Programmable Systems

The H41q and H51q System Families

Data Sheet / Operating Instructions
for Module
F 8628(X)

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Industrial Automation

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Caution

The safety-related H41q/H51q systems as described in this manual can be used for several different purposes. The knowledge of regulations and the technically perfect transfer carried out by qualified staff are prerequisites for the safe installation, start-up and for the safety during operation and maintenance of the H41q/H51q systems.

In case of unqualified interventions into the automation devices, de-activating or bypassing safety functions, or if advices of this manual are neglected (causing disturbances or impairments of safety functions), severe personal injuries, property or environmental damage may occur for which we cannot take liability.

Important Notes

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All listed modules are CE certified and meet the requirements of the EMC Guideline of the European Community.

All technical statements and data in this manual have been worked out very carefully, and effective checks and inspections have been applied. This manual may however contain flaws or typesetting errors. Therefore HIMA does not offer any warranties nor assume legal reponsibility nor any liability for the possible consequences of any errors in this manual. HIMA would appreciate being informed on possible errors.

The technology is subject to changes without notice.

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The prices shown in a special list are valid ex works, packing charges excluded. The prices are subject to change.

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HIMA

F 8628/F 8628X

F 8628X: PROFIBUS-DP slave module

Communication Module for PROFIBUS-DP Communication
Application in H41q/H51q PES (beginning with OS41q/51q V7.0-7 (9906)).
Appertaining Function block: HK-COM-3

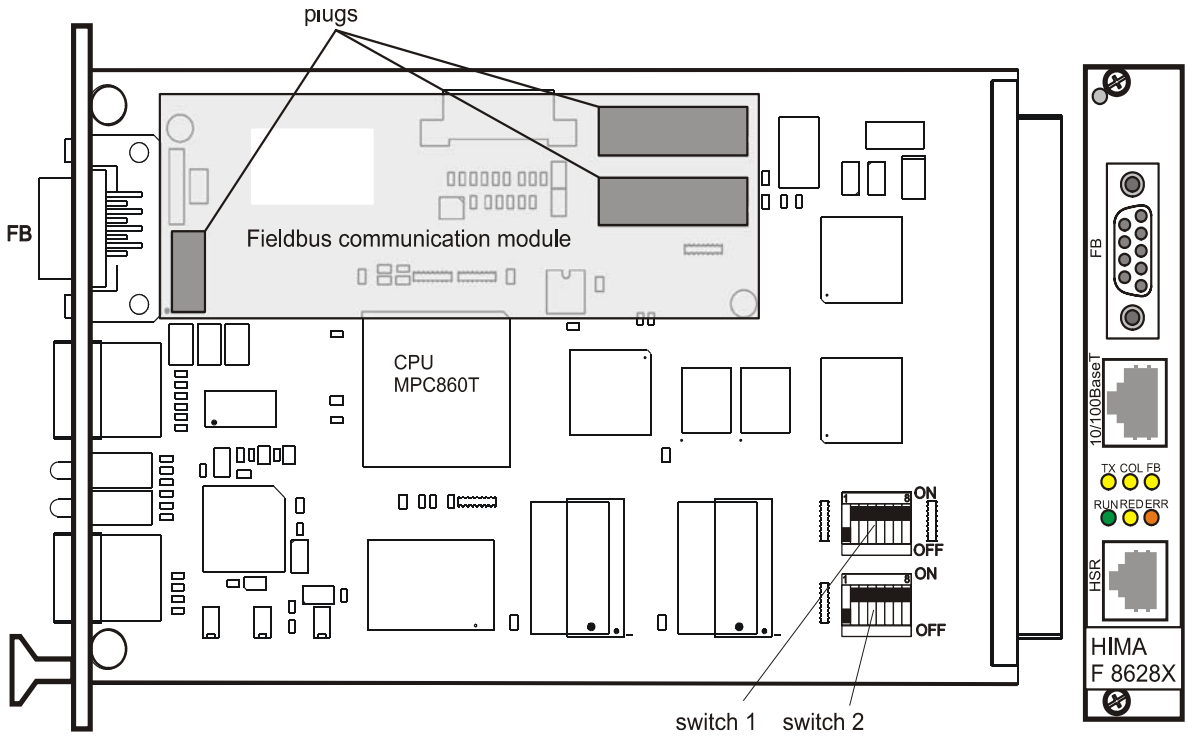


Figure 1: Communication module F 8628X

1 Technical data

Processor	32 Bit Motorola CPU MPC860T with integrated RISC communication controller
Operating voltage	5 VDC / 1 A
Space required	3 HU (units high), 4 SU (units width)
Serial interface FB	With PROFIBUS-DP slave module Connection via a 9-pole SUB-D plug
Ethernet interface	10Base-T or 100Base-TX according to the IEEE 802.3 standard, connection via an RJ-45 plug.
HSR interface	High-speed serial communication interface to the redundant HSR (High Speed Redundancy) communication module. Connection via an RJ-12 plug with BV 7053.
Diagnostic Display	6 LEDs for display diagnostic during operation
DIP switches	2 DIP switches for setting the module functions

2 Functions of the F 8628X

2.1 General

With the F 8628X communication module, a HIMA H41q/H51q controller can operate as a PROFIBU-DP Slave.
Beginning with operating system version 4.x, the F 8628X supports the function "ELOP II TCP". The ELOP II TCP connection enables a fast data exchange between a PADT (PC) and the F 865x central module.

Note The F 8628X has the same functions as the F 8628 and is compatible with it; however, the new function "ELOP II TCP" can only be used with an F 8628**X** with an operating system beginning with V4.x.

If an F 8628X module and a F 8621A coprocessor module operates in the same PES, the HK-COM-3 software function block with the proper parameterization must be used (see function block online help).

2.2 Replacing an F 8628X

An F 8628X must never be removed from a redundant operation without a special procedure.
Before removing an F 8628X, its fixing screws must be completely loosened and freely movable. Remove the module from the bus board by pushing the ejection lever (front label) top down and quickly removing in an upward motion to ensure faulty signals are not triggered within the system.
To attach the module, place it on the terminal block and press it inwards as far as it will go. This action should be performed quickly to ensure that faulty signals are not triggered within the system.

2.2.1 Operation of the ejection lever

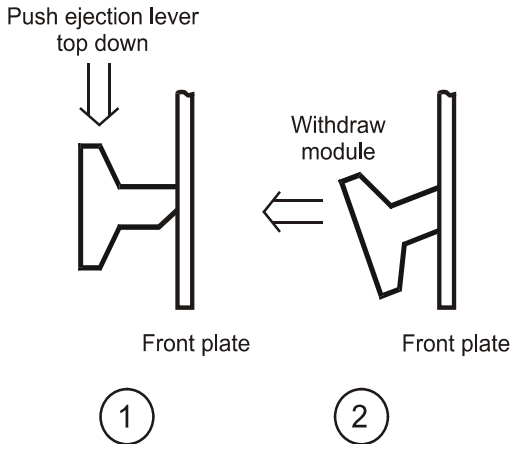


Figure 2: Operation of the ejection lever

2.2.2 Procedure for exchanging a redundant F 8628X in a redundant H41q/H51q controller

Make sure that you connect the Ethernet cable to the Ethernet socket (10/100BASE-T) and the HSR cable to the HSR socket (HSR).
The respective connectors must be pressed in until they snap into their sockets.

1. Unplug communication cable (PROFIBUS-DP).
2. Unplug communication cable (Ethernet).
3. Corresponding central module (e.g. F 8650X) with operating system
   - Version below (05.34): remove the central module!
   - Version beginning with (05.34): erase application program manually to deactivate the central module (see operation system manual "Erasing the application program")
4. Unplug HSR cable BV 7053 (if used).
5. Remove communication module F 8628X.
6. Check the new F 8628X
   - Check the DIP-switch settings
     (see chapter Chapter 4 and compare to the exchanged F 8628X).
   - Check whether if the operating system (see sticker on the F 8628X) support the used function (e.g. "ELOP II TCP" from OS version 4.x on)!
7. Plug the new communication module F 8628X.
8. Plug the HSR cable BV 7053 (if required).
9. Corresponding central module (e.g. F 8650X) with operating system
   - Version below (05.34): plug the central module!
   - Version beginning with (05.34): push the button "Ack" to activate the central module (see operation system manual "Self-Education")
10. Wait until the LED "RUN" on the F 8628X lights continiously.
11. Plug the communication cable (Ethernet).
12. Plug the communication cable (PROFIBUS-DP).

Note

The ARP entry on the PADT (PC) must be deleted if the new F 8628X has the **same IP address** as the old F 8628X.
If the new F 8628X has the same IP address it cannot be connected to the PADT (PC).

Example: Delete the ARP entry of an F 8628X with
IP address **192.168.0.67**.

- Start the "Dos Shell" on the PADT (PC)
- Enter the command **arp -d 192.168.0.67**.

2.3 Specifications for HIMA PROFIBUS-DP slaves

PROFIBUS is an international, open Fieldbus standard which was standardized in the EN 50170 Fieldbus standard.
Please contact your Regional PROFIBUS Association (RPA) or refer to the Internet page **www.profibus.com** for further information.

The functionality of the HIMA PROFIBUS-DP protocoll meets the requirements of EN 50 170 (DP V0).

	Sizes	**Comments**
RPA ident number	0x00EA	Assigned by the RPA (PNO in germany)
GSD file	HIQ200EA.GSD	The GSD file for configurating a H41q/H51q PROFIBUS-DP slave in a PROFIBUS-DP master can be downloaded from the internet page **www.hima.de**
HIMA PROFIBUS-DP station address	To be set via switch 1	Permissible station address from 0 to 125
Baud rates	9.6 kBit/s 19.2 kBit/s 45.45 kBit/s 93.75 kBit/s 187.5 kBit/s 500 kBit/s 1.5 MBit/s 3 MBit/s 6 MBit/s 12 MBit/s	Baud rate that can be set via switch 2 45.45 kBit/s (OS version 2.18 and higher).
Transmission	RS 485	Most frequently used transmission mode for PROFIBUS, often referred to as H2
Input max.	192 Byte	Inputs + outputs maximum number 256
Output max.	240 Byte	Inputs + outputs maximum number 256
Min. slave Interval	3 ms	
Accuracy of PROFIBUS-DP watchdog monitoring	+/- 10 ms	
Modes of connecting the HIMA PROFIBUS-DP slave	In accordance with the international PROFIBUS standard EN 50170	Cable lengths, terminating resistors etc. have to be considered

Table 1: Specification of the HIMA PROFIBUS-DP slave

3 Diagnostic LEDs on module front

3.1 Top row LEDs on module front

TX	COL	FB	Operating status
ON	-	-	Send LED of Ethernet communication
-	ON	-	Collision on the Ethernet segment
-	-	OFF	No PROFIBUS-DP slave activities on the bus
-	-	Flashing	Slave waits for its configuration from PROFIBUS-DP master
-	-	ON	Data exchange between Slave and PROFIBUS-DP master

Table 2: Top row LEDs on module front

3.2 Bottom row LEDs on module front

RUN	RED	ERR	Operating status
ON	-	OFF	PROFIBUS-DP communication protocol active
Flashing	-	OFF	PROFIBUS-DP communication protocol inactive
-	ON	OFF	Communication to redundant communication module active. Is used for the ELOP II TCP communication.
Flashing	-	Flashing	Communication module booting
ON	-	Flashing	OS version 4.6 and higher User Error / Configuration Error • Res-ID and ID are not equal • Ethernet communication protocol inactive, even if the communication module is in RUN status.
OFF	-	ON	Fatal error in communication module. Module must be replaced.
OFF	-	Flashes 3-times	Saving error code in Flash-EPROM (required for repair purposes) ***Do not unplug communication module!***

Table 3: Bottom row LEDs on module front

4 Functions of the switches

4.1 Functions of switch 1 (S1)

S1	ON	OFF	Description
1	1	0	The PROFIBUS-DP Slave address (0 to 125) for the F 8628X is set via switches 1/1-7 (See Table).
2	2	0	
3	4	0	
4	8	0	
5	16	0	
6	32	0	
7	64	0	
8	ID_IP ON	ID_IP OFF	For OS versions < 4.x no function ID_IP ON The bus station number (ID) which is set on the F 865x central module via switches (S1 1-7), is used as Res-ID, if no Res-ID could be determined from the loaded user program. ID_IP OFF The bus station number (ID) which is set on the F 865x central module via switches (S1 1-7), is never used for the Res-ID.

Table 4: Functions of switch 1 (S1)

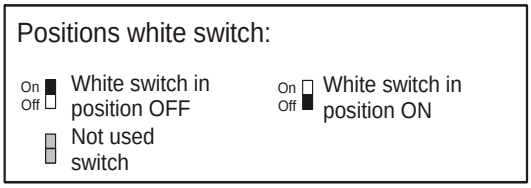
4.1.1 Switches 1/1-7

The switches 1/1-7 are used to set PROFIBUS-DP Slave address (0 to 125) for the F 8628X communication module.

Switch 1	PROFIBUS-DP address
	0
	1
	2
	3
	4
	5
	6
	7
	8
"	"
	124
	125

Table 5: Settings of switch 1/1-7

Legend:



4.2 Functions of switch 2 (S2)

S2	ON	OFF	Description
1	Ethernet Channel1	Ethernet Channel2	F 8628X allocation to the Ethernet channel 1 or Ethernet channel 2.
2	-	-	Not used
3	-	-	Not used
4	-	-	Not used
5	ON	OFF	The baud rate for the F 8628X module is set via switches 2/5-8 (See Table 6).
6	ON	OFF	
7	ON	OFF	
8	ON	OFF	

Table 6: Functions of switch 2 (S2)

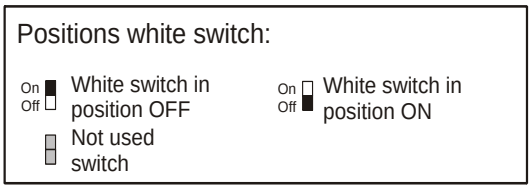
4.2.1 Switch 2/5-8

The switches 2/5-8 are used to set the F 8628X module's baud rate for communicating as a PROFIBUS-DP slave.

Switch 2	Baud rate
	9.6 kBit/s
	19.2 kBit/s
	93.75 kBit/s
	187.5 kBit/s
	500 kBit/s
	1.5 MBit/s
	3 MBit/s
	6 MBit/s
	12 MBit/s
	45.45 kBit/s[1)]

Table 7: Settings of switch 2/5-8

Legend:



5 Ethernet connection via the F 8628X

5.1 Determining the F 8628X IP address

For all OS versions the F 8628X IP address is determined from the resource name of the loaded user program.
The IP address is composed of the network address and the host address. The default network address is **192.168.0**.
The last byte of the IP address 192.168.0.x is the host address and is calculated as follows:

For ethernet module channel 1 (switch 2/1 = ON)
Host address = (the last two digits of the resource name) ∗ 2 + 1

For ethernet module channel 2 (switch 2/1 = OFF)
Host address = (the last two digits of the resource name) ∗ 2 + 2

Note The resource name **must** have eight characters and the last two characters (Res-ID) **must** be numbers!

Permitted ID's:
1 up to 99 (beginning with H41q/H51q OS version (05.34))

Example:
Resource name MT200_**33**, module channel 1 (switch 2/1 = ON)
Host address: 33 ∗ 2 + 1= 67; IP address = 192.168.0.**67**

Resource name MT200_**33,** module channel 2 (switch 2/1 = OFF)
Host address: 33 ∗ 2 + 2 = 68; IP address = 192.168.0.**68**

F 8628X settings upon delivery
IP address 192.168.0.63 (switch 2/1 ON) or 192.168.0.64 (switch 2/1 OFF).
Switch ID_IP is deactivated (switch 1/6 OFF).

5.2 ELOP II TCP connection to the central module (CM)

Via the PADT (PC), the user can establish an ELOP II TCP connection to the F 865x central module via the F 8628X.
The ELOP II TCP connection provides a fast data exchange between a PADT and the F 865x central module.

Res-ID: The Res-ID is identical to the last two numbers of the resource name.

ID: The ID is set via DIP switches 1 to 7 on the F 865x central module.

5.2.1 Requirements for a ELOP II TCP connection

- F 865x central module OS version (05.34) or higher
- ELOP II, version 4.1 build (6118) or higher
- F 8628X Ethernet module OS version 4.x or higher
- HSR cable in redundant systems

5.2.2 Connection of ELOP II PADT (PC) to F 8628X

A PADT can only connect to a H41q/H51q via a single F 8628X on the H41q/H51q (even in cases of redundancy).
The selected F 8628X transfers the telegrams to the associated F 865x central module and via the HSR cable (BV 7053) to the redundant F 8628X and the associated F 865x central module. The HSR cable between the two redundant F 8628X enables the communication to both central modules as well as the "Reload" of a redundant H41q/51q.

Note For ELOP II TCP connection, any free IP address for the PADT may be used. If the PADT IP addresses and the F 8628X are located in the same subnet, a routing entry for the subnet of the F 8628X is not required on the PADT (Chapter 5.2.6.1).

Note Carefully check that no other participant (e.g. H41q/H51q , OPC server or PC) has the same IP address, as this could cause communication problems. Next time, when expanding communication, please consider the H41q/H51q and the OPC server IP-addresses.

5.2.3 Create ELOP II TCP connection to a H41q/H51q

Perform the following settings on the H41q/H51q:

- Activate the ID_IP (switch 1/8 ON) on the F 8628X .
- Set channel 1 or channel 2 on the module F 8628X (see chapter 5.1).
- Set the redundant channel (if available) on the redundant module F 8628X (see chapter 5.1).
- Make sure that a proper operating system OS Version (05.34) or higher is loaded in the F 865x central modules.
- Set the same number for the "ID" on the F 865x central module (DIP switches, see F 865x data sheet), which is used as Res-ID in the resource name (last two digits of the resource name).

If necessary, delete the User Program of the Central Module F 865x
If a user program with a wrong resource name (e.g. no or wrong Res ID) exists in the F 865x, no ELOP II TCP connection can be established.
Delete the user program with the wrong resource name, so that the F 8628X can be determine the IP address from the F 865x ID settings (DIP switches 1-7).

Note Please refer to the manual "Functions of the operating system BS41q/ H51q (HI 800 105)" for further information about "Erasing the user program".

Perform the following Settings in ELOP II

- Create a resource, having a name from which the required IP address can be determined (see chapter 5.1).
- In the dialog "cabinet layout" add the F 8628X module icons for the documentation of the cabinet allocation.

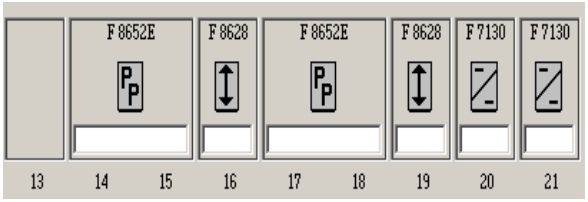


Figure 3: Cabinet Layout

- Open the context menu of the resource and select *Properties.*

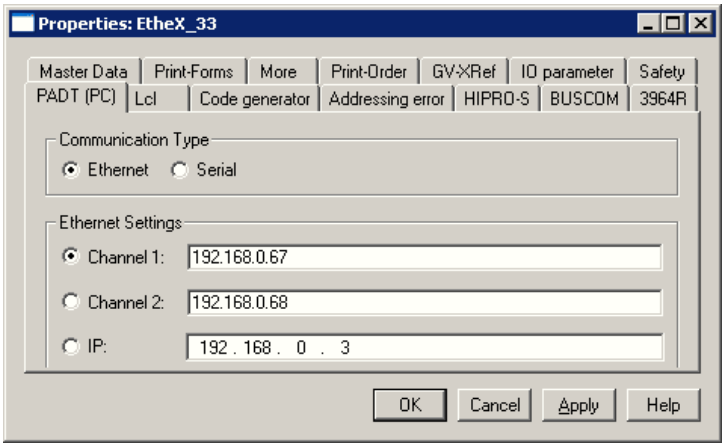


Figure 4: ELOP II dialog "Properties"

- Open the tab *PADT (PC)* and select the communication type *Ethernet*.
- Select one of the IP addresses *channel1* or *channel2* which are determined by ELOP II. By this the F 8628X connected to the PADT is selected.
- Click "OK" to close the "Properties" dialog with "OK".

Load the User Program into the H41q/H51q

- Connect the selected F 8628X with the PADT corresponding to a connection from chapter 5.2.5.

Note In case of a redundant H41q/H51q, make sure that the HSR cable (BV 7053) is plugged; otherwise there is no access available to the redundant central module F 865x.

- Open the context menu of the resource and select *Control Panel*.
  If a connection has been established, "OK" appears in the field "Communication".

- Load the user program into the central module(s) F 865x using "Download/Reload".
- Start the H41q/H51q controller.

In case of problems with the ELOP II TCP communication see also chapter 5.2.6.

5.2.4 Upgrade of a H41q/H51q to ELOP II TCP without system stop

Preconditions
A H41q/H51q controller may change to ELOP II TCP without a system stop if the following conditions are fulfilled:

- The conditions for a ELOP II TCP connection are fullfilled (see chapter 5.2.1).
- A suitable operating system OS version (05.34) or higher must be loaded in the central module(s) F 865x.
- In the F 865x a user program must exist having a resource name , from which the F 8628X can determine an IP address.
- On all F 865x the same number for the ID must be set, which is used as Res ID in the resources name. For the reading of the ID, see manual "functions of the operating system BS41q/H51q" (HI 800 105).

Installation of the F 8628X module
For installation of the F 8628X Consider chapter 2.2.

- On all F 8628X activate the ID_IP (switch 1/8 ON).
- Set channel 1 or channel 2 on the module F 8628X (see chapter 5.1).
- Set the redundant channel (if available) on the redundant module F 8628X (see chapter 5.1).
- Replace the existing modules F 8628 by F 8628X, by which the ELOP II TCP connection is carried out. If no F 8628X modules were used previously, then plug the F 8628X into the specified module slot.

Perform the following Settings in ELOP II

- Open the resource context menu and select *Properties.*
- Open the tab *PADT (PC)* and select the communication type *Ethernet*.
- Select one of the IP addresses *channel1* or *channel2* that are determined by ELOP II. By this the F 8628X connected to the PADT is selected.
- Click "OK" to close the "Properties" dialog with "OK".

Load the User Program into the H41q/H51q

- Connect the selected F 8628X to the PADT corresponding to a wiring from chapter 5.2.5.

Note In case of a redundant H41q/H51q, make sure that the HSR cable (BV 7053) is plugged; otherwise no access possible to the redundant central module F 865x.

- Open the context menu of the resource and select *control panel*.
  If a connection has been established, "OK" appears in the field "Communication"

In case of problems with the ELOP II TCP communication see also chapter 5.2.6.

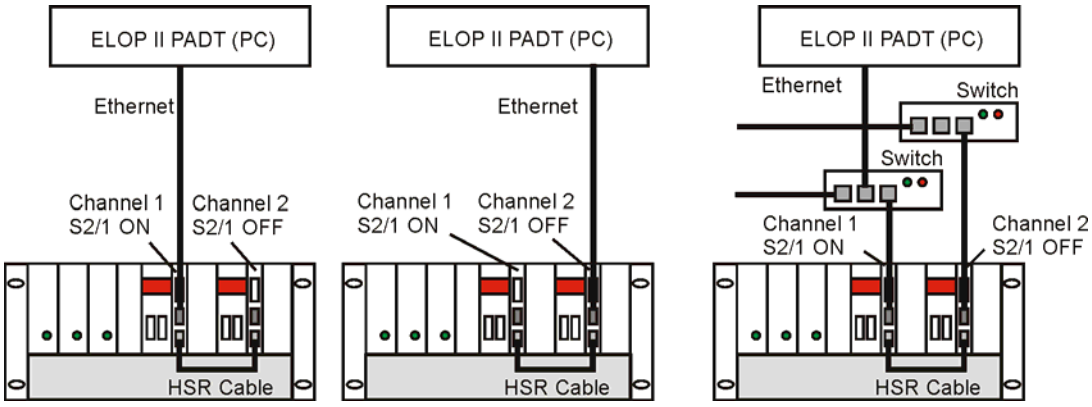
5.2.5 ELOP II TCP connections to H41q/H51q controllers

ELOP II TCP can operate on an existing Ethernet network.
Requirements for using an existing Ethernet network for the HIMA PES with F 8628X

- Network may only contain switches
- Full-Duplex (no collisions)
- Sufficient bandwidth for transmission
- Calculating the timeout with the delay time induced by active network components (e.g. switches, gateways) taken into account.

In case of direct connections (without switch) between the PADT and the H41q/H51q controller, a "cross over" Ethernet cable is required.

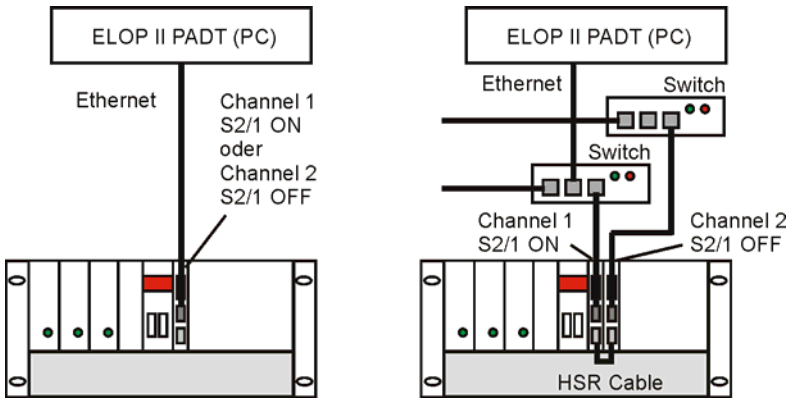
5.2.5.1 ELOP II TCP connections to redundant H41q/H51q controllers



The PADT can establish a connection to the H41q/H51q

- only via channel 1 (left figure).
- only via channel 2 (middle figure).
- only via channel 1 (right figure).

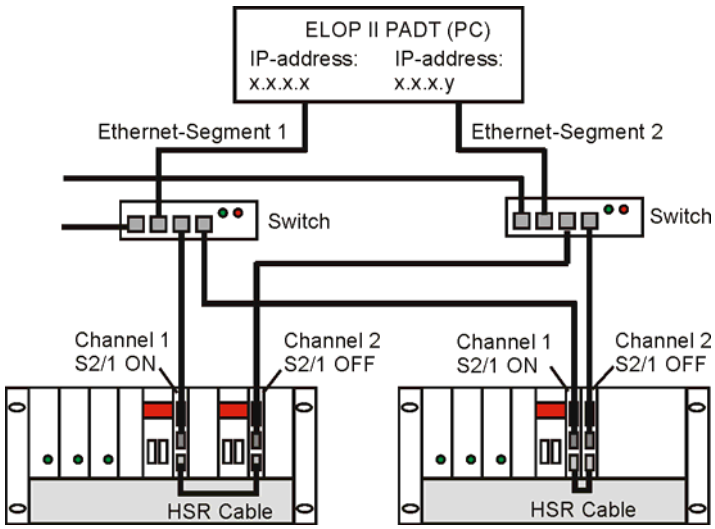
5.2.5.2 ELOP II TCP connections to mono H41q/H51q controller



The PADT can establish a connection to the H41q/H51q

- either via channel 1 or via channel 2 ,depending on F 8628X switch 2/1 (left figure).
- only via channel 1 (right figure).

5.2.5.3 ELOP II TCP connections to H41q/H51q controllers via a redundant network



The PADT can establish a connection to the H41q/H51q systems via ethernet segment 1 or ethernet segment 2.
A routing entry for each ethernet module of the PADT is required (see also chapter 5.2.6).

Others possibilities of the ELOP II TCP wiring shown above are not authorized and can cause problems!

Only communication modules of the same type may be connected to one another using the HSR cable (the connection between F 8627X and F 8628X is not permitted).

5.2.6 If ELOP II TCP communication can not be established

First check

- If ELOP II TCP wiring was correctly performed (see Chapter 5.2.5.1 to Chapter 5.2.5.3) and
- the F 865x ID (DIP switches 1-7) and the ressources RES-ID are identical.

Note A H41q/H51q PES can only communicate with a single PADT.
If the user accesses the same PES using a second PADT, he can establish a connection to this PES by repeatedly pushing the button "Initialize communication".
Then the connection to the first PADT is disconnected and the message "2. PADT (PC) connected to the PES" is displayed in the control panel's "Communication" field.

5.2.6.1 Is the PADT (PC) network card located in the same subnet?

1. Determining the IP address of the PADT(PC) network

- In MS-Windows, open the settings of the PADT network connections from the PADT.
- Select the network card used for connecting to the F 8628X.
- Select properties of the internet protocol.
  - If the network card is not located in the same F 8628X subnet "**192.168.0.**x", follow step 2 for creating a connection.
  - If the network card is located in the same subnet but no connection is available, check the connection using the function "Ping" specified in Chapter 5.2.6.3.

2. Establishing a network connection between a PC and an F 8628X, if they are located in different subnets.

- First method: Change the IP address of the PC network card in use
  - In the properties of the TCP/IP connection, enter a free IP address which is located in the same subnet as the F 8628X "**192.168.0.**x".

- Second method: Create a routing entry to the F 8628X on the PC
  - Start the "Dos Shell" on the PC
  - Enter the following command:
    route add [IP address F 8628X] mask 255.255.255.255 [IP address PC]

Note To ensure the routing entry remains permanent (e.g. after the PC is restarted), use the **-p** parameter with the route command.
Example: **route -p add**.
Check if the routing entry for connecting the PC network card to the F 8628X is correct by using the command **route print**.

- Start the ELOP II control panel to establish a connection to the F 8628X.

5.2.6.2 Connection problem after exchanging an F 8628X

The ARP entry on the PC must be deleted if the new F 8628X has the **same IP address** as the old F 8628X.
Otherwise the new F 8628X with the same IP address cannot be connected to the PADT (PC).

Example: Delete the ARP entry of an F 8628X with the
IP address **192.168.0.67**.

- Start the "Dos Shell" on the PADT (PC).
- Enter the command **arp -d 192.168.0.67**.

5.2.6.3 Check the connection to the F 8628X using "Ping"

- Start the "Dos Shell" on the PADT (PC)**.**
- Enter the command **Ping 192.168.0.x**.
- Messages generated by "Ping":
  - Ethernet connection is OK : "Reply from 192.168.0.x: bytes = 32 time < 4ms..."
    If ELOP II connection is available check the resource settings in ELOP II.
  - Ethernet connection is not OK: "Request timed out."
    Check the wiring, routing entry etc.

Note If all steps described in this chapter have been followed and the F 8628X does not respond, check if other participants can be accessed using the PC's netword card.

5.2.6.4 The F 8628X determines its IP address in accordance with the following priorities

1. The IP address is determined from the Resource ID (Res-ID) of the user program that is loaded in the F 865x.
   The Res-ID of the user program always has a higher priority than the F 865x ID settings (DIP-switch 1-7).
2. The IP address is determined from the F 865x ID settings (DIP switches 1-7), if the Res-ID cannot be determined from the current user program's resource name and switch ID_IP is activated on the F 8628X (switch 1/6 ON).
3. IP address of the "Basic Configuration"
   If no IP address can be determined using the Res-ID or ID (switch 1/6 OFF) as described in the first two cases, the last IP address determined on this F 8628X is used.

6 Parameter used in PROFIBUS-DP Master to reload a redundant H41q/H51q system

When reloading a redundant H41q/H51q system using a redundant PROFIBUS-DP connection, the PROFIBUS-DP communication is stopped for a short time after switching over to the central module that was loaded first.
To avoid failure reactions during the reload procedure, the downtime "t_{down}" must be considered when parameterizing the PROFIBUS-DP Master's redundancy management.

Estimating the downtime t_{down} for the PROFIBUS-DP Master

The following formula is used for estimating the downtime:

$$\mathbf{t_{down} < 200\ ms + WDT + t_{master}}$$

t_{down}: Within this time, the F 8628X modules cannot communicate.
WDT: H41q/H51q system watchdog time.
t_{master}: The amount of time after loading central module 1 that the PROFIBUS-DP Master requires before the F 8628X communication module can exchange data.
The time "t_{master}" is at least 6 bus cycles (polling cycles). The user must determine the actual number of bus cycles (polling cycles) from the PROFIBUS-DP master settings or by using a bus analyzer.

The estimate (formula) is only suited for PROFIBUS-DP slave modules of type F 8628X. The PROFIBUS-DP slave modules must be set to a fixed baud rate (via switch 2/5-8). When reloading the redundant H41q/H51q systems, one must ensure that the central module 1 is loaded first.

7 Address mapping of the BUSCOM variables

7.1 Data types of BUSCOM variables

Overview, how the BUSCOM variables are represented and stored.

ELOP II (variable data types)	Process data mapping on the F 8628X	Size of data types on the F 8628X and F 865x
BOOL	BOOL	1 Byte
WORD (WORD INT UINT)	WORD	2 Bytes

Table 8: Data type definitions

All 2 Byte data types configured in ELOP II as BUSCOM variables are transmitted as WORD. 1 Byte data types (e.g. Byte, SINT) must be packed into BUSCOM variables of data type WORD (e.g. with the function blocks "Pack" and "Unpack") such that they can be transmitted.

7.2 BUSCOM address of the F 865x central module

The user can set-up the BUSCOM Addresses of the BUSCOM variables by specifying the base and relative addresses in ELOP II.

The addresses of the BUSCOM variables are calculated on the central module F 865x as follows:

Base address + Relative address = BUSCOM address

The relative address must be set such that the BUSCOM address is located in the same range as the corresponding base address (see Table 9).

Note The base address' settings are located in resource's properties. In the "BUSCOM" tab, the user can set the base address separately for Import, Export and Import/Export; however, using the standard base address settings is recommended.

The BOOL and WORD variables are stored within the import and export areas of the F 865x and further separated into 0 and 1 areas.

Ranges	BOOL (BUSCOM address)	WORD (BUSCOM address)
Import range 0 (Base address 0000)	0000 to 2047	0000 to 2047
Import range 1 (Base address 4096)	4096 to 8191	4096 to 8191
Export range 0 (Base address 0000)	0000 to 2047	0000 to 2047
Export range 1 (Base address 4096)	4096 to 8191	4096 to 8191

Table 9: BUSCOM variable ranges in the F 865x central module

7.3 Mapping of the BUSCOM variables on the F 8628X

To transmit the BUSCOM variables, they are mapped from the F 865x central module to the F 8628X communication module.
The BUSCOM variables from the F 865x are copied into two memory areas located in the F 8628X internal memory.
The memory areas EV and IV reflect the export and the import variables respectively. In the memory area, a BUSCOM variable is described by its identity number.

Note This scheme for converting BUSCOM variables (on the F 865x) into identity numbers (on the F 8628X) is used for WORD as well as for BOOL variables.

7.3.1 Example 1

In this example the **WORD** variables in the export area 0 (on the F 865x) start with the BUSCOM address 0 and are mapped to the memory area EV (on the F 8628X) with the identity number 0.
The identity numbers of the WORD variables in memory area EV are in ascending order up to the last WORD variable (identity number 110) from export area 0.

In this example, the **BOOL** variables in export area 0 (on the F 865x) start with BUSCOM address 0 and are mapped to memory area EV (on the F 8628X) beginning with identity number 111, which follows the last identity number of the WORD variables (i.e. 110).
The identity numbers of the BOOL variables in memory area EV are in ascending order up to the last BOOL variable (indentity number 150) from export area 0.

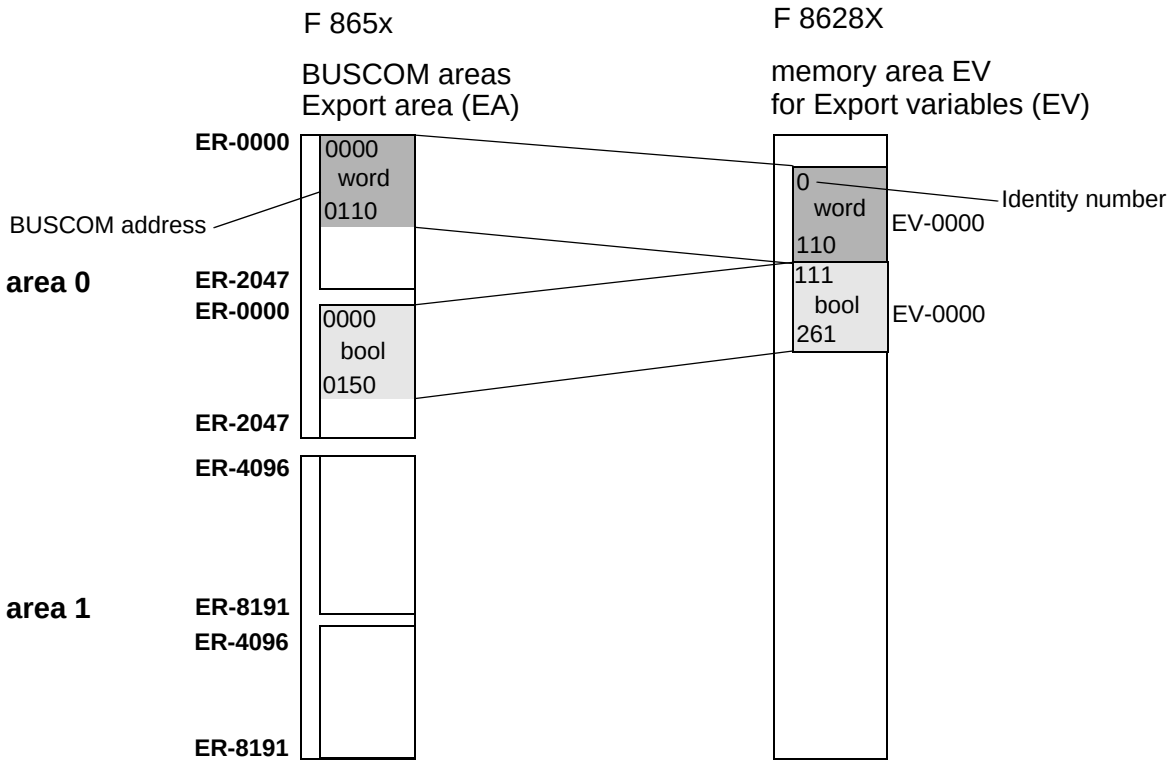


Figure 5: Mapping of the WORD- and BOOL-variables from the export area 0

7.3.2 Example 2

In this example the **BOOL** variables in the export area 0 (on the F865x) start with the BUSCOM address 0 and mapped to the memory area EV (on the F 8628X) with the identity number 0. The identity numbers of the BOOL variables in memory area EV are in ascending order up to the last BOOL variable (identity number 100) from export area 0.

In this example, the **BOOL** variables in export area 1 (on the F 865x) start with BUSCOM address 4096 and are mapped to memory area EV (on the F 8628X) beginning with identity number 101, which follows the last identity number of the BOOL variables (i.e. 100).
The identity numbers of the BOOL variables in memory area EV are in ascending order up to the last BOOL variable 4196 from export area 1.

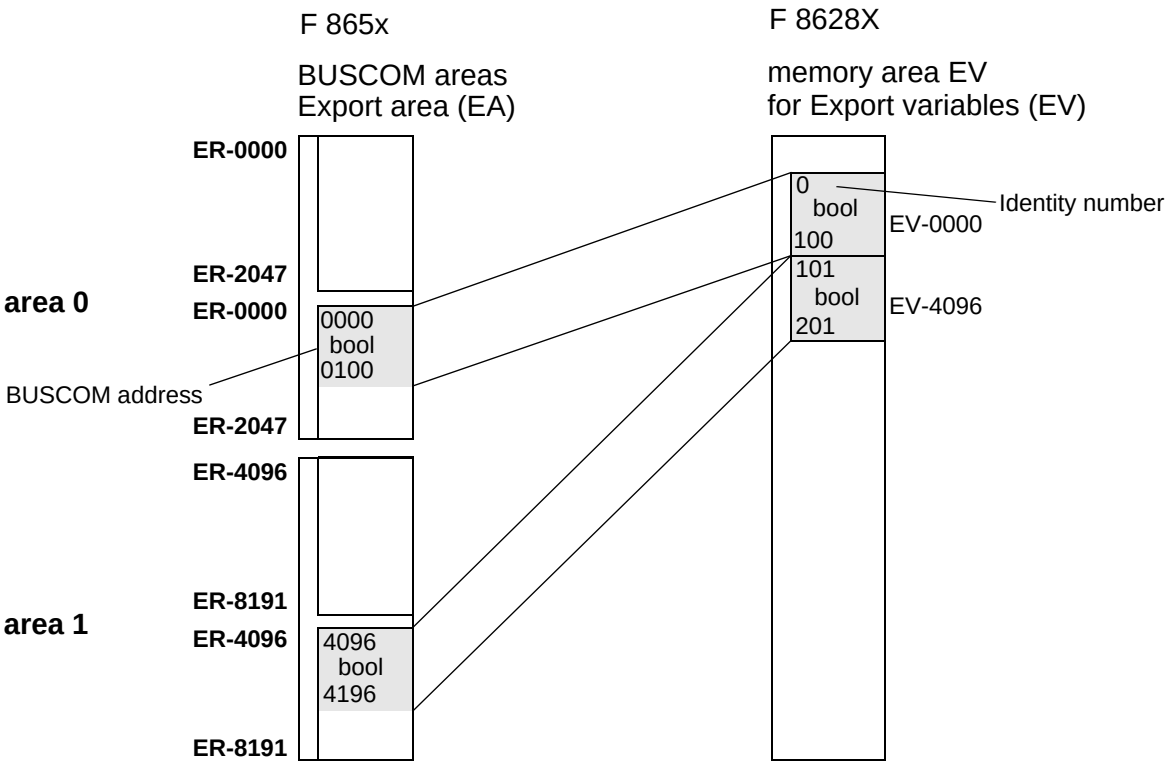


Figure 6: Mapping of the BOOL-variables from the export areas 0 and 1

7.3.3 Example 3

In this example, the **WORD** variables in export area 0 (on the F 865x) start with BUSCOM address 1 and are mapped to the memory area EV (on the F 8628X) beginning with identity number 1. The identity numbers of the WORD variables in memory area EV are in ascending order up to the last WORD variable (0110) from export area 0.
The unused BUSCOM address 0 is assigned a dummy variable and mapped to identity number 0 within memory area EV.

In this example, the **WORD** variables in export area 1 (on the F 865x) start with BUSCOM address 4100 and are mapped to the memory area EV (on the F 8628X) beginning with identity number 115. The identity numbers of the WORD variables in memory area EV are in ascending order up to the last WORD variable (4200) from export area 1.
The unused BUSCOM addresses 4096 to 4099 are assigned dummy variables and mapped to identity numbers 111 to 114 within memory area EV.

In this example, the **BOOL** variables in export area 0 (on the F 865x) start with BUSCOM address 0 and are mapped to the memory area EV (on the F 8628X) beginning with identity number 216 which follows the identity number 215 of the last WORD variable from export area 0.
The identity numbers of the BOOL variables in memory area EV are in ascending order up to the last BOOL variable (0100) from export area 0.

In this example, the **BOOL** variables in export area 1 (on the F 865x) start with BUSCOM address 4096 and are mapped to the memory area EV (on the F 8628X) beginning with identity number 317 which follows the identity number 316 of the last BOOL variable from export area 0.
The identity numbers of the BOOL variables in the memory area EV are ascending up to the last BOOL variable 4196 from the export area 1.

Note If BUSCOM variables do not start at the beginning of an area, this area is padded with dummy variables on the central module and also mapped on the communication module.

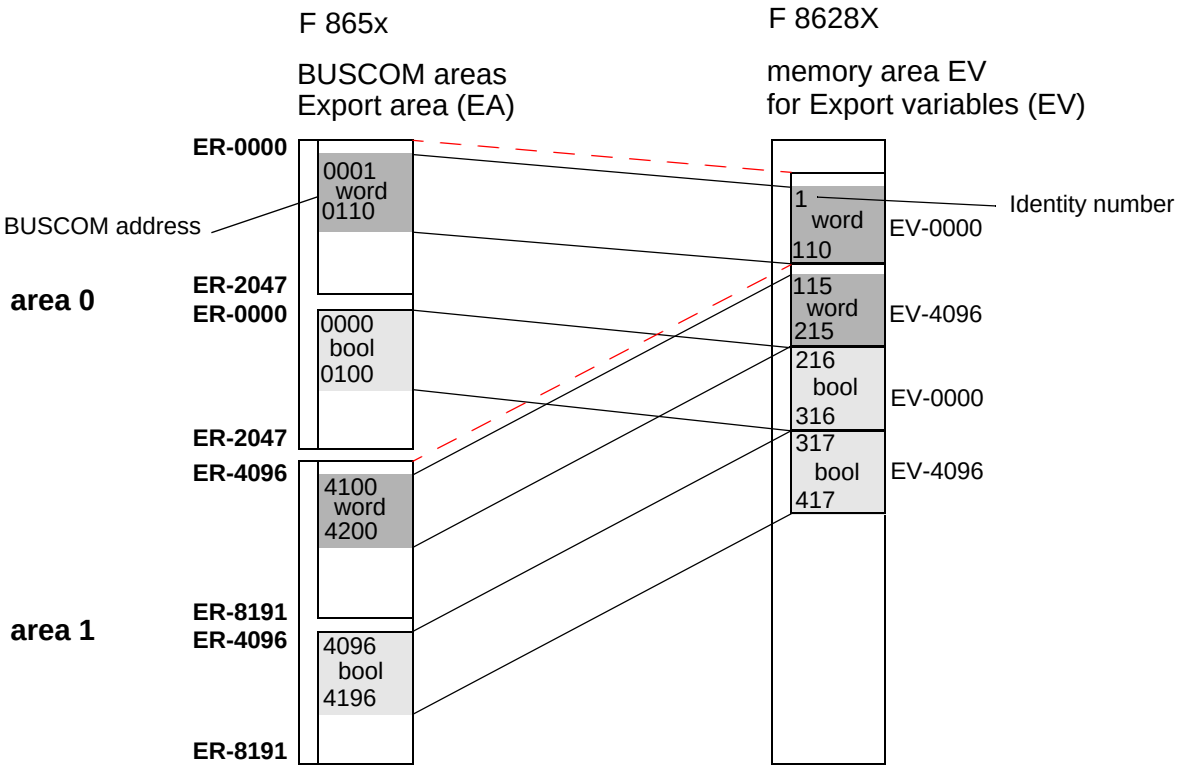


Figure 7: Mapping of the WORD- and BOOL-variables from the export area 0 and 1

8 Characteristics of the PROFIBUS DP transmission

On the PROFIBUS-DP's physical layer, the data are transferred in accordance with the RS-485 standard.
The following table presents the basic technical features of the RS 485 transmission used for PROFIBUS-DP.

Area	Sizes	Remark
Network topology	Linear bus, active bus termination on either end	Branch lines should be avoided.
Medium	Shielded, twisted cable	Shielding can be omitted depending on the environmental conditions.
Number of stations	32 stations in each segment without repeater	With repeaters, expandable up to 126 stations
Connectors	9-pole SUB-D connector	Available from HIMA

Table 10: Characteristics of the RS 485 transmission technology

8.1 Bus dependencies between cable length and baud rate

Baud rate	Range / Segment
9.6 kBit/s	1200 m
19.2 kBit/s	1200 m
45.45 kBit/s	1200 m
93.75 kBit/s	1200 m
187.5 kBit/s	1000 m
500 kBit/s	400 m
1.5 MBit/s	200 m
3 Mbit/s	100 m
6 Mbit/s	100 m
12 MBit/s	100 m

Table 11: Dependencies between cable length and baud rate

Cable lengths specified in Table 11 refer to cable type A with the following parameters:

- Surface impedance 135 Ω up to 165 Ω
- Capacitance per unit length < 30 pF/ m
- Loop resistance 110 W / km
- Core diameter 0.64 mm
- Core cross-section > 0.34 mm²

8.2 Bus connection and termination

The PROFIBUS-DP bus termination consists of a resistance combination ensuring a defined zero potential on the bus.

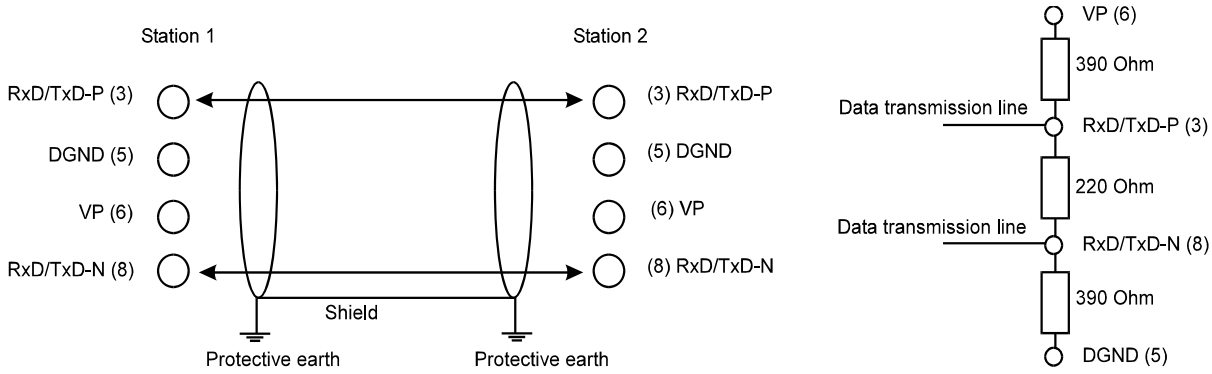


Figure 8: Bus connection and termination, pin assignment of the field bus interface

8.3 PROFIBUS-DP bus cable

In the IEC 61158, two bus cable types are specified. Cable type "A" may be used for all transfer rates up to 12 Mbps. Cable type "B" is outdated and should not be used any longer.

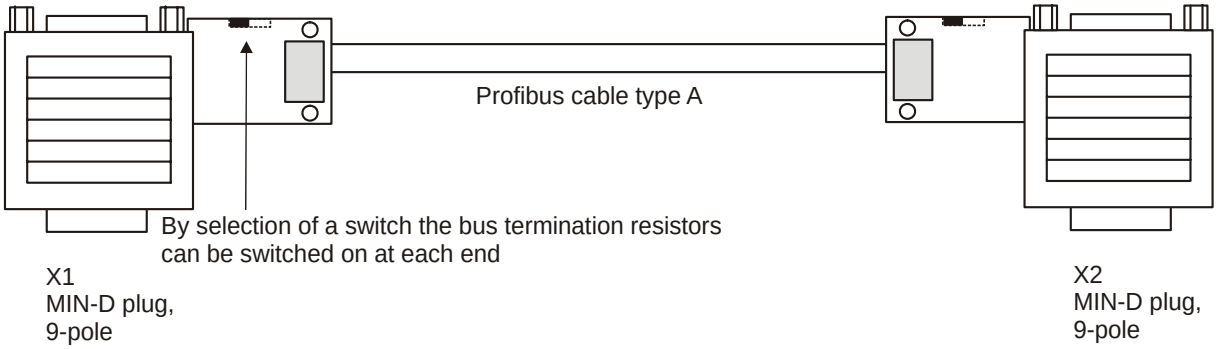


Figure 9: PROFIBUS-DP bus cable, Type A, with bus connector Plug

Note When using the F 8628X Ethernet interface (e.g. for ELOP II TCP), the straight PROFIBUS connector should be utilized. An angled connector might have to be removed to reach the F 8628X Ethernet interface.

The following table specifies the PROFIBUS connectors used within HIMA.

PROFIBUS Plug	PHOENIX CONTACT Description	HIMA Number
Axial	SUBCON-PLUS-PROFIB/AX/SC	52 000 9397
Angled plug, with additio-nal PG connection	SUBCON-PLUS-PROFIB/PG/SC2	52 000 9394

Table 12: PROFIBUS connectors manufactured by PHOENIX CONTACT

9 Configurating the PROFIBUS-DP slave using a PROFIBUS-DP Master

Via the FB interface, the HIMA PROFIBUS-DP slaves enables the PES to be connected with a PROFIBUS-DP.

Using this function, a PROFIBUS-DP master can read and write BUSCOM variables.

To configure the HIMA PROFIBUS-DP slave, the HIMA PROFIBUS-DP master must have the PROFIBUS-DP configuration software. This software may appear as displayed in Figure 10.

The user can define variable windows. There are four reading and four writing windows. These windows must be configured in the parameter range (parameter data) within the master PROFIBUS-DP configuration software, see Figure 12.

The PROFIBUS-DP master can thus address data in accordance with standards.
The user data length of the PROFIBUS-DP telegrams results from the window definition.
The PROFIBUS-DP master must then parameterize and configure these telegrams for the HIMA PROFIBUS-DP slave as a modular slave in accordance with the standard (via HIMA GSD file).

The HIMA PROFIBUS-DP slave is a modular slave. Modules are therefore included in the communication module GSD file (HIQ200EA.GSD). They are used to set the number of input and output bytes so that they correspond to the total of the parameterized windows (Figure 13).

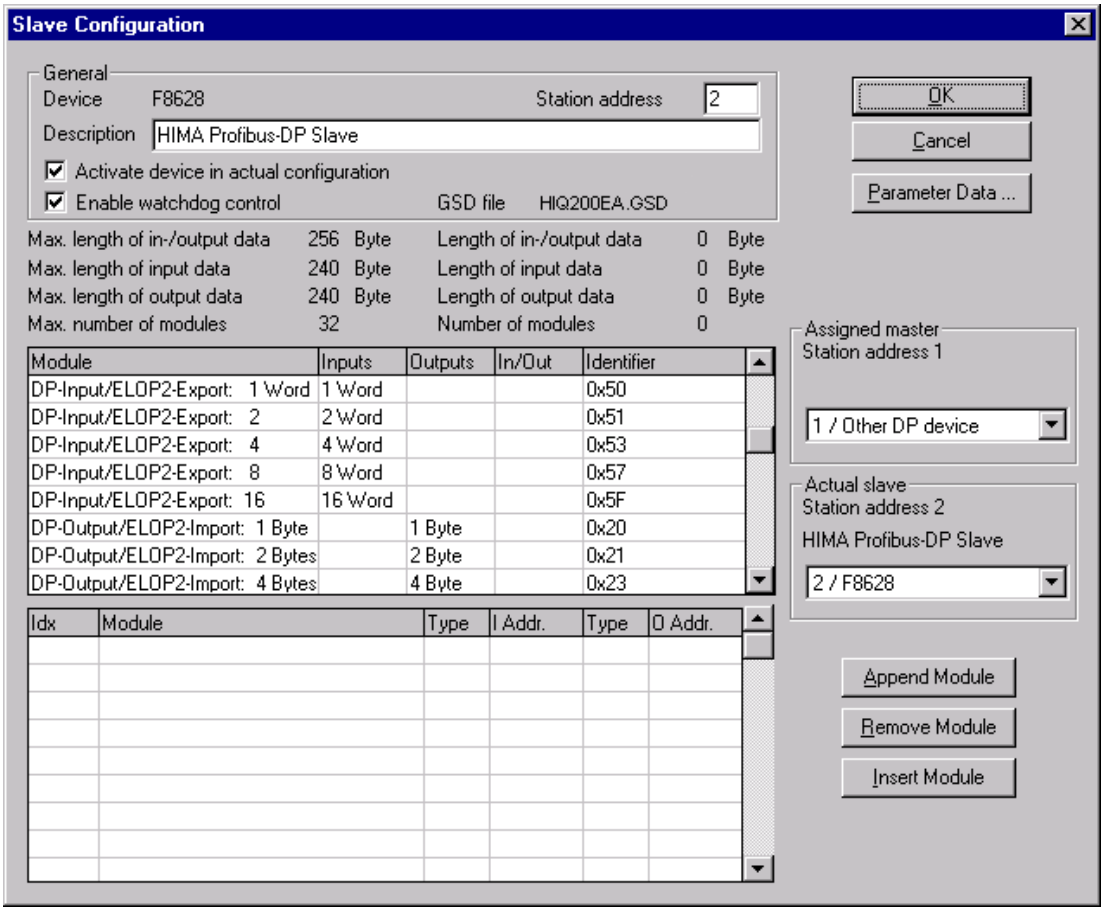


Figure 10:Slave configuration of the HIQ200EA.GSD file in a PROFIBUS-DP master with a selection of available modules

9.1 Data formats

The following description concerns the telegram user data only.
Please we refer to the EN 50 170 standard for further information about telegram data.

The BUSCOM data type **WORD** appears in a telegram as 2 consecutive bytes in big-endian format.

During the transmission, the BUSCOM data type **BOOL** is compressed such that up to 8 consecutive variables defined in the import/export range are packed in one byte. The TRUE value corresponds to 1, and the FALSE value corresponds to 0. The numbering of the Boolean BUSCOM variables in the bits of the byte begins at bit 0 and ends at bit 7. This corresponds to Boolean variable [a] to Boolean variable [a+7]. If integer multiples of 8 consecutive Boolean variables have not been defined in one range/data pool, the remaining bits of the last byte will remain undefined.
If Word variables follow a row of Boolean variables, the Word variables begin in the subsequent byte.

9.2 Addressing

The BUSCOM variables are addressed using their identity number, which is used to replace the BUSCOM address.

The window definition for PROFIBUS INPUT and OUTPUT appears as follows:

Range	Parameters	PROFIBUS INPUT	PROFIBUS OUTPUT
Export 1	[0,1] = Start identity number [2,3] = Number of variables	**X**	
Export 2	[4,5] = Start identity number [6,7] = Number of variables	**X**	
Export 3	[8,9] = Start identity number [10,11] = Number of variables	**X**	
Export 4	[12,13] = Start identity number [14,15] = Number of variables	**X**	
Import 1	[16,17] = Start identity number [18,19] = Number of variables		**X**
Import 2	[20,21] = Start identity number [22,23] = Number of variables		**X**
Import 3	[24,25] = Start identity number [26,27] = Number of variables		**X**
Import 4	[28,29] = Start identity number [30,31] = Number of variables		**X**

Table 13: Window definitions for PROFIBUS-DP input and output

The parameter range (parameter data in the master PROFIBUS-DP configuration software) consists of 32 byte initialized with 00 hex. In the PROFIBUS-DP master, they are set to their values (Figure 10).

The first 16 bytes (byte 0 to 15) describe the export variable windows; the last 16 bytes (byte 16 to 31) describe import variables of the communication module.
In ELOP II, export variables correspond to PROFIBUS input variables and import variables in ELOP II correspond to PROFIBUS output variables (modules in Figure 13).

The data in the parameter range (parameter data) each consist of 2 bytes forming a big-endian

coded 16 bit word.
The start identity number corresponds to an identity number in the corresponding data pool of the communication module. The number of variables determines the number of variables to be transmitted beginning with the start identification number.
The size of window always comprises integer bytes and is determined by the data types defined by the window and the number of data types (compressed or uncompressed).
The total of the sizes of the 4 export windows determines the user data length of the PROFIBUS INPUT telegram. The total of the sizes of the 4 import windows determines the length of the OUTPUT telegram.
The user data length of INPUT and OUTPUT together must not exceed 256 bytes. With this e.g. 2048 Boolean variables may be transmitted.

In accordance with the limit value specified in the PROFIBUS EN 50170 standard, a maximum of 240 bytes may be configured for INPUT or OUTPUT (i.e. up to 1920 Boolean variables in one direction).
The start identity number must have a value valid for the corresponding data pool of the communication module, i.e. a variable with this identity number must have been defined in this data pool. Also, beginning with this variable, a number of further variables must have been defined.
A window may have a sequence of variables of different types (i.e. both Bool and Word). Data are only compressed for the variables within one window.
If a window definition is not used, 0 must be entered for the start identification number and the number of variables.

9.3 Addressing example

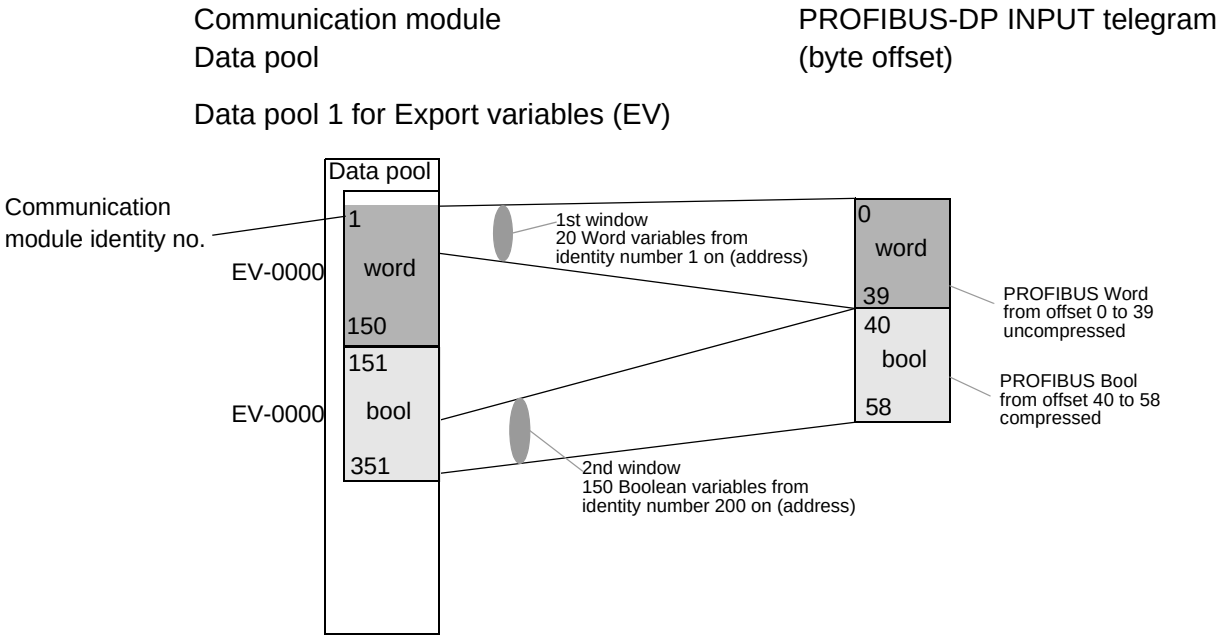


Figure 11:Example of address mapping for PROFIBUS-DP export variables (and for import variables accordingly)

The two export variable windows from data pool 1 are placed transparently onto the PROFIBUS-DP. The PROFIBUS-DP INPUT telegram has a user data length of 59 bytes (0 to 58). It has the following structure:

- 1st window: start of the variables beginning with identity no. 1. (1 dec = 0001 hex in big-endian format); number of variables: 20 (20 dec = 0014 hex).
  From identity no. 1 to 20, there are Word variables which cannot be compressed.
  Each word variable requires 2 bytes. A user data length of 40 bytes is generated (byte 0 to 39).

- 2nd window: start of the variables beginning with identity no. 200 (200 dec = 00C8 hex); number of variables: 150 (150 dec = 0096 hex).
  From identity no. 200 to 349 there are Boolean variables which can be compressed into bytes (150 / 8 = 18.75). A user data length of 19 bytes is generated. (offset by 1st window, bytes 40 to 58)

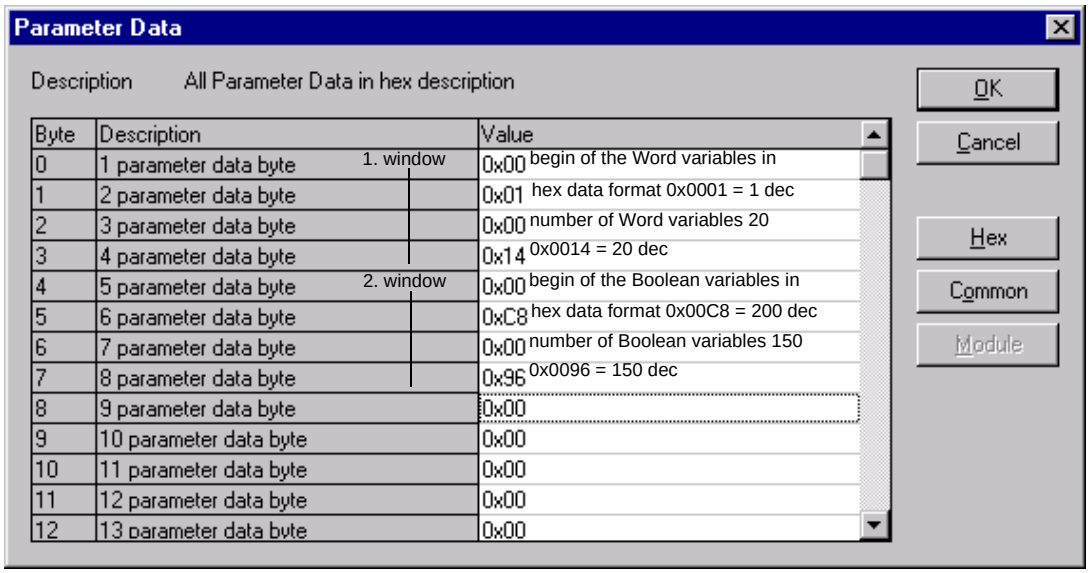


Figure 12:Example of address mapping for the export parameter data in the PROFIBUS-DP master

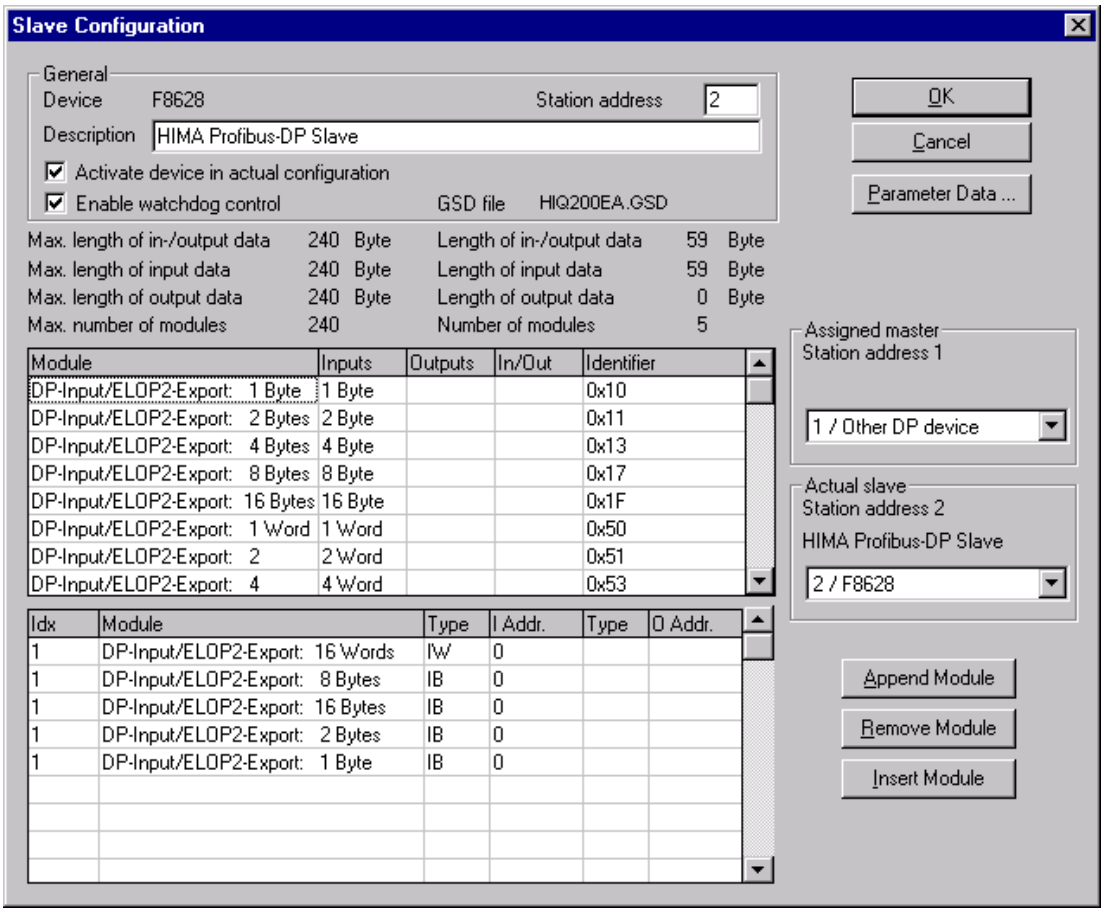


Figure 13:Example of address mapping for the PROFIBUS-DP input telegram, user data length of 59 bytes in 5 modules

10 Replace of the operating system

10.1 Upgrading/downgrading the operating system versions of the F 8628X

The following instructions describe the upgrade/downgrade the operation systems for the F 8628X module.

The upgrade/downgrade may be done only by HIMA service engineers. It is recommended to change the operating system only in the time of a shutdown of the plant.

10.1.1 Upgrading/downgrading from version 2.x

To upgrade/downgrade version 2.x, the operating system file with extension ***.flash** must be loaded.
Since the F 8628X has the same operating system as the F 8627X, the F 8628X must use the same operating system file.

When upgrading from version 2.x to another version, the user must ensure that only the correct operating system file is loaded into the corresponding module.
If the module F 8628X was loaded with any incorrect file, the functionality of the F 8628X is lost and can not be programmed any longer with the diagnostic dialog ComEth. In this case the module F 8628X must be programmed new by HIMA.

After an upgrade to version 3.x and higher a protection mechanism is activated and only operating system files with the extension ***.ldb** can be loaded.

10.1.2 Upgrading/downgrading from version 3.x and higher

To upgrade/downgrade version 3.x and higher, the operating system file with extension ***.ldb** must be loaded.
Since the F 8628X has the same operating system as the F 8627X, the F 8628X must use the same operating system file.

After downgrading to version 2.x, the protection mechanism preventing incorrect files from being loaded is no longer active!

10.2 Download of the operating system to the F 8628X

The operating system download for the module F 8628X is done using the diagnosis dialog **ComEth**.

The connection between the **ComEth**'s control panel and the F 8628X Ethernet module should be closed, if **ComEth** is not used.
The connection to the **ComEth**'s diagnosis panel can remain.

- Start the ComEth diagnosis dialog and check in the error-state viewer that the
  - "main program version" is 0.8.0 or higher
  - "diagnostic text version" is 0.2.0 or higher.
- Select *Project->New* on the menubar of the ComEth diagnosis dialog, to create a new Project.
- Select *New Configuration* in the context menu of the new project, to create a new configuration.
- Select *New Resource* in the context menu of the new configuration, to create a new resource.
- Select *New F 8628X* in the context menu of the new resource, to create a new F 8628X in the new resource.
- Select *Properties* in the context menu of the new F 8628X, to open the dialog window "Properties".

Configure the input fields as follows:

- Enter any unique name for the F 8628X (e.g. CU1CM1) in the input field.
- In the input field "IP address", enter the IP address of the F 8628X module into which the operating system is to be loaded. For determining the IP address of the F 8628X module, (see Chapter 5.1).
- The view box "IP address PC" displays all IP addresses of the available PADT (PC) network cards. Select the IP address of the network card to be used for creating the conection to the F 8628X module.

Note

OS versions < V4.x
The PADT (PC) IP address must:

- be located in the same subnet as the F 8628 module.
- have an IP address from 192.168.0.201 up to 192.168.0.254.

If several network cards are available on the PADT (PC), a corresponding routing entry must be set for the network card which is used for connection to the F 8628.

OS versions ≥ V4.x
Any free IP address for the PADT may be used. If the PADT IP addresses of the PADT and the F 8628X are located in different subnets, a routing entry for the subnet of the F 8628X is required on the PADT (PC).

- Select *Control Panel* in the context menu of the new F 8628X to open the Control Panel.
- Select *PADT->Connect* in the control panel to create a connection to the F 8628X module.

The next step causes a communication loss, if no redundant F 8628X module exists or if the redundant module does not have any connection!

- Click the button *Stop Device* in the ComEth control panel, to set the F 8628X module into the STOP state (green RUN LED blinks).
- Select *Extra->OS Update* in the ComEth control panel to open the standard dialog for opening a file.
- Select and load the **proper** operating system for the upgrade/downgrade into the selected F 8628X module (see Chapter 10.1.1 and Chapter 10.1.2).

If the operating system download of the F 8628X was aborted, then the F 8628X must **not** be withdraw!
Close the control panel of **ComEth** and open this again. Repeat the previous step to load the operating system of the F 8628X.

Note

After successfully downloading the operating system for the F 8628X, **the module F 8628X must be rebooted**. After the reboot the new operating system is started. Until then the F 8628X works with the old operating system.

To reboot the F 8628X:

- Remove and replace the F 8628X module or
- select the function *Extra->Reboot Device* located in the ComEth Control Panel dialog.
- Check the upgrade/downgrade
- Select *PADT->Connect* in the control panel to create a new connection to the F 8628X module.
- Select the tab *version* and check that the OS version displayed is the same as the OS version of the Upgrade/Downgrade.
- If a redundant F 8628X module exists, follow the same procedure.

Note

The ARP entry must be deleted on the PADT (PC) if another F 8628X is to be loaded and has the **same IP address** as the F 8628X loaded immediately beforehand; otherwise, a connection cannot be opened to the newly loaded F 8628X with the same IP address.

Example: Delete the ARP entry of a F 8628X with the IP address **192.168.0.67**.

- Start the "Dos Shell" on the PADT (PC)
- Enter the command **arp -d 192.168.0.67**.

11 Recommended literature

[1] Safety Manual H41q/H51q
HIMA GmbH+Co KG Bruehl, 2005: HI 800 013

[2] Functions of the Operating System H41q/H51q
HIMA GmbH+Co KG Bruehl, 2005: HI 800 105

[3] Online Help in ELOP II
HIMA GmbH+Co KG Bruehl, 2005

[4] First Steps ELOP II
HIMA GmbH+Co KG Bruehl, 2001: HI 800 000

[5] HIMA OPC Server 3.0 Rev. 2
HIMA GmbH+Co KG Bruehl, 2004

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