

PSS 5000 / PSI 6000 / PST 6000

Programming Field Buses in Resistance Welding Technology Technical Information

Edition

102

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Programming Field Buses in Resistance Welding Technology Technical Information

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Safety instructions and reader's information

Please read this documentation before working with field bus installations and Weld Timers (WT) for the first time.

Store this manual in a place to which all users have access at all times!

The products described have been developed, manufactured, tested and documented in compliance with the fundamental safety requirements of the EU Machinery Directive.

Nevertheless, there is some residual risk!

The present manual describes the field buses that may be used to program and operate weld timers through the following interfaces:

- PROFIBUS-FMS
- INTERBUS-PMS
- ETHERNET

The description is based on BOS-5000 Version 2.84.

Explanation of pictographs and symbols

The following warnings and notes may be attached to the individual hardware components which are designed to inform the user of certain circumstances.



Warning of dangerous electrical voltage!



Warning of eye injuries through strong light emission.



Components sensitive to electrostatic discharge!



Disconnect from mains before opening!



Pin for connecting PE conductor only!



Connection of shield conductor only!

There is a certain **hierarchy of warnings** in **this manual**. The warnings are printed in **bold letters** and marked by a warning sign at the margin.

The hierarchy of the warnings is as follows:

1. WARNING
2. CAUTION
3. NOTE



WARNING!

The term **WARNING** will be used wherever **danger is imminent**.
The possible consequences may be death or severe injury (personal injury).



CAUTION!

The term **CAUTION** will be used wherever a **dangerous situation is possible**.
The possible consequences include death, severe or light injury (personal injury) damage to property (destruction of modules) or environmental hazards.
In any case, the failure to observe/comply with these instructions will result in the loss of guaranty.



NOTE

The term **NOTE** will be used for making **recommendations on the use**. These sections contain additional information, recommendations, hints and tips.
Non-compliance with these recommendations may result in damage to property, e.g. to the machine or the workpiece.

Typographic conventions

General listing	-	Example:	-	The message is displayed on the screen.
Action	•	Example:	•	Insert floppy
			•	Read value
Screen displays, messages, displays	<i>Italics</i>	Example:		<i>Battery-Low</i> <i>Tip dress request</i>
(Welding) parameters	[in brackets]	Example:		[Weld time], [Schedule].
Interface signals, keys, command fields.	<key>	Example:		Press <F8>
Inputs: Values, texts	CAPITAL LETTERS			



NOTE

Note concerning this manual: Black bars in the margin of a page indicate modifications compared to the previous edition.

Intended use

The present manual contains information on the proper use of networked weld timers. In combination with the intended welding machine, weld timers networked by field bus systems are intended for

- **resistance welding of metals in industrial environments in accordance with DIN EN 50082-2 and DIN EN 50081-2 concerning electromagnetic compatibility (EMC).**

The timer is not intended for any other use!



CAUTION!

The use for purposes other than the intended use may result in personal damage to the user or third persons or damage to the equipment, the workpiece to be welded or environmental hazards.

Therefore, our products should only be used for their intended purpose!

Warning of magnetic fields

In the environment of resistance welding systems magnetic field strengths have to be expected which usually are below the limits specified in VDE 0848 Part 4; in cases of doubt, the field strength must be measured.

Dangers, if any, may arise from alternating magnetic fields (critical frequency: 1.6 Hz).



WARNING!

When using manual welding guns, the limit values may be exceeded for the extremities. In this case, additional work protection measures must be taken.

So far, no problems have been reported. Nevertheless, the possible influences are lower with medium-frequency welding than with AC welding.



NOTE

The strong magnetic fields arising in connection with resistance welding may cause lasting damages to wrist watches, pocket watches, floppy disks or cards with magnetic stripes (e.g. EC cards).

Therefore, you should not carry any such items on you when working in the direct vicinity of the welding equipment.

Not permitted for persons with cardiac pacemakers



WARNING for persons with cardiac pacemakers!

Warning signs should be posted for protecting persons with cardiac pacemakers because the function of these devices may be disturbed (impulse failure, total failure) and a negative influence on the pacemaker programming or even a total program destruction may occur !!!

We recommend posting a warning of the type shown below at all entrances to factory halls containing resistance welding equipment:



Qualified personnel

This manual is designed for welding technicians and engineers with special training on the use of field buses within the welding technology.

They require profound knowledge of the

- Field buses in general
- weld timers (WT)

The term qualified personnel refers to

- engineering personnel familiar with the safety standards of the electrical and automation technology.
- commissioning personnel entitled to commission, earth and label electrical circuits and equipment/systems in compliance with the standards of safety technology.

WARNING!



An exception are persons with cardiac pacemakers!

Due to the strong magnetic fields arising from resistance welding, the function of cardiac pacemakers may be disturbed. This may cause the death or considerable health damages to the persons concerned!

Therefore, these persons should avoid the welding system.

Please note our comprehensive range of training courses. More information is available from our **training center** (Telephone: +49 (0)6062 / 78258).

Storage and Transport



NOTE

Please note the environmental conditions given in the Technical data section to avoid damage to electronic components.

Static discharges may destroy field bus components. Therefore, the original packaging should be used for storage and transport. The equipment must be protected against humidity.



NOTE

CDs and floppies must be protected against negative external influences, e.g., dust or moisture by suitable packaging. They must never be exposed to the influence of magnetic fields.

Installation and assembly



CAUTION!

- Please observe all applicable safety and accident prevention regulations! The recognized rules of electrical engineering must be observed!
- Danger of injury or of damage to property due to inappropriate fastening! The place of installation and the fastening method for the field bus modules must be in compliance with our specifications!
- Danger of injury on sharp metal edges! Please wear protective gloves.
- Danger of damage to property through short-circuits! When drilling or sawing out openings within switch cabinets, metal burr may get inside modules that have already been installed. Likewise, water may emerge when connecting the cooling water lines and get inside the modules. The possibility of short-circuits and a destruction of the units cannot be entirely ruled out. Therefore, the modules should be well partitioned prior to any additional work! No liability is accepted in the event of non-compliance.
- Danger of life and of damage to property through insufficient protection type! Modules designed for degree of protection IP20 must be installed inside a switch cabinet that complies at least with degree of protection IP54.
- Danger of injury and of damage to property through incorrect installation! The modules, and especially the operating elements, must be installed so as to be sufficiently protected against unintentional operation or contact.
- Danger of injury and of damage to property when operating the modules outside a switch cabinet! Some modules (e.g. repeaters designed for degree of protection IP20) are designed to be installed in housings or switch cabinets and may only be operated in such housings or cabinets with the door closed!
- Danger of damages through static discharge! Elements or components of the modules may be damaged by static discharge. Do not touch any components or printed circuits with your hands. Installing and configuring the system is reserved to qualified personnel.



NOTE

Connecting lines and signal lines must be laid so as to avoid negative effects on the function of the units through capacitive or inductive interference and in compliance with the requirements on electromagnetic compatibility (EMC), cf. general information contained in the Bosch EMC manual for resistance welding components.

Electrical connection

Some modules are supplied with 24 V DC. These power supplies must provide safety separation in accordance with the Low-Voltage Directive (72/23/EEC, 93/68/EEC and 93/44/EEC).



WARNING!



- Considerable dangers are associated with the mains connection of the power unit!
- The possible consequences of inappropriate handling include death, severe bodily injury (personal injury) and damage to property.
- Therefore, the electrical connection may only be made by a skilled electrician who observes the valid safety regulations, the mains voltage and the maximum current consumption of the modules.
- The supply voltage must be identical with the nominal voltage indicated on the nameplate of the product!
- The mains system must be appropriately fused!
- Danger of life through electrical voltage!
- When working on the welding installation, suitable protective measures pursuant to DIN EN 50063 etc. must be installed (e.g. by grounding the welding gun) on the welding hardware!
Furthermore, the transformer must be labelled accordingly.

Operation

**CAUTION!**

- Danger of injury and of damage to property when operating the IP20 modules outside a switch cabinet or, more generally, for purposes other than the intended use! The modules to IP20 are designed to be installed in housings or switch cabinets and may only be operated in such housings or cabinets with the door closed. The recognized rules of electrical engineering must be observed.

 - Danger of injury and of damage to property through missing or false interpretation of fault messages or warnings!

 - Danger of bruises through electrode movement!
All users, line designers, welding machine manufacturers and welding gun producers are obliged to connect the output signal of the Bosch weld timer which initiates the electrode movement so that the applicable safety regulations are complied with.
By means of, e.g.,
 - two-handed start
 - fences
 - light barriers etc.the risk of bruises can be considerably reduced.
-

Retrofits and modifications by the user

The field bus modules have been designed and manufactured by us as a safe unit.





WARNING!

Retrofits or modifications may have negative effects on the safety of the field bus installation!

The possible consequences include death, severe or light bodily injury (personal injury), damage to property or environmental hazards.

Therefore, please contact us prior to retrofits or modifications to the field bus installation using third-party equipment. This is the only way to determine whether these parts are suitable for use with our product.

Maintenance and repair

-  **WARNING!**
- Danger of life through electrical voltage of power units!
Prior to any maintenance work - unless described otherwise - the system must always be switched off! In the event of necessary measurement or test procedures on the active system, the applicable safety and accident prevention regulations must be strictly observed. In any case, suitable insulated tools must be used!
 - Danger of life through inappropriate EMERGENCY-STOP facilities!
EMERGENCY-STOP facilities must be operative in all modes of the system. Releasing the EMERGENCY-STOP facility must by no means result in an uncontrolled restart of the system!
-
-  **CAUTION!**
- Only use spare parts/replacement parts approved by Bosch!
-



1 General

Manufacturer-independent field bus systems have been generally accepted in automation and control engineering.

Hardware and software modules compliant with international standards ensure a simple, flexible data transmission between the individual levels of automation, and within the level itself.

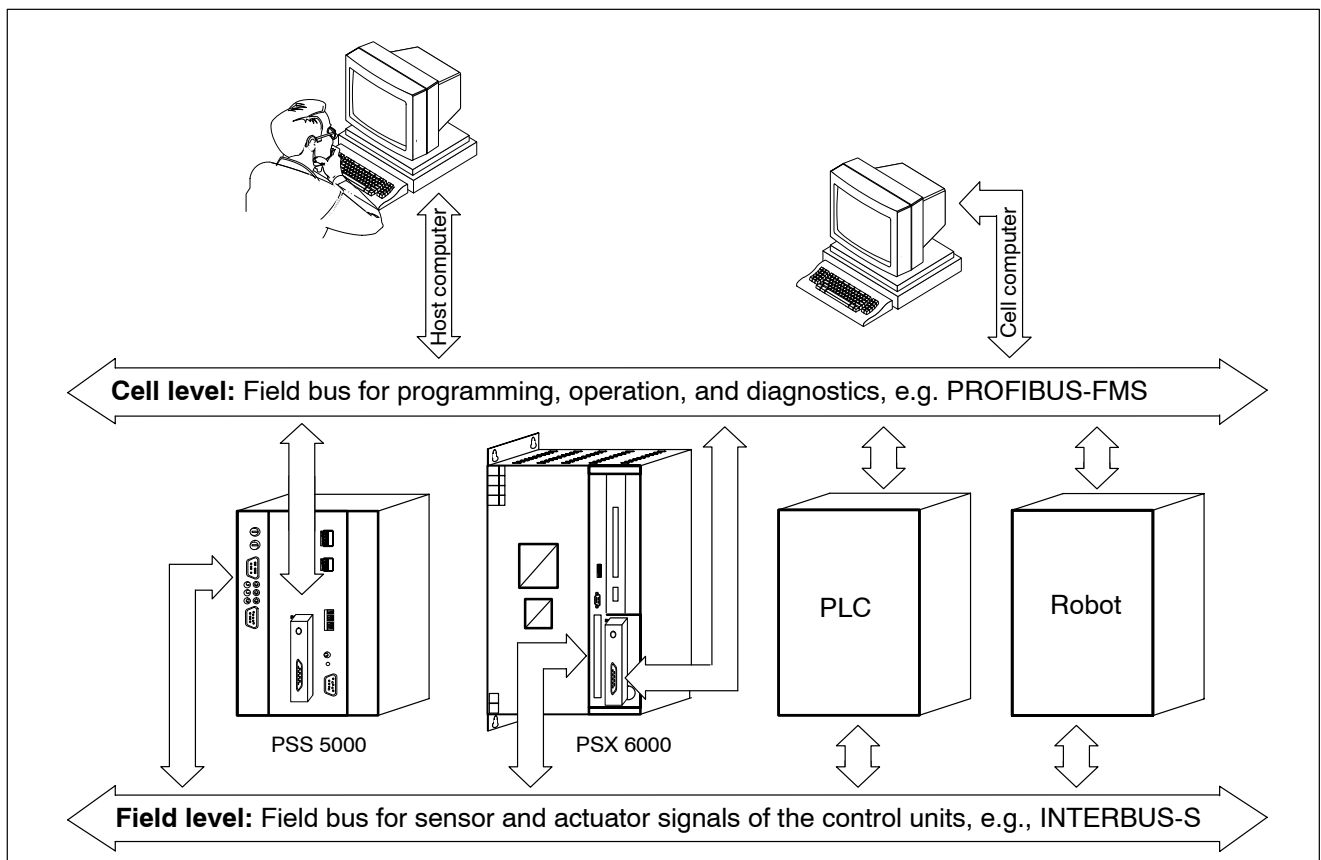
- Vertical communication between the control level and the programming terminal, the process control or cell computer;
- Horizontal communication between control units.

The welding control concept from Bosch offers this open, manufacturer-independent communication structure.

Field bus networking between the control units is achieved through various field bus interfaces

Transmission includes:

- Program data transmitted between the host computer or cell computer (programming terminal and weld timer).
- Welding schedule data transmitted to the host computer or cell computer for further processing.
- Signal data transmitted at the sensor-actuator level to other control units or elements of the welding device.



Conventional system installation

In a conventional installation, all sensor and actuator ports are hard-wired from their place of installation all the way to the timers, or between the individual timers. This requires high wiring efforts:

- Many multi-core cables requiring space and cost.
- High material and time expenditure in the event of expansions
- Confusing system installation.

Local system installation using field buses

In a decentralized configuration, all sensor and actuator ports are combined in their place of installation and transmitted through field bus systems. The wiring efforts are accordingly lower:

- A single cable transmits all signals within the system.
- Low material and time expenditure in the event of expansions
- Transparent system installation

Field buses in resistance welding technology

In industrial automation technology, the following field bus systems are currently most popular:

- PROFIBUS-FMS
- PROFIBUS-DP
- INTERBUS-PMS
- INTERBUS-S

They meet the following standards:

Bus system	standardized layer	Standard
PROFIBUS-FMS	1,2,7	DIN EN 50170, DIN 19245, Part 1 DIN EN 50170, DIN 19245, Part 2
PROFIBUS-DP		DIN EN 50170, DIN 19245, Part 3
INTERBUS-S, INTERBUS-PMS		DIN EN 50254, DIN 19258, Part 2

1.1 Field bus topologies

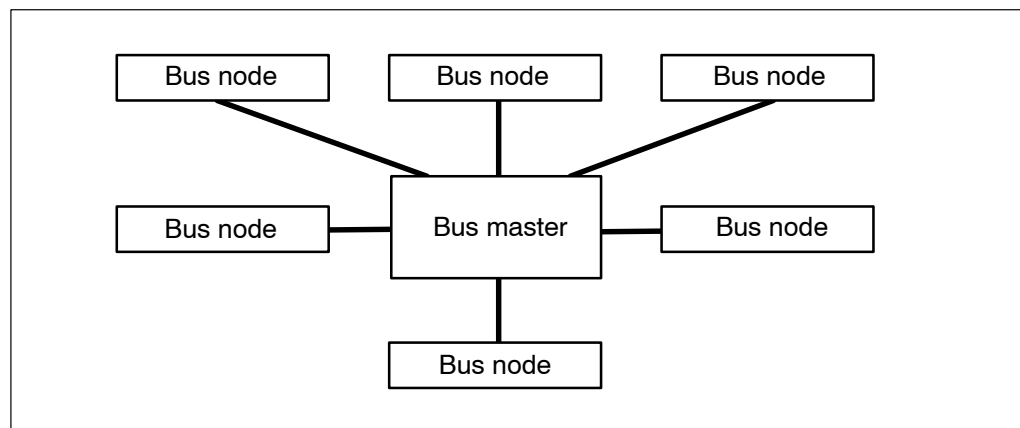
Field bus configurations may have either one of the following topologies:

- Star topology
- Line topology
- Tree topology
- Ring topology

The various field bus systems support one or several ones of these topologies.

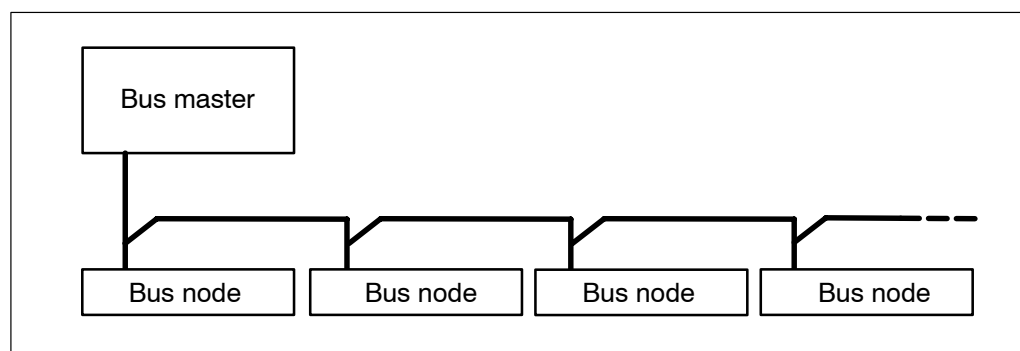
Star topology

The star topology of a field bus installation is most similar to a centralized configuration.



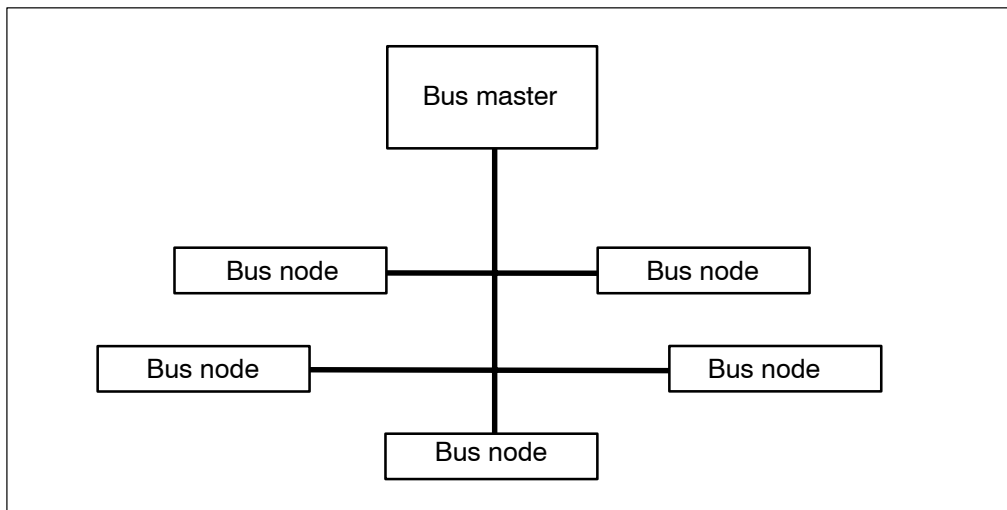
Line topology

A typical example of a line topology includes the PROFIBUS.



Tree topology

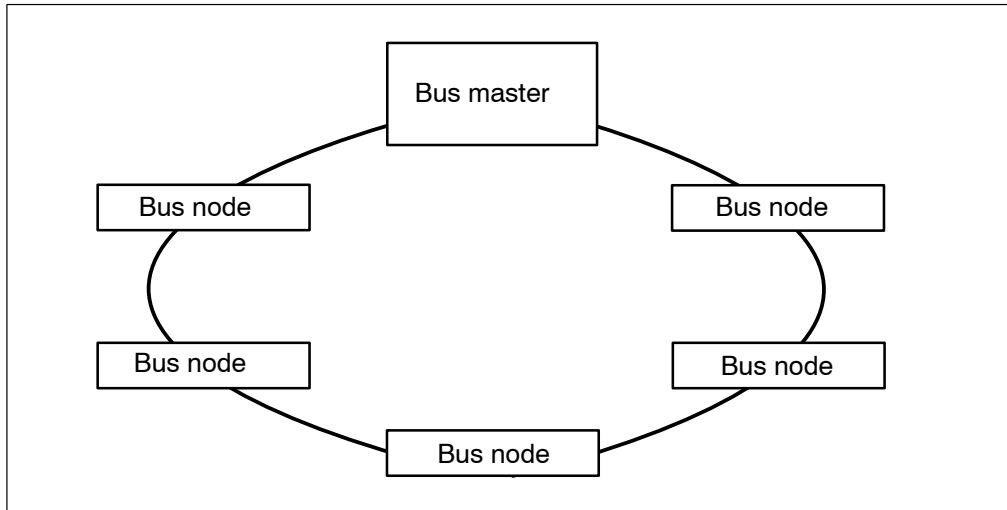
The tree topology is a combination between a star topology and a line topology.



Ring topology

A typical example of a ring topology includes the INTERBUS.

Plant configurations usually have a ring topology.





1.2 Field bus topology

The topology of a field bus installation is basically determined by

- the transmission rate,
- the maximum distance between nodes,
- the maximum number of nodes.

As a standard, copper cables are used for data transmission.

Optical waveguides may be used instead of copper cables, which offer a maximum cable length and maximum transmission rate.

PROFIBUS topology

Communication is performed via a shielded two-wire cable between the bus master and the nodes. The sequence of the nodes is not fixed.

Data exchange is based on the ISO-OSI reference model.

The PROFIBUS is designed as a line topology.

Features:

- The bus master coordinates the data exchange.
- The nodes cannot actively access the bus, access arbitration is rather handled by the bus master.
- Duties of the nodes:
 - receipt and acknowledgement of data.
 - data transmission at the request of the bus master.

The maximum bus length is determined by the transmission rate. It reaches from 100 m at 12 MBaud/s up to 1200 m at 9.6 kBaud/s.

The PROFIBUS interface module for the BOS-5000 application uses a fixed transmission rate of 500 kBaud/s over a maximum cable length, refer to 2.2.

The bus length may be increased by using repeaters.

INTERBUS topology

Communication is performed via a multi-wire cable between the bus master and the nodes. The order of the nodes on the bus is determined by the bus master's configuration file.

The INTERBUS is designed as a ring topology. The last node connected to a local or remote bus automatically detects the end of the bus by means of a missing connector on the bus interface leading to the next node and closes the ring internally.

Data exchange is performed using a summation frame protocol, which is designed for a cyclic data transmission between the bus master and the nodes. All the nodes defined in the configuration must be operative.

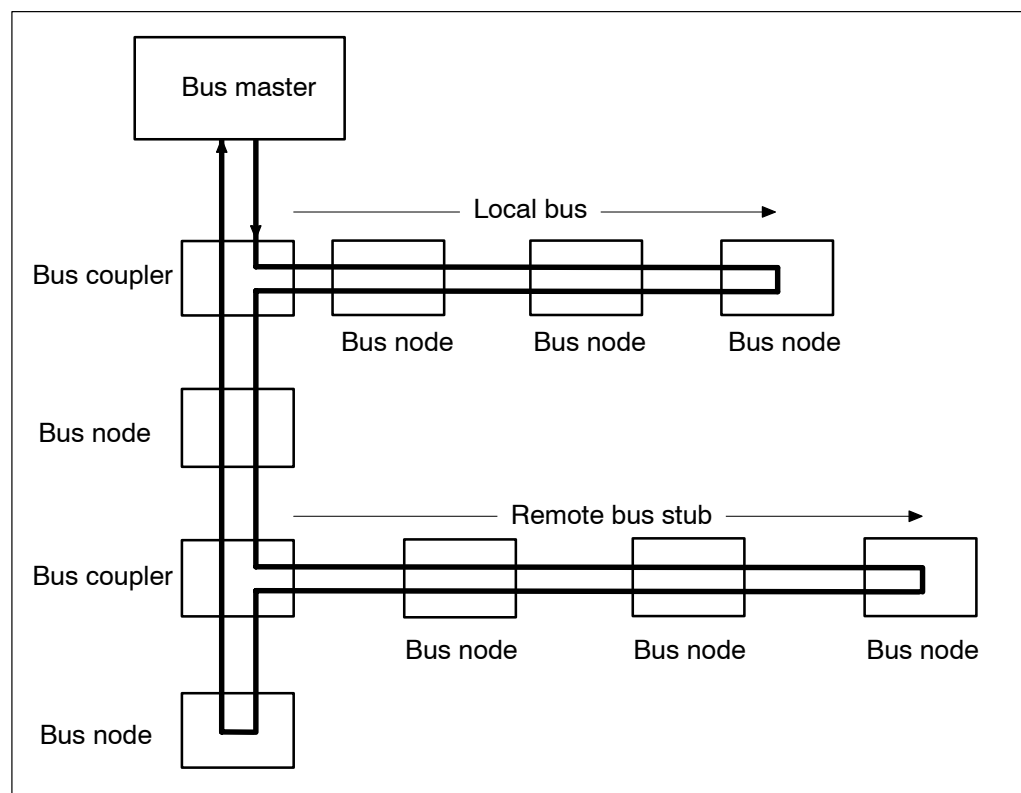
Features:

- The ring topology offers fully duplex data transmission, i.e. simultaneous transmission and receipt of data is possible.
- Nodes may access the bus actively:
 - Receiving data
 - Transmitting data

The transmission and receipt lines are included in a single bus cable. Therefore, an INTERBUS configuration resembles a line topology.

The maximum bus length is 12.8 km at a transmission rate of 500 K bits/s, corresponding to a maximum distance of 6.4 km.

The INTERBUS offers diagnostics capabilities in the bus master.





1.3 Addressing

PROFIBUS

Node addresses are allocated by:

- Centralized addressing through an address list in the bus master.
- Hardware address setting at the nodes.

Both addresses are checked for matching settings.

The hardware address of the nodes is read during the initialization phase only. An addressing change in running mode initially has no effect on the function.

INTERBUS

Node addresses are allocated by:

- Contents of the identification registers stored in the nodes.
 - Automatic configuration including address allocation corresponding to the physical position within the bus
- or
- Centralized addressing through an address list in the bus master.

1.4 Access method

The access method of a field bus controls bus access by the individual nodes.

The access method has great effects on

- the transmission rate (bits per second)
- the maximum cable length
- the real-time capability

Bus system	Access according to	Transmission
PROFIBUS	Arbitration	Token-passing method combined with Master-Slave
INTERBUS-S	Arbitration	Summation frame

Token-Passing in PROFIBUS

The Token-passing method involves arbitration of the bus access by the bus master to the nodes. The token telegram is used for this purpose. When a node has the token privileges, it may access the bus.

The Token-passing method is also referred to as multi-mastering. Each node performs the function of a master for a limited period of time, and the other nodes act as slaves during that time.

Summation frame of INTERBUS

The bus master transmits a summation frame to the nodes in a telegram. For each byte transmitted by the bus master to the nodes, one byte containing the node data is received from the bus master.

All bytes of this summation frame pass the shift registers of the nodes one by one.

Each slave takes the data designed for it from this summation frame and enters the data intended for the bus master into the summation frame protocol.



2 Technical data

2.1 Cables and transmission

Bus system	Cable	Transmission
PROFIBUS-FMS	Twisted pair shielded massive or trailing cable	RS 485
INTERBUS-PMS	Five-core cable twisted in pairs according to specification of Messrs. PHOENIX	RS 485
ETHERNET	Four-core cable twisted in pairs shielded Recommended type: UTP-5	

2.2 Transmission rate and cable length

Bus system	maximum number of nodes		Transmission rate
	without repeater	with repeater	Cable length
PROFIBUS-FMS with PROFiBoard PB-IF-03/HW	31	47 Repeaters are counted as nodes	500 Kbits/s, 400 m
INTERBUS-PMS	according to specification of Messrs. Phoenix		
ETHERNET	limited to 62 by BOS 5000		10 Mbits/s, 100 m

NOTE

The bus response (data transmission between node and programming terminal) increases with the number of nodes in the field bus installation.

2.3 PROFIBUS-FMS cable

2.3.1 Massive cable

	Electrical Data
Attenuation	
at 16 MHz	< 45 dB / km
at 4 MHz	< 22 dB / km
at 38.4 kHz	< 5 dB / km
at 9.6 kHz	< 3 dB / km
Surge resistance (nominal value)	150 Ω
at 3 to 20 MHz	150 ± 15 Ω
at 38.4 MHz	185 ± 18.5 Ω
at 9.6 MHz	270 ± 27 Ω
Conductor resistance	51.7 Ω / km
Operating voltage _{rms}	≤ 100 V

	Mechanical data
Cable type	1 x 2 x A / 0.64 / 2.54
Type of core	insulated copper
Number of cores	2
Arrangement of cores	twisted pair
Diameter of copper conductors	0.64 mm
Diameter of core insulation	2.54 mm
Type of core insulation	PE foam
Color of core insulation	different colors

**2.3.2 Flexible cable (trailing cable)**

	Electrical Data
Attenuation	
at 16 MHz	< 52 dB / km
at 4 MHz	< 25 dB / km
at 38.4 kHz	< 5 dB / km
at 9.6 kHz	< 3 dB / km
Surge resistance (nominal value)	150 Ω
at 3 to 20 MHz	150 \pm 15 Ω
at 38.4 MHz	185 \pm 18.5 Ω
at 9.6 MHz	270 \pm 27 Ω
Conductor resistance	76 Ω / km
Operating voltage _{rms}	\leq 100 V

	Mechanical data
Cable type	1 x 2 x A / 0.65 / 2.55
Type of core	stranded copper, 19 individual wires
Number of cores	2
Arrangement of cores	twisted pair
Diameter of copper conductors	0.65 mm
Diameter of core insulation	2.55 mm
Type of core insulation	PE foam
Color of core insulation	different colors

2.4 Repeaters for PROFIBUS-FMS

	Technical data
Power supply	24 V DC, 19.2 to 30 V
Power input from 24 V power supply	≤ 200 mA
Interface	RS 485, electrically isolated, ISO 5 V / ISO GND load 90 mA max.
Bus IN connector	RS 485
Bus OUT connector	RS 485
Baudrate	9.6 kBaud to 12 MBaud
Power input	max. 50 VA
Degree of protection	IP 20
Assembly	Mounting rail DIN EN 50 022

**2.5 Number of nodes within PROFIBUS-FMS**

The following applies when using the PROFiBoard interface module:

Number of nodes (total):	47 (addresses from 2 to 48)
Number of nodes per segment including PC or repeaters	32
Number of repeaters connected in series	3
Transmission rate	500 Kbits/s

Notes:



3 Welding User Interface (BOS) and PROFIBUS-FMS

Layer 7 of the ISO-OSI reference model specifies the FMS services for data transmission through the PROFIBUS-FMS.

- **FMS: Fieldbus Message Specification**

Data transmission on the PROFIBUS-FMS is performed according to the token-passing method, combined with the master-slave principle. The bus master offers communication objects which are accessed by the slaves. Communication is performed through logic channels, the so-called communication links or communication references.

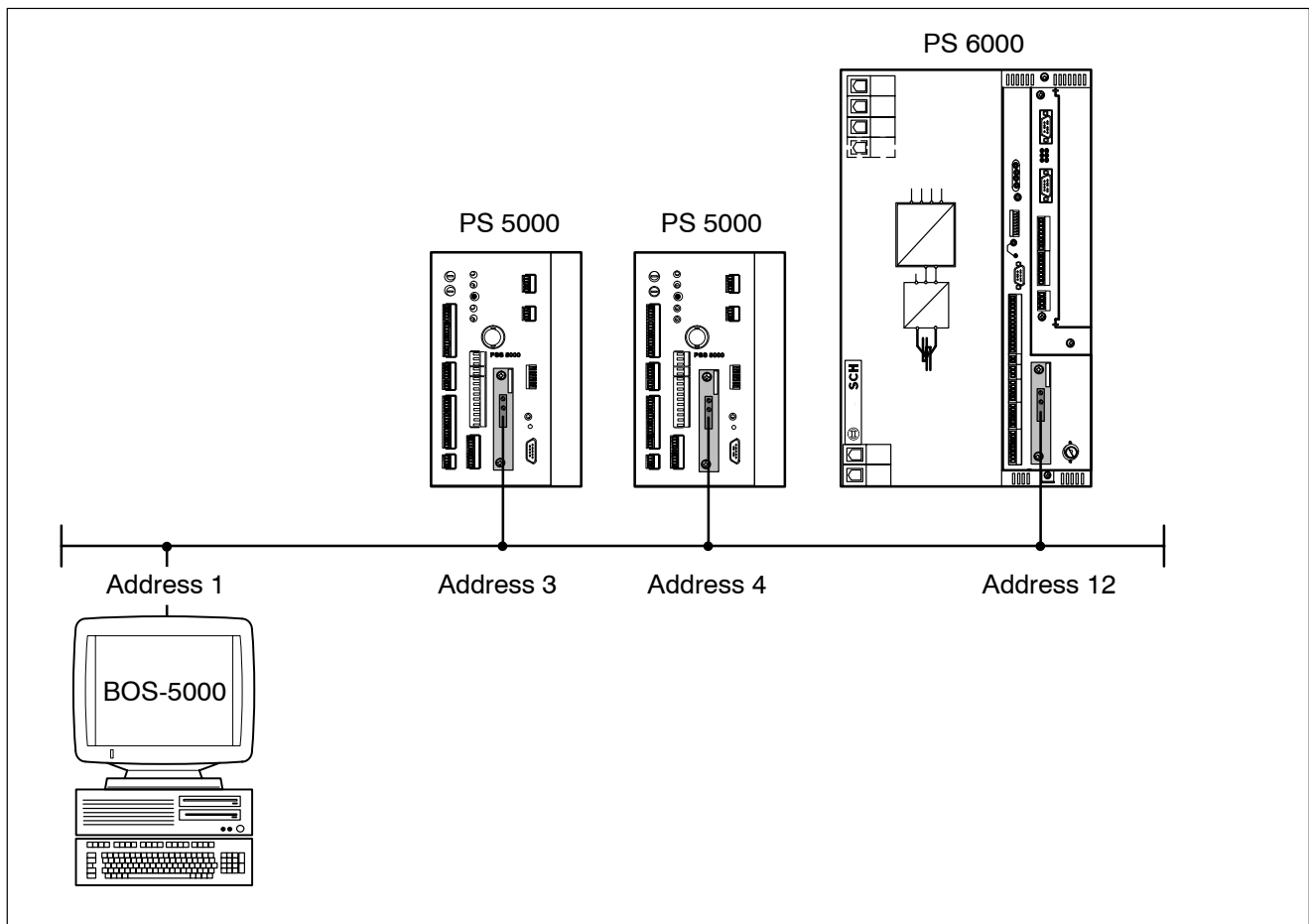
All communication references are stored in a communication reference list contained in a file (filename extension .KBL).

The PROFIBUS parameters have been defined in a bus file (filename extension .BUS).

During the installation of the welding user interface software (BOS), these files are copied to the C:\... \FBUS folder together with other information. They contain the complete configuration for the PROFIBUS-FMS in connection with the welding user interface software.

Example

PROFIBUS with three bus nodes.



3.1 PROFIBUS information

For more information concerning the PROFIBUS please contact:

PROFIBUS Nutzorganisation e.V.
Haid-und-Neu-Straße 7
D-76131 Karlsruhe

Telephone : +49 (0)721 / 96 58 590

Facsimile : +49 (0)721 / 96 58 589

Web address for PROFIBUS

<http://www.profibus.com>



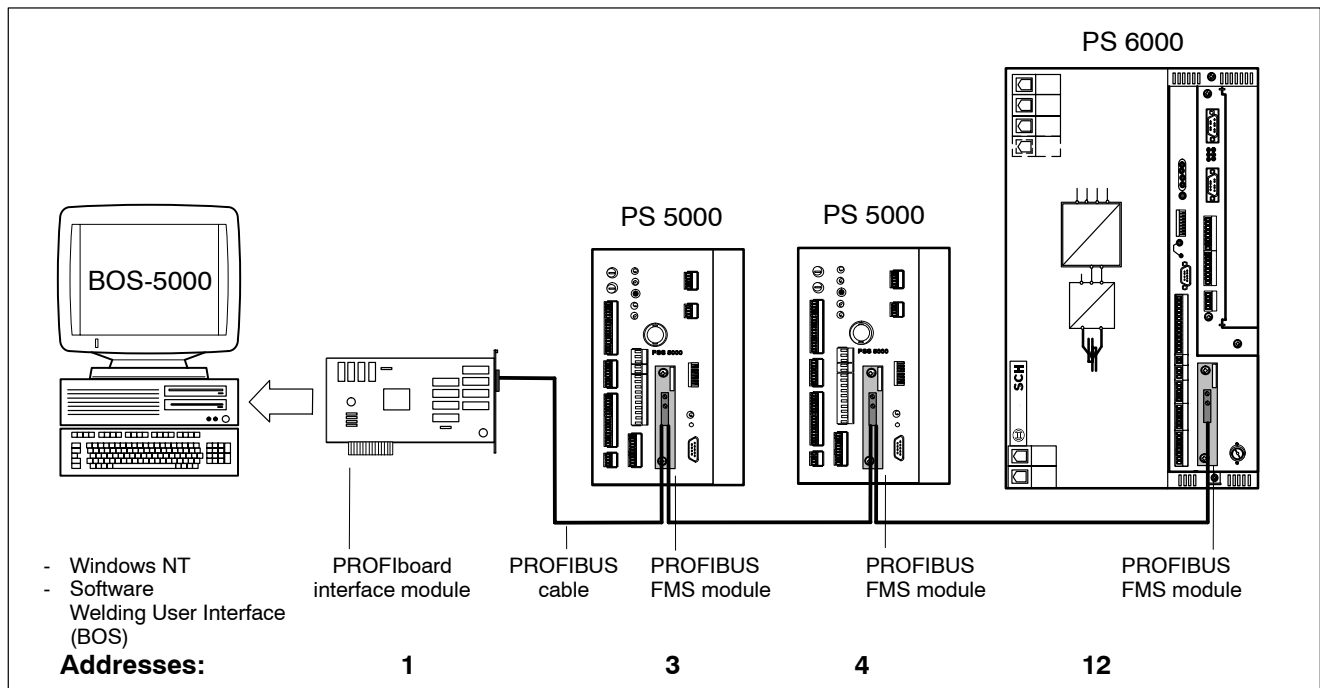
3.2 Hardware and software components of PROFIBUS-FMS

The following hardware and software components are required to build up a PROFIBUS-FMS network between several weld timers and a programming terminal (maximally two programming terminals are possible):

- One PROFIBUS-FMS module for each weld timer.
A suitable slot has been provided in weld timers intended for networking with PROFIBUS-FMS.
- One PROFiBoard interface module for the programming terminal.
- Cable according to PROFIBUS specification
- For long distances between units, repeaters have to be installed.
- Welding user interface software (BOS) for:
 - programming the *Welding parameters* and the *Basic setup*
 - operating the weld timers
 - visualization of the weld timers in the PROFIBUS network
 - diagnosis of the [Sequence] and *Status* of the weld timers
- Operating systems:
 - Windows 3.11, Windows 95/98, Windows NT

Example

PROFIBUS-FMS network.

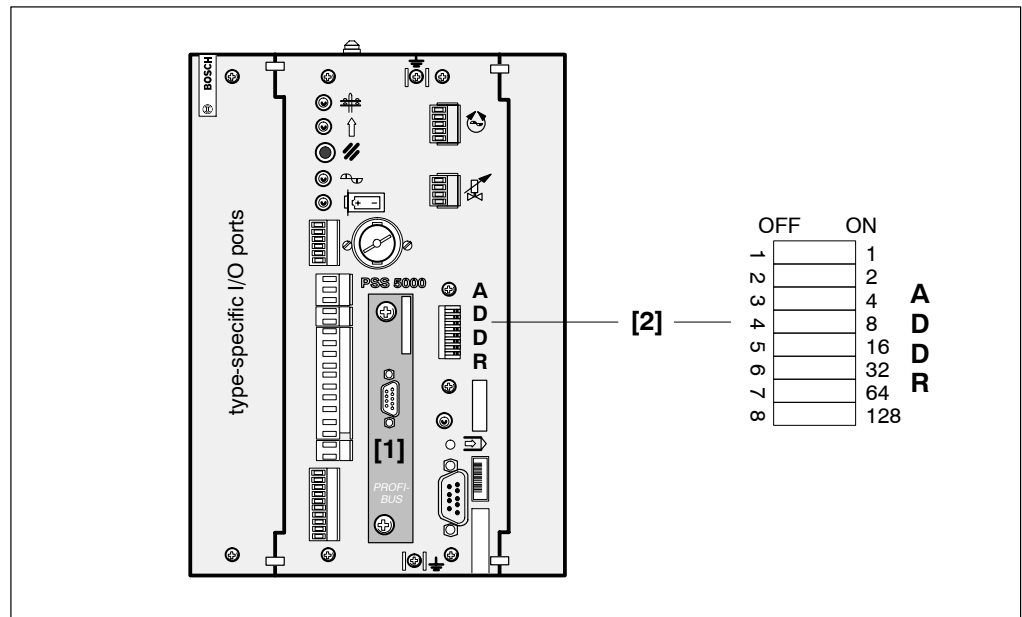


3.3 PROFIBUS-FMS module

Bosch offers a PROFIBUS-FMS module for networking weld timers in a PROFIBUS-FMS network, which may be optionally fitted to the weld timers.

This module is used to provide the link to the PROFiBoard interface module in the programming terminal and other bus nodes.

Addressing



[1] PROFIBUS-FMS module slot for connecting a PROFiBoard interface module to the programming terminal and other PROFIBUS-FMS modules.

[2] Address setting for the PROFIBUS-FMS module:

- Node address is entered in binary code.
- Numbers 1 to 128 on the right-hand side indicate the decimal value.

NOTE



The hardware addresses of the bus nodes are only read while the units are booted (after power-on of the bus nodes).

When addresses have been changed during operation, power has to be cycled to the bus node to take over the new address settings.

The addresses of the weld timers are set by making a selection from addresses 2 to 48 (one programming terminal) or 3 to 48 (two programming terminals).

**NOTE**

Recommendation: If the addresses of the weld timers start with address 3, a second programming terminal can be connected later on to the same PROFIBUS-FMS network without any address change.

**NOTE**

There may be gaps between allocated addresses.

Assembly

CAUTION!

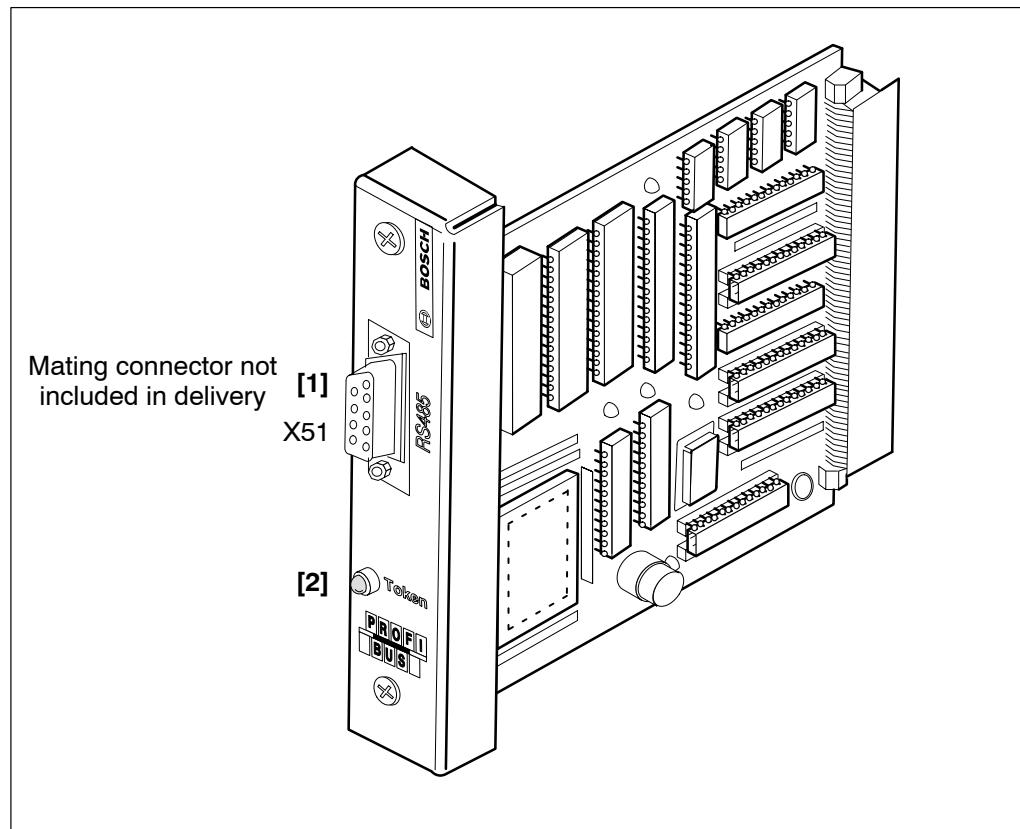


The PROFIBUS-FMS module may only be inserted or withdrawn when the timer is switched off. The upper hexagon socket screw is used to fasten the module to the timer.

NOTE



Before taking the PROFIBUS-FMS module out of its packaging, you should make sure that no hazards may arise from electrostatic discharge.



NOTE



No settings have to be made on the PROFIBUS-FMS module. The addresses are set by selecting the appropriate DIP switch positions [2], refer to page 3-4.

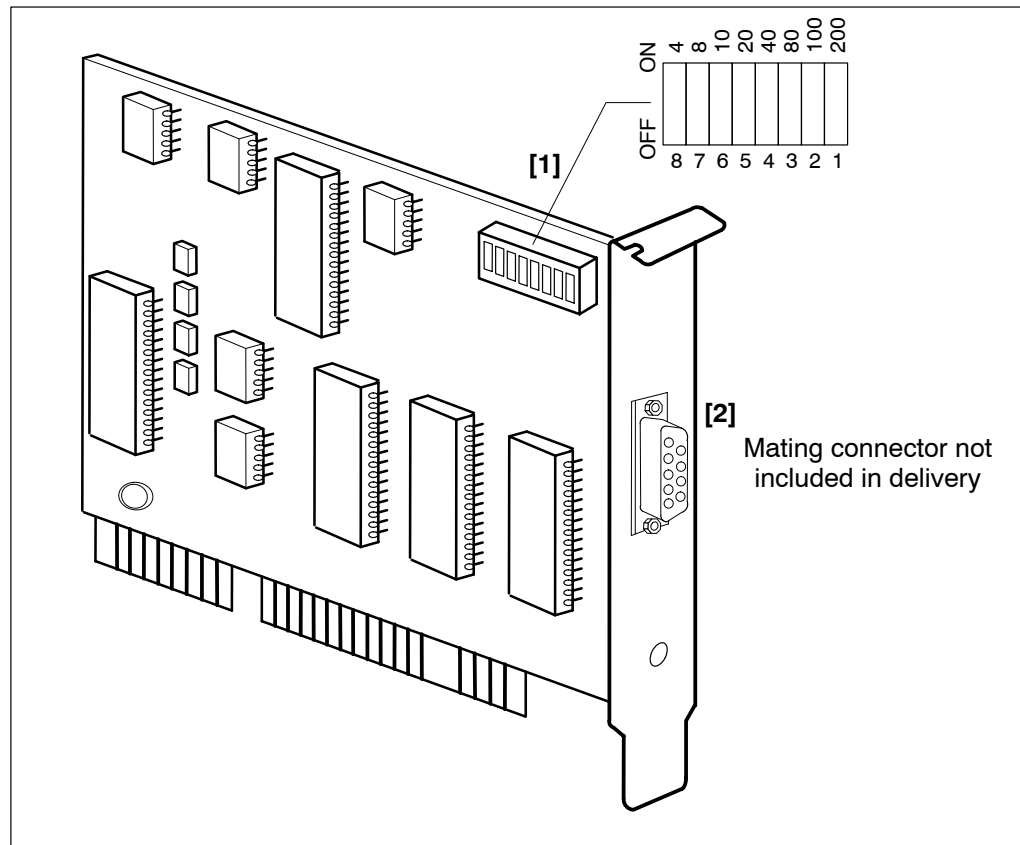
- [1] Interface X51 (9-pole, female D-Sub), PROFIBUS-FMS port for other bus nodes or the PROFIboard interface module of the programming terminal.
- [2] Led Token:
Flashing, data transmission on PROFIBUS-FMS is active.



3.4 PROFiBoard interface module

Description : PROFiBoard PB-IF-03/HW interface module

The PROFiBoard interface module provides for the electrical connection of up to 47 bus nodes (networked weld timers). A maximum of 31 additional bus nodes may be connected to one segment.



[1] Start address of the I/O address range (size 4 bytes)

[2] Interface (9-pole, female D-Sub) for PROFIBUS-FMS modules and repeaters.

System requirements

- State-of-the-art IBM-compatible computer.
- Unoccupied 16-bit ISA or EISA slot.
- Unoccupied 4-byte I/O address range in the address area 240_{hex} to 344_{hex} , address 240_{hex} is the default start address.
- Unoccupied 16 Kbyte upper memory area between $C800_{\text{hex}}$ and $F7FF_{\text{hex}}$, addresses $D000_{\text{hex}}$ to $D3FF_{\text{hex}}$ are the standard address range.
If a memory manager is used (e.g. EMM386, QEMM386, 386MAX, etc.), this memory range must not be used. Please use appropriate commands to suppress this memory. The memory manager is usually invoked in the CONFIG.SYS file.

- If you use a memory manager, you should reserve memory area D000_{hex} to D3FF_{hex} for the welding user interface software (BOS) by making an appropriate entry in the CONFIG.SYS file.

Example

DEVICE=C:\DOS\EMM386.EXE x=D000-D3FF

Installation

Setting the I/O address range [1]

- Select a free I/O address range on your computer.

NOTE



Before removing the interface module from its packaging, you should make sure that no hazards may arise from electrostatic discharge.

- Set the unoccupied I/O start address on DIP switch [1].
In the default configuration, the welding user interface software (BOS) uses 4 bytes starting with I/O address 240_{hex}.
Setting the start address of the I/O address range:

DIP switches 1 2 3 4 5 6 7 8	I/O start address (hex)
1 0 0 1 0 0 0 0	240 Default setting of the welding user interface (BOS)
1 0 0 1 0 0 0 1	244
1 0 1 0 0 0 0 0	280
1 0 1 0 0 0 0 1	284
1 1 0 0 0 0 0 0	300
1 1 0 0 0 0 0 1	304
1 1 0 1 0 0 0 0	340
1 1 0 1 0 0 0 1	344

If this default I/O address range is already used by your programming terminal for other purposes, another I/O start address has to be set. Furthermore, the I/O start address has to be adapted to a new setting in the system set-up of the welding user interface.

For setting other I/O start addresses, please use the values of the switches shown in the figure on page 3-7.

**Defining the memory area**

- The memory address of the PROFiBoard interface module is defined as described on page 3-7 and 3-8 for Windows 3.11, Windows 95/98.
- For the Windows NT operating system, the memory address of the PROFiBoard interface module is set by an appropriate driver configuration, refer to page 3-11.

3.5 PROFIBUS-FMS and Welding User Interface (BOS)

First, the PROFIBUS-FMS PROFIboard interface module must be selected as communication channel from the welding user interface during system installation.

In order to operate the PROFIboard interface module in the Windows NT operating system, certain driver files have to be installed.

Driver installation in the course of a new system configuration

When the installation routine has been completed, you are prompted to specify:

"Install PROFIboard driver for Windows NT?"

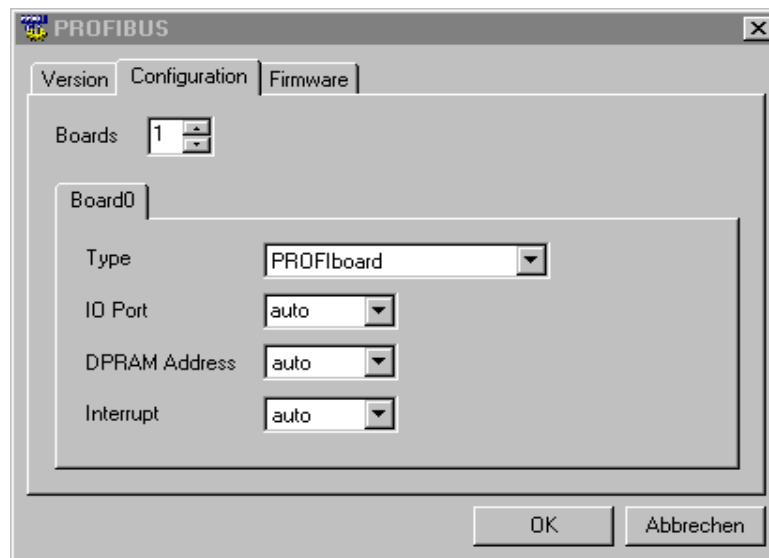
if no PROFIboard drivers had been installed before.

Complete your installation by performing the installation of the PROFIboard drivers. Once installed, the PROFIboard drivers have to be configured.

**Configuring Windows NT drivers**

When the driver installation has been completed, the drivers have to be configured for your system.

- Control panel - Select PROFIBUS symbol.
- Select Configuration tab.
- Set number of boards.

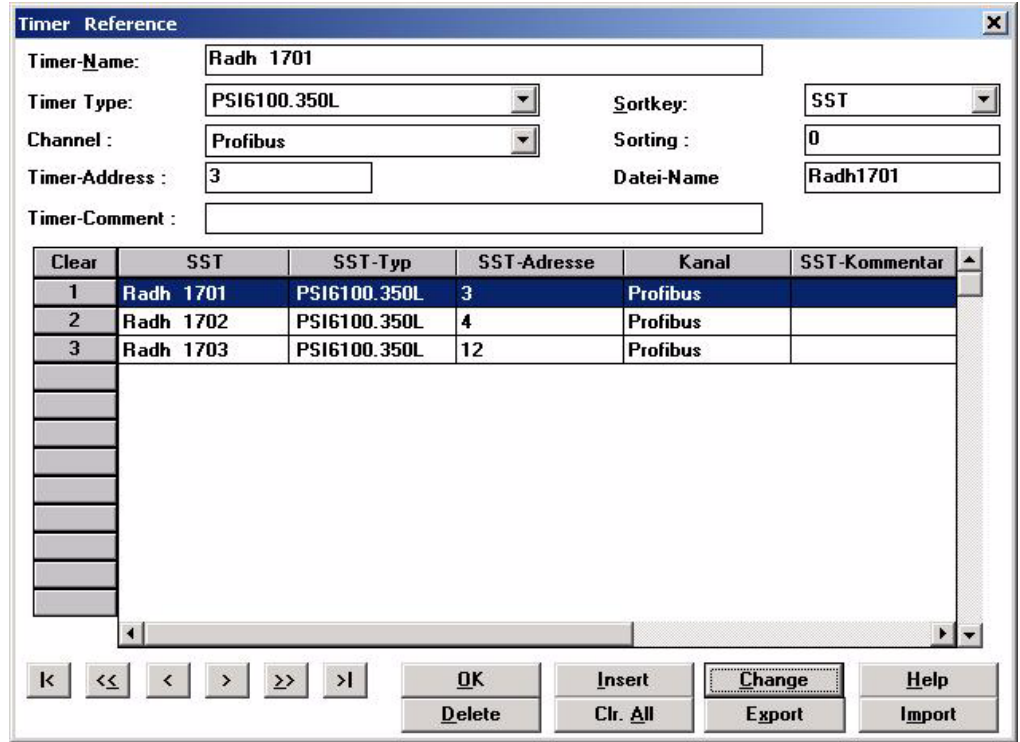


The following configuration setting has to be entered for a PROFIboard interface module:

- Type : "PROFIboard"
- IO Port : "auto"
- DPRAM Address : "auto"
- Interrupt : "auto"

3.5.1 Setting the PROFIBUS communication channel

- Select the PROFIBUS as the communication channel in *Timer reference*.

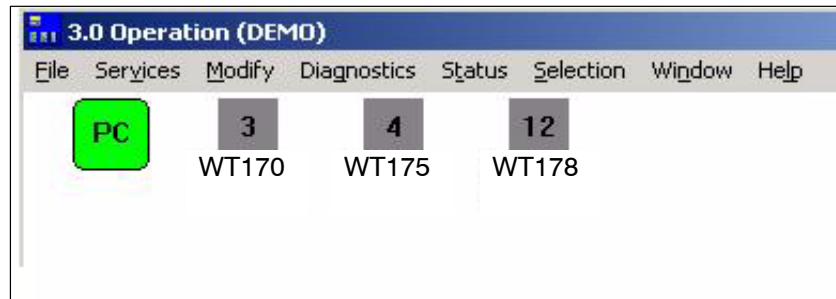


Clear	SST	SST-Typ	SST-Adresse	Kanal	SST-Kommentar
1	Radh 1701	PSI6100.350L	3	Profibus	
2	Radh 1702	PSI6100.350L	4	Profibus	
3	Radh 1703	PSI6100.350L	12	Profibus	



3.6 PROFIBUS plant image

In the plant image of the Operation function, the status of the nodes is indicated by a color change, refer to volume 1 of the BOS-5000 operating and programming instructions, part no. 1070 078 217.

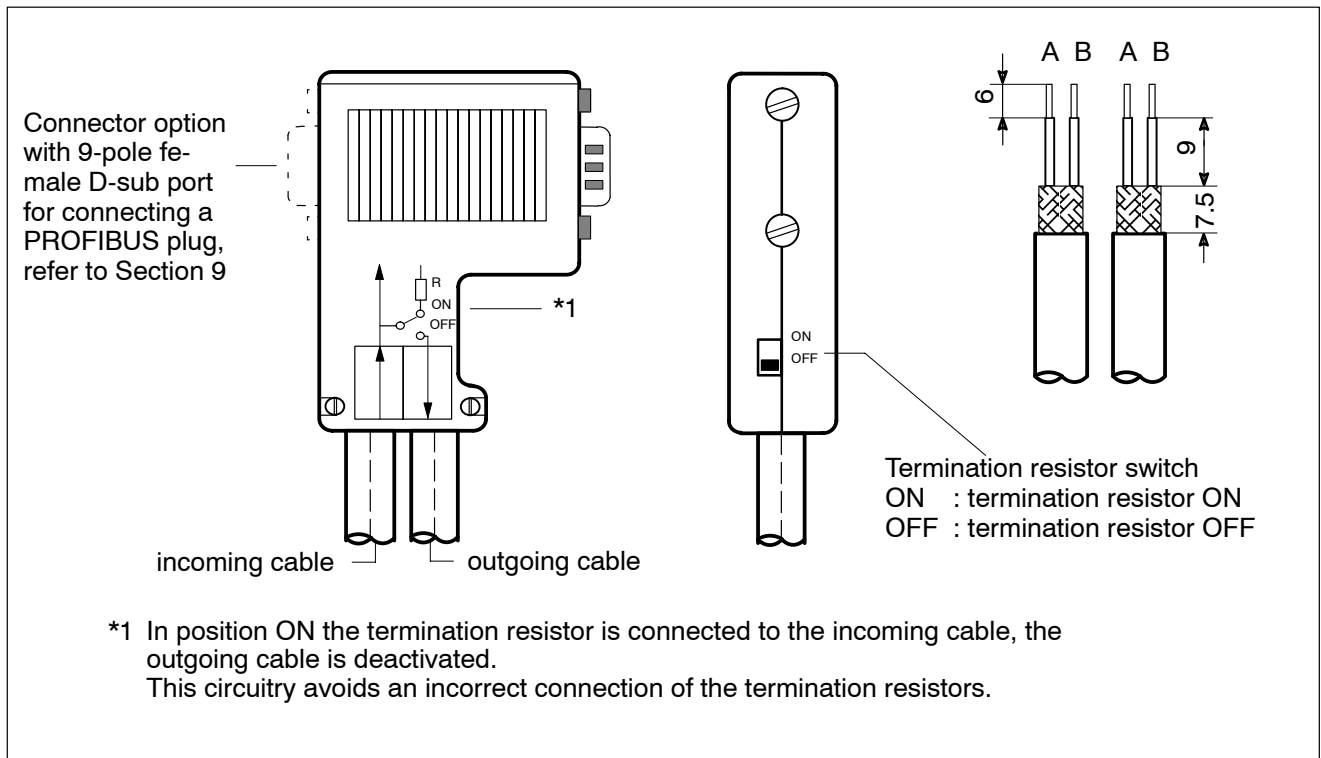


Notes:

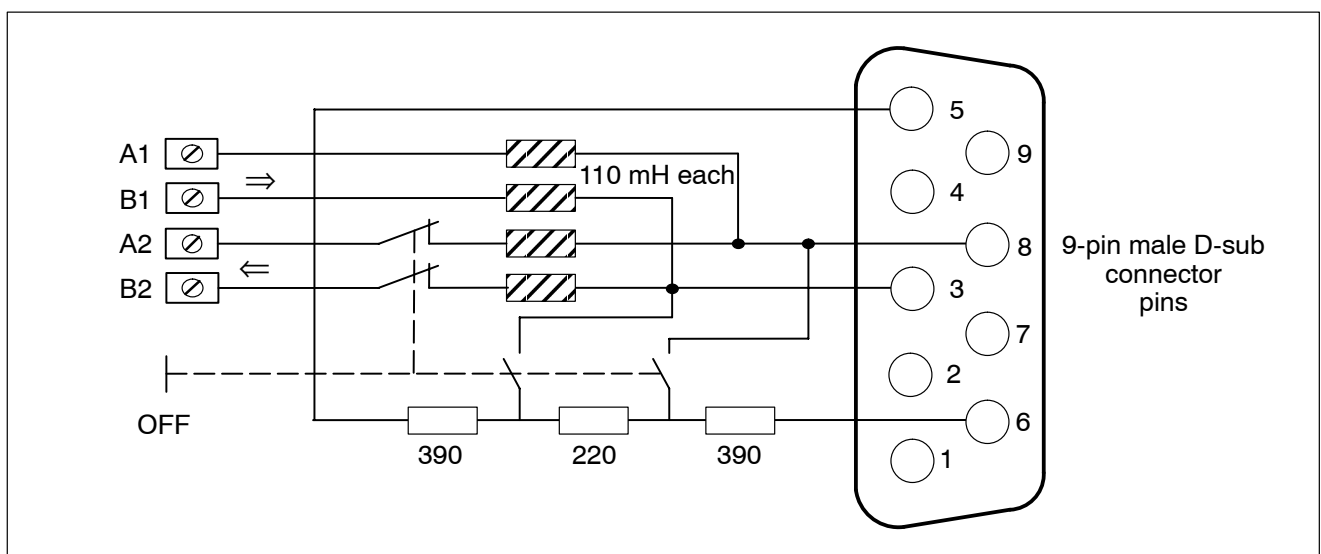


4 Installation of PROFIBUS Network

4.1 PROFIBUS-connector



PROFIBUS connector equivalent circuit diagram



4.1.1 Termination resistor of PROFIBUS-FMS

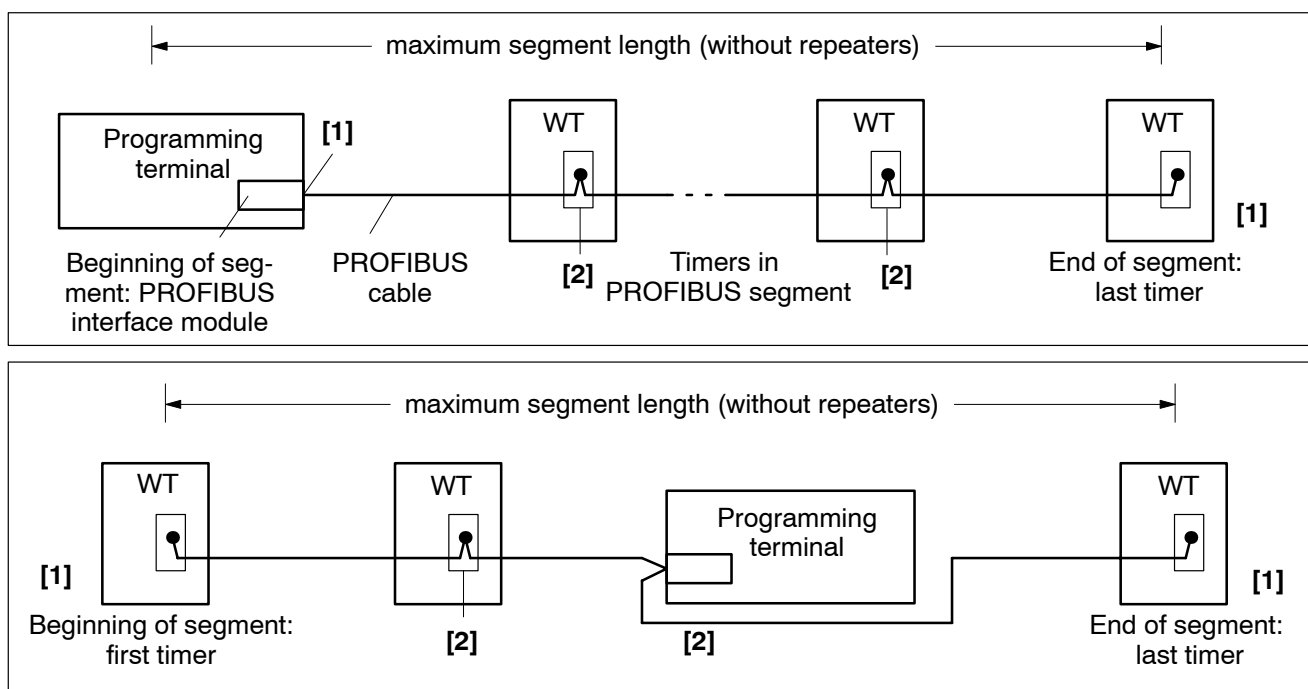
The bus wiring is terminated by activating the R_t termination resistor inside the PROFIBUS connector.

- in the connector at the beginning of the segment.
- in the connector at the end of the segment.

NOTE



No additional termination resistors may be inserted between an activated R_t termination resistor at the beginning of the segment and the R_t termination resistor at the end of the segment.



- [1] Beginning of segment and end of segment:
- Activated termination resistors R_t in PROFIBUS connector.
- [2] Bus nodes between beginning of segment and end of segment:
- Deactivated termination resistors R_t in PROFIBUS connector.

A maximum of 32 nodes (weld timers, PCs or other equipment) may be connected to one bus segment. If more than two timers are to be connected, or if the length of the bus cables between any two bus nodes exceeds the permitted maximum, repeaters have to be used, refer to section 4.6.1.

NOTE



The R_t termination resistor inside the PROFIBUS connector and the repeater must not be activated at the same time.

4.2 Bus cable

Two types of bus cables are available:

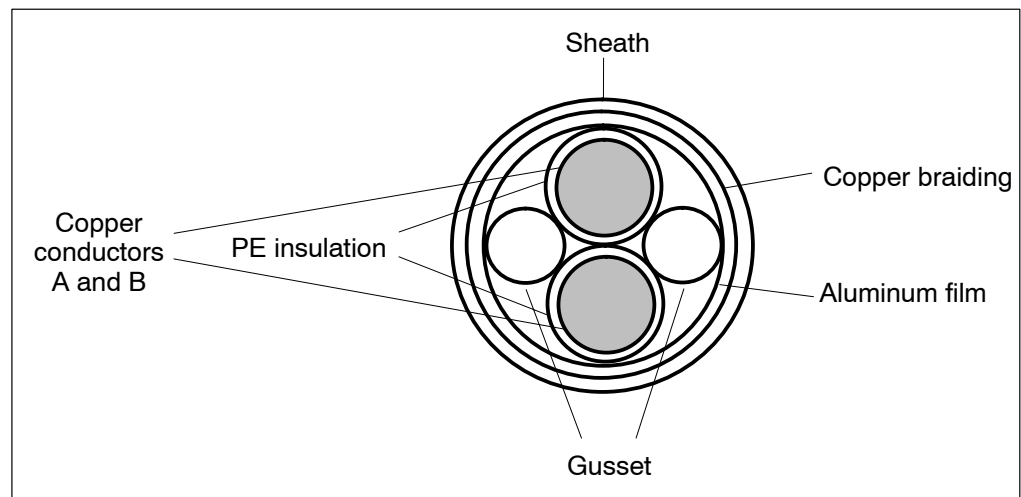
- a solid bus cable
- a flexible bus cable (trailing cable) that may be connected to mobile machine elements

A double shielded, twisted-pair cable with a circular conductor area is used as bus cable.

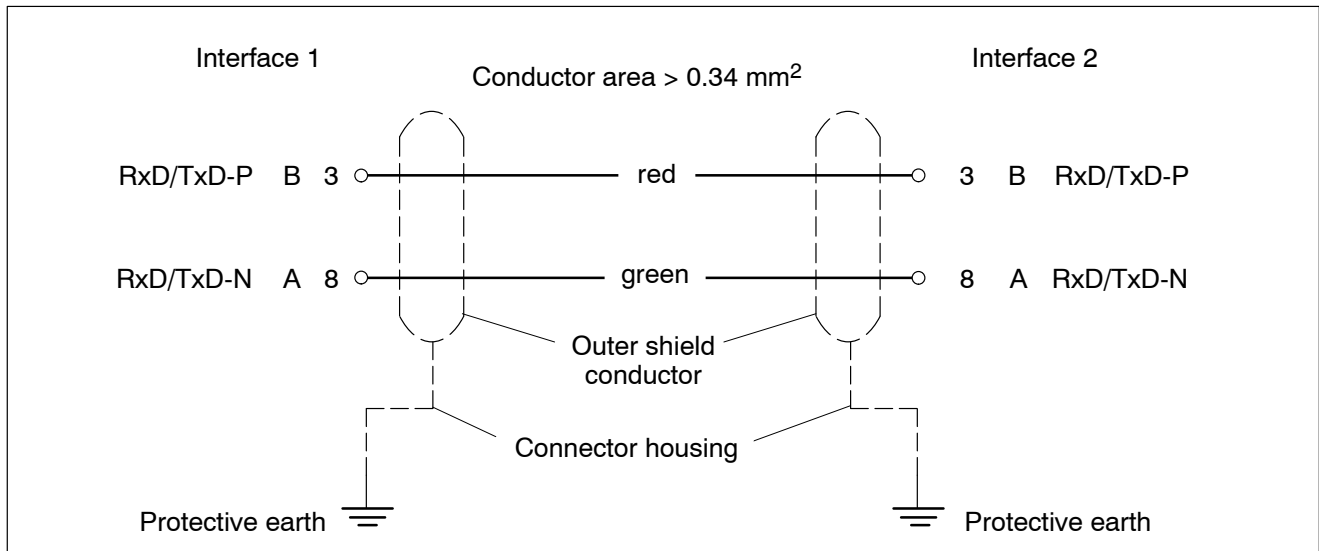
The double shield ensures safe bus operation in an industrial environment. Both ends of the shields should be connected to the protective earth conductor with good electrical continuity.

The shields must not be damaged when removing the plastic insulating sheath.

A continuous grounding concept of network installation can be achieved with the help of the outer shield conductor.



4.3 Cable connection between two nodes

**NOTE**

Cores A and B must not be crossed in the connection between two bus nodes.

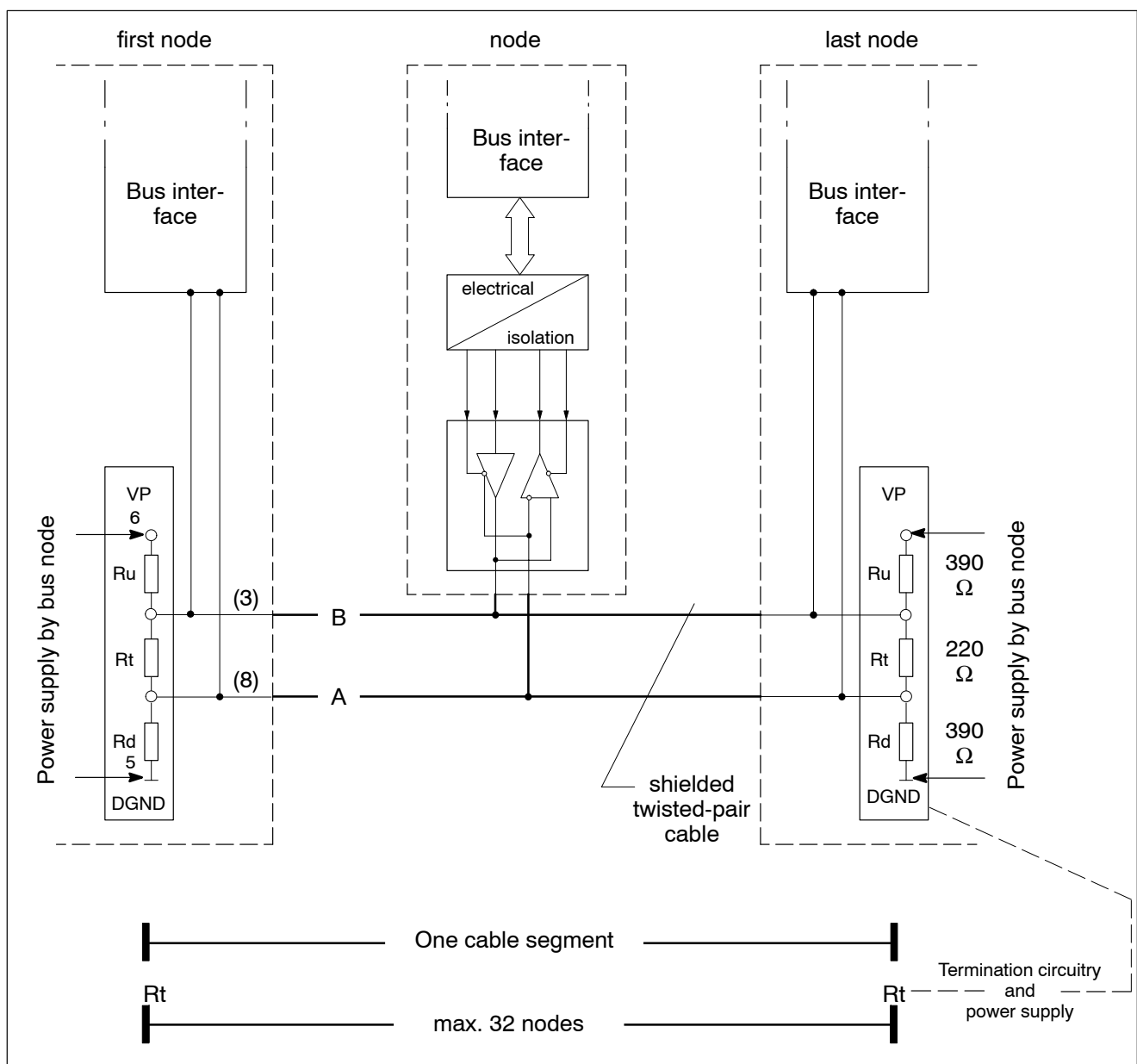
4.4 General bus configuration

The following figure shows the principle of a bus configuration and power supply.

NOTE



The cable termination resistor must be activated at the first and last node of a bus segment. The nodes must be switched on.



4.5 Network installation

Grounding and shielding

A large area of both ends of the shields must be connected to the protective earth via an earthing clamp.

As an exception, earthing the shields on a single side only is permitted in the case of different ground potentials.

As a rule, the connection between the cable shield and the protective earth is achieved through the metal equipment housing and the screwed connection of the sub-D connectors.

If this is not possible, we recommend exposing the cable shield in a suitable location of the cable and connecting it to the protective earth conductor using a short, low-inductance link. For example, a shield clamp may be attached close to the bus connector for this purpose.

Routing

Bus cables should not be routed together with power cables. They must not be bent or mechanically deformed.

The minimum bending radii according to the PROFIBUS specification are to be complied with.

Equipotential bonding

When cable shields are connected at both ends and grounded at different plant sections, different potentials may be present.

In order to avoid equipotential bonding currents across the shield, an equipotential bonding line should be installed:

- up to 200 m: 16 mm² Cu
- more than 200 m: 25 mm² Cu

**NOTE**

*For more instructions and guidance please refer to the manual
"Aufbaurichtlinie PROFIBUS/DP/FMS"
(Configuration instructions PROFIBUS/DP/FMS).*



4.5.1 Performing the network installation

- The network installation has to be performed by an expert and in compliance with all installation instructions given by the manufacturer.
- Only approved cables may be used.
- Only approved connectors may be used.
- Only approved repeaters may be used.
- The connectors must be inserted exactly as described in the assembly instructions.
- If stranded conductors are used, no strands may be damaged or cut off when stripping the insulation of the wires.
- Signal leads A and B must be routed without crossing in the entire network, and without any short-circuits or interruptions.
- The termination resistors may only be activated at the beginning and at the end of any segment.
- The units at both ends of the segment have to be switched on in order to provide energy supply to the termination circuitry.
- The maximum bus segment length must not be exceeded.
- The maximum number of bus nodes per segment must not be exceeded.
- The maximum number of repeaters must not be exceeded.
- Each bus address must be unique.

4.6 Repeaters

A RS485 repeater is required if:

- more than 32 bus nodes are to be connected.
- the bus segments are to be operated ground-free.
- The maximum cable length within a segment is exceeded.

The RS485 repeaters are used to amplify bus signals if the segment length exceeds the maximum permitted value, and to link bus segments. They require a 24 VDC power supply.

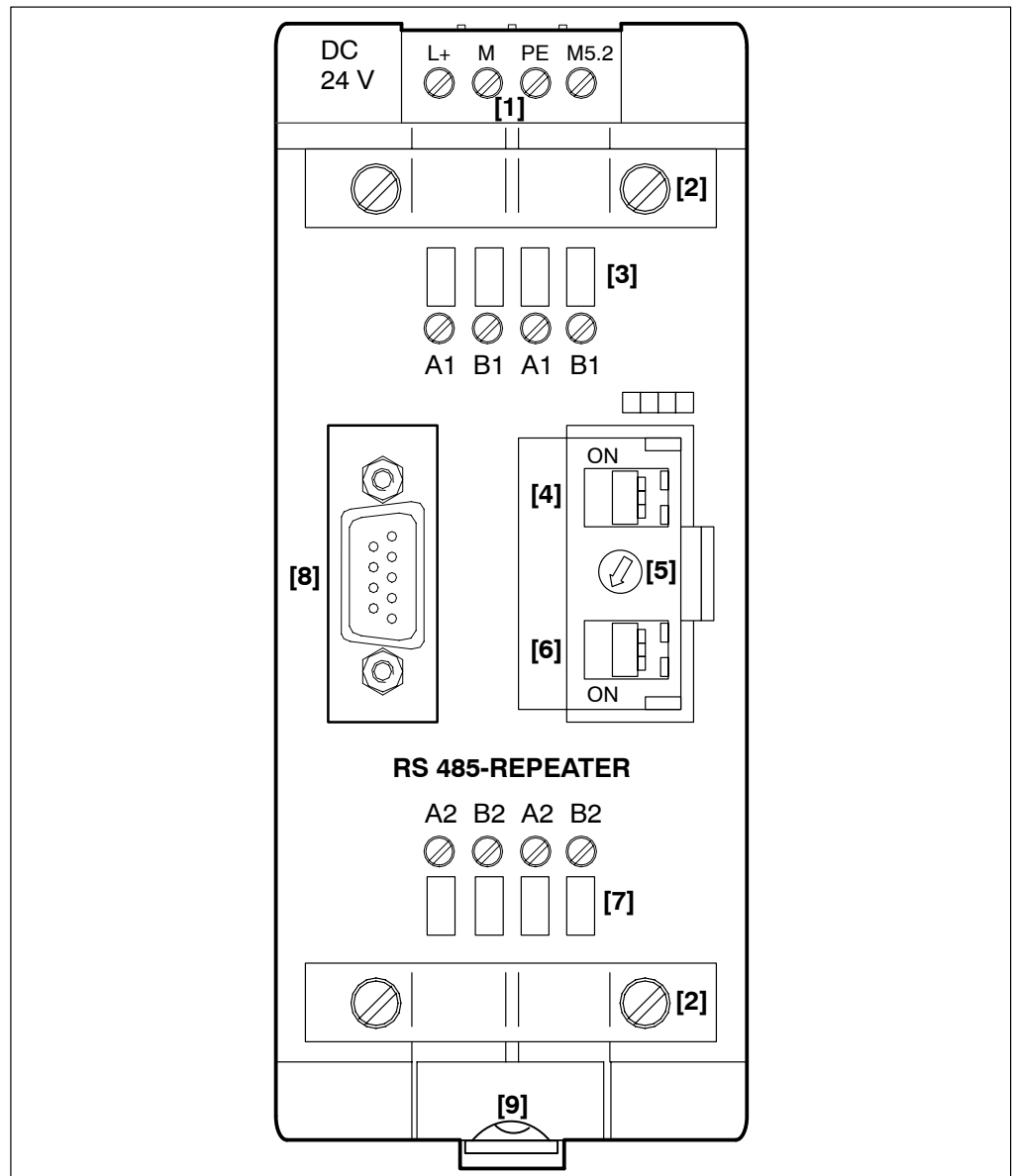
The following repeater type is available:

- Repeaters with degree of protection IP20 for installation in a suitable switch cabinet or a suitable housing.



NOTE

In the event of discrepancies between the following explanations and the product information provided on the repeater packaging, the current instructions and information contained in the product information shall be binding.



- [1] Power supply connection.
- [2] Shield clamp
 - A large area of the bare shield must be in contact with the metal.
- [3] Connection of bus segment 1.
- [4] Switch for termination resistor of bus segment 1.
 - ON : termination resistor is switched on.
 - OFF : termination resistor is switched off.
- [5] Switch for baudrate setting; the key to the switch positions and baudrates is printed on the left side of the repeater.
 - Switch position 5 : Baudrate 500 Kbits/s when using the PROFiBoard PB-IF-03/HW interface module

-
- [6]** Switch for termination resistor of bus segment 2.
 - ON : termination resistor is switched on.
 - OFF : termination resistor is switched off.
 - [7]** Connection of bus segment 2.
 - [8]** Port for programming terminal/operating program on bus segment 1.
 - [9]** Slide for removing the repeater.

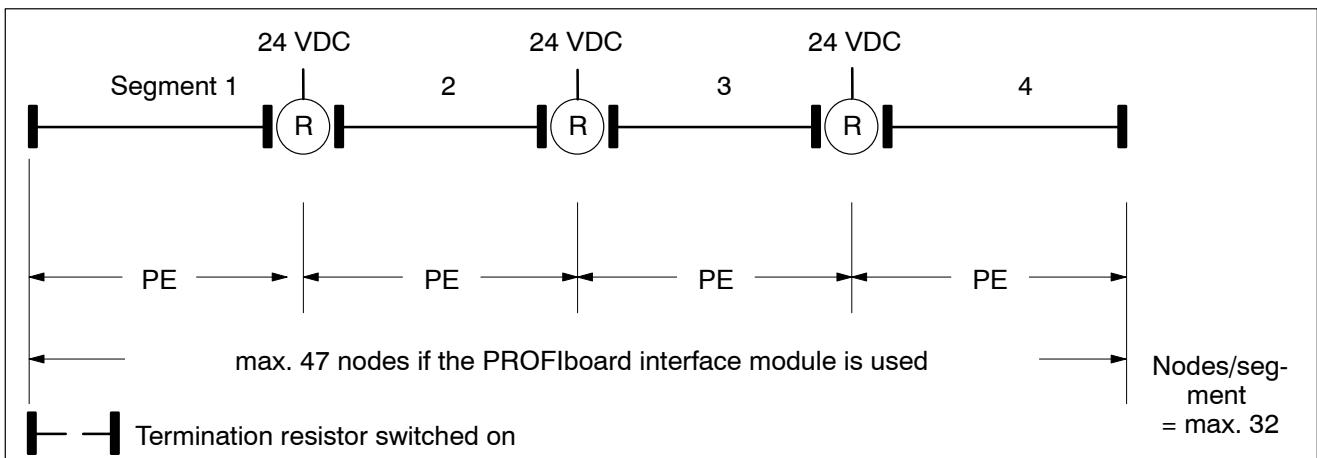


4.6.1 Enlarging networks with the help of repeaters

NOTE

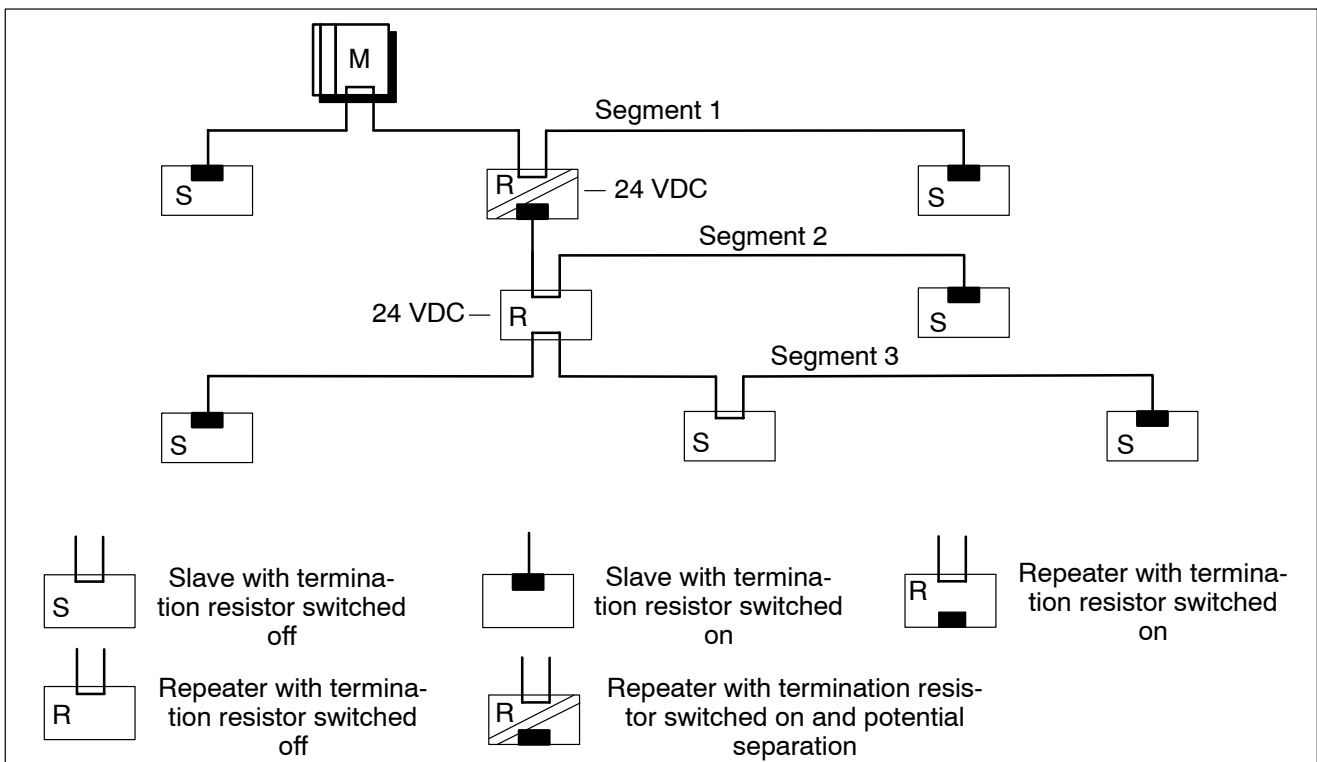
A maximum of three repeaters may be installed between any two nodes within a line topology.

Line topology



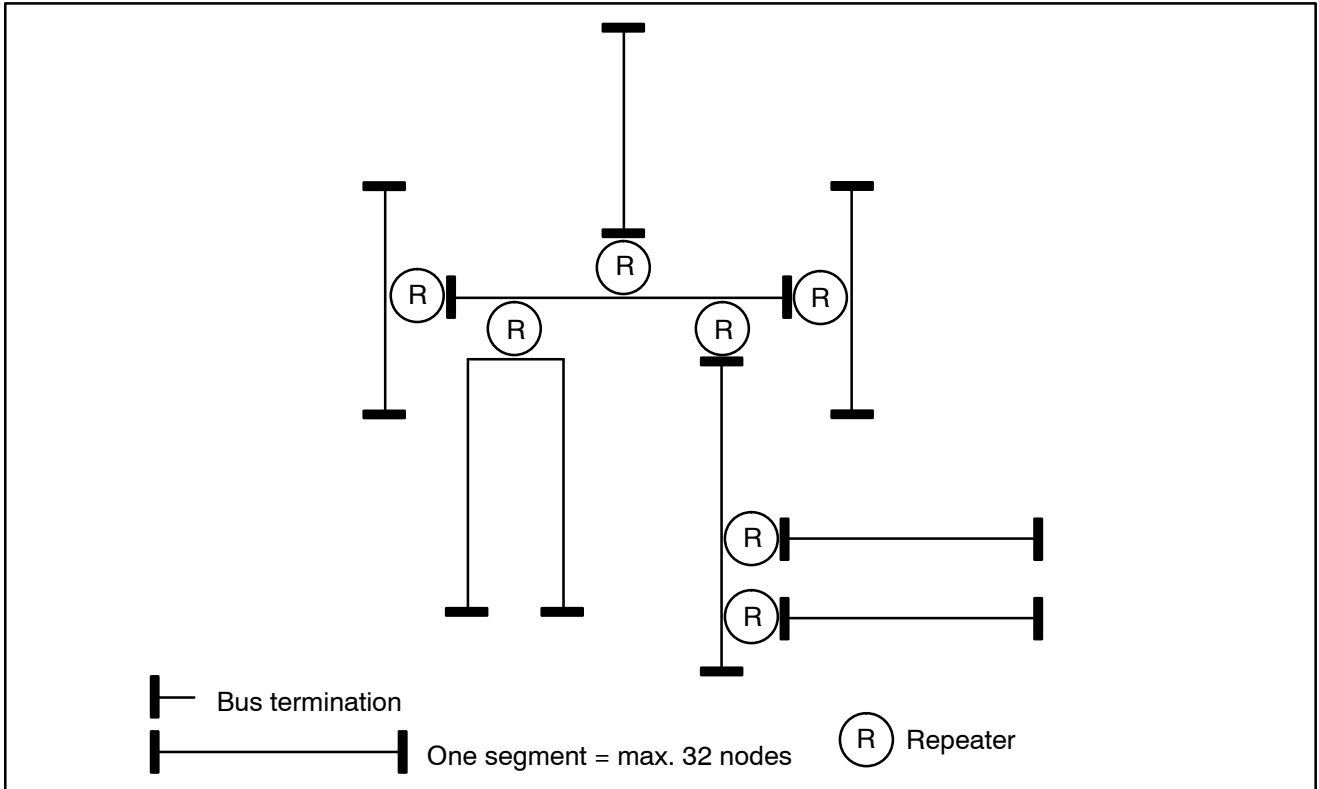
Tree topology

Representation according to PROFIBUS-Nutzerorganisation (PNO):



Star topology

Plant-wide network topology

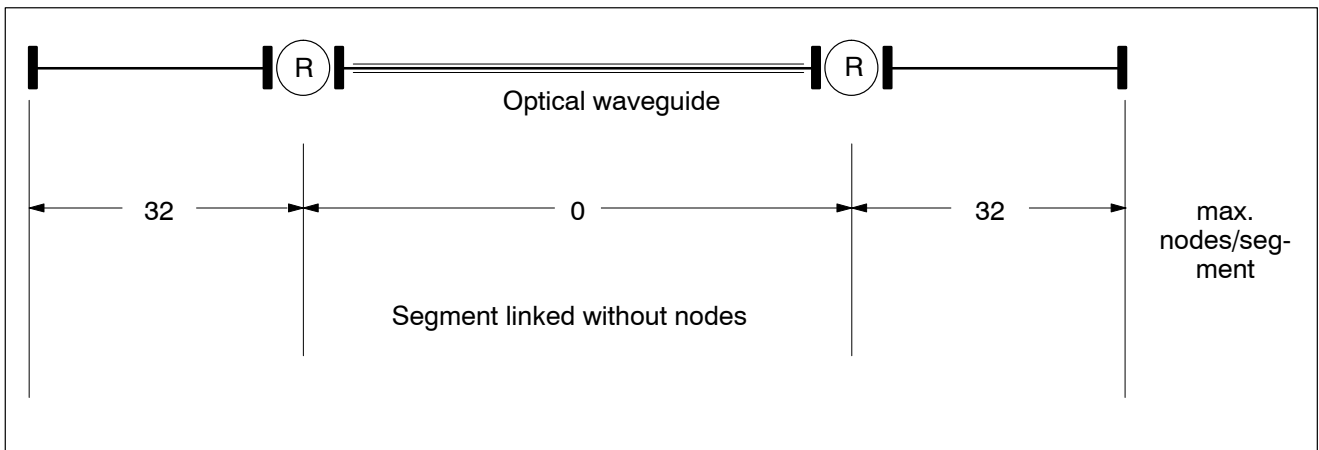


4.6.2 Expanding networks by linking segments

NOTE



As an alternative to a network configuration using copper cables, optical waveguides may be used, e.g., to bridge large distances.





5 Assembly

**CAUTION!**

- Danger of life and damage to property through inadequate degree of protection! The repeaters with degree of protection IP20 have to be installed in a suitable switch cabinet.
- Danger of injuries and damage to property through inappropriate assembly! When installing the devices and, in particular, the control elements it must be ensured that they are sufficiently protected against inadvertent operation or contact.
- Damage to property through short-circuits! When drilling or cutting holes into switch cabinets, burr may get inside previously installed modules. Furthermore, when connecting modules with cooling water lines water may leak into modules.
The possibility of short-circuits and destruction of the systems cannot be entirely ruled out.
Therefore, all modules should be well partitioned prior to all work! Non-compliance will result in the extinction of any warranty claims.

**NOTE**

- All connection or signal leads must be routed so as to prevent negative effects on device functions through capacitive or inductive interference!
- In long cables, interference is frequently injected and removed. Inverter lines and control cables should be routed separately. The influence of interfering lines on lines susceptible to interference can be minimized by observing the following distances:
 - > 100 mm with parallel installation of cables < 10m,
 - > 250 mm with parallel installation of cables > 10m.

Grounding, screening

For connection of the cable shields, refer to section 4.5.

The area of the ground wire must comply with VDE 0113, but has to be 1.5 mm² as a minimum.

Earth strips should preferably be used for reasons of EMC.

The ground conductor must be wired to the closest earthable point. During installation, it must be ensured that the contact areas are bare, i.e. free from paint or plastic coats.



6 Commissioning the PROFIBUS-FMS

**NOTE**

Please note the safety instructions, the technical data and the electrical wiring diagrams for the commissioning procedure.

The following sections contain suggestions concerning the commissioning procedure. Following these suggestions depends on the specific circumstances and is subject to the responsibility of the commissioning engineer.

The following components are needed for commissioning:

- Programming terminal with Windows 3.11, Windows 95/98 or Windows NT operating system
- PROFIBoard PB-IF-03/HW interface module
- PROFIBUS modules inside the weld timers
- PROFIBUS network with prescribed cables
 - Repeaters if the maximum cable lengths are exceeded
- Welding user interface software

The PROFIBoard interface module provides for communication between the programming terminal and the weld timer.

All *Welding parameters* are saved in the weld timer in Online mode (PROFIBUS/INTERBUS).

- The welding user interface software must be switched to online mode.
Conditions:
 - The *Timer reference* has been set for the PROFIBUS communication channel

For more information on these issues, please refer to the following documentation:

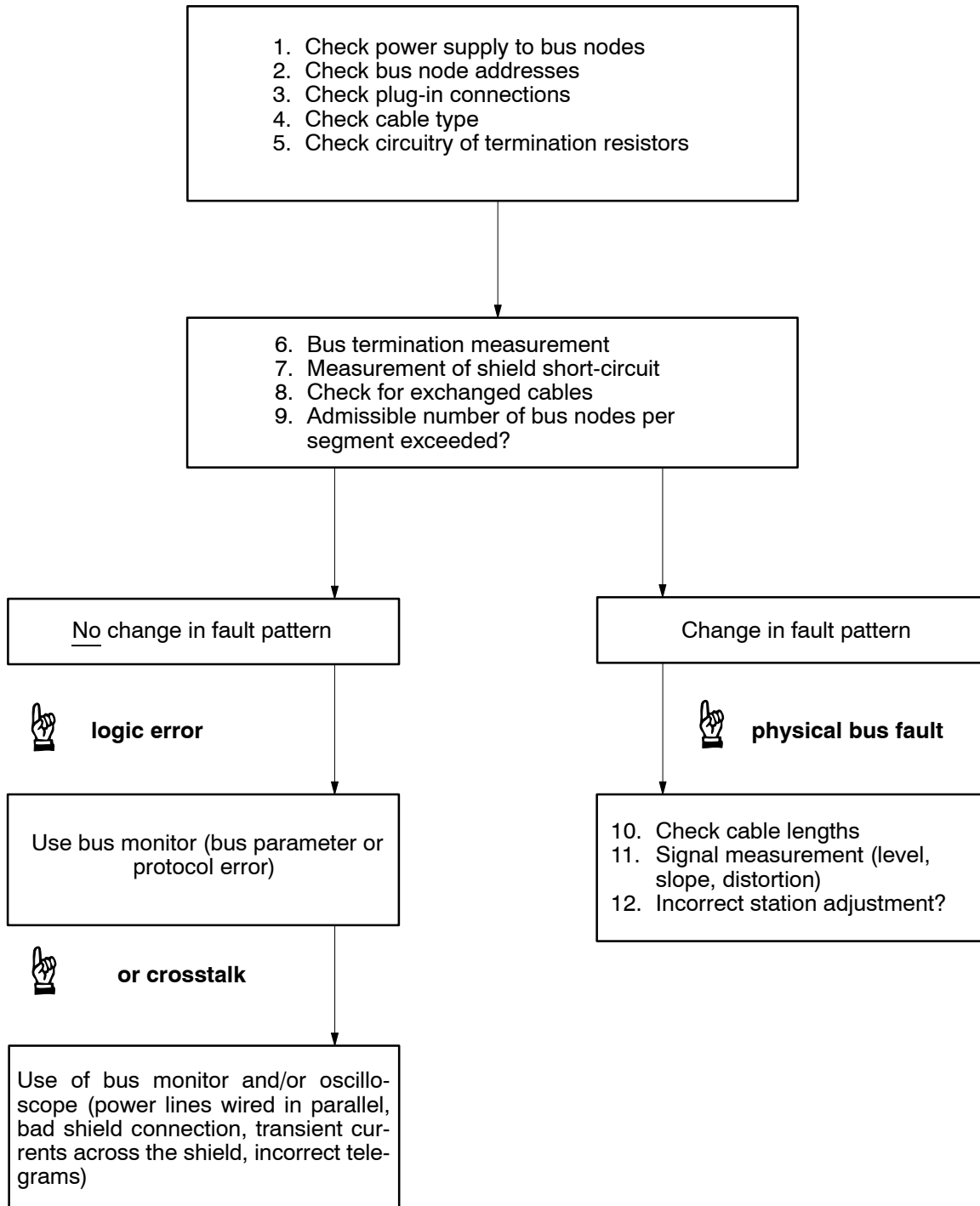
- Operating and programming instructions for welding user interface, volume 1, part no. 1070 078 217
- Operating and programming instructions for welding user interface, volume 2, part no. 1070 078 218

6.1 Preparations

- Connect the bus nodes as specified in the wiring diagrams and set power on.
- Call up the welding user interface software and enter your user group and user password.
- Select the *Operation* option.
- Check the plant image for a PROFIBUS link between the programming terminal and the weld timers.
 - If there is no link to the timer (gray timer symbol in the plant image, refer to section 3.6), please check:
 - the interface cable, for cable ratings refer to sections 6.4, 6.5
 - the address settings of the bus nodes, refer to section 3
 - the circuitry of the termination resistors, refer to section 6.3
 - the timer reference and the communication channel, cf. section 3.5.1
 - the power supply to the bus nodes
 - the initialization (driver settings) of the interface module PROFIboard, cf. section 3.5
- Select the timer and the commissioning sequence using the welding user interface software.



6.2 Remedy with bus problems



6.3 Measurement of termination resistors



NOTE

Measurements are not permitted unless the system has been switched off! (timer off, 24V off at all bus nodes).



NOTE

The resistance is measured between PIN 3 and PIN 8 of the plug-in connector at any station within a bus segment.

Number of stations with bus termination resistor ON	Resistance [Ω] ± 20%
0	~ 1300
1	~ 190
2	~ 110
3	~ 70
4	~ 55
5	~ 40

The following rule of thumb may be applied (if number of terminations > 0):

$$\text{Termination resistor PIN 3 - PIN 8} \approx \frac{220 \Omega}{\text{Number of terminations}}$$



NOTE

This formula may be applied to bus segment lengths up to 200 m only.



6.4 Measuring the shield short-circuit

The resistance is measured between PIN 3 and the shield conductor as well as PIN 8 and the shield conductor of the plug-in connector at any station within a bus segment.

- Short-circuit fault:
 - The ohmic resistance is approx. 7 Ω per 100 m of cable length
- high resistance: no short-circuit

6.5 Measurement of cable length (ohmic)

- The termination resistors must be deactivated.
 - Disconnect the bus nodes from power.
 - Produce short-circuit at the cable end (PIN 3 - PIN 8).
 - Ohmic measurement (R) at the beginning of the cable.
- The cable length is calculated according to the following formula:

$$L = (R - ((n-1) \times 0,32 \Omega)) \times 1000/2/A$$

L = cable length in m

R = resistance measured in Ω

n = Number of connectors with coils

A = core resistance in Ω/km

trailing cable $\leq 66.5 \Omega/\text{km}$

Bus cable $\leq 55 \Omega/\text{km}$

NOTE



*This formula is to be adjusted accordingly if mixed wiring is used.
An ohmic resistance of 0.32 Ω has been assumed to account for the inductances included in the connectors.*



7 Welding User Interface (BOS) and INTERBUS-PMS

The summation frame protocol is used for data transmission within the INTERBUS-S system. In addition to protocol-specific components, the summation frame protocol contains the following useful data for the bus nodes:

- process data
- parameter data

Process data

This data is mainly used for I/O data exchange at the sensor/actuator level or for networking timers through I/O signals. As a rule, process data directly influences the process.

Characteristics of process data:

- short data length, only a few bits
- cyclic data transmission
- current status information

Parameter data

This data type serves to transmit major amounts of data, e.g. welding parameters, to the weld timer. Parameter data require a lower transmission speed than process data, because parameter data usually do not act directly on the process.

Characteristics of process data:

- long data length, many bytes
- data transmission on request only, e.g. when welding parameters have changed, or transmission of messages from the welding process to the programming terminal

In order to transmit parameter data, gaps have been provided in the summation frame protocol. During these gaps, the parameter data that has previously been divided into several packages is transmitted in several cycles to the bus node, where they are subsequently restored into a single parameter record.

Process data channel

The process data is used in a process data channel for non-cyclic communication between the programming terminal (BOS-5000 software) and the weld timers.

Access to the process data is ensured by the services provided by layer 7 of the ISO/OSI reference model. Layer 7 defines the **P**eripherals **M**essage **S**pecifications, or **PMS**.

7.1 INTERBUS information

For more information concerning INTERBUS-S please contact:

Phoenix Contact GmbH & Co.
D-32823 Blomberg

Telephone : +49 (0)5235 / 300
Facsimile : +49 (0)5235 / 34 12 00

or

INTERBUS-S-CLUB e.V.
Geschäftsstelle
D-67659 Kaiserslautern

Telephone : +49 (0)631 / 79 42 4
Facsimile : +49 (0)631 / 97 65 8

Web address for INTERBUS

Technical data, manuals, or software programs may be downloaded from the following website:

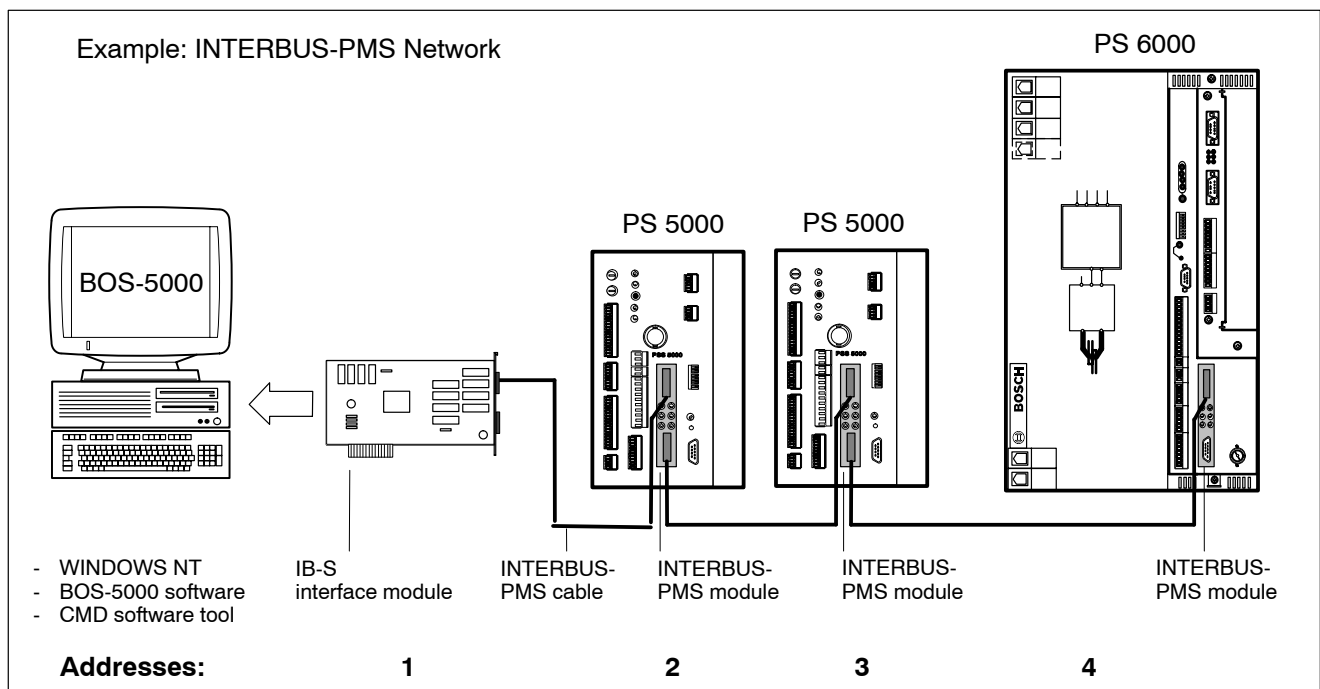
<http://www.phoenixcontact.com>



7.2 Hardware and software components of INTERBUS-PMS

The following hardware and software components are required to build up an INTERBUS-PMS network between several weld timers and a programming terminal:

- One INTERBUS-PMS module made by Bosch Rexroth AG for each weld timer. A suitable slot has been provided in weld timers intended for networking in the INTERBUS-PMS.
- One IB-S interface module for the programming terminal made by Phoenix GmbH for each INTERBUS network.
- Cable according to Phoenix INTERBUS specification
- BOS-5000 software from Bosch Rexroth AG for:
 - programming the *Welding parameters* and the *Basic setup*.
 - operating the weld timers
 - visualization of the weld timers in the INTERBUS network
 - diagnosis of the [Sequence] and *Status* of the weld timers
- **CMD** software tool (**C**onfiguration **M**onitoring **D**iagnostic) made by Phoenix GmbH for:
 - configuring the INTERBUS network
 - loading the bus configuration into the IB-S interface module
 - commissioning the INTERBUS-PMS network
 - diagnosing the INTERBUS-PMS network
- Operating system:
 - The IB-S interface module in your PC requires Windows NT.



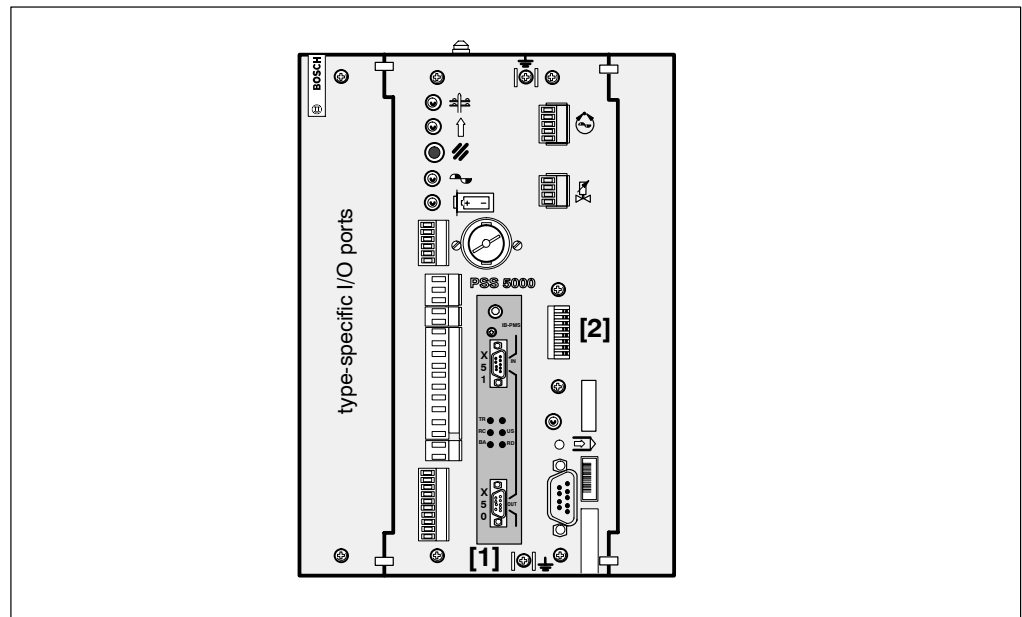
7.2.1 Address setting in the INTERBUS-PMS network

- The IB-S interface module is always located at the beginning of the bus and has address 1.
- Starting with address 2, all other addresses are assigned in ascending order corresponding to the physical location of the timers within the INTERBUS-PMS network according to the INTERBUS-PMS specification.

**7.3 INTERBUS-PMS module**

BOSCH offers an INTERBUS-PMS module for networking weld timers in an INTERBUS-PMS network, which may be optionally fitted to some weld timers.

This module is used to provide the link to the IB-S interface module in the programming terminal and other bus nodes.



- [1] INTERBUS-PMS module slot for connecting an IB-S interface module to the programming terminal and other INTERBUS-PMS modules.
- [2] Address setting on the field bus module when using an INTERBUS-PMS module without a function.

Assembly

CAUTION!

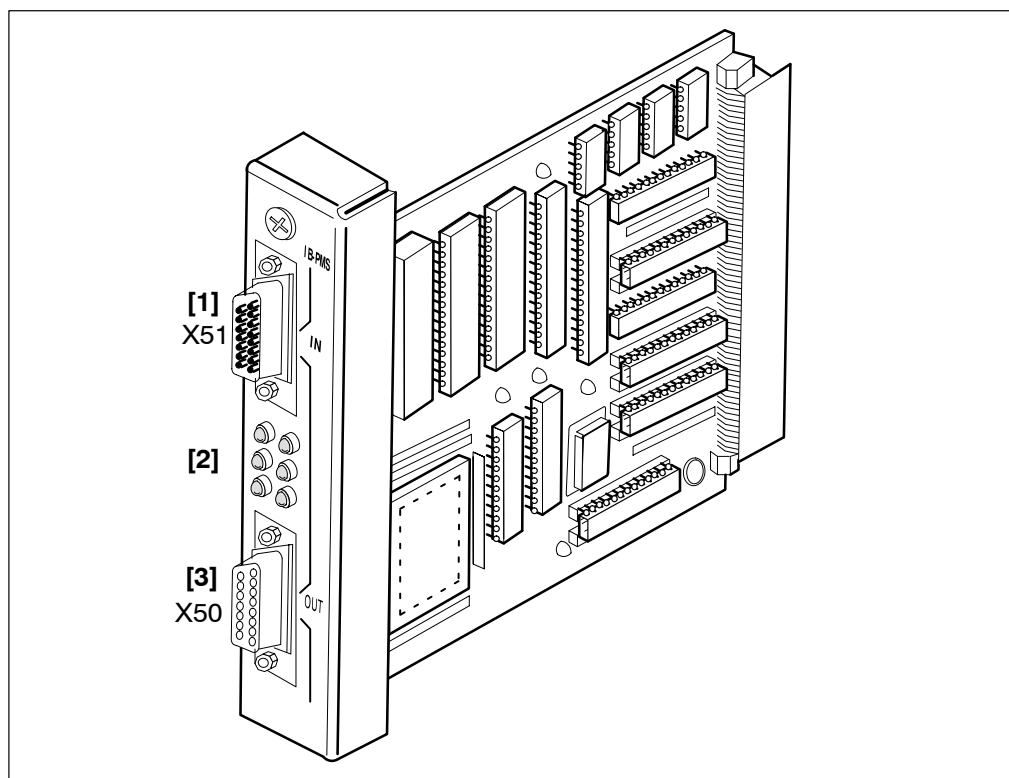


The INTERBUS-PMS module may only be inserted or withdrawn when the timer is switched off. The upper hexagon socket screw is used to fasten the module to the timer.

NOTE



Before removing the INTERBUS-PMS module from its packaging, you should make sure that no hazards arise from electrostatic discharge.



NOTE



No settings have to be made on the INTERBUS-PMS module. The address setting is performed through the contents of the identification register and the bus configuration using the CMD software provided by Messrs. Phoenix.

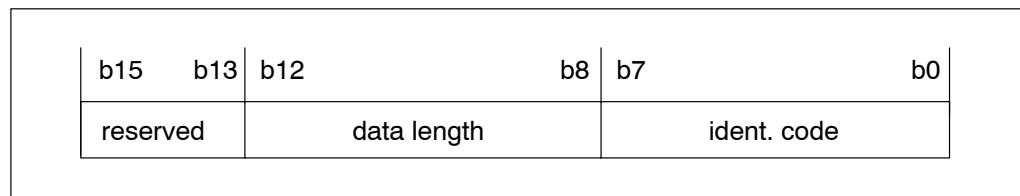
- [1] Interface X51 (9-pole, D-Sub pins) INTERBUS-IN port from the previous bus node or the IB-S interface module of the programming terminal.



- [2] INTERBUS-PMS messages:
- TR: Transmit / Receive
Not used.
 - RC: Remote Check, (green LED, has to be ON)
Indicates that the wiring of the remote bus cable input is ok.
 - BA: Bus Active (green LED, has to be ON)
Indicates an active INTERBUS-S data transmission.
 - US: Unit Supply (green LED, has to be ON)
Indicates that the INTERBUS-S signal voltage is present on the bus node.
 - RD: Remote bus Disable (red LED)
Indicates that the wiring of the remote bus cable output has been disconnected.
- [3] Interface X50 (9-pole, female D-Sub) INTERBUS-OUT port to the following bus node.
- Interface without connector:
- Termination of the bus cable; the bus termination is automatically activated internally using a termination resistor.
- Interface with connector:
- The INTERBUS line towards the next node is active.

7.3.1 Identification of the INTERBUS-PMS module

The module identification is provided by an identification register with the following structure:



The least significant 8 bits contain the module identification. The next 5 bits indicate the data length (number of words) of the process or parameter data. This information is required for the bus configuration.

Ident-Code of INTERBUS-PMS module

Device function	Ident-Code decimal	Ident-Code hex
INTERBUS-S node	229	E5

Length of data INTERBUS-PMS module

The length of the data in the parameter channel (telegram length) of the module is:

- 246 bytes for transmission
- 246 bytes for receiving

7.4 INTERBUS-PMS and BOS-5000 software



NOTE

The Windows NT operating system has to be installed on the programming terminal in order to use the BOS-5000 software in conjunction with networked weld timers in an INTERBUS-PMS system.

The IB-S interface module is selected as communication channel from the welding user interface during system installation.

7.4.1 Setting the IB-S communication channel in BOS-5000

- Select the INTERBUS as the communication channel in *Timer reference*.

Clear	SST	SST-Typ	SST-Adresse	Kanal	SST-Kommentar
1	Radh 1701	PSI6100.350L	3	Interbus	
2	Radh 1702	PSI6100.350L	4	Interbus	
3	Radh 1703	PSI6100.350L	12	Interbus	

**7.5 IBS-CMD software tool****NOTE**

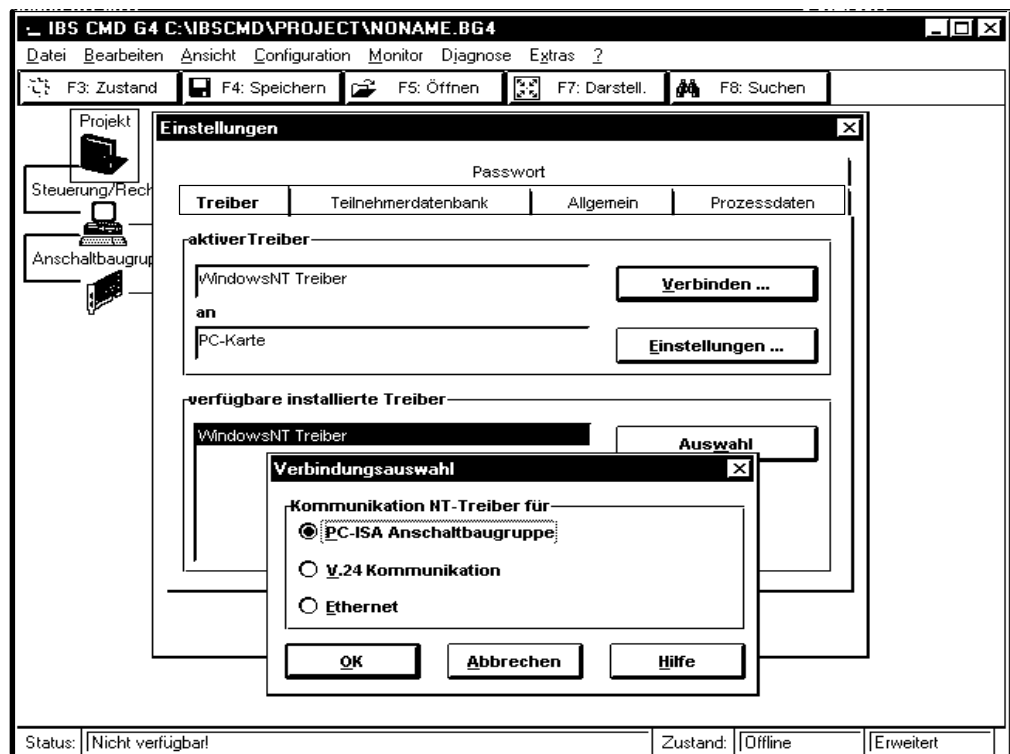
No liability is accepted concerning the description of the function and operation of the Phoenix products.

The latest instructions and information provided by Messrs. Phoenix concerning the products (IB-S interface module, CMD software tool, wiring, etc.) are binding.

Bosch does not accept any liability in case of outdated or erroneous information or damages arising from the information provided below.

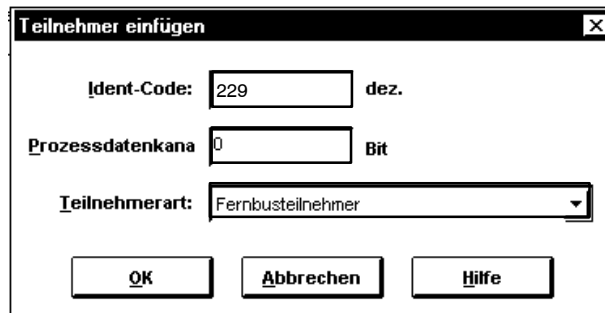
Creating new projects

- Start the IBS-CMD software tool (with extended scope of functions).
- Creating new projects:
 - Menu items *Datei - Neu* (File - New).
 - Select the *Treiber* (Drivers) tab from the *Extras - Einstellungen* (Extras - Settings) menu items.
 - Select the *Verbinden* (Connect) command button and set the *PC-ISA-Anschaltbaugruppe* (PC-ISA interface module).



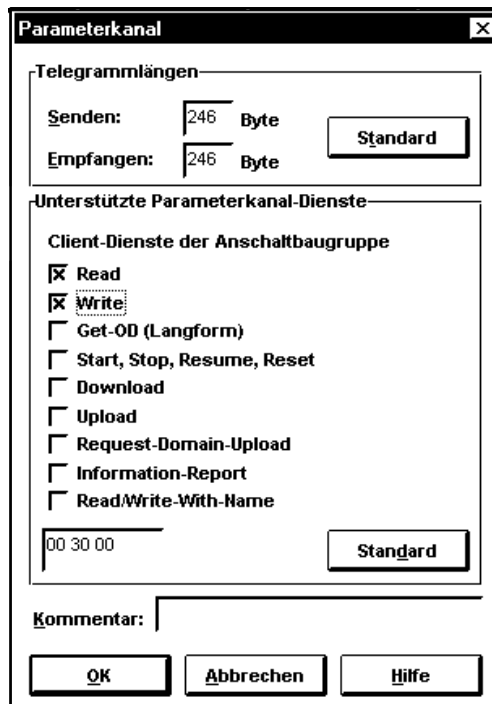
Including a timer in the bus system (creating an IBS project)

- Right-click on the interface module.
- Select *Einfügen mit Ident-Code (Insert with Ident-Code)*.
- Enter *Ident-Code 229* for the INTERBUS-PMS module in the *Teilnehmer einfügen (insert node)* screen.



Next, the *Parameterkanal (Parameter channel)* screen will be opened.

- Enter the following values:
 - Senden (Transmit) field = 246
 - Empfangen (Receive) field = 246
- The following services should be activated:
 - Check Read
 - Check Write

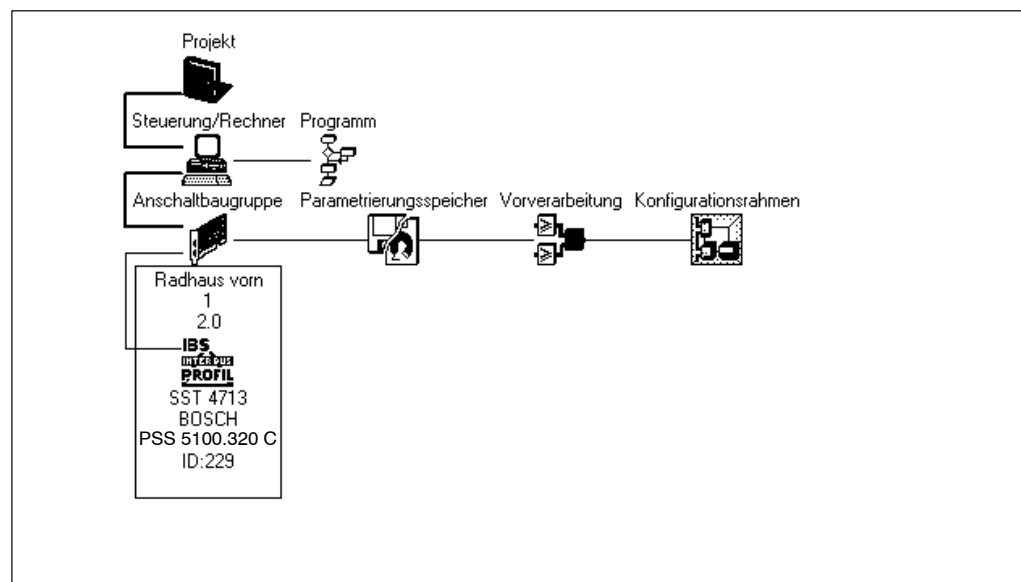




Next, the *Parameterkanal (Parameter channel)* screen will be opened. Some of the following inputs will be displayed later on in the bus visualization.

- Inputs:
 - Teilnehmernummer (Node number) : Number of the node on the bus
 - Gruppennummer (Group number) : (optional - not necessary)
 - Stationsname (Station name) : e.g. Station 10
 - Teilnehmername (Node name) : You may use the same name as in the timer reference at this point.
 - Hersteller (Manufacturer) : BOSCH
 - Geräte-Typ (Device type) : e.g. PSS 5100.320 C
 - CR : (Communication Reference) Must start with 2 and continue in ascending order without any gaps.

Visualization of the projected INTERBUS link by the example of a PSS 5100.320 C



- Save project with the options *Datei - Speichern unter (File - Save as)*.

Loading project in IB-S interface module

- Right-click on the interface module.
- Select *Parametrierung - Ausführen (Parameters - Execute)*.
- Confirm bus operating mode *Online wechseln (Change online)* by hitting **<Ja>(Yes)**.
- Select *Anlauf ohne Vorverarbeitung (Start without pre-processing)* (Parameter setting list field)
 - When everything has been successful, the INTERBUS has been started. The red "RD" LED on the timer goes off.
 - The following is shown on the status line of the CMD tool:
 - Bus läuft (Bus running)
 - Online

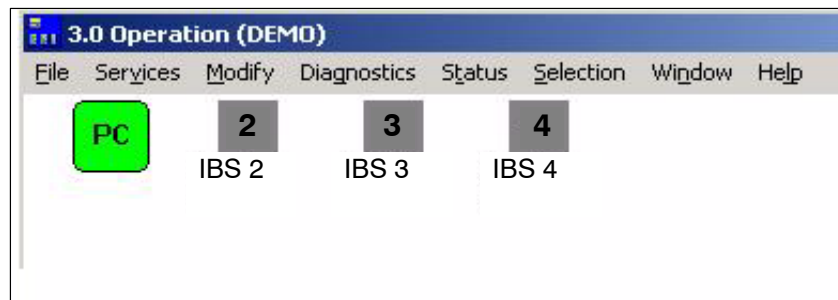
Message of the CMD software tool

- Bus fault messages:
 - 001 : Bus fault active
 - 002 : Timeout in the segment of the INTERBUS-PMS node no. X.



7.6 INTERBUS plant image

In the plant image of the Operation function, the status of the nodes is indicated by a color change, refer to section 3.6.



PC symbol status

- Green : Faultless connection between the programming terminal and the INTERBUS-PMS modules of the weld timers.
- Red : No connection between the programming terminal and the INTERBUS-PMS modules of the weld timers.
- Yellow : Data transmission on the INTERBUS stopped or not started.

In the event of bus faults, a message screen of the CMD tool is displayed.

Notes:



8 Ethernet link

Weld timers of the PSx 6000 series with the "Ethernet Functionality" option can be linked to a higher-level welding computer (programming terminal) using the Ethernet system. Thus, the

- Programming
- Operation
- Visualization, and
- Diagnoses

of max. 62 weld timers (WT) connected to the network can be performed at a single welding computer.

The following components are required:

- an Ethernet adapter (e.g. with RJ45 port) suitable for the welding computer (programming terminal) including driver software for the operating system in use. For the installation of the adapter, refer to the documentation of the individual manufacturer.
- Welding computer with Windows 98, NT (min. Service Pack 5) or Windows 2000 operating system. TCP/IP protocol installed.
- one Ethernet adapter per timer.
Part no.: 1070 085 753 (with female RJ45 port).
Alternatively, the Ethernet adapter is also available with optical ports.
The weld timer to be connected must have the "Ethernet functionality" option installed!
- properly installed Ethernet wiring
- BOS-5000 software release 2.99 or higher installed on the welding computer

NOTE



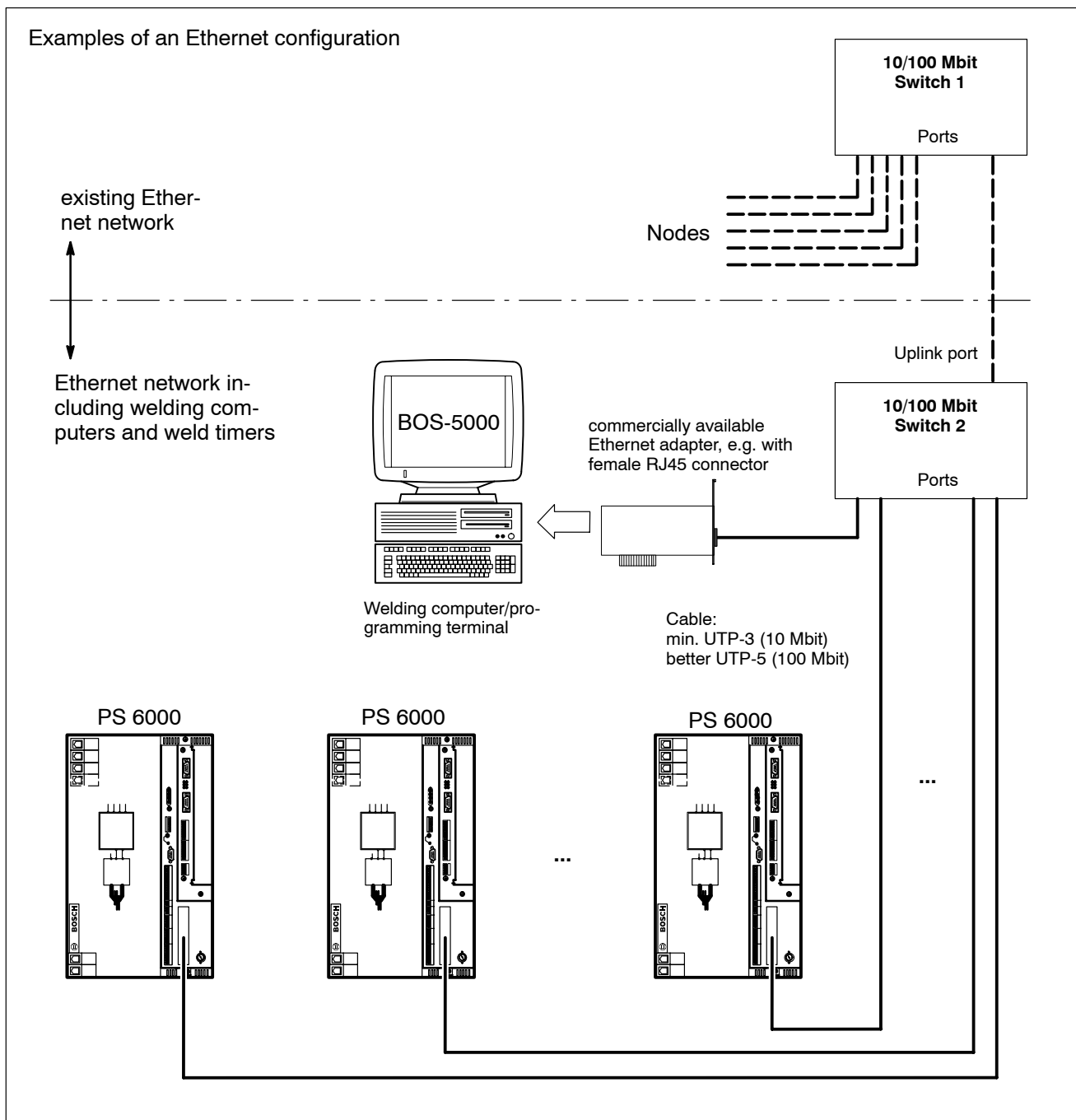
In order to link a single weld timer to a programming terminal (point-to-point connection), a cross-over cable with RJ45 connectors on both ends has to be used.

NOTE



We recommend using switches to connect the welding computer and weld timers, in particular, if an Ethernet system is already available. In this way, you reduce the network traffic because a switch (in contrast to a hub) does not transmit the data of two devices communicating with each other to other network nodes not involved in the communication.

Other benefits of using switches: 10 Mbit components may be integrated into a 100 Mbit environment without slowing down the entire Ethernet segment to 10 Mbits.



NOTE

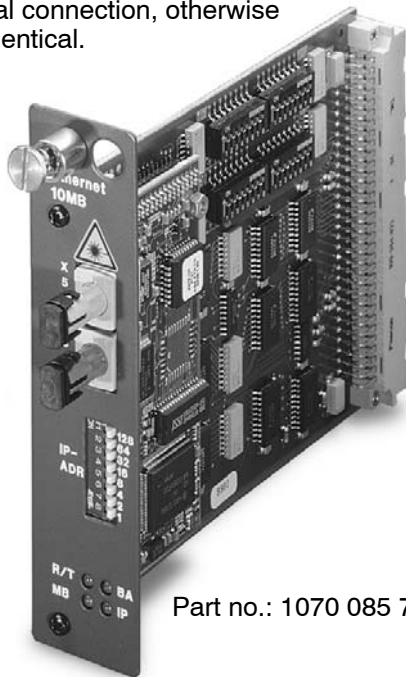


If switch 2 does not have a special uplink port, use a cross-over cable to connect switch 2 to one of its regular ports.



8.1 Ethernet adapter

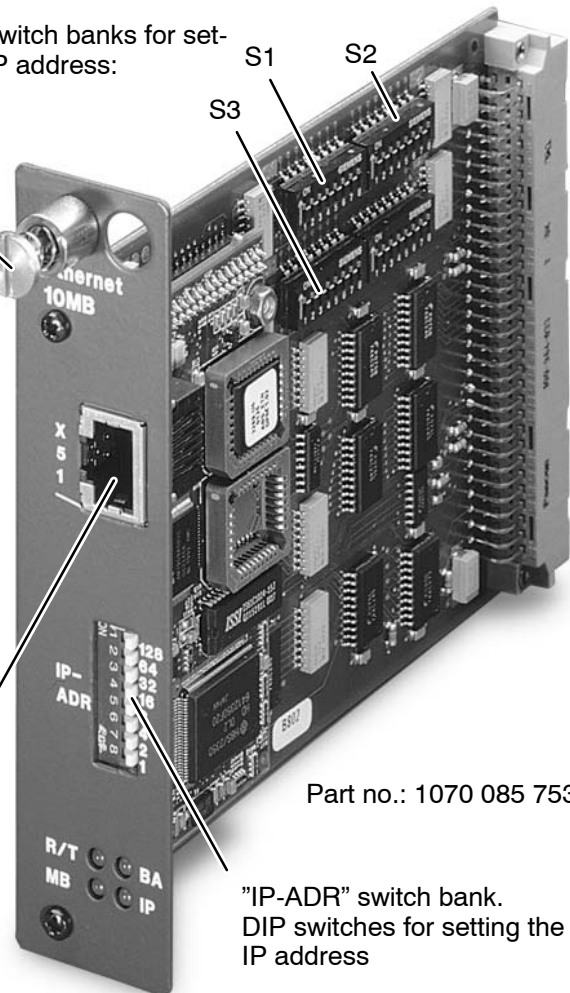
Ethernet adapter with optical connection, otherwise identical.



Part no.: 1070 085 754

Internal switch banks for setting the IP address:

Fastening screw



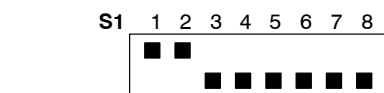
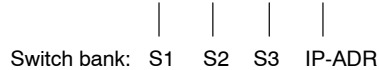
Part no.: 1070 085 753

Network connector (female RJ45)

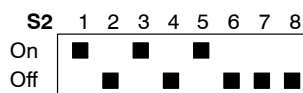
"IP-ADR" switch bank. DIP switches for setting the IP address

The IP address is set using the individual switch banks according to the following structure:
IP address = S1.S2.S3.IP-ADR

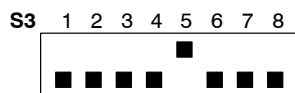
Example: IP address 192.168.008.253



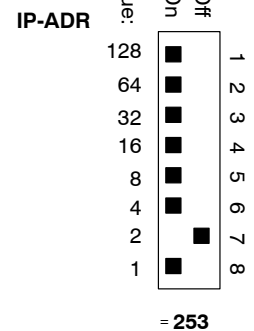
Value: 128 64 32 16 8 4 2 1
Value (dec): 128+64+0+0+0+0+0+0 = 192



On Off
Value: 128 64 32 16 8 4 2 1
Value (dec): 128+ 0+32+0+ 8+ 0+0+ 0 = 168

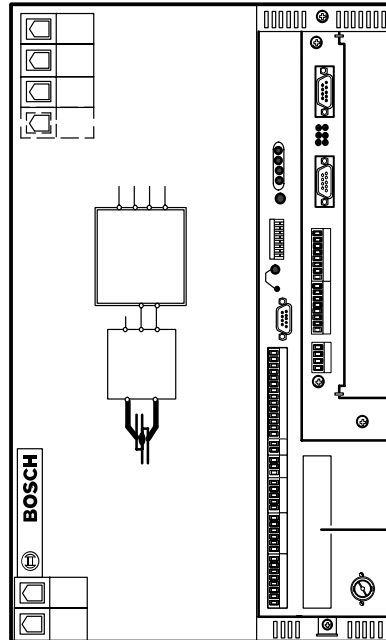


On Off
Value: 128 64 32 16 8 4 2 1
Value (dec): 0+0+0+0+8+0+0+0 = 8



Caution: The IP address desired for continuous operation may be set on the switch banks or alternatively by programming the internal flash memory accordingly, refer to section 8.2 !

PS 6000



Slot to accommodate the Ethernet adapter



8.2 Setting the IP address

Two alternatives are available for setting the IP address:

- Setting the IP address on switch bank S1, S2, S3 and IP-ADR.
This option should be used if
 - a maximum of 255 weld timers is used
 - the welding computer and weld timer are connected to the same subnet.
- Programming the IP address into the flash EPROM on the module.
This option should be used if
 - more than 255 weld timers are used
 - gateways or routers have been connected in between the welding computer and the weld timer.

Default settings: Class B subnet 255.255.0.0; Gateway 0.0.0.0

The IP address under which the weld timer can finally be reached is defined by the IP-ADR switch bank setting on the front side of the module:

Value of IP-ADR:

= 0: IP address from the flash EPROM is used

>0: IP address corresponds to settings of S1, S2, S3 and IP-ADR.

If no routers are used, all weld timers and the welding computer must be connected to the same subnet. This will be the case whenever the result of an AND operation between the IP address and the subnet mask is identical for the welding computer and the weld timer to be linked.

Examples:	Host subnet	Host address	Timer address:	reachable
	255.255.0.0	10.10.10.10	10.10.10.321	yes
	255.255.0.0	10.10.10.10	10.11.10.321	no
	255.255.255.0	10.10.10.10	10.10.10.321	yes
	255.255.255.0	10.10.10.10	10.10.11.321	no

The default subnet 255.255.0.0 is used whenever IP-ADR is set to a value > 0. If another subnet has to be used, you should program the flash EPROM accordingly.

CAUTION!



For this reason, you must not set any arbitrary IP addresses, otherwise, your Ethernet network may experience malfunctions with unexpected consequences. Therefore, you should ask your network administrator which IP address ranges have been reserved for the weld timers, and make sure that an individual IP address is not assigned to several devices. All IP addresses assigned should be logged precisely!

CAUTION!



The Ethernet adapter must not be inserted or removed unless the weld timer has been switched off (i.e. the 24 V supply of the weld timer).

NOTE



Prior to handling the module you should make sure that no hazards arise from electrostatic discharge.

**NOTE**

Modifications of the IP address will not be active unless the timer has been re-booted!

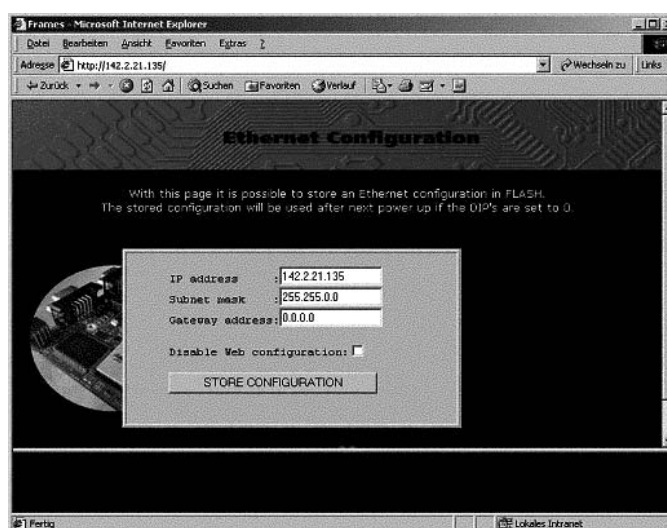
8.2.1 Setting switch banks S1, S2, S3 and IP-ADR

- First make sure that the weld timer is switched off (24 V supply OFF).
- Set the desired IP address on the Ethernet module (refer to Figure on page 8-3). Set a value larger than 0 on switch bank IP-ADR.
- Insert the Ethernet module into the slot provided (refer to Figure on page 8-3) until it engages properly.
Secure the module with the fastening screw.
- Connect the module to your network.
- Switch the 24V supply of the weld timer back on.

Now, the weld timer/Ethernet module can be accessed within the network at the IP address set.

8.2.2 Programming the flash EPROM of the module

- First you should make sure that the Ethernet module in question can be accessed at a free IP address within your network. This step has to be made in order to perform the remaining configuration procedure using your web browser. Please proceed as described in section 8.2.1.
- Select the IP address set on switch banks S1, S2, S3 and IP-ADR (e.g. "http://142.2.21.135") in your browser's address window. Make sure that the browser does not access this address via a proxy server. If the module can be accessed within your network, the following screen will be displayed:



- Enter the desired IP address, subnet mask and gateway address into the corresponding fields.
Transmit the data to the Ethernet module (click on "Store configuration" button). The flash EPROM is being programmed. Wait until this process has been completed.



- Set the value 0 on the IP-ADR switch bank (all switches OFF).

Each weld timer to which the Ethernet module programmed in this way is fitted can be accessed within the network at the IP address set after having been re-booted.

8.3 Configuring the BOS-5000 software for Ethernet

**NOTE**

For an operative Ethernet link, the BOS-5000 software release 2.99 or higher has to be available, as well as the "Ethernet functionality" option on the timer side.

- Make sure that all weld timers to be accessed by the weld timer
 - have a unique IP address (for address setting refer to page 8-5 ff.),
 - are connected to your network, and
 - are switched on (24V supply ON).
- Make sure that the following line is available in your "BOS_5000.ini" file (in the Windows folder under the [Communication] heading):
Ethernet=1
Otherwise, you should add this line.
Save and close the BOS_5000.ini file.
- Check whether a file named BOS_ETH.ini is available in the Windows folder. If so, load the file into an ASCII editor (e.g. Notepad).
Otherwise, create a new ASCII file named BOS_ETH.ini in the Windows folder and add the following lines:
[IpConfig]
Port=5001
Protocol=UDP
- In the next step, the IP addresses of all weld timers have to be entered which shall be accessed by the welding computer.
A separate line with the following structure is used for each IP address:
TimerAddr<x>=<IP1>.<IP2>.<IP3>.<IP4>
where <x> corresponds to the number specified later on in the timer reference for the weld timer in question in the "SST-Adresse" (Timer address) column (value range: 2 to 63). Refer to the figure below.

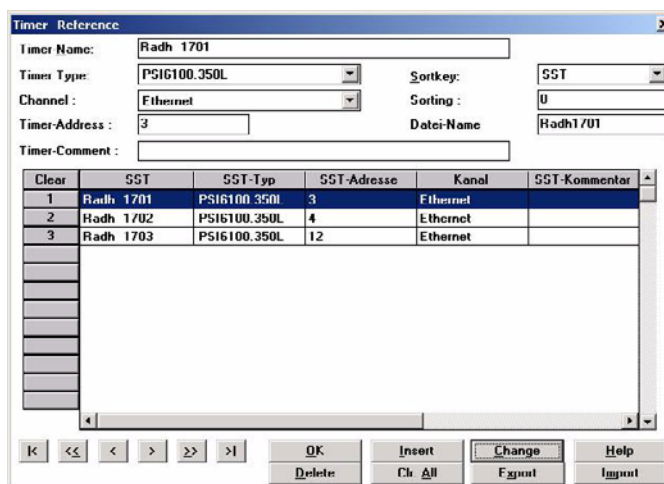
Example of a BOS_ETH.ini:

```
[IpConfig]
Port=5001
Protocol=UDP
TimerAddr2=192.168.8.12
TimerAddr3=192.168.8.13
TimerAddr4=192.168.8.14
TimerAddr5=192.168.8.15
```

:

After having entered all necessary data, save and close the BOS_ETH.ini file.

- Start the BOS-5000 software and log-on to the program.
Click on "Timer reference"
Add a separate line for each timer connected to the Ethernet channel and enter the desired data.



Clear	SST	SST-Typ	SST-Adresse	Kanal	SST-Kommentar
1	Radh 1701	PSIG100.350L	3	Ethernet	
2	Radh 1702	PSIG100.350L	4	Ethernet	
3	Radh 1703	PSIG100.350L	12	Ethernet	

Now the software has been configured for Ethernet and can access the weld timers.

- Close the "Timer reference"
- Check in the basic image in Operation whether all weld timers that have been allocated are included in the display.
If communication between the welding computer and the weld timer works properly, the symbol representing the weld timer in question is shown on a green background.
A weld timer not located by the welding computer is displayed in gray color. This may be due to one of the following causes:
 - The weld timer in question has been switched off (24V supply OFF) or not yet integrated into the system.
 - The Ethernet module has not been properly connected to the network.
 - The IP address in the BOS_ETH.ini file does not match the active IP address of the Ethernet module.
 - The Ethernet module, the weld timer, or the switch is defective.

NOTE



If the symbols of all weld timers are shown in gray color, a general network problem may be present.

In this case, please consult your network administrator.



8.4 Replacing components

We recommend re-using the Ethernet adapter of a timer that has been replaced in the new timer. In this case, the new timer can be immediately accessed within the network. If another Ethernet adapter has to be inserted, its IP address must be set to the values of the old module as described in section 8.2.

■ Notes:

**9 Order data****PROFIBUS-FMS**

Description	Part no.
PROFIBUS-FMS module for PS 5000 and PS 6000	1070 075 698
PROFIBUS repeater RS 485, IP20	1070 918 723
PROFIBUS connector IP20	1070 918 538
PROFIBUS connector IP20 with 9-pole female Sub-D connector	1070 918 539
PROFIBUS cable, massive PVC	1070 917 202
PROFIBUS cable, massive PVC, oil and grease-resistant	1070 919 661
PROFIBUS trailing cable, PUR, tensile load 100 N	1070 917 201
PROFIBUS trailing cable, PUR, tensile load 20 N, oil and grease-resistant	1070 919 660

INTERBUS-PMS

Description	Part no.
INTERBUS-PMS module for PS 5000 and PS 6000	1070 078 691
INTERBUS-PMS cable, according to Phoenix specification	on request
INTERBUS-PMS connector according to Phoenix specification	on request

ETHERNET

Description	Part no.
Ethernet board for PS 6000 with RJ45 port	1070 085 753
Ethernet board for PS 6000 with optical fiber port	1070 085 754

Notes:

**A Annex****A.1 Abbreviations, Terms**

BOS-5000	Welding user interface for programming, operation, logging and visualization of the PS 5000 and PS 6000 weld timers
CR	Communication reference, local short name of a communication reference
CRL	Communication reference list, contains all communication references
DSAP	Destination Service Access Point, entry contained in the communication reference list that indicates the data destination, e.g., when using several programming terminals within one PROFIBUS network
EMC	Electromagnetic compatibility
EN 50 170	European Norm for PROFIBUS, supersedes the national standard DIN 19245
FMS	Field Message Specification defines the application services of PROFIBUS-FMS, layer 7
KBL	Communication reference list, contains all communication references
KR	Communication reference, local short name of a communication reference
IEC	International Electrotechnical Commission
ISO	International Standards Organization
OSI	Open System Interconnect, open protocol layer model for interconnecting controllers
OV	Object reference, contains a description of all communication objects of a device
PNO	PROFIBUS Nutzerorganisation (PROFIBUS user organization), association of companies for the promotion of PROFIBUS
Token	Right to exchange data
VFD	Virtual Field Device, that part of a device that is available for communication
WT	Weld timer, also referred to as resistance weld timer or timer

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