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Programmable Safety Systems
PSS-Range

PSS(1) ControlNet Adapter
Hardware Manual
Item No. 19 905



The spirit of safety.

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II, 02/02

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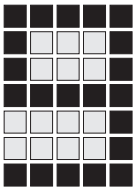
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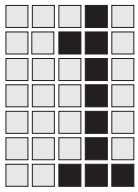
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Introduction



This manual describes the hardware of the communications modules

- PSS ControlNet Adapter and
- PSS1 ControlNet Adapter.

To fully understand this manual you will need to be conversant with the information found in the general documentation for the PSS-range (Safety Manual, System Description, Installation Manual, Programming Device and Programming Manual).

The software is described in a separate manual “ST SB ControlNet”.

To fully understand the bus-specific requirements and any associated requirements, you will need to be familiar with the “ControlNet International Specification” Version 2.0 from 31. March 1995.

This manual is intended for instruction and should be retained for future reference.

Introduction

Overview of documentation

1 Introduction
The introduction is designed to familiarise the user with the contents and structure of this manual and the definition of the symbols used within the manual.

2 Overview
Provides information on the most important features of the module and gives a brief outline of the application area.

3 Safety
This chapter **must** be read as it contains information on the safety requirements to be met and the intended use.

4 Function Description
Contains detailed information on the functionality of the module.

5 Module
This chapter explains the operator elements of the modules.

6 Installation and Configuration
This chapter shows you how to install and configure the module.

7 Commissioning and Operation
This chapter is designed to provide support during commissioning and how the module is put into operation.

8 Technical Details
Tables containing technical details.

9 Appendix
Includes a description of changes to the manual.

Terminology

- Throughout this manual the designation “module” or “PSS(1) ControlNet Adapter” is valid for all module versions. If the description relates to a specific module, then the product name for the module will be used (e.g. PSS ControlNet Adapter).
- The designation "PSS" is always used where the description is valid for all PSS programmable safety systems. If the description is only valid for one particular unit, then the specific product name will be used (e.g. PSS 3000, PSS 3100).
- In this manual, data transfer is regarded as viewed from the PSS. Input data or receive data is sent from another ControlNet subscriber to the PSS via the scanner. Output data or send data is sent from the PSS to another ControlNet-subscriber via the scanner.
- "Scanner" is a term used in ControlNet documentation. The purpose and function of a scanner on ControlNet corresponds to a large extent to the purpose and function of a master on other bus systems.
- "Adapter" is a term used in ControlNet documentation. The purpose and fucntion of an adapter on ControlNet corresponds to a large extent to the purpose and function of a slave on other bus systems.
- "Net Address" is a term used in ControlNet documentation. On ControlNet, the Net Address is used to describe the station address or node-ID of a bus subscriber.

Introduction

Definition of symbols

Information in this manual that is of particular importance can be identified as follows:



DANGER!

This warning must be heeded! It warns of a **hazardous situation that poses an immediate threat of serious injury and death,** and indicates preventive measures that can be taken.



WARNING!

This warning must be heeded! It warns of a **hazardous situation that could lead to serious injury and death,** and indicates preventive measures that can be taken



CAUTION!

This refers to a hazard that can lead to a less serious or minor injury plus material damage, and also provides information on preventive measures that can be taken.



NOTICE

This describes a situation in which the product or devices in its immediate environment could be damaged. It also provides information on preventive measures that can be taken.



INFORMATION

This gives advice on applications and provides information on special features, as well as highlighting areas within the text that are of particular importance.

Overview

The communications module PSS(1) ControlNet Adapter is used to connect a PSS modular safety system to the ControlNet bus system in accordance with the requirements of ControlNet International Version 2.0, 03/1998. The PSS operates in conjunction with the module and the relevant software package as the ControlNet Adapter.

Pilz programmable safety systems (PSS) have been designed for use in plant and machinery safety circuits. They consist of a failsafe (FS) setion and a standard (ST) section.

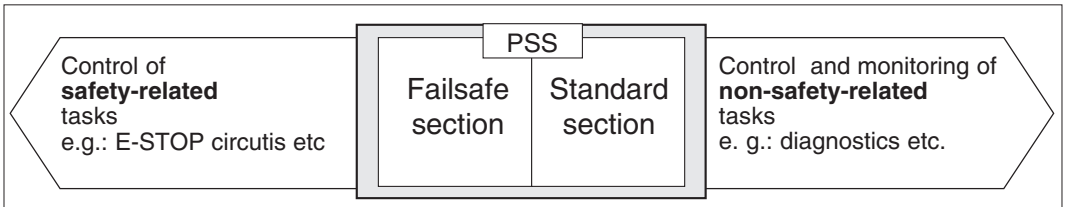


Fig. 2-1: Structure of the PSS

The module may only be used on the standard section of a PSS modular safety system.

Module versions

There are individual modules to use with the PSS 3000 and PSS 3100.

- PSS ControlNet Adapter module may only be used on the module rack of the PSS 3000.
- PSS1 ControlNet Adapter module may only be used on the module rack of the PSS 3100.

There is no difference in the functionality of both modules

Overview

Software package

There is a separate software package available for data exchange between the PSS and the ControlNet Scanner. The standard function block within the software must be incorporated within the user program in the standard section of the PSS. It carries out all of the tasks for data exchange between the PSS and the ControlNet Scanner.

Range

The hardware package consists of:

- One module
  - PSS ControlNet Adapter or
  - PSS1 ControlNet Adapter
- One operating Manual
  PSS(1) ControlNet Adapter - Hardware Manual

Safety

Intended use

The module is intended for use as a ContolNet Adapter in accordance with the requirements of ControlNet International Version 2.0, 03/1998. The module may only be used in the standard bus of the corresponding PSS programmable safety system.

PSS ControlNet Adapter may only be used in the standard bus of the PSS 3000 .

PSS1 ControlNet Adapter may only be used in the standard bus of the PSS 3100.

The module may only be used in conjunction with the software package "ST SB ControlNet" from Pilz.

Details of the module can be found in the chapter “Technical Details”.
Use of the standard function block outside the specifications will be deemed as improper application.
Any changes made by exchanging components or soldering work etc will be deemed as improper application.
Use of the module outside the application areas described in the operating manual will be deemed as improper application.
Following the guidelines given in the manual contributes to the intended use.

EMC

The module is intended for use in industrial environments only. Use in a domestic environment could lead to interference.

ESD

Electrostatic discharge can damage components on the module. Ensure against discharge before touching the terminal strips, e.g. by touching an earthed, conductive surface or by wearing an earthed armband.

Safety

Warranty and liability

All claims to warranty and liability will be rendered invalid if

- The module was used contrary to the purpose for which it is intended
- Damage can be attributed to not having followed the guidelines in the operating manual
- Operating personnel are not suitably trained or sufficiently qualified
- The housing was opened
- Changes have been made (e.g. by exchanging components or soldering work etc.).

Disposal

The unit must be disposed of properly when it reaches the end of its service life

Safety guidelines

This chapter is an important part of this manual. Failure to keep to the following guidelines and safety requirements will render all warranty, guarantee and liability claims invalid.

All rules and regulations for accident prevention relating to the specific area of application must be met. In particular, VDE and all local regulations regarding health and safety must be observed.

Use of qualified personnel

The module may only be assembled, installed, programmed, commissioned, operated, maintained and decommissioned by qualified personnel who, because they are:

- Qualified electrical engineers
- Have received training from qualified electrical engineers,

are suitably experienced to operate devices, systems, plant and machinery in accordance with the general standards and guidelines for safety technology.

It is the company's responsibility only to employ personnel who:

- Are familiar with the basic regulations concerning health and safety / accident prevention
- Have read and understood the safety guidelines given in the manual

Unit-specifc safety regulations

Before installing and commissioning the module, you should refer to any guidelines laid down by the pant manufacturer or operator.

Safety

Installing the module

- **Please read the Safety Manual and the Installation Manual for the relevant PSS before installing and commissioning the module.**
- Keep as large a distance as possible between the PSS and any electromagnetic fields, particularly when frequency converters are nearby. Where necessary, use suitable screening to separate the PSS from the source of interference
- Ensure the maximum ambient and operating temperatures are not exceeded
- Avoid the build up of heat
- Protect the module from direct sunlight and dust.
- Ensure that liquids or objects cannot get into the module
- Do not use chemicals close to the module
- Do **not** position the module close to flammable materials.

Cable material and cable layout



NOTICE
Only use screened cables and follow any requirements laid down by ControlNet.

Measures to protect against interference

Follow any requirements laid down by ControlNet.

Assembling and connecting the module

- Only install the module when no voltage is applied
- The information given in “Technical Details” must be followed.

Function Description

The PSS, together with the module, operates as a ControlNet Adapter within the bus system. The module supports redundant data transfer via the dual-channel transmission of bus data. Both bus cables are connected to the module via separate connections. This provides a greater availability of data.
The module supports data exchange for Scheduled and Unscheduled Data.

Data transfer on ControlNet is carried out using a fixed bit rate of 5 MBit/s.

The software package from Pilz is required for commissioning and operating the module.

The module occupies part of the range of freely-programmable word modues (XW-access) on the PSS. The address range for the module consists of 1024 words.

Module's operating elements

Net address

The module must be assigned an address so that it can be identified on the bus. Two rotary switches are available to set the address and are marked as “Net Address” .

Status indicators

Various errors and the operating status are displayed via the LEDs on the module.

LED "module status" shows the operating status or communication faults between the module and PSS.

LEDs "A" and "B" shows the operating status or communication faults on both redundant transmission channels.

Function Description

Module interfaces

The module has two ControlNet interfaces (channel A and channel B) and a connection for temporary bus access (NAP).

ControlNet interfaces

There are two channel available to connect the module to ControlNet redundantly. It is connected via two standard BNC plug connectors. They are marked as "A" and "B".

Network Access Port (NAP)

The Network Access Port is used to access the bus temporarily. It can therefore be used for diagnostic and configuration changes using a suitable monitoring tool.

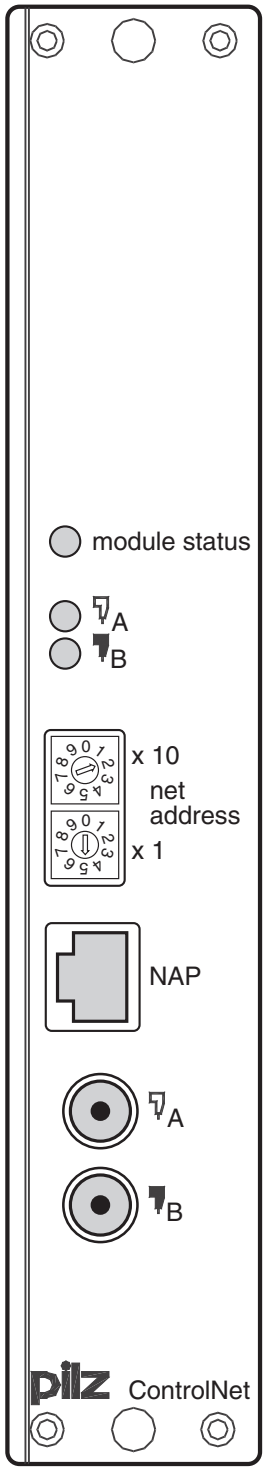
Module's mode of operation

As a ControlNet Adapter the module carries out data exchange of Scheduled Data (process data) exclusively at the request of the ControlNet Scanners. Communication via ControlNet is carried out in PSS using the standard function block SB236 (software package).
SB 236 provides the link for the module and supports all the tasks required for data exchange of Scheduled Data .

Data exchange of Unscheduled messages is also supported via SB 236.

Module

Front view



Operating status and error LEDs:
- Communication: module and PSS (module status)
- Communication: ControlNet (channel A and B)

Rotary switches to set the Net Address

Network Access Port (NAP) for temporary access

Interfaces to connect to ControlNet (channel A and B)

Fig. 5-1: Front view

Module

Cables and interfaces

ControlNet connections

Connections for ControlNet channel A and channel B use Standard BNC-connectors. Requirements for the BNC-connectors are defined in the ControlNet International Specification (Version 2.0, 03/1998) in the chapter "Connectors".

ControlNet connection cable

The ControlNet International Specification specifies that the connection cable used for the Trunkline (remote bus) and Droplines (stub lines) should be coax cable. The connection cable must conform to the requirements of ControlNet International Specification (Version 2.0, 03/1998). The requirements are defined in the chapter “Topology” and “Tabs”.

Cable runs

On ControlNet the correlation between cable runs and the number of bus subscribers can be illustrated simply using a diagram (see Fig. 5-2).

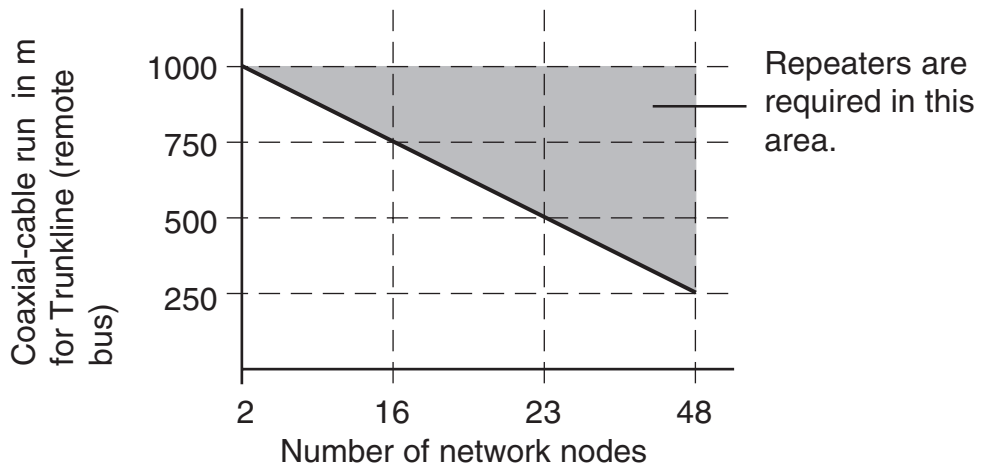
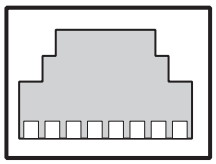


Fig. 5-2: Correlation between the cable run and number of bus subscribers

INFORMATION
More detailed information on the topology conditions can be found in the ControlNet International Specification (from Version 2.0, 03/1998).

Network Access Port

Socket for western plug connector
(RJ45)
8-pin



1: GND REF
2: N.C.
3: Tx_H
4: Tx_L
5: Rx_L
6: Rx_H
7: N.C.
8: GND REF

N.C. = No connection

Fig. 5-3: Socket for western plug connector (top view)

Connection cable for the Network Access Port

Western plug connector (RJ45)
8-pin

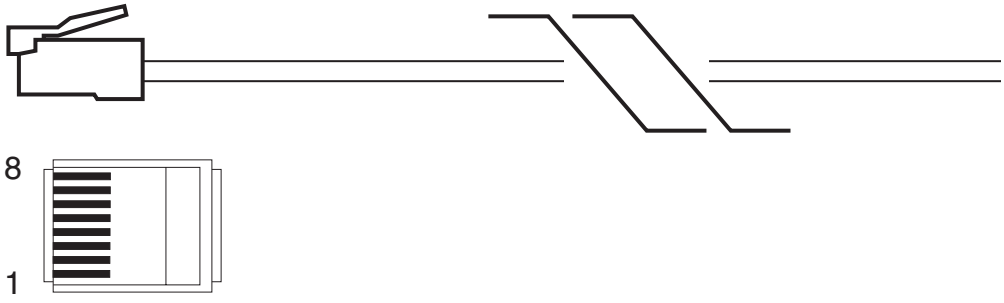


Fig. 5-4: Layout of the western plug connector (View from below)

INFORMATION
Only use screened cables for the NAP cable. The connection cable must meet the requirements of the ControlNet International Specification (from Version 2.0, 03/1998).

Module

Net Address

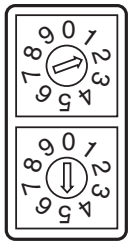


Fig. 5-5: Setting the Net Address (shown here as 25_D)

Valid values for the Net Address are 0 ... 99_D.

INFORMATION
Set the Net Address when the module is switched off.
A change to the net address will have no effect once the system has powered up

LEDs for operating status and errors

LED "module status"

The LED "module status" displays the module's operating status. It also signals errors.

LED "module status"	Description
LED off	No supply voltage applied or module not ready for bus communication
LED red	Self-check (after power-up) or major internal error (cannot be removed)
LED flashing red	Communication error
LED green	Operating mode Module operating error-free
LED flashing green	Module not active (programming mode), Waiting for connection structure

INFORMATION
Further information can be found in the ControlNet Specification (from Version 2.0, 03/1998), table 10-5.

LED "$\overline{\text{A}}$" and LED "$\overline{\text{B}}$" (network status)

LEDs display the network status and errors for both redundant ControlNet-channels.

LED diaplay	Priority	LED status	Description
LED "$\overline{\text{A}}$" and LED "$\overline{\text{B}}$" (simultaneous)	Highest 1	switched off	Reset or no supply voltage
	2	red	Faulty interface connection
	3	red/green flashing	Self-check (ca. 3 s)
	4	red flashing	Faulty channel configuration (e.g. Net Address entered several times or not configured)
LED "$\overline{\text{A}}$" and/or LED " (independent)	5	switched off	Channel de-selected or not supported
	6	red/green flashing	Faulty connection configuration: Connection paramters were requested that were invalid or not supported
		red flashing	Major connection fault or no MAC-Frame received
	8	green flashing	Periodic transfer error or "Listen only" mode
	9 lowest	green	Operating mode: the bus interface operates error-free

INFORMATION
Further information can be found in the ControlNet International Specification (from Version 2.0, 03/1998), table 9-1 and paragraph 2.4.4 States.

Installation and Configuration

Installing the module in the module rack

Install the module as described in the modular PSS “Installation Manual”.

CAUTION!

Electrostatic discharge (ESD) can damage components on the PSS. Ensure against discharge before installing the in the module rack, e.g. by wearing an earthed wristband.

Ensure the module is also protected from ESd during operation.

Configuration

Setting the Net Address

Set the Net Address using both rotary switches “Net address” (see chapter 5).
Please note, each station address on ControlNet can be used once only.

INFORMATION

- Set the Net Address when the PSS is switched off (no voltage applied). Settings will take effect **once** the module has booted.
- If settings are made when the PSS is in STOP, and then the PSS is switched to RUN, changesmade to the settings will **not** be transferred.
- Any changes to the setting made while the PSS is in RUN will **not** be transferred

Bus termination

ControlNet International Specification requires that the coaxial cable for the Trunkline is fitted with terminating resistors at the start and end of the bus.
For this reason use a Standard-T-connection piece for coaxial cable with standard coaxial cable-terminating resistors.
Specification: 75 Ohm, 5%

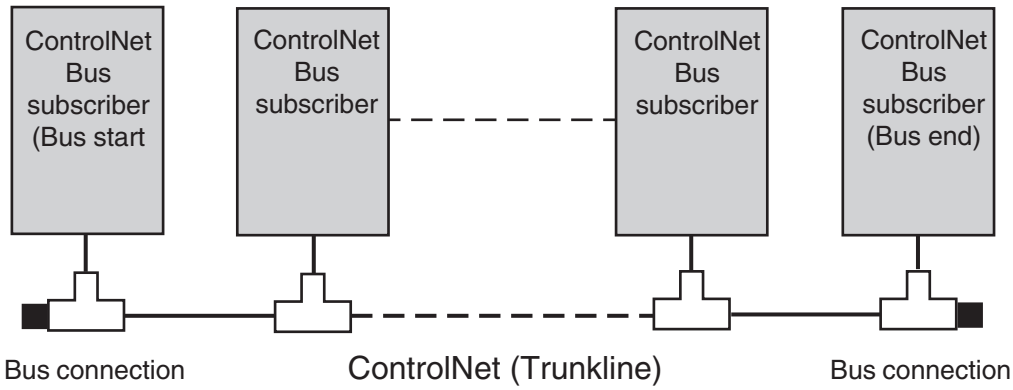


Fig. 6-1: Bus termination

Commissioning and Operation

Initial commissioning

Testing the components

Before operating the module, ensure the follwoing points are met:

- The module must be on a slot in the module rack on the standard bus of the PSS.
  How to install the module correctly is described in the “Installation Manual” (Modular PSS Installation Manual).
- The physical bus structure must be installed correctly (correct bus termination, no cable breaks...).
- The bus is configured correctly (refer also to the chapter “Configuration” in the operating manual "ST SB ControlNet - Software Manual").
- The Net Address for the module must be set correctly.

Initialising the PSS

- Switch on the PSS
- Transfer the user program to the PSS
- Switch off the PSS.

Quick start

Once the above-mentioned points have been checked, the module is ready to set into operation. Proceed as follows:

- Switch on the PSS.
- Wait until the module has run through its self-check and initialisation phase. These processes may take a while.
  When the module is ready for operation the LED for “module status” will be green (refer also to the table in chapter 5 in the section “LEDs for operating status and errors ”).
- Start communication via the ControlNet Scanner. Communication is error-free when the corresponding LEDs for channel A and channel B are green (refer also to the table in chapter 5 in the section “LEDs for operating status and errors ”).

The module is ready for operation.

Error diagnostics

If the module has not achieved the correct operating status, there are several options available for error diagnostics:

- Evaluating the operating status LED
- Evaluating the output paramter *ERR* of SB 236 (see ST SB ControlNet - Software Manual)
- Evaluating the data block for status information DB_S (see ST SB ControlNet - Software Manual)
- Bus diagnostics via the NAP-interface for the module

For this purpose an additional monitoring tool is required. Further information can be found in the relevant operating mnaual for the monitoring tool.

Operation

The module is operated on ControlNet using a software package from Pilz. It contains the standard function block SB 236 which runs in the standard section of the PSS. It is used for communication between the PSS and other ControlNET subscribers (send/receive data).
More detailed information on SB 236 can be found in a separate operating manual “ST SB ControlNet - Software Manual”. This is supplied with the software package.

Technical Details

Electrical data	
Power consumption	Average: 380 mA
Interfaces (galvanically isolated)	ControlNet Network Adapter Port
Bus interface	BNC-plug connector for channel A/B
Network Adapter Port	8-pin Western-socket (RJ45)
ControlNet	
Device type	Adapter
Status indicator	LED
Error indicator	LED
Bit rate	5 MBit/s (fixed)
Net Address	Set via rotary switches in the range 0 ... 99_D
Data length Scheduled Data Input data Output data	Max. 256 words 128 words (configurable) 128 words (configurable)
Data length Unscheduled Data Input data Output data	64 words 32 words (configurable) 32 words (configurable)
Data transfer	Word-by-word
Operating data	
Terminating resistance	Can be set
Communications structure	Via standard function block
Module code	$BC20_H$
XW-range standard bus	1024 words

Technical Details

Environmental data	
Protection type (EN 60 529, 10/91)	IP 20 (installed on module rack)
Ambient temperature (DIN IEC 68-2-14, 06/87)	0 ... +60 °C
Storage temperature (EN 60068-2-1/-2, 03/93)	0 ... +70 °C
Climatic suitability (DIN IEC 68-2-30, 09/86)	Max. 95% relative humidity.
Condensation	Not permitted
Vibration (EN 60068-2-6, 04/95)	Frequency range: 10 ... 100 Hz Amplitude: 0.1 mm, max. 5g
Shock (DIN IEC 68-2-29)	30 g, 11 ms/10 g, 16 ms
EMC	EN 50082-2, 03/95 EN 55011 A, 08/96
Mechanical data	
Space requirement	1 slot
Mounting position	Vertical in module rack
Weight PSS ControlNet Adapter PSS1 ControlNet Adapter	 1000 g 600 g

Appendix

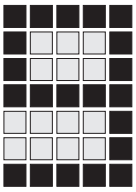
Changes to the operating manual

Changes from Version II to Version I

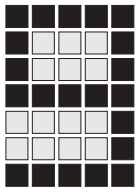
Old page	New page	Changes
8-2	8-2	No technical data on "protection class"
---	9-1	New: This chapter

Appendix

Notes



Notes



Notes

A

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