Programmable Systems

The H41q and H51q System Families

Data Sheet / Operating Instructions
for Module
F 8627

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Industrial Automation

F 8627 IEA (0508)

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.

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Table of Contents

HIMA

F 8627

1 Overview

F 8627 Communication Module for Ethernet-Communication
Application in H41q/H51q PES (usable with BS41q/51q V7.0-7 (9835) and higher) with ELOP II.
Appertaining Function block: HK-COM-3

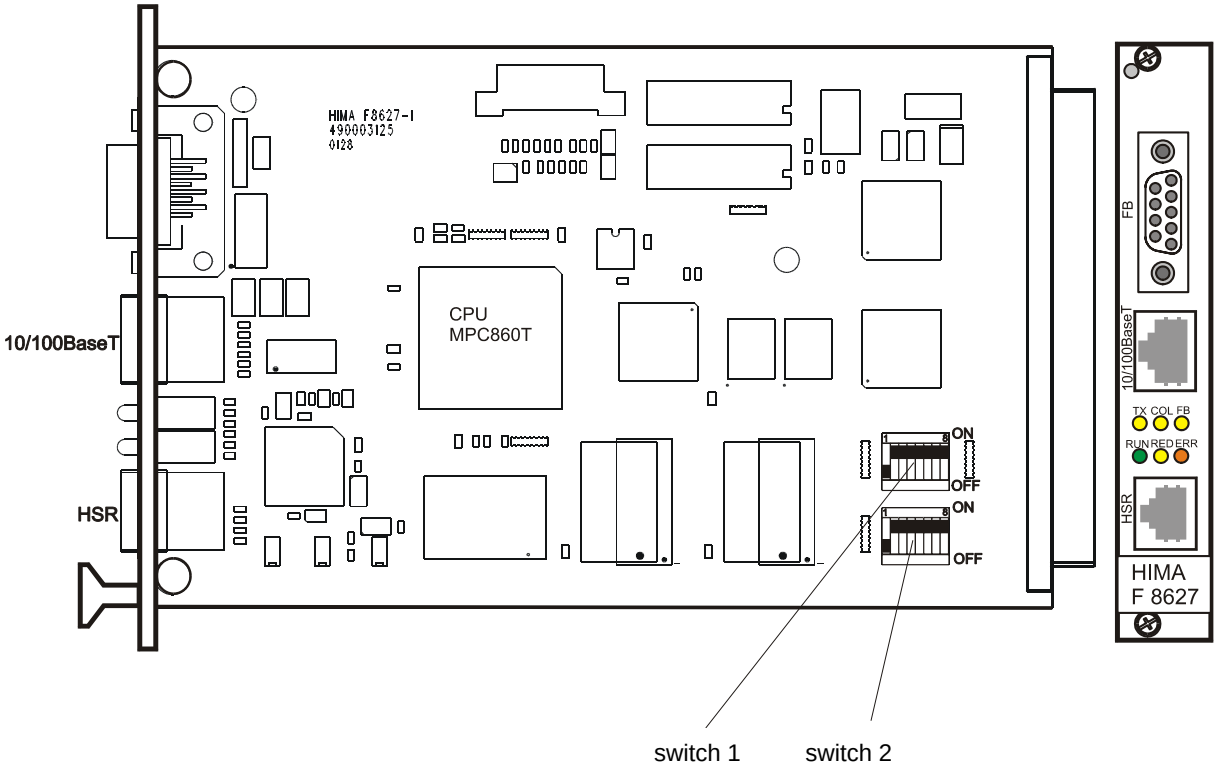


Fig. 1: Communication module F 8627

2 Technical data

Processor	32 bit Motorola CPU MPC860T with integrated RISC communication controller
Operating voltage	5 V
Current consumption	1 A
Space required	3 HE (units high), 4 TE (units wide)
Ethernet Interface	10BaseT 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.
Serial Interface	Serial interface FB not used.
Diagnostic Display	6 LED's for display diagnostic during operation
DIP switches	2 DIP switches for setting the module functions.

3 Functions of F 8627

3.1 General

Via the F 8627 a H41q/H51q can exchange safety-related data via safe**ethernet**. The safety is ensured by the central module (e.g. F 8650E).

In addition, the F 8627 can exchange not safety related data with an HIMA OPC server.

A maximum of five F 8627 per central module can operate in a H41q/H51q at the same time.

3.2 Operating system versions

Consider the release of your F 8627 (stickers or read out via the Tool "**ComEth**").
The differences of the operating system versions are referred in this data sheet.

Operating system version	Properties/Mode
From OS Version 2.x	• HIPRO-S Mode • A maximum of 31 HIMA PES can communicate with each other in safety-related manner. • A PES communicate with a maximum of 4 OPC-Server.

From OS Version 3.x	• Compatible to OS Version 2.x
	• HIPRO-S-DIRECT Mode
	  • In HIPRO-S-DIRECT mode a maximum of 64 HIMA PES can communicate with each other in a safety-related manner.
	  • In HIPRO-S-DIRECT mode the number of OPC-Servers can be set via switch from 0 up to 14.

For the F 8627, an upgrade to the current operating system is commended, to use the new functions (HIPRO-S-DIRECT).
An upgrade of the operating system of the F 8627 can be done with the tool „**ComEth**“.

3.3 Compatibility of the F8627 to F 8625

- The modules must operate in HIPRO-S Mode (S1/7 „OFF“).
- "Passive mode" may only be switched on if this is also supported on the redundant F 8625/F 8627 device.

3.4 Replace a F 8627

In no case, a F 8627 may be without a special procedure withdraw from a redundant operation.

3.4.1 Procedure for Exchanging a redundant F 8627:

1. Unplug communication cable (Ethernet).
2. Withdraw appropriate central module (e.g. F 8650E).
3. Withdraw communication module F 8627.
4. Unplug HSR cable (if used).
5. Check the settings of the DIP-switches on the new F 8627.
6. Plug the new communication module F 8627.
7. Plug the HSR cable BV 7053 (if required).
8. Plug the communication cable (Ethernet).
9. Plug the appropriate central module (e.g. F 8650E).

4 Operating Diagnostic Display on Module Front

4.1 Top row LEDs

TX	COL	FB	Operating status
ON	-	-	Send LED of Ethernet communication
-	ON	-	Collision on the Ethernet segment
-	-	OFF	No display (always OFF)

Tab. 1: Display readings during operation, top row

4.2 Bottom row LEDs

RUN	RED	ERR	Operating status
ON	-	OFF	Ethernet communication protocol active
Flashing	-	OFF	Ethernet communication protocol inactive
-	ON	OFF	Communication to redundant communication module active
Flashing	-	Flashing	Booting of the communication module
OFF	-	ON	Fatal error in communication module. Module must be replaced.
OFF	-	Flashing 3-times	Saving of error code in Flash-EPROM (required for repair purposes) ***Do not unplug communication module!***

Tab. 2: Display readings during operation, bottom row

5 Functions of the Switches

5.1 Functions of Switch 1 (S1)

S1	ON	OFF	Description
1	10 ms	0 ms	The "Timeout" for the response of the communication partners is set via the switches S1/1-5. Standard value: 10 ms (switch 1/1-5 "OFF"). The switches S1/1-5 can be combined by user. 10 ms must add to each combination of the switches. HIPRO-S-DIRECT must be activated (switch 1/7 "ON").
2	20 ms	0 ms	
3	40 ms	0 ms	
4	400 ms	0 ms	
5	1000 ms	0 ms	
6	-	-	Not used
7	DIRECT Mode enabled	DIRECT Mode disabled	HIPRO-S-DIRECT Mode must activated, if more than one bus configuration is required. HIPRO-S-DIRECT is available from OS-Version 3.x of the F 8627.
8	Passive Mode disabled	Passive Mode enabled	The Passive Mode controls the communication to the HIMA OPC Server. Passive Mode enabled: The Token Passing from the F 8627 to the HIMA OPC Servers (and vice versal) is disabled. The HIMA OPC Server exchange cyclic data with the F 8627, independent by the hold of the Token. Passive Mode disabled: The Token Passing from the F 8627 to the HIMA OPC Servers (and vice versal) is enabled. The HIMA OPC Server only exchange data with the F 8627, if the HIMA OPC Server hold the Token.

Tab. 3: Functions of switch 1 (S1)

5.2 Functions of Switch 2 (S2)

S2	ON	OFF	Description
1	Ethernet Segment 1	Ethernet Segment 2	Allocation of the F 8627 to the Ethernet Segment 1 or Ethernet Segment 2 (see Figure 2).
2	Mono	Redundant	Wiring of the modules (Not used in HIPRO-S-DIRECT Mode)
3	Auto-Negotiation On	Auto-Negotiation Off	Automatic adaptation of transmission rate (10/100 MBit/s) when Switch S2/3 is ON.
4	100 MBit/s	10 MBit/s	Position of switch is only relevant, when Switch S2/3 (auto-negotiation) is OFF.
5	Full duplex	Half duplex	Simultaneous sending and receiving, when Switch S2/5 is ON. Note on full-duplex operation: In network topologies where hubs are used, the hubs must be replaced by full-duplex switches (hubs are not full-duplex capable).
6	2 OPC Server	0	From OS Version 3.x of the F 8627, the number of HIMA OPC Servers (0 up to 14) must set via switches. The switches S2/6-8 can be combined by the user. No function, if HIPRO-S-DIRECT is not active (in this case the number of HIMA OPC Servers is firm on four).
7	4 OPC Server	0	
8	8 OPC Server	0	

Tab. 4: Functions of switch 2 (S2)

6 Determining the IP Address for the F 8627

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

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

Note The resource name **must** have eight characters and the last two characters **must** be numbers!
Permitted ID's:
1 up to 64: Including H41q/H51q-OS V7.0-8 (0410) or V 3.x of the F 8627

Example:
Resource name MT200_33 and module 1 (switch 2/1 = ON)
Host address: 33 ∗ 2 + 1= 67; IP address= 192.168.0.**67**

Resource name MT200_33 and module 2 (switch 2/1 = OFF)
Host address: 33 ∗ 2 + 2 = 68; IP address = 192.168.0.**68**

7 Communication via the F 8627

7.1 Overview

The following table shows an overview of the properties of the communications variants from the F 8627 and the conditions, which are needed.

HIPRO-S		HIPRO-S-DIRECT
F8625/F8627		F 8627 from BS Version 3.x
Hub/Switch		Switch
HSR cable for redundancy		HSR cable not required
Half/Full-Duplex		Full-Duplex
Token passing		No token passing
Communication from each PES with each other PES (HIPRO-S dummys may have to be configured)		Not necessary
Number of HIMA OPC Servers set fixed to 4		Number of OPC-Server is adjustable max. 14
Timeout fixed on 16 ms		Timeout adjustable
Maximal 31 safe**ethernet** members		Maximal 64 safe**ethernet** members
Ethernet network with low load: Only HIMA PES or HIMA OPC servers		An existing Ethernet network can be used if the requirements A) are fullfiled.
OPC without Passive Mode	**OPC without Passive Mode**	**OPC with Passive Mode**
For the communication with a HIMA OPC server HIPRO-S variables must always be configured (dummy variables).	Communication with a HIMA OPC server in passive mode may operate **without** HIPRO-S variables F 8625: from V. 1.13 F 8627: from V. 2.x **or with** HIPRO-S variables F 8625: from V. 1.17 F 8627: up to V. 3.x	Communication with a HIMA OPC server in passive mode may operate **with or without** HIPRO-S Variables F 8627: from V. 3.x
Hub/Switch	Switch	Switch
HSR cable for redundancy	HSR cable for redundancy	HSR cable not required
Half/Full-duplex	Full-Duplex	Full-Duplex
Token passing to an HIMA OPC Server	No token passing to an HIMA OPC Server	No token passing to an HIMA OPC Server
Monitoring Time for HIMA OPC Server: fixed 16 ms	Monitoring Time for HIMA OPC Server: fixed 16 ms	Monitoring time for HIMA OPC Server: fixed 6 seconds

Tab. 5: Overview of the communication via the F 8627

A): Requirements to use an existing network for the HIMA PES with F 8627

- Network may only contain switches
- Full-Duplex (no collisions)
- Enough bandwidth for transmission
- Calculation of timeout, consider the delay time of the used active network components (e.g. switches, gateways).

7.2 Application Guidelines/Notes

- The IEEE 802.3 standards must be complied.
- The cycle time of the central module of the communication partners may differ among each other maximally by the factor 4.
- The entire transmission link must ensure a transmission rate of 10 MBit/s or 100 MBit/s.
- To ensure a deterministic data exchange for safety-related communication, a load-free Ethernet segment must be connected to the HIMA communication modules.
  If this is not possible, no defined time behavior on the Ethernet segment can be ensured. This may result in a safety shutdown because of exceeding the Monitoring Time.
- Redundant Ethernet segments must not be connected with each other.
- If using HIPRO-S-DIRECT, the HSR Cable BV 7053 is not required.
- When replacing a communication module with attached HSR cable, first withdraw the module to ensure a defined cancelling of the Ethernet segment.
- Should the Ethernet segment not be available to the HIMA communication modules alone, the IP address range from
  192.168.0.3 up to 192.168.0.130 (up to OS version 3.x)
  192.168.0.3 up to 192.168.0.200 (from OS version 3.x on)
  must not be used otherwise.
- All single communication module connections must be connected to the same logical Ethernet segment.
- Communication modules belonging to one PES and having the same module number must be connected to different Ethernet segments.
- The mixed operation of safety-related communication via a coprocessor module F 8621A and a communication module for Ethernet communication F 8627 in parallel is not allowed in a PES.

The F 8627 automatically accesses all HIPRO-S data, which are configured in the PES. This may lead to problems, if a F 8621 operates as PES master in the same PES at the same time.
In this case, the HIPRO-S communication via the F 8627 must be deactivated by the function block HK-COM-3. Or the configuration of the F 8621 must changed to HIPRO-N.

7.3 Connection possibilities

All connected Ethernet components must adhere to the application guidelines!
The redundant structure of the Ethernet segments is possible at any time. If using HIPRO-S, then the HSR cable BV 7053 has to be plugged in between the redundant communication modules (via the HSR interface).
If using HIPRO-S-DIRECT the HSR cable is not required.

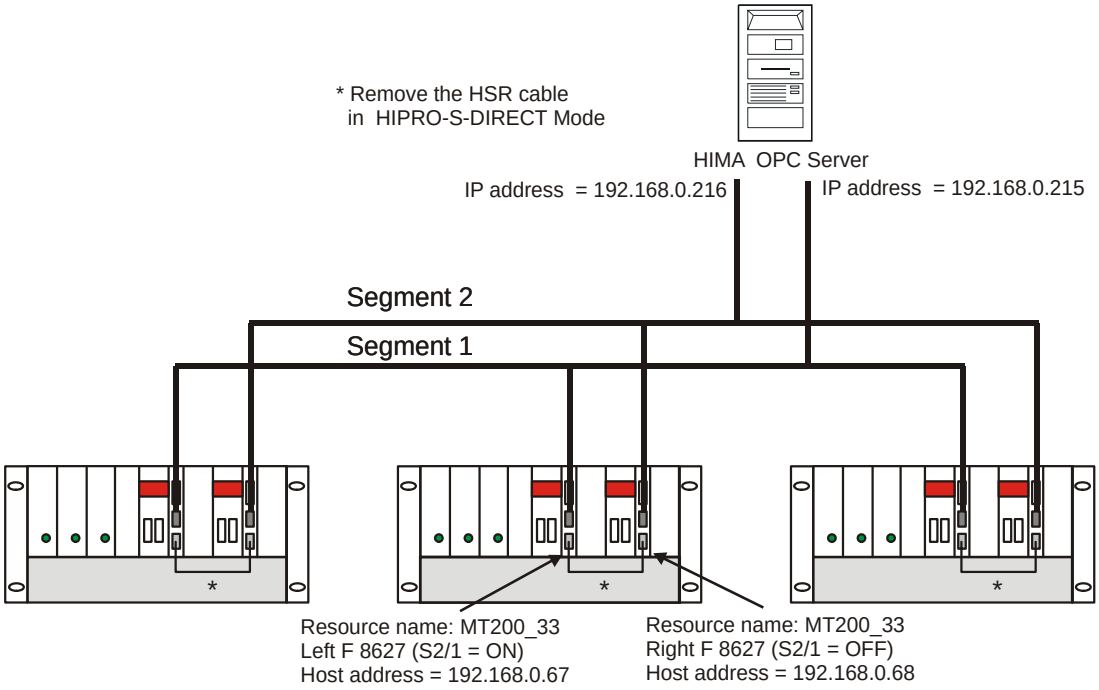


Fig. 2: Redundant connection via 2 segments

For a "proper" redundant connection, an own network segment is required for each channel. All F 8625/27 (and network cards of the PC) with odd IP addresses (e.g. 192.168.0.67) are to be attached to segment 1 all with even IP addresses to segment 2 (see Chapter 6).

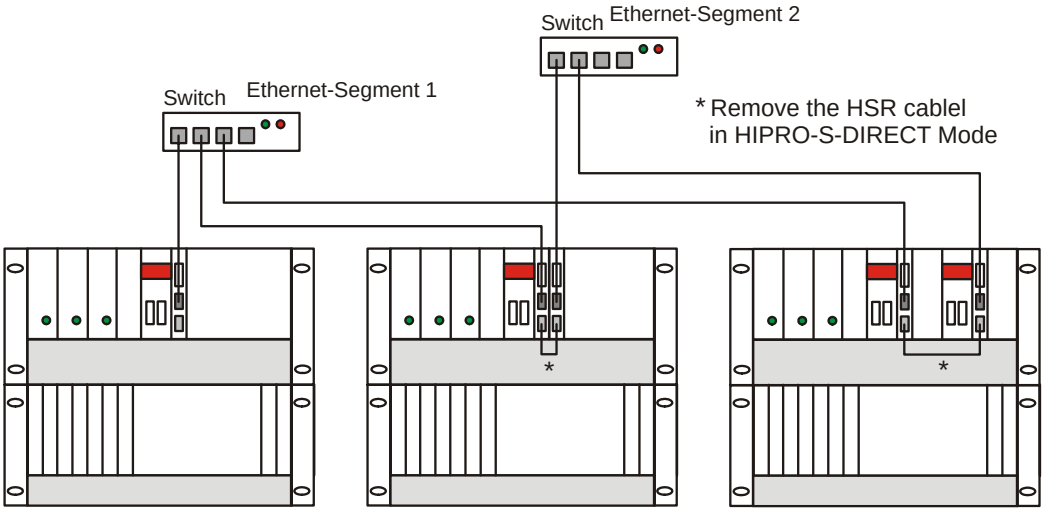


Fig. 3: Ethernet topology: Possible PES connections

Figure 3 shows all possibilities of interconnecting the PES.

- Left: Single PES on one Ethernet segment (each switch is an independent Ethernet segment).
- Centre: Single PES with two communication modules on both Ethernet segments.
- Right: Redundant PES with two communication modules on both Ethernet segments.

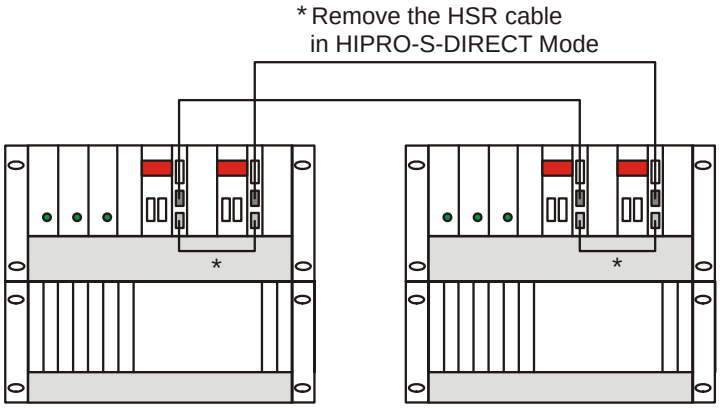


Fig. 4: Ethernet Topology - Interconnection of two PES

When two PES are interconnected (Figure 4), the switch is not necessary. The two 10BaseT or 100BaseTX interfaces of the communication modules are connected directly by a special cross-over cable (with twisted wires).

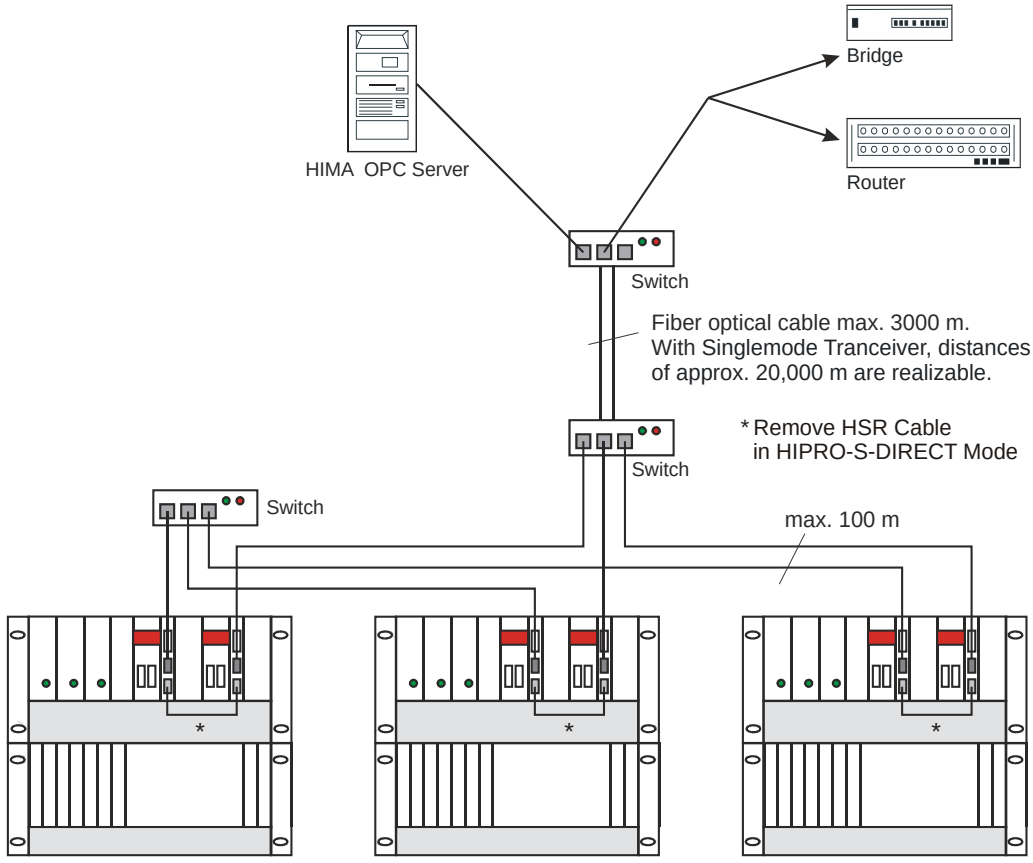


Fig. 5: Ethernet Topology-Redundant interconnection with switches

In Figure 5, three PES are completely redundantly interconnected via two switches.
A third switch is connected to the redundantly interconnected PES via a redundant fibre optic connection (the fibre optic interface is integrated in the switch). An HIMA OPC Server and further Ethernet components are connected to the third switch.

7.4 HIPRO-S (OS versions from V 1.x of the F 8627)

HIPRO-S is a safety communication via the HIPRO-S variables, which are configured in the PES.
In the HIPRO-S Mode the Ethernet bus access control is done by token passing. This mode provide the operation with a hub and avoid collisions on the network.

A PES can have a maximum of 30 communication partners, since a bus configuration in ELOP II supports a maximum of 31 communication partners.
All communication partners must be configured in the same bus configuration.
A PES can communicate with maximal 4 HIMA OPC Servers. The number of communication partners is not reduced by the number of configured HIMA OPC Servers.

The configuration of the communication modules for HIPRO-S must be configured in ELOP II and via the switches.

- The switch 2/1 sets the module number, which corresponds to the attached Ethernet segment (see Table 4 and Figure 2).
- With the switch 2/2 mono or redundant interconnecting of the communication module group is stopped (see Table 4 and Figure 2).

7.4.1 Notes for creation of the user program of HIPRO-S

By the creation of the user program, the following points are to be considered:

- The resource name under ELOP II must have eight characters (see Chapter 6.)
- Safety-related communication with HIPRO-S is to be established in a way that enables the safety-related configuration of data exchange of **each PES with each other PES** (i.e. exchange of dummy data, if no user data are exchanged). The direction of the data exchange can be selected free.
- To check the HIPRO-S configuration, the PES master programme should be compiled, but not loaded into the master, because mixed operation is not allowed. Errors that may occur can then be corrected.
- Via the system variables, the diagnosis of the safety-related communication can be analyzed in the user program.
- For project configuration and monitoring of the F 8627 in ELOP II, the HK-COM-3 software function block is used.
- Calculate the Monitoring Time „MT/MTe“ for HIPRO-S connections (Chapter 7.6).

7.5 HIPRO-S-DIRECT (OS versions from V 3.x of the F 8627)

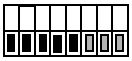
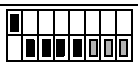
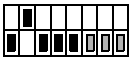
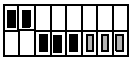
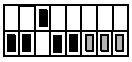
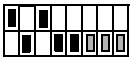
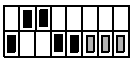
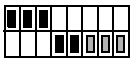
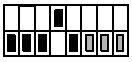
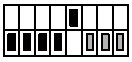
HIPRO-S-DIRECT is a safety communication via the HIPRO-S variables, configured in the PES. This mode can only be used with switches.
The HIPRO-S-DIRECT mode allows a faster data communication than the HIPRO-S mode.

A PES can have a maximum of 63 communication partners.
A maximum of 64 participants can be configured in the total network.
If more than 30 communication partners are configured, several bus configurations must be created in ELOP II. Since a bus configuration in ELOP II supports a maximum 31 bus participants.

The number of HIMA OPC Servers can be set from 0 to 14. The number of communication partners is not reduced by the number of configured HIMA OPC Servers.

The configuration of the communication modules for HIPRO-S must be configured in ELOP II and via the switches

- The switch 2/1 sets the module number, which corresponds to the attached Ethernet segment (see Table 4 and Figure 2).
- Set the switch 1/7 (Table 3 on page 5) to “ON” to activate the HIPRO-S-DIRECT mode.
- The switches 1/1 up to 1/5 (Table 3 on page 5) set the “Timeout“ for the answer of the communication partner.

Switch 1	Timeout
	10 ms
	20 ms
	30 ms
	40 ms
	50 ms
	60 ms
	70 ms
	80 ms
	400 ms
	1000 ms

Tab. 6: Settings of switch 1 (S1)

Note All communication partners must be connected by switches. Consider the delay time of the used switches. If the delay time is higher than 5 ms, then the “Time-out” for the answer of the communication partners must be configured via the settings of the switches (S1/1-5) on each F 8627.

- The redundancy mode of the F 8627 is firmly set to MONO in the HIPRO-S-DIRECT operating mode, independently from the position of the switch 2/2. The HSR cable connection is not required.
- The number of HIMA OPC Servers (0, 2, 4, 6, 8, 10, 12 or 14) can be set with the switches 2/6 up to 2/8 (see Table 4 on page 6).

7.5.1 Notes for creation of the user program of HIPRO-S-DIRECT

By the creation of the user program, the following points are to be considered:

- The resource name under ELOP II must have eight characters (see Chapter 6.)
- The exchange of dummy data, is not necessary.
- If more than 31 communication members are required, they can be configured in several bus configurations. A communication partner must be configured in all bus configurations in which its communication partners are configured (see Chapter 7.7).
- To check the HIPRO-S configuration, the PES master program should be compiled, but not loaded into the master, because mixed operation is not allowed. Errors that may occur can then be corrected.
- Via the system variables, the diagnosis of the safety-related communication can be analyzed in the user program.
- For project configuration and monitoring of the F 8627 in ELOP II, the HK-COM-3 software function block is used (see ELOP II Online Help).
- Calculate the Monitoring Time „MT/MTe“ for HIPRO-S connections (Chapter 7.6).

7.6 Calculation of the Monitoring Time for HIPRO-S Connections

The Monitoring Time for HIPRO-S/ HIPRO-S-DIRECT connections serves for monitoring the update of HIPRO-S import variables at regular intervals.
The relevant factor is the safety time of the common plant. If no imported safety-related variables are written within the defined period of time, all these variables are set to 0 in the PES.
The monitoring time of the HIPRO-S/ HIPRO-S-DIRECT connections is set in the dialog window *Properties->HIPRO-S* in the respective target resource and must not be confused with the monitoring time of each PES.

The setting of the Monitoring Time depends on the process and has to be agreed by the authority. The setting of the Monitoring Time must not be greater than this agreed time.

If the monitoring time given by the authority is larger or equivalent **13200 ms**, then the user can set the monitoring time of the HIPRO s or HIPRO S DIRECT connections to **13200 ms** in the target resource. This value corresponds to the monitoring time, which is sufficient for the maximum size of a bus configuration (HIPRO s with 31 or HIPRO S DIRECT with 64 members).

7.6.1 Calculation method and formulas

Step 1: Determine the maximum Ethernet transmission time (T_{max})
To calculate the Monitoring Time, the maximum Ethernet transmission time of the HIPRO-S data T_{max} must be determined.

T_{max} for HIPRO-S communication
$T_{max} = (NP^2 + NP + 100)$ ms
If T_{max} < 600 ms than T_{max} must set to 600 ms.

NP: Number of PES communication partners + 4 OPC-Server, which are configured fix in HIPRO-S mode.
T_{max}: Maximum Ethernet transmission time of the HIPRO-S Data.

T_{max} for HIPRO-S-DIRECT communication
$T_{max} = T_{DIP}$

T_{DIP}: Setting value of the Timeout for HIPRO-S-DIRECT (Chapter 7.5) via switch 1/1-5.
T_{max}: Maximum Ethernet transmission time of the HIPRO-S-DIRECT data.

Step 2: Calculation of the Watchdog Time

- $\mathbf{WD_{Source(Target)} = CT * 1.7}$ for H41q/H51q (F 8650 up to F 8653)
- $\mathbf{WDe_{Source(Target)} = CT * 1.5 + D * 5.5}$ for H41qe/H51qe (F 8650E up to F 8653E)

WD_{Target}: Watchdog time (ms) for the target resource
WD_{Source}: Watchdog time (ms) for the source resource
CT: Maximum cycle time (ms) of the central module in status RUN (is shown in the control-panel of ELOP II).
D: Data size in kByte “Data Size (without SI Data)“ (is shown by the ELOP II Compiler).

Step 3: Calculation of the Monitoring Time MT/MTe

Calculation of the Monitoring Time MT for H41q/H51q

$$\mathbf{MT = 2 * WD_{Source} + 2 * T_{max} + 2 * WD_{Target}}$$

MT: Monitoring time (HIPRO-S connection)
WD_{Target}: Watchdog time (ms) for the target resource
WD_{Source}: Watchdog time (ms) for the source resource
T_{max}: From "Step 1"

Calculation of the Monitoring Time MTe for H41qe/H51qe

$$\mathbf{MTe = 2 * WDe_{Source} + 2 * T_{max} + 2 * WDe_{Target}}$$

MTe: Monitoring time (HIPRO-S connection)
WD_{Target}: Watchdog time (ms) for the target resource
WD_{Source}: Watchdog time (ms) for the source resource
T_{max}: From "Step 1"

Step 4: Setting of the calculated monitoring time
The calculated Monitoring Time MT or MTe must set in the dialog window *Properties -> HIPRO-S* of the target resource.

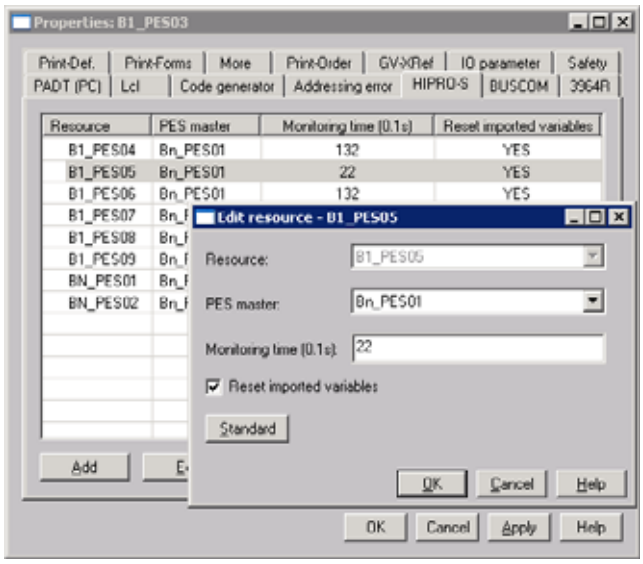


Fig. 6: Configuration of the HIPRO-S connections

The setting of the Monitoring Time depends on the process and has to be agreed by the authority. The setting of the Monitoring Time must not be greater than this agreed time.

7.6.2 Example for the calculation of the Monitoring Time

Calculation of the Monitoring Time for a H41qe/H51qe with HIPRO-S and 20 communication partners.

Step 1: Calculate the maximum transmission time "T_{max}"
20 communication partners + 4 HIMA OPC Server (configured fix)
-> **NP = 24**
$T_{max} = NP^2 + NP + 100$
$T_{max} = 576 + 24 + 100$
$T_{max} = 700$ ms
$T_{max} = 700$ ms

Note In HIPRO-S-DIRECT mode, T_{max} is not calculated but it must set via DIP switches 1/1-5 (see Chapter 5.1).

Step 2: Calculation of the HIPRO-S source/target resource

Calculation of the Watchdog Time WDe_{Source} from the source resource.

- Note the maximum cycle time "**CT**" of the PES in RUN status, which is shown in the ELOP II control panel of the HIPRO-S source-resource (e.g. **100 ms**).
- Note the datasize "**D**" in kByte „Data Size (without SI Data)“ from the source-resource, which is shown by the ELOP II Compiler (e.g. **2 kByte**).
- Calculate the Watchdog Time "WDe_{Source}" for the source-resource
  $WDe_{Source} = CT * 1.5 + D * 5.5$
  $WDe_{Source} = 100 * 1.5 + 2 * 5.5$
  WDe_{Source} = 161 ms

Calculation of the Watchdog Time WDe_{Target} from the target resource

- Note the maximum cycle time "**CT**" of the PES in RUN status, which is shown in the ELOP II control panel of the HIPRO-S target-resource (e.g. **150 ms**).
- Note the datasize "**D**" in kByte „Data Size (without SI Data)“ from the target-resource, which is shown by the ELOP II Compiler
  (e.g. **1.5 kByte**).
- Calculate the Watchdog Time "WDe_{Target}" for the target-resource
  $WDe_{Target} = CT * 1.5 + D * 5.5$
  $WDe_{Target} = 150 * 1.5 + 1.5 * 5.5$
  WDe_{Target} = 233.25 ms -> 234 ms

Step 3: Calculation of Monitoring Time "MTe"

- $MTe = 2 * WDe_{Source} + T_{max} + 2 * WDe_{Target}$
  $MTe = 2 * 161 + 2 * 700 + 2 * 234$
  MTe = 2190 ms -> 2200 ms

Step 4: Set the calculated Monitoring Time "MTe" in the target-resource

- Open the dialog window "Properties" via the context menu
  Properties -> HIPRO-S of the target-resource.
- Select the source-resource in the list of the HIPRO-S communication partners and click the button *EDIT*.
- Set in the dialog window "Edit resource" the Monitoring Time "**MTe**".

Calculating the Monitoring Time "**MTe**"

- for each of the 20 communication partners in this target-resource.
- for each of the 20 communication partners in its own resource.

The setting of the Monitoring Time depends on the process and has to be agreed by the authority. The setting of the Monitoring Time must not be greater than this agreed time.

7.7 Bus configuration with 64 Resources

In this example 64 resources are configured, which are separated in to three bus configurations. The two resources "B*n*_PES01" and "B*n*_PES02" are configured for each bus and serve as a gateway between the three bus configurations.
The bus configuration is identical for the communication versions “MONO” and “Double MONO”. For “Double MONO” a second communication module F 8627 with the according DIP switch settings must be plugged into the redundant module slot for each communication partner.

Note Attend to the guidelines and application notes for the mounting of the Ethernet Segments (Chapter 7.2).

7.7.1 Function description of bus configuration

- The resources “B*n*_PES01” and “B*n*_PES02” are created in all three bus configurations. Thereby the resources “B*n*_PES01” and “B*n*_PES02” can exchange data with each of the 62 configured resources.
- In the bus configuration “BUS 1", the resources “B1_PES03” up to “B1_PES31” can communicate directly with each other.
- In the bus configuration “BUS 2", the resources “B2_PES32” up to “B2_PES60” can communicate directly with each other.
- In the bus configuration “BUS 3", the resources “B3_PES61” up to “B3_PES64” can communicate directly with each other
- If data must be exchanged between resources from different bus configurations, the data must sent via the gateway resources “B*n*_PES01” and “B*n*_PES02”.

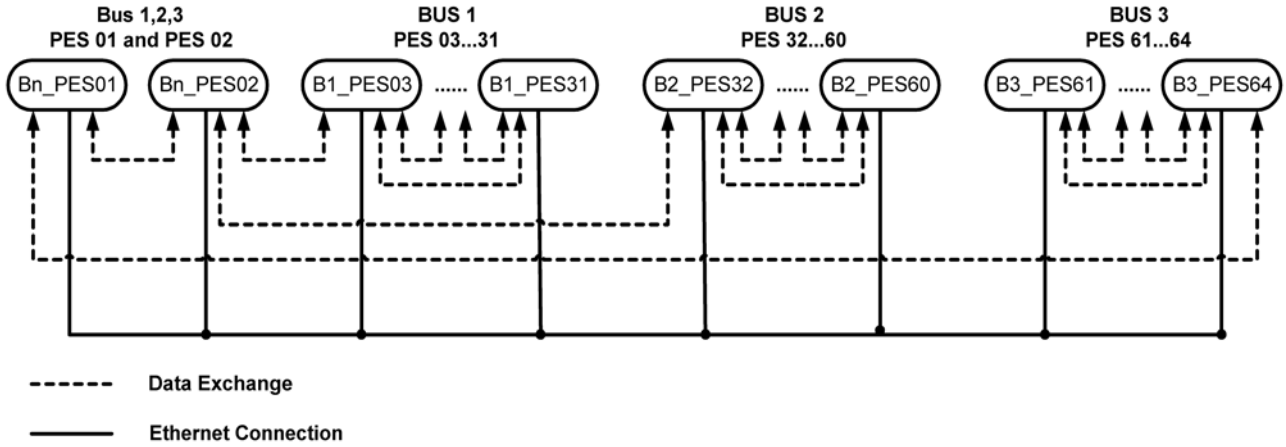


Fig. 7: “MONO” bus configuration with HIPRO-S-DIRECT

Note All communication partners must be connected via switches. Consider the delay time of the used switches. If the delay time is higher than 5 ms, then the “Time-out” for the answer of the communication partners must be configured via the settings of the switches (S1/1-5) on each F 8627.

7.7.2 Setting of the bus configuration in ELOP II

The user should be familiar with the programming tool **ELOP II** and the HIMA H41q/H51q PES. For further information the manual “First steps ELOP II” and the Online Help of ELOP II are recommended.

Note All resources must be created in the same configuration (here „Config“). Consider also the notes on the parameterization of the HIPRO-S-DIRECT mode and on the generation of the user program (Chapter 7.5).

Create the following resources in the configuration „Config“:

- “B*n*_PES01” and “B*n*_PES02”
- “B1_PES03” up to “B1_PES31”
- “B2_PES32” up to “B2_PES60”
- “B3_PES61” up to “B3_PES64”

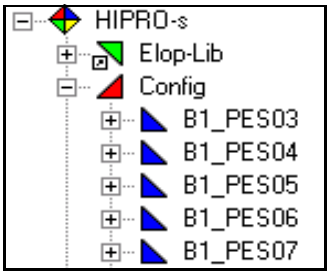


Fig. 8: 64 resources in the configuration „Config“

In the application programs of each resource, use the software function block HK-COM-3 for configuration and monitoring of the F 8627.

- These inputs of the software function block HK-COM3 are to be assigned mandatory.

Input	Value
CU-Slot (1,2)	1
COM-Slot (1,2,3,4,5)	1
Enable Configuration	TRUE/FALSE
Function	0, 1 or 3

- The outputs of the software function block HK-COM3 in the user program are used for monitoring.

Create and configure the three busses (see Table 7, Table 8, Table 9):

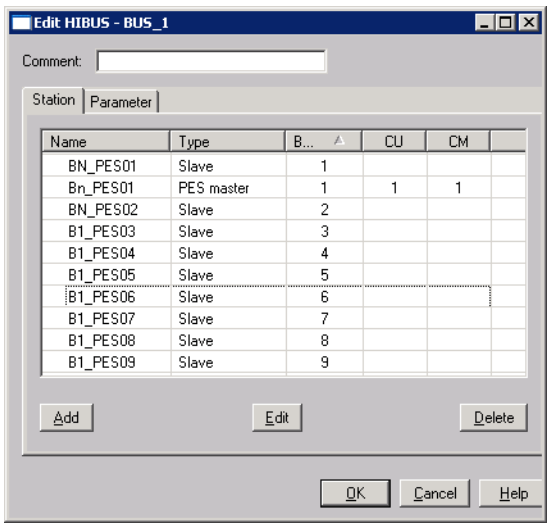


Fig. 9: Configuration of bus 1 in ELOP II

BUS 1 (Bus member)					
Name	**Type**	**BSN**	**ZB**	**CB**	**Number**
B*n*_PES01	PES-Master	1	1	1	1
B*n*_PES01	Slave	1			1
B*n*_PES02	Slave	2			1
B1_PES03	Slave	3			29
"	"	"	"	"	
B1_PES31	Slave	31			

Tab. 7: Configuration of bus 1

BUS 2 (Bus member)					
Name	**Type**	**BSN**	**ZB**	**CB**	**Number**
B*n*_PES02	PES-Master	2	1	2	1
B*n*_PES01	Slave	1			1
B*n*_PES02	Slave	2			1
B2_PES32	Slave	3			29
"	"	"	"	"	
B2_PES60	Slave	31			

Tab. 8: Configuration of bus 2

BUS 3 (Bus member)					
Name	**Type**	**BSN**	**ZB**	**CB**	**Number**
B3_PES61	PES-Master	3	2	2	1
B*n*_PES01	Slave	1			1
B*n*_PES02	Slave	2			1
B3_PES61	Slave	3			4
"	"	"	"	"	
B3_PES64	Slave	6			

Tab. 9: Configuration of bus 3

In each resource define the communication partners (resources), with which the HIPRO-S data are to be exchanged.
Determine and set the Monitoring Time for the communication partners
(see Chapter 7.6)
.

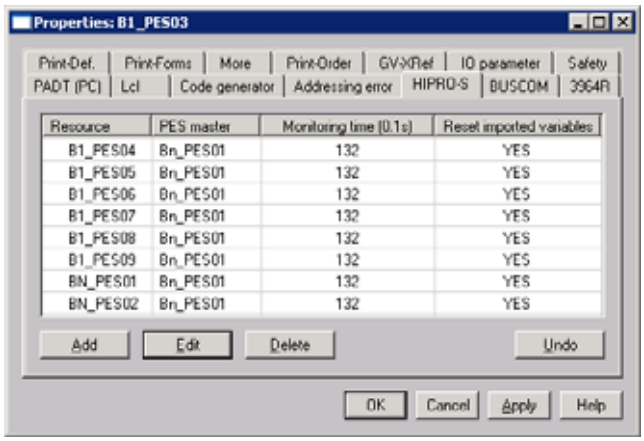


Fig. 10: HIPRO-S communication partners of the resource

The setting of the Monitoring Time depends on the process and has to be agreed by the authority. The setting of the Monitoring Time must not be greater than this agreed time.

In ELOP II define the HIPRO-S variable, which is to be used for the HIPRO-S communication:

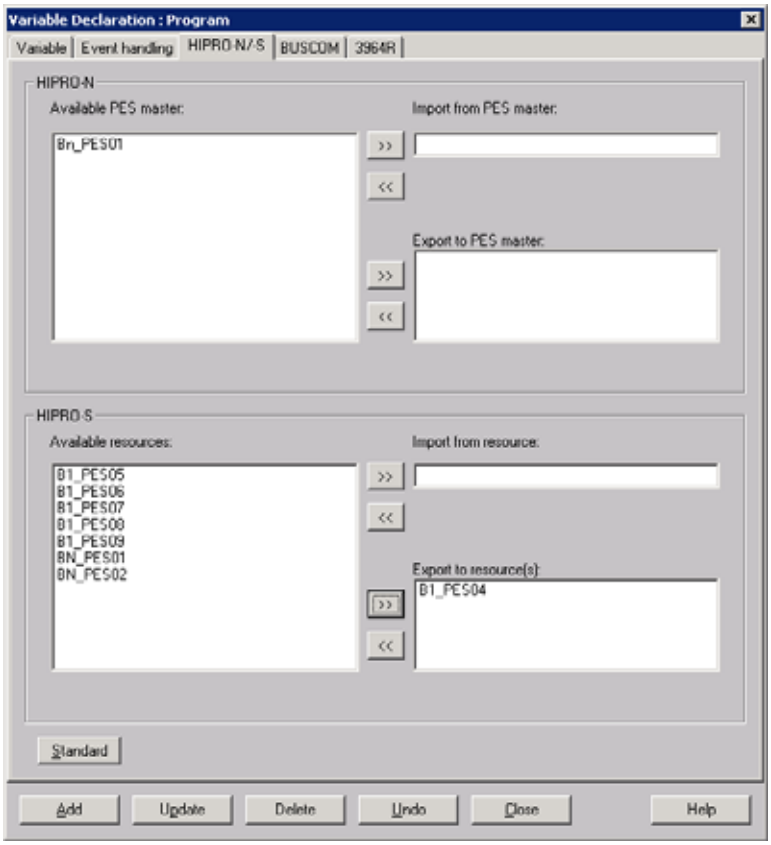


Fig. 11: Configuration of a HIPRO-S variable

Note As a check of the HIPRO-S-DIRECT configuration the PES master program should be compiled, but not be loaded into the master. Possibly arising errors can then be corrected.

7.8 Communication with HIMA OPC Server (BUSCOM)

(OS-Versions of the F 8627 from V 2.x)
The F 8627 communicates with an OPC-Server via the not safety related BUSCOM variables.

Note The OPC communication of an F 8627 is only possible with a HIMA OPC Server.

7.8.1 Configuration of the F 8627

The configuration of the F 8627 is done via DIP switches and the user program in ELOP II.

The resource name under ELOP II must have eight characters, of which the last two have to be numbers. Any numbers between 01 to 64 can be used. The numbers must be unique to prevent collisions in determining the IP address of the communication module.

By the configuration of the communication with a HIMA OPC server the passive mode must be special considered (see Chapter 7.8.1.1 up to Chapter 7.8.1.3).

7.8.1.1 Passive Mode deactivated (switch S1/8 auf „ON“)

The token passing between the F 8627 and the HIMA OPC server is active.

- If the Passive Mode is disabled on the F 8627, then the Passive Mode must also be disabled on the HIMA OPC Servers.
- Safety-related communication with HIPRO-S is to be established in a way that enables the safety-related configuration of data exchange of **each PES with each other PES** (i.e. exchange of dummy data, if no user data are exchanged). The direction of the data exchange can be selected freely.
  The reason for this proceeding is the fact that for safe**ethernet** the network of Ethernet nodes must be known in every PES, so that communication within the network (token passing) is possible.

7.8.1.2 Passive Mode activated (switch S1/8 auf „OFF“)

In the "passive mode" the F 8627 is passive and is polled by the HIMA OPC Server in certain time intervals.
The token passing between the F 8627 and the HIMA OPC server is deactivated.

- The passive mode may be only activated on the F 8627, if the HIMA OPC server also supports the passive mode (HIMA OPC server from V. 3.2.0 on).
- Consider following for operating system versions before 3.x.
  The F 8627 operates only in passive mode, if no safety related data (HIPRO-S) is received. When the F 8627 receives safety related data, the setting of the switch S1/8 does not care. In this case, the F 8627 operates with token passing.
- From operating system version 3.x, on the Passive Mode can also be switched on, if safety-related communication for the F 8627 module is configured.

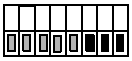
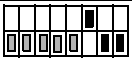
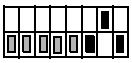
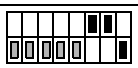
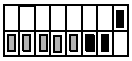
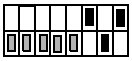
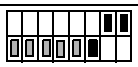
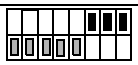
7.8.1.3 Advantages of Passive Mode

- If no safety-related communication should be operate via the F 8627, then no safety-related dummy variables must be defined by configuration between the PES.
- It is now possible to have safety related communication (via AG master F 8621A or a second F 8625/27) and not safety related to a HIMA OPC server in one PES at the same time, since no more dummy variables are needed for communication with the HIMA OPC server.
- To prevent an overload of the PC on which the HIMA OPC Server works, when the number of available communication partners is too small. (Becauses of the frequent token holding, caused by the short token cycle).

Note Hubs may not be used in passive mode. Switches are recommended.

7.8.1.4 Numbers of HIMA OPC Server

- HIPRO-S mode (S1/7 „OFF“): Firm on four 4 HIMA OPC Server.
- HIPRO-S-DIRECT mode (S1/7 „ON“):
  The number of HIMA OPC Servers with which the F 8627 exchange BUSCOM variables, is set via the switches 2/6-8.

Switch 2	HIMA OPC Server
	0
	2
	4
	6
	8
	10
	12
	14

Tab. 10: Settings of switch 2 (S2)

7.8.2 Configuration of the BUSCOM variables in ELOP II

The F 8627 communicates with an OPC-Server via the BUSCOM variables, which must be created in ELOP II by the user.
The BUSCOM variables created in ELOP II can be exported into a text file, which can be imported directly into the HIMA OPC-Server for configuration.

7.8.2.1 Address range of the BUSCOM variables

The address of the BUSCOM variables calculated as follows
Base address + Relative address =BUSCOM address.

Note You find the settings for the base address in the properties of the resource. In the register „BUSCOM“ you can set the base address separately for Import, Export and Import/Export. However it is recommended to use the standard base address settings.

The following address ranges can be used for BUSCOM variables:

BUSCOM variables	Address ranges (Base address+ relative address)
BOOL	0 up to 2047 or 4096 up to 8191
UINT (WORD, INT, SINT, USINT)	0 up to 2047 or 4096 up to 8191

Tab. 11: Address range of the BUSCOM variables

Note Select one of the two available address ranges for the BUSCOM variables. If this is not possible, please contact the HIMA support.

The address allocation for the BUSCOM variables can be carried out automatically or manually where each address allocation is based on the base address.

7.8.2.2 Manual address allocation for BUSCOM variables

If you activate the function „set relative address“ in the dialog „Variable Declaration“, then you must set the address manually. The base address is displayed above the input field. You find an overview for all used addresses in the *context menu of the resource->documentation->Res docu (generated)*.

Note The user should use the manual address assignment for the BUSCOM variables, in order to prevent a reorganization of the addresses (address shift) after adding new BUSCOM variables.

7.8.2.3 Automatically address allocation for BUSCOM variables

In the dialog „Variable Declaration“, the function „set relative address“ must be deactivated.
The automatically address allocation of the BUSCOM variables is arranged in a alphabetical sequence of the variable name.
You find an overview for all used addresses in the *context menu of the resource->documentation->Res docu (generated)*.

After the adding of new BUSCOM variables, always generate *not reloadable code* to determine the new addresses.

7.8.3 Example of a Configuration in ELOP II for the communication with a HIMA OPC-Server

Define the BUSCOM variables, which are used for the OPC communication:

- Select one of the following properties to select the communication direction of the BUSCOM variables:

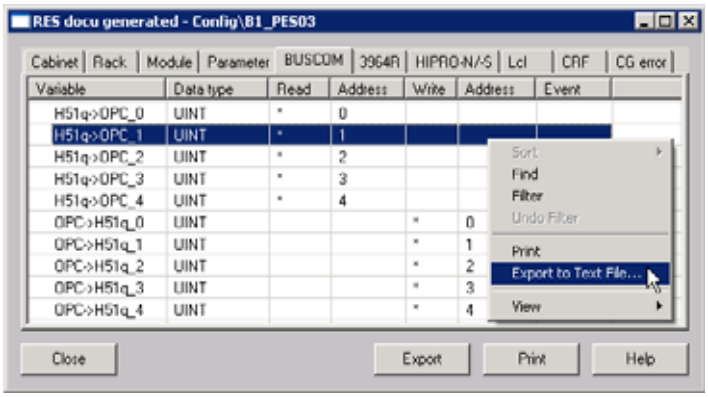
Export:	to be read by HIMA OPC-Server
Import:	to be written by HIMA OPC-Server
Import/Export:	to be both written and read by HIMA OPC-Server

Create the BUSCOM list of the resources for the HIMA OPC server:

- Open the context menu of the resource and select the menu function *Documentation*.
- Select the submenu function *RES-Docu (generated)* to open the dialog „Res-Docu (generated)“.
- Select the register„BUSCOM“ in the dialog „Res-Docu (generated)“.
- Right click into the row of a BUSCOM variables, to open the context menu for exporting.
- Select *Export to Text File...*

Note Consider that no filters are set during the export!

- Save the file with the extension **.txt* on a storage medium (Server, floppy disk), from which the HIMA OPC server can read it.



Read: To be read by the HIMA OPC-Server

Write:To be written by the HIMA OPC-Server

Fig. 12: Dialog „Res-Docu (generated)“

The generated BUSCOM list looks as follows and can be use by the HIMA OPC server without any changes.

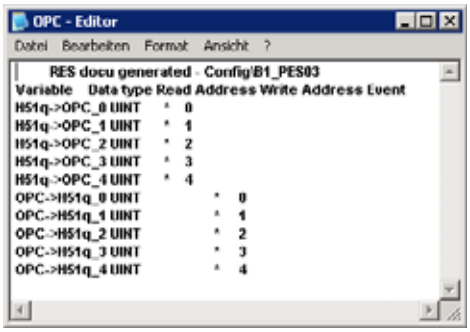


Fig. 13: BUSCOM list for the HIMA OPC server

8 Replace of the Operating System

8.1 Upgrade/Downgrade of the operation system versions of the F 8627

The following instructions describe the upgrade from the operation system version 2.x to 3.x and the downgrade from operating system version 3.x to 2.x for the module F 8627.

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

8.1.1 Upgrade from Version 2.x to 3.x

For the upgrade from Version 2.x to Version 3.x the file **f8627_bs_v3_x.flash** must be loaded.

With the upgrade from the version 2.x to version 3.x it is absolutely certain, that only the correct operating system file is loaded into the correct module. If the module F 8627 was loaded with any incorrect file, the functionality of the F 8627 is lost and can not be programmed any longer with the diagnostic dialog ComEth. In this case the module F 8627 must be programmed new by HIMA.

After the upgrade to Version 3.x a protection mechanism is activated and only operating system files **8627_bs_v3_x.ldb or f8627_bs_v2_x.ldb** can be loaded.

8.1.2 Downgrade from Version 3.x to 2.x

For the downgrade from Version 3.x to Version 2.x the file **f8627_bs_v2_x.ldb** must be loaded.

After the downgrade to version 2.x the protection mechanism to prevent loading any incorrect file is not more active!

8.2 Download of the operating system to the F 8627

The operating system download for the module F 8627 is done using the diagnosis dialog **ComEth**.

- Start the diagnosis dialog ComEth, and check in the error-state viewer that the
- “main program version“ is 0.8.0 or later
- “diagnostic text version“ is 0.2.0 or later.
- Select *Project->New* in the menubar of the diagnosis dialog ComEth, 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 8627* in the context menu of the new resource, to create a new F 8627 in the new resource.
- Select *Properties* in the context menu of the new F 8627, to open the dialog window “Properties“.
  Configure the input fields as follows:
- Enter an arbitrary unique name for the F 8627 (e.g. CU1CM1) in the input field.
- Enter the IP address of the module F 8627 in the input field “IP address“, into which the operating system should be loaded. To determine the IP address of the module F 8627 (see Chapter 6).
- In the view box "IP address PC“, all IP addresses of the available network cards of the PADT (PC) are displayed. Select the IP address of the network card via which the connection to the module F 8627 should be created.

Note

The IP address of the PADT (PC) must:

- be located in the same subnet as the module F 8627.
- own an IP address
  - from192.168.0.201 up to 192.168.0.214 or
  - from192.168.0.243 up to 192.168.0.254.

If several network cards are available on the PADT (PC), then an accordant routing entry has to be set for the network card, which is used for connection to the F 8627.

- Select *Control Panel* in the context menu of the new F 8627, to open the Control Panel.
- Select *PADT->Connect* in the control panel, to create a connection to the module F 8627.

The next step leads to a communication loss, if no redundant module F 8627 exists or if the redundant module has no connection!

- Click the button *Stop Device* in the control panel of ComEth, to set the module F 8627 into the state STOP (green RUN LED flashes).
- Select *Extra->OS Update* in the control panel of ComEth, to open the standard dialog to open a file.
- Select and load the **proper** operating system for the upgrade/downgrade into the selected module F 8627 (see Chapter 8.1.1 and Chapter 8.1.2).

Note After successfully downloading the operating system for the F 8627, **the module F 8627 must be rebooted**. After the reboot the new operating system is started. Until then the F 8627 works with the old operating system.

- The reboot of the F 8627 can be done by
- withdraw and plug of the module F 8627 or
- the function *Extra->Reboot Device* in the Control Panel of the dialog ComEth.
- Check the upgrade/downgrade
- Select *PADT->Connect* in the control panel to create a connection to the module F 8627 again.
- Select the tab *Version* and check that the shown OS-Version is the same as the OS Version of the Upgrade/Downgrade.
- If a redundant module F 8627 exists, the same procedure must be done for the redundant F 8627.

Note The ARP entry on the PADT (PC) must be deleted if another F 8627 should be loaded with the **same IP address** as the F 8627 loaded before.
Otherwise no other F 8627 with the same IP address can be connected to the PADT (PC).

Example: Delete the ARP entry of a F 8627 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**.

9 List of Literature

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

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

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

HIMA
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