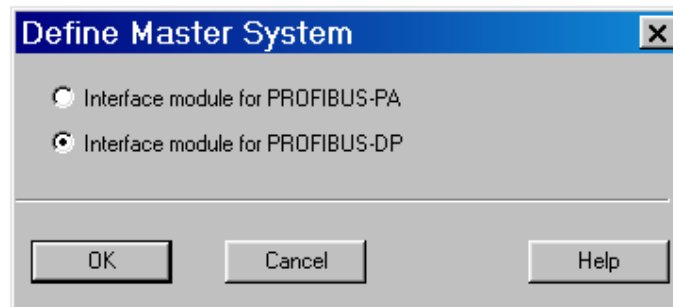
The Profibus Master system (CP or at the CPU) must be configured as DP Master system:
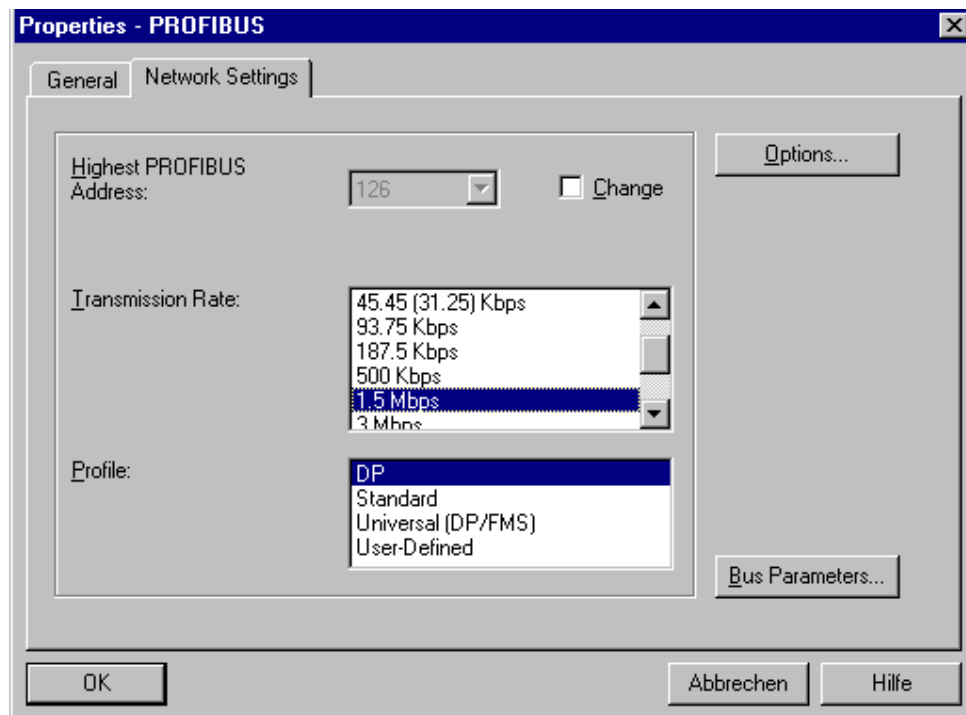
By projection over the DP Master system, you can choose the slave addresses between 3 and 125.
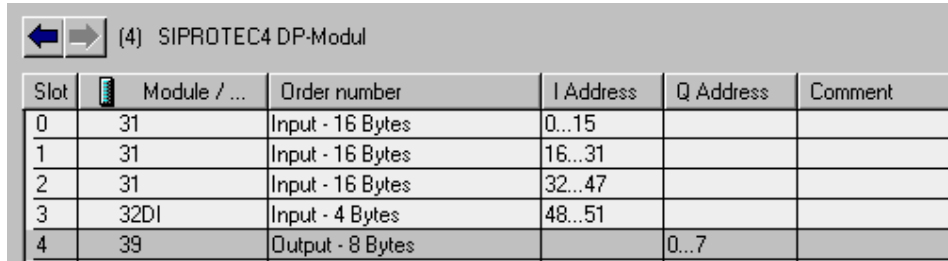
⚠ **ATTENTION!!**

- *When there are many different devices projected over the DP bus, the devices, which work with the Y-link, have to be addressed first.*
  That means that they get the lower addresses.

- The number of slaves that you can project over the DP bus is limited:
  - Up to 64 devices can be connected to the Y-link
  - The total of modules belonging to the devices connected to the Y-link is limited to 236
  - The Profibus telegram supports a maximum of 244 input bytes and 244 output bytes.

By the configuration of the PROFIBUS-DP Slave of the SIPROTEC4-Device, starting point is standard mapping for the device parameterisation:

7UM61 standard mapping 2-1	Telegram data: - 52 Bytes Input - 8 Bytes Output
7UM62 standard mapping 3-1	Telegram data: - 68 Bytes Input - 8 Bytes Output

Slot	Module / ...	Order number	I Address	Q Address	Comment
0	31	Input - 16 Bytes	0...15		
1	31	Input - 16 Bytes	16...31		
2	31	Input - 16 Bytes	32...47		
3	32DI	Input - 4 Bytes	48...51		
4	39	Output - 8 Bytes		0...7	

Example: Configuration of the SIPROTEC4 DP-Module for 7UM61

3.2.4. Project planning tips

Run sequence:

Before to download in the CPU, you have to check the run sequence (see CFC Menu: Edit\Run sequence).
In all OBs (70, 72, 82, 85, 86, 100, 122, cyclic interrupt OB), **Y_S_2** driver block have to be projected at the beginning of the sequence.
The driver blocks of device such as **SIP7UM61**,... etc has to be projected after it.
You have also to pay attention to the fact that RACK or SUBNET Block have not to be integrated before.

HKIR:

You have to use CPU Firmware as of 3.0. By HKIR, you have the possibility to erase or to insert slaves over the non redundant bus. For the Y Link, that means a telegram construction change. To be sure that the present slaves won't be disturbed during the HKIR, you can set the input **LGCADRON** to 1 before this action. You have also to check before, that **LGCADR_0**, **LGCADR_1**… match the logical addresses in Hardware Config. You can reset the input **LGCADRON** after the HKIR. In any case, the input **RACK_NO** must be always correctly parameterised, also when **LGCADRON** is switched on (for the diagnosis analysis).

3.3. Device parameterisation multifunction protection relay

To parameterise the device you have to use the software **DIGSI valid from Version 4.21**.

Each device has many possibility of standard mapping, which provide an assignment of device data object to Profibus DP telegram position. This standard allocation will be changed for the transfer of the measured values over Profibus DP and the display of the FB-Parameter.
The change of the measured value conversion in device (scaling) takes place in DIGSI-Manager \ Parameter \ Assignment in Object properties- Dialog window of the measured value through choice of a scaling index.
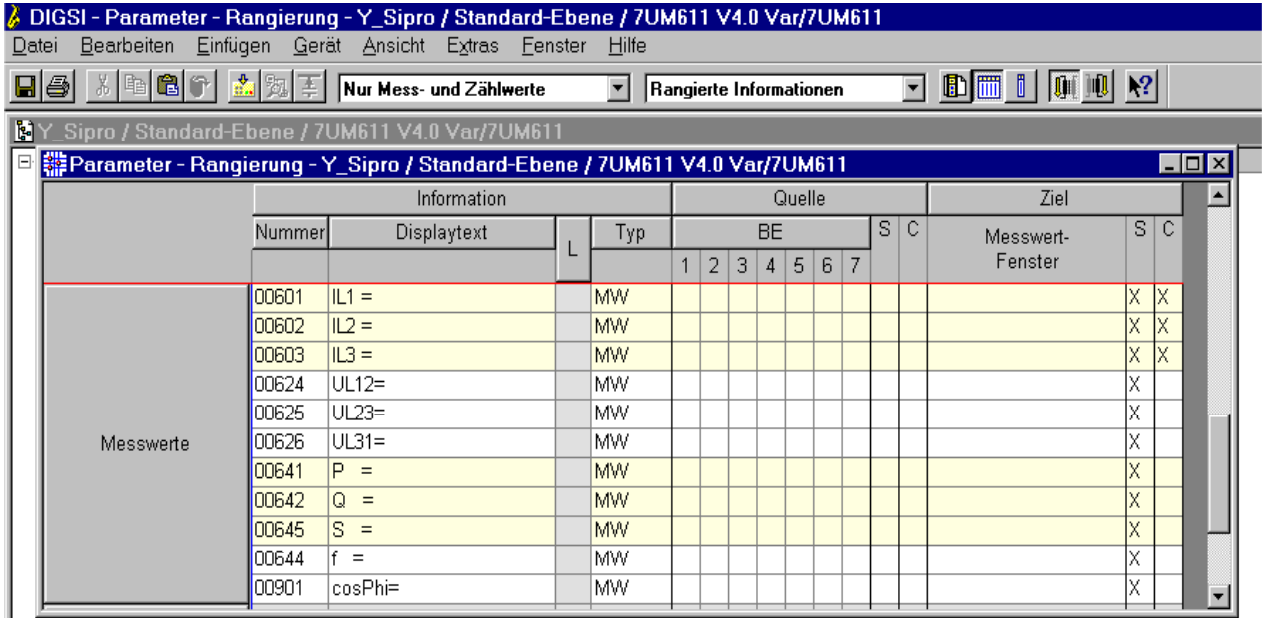
The unit of the measured value will be automatically assigned and act by primary values in accordance with the parameterised nominal values of the primary power system (DIGSI: Power system data1 and Power system data 2).

Attention: After change of bus specific parameters (for example PROFIBUS-DP Slave address) all scaling will be reset to the default values using DIGSI till V4.3.

3.3.1. Parameterization 7UM61

Starting with standard mapping 2-1 of the device 7UM61, the measured values have to be allocated to the target system interface as follow using DIGSI:

Byte Offset	Object No	Measured value	Scaling-index
14	*601*	IA	2
16	*602*	IB	2
18	*603*	IC	2
20	*624*	Va-b	2
22	*625*	Vb-c	2
24	*626*	Vc-a	2
26	*641*	P	1
28	*642*	Q	1
30	*645*	S	1
32	*644*	f	0
34	*901*	cos(PHI)	0

3.3.2. Parameterization 7UM62

Starting with standard mapping 3-1 of device 7UM62 the measured and counter values will be allocated as follow using:

Byte Offset	Object No	Measured Value	Scaling index
20	*624*	Va-b	2
22	*625*	Vb-c	2
24	*626*	Vc-a	2
26	*641*	P	1
28	*642*	Q	1
30	*645*	S	1
32	*644*	f	0
34	*901*	cos(PHI)	0
36	*721*	IAS1	2
38	*722*	IBS1	2
40	*723*	ICS1	2
44	*627*	UE	0
46	*621*	UL1E	2
48	*622*	UL2E	2
50	*623*	UL3E	2
52	*888*	WpImp	1
56	*889*	WqImp	1

4. Description of the function blocks

4.1.   Function block Y_S_2

Type / Number   FB 452

4.1.1.   Function and Operating principle

The function block **Y_S_2** forms the interface between the Y-link also known as Y-Switch (2 DP/PA Links + Y-Coupler) and the blocks of the SIMATIC PCS7 libraries. It also can be interconnected with other SIMATIC S7 blocks.
It can only be used on a SIMATIC S7 with PROFIBUS-DP master properties. Beyond it the CPU must possess the reporting ability with ALARM_8P.

For all the devices connected to a Y-link, the associated function blocks have to be connected via the output **RACK_CONNECT** to the **Y_S_2** block with the input **CONNECT**.

The inputs **RACK_NO** (Y-link Profibus address), **SUBN_1_ID** (primary DP-Master number) and **SUBN_2_ID** (redundant DP-Master number) must be specified like projected in Hardware Configuration.
The input **CP_ON** must be set to 1, if the PROFIBUS DP connection is realised with CPs (e.g. CP 443-5 Ext.).

With the input **EN_MSG=1** the PLC Process Control Messages will be enabled.
If the DP master is configured with the DP mode "DPv1", the input **DPV1_MODE** must be set to 1 otherwise it has to be set to 0.

In addition the function **FC 501** (GET_DBN) have to exist in the block folder of the project.

4.1.2.   Calling OBs

The block can be installed alternatively in the following OBs:
   • Watchdog interrupt OB: e.g. OB35

The block must be installed with the same instance in the following OBs:
   • OB70 for Periphery redundancy failure

   • OB72 for CPU redundancy failure

   • OB82 for diagnosis interrupt recognition

   • OB85 for I/O access failure over Process image

   • OB86 for rack or line failure recognition

   • OB100 for start-up recognition

   • OB122 for I/O access error recognition

Caution
The OBs listed in the preceding paragraph must be loaded into the AS, as otherwise the AS will call the respective OB when one of the triggering events occurs, and – if it finds no OB – will switch to STOP. In project design with CFC this is handled automatically, provided you are using **Y_S_2** driver blocks. To ensure that the CPU remains in RUN when one of these events occurs, the local data stacks (priority classes) belonging to the OBs must be increased accordingly (see manual: "System software for S7-300/400, system and standard functions"). These are to be changed in Hardware Config/CPU/Properties/local data. If the local data stack overflows the CPU switches to Stop.

4.1.3.   Start-up Characteristics

In cold start/start-up the block determines, on the basis of **SUBN_1_ID** and **RACK_NO** or, in redundancy case, of **SUBN_2_ID** and **RACK_NO**, whether a device with the properties of a Y-Switch is connected to the PROFIBUS-DP. In the event of an error **QPARF_1** or **QPARF_2** is set to 1 (see „Error Handling").

4.1.4.   Error Handling

The block algorithm handles the following cases:

Parameter	Description
QPARF_1 = 1	Parameter setting error primary DP/PA Link. Wrong DP station number (SUBN_1_ID, RACK_NO)
QPARF_2 = 1	Parameter setting error redundant DP/PA Link. Wrong DP-station number (SUBN_2_ID, RACK_NO)
QPERAF_1 = 1	Periphery accesses failure. The block was unable to access primary DP/PA Link.
QPERAF_2 = 1	Periphery accesses failure. The block was unable to access redundant DP/PA Link.
QRACKF_1 = 1	DP device failure. No communication with primary DP/PA Link. Possible causes are: PROFIBUS-DP failed, primary Link failed, not switched on, no link to the PROFIBUS-DP.
QRACKF_2 = 1	DP device failure. No communication with redundant DP/PA Link. Possible causes are: PROFIBUS-DP failed, redundant Link failed, not switched on, no link to the PROFIBUS-DP.
QTOT_ERR = 1	No communication to both DP/PA Links
QHLV_ERR = 1	Start-up delay of IM157 active (no communication)
QPDP_ERR = 1	Missing parameterisation, station unknown (no Communication)
QCOM_ERR = 1	Communication error to at least one station.

Note

In the event of a parameter assignment error or DP device failure, access is no longer made to the belonging DP/PA Link (primary or redundant). After the fault has been rectified, the block automatically resumes communication with DP/PA Link.

4.1.5. Message Characteristics

With the input **EN_MSG=1** you can enable the PLC Process Control Messages.
In the table you will find the message texts of the driver block **Y_S_2** and their allocation to the driver block parameters.

Message number	Block parameter	Default message text	Message class
1	QRACKF_1	Comm. Failure primary DP/PA Link	S
2	QRACKF_2	Comm. Failure redundant DP/PA Link	S
3	QPERAF_1	Periph. failure primary DP/PA Link	S
4	QPERAF_2	Periph. failure redundant DP/PA Link	S
5	QPARF_1	Param. failure primary DP/PA Link	S
6	QPARF_2	Param. failure redundant DP/PA Link	S
7	QCOM_ERR	Failure in at least one station	S
8	QTOT_ERR	Comm. Failure primary and redundant DP/PA Link	S

Over the ten associated values of ALARM_8P the three first one are occupied with **SUBN_1_ID**, **SUBN_2_ID** and **RACK_NO**. In associated value 4 the active Subnet number and in associated value 5 the active Rack number are copied. The other associated values are free. The following table presents the allocation of the associated values to the driver block parameters.

Associated value	Block parameter
1	SUBN_1_ID
2	SUBN_2_ID
3	RACK_NO
4	BEGL5 (active Subnet number)
5	BEGL6 (active Rack number)
6	Free
7	Free
8	Free
9	Free
10	Free

4.1.6. CFC Representation
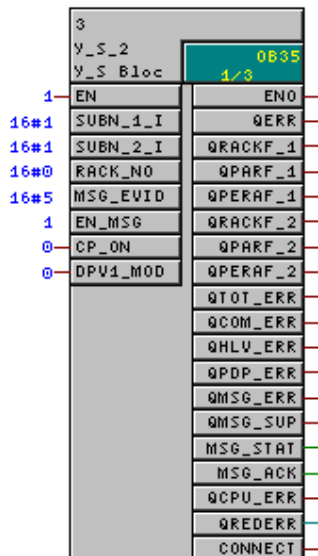
4.1.7. I/O list of the Y_S_2 block

Type	I/O Name	Data Type	Default	Comment within Interface
I	SUBN_1_ID	BYTE	1	Subnet ID primary Module
I	RACK_NO	WORD	0	Rack Number Module
I	SUBN_2_ID	BYTE	1	Subnet ID red. Module
I	MSG_EVID	DWORD	2	Message ID
I	EN_MSG	BOOL	1	Enable 1=Alarming
I	CP_ON	BOOL	0	1=Y-Link over CP
I	DPV1_MODE	BOOL	0	1 = DPv1 mode otherwise S7 compatible
O	QERR	BOOL	1	1=Error
O	QMSG_ERR	BOOL	0	ALARM_8P Error
O	QMSG_SUP	BOOL	0	1=Message Suppression active
O	MSG_STAT	WORD	0	ALARM_8P: STATUS Output
O	MSG_ACK	WORD	0	ALARM_8P: ACK_STATE Output
O	QRACKF_1	BOOL	0	1=Rack Failure prim. gateway
O	QPERAF_1	BOOL	0	1=I/O Module Access Failure prim. gateway
O	QPARF_1	BOOL	0	1=Parameter Assignment Error prim. gateway
O	QRACKF_2	BOOL	0	1=Rack Failure red. gateway
O	QPERAF_2	BOOL	0	1=I/O Module Access Failure red. gateway
O	QPARF_2	BOOL	0	1=Parameter Assignment Error red. gateway
O	CONNECT	BOOL	0	Connect to slave
O	QCOM_ERR	BOOL	0	1=Slave Communication failure
O	QHLV_ERR	BOOL	0	1=Delay for active IM157
O	QPDP_ERR	BOOL	0	1=Default parameterisation
O	QCPU_ERR	BOOL	0	1= CPU error
O	QREDERR	INT	0	CPU error code
O	QTOT_ERR	BOOL	0	1=Total failure

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4.2. Function block SIP7UM61

Type / Number   FB 570

4.2.1. Function and Operating principle

The **SIP7UM61** block forms the interface between the Siprotec Devices 7UM61 and the blocks of the SIMATIC PCS7 libraries. It can also be interconnected with other SIMATIC S7 blocks.
It can only be used on one SIMATIC S7 with PROFIBUS-DP master properties. The CPU has to support the ALARM_8P functionalities.

As configured in the HW Config, the Profibus DP address of the device and the Subnet ID must be parameterized over the input parameters **RACK_NO** and **SUBN_ID**.
If the DP master is configured with the DP mode "DPV1", the input **DPV1_MODE** must be set to 1 otherwise it has to be set to 0.

With the input **EN_MSG=1** the PLC Process Control Messages will be enabled.

The block **SIP7UM61** can be used redundant (connected to Y Link) or not redundant.

Non-redundant system:
    In a non-redundant system **RED_ON** must be set to „0".

Redundant system:
    The input **SUBN_ID** is not active in this configuration.
    The input parameter **RACK_CONNECT** has to be connected to the output parameter **CONNECT** of the **Y_S_2** Block.
    The output **QRACKF** may be set to 1 if special events occur at the **Y_S_2** block:
-     QTOT_ERR = 1 or QPDP_ERR = 1 or QHLV_ERR = 1
-     Diagnostics analysis.

    You can also choose to give manually the logical addresses for inputs / outputs over the parameters **LGCADR_0,**…. To use this parameter, you have to set **LGCADRON** = 1.

⚠️   *You have to pay attention that all the devices connected to the Y-Switch have their corresponding function blocks SIP7UM6x connected to the Y_S_2 block and are correctly parameterized.*

4.2.2. Calling OBs

The block can be installed alternatively in the following OBs:
- Watchdog interrupt OB: e.g. OB35

The block must be installed with the same instance in following OBs:
- OB85 for priority class error
- OB86 for rack or line failure recognition
- OB100 for start-up recognition
- OB122 for I/O access error recognition

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Caution

The OBs listed in the preceding paragraph must be loaded into the AS, as otherwise the AS will call the respective OB when one of the triggering events occurs, and – if it finds no OB – will switch to STOP. In project design with CFC this is handled automatically, provided you are using these blocks. To ensure that the CPU remains in RUN when one of these events occurs, the local data stacks (priority classes) belonging to the OBs must be increased accordingly (see manual:"System software for S7-300/400, system and standard functions"). These are to be changed in Hardware Config/CPU/Properties/local data. If the local data stack overflows the CPU switches to Stop.

4.2.3. Start up characteristics

The block determines, on the basis of **SUBN_ID** and **RACK_NO** (or only of **RACK_NO** in redundant mode), whether a device with the properties of an Siprotec is connected to the Profibus-DP. In the event of an error **QPARF** (and QPARF2 in redundant mode) is set to 1 (see „Error Handling").

4.2.4. Error handling

The block algorithm handles the following cases:

QPARF = 1	Parameter setting error. If the primary DP station number (SUBN_ID, RACK_NO) is wrong, the output is set equal to 1.
QPARF2 = 1	Parameter setting error. If the redundant DP station number (SUBN_ID2, RACK_NO) is wrong, the output is set equal to 1.
QRACKF = 1	DP device failure. No communication with the device. Causes are: PROFIBUS-DP failed, Device failed, off, no link to PROFIBUS-DP.
QPERAF = 1	Periphery access failure. The block was unable to access the device.

Note
Access is no longer made to the device in the event of a parameter assignment error or DP device failure. After the fault has been rectified, the block automatically resumes communication with device.
The fault messages of the device must be reset by means of fault acknowledgement.
Diagnostic data relating to fault messages can be read only via the parameter assignment interface.

In redundant mode, if **QPARF**= 1 and **QPARF2** = 1, the configuration of the function block is wrong or the **Y_S_2** block is returning a general error.

4.2.5. Message Characteristics

In the table you will find the message texts of the driver block and their allocation to the driver block parameters.

Message Number	Block parameter	Default message text	Message class
1	QRACKF	DP device failure	S
2	QPARF OR QPARF2	Parameter failure	S
3	QPERAF	Access failure	S

Over the associated values of ALARM_8P are transmitted several data or parameters values which are listed in the following table.

Associated value	Block parameter
1	Act. SUBN_ID
2	Act. RACK_NO

4.2.6. Diagnosis

Over the status byte **QSTATE** will be displayed the following states:

QSTATE Bit	Designation	Comments	Internal Object No
0	Device OK	1 = Update of the device replica in the Siprotec device completed after initial start or restart	51
1	ProtActive	1 = At least one protection function is active	52
2	Error Sum Alarm	1 = Error with a summary alarm ON	140
3	Alarm Sum event	1 = Alarm summary event ON	160
4	Relay PICKUP	1 = Relay PICKUP (summary alarm)	501
5	Relay Trip	1 = Relay general Trip command (summary alarm)	511
6	Operat. cond	1 = suitable measured quantities present at the device inputs ($V > 0,1 * V_{nom}$, $I > 0,1 * I_{nom}$ and 10 Hz < freq. < 70 Hz)	5002
7	<reserved>		

The "Error with a summary alarm" is ON if at least one of the following internal alarms assumes the value ON:
"Error: A/D converter", "Error: 1A/5A wrong", "Error: Neutral CT different from MLFB", "Error Board 0", "Error Board 1", "Error Board 2", "Error Board 3", "Error Board 4", "Error Board 5", "Error Board 6", "Error Board 7".

The "Alarm summary event" is indicated if at least one of the following internal alarms assumes the ON status:
"Failure: Current supervision", "Failure: Voltage supervision", "VT Fuse Failure", "Failure: Phase sequence", "Alarm: No calibration data available", "Error: Offset", "Error: Power supply", "Failure: Battery empty".

4.2.7. **CFC Representation**

```
┌──────────────────────┐
│ 5                    │
│ SIP7UM61    ┌────────┤
│ Driver f    │  OB35  │
│             │  1/5   │
16#1─┤ SUBN_ID │  QERR ├─
16#0─┤ RACK_NO │ QRACKF├─
  0──┤ RED_ON  │ QPERAF├─
  1──┤ DPV1_Mod│ QPARF ├─
  1──┤ EN_MSG  │ QSTATE├─
  0──┤ LGCADRON│   IL1 ├─
   ──┤ RACK_CON│   IL2 ├─
16#6─┤ MSG_EVID│   IL3 ├─
  0──┤ LGCADR_0│  UL12 ├─
  0──┤ LGCADR_1│  UL23 ├─
  0──┤ LGCADR_2│  UL31 ├─
  0──┤ LGCADR_3│     P ├─
  0──┤ LGCADR_4│     Q ├─
│             │     S ├─
│             │  Freq ├─
│             │ cosphi├─
└─────────────┴────────┘
```

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4.2.8. I/O list of the SIP7UM61

IO	Parameter	IO Type	Comment
I	SUBN_ID	BYTE	Subnetz-Nummer Profibus DP
I	RACK_NO	WORD	DP Teilnehmeradresse des 7UM61
I	RED_ON	BOOL	1=Redundancy ON
I	DPV1_Mode	BOOL	1 : DPV1 , 0 : S7 compatible
I	EN_MSG	BOOL	Enable 1=Alarming
I	LGCADRON	BOOL	1:logical adress ON (only by red.)
I	RACK_CONNECT	ANY	Connect to Y block
I	MSG_EVID	DWORD	Message ID
IO	LGCADR_0	INT	logical adress for module 0 (only by red.)
IO	LGCADR_1	INT	logical adress for module 1 (only by red.)
IO	LGCADR_2	INT	logical adress for module 2 (only by red.)
IO	LGCADR_3	INT	logical adress for module 3 (only by red.)
IO	LGCADR_4	INT	logical adress for module 4 (only by red.)
O	QERR	BOOL	1=Error
O	QRACKF	BOOL	1=Rack Failure
O	QPERAF	BOOL	1=Periphery Access Failure
O	QPARF	BOOL	1=Parameter Assignment Error
O	QPARF2	BOOL	1=Parameter Assignment Error (for redundant bus)
O	QSTATE	BYTE	Diagnosebyte
O	IL1	REAL	Messwert IL1
O	IL2	REAL	Messwert IL2
O	IL3	REAL	Messwert IL3
O	UL12	REAL	Verkettete Spannung L1-L2
O	UL23	REAL	Verkettete Spannung L2-L3
O	UL31	REAL	Verkettete Spannung L3-L1
O	UE	REAL	Spannung UE
O	P	REAL	Wirkleistung P (Gesamtleistung)
O	Q	REAL	Blindleistung Q (Gesamtleistung)
O	S	REAL	Scheinleistung S
O	Freq	REAL	Frequenz f
O	cosphi	REAL	Leistungsfaktor cos(phi)
O	QMSG_ERR	BOOL	ALARM_8P Error
O	QMSG_SUP	BOOL	1=Message Suppression active
O	MSG_STAT	WORD	ALARM_8P: STATUS Output
O	MSG_ACK	WORD	ALARM_8P: ACK_STATE Output

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4.3. Function block SIP7UM62

Type / Number   FB 571

4.3.1. Function and Operating principle

The **SIP7UM62** block forms the interface between the Siprotec Devices 7UM62 and the blocks of the SIMATIC PCS7 libraries. It can also be interconnected with other SIMATIC S7 blocks.
It can only be used on one SIMATIC S7 with PROFIBUS-DP master properties.
The CPU has to support the ALARM_8P functionalities.

As configured in the HW Config, the Profibus DP address of the device and the Subnet ID must be parameterized over the input parameters **RACK_NO** and **SUBN_ID**.
If the DP master is configured with the DP mode "DPV1", the input **DPV1_MODE** must be set to 1 otherwise it has to be set to 0.

With the input **EN_MSG=1** the PLC Process Control Messages will be enabled.

The block **SIP7UM62** can be used redundant (connected to Y Link) or not redundant.

Non-redundant system:
    In a non-redundant system **RED_ON** must be set to „0".

Redundant system:
    The input SUBN_ID is not active in this configuration.
    The input parameter **RACK_CONNECT** has to be connected to the output parameter **CONNECT** of the **Y_S_2** Block.
    The output **QRACKF** may be set to 1 if special events occur at the **Y_S_2** block:
- QTOT_ERR = 1 or QPDP_ERR = 1 or QHLV_ERR = 1
- Diagnostics analysis.

    You can also choose to give manually the logical addresses for inputs / outputs over the parameters **LGCADR_0,….** To use this parameter, you have to set **LGCADRON** = 1.

⚠️ *You have to pay attention that all the devices connected to the Y-Switch have their corresponding function blocks SIP7UM6x connected to the Y_S_2 block and are correctly parameterized.*

4.3.2. Calling OBs

The block can be installed alternatively in the following OBs:
- Watchdog interrupt OB: e.g. OB35

The block must be installed with the same instance in following OBs:
- OB85 for priority class error
- OB86 for rack or line failure recognition
- OB100 for start-up recognition
- OB122 for I/O access error recognition

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Caution

The OBs listed in the preceding paragraph must be loaded into the AS, as otherwise the AS will call the respective OB when one of the triggering events occurs, and – if it finds no OB – will switch to STOP. In project design with CFC this is handled automatically, provided you are using these blocks. To ensure that the CPU remains in RUN when one of these events occurs, the local data stacks (priority classes) belonging to the OBs must be increased accordingly (see manual: "System software for S7-300/400, system and standard functions"). These are to be changed in Hardware Config/CPU/Properties/local data. If the local data stack overflows the CPU switches to Stop.

4.3.3. Start up characteristics

The block determines, on the basis of **SUBN_ID** and **RACK_NO** (or only of RACK_NO in redundant mode), whether a device with the properties of an Siprotec is connected to the Profibus-DP. In the event of an error **QPARF** (and QPARF2 in redundant mode) is set to 1 (see „Error Handling").

4.3.4. Error handling

The block algorithm handles the following cases:

QPARF = 1	Parameter setting error. If the primary DP station number (SUBN_ID, RACK_NO) is wrong, the output is set equal to 1.
QPARF2 = 1	Parameter setting error. If the redundant DP station number (SUBN_ID2, RACK_NO) is wrong, the output is set equal to 1.
QRACKF = 1	DP device failure. No communication with the device. Causes are: PROFIBUS-DP failed, device failed, off, no link to PROFIBUS-DP.
QPERAF = 1	Periphery access failure. The block was unable to access the device.

Note

Access is no longer made to the device in the event of a parameter assignment error or DP device failure. After the fault has been rectified, the block automatically resumes communication with device.
The fault messages of the device must be reset by means of fault acknowledgement.
Diagnostic data relating to fault messages can be read only via the parameter assignment interface.

In redundant mode, if **QPARF**= 1 and **QPARF2** = 1, the configuration of the function block is wrong or the **Y_S_2** block is returning a general error.

4.3.5. Message Characteristics

In the table you will find the message texts of the driver block and their allocation to the driver block parameters.

Message Number	Block parameter	Default message text	Message class
1	QRACKF	DP device failure	S
2	QPARF OR QPARF2	Parameter failure	S
3	QPERAF	Access failure	S

Over the associated values of ALARM_8P are transmitted several data or parameters values which are listed in the following table.

Associated value	Block parameter
1	Act. SUBN_ID
2	Act. RACK_NO

4.3.6. User defined commands

The inputs **Comm0**, **Comm1**, ... of the driver block **SIP7UM62** allow to send user defined command, which can be routed on bytes 0 and 1 as continuous output as „source system interface" using DIGSI. They will be executed internal as double command with Profibus DP.

4.3.7. Scaling of measured values and divisors

Measured values are transferred via PROFIBUS-DP between the SIPROTEC device and the PROFIBUS-DP master as integer values (two bytes) but they are in general available in the SIPROTEC device in floating-point format as a percent-age referred to the parameterized nominal values of the primary equipment. The scaling factor you choose via the **DIGSI**-Manager.

The measured value in the SIPROTEC device (floating-point format) is multiplied by the scaling factor before transformation to an integer value (for PROFIBUS-DP). It is possible to transfer fractional digits by multiplication by a multiple of 10 in the integer value with that.
(Manual „SIPROTEC Communication module, PROFIBUS-DP - Communication profile")

With the FB inputs „divisors" you fit the measured value representation at the FB outputs as requested:

        Div_0   current (IL1S1, IL2S1, IL3S1)
        Div_1   voltage (UL1E, UL2E, UL3E; UL12, UL23, UL31)
        Div_2   power (P, Q, S)
        Div_3   UE
        Div_4   Freq
        Div_5   cosPhi

4.3.8. cos Phi

In the case of **EN_ROUND** = 1 and **Div_5** > 0, the output **cosPhi** is rounded. This is done to the second position after decimal point.

Example:

Cosphi with EN_ROUND = 0	Cosphi with EN_ROUND = 1
0,9990	1,00
0,9950	1,00
0,9949	0,99
0,9060	0,91

4.3.9. Diagnosis

Over the status byte **QSTATE** will be displayed the following states:

QSTATE Bit	Designation	Comments	Internal Object No
0	Device OK	1 = Update of the device replica in the Siprotec device completed after initial start or restart	51
1	ProtActive	1 = At least one protection function is active	52
2	Error Sum Alarm	1 = Error with a summary alarm ON	140
3	Alarm Sum event	1 = Alarm summary event ON	160
4	Relay PICKUP	1 = Relay PICKUP (summary alarm)	501
5	Relay Trip	1 = Relay general Trip command (summary alarm)	511
6	Operat. cond	1 = suitable measured quantities present at the device inputs $(V > 0,1 * V_{nom}, I > 0,1 * I_{nom}$ and 10 Hz < freq. < 70 Hz)	5002
7	Data valid	1 = Data in the PROFIBUS-DP message are valid	-

The "Error with a summary alarm" is ON if at least one of the following internal alarms assumes the value ON:

Measured value error (IN-S1 false, IN-S2 false, IE-Wdl. False, Error MU1 Bridge, Error MU2 Bridge, Error MU3 bridge, error board 0 = C–CPU–2, error board 3 = C–I/O–2, error board 5 = C–I/O–6, error board 6 = C–I/O–1), Stör. Offset, open circuit (open circuit IAS1, open circuit IBS1, open circuit ICS1, open circuit IAS2, open circuit IBS2, open circuit ICS2).

The "Alarm summary event" is indicated if at least one of the following internal alarms assumes the ON status:

Failure: current supervision (Error SI S1, Error SI S2, Error Isym S1, Error Isym S2), Failure voltage supervision (Error SVphe, Error Vsym), Failure phase sequence (Error Drehf I S1, Error Drehf I S2, Error Drehf V), Error power supply, Fuse Failure, Alarm: no calibration data available, Failure battery empty, Error Hour.

If QSTATE bit 7 messages *Data are valid = 0,* the FB outputs measured values/ metered measurands (**UL1E**, .. , **WqImp**) and messages (**QMSG_0, QMSG_1, QMSG_2**) are frozen. **EN_FREEZE** activates this functionality.

4.3.10. Annunciations

Over the **SIP7UM62** outputs **QMSG_0**, **QMSG_1**, **QMSG_2** will be displayed the annunciations (order historically conditioned), which are allocated to the following bits:

Assignment of QMSG_0:

Offset gives the bit position, which are allocated with standard mapping 3-1.

QMSG_0 Bit	Off set	Annunciation	Designation	Comments	Internal Object No
0	2/4	Overcurrent time protection I>	50/51 Trip	1 = 50/51 I> Trip	1815
1	3/2	Overcurrent time protection I>>	51/67 Trip	1 = 50/51/67 I>> Trip	1809
2	3/6	Inverse Time overcurrent protection	51V Trip	1 = 51V Trip	1900
3	4/0	Thermal overload protection	49 O/L I Alarm	1 = 49 overload current alarm (I alarm)	1515
4	4/1	Thermal overload protection	49 O/L Θ Alarm	1 = 49 Thermal overload alarm	1516
5	4/2	Thermal overload protection	49 Th O/L Trip	1 = 49 Thermal overload trip	1521
6	4/7	Unbalanced load protection	46- Θ Trip	1 = 46 Trip of thermal stage	5161
7	5/4	Sensitive earth fault protection	50Ns-2 Trip	1 = 50Ns-2 Trip	1223
8	5/5	Stator earth fault protection	59/67 V0 PU	1 = 59N/67GN V0 picked up	5186
9	6/0	Stator earth fault protection	59N/67GN Trip	1 = 59N/67GN trip	5193
10	6/5	Overvoltage protection	59-1 Trip	1 = 59-1 Overvoltage V > Trip	6570
11	6/6	Overvoltage protection	59-2 Trip	1 = 59-2 overvoltage V >> Trip	6573
12	7/1	Undervoltage protection	27-1 Trip	1 = 27-1 Undervoltage V < Trip	6539
13	7/2	Undervoltage protection	27-2 Trip	1 = 27-2 Undervoltage V<< Trip	6540
14	7/7	Frequency protection	81-1 Trip	1 = 81-1 Trip	5236
15	8/0	Frequency protection	81-2 Trip	1 = 81-2 Trip	5237
16	8/1	Frequency protection	81-3 Trip	1 = 81-3 Trip	5238
17	8/2	Frequency protection	81-4 Trip	1 = 81-4 Trip	5239
18	8/3	Overexcitation protection	24 warn	1 = 24 V/f warning stage	5367
19	8/6	Overexcitation protection	24 th. Trip	1 = 24 Trip of thermal stage	5372

QMSG_0 Bit	Off set	Annunciation	Designation	Comments	Internal Object No
20	8/7	Overexcitation protection	24-2 Trip	1 = 24-2 trip of V/f >> stage	5371
21	9/1	Reverse power protection	32R Trip	1 = 32R Trip	5097
22	9/2	Reverse power protection	32R+SV Trip	1 = 32R Trip with stop valve	5098
23	9/5	Forward power supervision	32F P < Trip	1 = 32F P < stage Trip	5128
24	9/6	Forward power supervision	32F P > Trip	1 = 32F P > stage Trip	5129
25	9/7	Fuse Failure Monitor	Fuse Failure	1 = voltage transformer fuse failure	6575
26	10/2	Underexcitation protection	40-1 Trip	1 = 40 characteristic 1 Trip	5344
27	10/3	Underexcitation protection	40-2 Trip	1 = 40 characteristic 2 Trip	5345
28	10/4	Underexcitation protection	40&V < Trip	1 = 40 characteristic &Vexc<Trip	5346
29	10/5	Underexcitation protection	40-3 Trip	1 = 40 characteristic 3 Trip	5343
30	10/7	Circuit breaker failure protection	50BF Trip	1 = 50BF Trip	1471
31	11/4	Impedance protection	21 Z1< Trip	1 = 21 Z1 < Trip	3977

Assignment of QMSG_1:

Offset gives the bit position, which are allocated with standard mapping 3-1.

Message positions 18 / 4 to 19/ 2 are available with 7UM62 V4.10 or higher.
With 7UM62 V4.00 the value 0 is transmitted at these positions.

QMSG_1 Bit	Off set	Annunciation	Designation	Comments	Internal Object No
0	11/5	Impedance protection	21 Z1B< Trip	1 = 21 Z1B < Trip	3978
1	11/6	Impedance protection	21 Z2< Trip	1 = 21 Z2<Trip	3979
2	11/7	Impedance protection	21 T3> Trip	1 = 21 T3>Trip	3980
3	12/0	Binary inputs	Ext1 Gen. TRP	1 = External trip 1: General TRIP	4537
4	12/1	Binary inputs	Ext2 Gen. TRP	1 = External trip 2: General TRIP	4557
5	12/2	Binary inputs	Ext3 Gen. TRP	1 = External trip 3: General TRIP	4577
6	12/3	Binary inputs	Ext4 Gen. TRP	1 = External trip 4: General TRIP	4597
7	12/5	Inadvertent energisation protection	50/27 Trip	1 = 50/27 Trip	5548
8	12/6	Trip coil monitor	Fail: Trip cir.	1 = 74TC Failure Trip Circuit	6865
9	13/0	Inverse undervoltage protection	Vp< Trip	1 = Inverse Undervoltage Vp<Trip	6527
10	13/6	Rotor earth fault protection	64R-2 Trip	1 = 64R-2 Trip	5399
11	14/3	State of the out-of-step protection	78 Trip char. 1	1 = 78 Trip characteristic 1	5071
12	14/4	State of the out-of-step protection	78 Trip char. 2	1 = 78 Trip characteristic 2	5072
13	14/7	Differential protection	87 Trip Phase A	1 = 87 differential protection: Trip Phase A	5672
14	15/0	Differential protection	87 Trip Phase B	1 = 87 differential protection: Trip Phase B	5673
15	15/1	Differential protection	87 Trip Phase C	1 = 87 differential protection: Trip Phase C	5674
16	15/2	Differential protection	87 Diff> Trip	1 = 87 differential prot.:Trip by IDIFF>	5691
17	15/3	Differential protection	87 Diff>> Trip	1 = 87 Diff>> Trip	5692
18	4/3	Unbalanced load protection	46-1 Warn	1 = 46-1 Current warning stage	5156
19	4/6		46-2 TRIP	1 = 46-2 TRIP of current stage	5160
20	18/7	Fault indications of protection functions	Failure 64R	1 = Failure 64R: measuring circuit	5400

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QMSG_1 Bit	Off set	Annunciations	Designation	Comments	Internal Object No
21	13/5	Rotor ground fault protection	64R-1 picked up	1 = 64R-1 picked up (Alarm)	5397
22	18/6	Fault indications of protection functions	Failure SGF	1 = Failure stator ground fault prot. 100%	5486
23	18/0	Stator ground fault protection 100%	SGF100 Alarm	1 = Stator ground fault prot. 100%: Alarm stage	5487
24	18/1		SGF100 TRIP	1 = Stator ground fault prot. 100%: TRIP	5489
25	19/0	Fault indications of protection functions	Fail 64R 1-3Hz	1 = Failure 64R protection (1-3Hz)	5401
26	18/2	Rotor ground fault protection 1-3 Hz	64R-1_3Hzpickup	1 = 64R-1 (1-3Hz) picked up (Alarm)	5403
27	18/3		64R-2_3Hz TRIP	1 = 64R-2 (1-3Hz) TRIP	5407
28	19/1	Fault indications of protection functions		Not pre-allocated	-
29	19/2			Not pre-allocated	-
30	5/0	Sensitive ground fault protection	Failure 64R In<	1 = Failure 64R In<: measuring circuit	5396
31	18/5	Restricted ground fault protection	87N TRIP	1 = 87N TRIP	5821

Assignment of QMSG_2:

Offset gives the bit position, which are allocated with standard mapping 3-1.

Message positions 19 / 3 to 19/ 7 are available with 7UM62 V4.10 or higher.
User-defined double-point indications (e.g. check back indications of double commands) can be routed on the positions 19 / 4 to 19 / 7 as "Destination system interface" using the DIGSI configuration matrix.
With 7UM62 V4.00 the value 0 is transmitted at these positions.

QMSG_2 Bit	Off set	Annunciations	Designation	Comments	*Internal Object No*
0	16/0			Not pre-allocated	-
1	16/1			Not pre-allocated	-
2	16/2			Not pre-allocated	-
3	16/3			Not pre-allocated	-
4	16/4			Not pre-allocated	-
5	16/5			Not pre-allocated	-
6	16/6			Not pre-allocated	-
7	16/7			Not pre-allocated	-
8	17/0			Not pre-allocated	-
9	17/1			Not pre-allocated	-
10	17/2			Not pre-allocated	-
11	17/3			Not pre-allocated	-
12	17/4			Not pre-allocated	-
13	17/5			Not pre-allocated	-
14	17/6			Not pre-allocated	-
15	17/7			Not pre-allocated	-
16	15/4			Not pre-allocated	-
17	15/5			Not pre-allocated	-
18	15/6			Not pre-allocated	-
19	19/3			Not pre-allocated	-
20	19/4	Double-point indications	<User-defined> OFF	Not pre-allocated	-
21	19/5		<User-defined> ON	Not pre-allocated	-
22	19/6		<User-defined> OFF	Not pre-allocated	-
23	19/7		<User-defined> ON	Not pre-allocated	-
24		Free			-
25		Free			-
26		Free			-
27		Free			-
28		Free			-
29		Free			-
30		Free			-
31		Free			-

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4.3.11. CFC Representation

```
         ┌─────────────────────┐
         │ 6                   │
         │ SIP7UM62 ┌──────────┤
         │ Driver f │    0B35  │
         │          │    1/6   │
  16#1 ──┤ SUBN_ID  │     QERR ├──
  16#0 ──┤ RACK_NO  │   QRACKF ├──
     0 ──┤ RED_ON   │   QPERAF ├──
     1 ──┤ DPV1_Mod │    QPARF ├──
     0 ──┤ LGCADRON │   QSTATE ├──
       ──┤ RACK_CON │     UL1E ├──
     1 ──┤ Div_0    │     UL2E ├──
     1 ──┤ Div_1    │     UL3E ├──
     1 ──┤ Div_2    │     UL12 ├──
   5.0 ──┤ Div_3    │     UL23 ├──
     1 ──┤ Div_4    │     UL31 ├──
     1 ──┤ Div_5    │       UE ├──
     0 ──┤ EN_FREEZ │        P ├──
     1 ──┤ EN_ROUND │        Q ├──
     0   │ LGCADR_0 │        S ├──
     0   │ LGCADR_1 │    IL1S1 ├──
     0   │ LGCADR_2 │    IL2S1 ├──
     0   │ LGCADR_3 │    IL3S1 ├──
     0   │ LGCADR_4 │     Freq ├──
     0   │ LGCADR_5 │   cosphi ├──
     0 ──┤ Comm0    │    WpImp ├──
     0 ──┤ Comm1    │    WqImp ├──
     0 ──┤ Comm2    │   QMSG_0 ├──
     0 ──┤ Comm3    │   QMSG_1 ├──
     0 ──┤ Comm4    │   QMSG_2 ├──
     0 ──┤ Comm5    │  QFREEZE ├──
     0 ──┤ Comm6    │          │
     0 ──┤ Comm7    │          │
         └──────────┴──────────┘
```

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4.3.12. I/O list of the SIP7UM62

IO	Parameter	IO Type	Comment
I	SUBN_ID	BYTE	Subnetz-Nummer Profibus DP
I	RACK_NO	WORD	DP Teilnehmeradresse des 7UM62
I	RED_ON	BOOL	1=Redundancy ON
I	DPV1_Mode	BOOL	1 : DPV1 , 0 : S7 compatible
I	LGCADRON	BOOL	1=logical adress ON (only by red.)
I	RACK_CONNECT	ANY	Connect to Y block
I	EN_MSG	BOOL	Enable 1=Alarming
I	MSG_EVID	DWORD	Message ID
IO	LGCADR_0	INT	logical adress for module 0 (only by red.)
IO	LGCADR_1	INT	logical adress for module 1 (only by red.)
IO	LGCADR_2	INT	logical adress for module 2 (only by red.)
IO	LGCADR_3	INT	logical adress for module 3 (only by red.)
IO	LGCADR_4	INT	logical adress for module 4 (only by red.)
IO	LGCADR_5	INT	logical adress for module 5 (only by red.)
I	Div_0	REAL	Divisor 0: Strom (IL1S1,IL2S1,IL3S1)
I	Div_1	REAL	Divisor 1: Spannung (UL1E,UL2E,UL3E; UL12,UL23,UL31)
I	Div_2	REAL	Divisor 2: Leistung (P,Q,S)
I	Div_3	REAL	Divisor 3: UE
I	Div_4	REAL	Divisor 4: Freq
I	Div_5	REAL	Divisor 5: cosPhi
I	EN_FREEZE	BOOL	1=Einfrieren Meßwerte und Meldungen
I	EN_ROUND	BOOL	1=round cosphi
IO	Comm0	BOOL	Command0, continuous output
IO	Comm1	BOOL	Command1, continuous output
IO	Comm2	BOOL	Command2, continuous output
IO	Comm3	BOOL	Command3, continuous output
IO	Comm4	BOOL	Command4, continuous output
IO	Comm5	BOOL	Command5, continuous output
IO	Comm6	BOOL	Command6, continuous output
IO	Comm7	BOOL	Command7, continuous output
O	QERR	BOOL	1=Error
O	QRACKF	BOOL	1=Rack Failure
O	QPERAF	BOOL	1=Periphery Access Failure
O	QPARF	BOOL	1=Parameter Assignment Error
O	QPARF2	BOOL	1=Parameter Assignment Error (for redundant bus)
O	QSTATE	BYTE	Diagnose
O	UL1E	REAL	Messwert UL1E
O	UL2E	REAL	Messwert UL2E
O	UL3E	REAL	Messwert UL3E
O	UL12	REAL	Verkettete Spannung L1-L2
O	UL23	REAL	Verkettete Spannung L2-L3
O	UL31	REAL	Verkettete Spannung L3-L1
O	UE	REAL	Spannung UE

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IO	Parameter	IO Type	Comment
O	P	REAL	Wirkleistung P (Gesamtleistung)
O	Q	REAL	Blindleistung Q (Gesamtleistung)
O	S	REAL	Scheinleistung S
O	IL1S1	REAL	Strom Leiter L1 Seite 1
O	IL2S1	REAL	Strom Leiter L2 Seite 1
O	IL3S1	REAL	Strom Leiter L3 Seite 1
O	Freq	REAL	Frequenz f
O	cosphi	REAL	Leistungsfaktor cos(phi)
O	WpImp	REAL	Impulszähler Wirkarbeit Wp
O	WqImp	REAL	Impulszähler Blindarbeit Wq
O	QMSG_0	DWORD	Meldungen 0
O	QMSG_1	DWORD	Meldungen 1
O	QMSG_2	DWORD	Meldungen 2
O	QFREEZE	BOOL	1=Einfrieren Meßwerte und Meldungen aktiv
O	QMSG_ERR	BOOL	ALARM_8P Error
O	QMSG_SUP	BOOL	1=Message Suppression active
O	MSG_STAT	WORD	ALARM_8P: STATUS Output
O	MSG_ACK	WORD	ALARM_8P: ACK_STATE Output

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Further information: