Modicon TSX Compact and TIO

for Rail(way) Applications with CAN

User Manual

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■ Merlin Gerin ■ Modicon ■ Square D ■ Telemecanique

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Contents

Information

This publication is the basic document for programmable controllers used in rail applications with MVB. It describes the performance range of the programmable controller and provides the user with all the information required to complete a design used to operate standard applications as well as download the user program.
The description includes:

- Configuration (I/O points, programming unit, control unit)
- Hardware assembly
- Configuration of the network supply
- Connection of the cables leading to the process
- Procedure for intial start up

Furthermore, whenever appropriate, there are references to publications that are dealing with special applications, e.g. programming.

- Symbols used
- Terms and abbreviations
- Additional documentation
- Scope of application

Caution
For applications using controllers with security requirements, the appropriate regulations must be observed.
For reasons of safety and maintenance of documented systems data, repairs on components should only made by the manufacturer.

Symbols Used

Note
This symbol is used to emphasize important facts.

Caution
This symbol refers to sources of frequently occurring errors.

Warning
This symbol points out potential sources of danger, that may lead to financial losses and health hazards or other serious consequences.

Expert
This symbol is used when further information is provided exclusively intended for experts (specialized training). Skipping this information in no way impedes the understanding of the document, nor does it restrict the standard operation of the product.

Tip
This symbol is used to emphasize the explanation of special tips when working with the product.

Example

Example

This symbol represents examples of application.

▶

Please proceed as follows:
This marks the beginning of a series of instructions that must be executed in order to achieve a certain product function.

This symbol points to manuals/sources dealing more thoroughly with the theme in question.

 This symbol identifies the menu path.

Terms and Abbreviations Used

Numbers are written according to international practice as well as according to the approved SI (Système International d' Unités) layout: The thousands are separated by a space, and the decimal point is used, e. g. 12 345.67.

You will find all abbreviations used listed in the appendix under "Abbreviations, and Standards".

Scope of Application

This user manual is based on version 2.1 of Concept and version 2.101 of the TCN tool.

General Information Concerning the Compact PLC

1

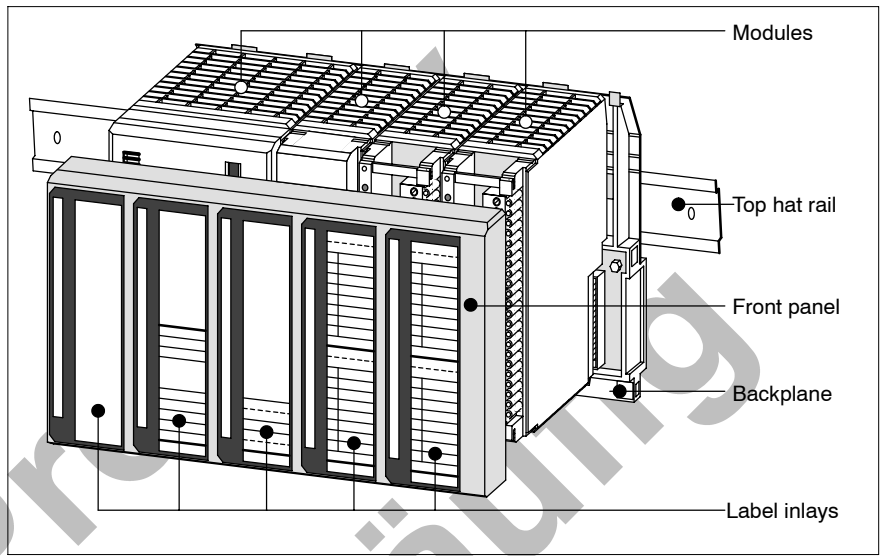
This chapter provides an overview of the CAN rail components and describes the integration in its programming technology. The main topic discussed is ”What are the possibilities when using the TSX Compact for rail applications and what are its performance limits?”.
Chapter 3 deals with hardware configuration and provides very concrete and detailed work instructions.

Each of the following topics are explained:

- Construction and Configuration limits
- Programming technology (special programming languages, programming and peripheral devices)
- Overview of the components (Software, Hardware)

1.1 Design

Figure 1 Primary unit



Modicon TSX Compact is a controller with front connection that has a modular architecture suitable for small to medium size automation tasks.
This includes:

- Controlling and computing
- Rules
- Processing the measured values
- and monitoring
- Control sequencing
- Diagnostics
- Communication via CAN

This architecture facilitates installation on the top hat rail where the backplane is secured (see Figure).
The backplane is a baseplate for the accommodation of modules.

Backplanes come in a width of 1/2 19” and 3 height units. To cover the front connectors of the modules, front panels matching the backplane can be used. The function indicators are visible through the front panel which has spaces for label inlays to identify individual terminal assignments. When the modules are exchanged, the label identification remains.

1.2 Configuration Limits

The TSX Compact consists of a **primary unit** and of up to 3 **expansions** depending on the definition of the design (refer to Figure 2 figure).

The **primary unit** is made up of:

- Primary backplane AS-HDTA-200, a CPU with integrated power supply module, an CAN communications module and up to 2 I/O modules

An **expansion** consists of:

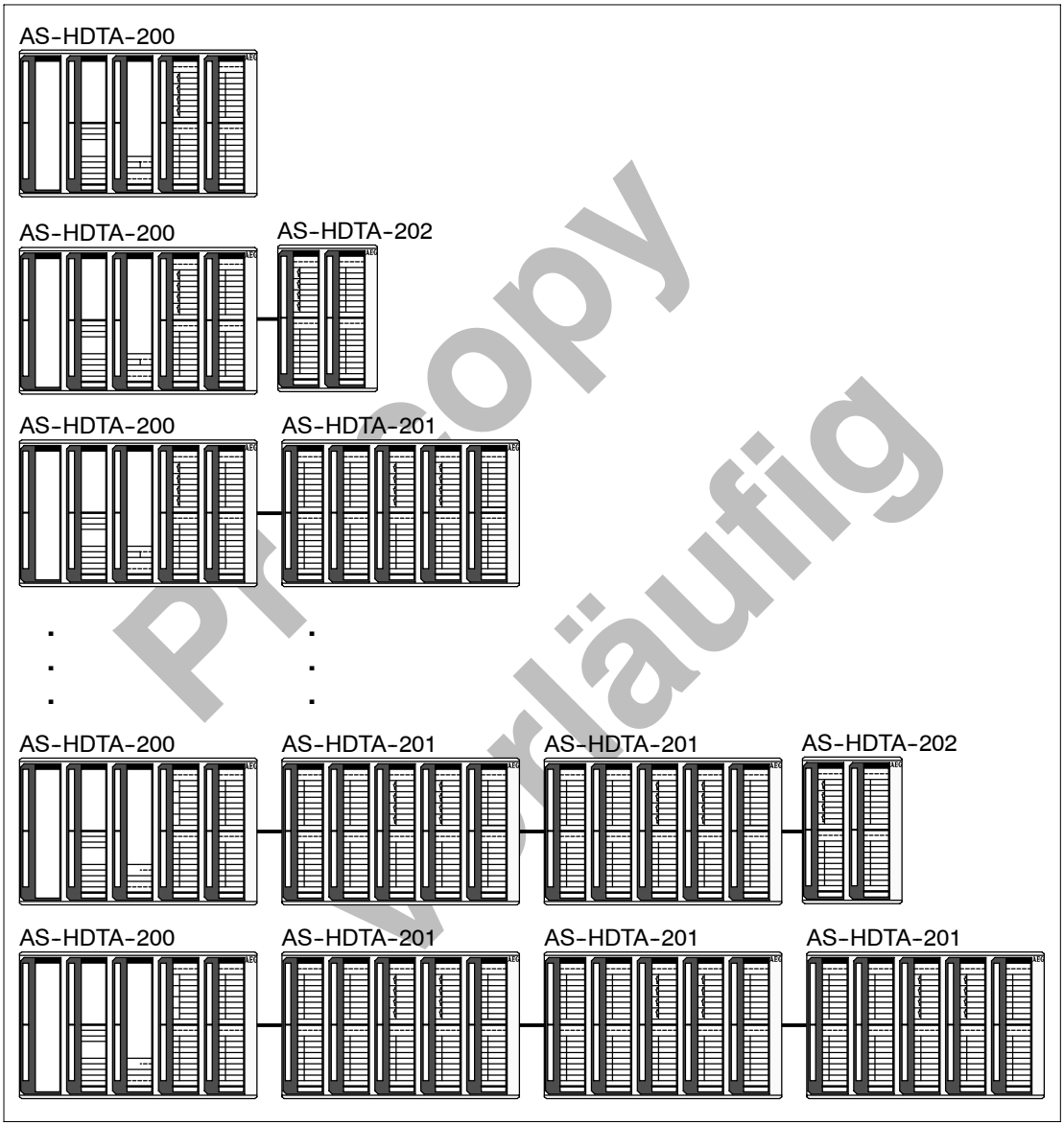
- Expansion backplane AS-HDTA-201 with up to 5 I/O modules
  or
- Terminating backplane AS-HDTA-202 with up to 2 I/O modules

The following maximum build limits apply to the TSX Compact I/O peripherals:

Table 1 Maximum build limits

Configuration	I/O slots
Primary backplane AS-HDTA-200	3
Expansion backplane AS-HDTA-201	5
Expansion backplane AS-HDTA-202	2
TSX Compact with 3 AS-HDTA-201 expansion backplanes (maximum build)	18

Figure 2 All possible options for a single line TSX Compact design



1.3 Programming

- Expert programming languages
- Creating programs
- Programming units

1.3.1 Expert Programming Languages

Concept
Programming is performed off-line in compliance with IEC 1131-3.
The following specific editors are available for working with various programming languages:

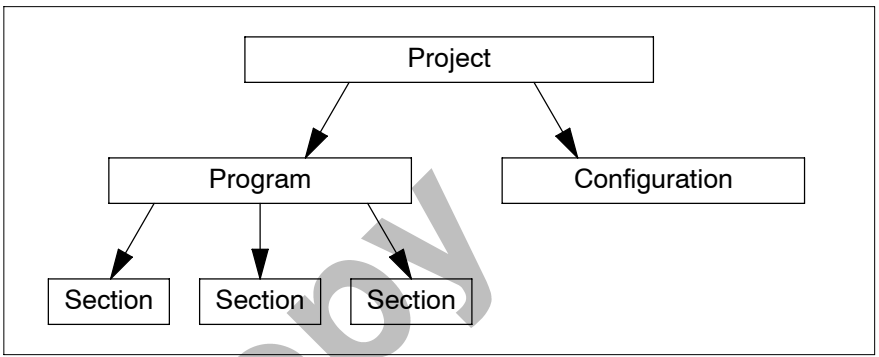
- FBD editor (function block language)
- LD editor (contact plan)
- SFC editor (job sequencing)
- IL editor (instruction list)
- ST editor (structured text)

The detailed programming description is included in the documentation supplied with the software package.

1.3.2 Creating Programs

A PLC is programmed using Concept according to a hierarchy of projects, configurations, programs and sections. Programming can be performed top down or bottom up.

Figure 3 Programming hierarchy in Concept



Program
A program is made up of one or several sections, describing the functional details of the entire system. The section processing order is specified in the program. In addition, this is where the variables, constants, literals, and direct addresses used are managed.

Various data types are available for variables, constants and literals.

Section
A program consists of one or several sections. A section describes the operating mode of a technological unit (e.g. a motor) in a system. Sections can be programmed using the IEC programming languages FBD and SFC. Only one of the listed programming languages can be used within a given section.

Configuration Data
The configurator is the interface between the program and the hardware.

The configuration data mainly consists of the I/O map and the specification of address ranges for the program.

1.3.3 Programming Units

When using standard PCs, the following conditions apply:

- Windows ≥ 3.1 or Windows 95 on a suitable PC
- 4 MB RAM
- 60 MB hard disk
- 3 1/2” diskette drive (1.44 MB)
- VGA graphic display adapter and screen
- Microsoft compatible mouse
- MS-DOS version ≥ 6.0

The programming unit is connected to the ”MB1” RS 232C interface on the CPU.

1.4 Overview of the Components

- Software
- Hardware (rail-qualified components)
- Indicator elements
- Control elements

1.4.1 Software

Table 2 Software overview

Type	Function
372 SPU 429 01	Program Compact using Concept
TCN-Tool	Define the parameters of the CAN nodes

Further information can be found in the documentation enclosed with each software package.

1.4.2 Hardware (Rail-qualified Components)

Table 3 Overview of backplanes, CPUs, interface modules

Module	Function
	Backplane
AS-HDTA-200	Primary backplane, 5 slots
AS-HDTA-201	Expansion backplane, 5 slots
AS-HDTA-202	Termination backplane, 2 slots
	CPUs
PC-E984-258	CPU for rail applications
	Communication
AS-BCAN-259	CAN communications module
470 NAV 511 00	CAN TAP (Terminal Access Point)
AS-WCAN-201	Connecting cables AS-BCAN-259 to 470 NAV 511 00

Table 4 Overview of discrete I/O modules

Module	Function
	Input modules
AS-BDEP-254	16 inputs 24 ... 48 VDC, isolated
AS-BDEP-256	16 inputs 24 VDC, isolated
AS-BDEP-257	16 inputs 110 VDC, isolated
	Output modules
AS-BDAP-258	8 relay outputs 24 VDC ... 230 VAC, 2 A, isolated
	Input and output modules
AS-BDAP-250	8 inputs 24 VDC, isolated, 8 semiconductor outputs 24 VDC, 2 A, isolated
AS-BDAP-252	8 inputs 24 VDC isolated, 4 relay outputs 24 VDC ... 230 VAC, 2 A
AS-BDAP-253	8 inputs 110 VDC isolated, 4 relay outputs 24 VDC ... 230 VAC, 2 A

Table 5 Overview of analog I/O modules

Module	Function
	Input modules
AS-BADU-256	4 inputs +/-1 V / +/-10 V / 0 ... 10 VDC / +/-20 mA / 0 ... 20 mA, isolated
	Output modules
AS-BDAU-252	2 outputs +/-10 V / +/-20 mA, isolated back-to-back

Table 6 Overview of accessories

Module	Function
	Power supply modules
470 IPS 258 00	Power supply module 24 VDC (-30 % ... +25 %) to 22 VDC (+/-5 %)
	Module accessories for Compact
AS-BNUL-200	Dummy for the pre-wiring of future points
AS-BNUL-202	Dummy for the placement of supply lines
SIM 011	Simulator, clip-on, for 8 discrete inputs
	TIO accessories (bus bars, terminals)
170 XTS 006 00	Single-row screw terminal
170 XTS 005 00	Double-row screw terminal
170 XTS 004 00	Triple-row screw terminal
170 XCP 200 00	Set of coding wedges and coding riders
170 XTS 011 00	Set of screw/plug-in terminals (8-pin, 3 each)
	Physical system
HUT 3573	Top hat rail as per DIN-EN 50 022, profile 35 x 7.5 mm (by the meter)
CER 001	Cable grounding rail for 8 cables
EDS 000	Grounding clamp
GND 001	Capacitive discharge terminal
OVP 001	Overvoltage protection 10 A
OVP 2480	Overvoltage protection 25 A
	Cables
AS-WBXT-201	DTA bus extension 500 mm (stacked drop layout)
110 XCA 282 01	Programming cable CPU to PC, 1 m long
110 XCA 282 02	Programming cable CPU to PC, 3 m long
110 XCA 282 03	Programming cable CPU to PC, 6 m long
110 XCA 203 00	Adapter RJ45 to 9-pin for PC (AT)
KAB-2205-LI	Cable with shield (by the meter) 2 x 2 x 0.5 sq/mm for the connection of analog sensors and actuators

1.4.3 Indicator Elements

Most modules have LED indicators for diagnostic purposes. There are **yellow** and **red** LEDs having the following basic meaning (there are possible deviations):

Yellow LED

The LED lights up when the power, working voltage or the sensor supply required by the corresponding module are available or when one of the processors on the module is operating. In output modules it signals overload or a short-circuit.
In TIO modules, the yellow LED indicates a ”1” signal at the respective inputs/outputs.

Red LED

In TSX Compact I/O modules, the red LED indicates a ”1” signal at the respective inputs/outputs. Otherwise, its function is module-specific.

A list of the indicator elements of each module and a concrete explanation of their function is included in the description of each module.

1.4.4 Control Elements

The PLC does not have any specific control elements intended for its operation. Therefore, there are no accessible control switches on the mounted front plate. Details regarding default settings for configuration and maintenance are included in the description of each individual module.

☞ **☞Note**
The switches on the CPU that can be accessed upon removing the front panel of the DTA are configuration settings.

Controller Area Network (CAN)

2

The Controller Area Network (CAN) is a serial communications protocol which combines realtime data transfer and a high level of security with no network administration overhead. Messages have a fixed format of different but limited length. Messages may be sent whenever the bus is available. In CAN networks a specific node does not need to be known to other nodes.

The content of a message is recognized by a so-called identifier.This identifier does not indicate the source or destination of the message. It merely describes the content of the data. Any node interested in these data may act upon them.

As a consequence of the above mentioned functionality any number of nodes may receive a particular message. This behavior is also known as multicast or - if all nodes are interested in the data - as broadcast.

CAN provides mechanisms to achieve data consistency of the entire network. This is done by assuring that a message is either accepted by all nodes or be none.

Two voltage levels may exist on the bus. The level with the relatively high voltage is called recessive and equals to value logical high. A level of zero volts is called dominant and equals to a logical low. If two transmitters are sending a different level at the same time than the resulting level on the bus is zero, hence the expression of 'dominant' and 'recessive'.

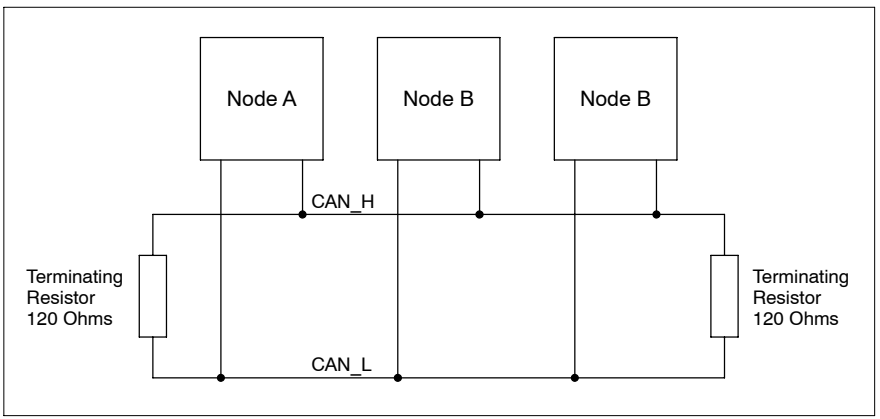
If two messages are to be transmitted simultaneously the resulting bus access conflict is resolved by a bitwise arbitration using the identifier. During the transmission of the message every transmitter compares the level on the bus with the level transmitted. If levels are equal the device continues to transmit. Otherwise it is assumed that a message with a higher priority is also transmitted and the unit withdraws from the bus. It will try to start transmitting again once the current message has been transmitted.

Because arbitration is based on the identifier messages are automatically given a certain priority on the bus thus insuring well defined latency times. The lower the identifier the higher the priority

In order to facilitate clock synchronization of nodes the method of ’bit stuffing’ is employed. Bit stuffing is done whenever a sequence of more than five bits of the same polarity is transmitted. In this case a bit of the complentary polarity is inserterd into the bit stream.

2.1 Hardware and Bus Topology

The CAN bus topology is a single cable segment of up to 1 km length approximately. At each end of the cable a terminating resistor of 120 Ohms must be installed to avoid signal reflexions. All Schneider CAN devices feature terminating resistors that may be connected to the bus if the device is the last on the segment. Star topologies without additional hardware are not allowed.



The following table shows the range of baudrates supported Schneider by CAN devices and the resulting maximum length of the bus cable.

Baudrate	**Maximum cable length in m**
1 MBit/s	25
800 kBit/s	50
500 kBit/s	100
250 kBit/s	250
125 kBit/s	500
50 kBit/s	1000
20 kBit/s	2500
10 kBit/s	5000

2.2 Message Types

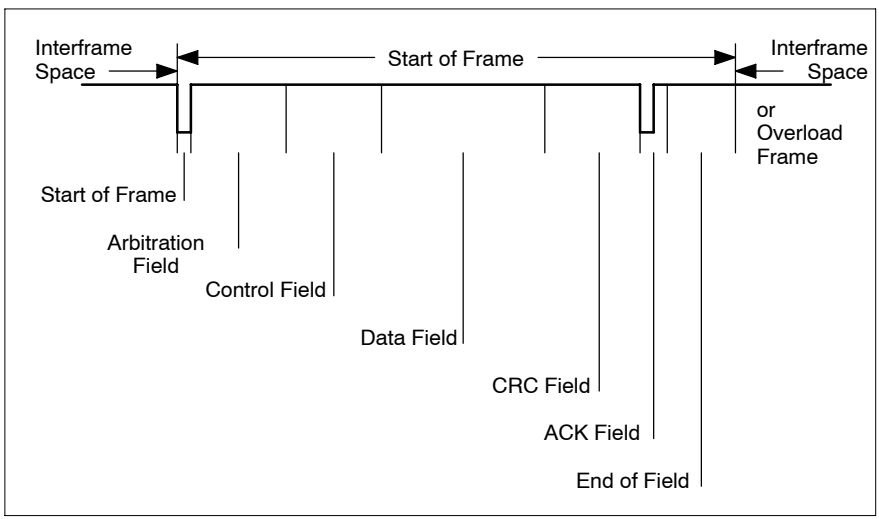
There are four mesage types on a CAN network that are used for data transmission and security purposes.

- Data frames carry data from transmitters to receivers
- Remote frames are transmitted to request data from devices
- Error frames are transmitted by a unit on detecting a bus error
- Overload frames are used to provide an extra delay between consecutive remote frames or data frames

2.2.1 Data Frame – Standard and Extended Format

There are two different types of data frames specified by the CAN 2.0 specification. Standard and Extended dataframes. The difference between the two of them is the maximum message number allowed. In order to increase this number the number of bits used for message identification is 29 bit for extended frames in comparison to 11 bit for standard frames.

The general format of a CAN data frames is as follows:



2.2.2 Data Frame - Standard Format

A Standard format data frame is composed of the following seven bit fields:

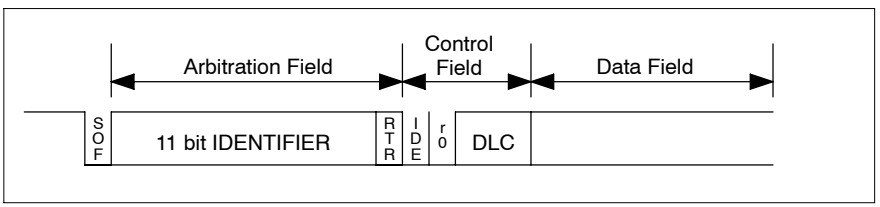
Start of Frame, Arbitration Field, Control Field,Data Field, CRC Field, ACK Field, End of Frame. The length of the data may also be zero.

Start of Frame

Marks the beginning of Data frames and Remote frames

Arbitration Field

The Arbitration Field consists of the Identifier and the RTR-Bit



Identifier

The Identifier's lerngth is 11 This Bits are transmitted in the order from 10 to 0. The LSB is Bit 0.

RTR-Bit

In data frames this bit has to be dominant whereas in remote frames it will be recessive.

Control Field

The Control Field consists of six bits. The Identifier Extension Bit (IDE) is dominant and distinguishes standard from extended frames.The second bit is reserved for future use and the four succeeding bits are the Data Length Code.

Data Length Code

The Data Length Code indicates the number of data bytes transmitted according to the following table.

Number of Data Bytes	Data Lengh Code			
	DLC3	DLC2	DLC1	DLC0
0	d	d	d	d
1	d	d	d	r
2	d	d	r	d
3	d	d	r	r
4	d	r	d	d
5	d	r	d	r
6	d	r	r	d
7	d	r	r	r
8	r	d	d	d

Data Field

The Data Field contains up to eight bytes. Each byte is transmitted MSB first.

CRC Field

The CRC Filed holds the CRC value, and a recessive delimiter bit.

ACK Field

All nodes having correctly received the message so far will superscribe the transmitters recessive bit with a dominant bit. A recessive bit is the ACK Field delimiter.

END of Frame

Each Data and Remote frame is delimited by flag seqeunce of seven recessive bits.

2.2.3 Data Frame - Extended Format

A Extended format data frame is composed of the following seven bit fields:

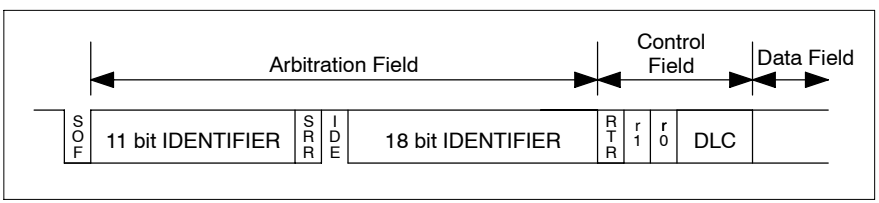
Start of Frame, Arbitration Field, Control Field,Data Field, CRC Field, ACK Field, End of Frame. The length of the data may also be zero.

Start of Frame

Marks the beginning of Data frames and Remote frames

Arbitration Field

The Arbitration Field consists of the 29 Bit Identifier, the SRR-Bit, the IDE-Bit and the RTR-Bit



Identifier

In contrary to the standard formt the Identifier's length is 29 bit There are two sections defined in this format. The Base ID consisting of 11 bits and the extended ID consisting of 18 bits. The base ID is transmitted in order from 28 to 18. It is equivalent to to the format of the standard Identifier.

SRR-Bit

The Substitute RTR-Bit is always a recessive bit.
Mixing of standard and extended frames is allowed giving standard frames a higher priority.

IDE-Bit

The Identifier Extension Bit is recessive

RTR-Bit

In data frames this bit has to be dominant whereas in remote frames it will be recessive

Control Field

The Control Field consists of six bits. The first two of them are reserved for future use and the four succeeding bits are the Data Length Code

Data Length Code

The Data Length Code indicates the number of data bytes transmitted

Data Field

The Data Field contains up to eight bytes. Each byte is transmitted MSB first

CRC Field

The CRC Filed holds the CRC value, and a recessive delimiter bit

ACK Field

All nodes having correctly received the message so far will superscribe the transmitters recessive bit with a dominant bit. A recessive bit is the ACK Field delimiter

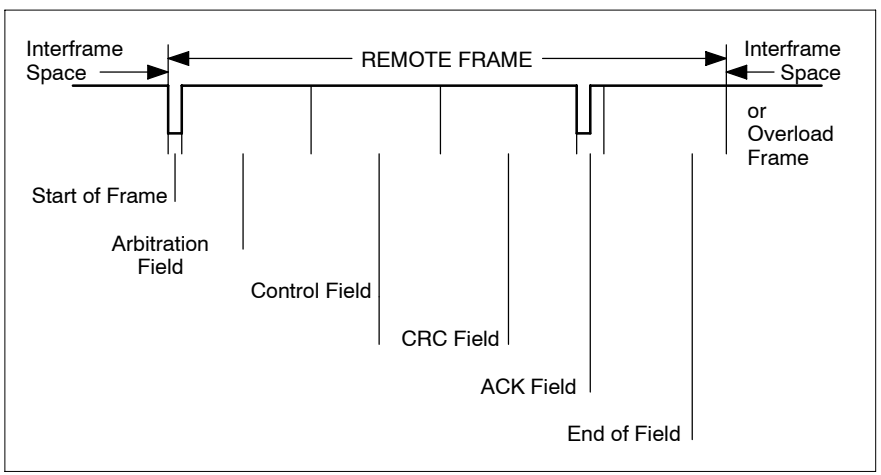
END of Frame

Each Data and Remote frame is delimited by flag seqeunce of seven recessive bits

2.2.4 Remote Frame

A Remote frame is transmitted in order to request data from a source device. It is used in both standard and extended frame formats. A Remote frame is composed of the following six bit fields:

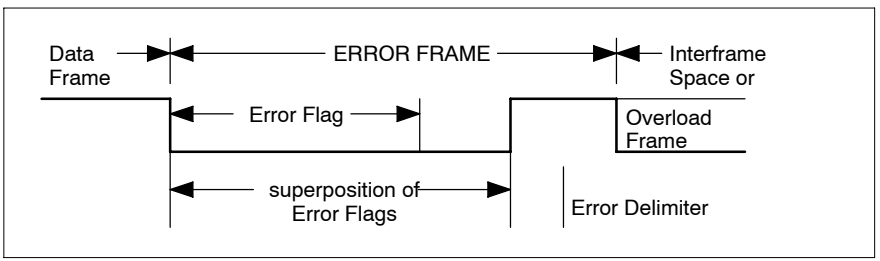
Start of Frame, Arbitration Field, Control Field, CRC Field, ACK Field, End of Frame. In contrary to the data frame the RTR–Bit is recessive. There is no data field



2.2.5 Error Frame

An **Error frame** is used to indicate that at least one node on the network has not received the last message correctly. An Error frame consists of two fields the Error Flags and the Error Delimiter.

Usually an error is indicated by consecutively transmitting six dominant bits thus violating the rule of 'bit stuffing'. This is how the transmitting node can tell whether or not all nodes have received the last message without error.



Overload frames are used to indicated that a node on the network needs some extra time before the next node is allowed to transmit a message. Up to two consecutive frames may be transmitted. Today there is hardly a CAN chip available that makes use of this feature. Schneider CAN devices do not generate Overload frames.

2.2.6 Remark on Identifiers

Due to compatibility with certain old CAN controllers identifiers must not have the 7 most significant bits set to all ones, so only the identifiers 0..2031 are left for the 11-bit identifiers, and the user of 29-bit identifiers can use 532676608 different values.

2.3 The ISO/OSI Reference Model

According to the ISO/OSI reference model communication can be regarded as a layered architecture consisting of the following layers.

Layer	Function	Description
Layer 1	Physical	The actual hardware involved (voltage levels, timing, etc.)
Layer 2	Datalink	How messages are transmitted
Layer 3	Network	Provides for routing functionality
Layer 4	Transport	Mechanisms for ensuring communication via unreliable media
Layer 5	Session	Dynamically connect and disconnect functions
Layer 6	Presentation	How data are stored and passed to and from the network
Layer 7	Application	The actual meaning of the data

ISO 11898 is defininig the standards for Layer 1 and 2 to a certain extend (see chapter 'Message Types). When dealing with realtime networks in the automation area Layer 3 to 6 are usually not implemented, e.g. digital I/O modules do not need a functionality equivalent to 'LOGON'.

2.3.1 CANopen as the Application Layer (Layer 7)

The Application Layer also referred to as Layer 7 defines the actual meaning of the data transmitted. In order to transfer a certain value from one node to another node on a CAN network the identifier of the message and the value's byteposition within the message must be defined. It is obvious, that defining all messages, message contents and transmission conditions for a larger automation network can become a complex and error prone task.

For this reason several standards have been created in order to facilitate this undertaking. One of them is the CANopen standard defined by the CAN in Automation (CiA) e.V. Erlangen, Germany.

CANopen is actually a subset of the CAN Application Layer (CAL) according to CiA Draft Standard (DS) 201 - 207. The communication protocol is described in DS 301. In order to reflect the specifics of certain device types a set of so-called device profiles (DS 40X) has been created, e.g. HMI devices are described in DS 403.

2.3.2 Communications model

The CANopen protocol defines several methods for transmission and reception of messages over the CAN bus. These messages are referred to as communication objects. Synchronous data transfers allow network wide coordinated data acquisition and actuation. Synchronous transfers are supported by predefined communication objects i.e. Sync Objects transmitted on a cyclic time period and Time Stamp objects. Asynchronous or event messages may be sent at any time and allow a device to immediately notify another device without having to wait for a synchronous data transfer to take place. The content of both synchronous and event messages (Process Data Objects) may be dynamically configured at boot up by the machine controller. Although CAN is restricted to transfers of a maximum of 8 data bytes within one message, data transfers larger than 8 bytes are also provided for by the protocol (Service Data Objects).

2.3.3 The Object Dictionary

All device parameters and data are listed in the standardized CANopen Object Dictionary and each entry is assigned a 16 bit index which is used to access the data. The Object Dictionary contains the description, data type and structure of each parameter.

The CANopen Object Dictionary is organized in several sections comprising a data type area, a communication profile area, a device profile area and a manufacturer specific area. The general structure is shown in the following table:

Index	**Object Dictionary Section**
0001-001F	Static Data Types (e.g. Boolean, Integer 16)
0020-003F	Complex Data Types (e.g. PDO, CommPar, SDO Parameter)
0040-005F	Manufacturer Specific Data Types
0060-009F	Device Profile Specific Data Types
1000-1FFF	Communication Profile Area
2000-5FFF	Manufacturer Specific Area
6000-9FFF	Device Profile Area (as defined in the CANopen Device Profiles)

2.3.4 Service Data Objects (SDO)

Service Data Objects (SDO)'s are normally used for device configuration such as setting device parameters or downloading programs. They are also used to define the type and format of information communicated using the Process Data Objects. Service Data Objects provide the following functionality:

- Transmit data of any size (boolean to large files)
- Confirmed services (request/response) for read and write of any data
- Expedited transfer of data less than or equal to 4 bytes total length
- Segmented transfer of data greater than 4 bytes total length
- Abort of data transfer by either Client or Server with optional error feedback

2.3.5 Process Data Objects (PDO)

The Process Data Objects (PDO) do not contain any explicit protocol overhead and this allows very fast and flexible exchange of data between applications running on each node. PDO's can be transmitted directly from any device on the network simultaneously to any number of other devices. This multicast capability is one of the unique features of CAN and is exploited to the full by CANopen.

HW Configuration

3

This chapter contains detailed configuration descriptions, hardware settings as well as design guidelines with instructions for start-up of the Modicon TSX Compact.

For the system design, configure the following:

- I/O map and definition of I/O nodes as well as total current on the I/O bus (refer to chapter 3.1, page 34)
- Power supply for supply voltage UB (refer to chapter 3.2, page 38 and chapter 3.2.2, page 41)
- Power supply for working voltage US (refer to chapter 3.2, page 38 and chapter 3.2.3, page 48)
- Sensor cabling (refer to chapter 3.2.2, page 41 and chapter ”Grounding Shielded Lines”, page 68)
- Cabling actuators (refer to chapter 3.2.3 , page 48 and chapter ”Grounding Shielded Lines”, page 68)
- Installation, (refer to chapter 3.3, page 52)
- Installation of the CAN line (refer to chapter 3.3.5, page 60)
- Grounding (refer to chapter 3.3.6, page 65)

3.1 Hardware Configuration

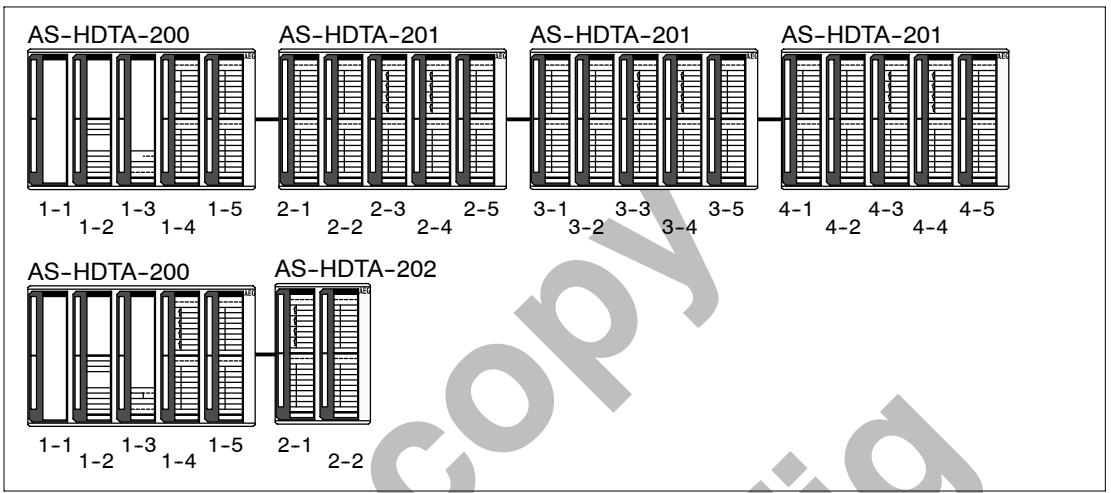
- Mapping and specifying I/O slots
- Total current

3.1.1 Mapping and Specifying I/O Slots

During configuration it must be defined where to plug in which modules, i.e. at which location in the respective backplane.
In the primary backplane the CPU has the fixed slots 1-1 and 1-2
All other slot numbers are used to receive the I/O modules or the communications modules.
Not all I/O slots must be equipped with a module (leave empty or insert a dummy).
For each I/O slot number, use the programming software to enter the corresponding I/O type.

Specifying I/O slots without stacked drop layout
When designing the controller in a single row, the slots are numbered according to the following figure.
The first I/O slot in the primary backplane AS-HDTA-200 has position 1-3.
The first expansion backplane AS-HDTA-201 has the positions 2-1 to 2-5. The next, 3-1 to 3-5, etc.

Figure 4 Slot numbers on the TSX Compact



☞ **Note**
The slot number is also called node number, device number, or address number, refer to module descriptions.
When using the termination backplane AS-HDTA-202, addressing can not be continued.

Specifying I/O slots in stacked drop layout
Refer to the Basic User Manual Modicon TSX Compact

3.1.2 Total Current

Please check whether the CPU can sufficiently supply all nodes attached to the I/O bus (PAB).

In the table of power load actuators (Table 8) List of power load actuators (I/O and communications modules)you will find the list of all nodes with an indication of the maximum current requirement.

The loading for the dimensioning of the 24 V power supply units can be determined in the same way.

Table 7 List of current sources

Module	Type of potentials	I (24 V) max. primary	I (5 V) max. secondary for I/Os
PC-E984-258R	Isolated	1.2 A	approx. 2.3 A

Table 8 List of power load actuators (I/O and communications modules)

Module	I (5 V) typical	I (5 V) max.	I (UB = 24 V) max.	I (UB = 22 V) max.	I (US = 24 V) max.
AS-BADU 256	60 mA	100 mA	100 mA	–	–
AS-BDAP 250	35 mA	60 mA	70 mA *)	–	8 A
AS-BDAP 252	20 mA	25 mA	50 mA *)	70 mA	8 A **)
AS-BDAP 253	20 mA	25 mA	30 mA for 110 VDC *)	70 mA	8 A **)
AS-BDAP 258	50 mA	60 mA	–	150 mA	16 A **)
AS-BDAU 252	40 mA	60 mA	150 mA	–	–
AS-BDEP 254	15 mA	22 mA	160 mA *) for 24...48 VDC	–	–
AS-BDEP 256	20 mA	25 mA	100 mA *)	–	–
AS-BDEP 257	20 mA	25 mA	50 mA for 110 VDC *)	–	–
AS-BCAN-259	500 mA	600 mA	–	–	–

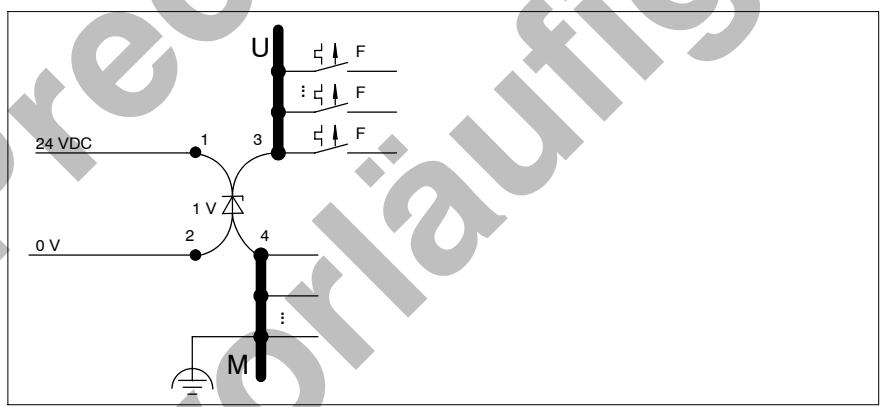
*) For sensor power supply

**) also suitable for the switching of actuators using other working voltages, e.g. 110 VDC.

3.2 Configuring the Power Supply

At the entry of the fused supply voltage into the system, an overvoltage protection (suppressor diode) must be interconnected (see Figure).
The suppressor diodes, e.g. overvoltage protection for OVP 001 top hat rail mounting or overvoltage protection for securing OVP 2480, must be wired like quadripoles and must be aligned close to the power supply unit using a low-resistance reference conductor.
Each branch must be fused, and if the lines are long it must be wired with a suppressor diode, e.g. 1N5646A. The fuse must be adjusted to the permissible current loading of the suppressor diode. The advantage of this layout is a selective interruption of a branch through the attached fuse even if there is a short-circuit of the diode. In areas that are very lightning prone, additional lightning surge protection measures must be taken.

Figure 5 Principal power supply design



Legend

F Automatic circuit-breaker or fuse

V1 Overvoltage protection OVP 001 (10 A max.) or OVP 2480 (25 A max.), configured next to the power supply

1, 2, 3, 4 OVP terminals, refer to both of the following figures

Figure 6 OVP 001 terminals and dimension drawing

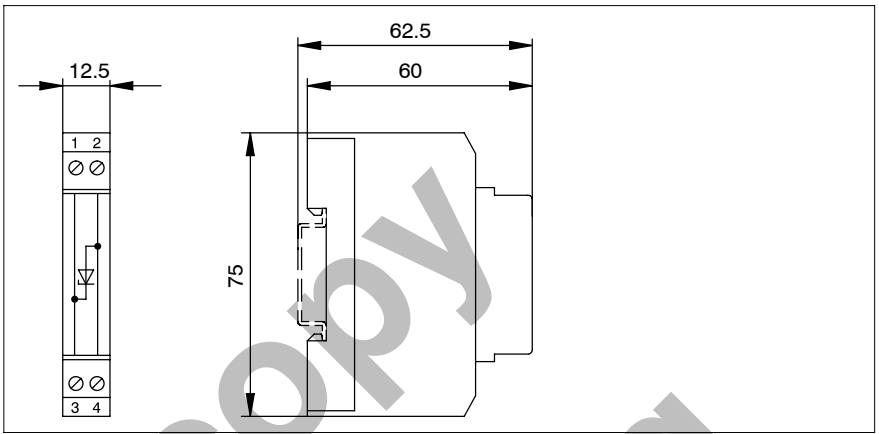
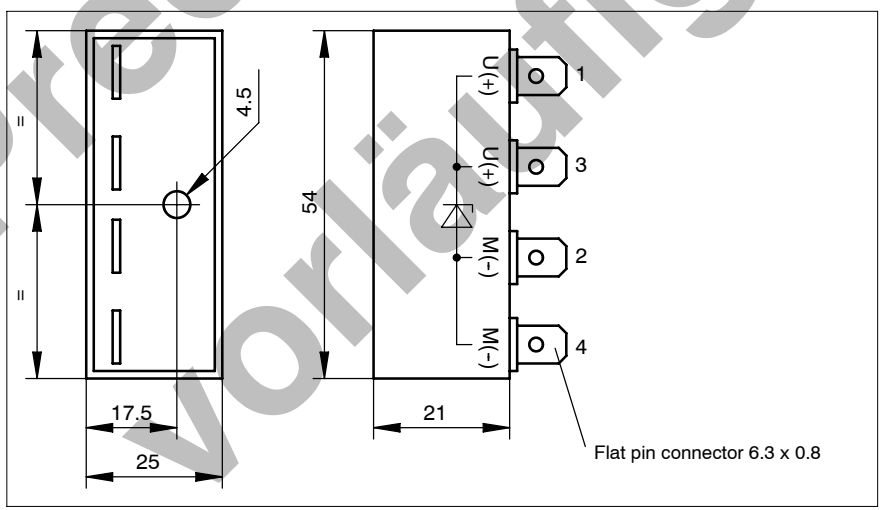


Figure 7 OVP 2480 and dimension drawing



Related topics

Planning and Distribution of Circuits
Connection scheme for power supply UB
Connection scheme for the working voltage power supply

3.2.1 Planning and Distribution of Circuits

The following must be distinguished:

- Supply voltage UB(1) feeding the modules and sensors,
- Supply voltage UB(2) feeding the relay coils as well as the
- Working voltage US driving the actuators

It is generally recommended to draw the supply voltage UB and the working voltage US from different power supply units (e.g. 10 A or 25 A, identified as N1 and N2 in the following), so that interruptions caused by switching operations do not affect the power supply of the electronics. For larger load currents, additional power supply units must be configured for the working voltage (N3, ...).

When designing the power supply, please make sure that:

- Each system is fed point-to-point with UB, US, and M2, M4 from the power supply
- The UB / M2 and US / M4 supply lines are run in pairs (avoid induction loops)
- You avoid any serial connection of several automatic circuit breakers because of increased inductive line share in the lead wires of the working voltage

☞ **Note**

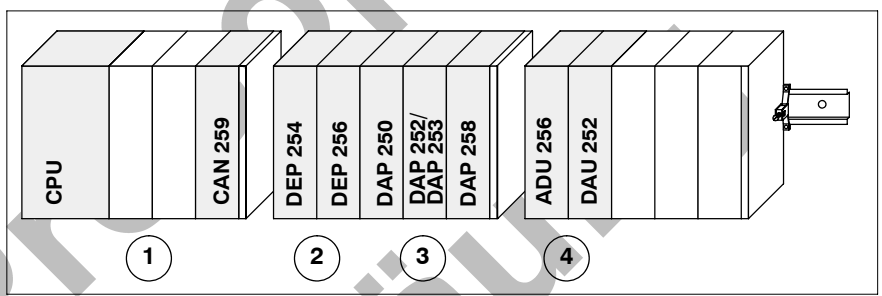
Your system will only be able to operate perfectly if the individual modules are guaranteed a sufficient supply of power (refer to chapter ”Total Current” and to the respective module descriptions under ”Technical Specifications”). However, start-up currents, large cable lengths, and small line profiles may be responsible (especially given a high coincidence factor) for breakdowns in voltage supply. Therefore, power supply units should be configured with a sufficient power back-up, and cable profile as well as cable length must be selected appropriately!

3.2.2 Connection Scheme for Power Supply UB (24 VDC for Modules and Sensors)

Configure a joint power supply circuit with its own power supply unit for the supply of the modules and sensors (inputs).

☞ **Note**
The layout shown applies to supply voltage line lengths between the power supply and TSX Compact of approx. 5 m.
The circuits shown must be regarded as examples.

Figure 8 Mapping example for connection scheme of power supply UB (24 VDC)



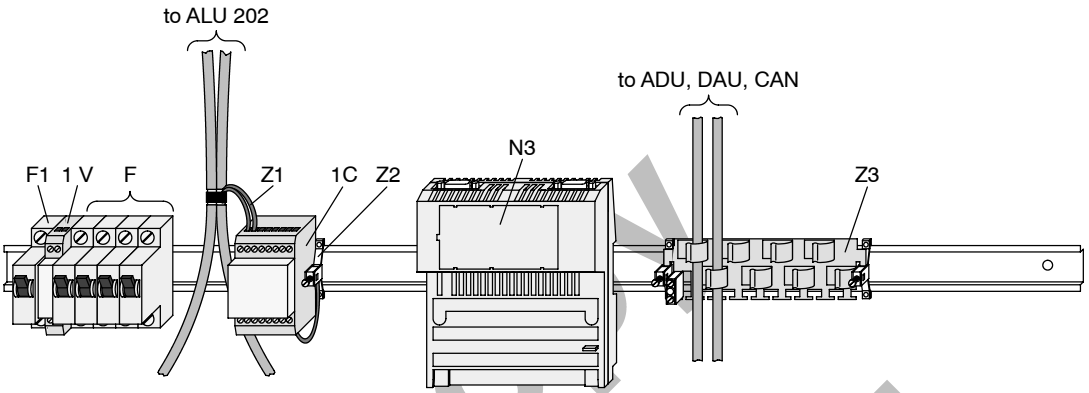
(1)
Refer to Detailed connection for CPUs and remote I/Os

(2)
Refer to Detailed connection for the supply of discrete inputs

(3)
Refer to Detailed connection for the supply of output relays

(4)
Refer to Detailed connection for the supply of analog I/Os

Figure 9 Example of layout for installation accessories



C1 capacitive discharge terminal GND 001
F automatic circuit-breakers
F1 automatic circuit-breaker 10 A
N3 DC/DC transformer IPS 258
V1 overvoltage protection OVP 001
Z1 shield connection, included in delivery as part of cable grounding rail CER 001
Z2 grounding clamp EDS 000
Z3 cable grounding rail CER 001

Figure 10 Connection overview of power supply UB (24 VDC)

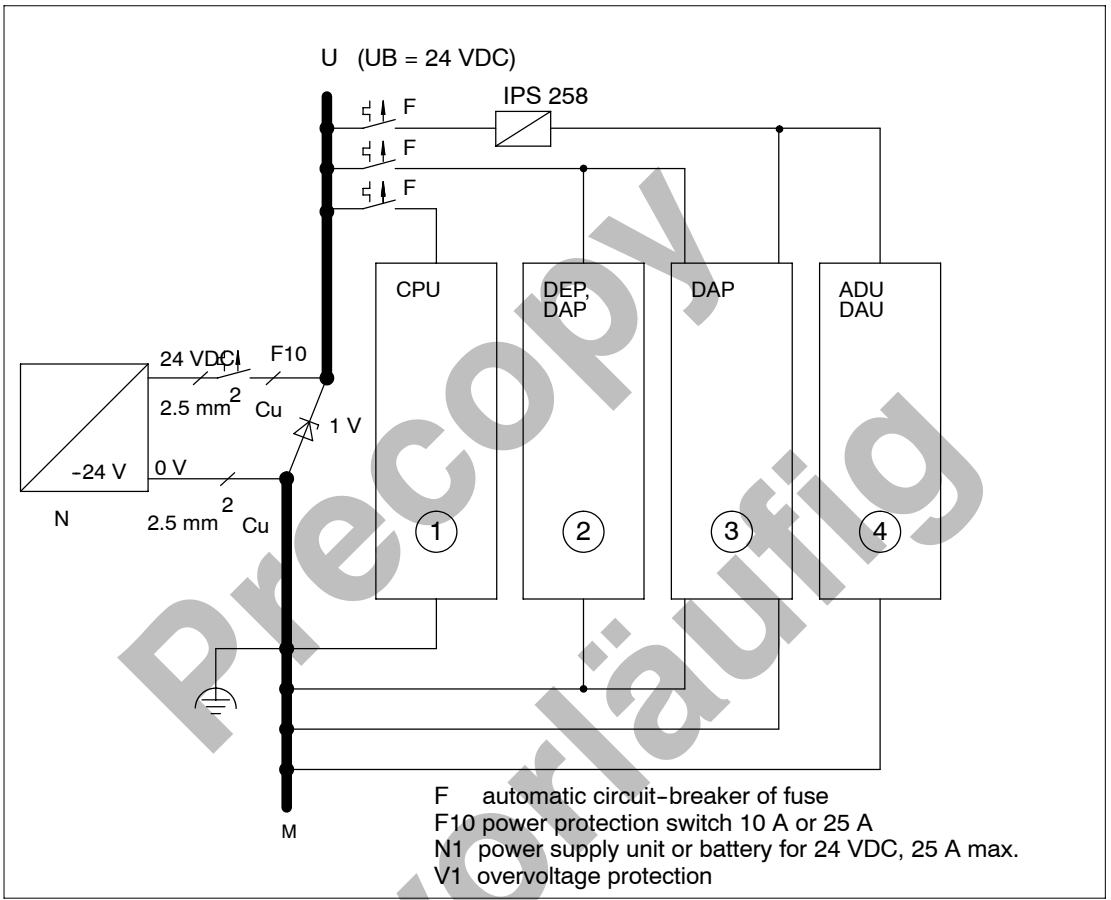
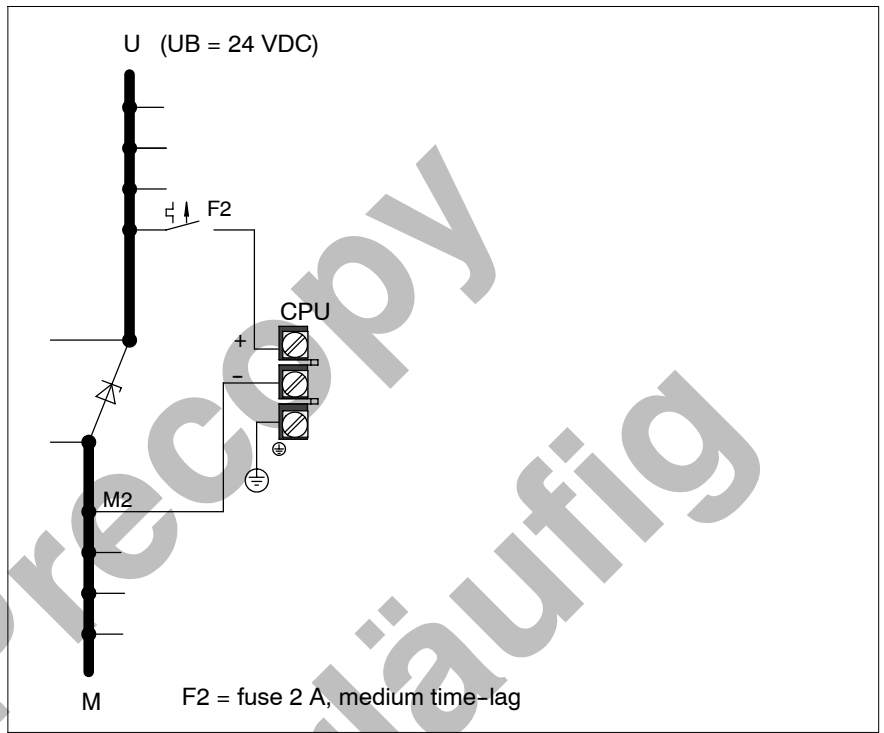


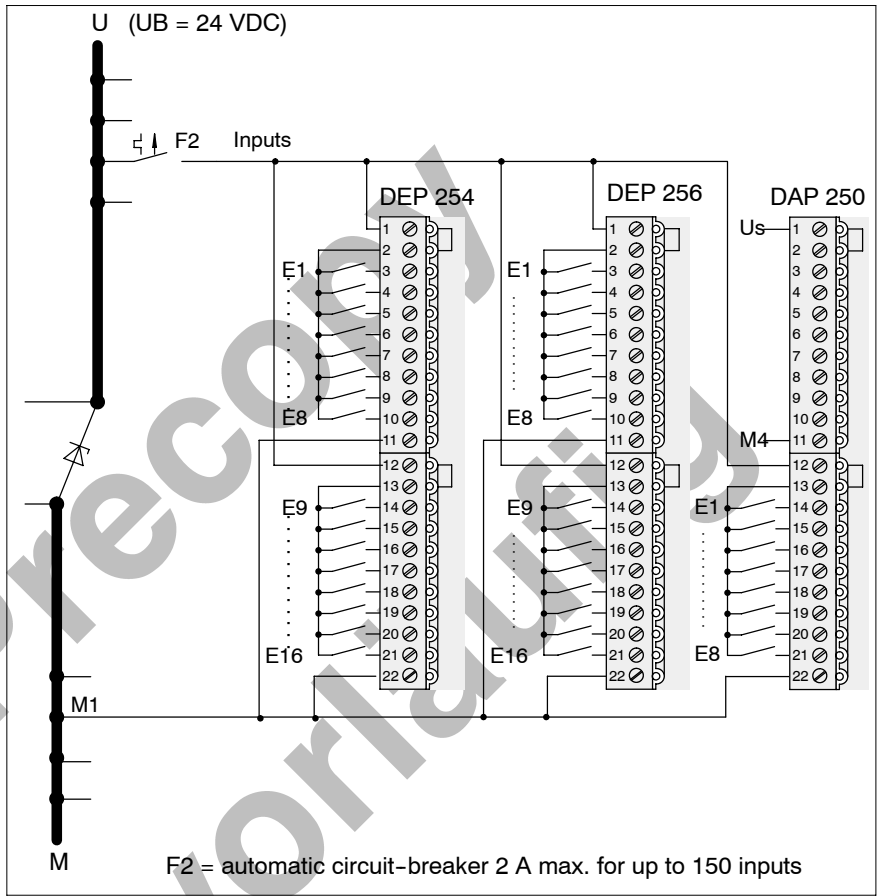
Figure 11 Detailed connection for CPUs and remote I/Os (1)



☞ **Note**
The CPU has a suppressor diode already built-in that is dimensioned as EMC protection.

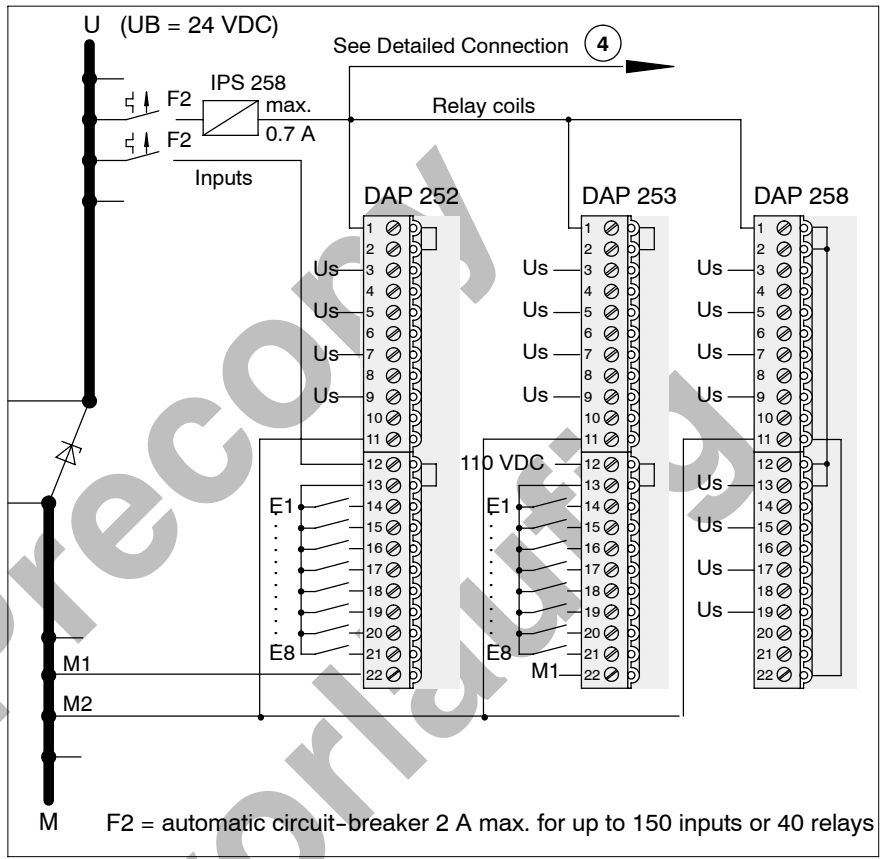
☞ **Note**
For all subsequent I/O modules!
Noise immunity can be increased if discharge capacitors are connected to the U and M terminals of the corresponding module.
Further details can be found on page 67 under ”Improvement of EMC stability on the modules” .

Figure 12 Detailed connection for the supply of discrete inputs (2)



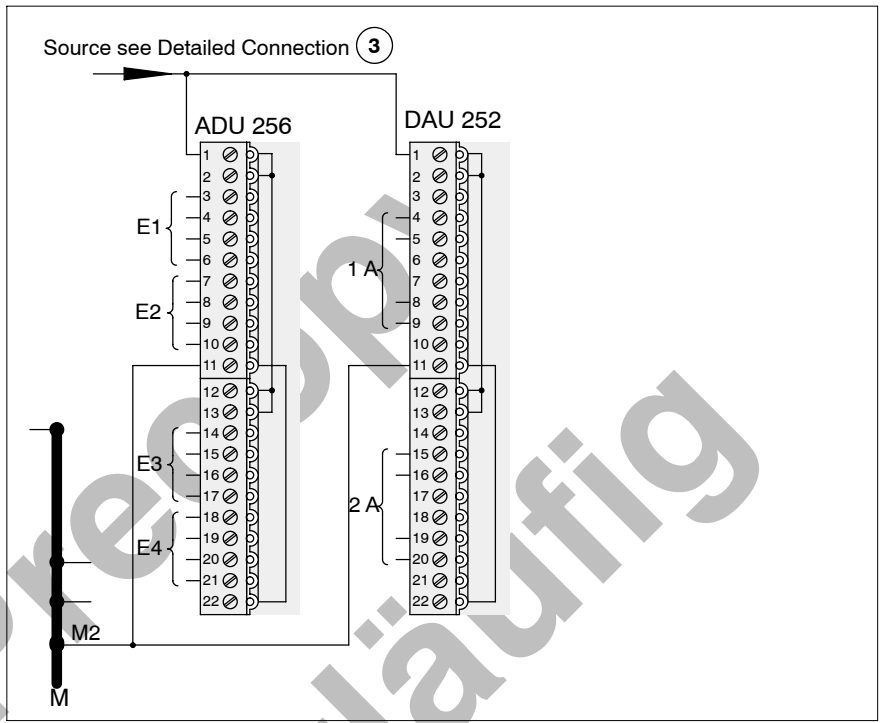
Note
Module AS-BDEP 257 requires a 110 VDC connection, refer to the description of the module.

Figure 13 Detailed connection for the supply of output relays (3)



☞ **Note**
The DAP modules have built-in suppressor diodes that are dimensioned for EMC protection.

Figure 14 Detailed connection for the supply of analog I/Os (4)



☞ **Note**

Modules AS-BADU256 and AS-BDAU 252 have built-in suppressor diodes that are dimensioned for EMC protection.

Detailed connection schemes for sensors and actuators can be found in the respective module description, Appendix A.

The shields must be grounded according to chapter ”Grounding Shielded Cables” (page 68).

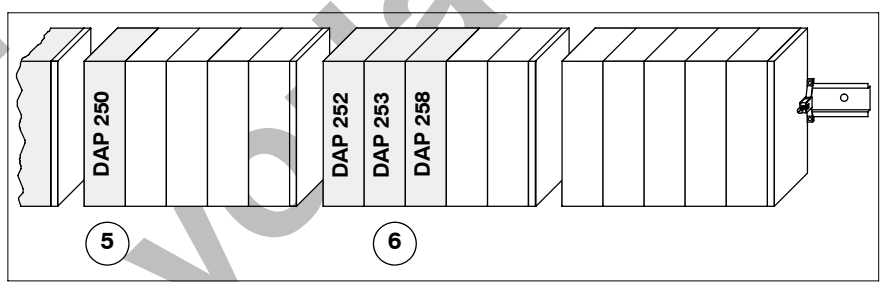
3.2.3 Connection Scheme of the Working Voltage Supply (US = 24 VDC)

The working voltages for two or more outputs are joined (corresponds to a group). Each group must be fused separately.
Please make sure that switching operations of inductive actuators do not cause unacceptable overvoltages that could result in damaging or destroying semiconductors in the programmable controller.

US = 24 VDC
The 24 VDC working voltage should come from a separate power supply unit. Configure additional power supply units for load currents >25 A.
According to VDE 0100 and VDE 0113 it is permissible to operate auxiliary circuits either grounded or non-grounded. For non-grounded operation, use an insulation monitoring device that will initiate a signal in case of an insulation error.

☞ **Note**
With a 24 VDC power requirement of <25 A for the entire system and an increased interference risk, the use of a single power supply unit is authorized.
Please refer to chapter "Configuration of Network Supplies", page 38.

Figure 15 Mapping example for the connection scheme of the working voltage supply



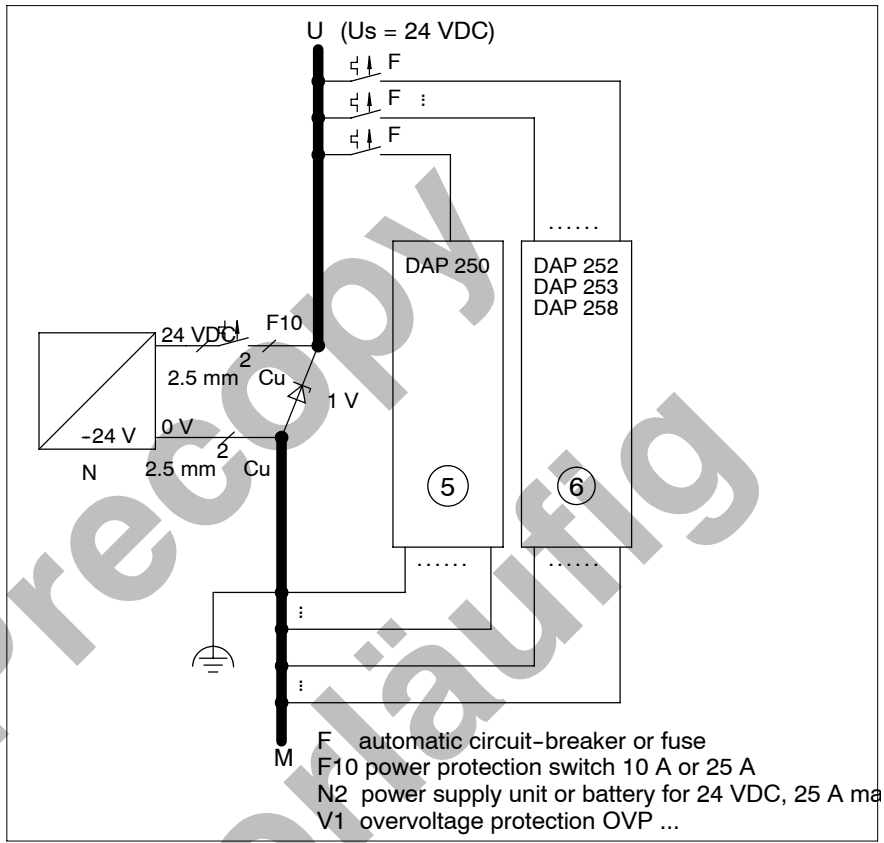
5

Refer to Detailed connection for modules with semiconductor outputs (US = 24 VDC)

6

Refer to Detailed connection for modules with relay outputs (US = 24 VDC)

Figure 16 Connection overview of power supply US (24 VDC)

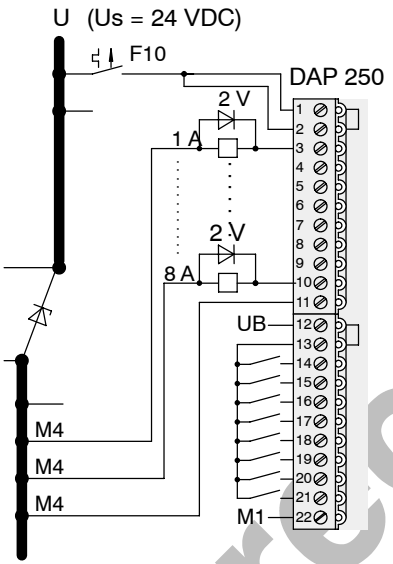


We recommend the distribution of the circuits according to the following detailed connection drawings:

The connection schemes provide additional information regarding measures to be taken according to the supply voltage, such as:

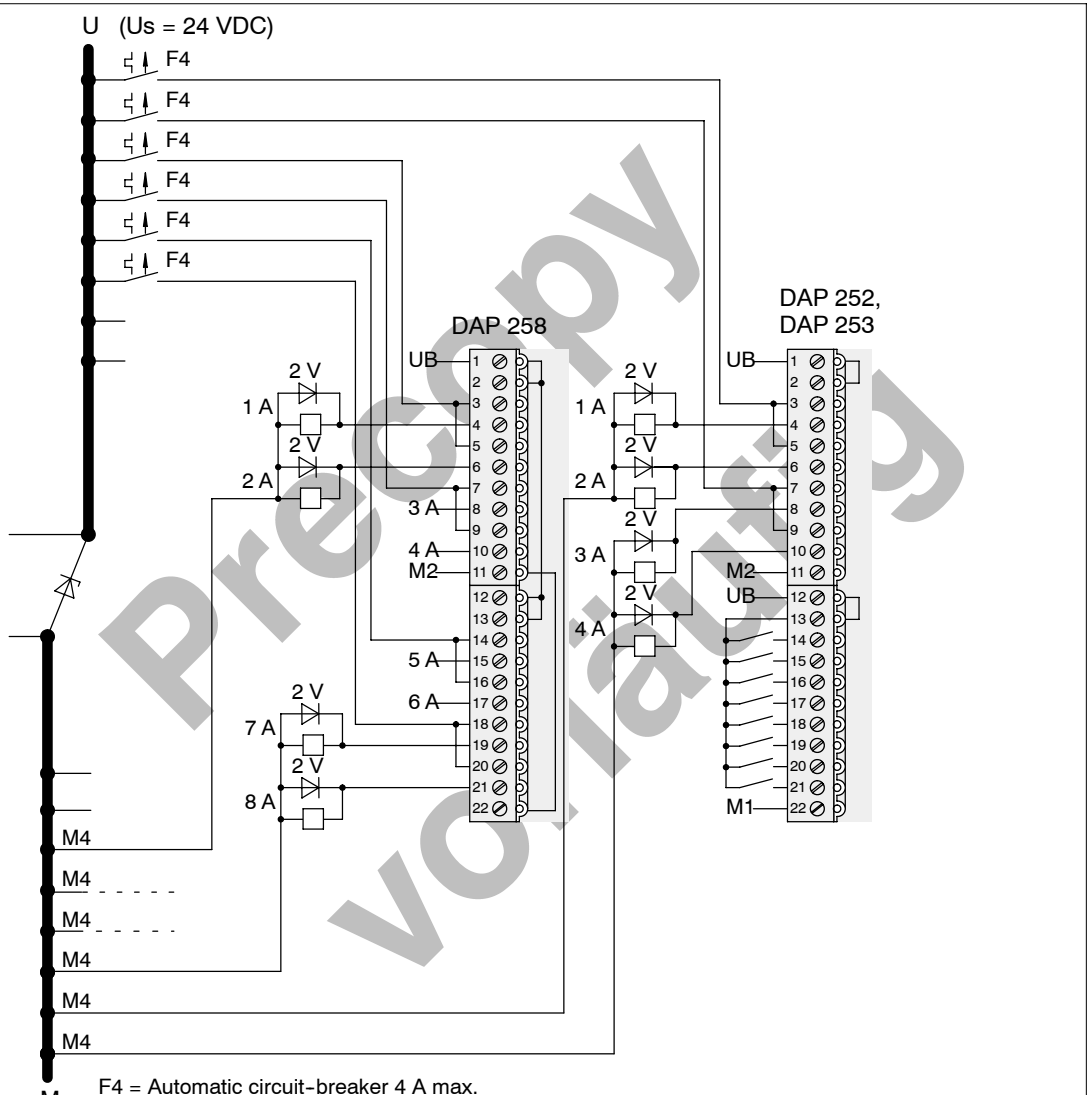
- Fuse protection
- Overvoltage protection
- Protective circuit made up of inductive actuators, etc.

Figure 17 Detailed connection for modules with semiconductor outputs (US = 24 VDC) (5)



F10 = automatic circuit breaker 10 A max.
V2 = clamping diode required if inductive loads are connected and if conventional contact elements
are in the output lines, e.g. for safety lock-outs. Perform the protective circuit directly at the inductance.

Figure 18 Detailed connection for modules with relay outputs (US = 24 VDC) (6)



3.3 Installation

3.3.1 Top hat rail

The TSX Compact can be installed onto the following top hat rails (refer to the figure):

- Clearance 7.5 mm as per DIN-EN 50 022
- Clearance 15 mm.

Figure 19 Top hat rail with 7.5 mm clearance (left) and with 15 mm clearance (right)

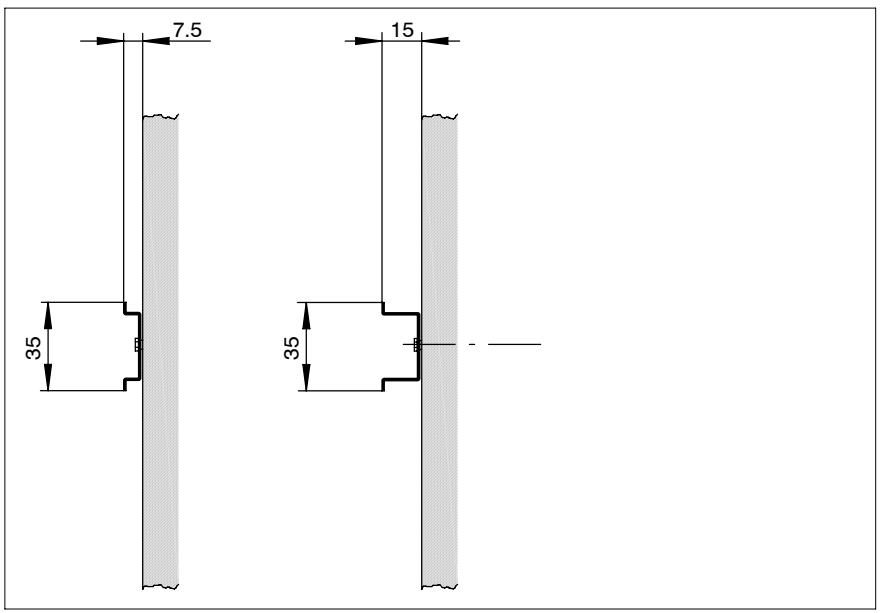


Figure 20 Drill holes for top hat rail and backplane in back panel mounting

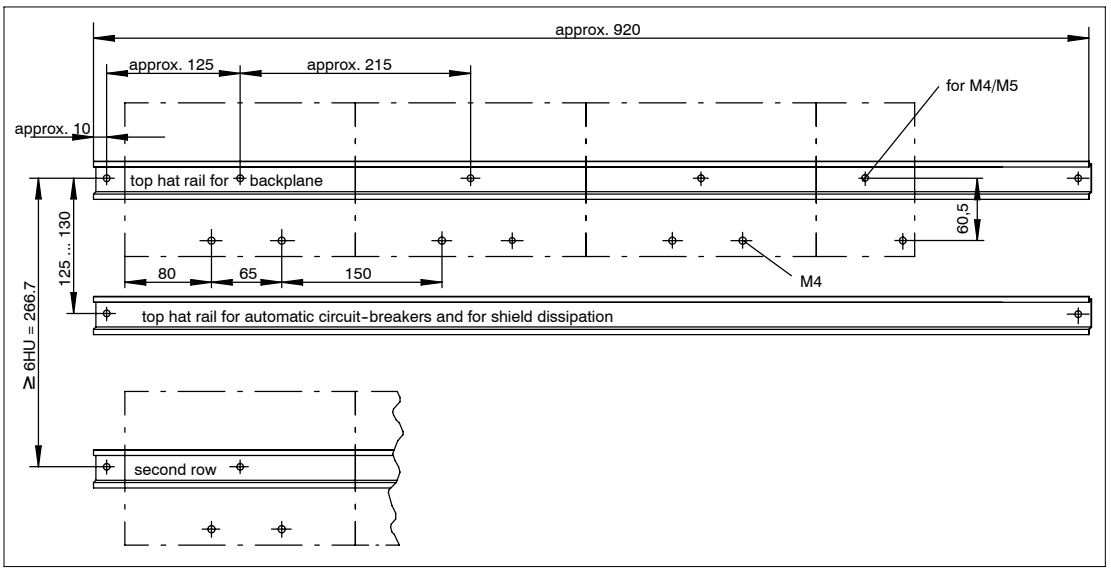
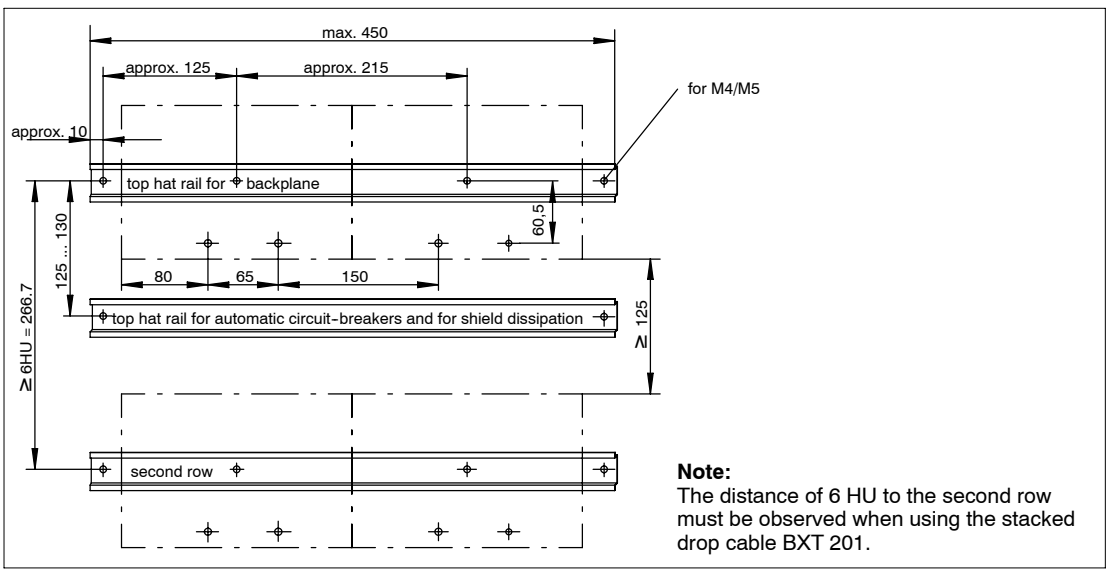


Figure 21 Drill holes for top hat rail and backplane in 19" cabinet mounting



Note:
The distance of 6 HU to the second row must be observed when using the stacked drop cable BXT 201.

3.3.2 Backplane

Backplane mounting
Fit the AS-HDTA-200, -HDTA-201, and -HDTA-202 backplanes onto the top hat rail in the following order (7.5 mm):

Step1

Pull off the two clamps located underneath the DTA.

Step2

Hang the backplane.
With 15 mm top hat rails:
First, enclosed spacer A must be snapped into place flush to the drillings in the rear of the DTA.

Step3

Swing the backplane towards the top hat rail and snap it in.

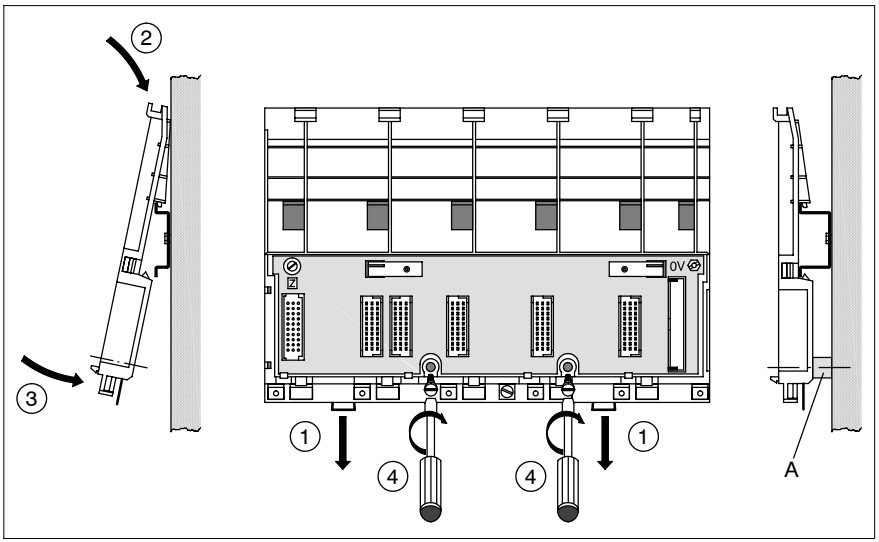
Step4

The backplane must also be secured using two screws (4 mm ø max.).
With 7.5 mm top hat rails as per DIN-EN 50 022: approx. 20 mm long
With 15 mm top hat rails: approx. 25 mm long.

Step5

Move the two clamps back into their initial position. Hang the backplane

Figure 22 Mounting the backplanes



Connecting the backplanes
Interconnect the backplanes as follows:

Step1

Mount expanding DTA flush onto joint top hat rail

Step2

Unlock and remove the cover of the bus connection

Step3

Slip on and lock the bus cable. Make sure the eject lever is flush with the plug-and-socket device after attaching the cable (ribbon cable or stacked drop layout cable BXT 201)

Step 4.1

Loosen both screws

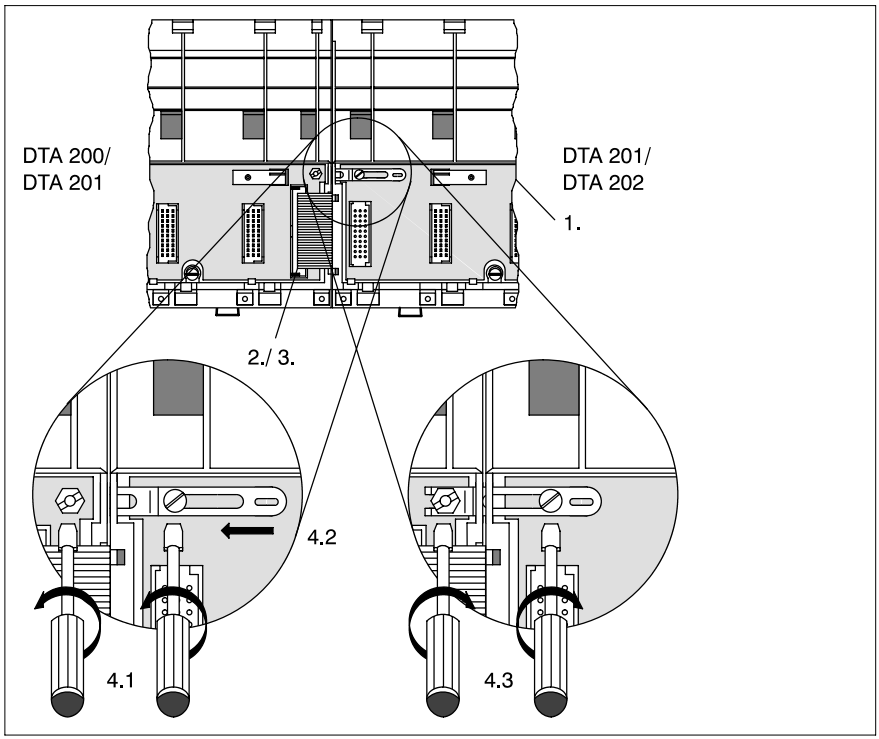
Step 4.2

Move 0V ground strap to the left

Step 4.3

Tighten both screws

Figure 23 Coupling DTA 200 or DTA 201 with DTA 201 or DTA 202

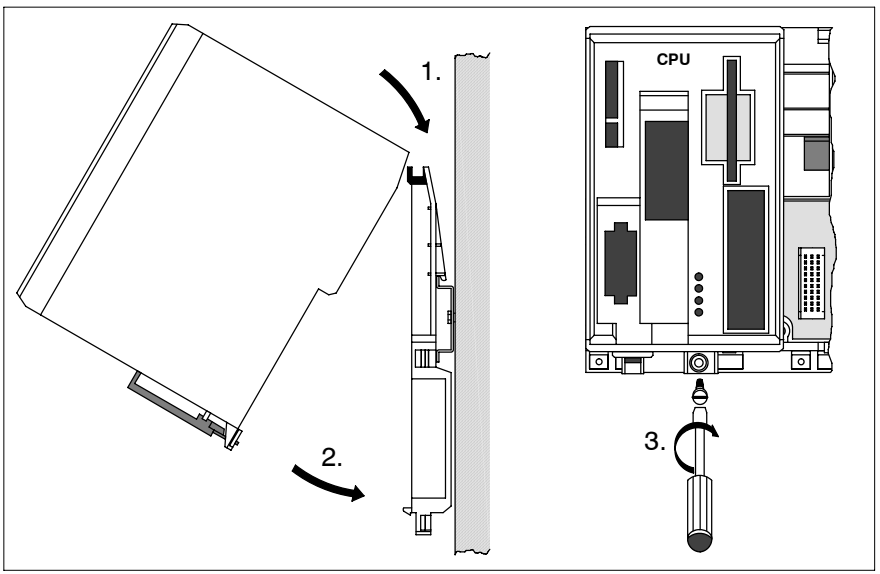


Both backplanes are now interconnected via the bus and ground strap.

Installation and connection of the backplanes using the BXT 201
Refer to Basic User Manual ”Modicon TSX Compact, Modular Programmable Controller”

3.3.3 Modules

Figure 24 Mounting the CPU



Mount the communications module and the CAN-TAP according to the description of module AS-BCAN-259 (starting on page 181).

Figure 25 Installation of remaining modules

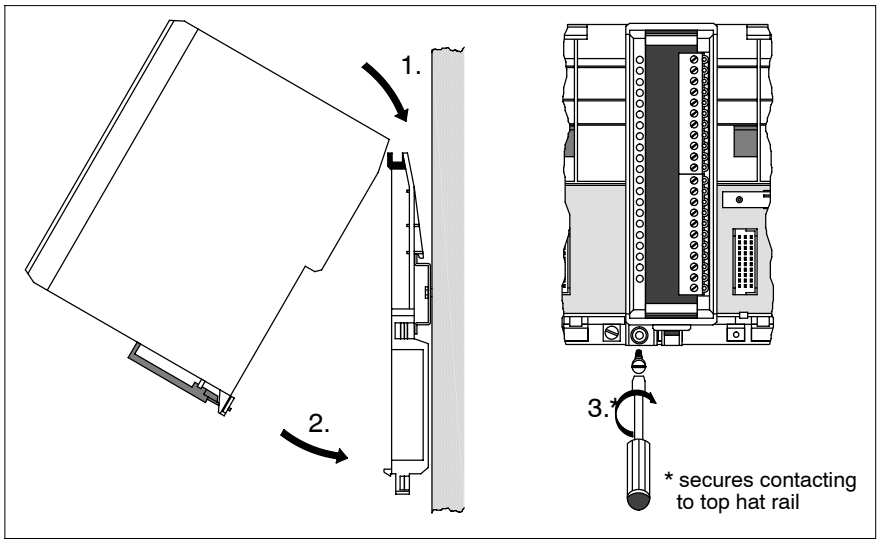
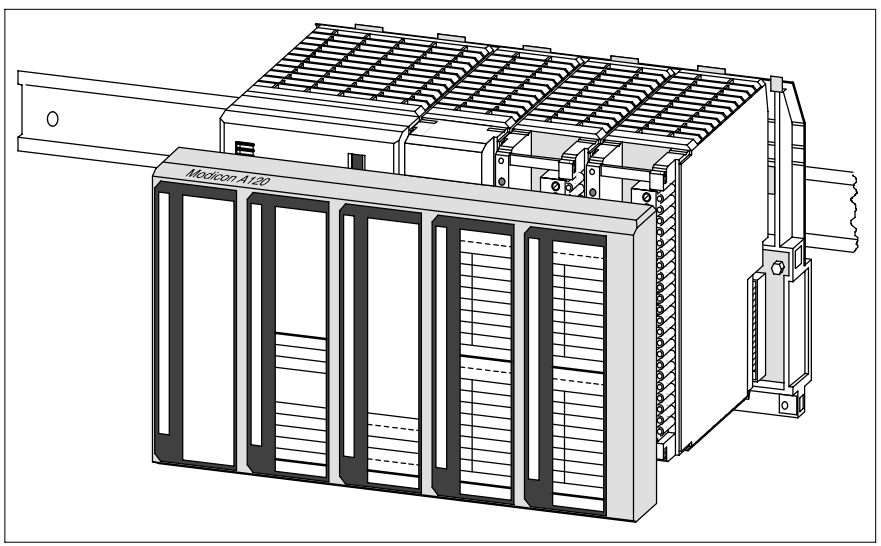
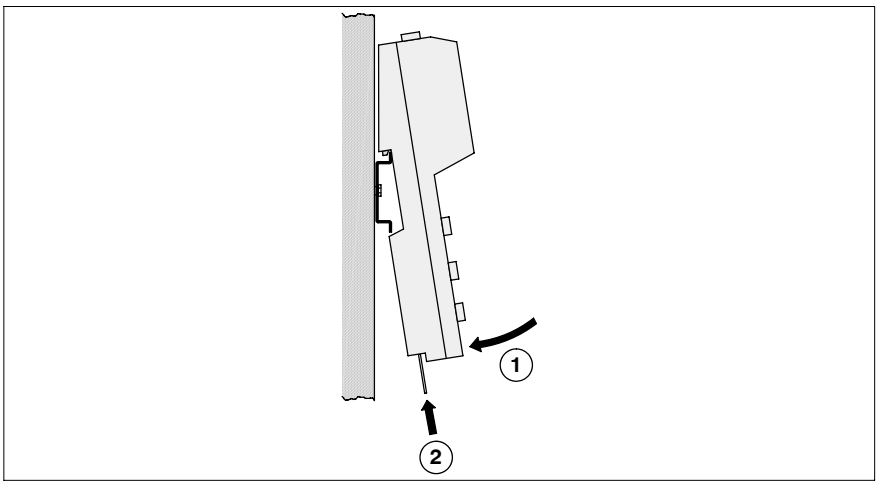


Figure 26 Completed installation of the Modicon TSX Compact



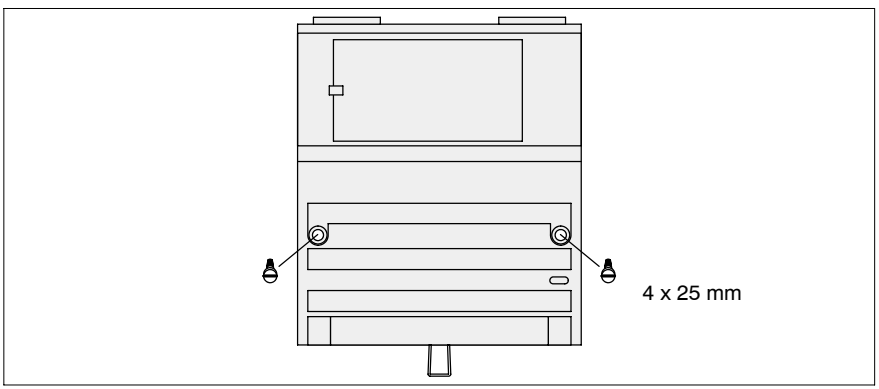
3.3.4 Mounting 470 IPS 258 00 and 470 NAV 511 00

Figure 27 Top hat rail mounting



The grounding spring integrated into the right back panel establishes the electric contact to the top hat rail.

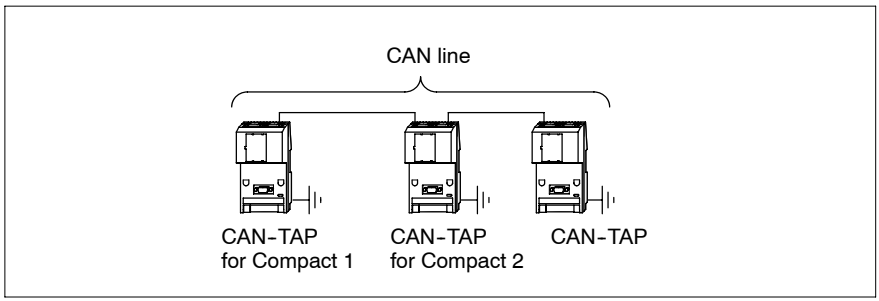
Figure 28 Installation on machine housing or wall



The screws are used to ground the module.

3.3.5 Installing the CAN Line

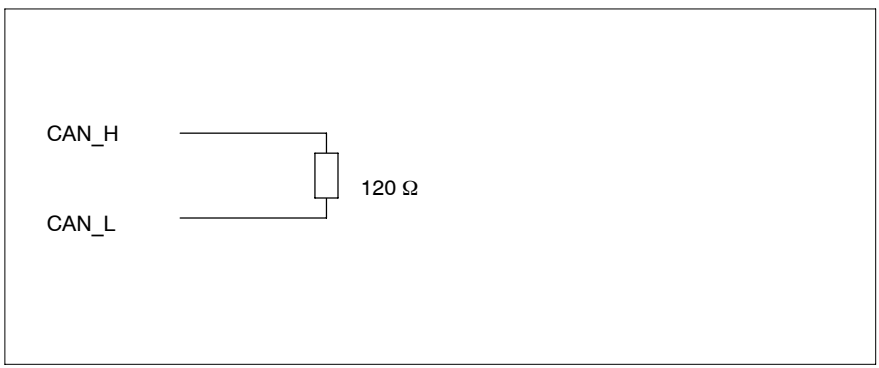
Figure 29 Example of an CAN line



CAN termination
The final nodes (Compact 1 and Compact 2) for Compact 3 must be equipped with terminators (CAN terminators):

- At beginning of bus (Compact 1)
- At end of bus (Compact 3)

Figure 30 Electrical structure of the terminator



CAN connection
The user will have to build the CAN cable to network all individual nodes.
Required installation material:

- CAN-Bus cabel ”UNITRONIC-Bus FD P LD 2 x 2 x 0.25 sq mm” (2 twisted pairs with common shield; the characteristic wave impedance amounts 100 through 120 Ohm)
- Male connector assembly set (pins) ”748046-1” for outgoing CAN
- Female connector assembly set (sockets) ”748047-1” for incoming CAN

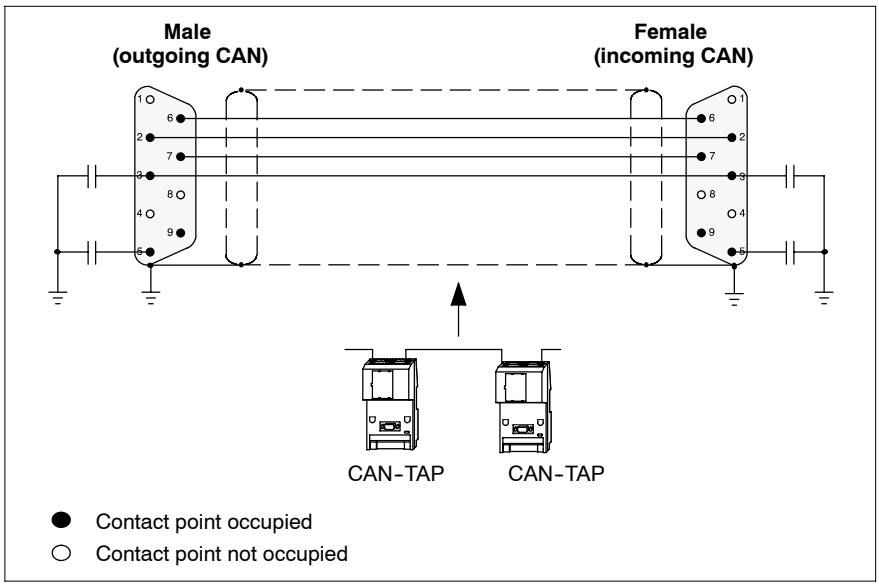
The above mentioned cable is suitable for the most of the applications if the length of the cable will not decrease 100 m and the number of nodes will not decrease 64. General recommendations are:

Length of cable	32 Nodes	64 Nodes
100 m	0.25 sq mm	0.25 sq mm
250 m	0.34 sq mm	0.5 sq mm
500 m	0.75 sq mm	0.75 sq mm

You will find the references of the suppliers of installation hardware in the appendix ”Supplier References” (page 228).

Perform the wiring of the individual cables as follows:

Figure 31 CAN cable wiring (grounding and housing)



Pin	Signal	Meaning
1	-	Reserved
2	CAN_L	CAN_L bus line (dominant low)
3	CAN_GND	CAN ground
4	-	Reserved
5	CAN_SHLD	Optional CAN shield
6	GND	Optional CAN ground
7	CAN_H	CAN_H bus line (dominant high)
8	-	Reserved
9	CAN_V+	Optional external positive supply

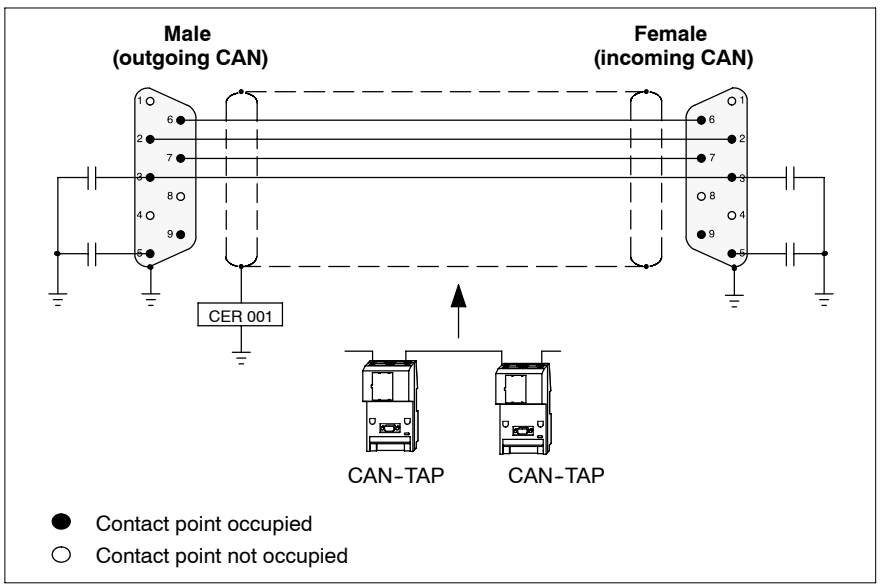
CAN Grounding (Through the Housing)
Within the respective CAN module, the male and female connectors are connected to the top hat rail and to the PE port directly with the ground contact springs. The shielding of the CAN cable must be connected directly with the male and female connector housing (refer to figure ”CAN cable wiring”). Through the connector union, via the top hat rail the shielding is connected at both ends with the ground, also refer to chapter ”Grounding”.

☞ **☞Note**
For further details and how to open the TAP’s housing, please refer to Appendix AS-BCAN-259.

Optional: Galvanized CAN Grounding
Optional each cable between two TAP's can be grounded directly via CER 001.

Perform the wiring of the individual cables as follows:

Figure 32 CAN cable wiring (galvanize grounding)



Pin	Signal	Meaning
1	-	Reserved
2	CAN_L	CAN_L bus line (dominant low)
3	CAN_GND	CAN ground
4	-	Reserved
5	CAN_SHLD	Optional CAN shield
6	GND	Optional CAN ground
7	CAN_H	CAN_H bus line (dominant high)
8	-	Reserved
9	CAN_V+	Optional external positive supply

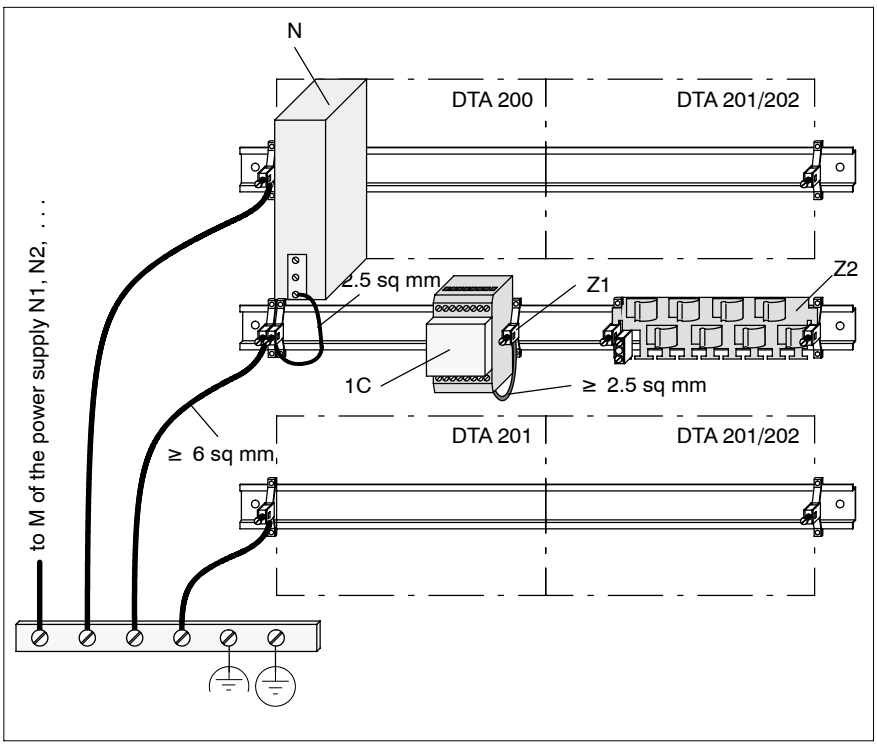
☞ **Note**
For further details and how to open the TAP's housing, please refer to Appendix AS-BCAN-259.

3.3.6 Grounding

Grounding the Compact components
The grounding of the 0 V on the backplane is already preset when delivered.

For uninterrupted operation, take the following grounding measures (also refer to chapter ”Grounding and EMC Measures” in the Basic User Manual ”Modicon TSX Compact, Modular Programmable Controller”).

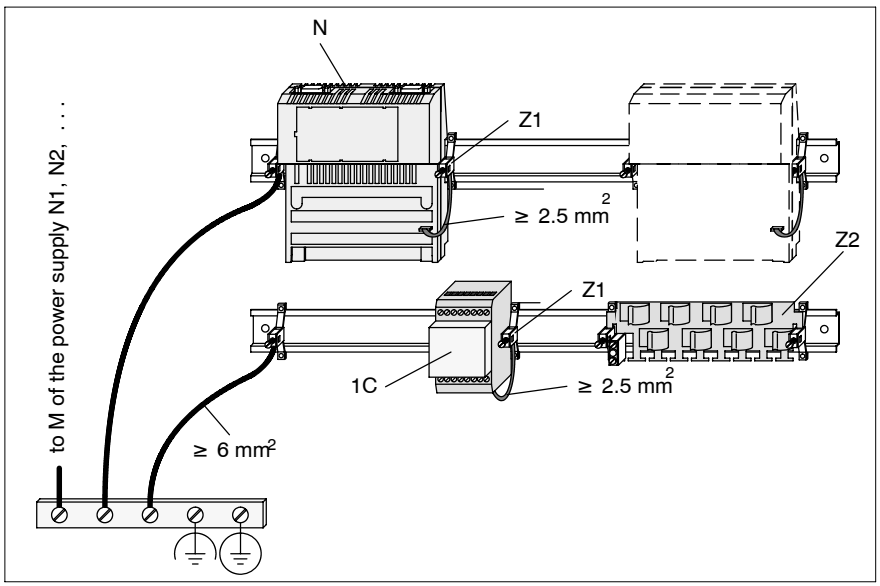
Figure 33 Grounding the top hat rails and Compact components



Legend	
1C	Capacitive discharge terminal GND 001 (optional)
N	Power supply module CPU
Z1	Grounding clamp EDS 000
Z2	Cable grounding rail CER 001 (optional, for grounding of analog lines)

Grounding TIO components 470 IPS 258 00 and 470 NAV 511 00
For uninterrupted operation, perform the following grounding measures. Make sure the contact is properly established!

Figure 34 Grounding the top hat rails and TIO components



Legend	
1C	Capacitive discharge terminal GND 001 (optional)
N	470 IPS 258 00 (power supply module), 470 NAV 511 00 (CAN-TAP)
Z1	Grounding clamp EDS 000
Z2	Cable grounding rail CER 001 (optional, for grounding of analog lines)

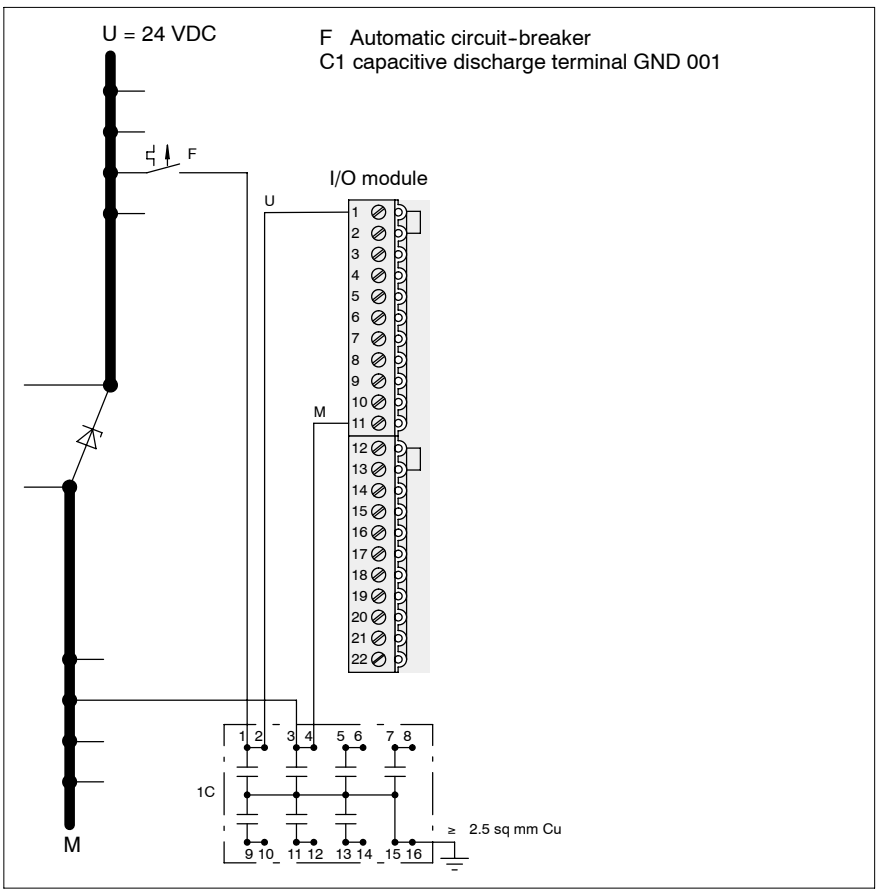
Caution
Heavy EMC interference can lead to problems with the telegram traffic to the TIO modules. This leads to intermittent absence of inputs / outputs in the TIOs.

You must therefore make sure that the top hat rail mounted onto the TIO is grounded adequately. With more recent TIOs, the possibility for grounding through the fixed connector should be used.

Improvement of the EMC stability on the modules

To improve EMC stability on the modules it is recommended that the U and M connections used here have a capacitive discharge that is as short as possible from terminal to functional ground. This is the purpose of the capacitive discharge terminal GND 001, refer to the figure below.

Figure 35 Improvement of EMC stability on the modules

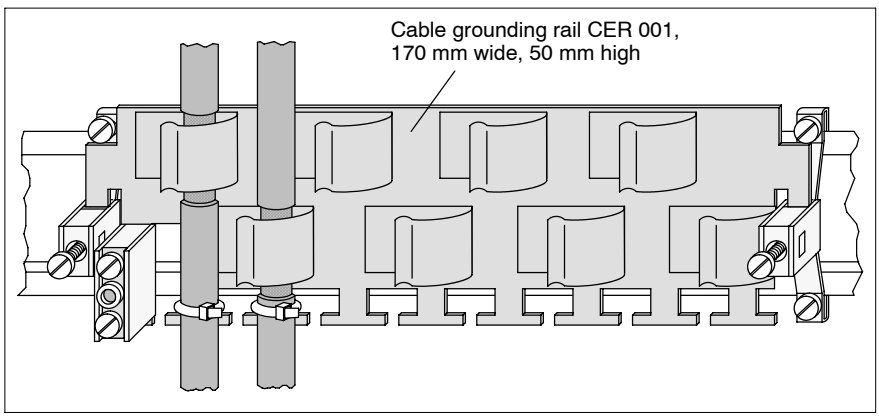


In an interference-prone environment, it is recommended to increase the capacity on the C1 from 2.2 nF to 22 nF.

Grounding the shielded cable lines
The shielded cable lines must be grounded as follows:

- Run the shielded cables via the cable grounding rail CER 001
- Remove the shield insulation at the level of the corresponding cable clamp
- Press the cable with the uncovered shield into the cable clamp (contact to top hat rail)
- Use cable clips to strain-relieve the individual cables according to the figure

Figure 36 Grounding the I/O line shields to the ADU, DAU



3.3.7 Dimension Drawings

Figure 37 Dimension drawing of the Modicon TSX Compact

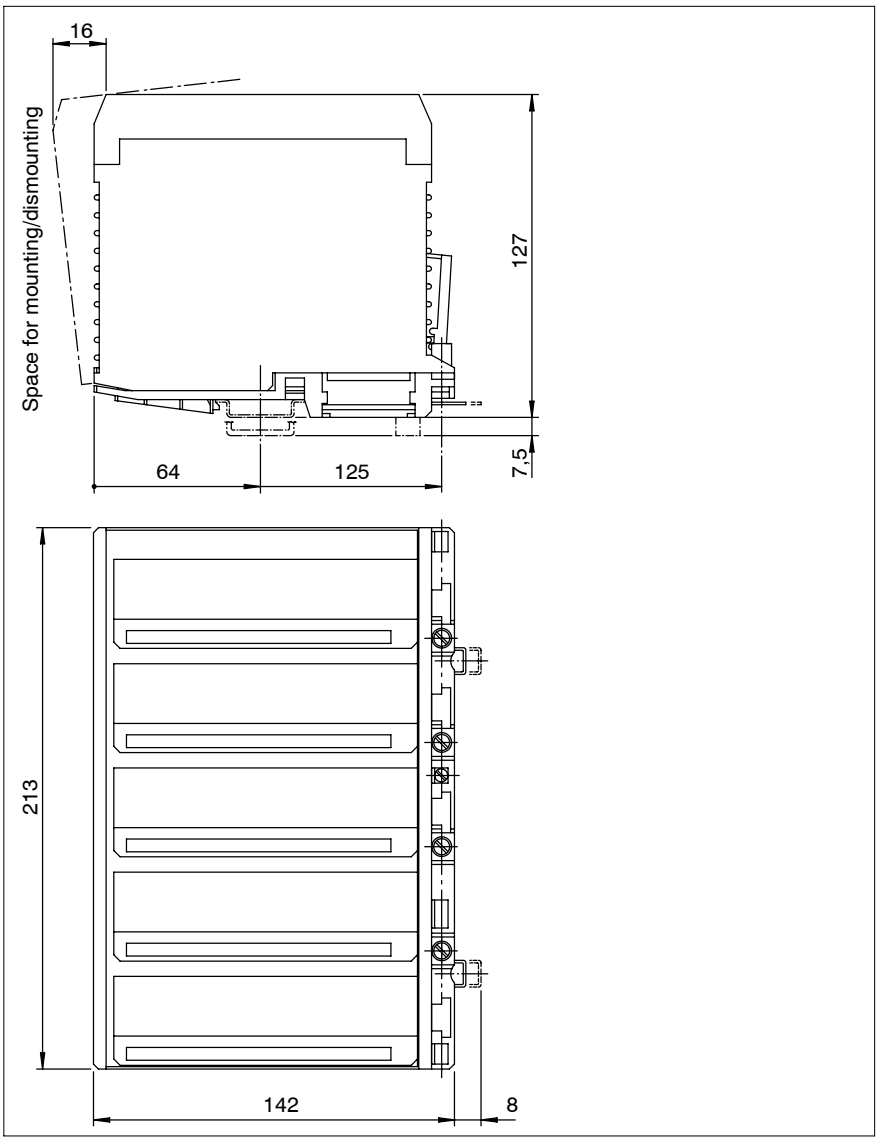
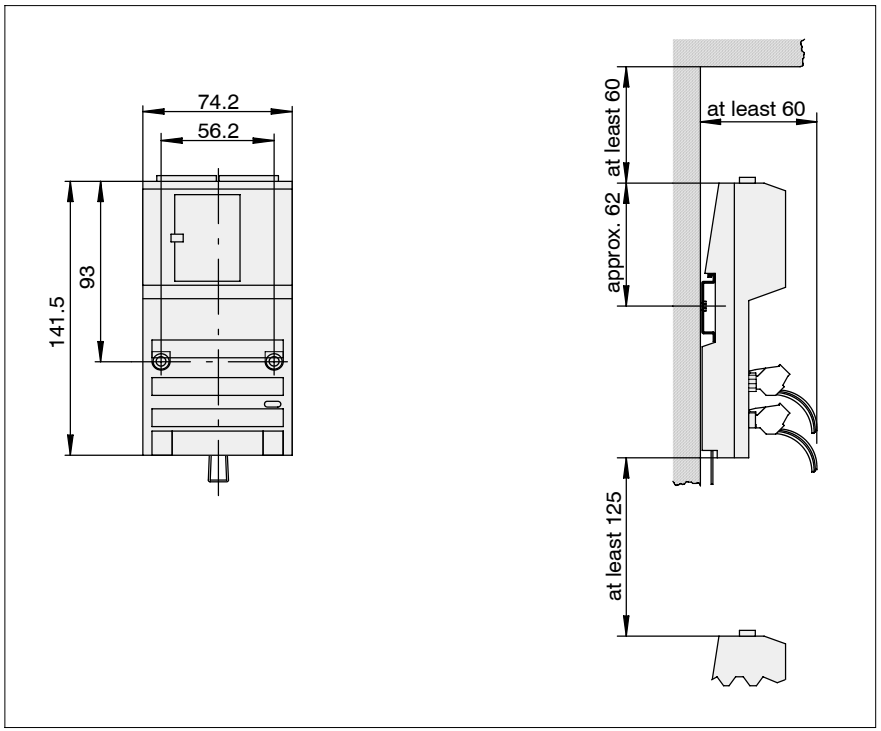
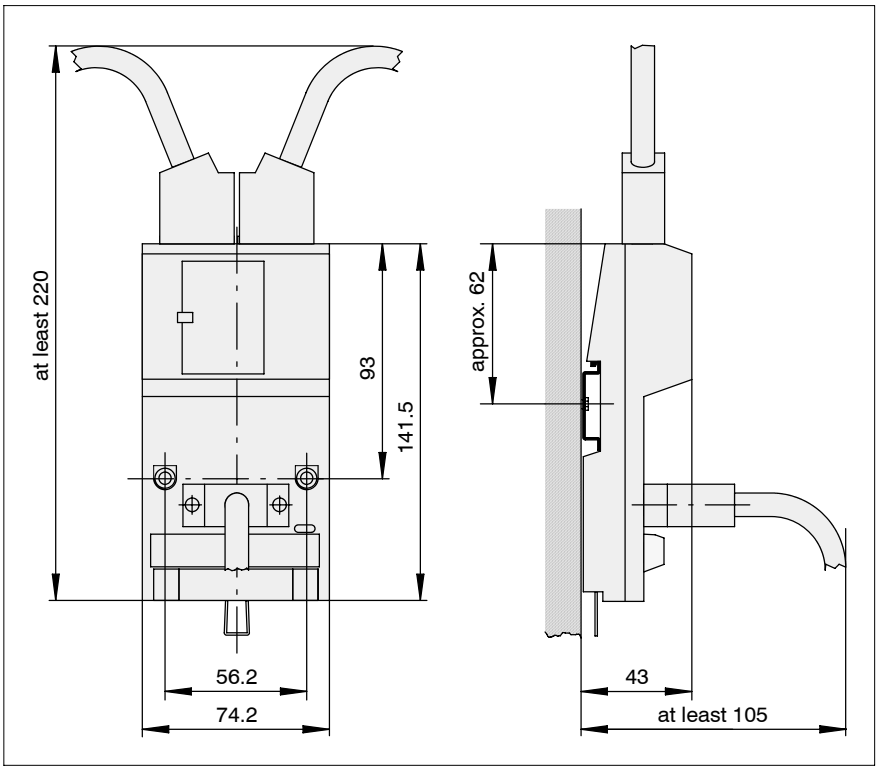


Figure 38 470 IPS 258 dimension drawing (units in mm)



The vertical distances must be observed for ventilation purposes!

Figure 39 470 NAV 511 dimension drawing (units in mm)



Software Installation

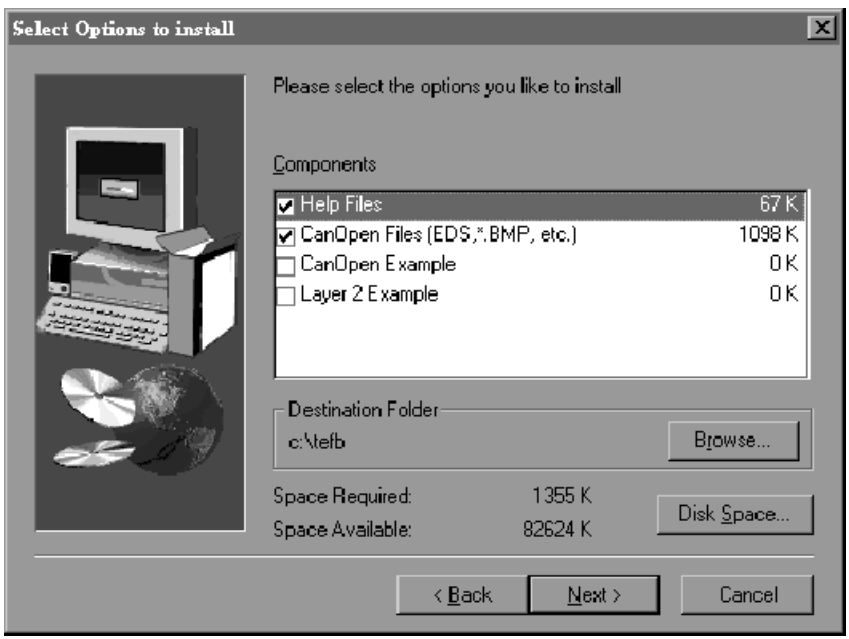
4

4.1 CANopen Installation Routine

In order to operate the AS-BCAN 259 Concept 2.1 must be installed on the programming panel. If you intend to use the AS-BCAN 259 within a CANopen network it is recommended to install the CANopen network configuration tool prior to installing the EFB's for AS-BCAN 259.

Along with the AS-BCAN 259 two 3,5" disks have been shipped. To start the installtion insert the disk labled disk 1 into the floppy drive and execute the program SETUP.EXE using the start->execute function from the taskbar. Make sure that concept is not running.

After having selected the Concept 2.1 installation path your have several options to install:



It is recommended to install the respective example programs for a better understanding of the system and as a basis for application programming.

If you decided on installing the CANopen related files you are prompted to enter your CANopen network configuration tool installation path. Setup will install all related files into the subdirectory \EDS and \EXEC. If you have not installed the CANopen network configuration tool yet you may use any existing directory or create a new one.

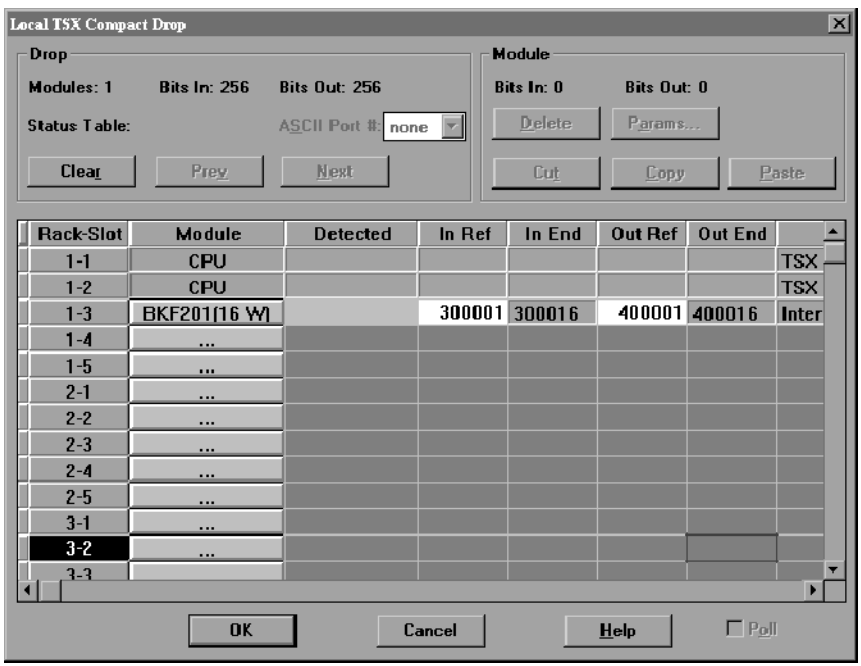
After finishing the installation you may take look at the provided help file which is installed into Concept 2.1 installation directory.

4.2 Layer 2 Applications

This chapter provides information on how to program simple CAN applications. Because this type of application uses only messages with user defined identifiers and data contents and no standardized Layer 7 protocol is employed it is also referred to as Layer 2 application.

4.3 Configurator

When using the AS-BCAN 259 it is a necessarry to enter the module into the I/O-map by selecting ”BKF201(16W)” from I/O-modules selection. This indicates that the corresponding slot is used and therefore not available for other modules. The 3XXXX and 4XXXXX references that must be assigned to this module should not be used in PLC program.



You do not need to use the Params option in the I/O-map dialog.

EFB's for AS-BCAN-259

5

This type of application requires three different EFB's:

CAN_CFG	Used for initialization of the AS-BCAN-259
CAN_SND	Used to send user defined messages
CAN_RCV	Used to receive user defined messages

They can be found in the CAN library in a group named Layer 2.

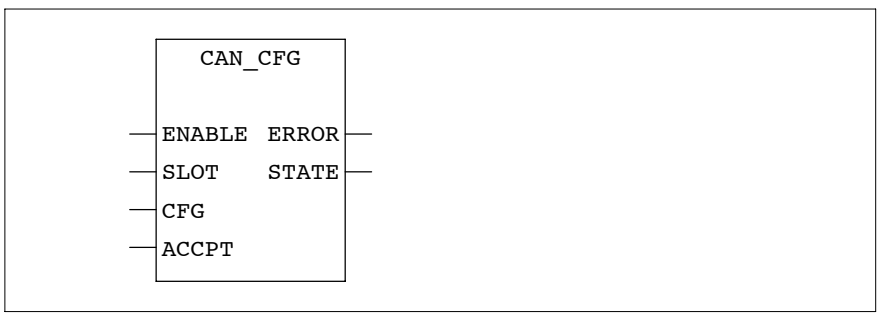
5.1 CAN_CFG

5.1.1 Short Description

This EFB enables Layer 2 functionality. It must be used in applications that do not require CANopen functionality. It defines parameters of Layer 2 operation such as baudrate and message acceptance. CAN_CFG must be used exactly once within the PLC program for every AS-BCAN-259 installed. CAN_CFG builds a list of Layer 2 messages that are to be received in the module's DPM based on the data provided by the ACCPT input. Therefore it should be executed before CAN_RCV.

5.1.2 Layout

Symbol



Description of the Parameters

Parameter	Data Type	Meaning
ENABLE	BOOL	Enable EFB, every rising edge will reconfigure the module
SLOT	UINT	Slot where the AS BCAN 259 is located (3...5)
CFG	CAN_CFG_DATA	Configuration data
ACCPT	CAN_ACCPT	Message acceptance data
ERROR	BOOL	Error occured
STATE	UINT	Current status or errorcode

5.1.3 Datatype CAN_CFG_DATA

This structure describes the mode of operation of the AS BCAN 259 module. It is evaluated when ENABLE is triggered by a rising edge. The entries are as follows:

Entry	Datatype	Meaning	Comment
PROTOCOL0	UINT	Protocol selection channel 0	0 = Layer 2 only 1 = CANopen + Layer 2
BAUD0	UINT	Baudrate channel 0	Baud rate in kBit/s (10, 20, 50, 125, 250, 500, 800, 1000)
PROTOCOL1	UINT	Protocol selection channel 1	0 = Layer 2 only
BAUD1	UINT	Baudrate channel 1	Baud rate in kBit/s (10, 20, 50, 125, 250, 500, 800, 1000)
RELAISCTL0	UINT	Relais operation control word 0	
RELAISCTL1	UINT	Relais operation control word 1	
RELAISDATA	UDINT	Relais operation data	e.g. Identifier of message to be monitored
NUMDIGIN	UINT	Number digital inputs	(CANopen only) 1024 max.
NUMDIGOUT	UINT	Number digital outputs	(CANopen only) 1024 max.
NUMANAIN	UINT	Number analog inputs	(CANopen only) 128 max.
NUMA-NAOUT	UINT	Number analog outputs	(CANopen only) 128 max.
NUML2MSG	UINT	Number of Layer 2 messages to receive, 73 max	

5.1.4 Relais operation control

These parameters define the operation mode of the AS-BCAN-259 internal relais or they may be used to enable passive nodeguarding. The least significant byte of RELAISCTL0 defines the global operation mode.

Mode	Operation
0	relais off
1	monitor CAN message
2	all nodes configured and network started (CANopen on channel 0)
3	flash if module is healthy
4	copy module firmware version into RELAISCTL1 (format XX.XX)
5	relais off, activate passive nodeguarding (CANopen)

The most significant byte of RELAISCTL0 hold additional information for operation mode 1 and 2:

Bit	Meaning if bit is set to TRUE
31 (MSB)	channel select (0 = channel 0, 1 = channel 1)
30	message is RTR frame (layer 2 only)
29	message is extended identifier (layer 2 only)
28	If mode 1 is selected 0 = after timeout has occured and message is received switch on relay again 1 = after timeout has occured relay remains in inactive state until module is restarted

If mode 1 is selected RELAISCTL1 holds the timeout value in milliseconds for the CAN message to be monitored. RELAISDATA is the identifier of this message. If mode 4 is selected RELAISCTL1 will receive the firmware version for the module. If mode 5 is selected RELAISCTL1 holds the timeout value in milliseconds for the CANopen nodeguard message to receive.

5.1.5 Data Type CAN_ACCPT

CAN_ACCPT is a table of 73 entries of the type CAN_MSG that describes which Layer 2 messages are accepted by the AS-BCAN-259 for reception from the network. Only messages entered in this table can be received by CAN_RCV.

There is one line for every message. The entries are as follows:

Entry	Data Type	Meaning
CHANNEL	UINT	Channel to receive data from (0,1)
IDENT	UDINT	Message identifier
EXT	BOOL	Message has extended frame
RTR	BOOL	Message is RTR frame

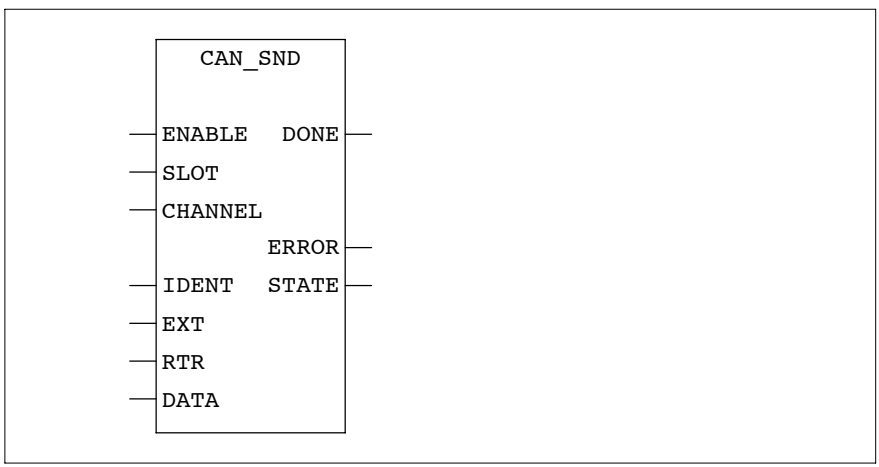
5.2 CAN_SND

5.2.1 Short Description

This EFB enables the transmission of simple Layer 2 messages. The parameters are as follows:

5.2.2 Layout

Symbol



Description of the Parameters

Parameter	Data Type	Meaning
ENABLE	BOOL	Start transmission (rising edge)
SLOT	UINT	Slot where the AS BCAN 259 is located (3...5)
CHANNEL	UINT	Channel for transmission (0,1)
IDENT	DINT	Message identifier
EXT	BOOL	Use extended identifier (29 bit)
RTR	BOOL	Send RTR frame (DATA is ignored)
DATA	ANY	Data to be transmitted (up to 8 byte) The number of bytes transmitted is determined by the size of DATA variable. If the size of the DATA variable is greater than 8 then DLC ist set to zero and and no data bytes are transmitted
DONE	BOOL	Function completed (active for one scan)
ERROR	BOOL	Error occured
STATE	UINT	Current status or errorcode

☞ **☞Note**
Even when transmitting RTR messages a length information is required to generate the DLC (Data Length Code) field entry.

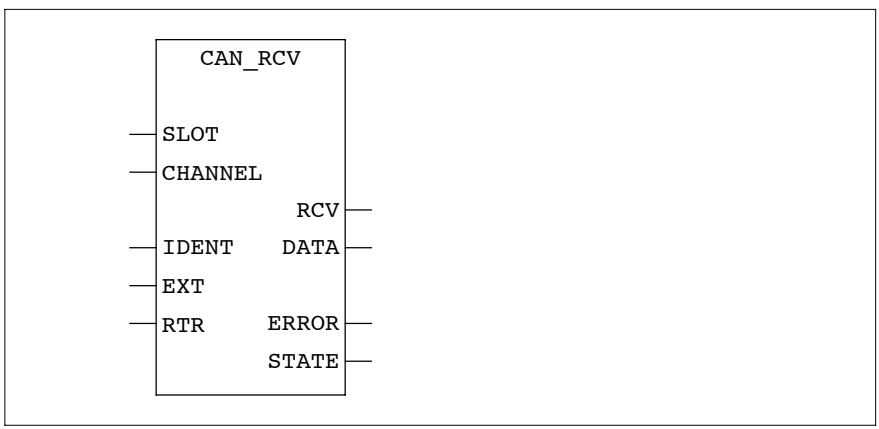
5.3 CAN_RCV

5.3.1 Short Description

This EFB enables the reception of simple Layer 2 messages. Only messages that match the given parameters and that have been listed in the ACCPT (Message acceptance) field of the CIA_SVR or CAN_CFG EFB's are accepted. CAN_CFG or CIA_SVR must be executed before CAN_RCV can be used. The parameters are as follows:

5.3.2 Layout

Symbol



Description of the Parameters

Parameter	Data Type	Meaning
SLOT	UINT	Slot where the AS BCAN 259 is located (3...5)
CHANNEL	UINT	Channel for transmission (0,1)
IDENT	DINT	Message identifier
EXT	BOOL	Extended identifier (29 bit)
RTR	BOOL	RTR frame
RCV	BOOL	Matching message received (active for one scan)
DATA	ANY	Data received (up to 8 byte) The number of bytes to be received is determined by the size of DATA variable. If the size is greater than 8 a frame of zero length is expected and no data will be copied
ERROR	BOOL	Error occured
STATE	UINT	Current status or errorcode If ERROR is zero, STATE gives the Index into the Message acceptance data field

Note

Even when receiving RTR frames a length information is required to check the DLC (Data Length Code) field entry. Therefore do not omit the DATA parameter.

5.4 CANopen

This chapter provides information about how the AS-BCAN-259 is integrated into a CANOpen network. It describes the implemented functionality and how it is used.

The AS-BCAN-259 can have several functions within a CANopen network:

CMT Master

Store the CANopen configuration of all or selected devices and downloads them into the devices

NMT Master

Start and stop all network devices and monitors them using the CANopen defined nodeguarding mechanism

NMT Slave

Send and receive PDO's to/from the network

Of course, a combination of the above mentioned functions is also possible.

Moreover if the module is used for PDO communication it may operate in two modes with respect to acquistion and distribution of PDO data. These two modes are referred to as "Network mode" and "High density mode"

Network Mode (NWM) receives data from the network and stores them in a datastructure of the *.DTY provided datatype CANOPEN_DATA_SLOT0. Data send to the network are taken from this structure. A PLC application using this mode needs PLC programming in order to drive PLC outputs and to route PLC inputs to the network

High Density Mode (HDM) routes incoming data from the network directly to PLC outputs. PLC inputs are routed directly to the network. This mode requires a very simple PLC program only and is used in those cases where the PLC simply acts as a complex I/O module.

Both modes may be combined.

Note
The Object Dictionary of AS-BCAN-259 you will find in Appendix A.

5.5 ProCanOpen

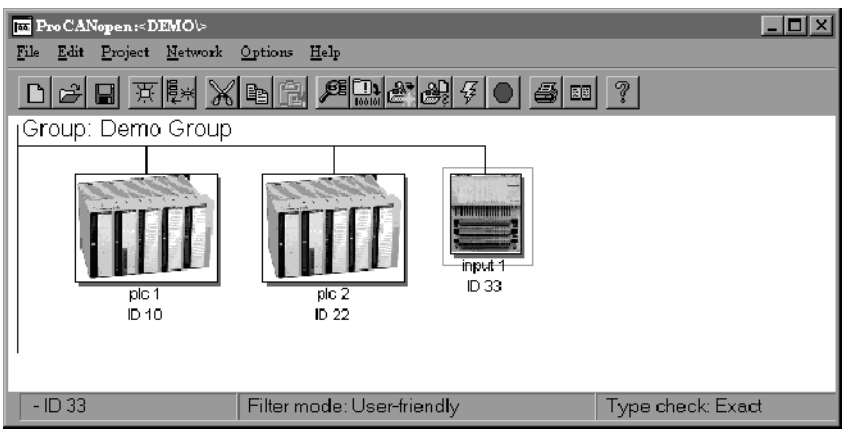
If the AS-BCAN-259 is to be used within a CANopen network a network configuration tool is necesarry. The tool ProCANopen Version 2.0B or higher of Vector Informatik GmbH, Stuttgart has been tested with this module and is highly recommended.

This chapter describes the basic steps that need to be taken in order to integrate the AS-BCAN-259 into the network. For details refer to the provided ProCANopen documentation.

5.5.1 Configure Network

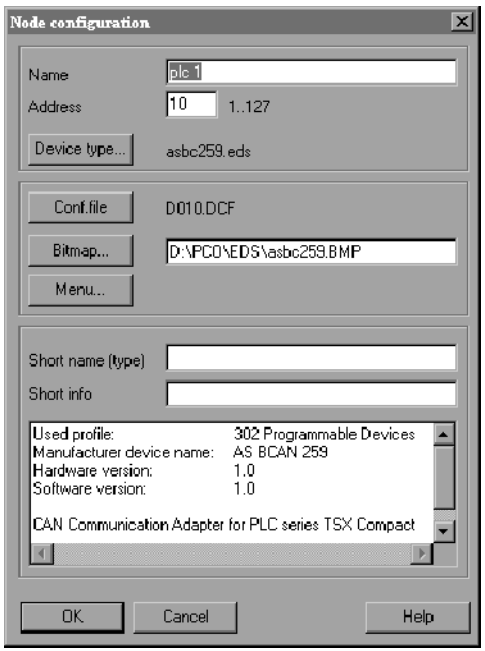
Network configuration is done by adding nodes to an empty network and assigning node id's, names and groups to them.

ProCANopen has the ability to scan the network for installed nodes. This is the most convenient and also the safest way to add nodes to the network. If you intend to use this feature make sure that all connected devices have a different node id and the same baudrate. The result may look like this :



If the ASBC259.EDS file of AS-BCAN-259 is located in the ProCanopen \EDS subdirectory and the module is configured by the CIA_SVR EFB (see chapter CIA_SVR) the module will be recognized by ProCANopen.

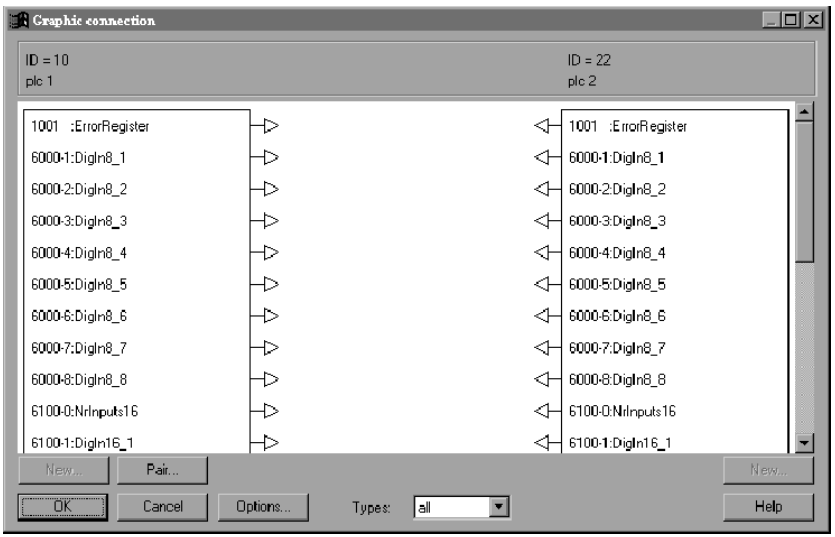
If you decide on entering nodes manually you need to add nodes by using the new node menu option from the main menu and configure the node using the configuration dialog available from the node's context menu.



If you intend to use the AS-BCAN-259 as the CMT master notify ProCANopen by entering the appropriate data into the Global Configuration Dialog. Only one node may be the CMT manager.

5.5.2 Variable Connections

Once all nodes are configured you may start to assign the connections beween nodes by either using the graphical connection or entering the connection using the connection dialog. These options can be selected by right-clicking on the corresponding node.



New variables in the AS-BCAN-259 are created by clicking on the New button in the graphical connection dialog. If two AS-BCAN-259 module are to be connected click on the Pair button. In either case it is possible to assign a name to the variable within the AS-BCAN-259. This variable must only exist once within a single AS-BCAN-259 as it will be used in the corresponding Concept program. Not adhering to this rule will prevent the variables from being accessible from within the Concept application. Note that variable names can be changed by the user anytime after the connection has been made by using the node's variable list dialog or - preferably - the device access dialog.

5.5.3 The slavecfg Tool

Using the device access dialog of the AS-BCAN-259 you may assign NMT and CMT specific parameters according to the object dictionary listed above.

In order to symplify NMT parameter setting you may select index 1F80H and click on the symbolic button. The appearing dialog enables you to set the NMT master guarding parameters to the same value for all slaves in the network. You may also select the NMT master to start all nodes simultaneously. It is recommed to use this dialog and afterwards change those entries for nodes that need different guarding parameters.

Still, the entries in the corresponding configurations of the network NMT slaves need to be entered so as to enable guarding error reactions. The option "Config all slaves" which is available by right-clicking on the AS-BCAN-259 will start a tool that drastically speeds up this task. You need to save the network before performing this operation. The tool will set all guarding parameters in the network.

If the option "Derive guarding settings from NMT Mastr" is selected the resulting slave's entries will be exactly the same as the corresponding master's entries of index 1F80H. If the option is not selected the entries will be taken from the dialog's appropriate entry fields. All nodes on the network except the selected AS-BCAN-259 will be affected.

5.5.4 Downloading the configuration into AS-BCAN-259

After finishing the actual configuration the network configuration is downloaded to the AS-BCAN-259 that acts as the CMT/NMT master. Select "Store in network" from the "Network" menu. Before starting the operation click on the Info button to check the size of the actual configuration that will be downloaded. Currently the maximum configuration size supported is 16384 byte. After powercycling the AS-BCAN-259 all nodes in the network will be configured according to entries in the obeject dictionary of the module.

5.5.5 Generating the *.DTY File

In order to access network data in NWM from within concept a special datatype must be created. This is done by selecting "DTY Generator" from the AS-BCAN-259 context menu. A file named DXXX.DTY is created in the network's subdirectory. XXX is the node id of the AS-BCAN-259.This file specifies a variable type named CANOPEN_DATA_SLOT0. By connecting an instance of the datatype to the NWK_DATA pin of the CIA_SVR EFB the transfer of data from the CANopen network to the plc's state memory and vice versa will be enabled.

The *.DTY file must be copied to the local DFB directory of the concept project the AS-BCAN-259 is associated with.

☞ **Note**
Because the datytype and therefore the *.DTY file is unique for every AS-BCAN-259 concept projects for PLC's within the same network must not reside in the same subdirectory.

If you intend to use more than one AS-BCAN-259 in one PLC as CANopen nodes you need to merge the resulting *.DTY files and rename the datatype CANOPEN_DATA_SLOT0 to e.g.
CANOPEN_DATA_SLOT1, CANOPEN_DATA_SLOT2, CANOPEN_DATA_SLOT3.

CANopen Integration into Concept

6

This chapter describes how CANopen is integrated into the IEC 1131 environment of Concept 2.1. It explains which Elementary Function Blocks (EFB's) are used and what type of variables are necessarry.

6.1 Configurator

When using the AS-BCAN-259 it is a necessarry to enter the module into the I/O-map by selecting ”BKF201(16W)” from I/O-modules selection. This indicates the the corresponding slot is used and therefore not available for other modules. The 3XXXX and 4XXXXX references that must be assigned to this module should not be used in PLC program.

You do not need to use the Params option in the I/O-map dialog.

6.2 EFB Overview

A standard CANopen application requires at least the CIA_SVR EFB. More sophisticated applications that need to perform special tasks on the network may take advantage of the additional EFB's. Here is an overview of the EFB's that can be found in the library CAN in the group named Canopen.

CIA_SVR	Used for Initialization of the AS-BCAN-259, PDO data transfer and network diagnosis
CIA_SDOW	Used for SDO write operations. Either the local object dictionary or any network node's object dictionary can be written to
CIA_SDOR	Used for SDO read operations. Either the local object dictionary or any network node's object dictionary can be read
CIA_NMT	Used to issue NMT Master commands
CIA_CMT	Used to initiate CMT downloads to specific nodes or the entire network
CIA_EMCY	Transmits the CiA defined emergency object
CIA_ISCL	Used for scaling of analog values coming in from the network
CIA_OSCL	Used for scaling of analog values sent to the network

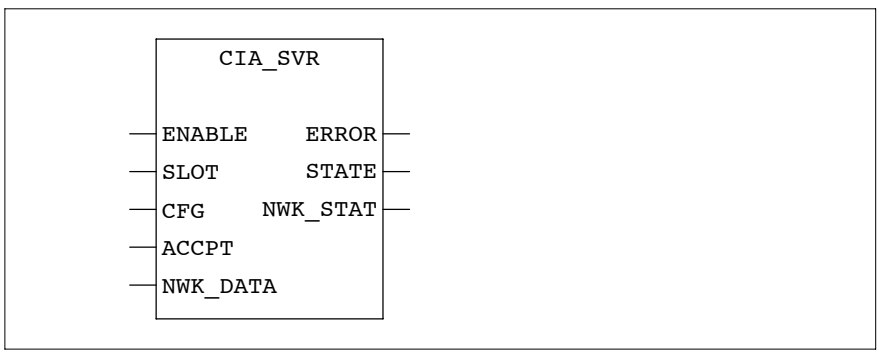
6.3 CIA_SVR

6.3.1 Short Description

This EFB enables the CANopen functionality. It is used for AS-BCAN-259 initialization, CANopen configuration and communication. It also enables Layer 2 functionality. Either CIA_SVR or CAN_CFG must be used exactly once for every AS-BCAN-259 installed. Data are sent to and received from the network (NWM). Plc inputs (1XXXX and 3xxxx) may also be sent to the network directly (HDM). Data that are received from the network may also be copied to plc outputs (0XXXX and 4XXXX) directly without any additional logic. Make sure that the outputs configured in your CANopen Configuration are not written elsewhere in plc program. The number of data to be copied by the latter two funtions is determined by the Configuration data parameter.

6.3.2 Layout

Symbol



Description of the Parameters

Parameter	Data Type	Meaning
ENABLE	BOOL	Enable EFB, every rising edge will reconfigure the module
SLOT	UINT	Slot where the AS BCAN 259 is located (3...5)
CFG	CAN_CFG_DATA	Configuration data
ACCPT	CAN_ACCPT	Message acceptance data
NWK_DATA	ANY	Data to to send to the network (first half of used memory, e.g byte 1-18 of ByteArr36) and data receive from the network (second half, e.g byte 19-36 of ByteArr36). Usually an instance of CANOPENDATA_SLOT0 is connected to this input
ERROR	BOOL	Error occured
STATE	UINT	Current status or errorcode
NWK_STAT	NWK_STATE	Network status information

For additional info on the CFG anf ACCPT parameter refer to the the description of the CAN_CFG EFB.

6.3.3 Datatype NWK_STATE

Along with this EFB library a set of derived datatypes has been created. One of them is NWK_STATE. It is a STRUCT of two arrays named NETWORK0 and NETWORK1. They represent the CANopen networks that are connected to channel 0 and channel 1. Currently CANopen is only available on channel 0, therefore NETWORK1[1] to NETWORK1[127] are not used.

These arrays are tables of 128 entries of the datatype NODE_STATE. NODE_STATE describes the status of a single CANopen node. Index 1 represents the status of CANopen node 1.

NODE_STATE consists of the following components:

Entry	Datatype	Meaning
ONLINE	BOOL	Node is online
INFO	UINT	General node status
ERROR	BOOL	Node is in erroneous state
ERRORCODE	BYTE	Error information from node, valid if ERROR is TRUE

If the corresponding node is guarded and nodeguarding errors that indicate that the node is not present are encountered the node will be considered offline. In this case the ONLINE bit will be set to FALSE state.

If an emergency object is received from the corresponding node the first byte of the received emergency object is written to the ERRORCODE entry and ERROR is set to TRUE state. Upon reception of the message ”No error or error reset” the ERROR bit is set to FALSE state.

☞ **☞Note**

Data received from the network are not automatically set to zero if the source node is not online. Therefore additional action must be taken to achieve this behavior on the PLC application level.

NETWORK0[0] and NETWORK1[0] are reserved for local status information.

Entry	Meaning
NETWORK0[0].ONLINE	This CANopen node is operational
NETWORK1[0].INFO	holds the CAN Controller Chip states
NETWORK1[0].ONLINE	If this node is guarded by an external NMT Master, this bit is set to TRUE if guarding messages are received and passive nodeguarding is activated using Relais Operation Control
NETWORK1[0].ERRORCODE	reserved for internal error information
NETWORK1[0].INFO	reserved for internal error information

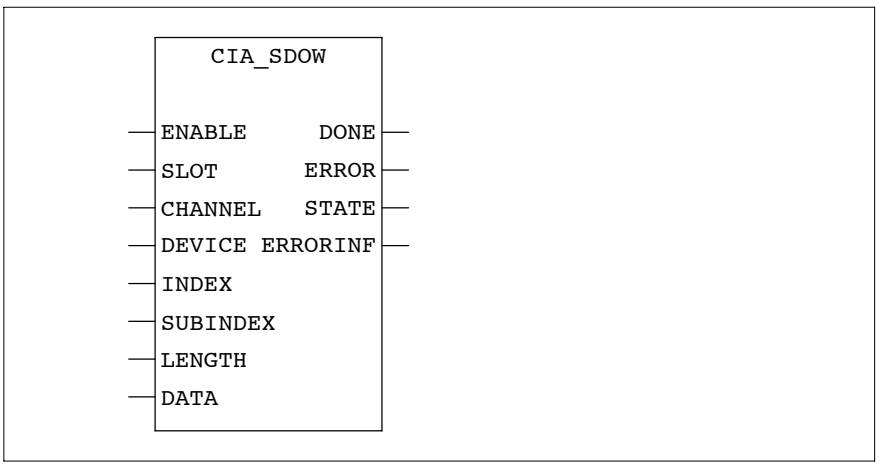
6.4 CIA_SDOW

6.4.1 Short Description

This EFB sends a SDO (Service Data Object) write request to the CANopen network.

6.4.2 Layout

Symbol



Description of the Parameters

Parameter	Data Type	Meaning
ENABLE	BOOL	Start transmission (rising edge). If ENABLE is FALSE while the operation is still in progress the transfer of data is aborted
SLOT	UINT	Slot where the AS-BCAN-259 is located (3...5)
CHANNEL	UINT	Channel for transmission (0...1)
DEVICE	BYTE	Device to write SDO to
INDEX	WORD	Index to write data to
SUBINDEX	BYTE	Subindex to write data to
LENGTH	UINT	Number bytes to write
DATA	ANY	Data to be send (up to 132 byte)
DONE	BOOL	Function completed
ERROR	BOOL	Error occured
STATE	UINT	Current status or errorcode
ERRORINF	CIA405_SDO_ER-ROR	SDO error structure as defined in CiA DS 405 document

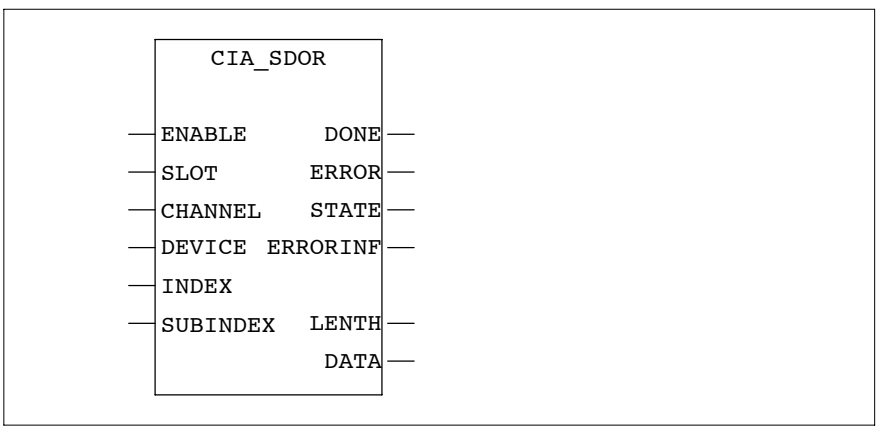
6.5 CIA_SDOR

6.5.1 Short Description

This EFB sends a SDO (Service Data Object) read request to the CANopen network.

6.5.2 Layout

Symbol



Description of the Parameters

Parameter	Data Type	Meaning
ENABLE	BOOL	Start transmission (rising edge). If ENABLE is FALSE while the operation is still in progress the transfer of data is aborted
SLOT	UINT	Slot where the AS BCAN 259 00 is located (3...5)
CHANNEL	UINT	Channel for transmission (0...1)
DEVICE	BYTE	device to read SDO from
INDEX	WORD	index to read data from
SUBINDEX	BYTE	subindex to read data from
DONE	BOOL	Function completed
ERROR	BOOL	Error occured
STATE	UINT	Current status or errorcode
ERRORINF	CIA405_SDO_ER-ROR	SDO error structure as defined in CiA DS 405 document
LENGTH	UINT	Number bytes received
DATA	ANY	Data read (up to 132 byte)

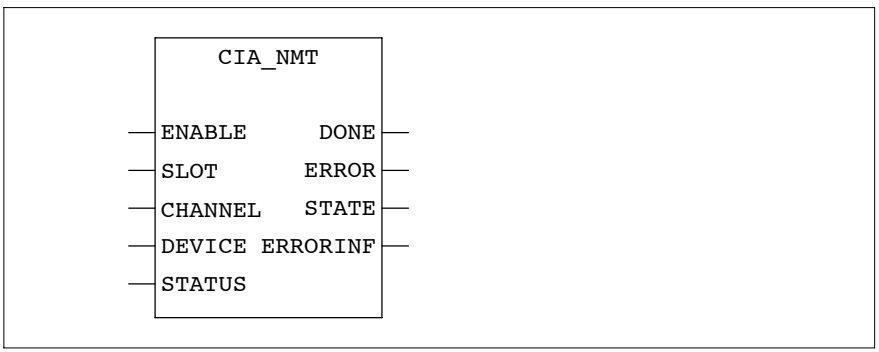
6.6 CIA_NMT

6.6.1 Short Description

This EFB is used to set a node's NMT state in a CANopen network.

6.6.2 Layout

Symbol



Description of the Parameters

Parameter	Data Type	Meaning
ENABLE	BOOL	Start function (rising edge)
SLOT	UINT	Slot where the AS BCAN 259 is located (3...5)
CHANNEL	UINT	Channel for transmission (0...1)
DEVICE	BYTE	device whose status is to be changed 0 = All devices
STATUS	UINT	Status to set device into: 4 = Prepared 5 = Operational 6 = ResetNode 7 = ResetCommunication 127 = PreOperational
DONE	BOOL	Function completed
ERROR	BOOL	Error occured
STATE	UINT	Current status or errorcode
ERRORINF	CIA405_SDO_ER-ROR	SDO error structure as defined in CiA DS 405

The EFB performs the operation by writing to the object dictionary of the local AS-BCAN-259 using a SDO write function. If the EFB fails ERRORINF holds additional information on the error.

6.7 CIA_CMT

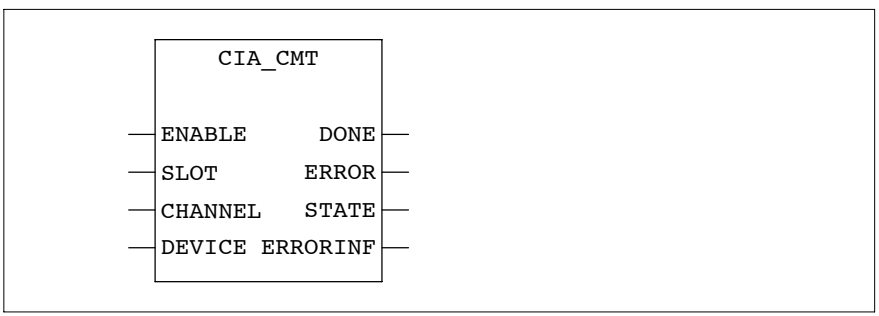
6.7.1 Short Description

If the AS-BCAN-259 module has been configured to be CANopen configuration manager this EFB is used to configure a single node or an entire CANopen network.

Note
Configuring nodes on a running network is a highly crucial operation and should only be done after close consideration of the operation's impact on the the network and the application.

6.7.2 Layout

Symbol



Description of the Parameters

Parameter	Data Type	Meaning
ENABLE	BOOL	Start function (rising edge)
SLOT	UINT	Slot where the AS BCAN 259 is located (3...5)
CHANNEL	UINT	Channel for transmission (0...1)
DEVICE	BYTE	device that is to be configured 0 = All devices
DONE	BOOL	Function completed
ERROR	BOOL	Error occured
STATE	UINT	Current status or errorcode
ERRORINF	CIA405_SDO_ER-ROR	SDO error structure as defined in CiA DS 405

The EFB performs the operation by writing to the object dictionary of the local AS-BCAN-259 using a SDO write function. If the EFB fails ERRORINF holds additional information on the error.

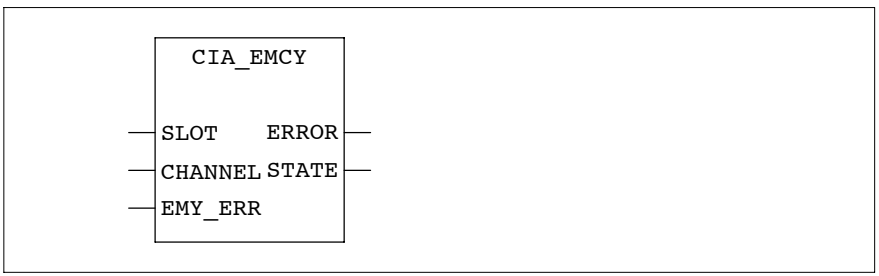
6.8 CIA_EMCY

6.8.1 Short Description

This EFB enables transmission of the local emergency state to the CANopen network. The emergency message is transmitted whenever the values of ERROR_REGISTER or EMY_ERROR_CODE of the EMY_ERR variable has changed.

6.8.2 Layout

Symbol



Description of the Parameters

Parameter	Data Type	Meaning
SLOT	UINT	Slot where the AS-BCAN-259 is located (3...5)
CHANNEL	UINT	Channel for transmission (0...1)
EMY_ERR	CIA405_EMY_ERROR	Error structure as defined in CiA DS 405 document
ERROR	BOOL	Error occured
STATE	UINT	Current status or errorcode

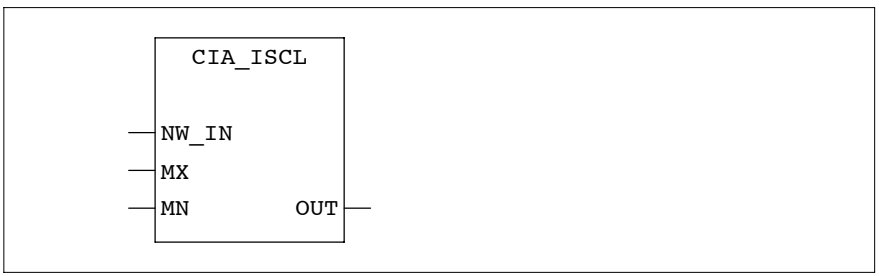
6.9 CIA_ISCL

6.9.1 Short Description

This EFB is used for scaling of analog inputs from a CANopen network.

6.9.2 Layout

Symbol



Description of the Parameters

Parameter	Data Type	Meaning
NW_IN	WORD	Analog value received from network
MX	INT	Max value
MN	INT	Min value
OUT	INT	Scaled value

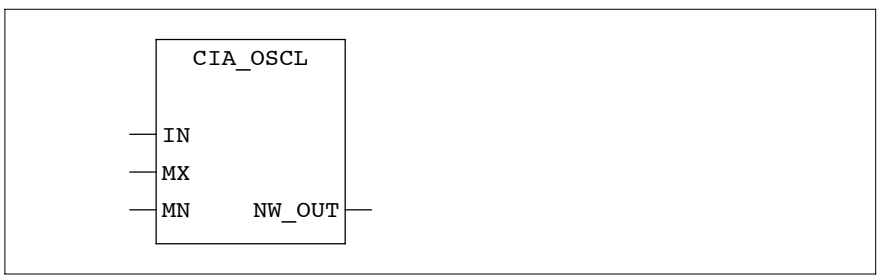
6.10 CIA_OSCL

6.10.1 Short Description

This EFB is used for scaling of analog values prior to sending them to a CANopen network.

6.10.2 Layout

Symbol



Description of the Parameters

Parameter	Data Type	Meaning
IN	INT	Analog value to send to network
MX	INT	Max value
MN	INT	Min value
OUT	WORD	Scaled value

Note
The input value is not checked against the MN and MX values. Make sure that the IN value does not exceed these boundaries

Error Diagnostics for I/O Modules

7

A useful feature for checking the configuration is the diagnosis of errors.

This provides you with:

- A slot check for I/O assignment
- Information concerning error markers and status messages

The slot query informs you of the module's operability and is available for all modules.

The error markers / status messages are made available by some I/O modules as well as by intelligent modules. These inform you of the device-specific status, including open circuits and overload.

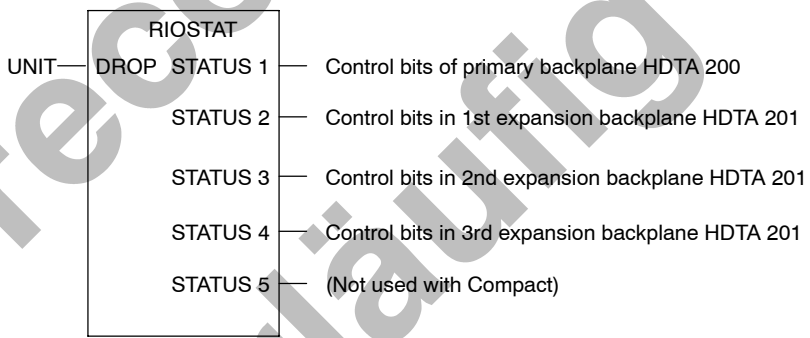
7.1 Slot Check

The slot check is used to check the configured I/O modules. Each module sends a control bit for this purpose. The control bits of each backplane are combined into a word and transferred to the CPU by the EFB ”RIOSTAT”. According to the maximum configuration limit of four backplanes four words are produced.

7.1.1 EFB (Elementary Function Block) ”RIOSTAT”

The status bits (healthy bits) of the configured modules can be made available using the ”RIOSTAT” EFB refer to Figure 40.

Figure 40 Symbolic representation of the ”RIOSTAT”



Always enter a ”1” under ”Unit”. Under STAT1 ... STAT4 enter the addresses under which you want to store the single control words (4:xxxxx Register).

Significance of the control bits

Bit = 1:

The module is OK, i.e., the module answered with its hardware ID code (HW–ID) and has been entered appropriately in the I/O map.

Bit = 0:

The module is defective, not entered appropriately, not entered or missing.

The status of a module thus is ”1”, when it answers from the parameterized slot using the right hardware ID code. The status = 0 means that the module is not configured, inappropriately configured, not assigned or defective. This status information is supplied by all I/O modules.

7.1.2 Configuring the EFB ”RIOSTAT”

The individual steps required to configure the ”RIOSTAT” EFB are described in the order in which they should be performed.

1. Open a new section via the `File -> New Section ->` FBD menu command.
2. Enter a section name, e.g., iostatus. Confirm with OK.
3. Select the `RIOSTAT` EFB via `Objects -> FFB selection -> Library -> System` and confirm with `Close`.
4. Place the ”`RIOSTAT`” EFB and then deselect the EFB.
5. Allocate the EFB’s inputs and outputs. Activate the input menu field by double-clicking on the input/output. In order to activate the EFB RIOSTAT, input DROP must be set to 1. You can assign the 4xxxxx output registers as you like. A possible assignment is provided in the table below.

Table 9 Example of addressing for the RIOSTAT

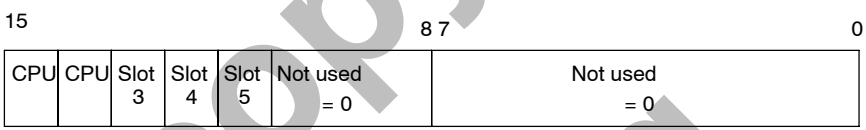
Input	DROP e.g. literal 1	
Outputs	STATUS 1	e.g., direct address 4:00001
	STATUS 2	e.g., direct address 4:00001
	STATUS 3	e.g., direct address 4:00001
	STATUS 4	e.g., direct address 4:00001
	STATUS 5	(Not used with Compact)

Once the addresses of the outputs have been successfully assigned, the status information (healthy bits) of the I/O modules is available.

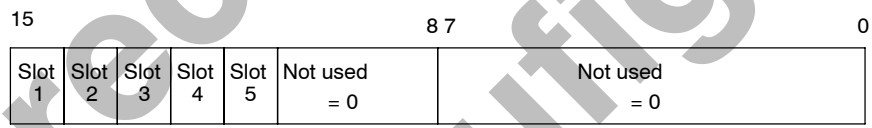
The 4:xxxxx registers assigned in Table 9 are assigned to the corresponding backplanes as follows:

Register 4:00001	Status bit in primary backplane DTA 200
Register 4:00002	Status bits in the 1st expansion backplane DTA 201
Register 4:00003	Status bits in the 2nd expansion backplane DTA 201
Register 4:00004	Status bits in the 3rd expansion backplane DTA 201

Partitioning of the status bits
The status bits are stored as follows in the 4:xxxxx registers:



Primary backplane (4:00001)



Expansion backplane (4:00002 to 4:00004)

7.1.3 Uploading the Status Bits

To be able to read the current state of the status bits (healthy bits), an online connection must be established (`Online -> Connect -> Modbus -> OK`). Subsequently, the 4:xxxxx registers can be displayed in the RDE editor (Reference Data Editor). To access it, choose `Online -> Reference Data Editor`. Enter the register addresses in the `Address` column. To clearly identify the status bits, the `Bin` display type must be set in the format settings.

The information of the status bits can be uploaded and processed as you like, in the same way as for any other data stored in the stack.

7.2 Error Markers and Status Messages

A series of modules, essentially analog I/O modules and experts, provide specific error markers and/or status messages (e.g., open circuits, overload/underload of the measuring range, short circuit/overload, etc.).

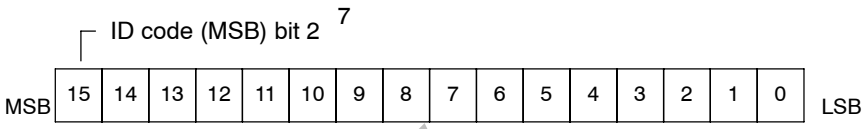
The following modules do not supply any device-specific status:
AS-BDAP-258; AS-BDAP252; AS-BDAP-253; AS-BDEP-254; AS-BDEP-256; AS-BDEP-257.

Status information in drop status
One word is reserved for each slot for status messages. There are thus 20 successive words available, of which the first two words are reserved for the CPU. The 3x range can be defined by the user. To do this, choose the `Project -> Config ->I/O Map -> Status` menu command. The following Table 10 lists the structure of the 3x registers.

Table 10 Register partitioning

3x	Word	Slot	Backplane
	1	CPU slot	1. Backplane
	2	CPU slot	
	3	1 I/O module	
	4	2 I/O module	
	5	3 I/O module	
	6	4 I/O module	2. Backplane
	7	5 I/O module	
	8	6 I/O module	
	9	7 I/O module	
	10	8 I/O module	
	11	9 I/O module	3. Backplane
	12	10 I/O module	
	13	11 I/O module	
	14	12 I/O module	
	15	13 I/O module	
	16	14 I/O module	4. Backplane
	17	15 I/O module	
	18	16 I/O module	
	19	17 I/O module	
3x + 19	20	18 I/O module	

For all modules that have status information, the storage of information appears as follows in the I/O map word:



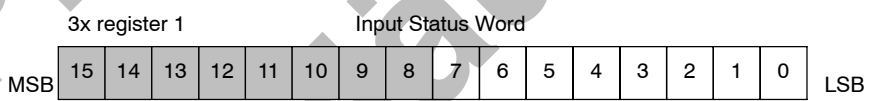
The high byte register (bit 2^7) specifies whether the module supplies status information. In this context the meaning is as follows:

MSB = 0	no status information for the module
MSB = 1	the module has status information

7.2.1 Module-specific Register Assignment

Next to the status information in the drop status, the following modules power supply module-specific information. The information is stored in one or several registers according to the module.

Register partitioning of AS-BADU 256
Input module AS-BADU 256 with four analog, isolated inputs requires five 3x registers. These are partitioned as follows:

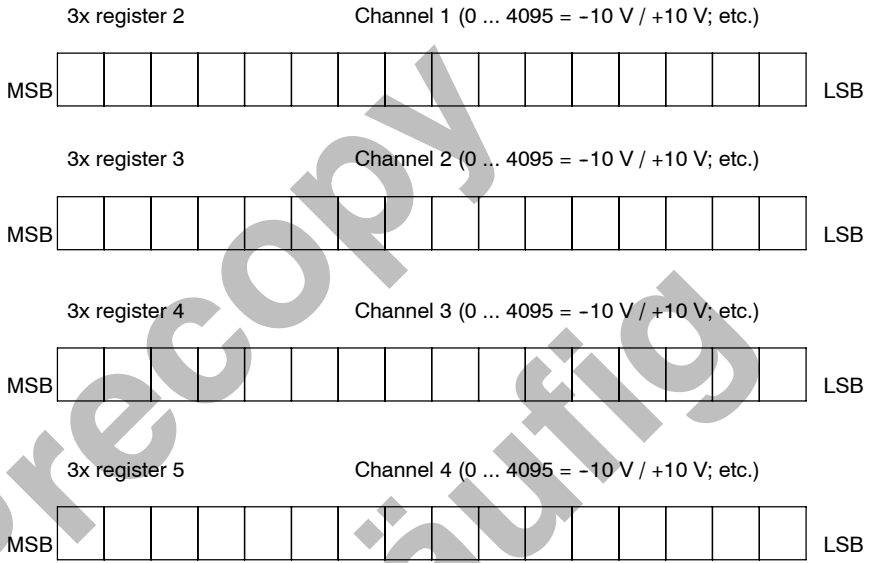


The status information of the low byte register are assigned as follows:

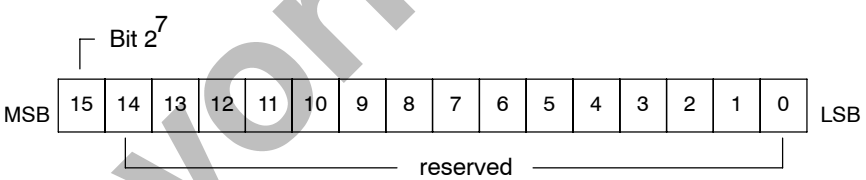
Bit 0	Overflow or open circuits (I< 2.08 mA) at input 1
Bit 1	Overflow or open circuits (I< 2.08 mA) at input 2
Bit 2	Overflow or open circuits (I< 2.08 mA) at input 3
Bit 3	Overflow or open circuits (I< 2.08 mA) at input 4
Bit 4	Unipolar
Bit 5	4 ... 20 mA / 2 ... 10 V at inputs 1 ... 4
Bit 6	24 VDC missing
Bit 7	ADU not ready, cause: - Overflow or open circuit at one or several inputs - Processor monitoring has responded - 24 VDC is missing - ADU is in initialization phase

The high byte register (bits 8 – 15) has no function.

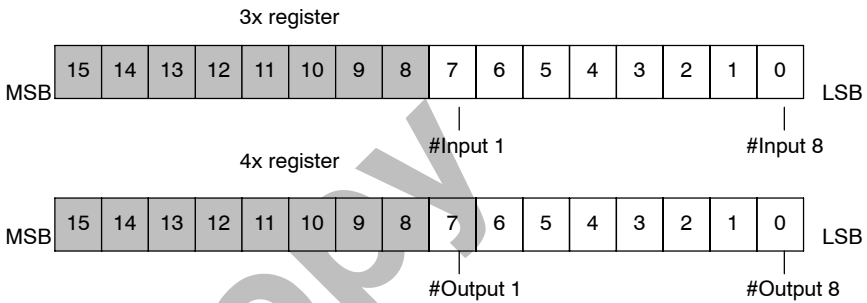
Translation value storage
The translation values are stored in the 3x registers word by word in a range from 0 to 4095. This applies to each of the four inputs.



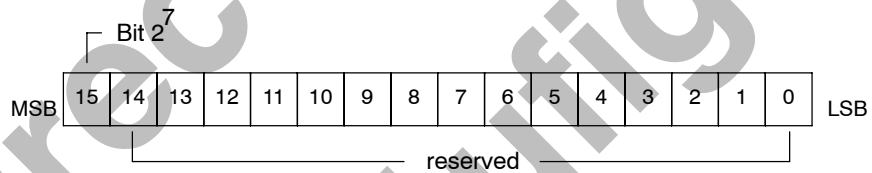
I/O map status word of AS-BADU 256



Register partitioning of AS-BDAP 250
Input / output module AS-BDAP 250 with eight isolated inputs / outputs requires one 3x register and one 4x register each. These are partitioned as follows:



I/O map status word of AS-BDAP 250

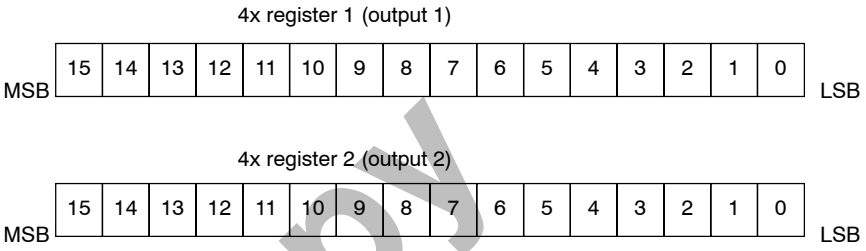


Additional function of the status word of the AS-BDAP 250:
If 2^7 is set (MSB = 1), this can mean of the following:

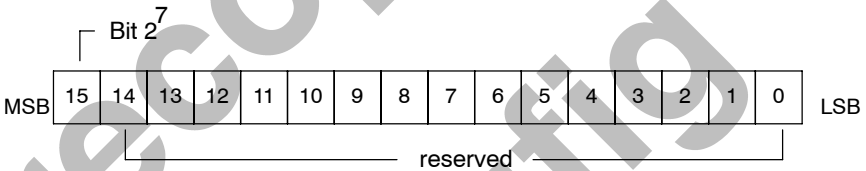
- the working voltage US is missing
- the 10 A fuse went
- there is a short circuit or overload

Register partitioning of AS-BDAU 252

Output module AS-BDAU 252 with two isolated outputs requires one 3x register and one 4x register. These are partitioned as follows:

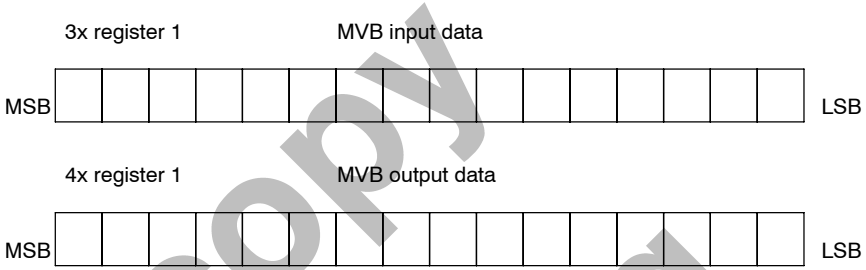


I/O map status word of AS-BDAU 252

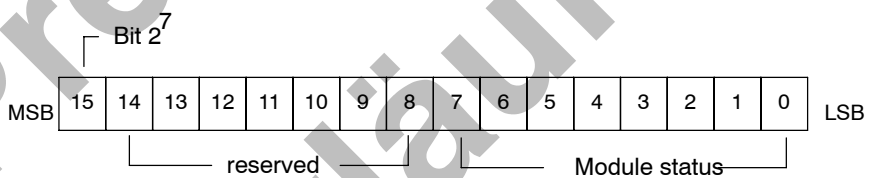


Register partitioning of AS-BCAN-259
Communications module AS-BCAN-259 requires one 3x register and one 4x register.

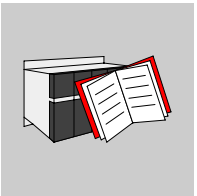
- 3x register: contains the slot number of module AS-BCAN-259.
- 4x register: reserved



I/O map status word
The message ID is stored in the I/O map status word (refer to the appendix for AS-BCAN-259).



Module Descriptions



The module descriptions are documented in alphabetical order.

AS-BADU 256
Analog inputs

The **AS-BDAU 256** is an input module for rail-specific applications with 4 analog, isolated inputs. The AD converter works with step-by-step approximation.

Enclosed you will find the following module-specific information:

- Features and functions
- Configuration
- Diagnostics
- Technical specifications

1 Features and Functions

1.1 Features

- Various measuring ranges can be selected through the software or through wiring:
  Input voltage
  +/-1 V; 0 ... 1 V; 0.2 ... 1 V; +/-10 V; 0 ... 10 V; 2 ... 10 V
  Input current
  +/-20 mA; 0 ... 20 mA; 4 ... 20 mA

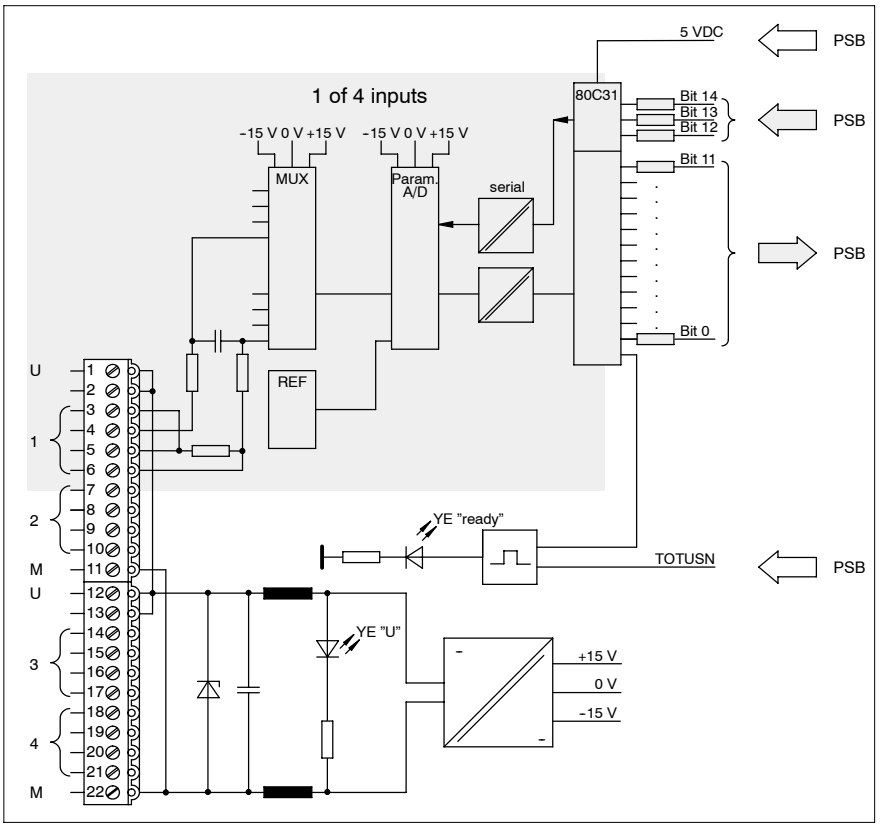
- Each input can be set to one of the measuring ranges 1 V (20 mA) or 10 V max. individually. Line supervision can be selected via the software.

- The converter works with a resolution of 11 bits plus sign.

- The 5 V power supply is provided internally through the installation bus. The 24 VDC power supply must be set externally.

- Extended temperature operating range from -25 to +70 degrees Celsius.

1.2 Operating mode



2 Configuration

Configure the following:

2.1 Mounting Location

Select the module's mounting location (slot) on the backplane according to the Concept list "I/O map".
For each respective mounting location, use the software to select the module designation "ADU 2x6/282".

For installation onto the backplane, follow the enclosed user information.

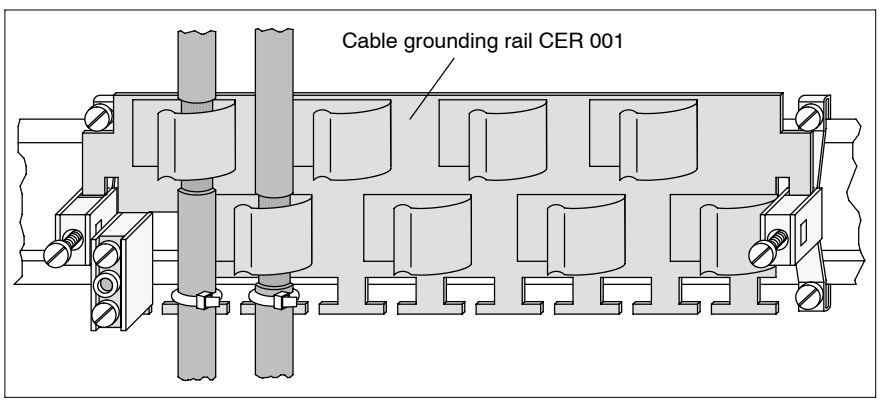
2.2 **Wiring**

- Use shielded cables (twisted 2 x 2 x 0.5 qmm, for each input e.g., KAB-2205-LI) for connection purposes. All analog inputs or outputs can be routed in a common shielded cable as well.
- When connecting sensors in a 4-wire connection, e.g. Pt 100, the wires must be twisted in pairs.
- The shield must be connected to the ground/earth with a short wire (<20 cm) on one side.
- The cable may not be run together with power supply wires or any other similar source of electrical noise. Distance >0.5 m.

Grounding of shields

- Run the shielded cables through cable grounding rail CER 001.
- Remove the shield isolation at the level of the corresponding cable clamp.
- Slip the exposed part of the cable into the cable clamp (contact with the top hat rail).
- Relieve the tension of each cable using cable clips.

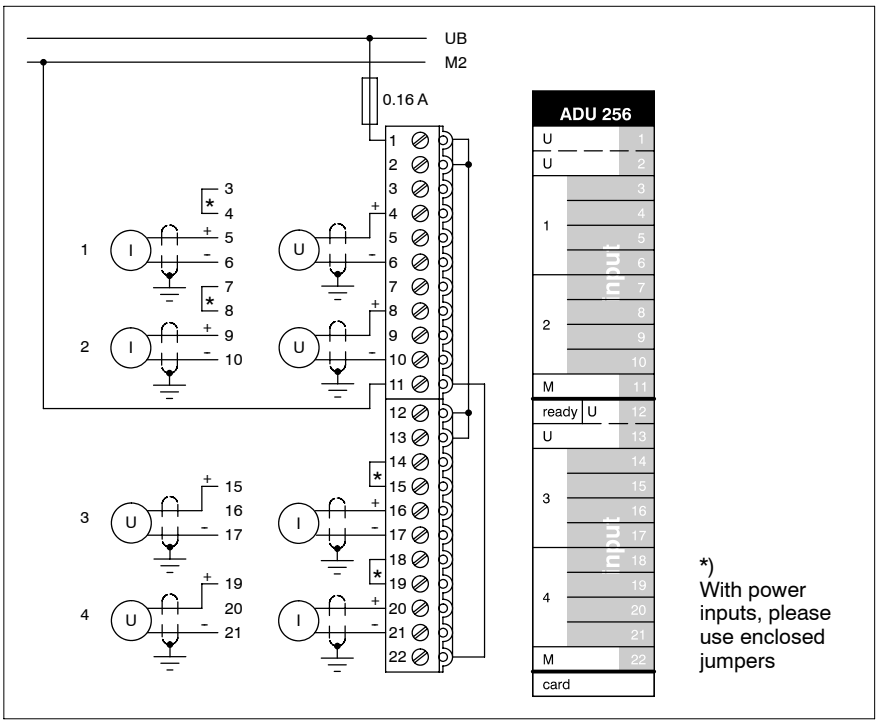
Figure 41 Shield grounding



2.3 Connection

Perform the connection of the peripherals according to the Concept lists ”I/O Map” and ”Variable List”.

Figure 42 Example of connection



Optionally, the following can be connected:

2-pole voltage sensor
+/-1 V; 0 ... 1 V; 0.2 ... 1 V; +/-10 V; 0 ... 10 V; 2 ... 10 V or

2-pole current sensor
+/-20 mA; 0 ... 20 mA; 4 ... 20 mA.

The selection for power input (I) or voltage input (U) is established with the connection (mixed operation is allowed).

When connecting current sensors, the following jumpers are required:

3-4 for input 1
7-8 for input 2
14-15 for input 3
18-19 for input 4.

An additional pack of 4 jumpers is also enclosed.

Unused voltage inputs must be short-circuited as follows:

3-4 and 5-6 for input 1
7-8 and 9-10 for input 2
14-15 and 16-17 for input 3
18-19 and 20-21 for input 4.

The measuring ranges +/-1 V / +/-10 V / +/-20 mA are individually valid for each input. The measuring ranges 2 ... 10 V / 4 ... 20 mA are jointly valid for all 4 inputs. This requires the unused inputs to be wired with a valid measuring value.

After the conversion, the analog input values are forwarded as input words to the ref. 3x + 1 to 3x + 4.

The appropriate signal names or signal addresses should be entered on the label inlays.

2.4 Measuring Range Selection and Error Analysis

The selection for current input or voltage input is made through the type of connection. The respective measuring range is set in Concept under "I/O mapping", "Parameters...".

In the basic settings (factory settings) the content is = 0, which means:

- All 4 inputs are set to measuring range +/-1 V or +/-20 mA depending on the connection.
- No overload detection.
- No open wire detection.
- Bipolar operation.

Deviating from the basic settings, the following individual preferences are possible.

Table 11 Potential combinations with the following parameters: Priority = bipolar, no monitoring of open-circuit and overload

Contents *	Input 1	Input 2	Input 3	Input 4
0	+/-1 V; +/-20 mA	+/-1 V; +/-20 mA	+/-1 V; +/-20 mA	+/-1 V; +/-20 mA
1	+/-10 V	+/-1 V; +/-20 mA	+/-1 V; +/-20 mA	+/-1 V; +/-20 mA
2	+/-1 V; +/-20 mA	+/-10 V	+/-1 V; +/-20 mA	+/-1 V; +/-20 mA
3	+/-10 V	+/-10 V	+/-1 V; +/-20 mA	+/-1 V; +/-20 mA
4	+/-1 V; +/-20 mA	+/-1 V; +/-20 mA	+/-10 V	+/-1 V; +/-20 mA
5	+/-10 V	+/-1 V; +/-20 mA	+/-10 V	+/-1 V; +/-20 mA
6	+/-1 V; +/-20 mA	+/-10 V	+/-10 V	+/-1 V; +/-20 mA
7	+/-10 V	+/-10 V	+/-10 V	+/-1 V; +/-20 mA
8	+/-1 V; +/-20 mA	+/-1 V; +/-20 mA	+/-1 V; +/-20 mA	+/-10 V
9	+/-10 V	+/-1 V; +/-20 mA	+/-1 V; +/-20 mA	+/-10 V
10	+/-1 V; +/-20 mA	+/-10 V	+/-1 V; +/-20 mA	+/-10 V
11	+/-10 V	+/-10 V	+/-1 V; +/-20 mA	+/-10 V
12	+/-1 V; +/-20 mA	+/-1 V; +/-20 mA	+/-10 V	+/-10 V
13	+/-10 V	+/-1 V; +/-20 mA	+/-10 V	+/-10 V
14	+/-1 V; +/-20 mA	+/-10 V	+/-10 V	+/-10 V
15	+/-10 V	+/-10 V	+/-10 V	+/-10 V

* of the control register:

■ ■ Set in Concept under ”I/O mapping”, ”Parameters...”

Table 12 Potential combinations with the following parameters: no monitoring in case of overload.

Contents	Input 1	Input 2	Input 3	Input 4	Priority	Overload monit.
16	0 ... 1 V / 0 ... 20 mA	0 ... 1 V / 0 ... 20 mA	0 ... 1 V / 0 ... 20 mA	0 ... 1 V / 0 ... 20 mA	Unipolar	no
31	0 ... 10 V	0 ... 10 V	0 ... 10 V	0 ... 10 V	Unipolar	no
32*	0.2 ... 1 V / 4 ... 20 mA	0.2 ... 1 V / 4 ... 20 mA	0.2 ... 1 V / 4 ... 20 mA	0.2 ... 1 V / 4 ... 20 mA	Bipolar	yes
47*	2 ... 10 V	2 ... 10 V	2 ... 10 V	2 ... 10 V	Bipolar	yes **
48	0.2 ... 1 V / 4 ... 20 mA	0.2 ... 1 V / 4 ... 20 mA	0.2 ... 1 V / 4 ... 20 mA	0.2 ... 1 V / 4 ... 20 mA	Unipolar	yes
63	2 ... 10 V	2 ... 10 V	2 ... 10 V	2 ... 10 V	Unipolar	yes **

* This requires the wiring of unused inputs with a valid measuring value. This can happen when using a reference measuring location or with voltage input (parallel connection) or current input (serial connection) of inputs.

** Monitoring with voltages <2 V

Table 13 Potential combinations with the following parameters: Priority = bipolar, no open-circuit monitoring, with overload monitoring

Contents	Input 1	Input 2	Input 3	Input 4
64	+/-1 V; +/-20 mA	+/-1 V; +/-20 mA	+/-1 V; +/-20 mA	+/-1 V; +/-20 mA
65	+/- 10 V	+/-1 V; +/-20 mA	+/-1 V; +/-20 mA	+/-1 V; +/-20 mA
66	+/-1 V; +/-20 mA	+/- 10 V	+/-1 V; +/-20 mA	+/-1 V; +/-20 mA
67	+/- 10 V	+/- 10 V	+/-1 V; +/-20 mA	+/-1 V; +/-20 mA
68	+/-1 V; +/-20 mA	+/-1 V; +/-20 mA	+/- 10 V	+/-1 V; +/-20 mA
69	+/- 10 V	+/-1 V; +/-20 mA	+/- 10 V	+/-1 V; +/-20 mA
70	+/-1 V; +/-20 mA	+/- 10 V	+/- 10 V	+/-1 V; +/-20 mA
71	+/- 10 V	+/- 10 V	+/- 10 V	+/-1 V; +/-20 mA
72	+/-1 V; +/-20 mA	+/-1 V; +/-20 mA	+/-1 V; +/-20 mA	+/- 10 V
73	+/- 10 V	+/-1 V; +/-20 mA	+/-1 V; +/-20 mA	+/- 10 V
74	+/-1 V; +/-20 mA	+/- 10 V	+/-1 V; +/-20 mA	+/- 10 V
75	+/- 10 V	+/- 10 V	+/-1 V; +/-20 mA	+/- 10 V
76	+/-1 V; +/-20 mA	+/-1 V; +/-20 mA	+/- 10 V	+/- 10 V
77	+/- 10 V	+/-1 V; +/-20 mA	+/- 10 V	+/- 10 V
78	+/-1 V; +/-20 mA	+/- 10 V	+/- 10 V	+/- 10 V
79	+/- 10 V	+/- 10 V	+/- 10 V	+/- 10 V

Table 14 Potential combinations with the following parameters: with overload monitoring

Contents	Input 1	Input 2	Input 3	Input 4	Priority	Open-circuit monit.
80	0 ... 1 V / 0 ... 20 mA	0 ... 1 V / 0 ... 20 mA	0 ... 1 V / 0 ... 20 mA	0 ... 1 V / 0 ... 20 mA	Unipolar	no
95	0 ... 10 V	0 ... 10 V	0 ... 10 V	0 ... 10 V	Unipolar	no
96*	0.2 ... 1 V / 4 ... 20 mA	0.2 ... 1 V / 4 ... 20 mA	0.2 ... 1 V / 4 ... 20 mA	0.2 ... 1 V / 4 ... 20 mA	Bipolar	yes
111*	2 ... 10 V	2 ... 10 V	2 ... 10 V	2 ... 10 V	Bipolar	yes **
112	0.2 ... 1 V / 4 ... 20 mA	0.2 ... 1 V / 4 ... 20 mA	0.2 ... 1 V / 4 ... 20 mA	0.2 ... 1 V / 4 ... 20 mA	Unipolar	yes
127	2 ... 10 V	2 ... 10 V	2 ... 10 V	2 ... 10 V	Unipolar	yes **

* This requires the wiring of unused inputs with a valid measuring value. This can happen when using a reference measuring location or with voltage input (parallel connection) or power input (serial connection) of inputs.

** Monitoring with voltages <2 V

☞ **Note** After powering up, the first value measured corresponds to the initial position of the input type. Changing the input type will not have any effect on the measuring value until the cycle following the next one, at the earliest.
Since one ADU 256 conversion cycle takes 10 ms, this could even take longer given cycle times below 10 ms.

Table 15 Bipolar translation values with Concept

Analog val. +/-1 V	Analog val. +/-10 V	Analog val. 2 ... 10 V	Analog val. +/-20 mA	Analog val. 4...20 mA	Decimal value (Concept)	Range
-1.024 ... -1.015 -1.001	-10.24 ... -10.15 -10.01		-20.48 ... -20.30 -20.02		0 47	Overload
-1.00	-10.00		-20.00		48	linear
-0.50	-5.00		-10.00		1 048	linear
-0.10	-1.00		-2.00		1 848	linear
-0.05	-0.50		-1.00		1 948	linear
-0.01	-0.10		-0.20		2 028	linear
-0.001	-0.01		-0.02		2 046	linear
-0.0005	-0.005		-0.01		2 047	linear
0.00	0.00	+2.00	0.00	+4.00	2 048	linear
+0.0005	+0.005	+2.004	+0.01	+4.008	2 049	linear
+0.001	+0.01	+2.008	+0.02	+4.016	2 050	linear
+0.01	+0.10	+2.08	+0.20	+4.16	2 068	linear
+0.05	+0.50	+2.40	+1.00	+4.80	2 148	linear
+0.10	+1.00	+2.80	+2.00	+5.60	2 248	linear
+0.50	+5.00	+6.00	+10.00	+12.00	3 048	linear
+1.00	+10.00	+10.00	+20.00	+20.00	4 048	linear
+1.001 ... +1.024	+10.01 ... +10.24	+10.01 ... +10.19	+20.02 ... +20.47	+20.02 ... +20.38	4 095	Overload

Table 16 Unipolar translation values with Concept

Analog val. V0...1	Analog val. V0...10	Analog val. 0.2...10 V	Analog val. V2...10	Analog val.0...20 mA	Analog val.4...20 mA	Decimal val.
0	0	0.2	2	0	4	0
0.1	1			2		400
0.5	5			10		2 000
1	10	1	10	20	20	4 000

3 Diagnostics

3.1 LED Indicators

The front of the module contains the following displays:

Table 17

No.	Designation (label inlay)	Color	Function
1	U	yellow	for 24 V supply on: Supply available off: Supply not available
12	ready	yellow	for the processor run on: Error-free data run off: Bad data run

3.2 Error Analysis

The first 3x ref. assigned to the ADU contains the detailed error information.

Table 18 Error Analysis

Bit	Function
0	Overload or open-circuit with currents <2.08 mA at Input 1
1	Overload or open-circuit with currents <2.08 mA at Input 2
2	Overload or open-circuit with currents <2.08 mA at Input 3
3	Overload or open-circuit with currents <2.08 mA at Input 4
4	Unipolar
5	2 ... 10 V / 4 ... 20 mA at Inputs 1 ... 4
6	U=24 V missing
7	ADU not ready, cause: Overload or open-circuit at one of the 4 inputs or processor monitoring has responded or U = 24 V is missing or ADU is still in initialization phase.

4 # Technical Specifications

Allocation	
Device	TSX Compact (rail applications)
Structure	in I/O range
Power supply	
external supply	U = 20 ... 30 VDC; 100 mA max., typically 70 mA
Reference potential M	M2
internal via I/O bus	5 V; 100 mA max., typically 60 mA
Inputs	
Number	4, (2-pole as voltage or current inputs)
Type of networking	Optical coupler against supply and I/O bus Varistor opposite protective ground Inputs stacked non-isolated
Linear measuring range (selectable)	+/-1 V / +/-20 mA (subject to connection) 0.2 ... 1 V/4 ... 20 mA (subject to connection) 0 ... 1 V / 0 ... 20 mA (subject to connection) +/-10 V / 0 ... 10 V / 2 ... 10 V (subject to measuring range selection)
maximum input voltage	+/-30 V inputs stacked for 1 min. max.
maximum input current	40 mA max. continuously
Input resistance	50 ohms for current inputs >1 MOhm for voltage inputs
Translation values	refer to Ch. "Translation Values"
Common-mode voltage on return conductors stacked	 at 10 V, upper range value +2 V max. at 1 V, upper range value +11 V max.
Insulation voltage	500 V max. process connection to internal I/O bus or to ext. 24 V supply
Common-mode rejection to ground	60 dB min at 1 kHz
Filter time const. of the inputs	1.5 ms
conversion time	10 ms max. for all inputs
Resolution	11 bits plus sign (bipolar), 12 bit (unipolar)
Operational limit (0 ... 60 degrees Celsius)	0.40 % max. relative to voltage range 0.56 % max. relative to current range
Processor	
Type of processor	Microprocessor Intel 80C31 (8-bit)
Memory	128 bytes RAM for data exchange 32 Kbytes EPROM for firmware

Data interface	
internal I/O bus	parallel I/O bus, refer to Basic User Manual, Ch. "Specifications"
Physical characteristics	
Module	in standard-size case
Format	3 HE, 8 T
Ground	approx. 330 g
Type of connection	
Process cable to process Installation distance Cable length	2 pluggable 11-pole screw/plug-in terminals minimum cross-section 0.5 sq. mm, twisted-pair, reference conductor incorporated, shielded. e.g. KAB-2205-LI (2 x 2 x 0.5 sq. mm) >0.5 m side-by-side potential sources of electrical noise 100 m max.
I/O bus (internal)	1/3 C30M
Environmental conditions	
Regulations	VDE 0160, LES-DB
Systems data	refer to Basic User Manual, Ch. "Specifications"
Authorized ambient operating temperature	 -25 ... +70 degrees Celsius permanent -30 ... +85 degrees Celsius temporary (10 minutes)
Power dissipation	3 W max., typically 2 W
Shock, vibration	according to LES-DB

AS-BDAP 250
Discrete Inputs and Outputs

The **AS-BDAP 250** is an output module for rail-specific applications with 8 discrete, isolated 24 VDC (+/-40 %) inputs and 8 discrete outputs. The outputs are isolated, they have short circuit and overload protection for 24 VDC (+/-40 %), 2 A (semiconductor design).

Enclosed you will find the following module-specific information:

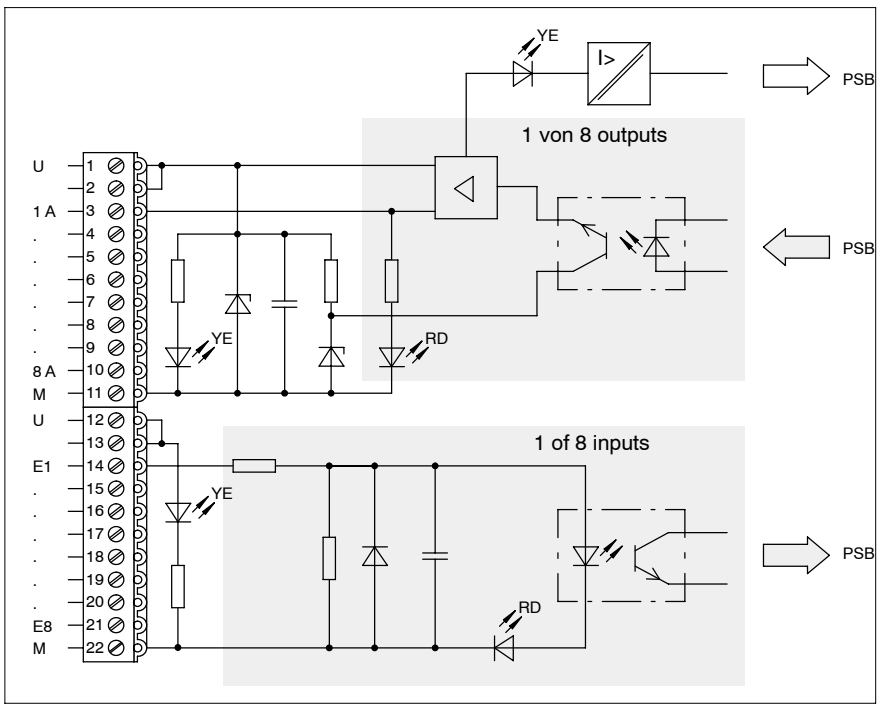
- Features and functions
- Configuration
- Diagnostics
- Technical specifications

1 Features and Functions

1.1 Features

Operating voltage UB = 24 VDC for sensor supply (inputs) and working voltage US = 24 VDC for the outputs must be provided externally.
The 5 V supply is provided internally through the I/O bus.
The operating temperature range was extended to –25 ... +70 degrees Celsius.

1.2 Operating mode



2 Configuration

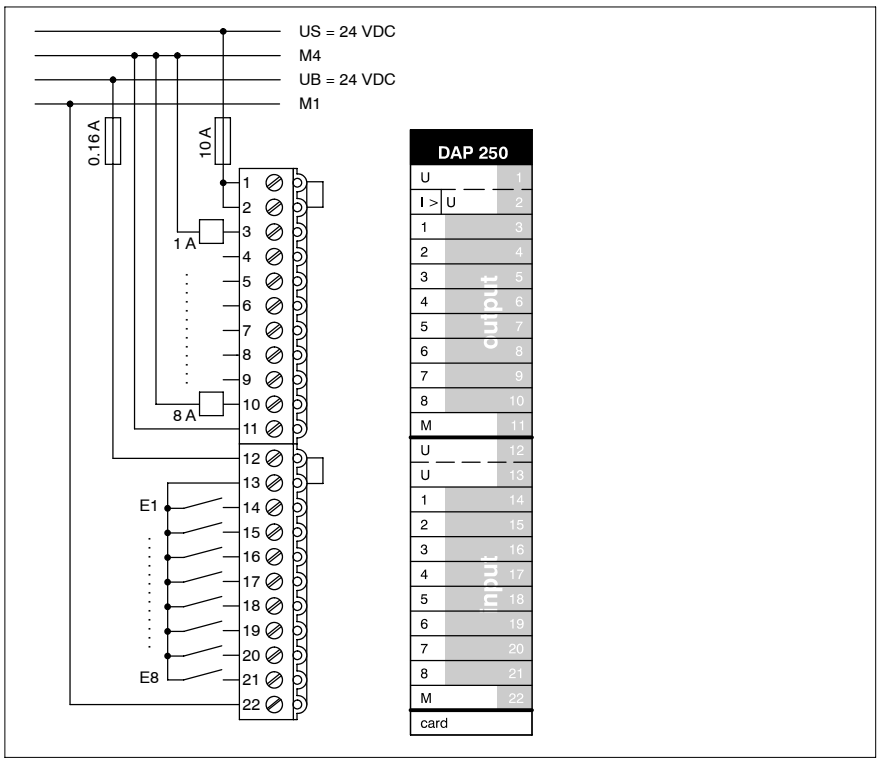
Configure the following:

- Module's mounting slot (backplane slot) on the backplane (according to the Concept list "I/O Map").
  For each respective mounting location, use the software to select the module designation "DAP 2x0".
  For installation onto the backplane, refer to the enclosed user information.

- Short circuit behavior, refer to chapter "Diagnostics".

- Connection of the peripheral device (according to the Concept lists "I/O Map" and "Variable List").

Figure 43 Example of connection



Caution

In case of inductive loads on the outputs, make a local protective circuit (parallel to the operating coil) using a freewheeling diode. The protective circuit is mandatory if there are conventional contact elements in the output lines, if the lines to the peripherals are very long, or the load current is >1 A.

The appropriate signal names or signal addresses should be entered on the label inlays.

3 # Diagnostics

The front of the module contains the following displays:

Table 19 Explanation of the LEDs

No.	Designation (label inlay)	Color	Function
1	U	yellow	for the working voltage of 8 outputs on: working voltage available off: working voltage not available
2	I>	yellow	for overload or short circuit at the outputs on: Short circuit or overload off: Error-free operation
3 ... 10	1 ... 8	red	for the output signals on: Output carries ”1” signal off: Output carries ”0” signal
12	U	yellow	for external sensor supply on: Sensor supply available off: Supply not available
14 ... 21	1 ... 8	red	for input signals on: Input carries ”1” signal off: Input carries ”0” signal or is not connected Cause: - Sensor supply not available - Reference potential M1 interrupted

For simulation, the SIM 011 simulator can be plugged into the 8 inputs (bottom 11-pole screw/plug-in terminal).

Short circuit behavior
The output stages do not have fault cut-off with status hold in case of overload. If the load voltage is not switched off during overload, there are continuously repeating turn-on attempts at the output stage which result in increased component temperature.

Therefore, link the system marker assigned to the slot of the DAP 250 in such a way in the user program that the outputs are switched to 0 signal in case of overload. This system marker switches to signal 1 if:

- the switching voltage US is missing
- there is a short circuit or an overload
- the 10 A fuse went

☞ **Note**
Please note that in case of a single overload all other related outputs are cut off as well.

4 Technical Specifications

Allocation	
Device	TSX Compact (rail applications)
Structure	in I/O range
Power supply	
external sensor voltage	UB = 24 VDC (+/-40 %)
external working voltage	US = 24 VDC (+/-40 %)
internal via I/O bus	5 V; 60 mA max., typically 35 mA
Inputs	
Sensor supply	UB = 14.4 ... 33.6 VDC for all 8 inputs
Reference potential M	M1 for all 8 inputs
Number of inputs	8
Type of networking	Optical coupler, isolation to I/O bus and to outputs
Rated signal value	+24 V
Signal level	1 signal: +12 ... +37 V 0 signal: -2 ... +5 V
Input current	7 mA at 24 V, 8.5 mA at 30 V
Input delay	4 ms

Outputs	
Working voltage U	US = 14.4 ... 33.6 VDC, for all 8 outputs
Reference potential M	M4 for all 8 outputs
Number	8 semiconductor outputs
Design	- short circuit and overload protected - without reclosing lockout - group display in case of overload/short circuit - group signal through systems marker
Type of networking	potential-free (optical coupler)
Actuator connection	between output and reference potential M4
Signal language	positive logic
Signal output level	1 signal: U = Us - 0.4 V; 0-Signal: 0 ... +2 V, <1 mA Upper limit of inductive disconnect voltage at -15 VDC (built-in field forcing)
Load current per output	10 mA ... 2 A, 10 W max. for incandescent lamps
Starting current for incandescent lamp	Ion = 10 x I
Load current of all outputs	8 A max.
Required external fuse	10 A, fast
Operating delay	<1 ms
Protective circuit with inductive loads	refer to chapter "Configuration" page 140
switching cycles	1000 /h (0.28 /s) with inductive load and perm. max. power per output 100 /s with ohmic load 10 /s with max. lamp load
Data interface	
Internal I/O bus	parallel I/O bus, refer to basic user manual "Modicon TSX Compact", chapter "Specifications"
Physical characteristics	
Module	in standard-size case
Format	3 HE, 8 T
Weight	280 g
Type of connection	
Process	2 clip-on 11-pole screw/plug-in terminals
Systems bus (internal)	1/3 C30M

Environmental conditions	
Regulations	VDE 0160, LES-DB
Systems data	refer to the basic user manual ”Modicon TSX Compact”, chapter ”Specifications”
Authorized ambient operating temperature	-25 ... +70 degrees Celsius permanent -30 ... +85 degrees Celsius temporary (10 minutes)
Power dissipation	typically 5 W
Shock, vibration	according to LES-DB

AS-BDAP 252, AS-BDAP 253
Discrete Inputs and Outputs

The **AS-BDAP 252** is an output module for rail-specific applications with 8 discrete isolated inputs for **24 VDC** (+/-40 %) and 4 discrete relay outputs.

The **AS-BDAP 253** is an output module for rail-specific applications with 8 discrete isolated inputs for **110 VDC** (+/-40 %) and 4 discrete relay outputs.

The relay contacts are led through potential-free as normally open contacts.

Enclosed you will find the following module-specific information:

- Features and functions
- Configuration
- Diagnostics
- Technical specifications

1 Features and Functions

1.1 Features

The 22 VDC supply of the relay coils and the sensor supply must be provided externally.
The 5 V supply is provided internally through the I/O bus.
The operating temperature range was extended to –25 ... +70 degrees Celsius.

1.2 Operating mode

Figure 44 DAP 252 Operating mode

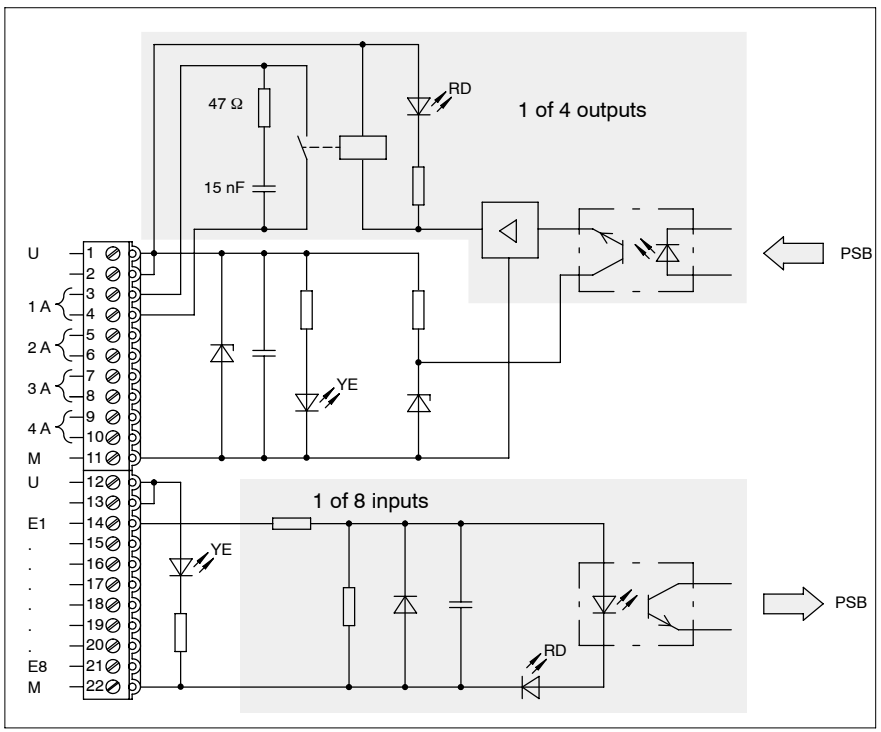
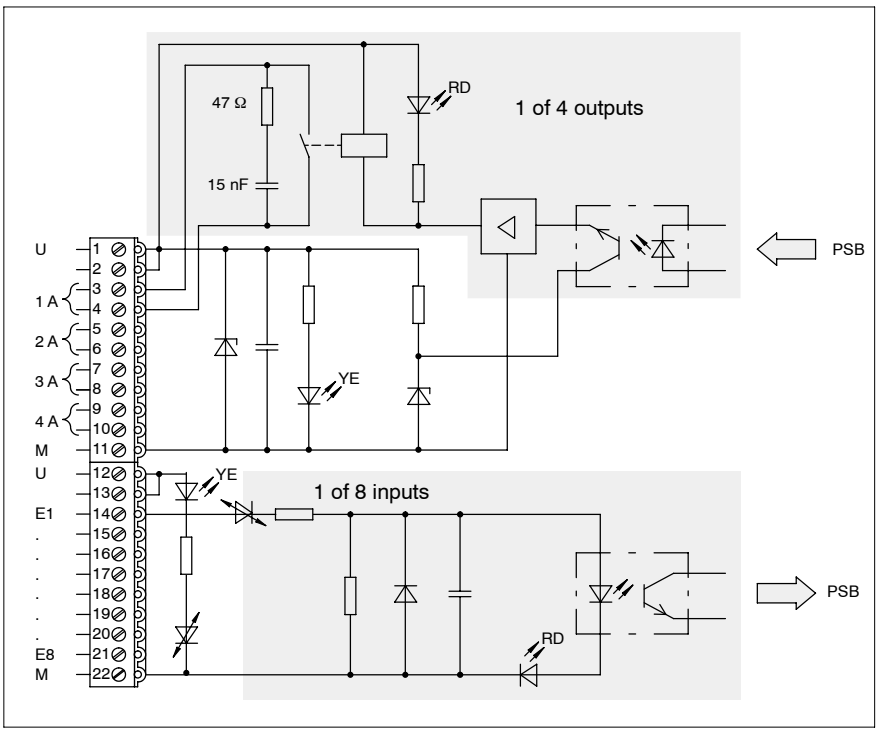


Figure 45 DAP 253 Operating mode



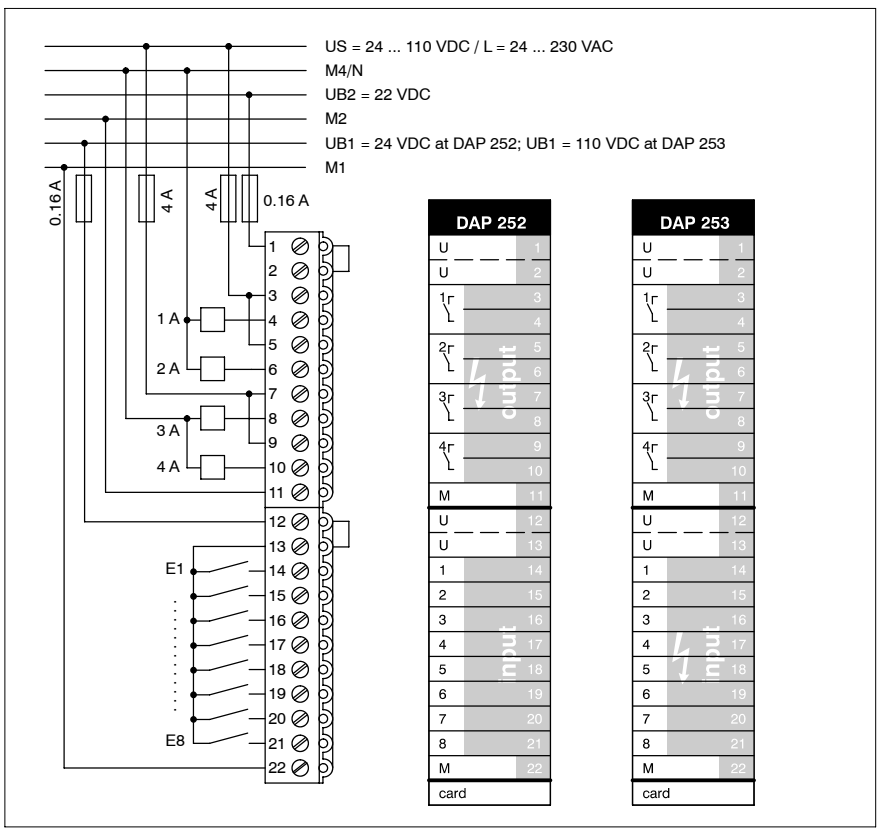
2

Configuration

Configure the following:

- Mounting slot (backplane slot) of the module onto backplane (according to the Concept list ”I/O Map”).
  For each respective mounting location, use the software to select the module designation ”DAP 2x2/253”.
  For installation onto the backplane, refer to the enclosed user information.
- Connection of the peripheral device (according to the Concept lists ”I/O Map” and ”Variable List”).

Figure 46 Example of connection DAP 252, DAP 253



The appropriate signal names or signal addresses should be entered on the label inlays.

In case of inductive loads for switching, make a local protective circuit parallel to the inductance (operating coil):

- In case of working voltages of L = 230 VAC an additional RC circuit of appropriate dimensions (according to the manufacturers specifications) is **required** to increase the service life and the EMC stability.
- In case of working voltages US = 24 to 110 VDC a freewheeling diode is **required** to increase the service life.

3 Diagnostics

The front of the module contains the following displays:

Table 20 Explanation of the LEDs

No.	Designation (label inlay)	Color	Function
1	U	yellow	for the supply of relay coils on: Supply voltage available off: Supply voltage not available
3, 5, 7, 9	1 ... 4	red	for the output signals on: Outputs carry ”1” signal off: Outputs carry ”0” signal
12	U	yellow	for the sensor supply on: Supply available off: Supply not available
14 ... 21	1 ... 8	red	for input signals on: Inputs carry ”1” signal off: Inputs carry ”0” signal

For simulation of the AS-BDAP 252, the SIM 011 simulator can be plugged into the 8 inputs (bottom 11-pole screw/plug-in terminal).

Caution
It is prohibited to combine the use of the SIM 011 simulator with the AS-BDAP 253.

4 # Technical Specifications

Allocation	
Device	TSX Compact (rail applications)
Structure	in I/O range
Power supply	
External input voltage for sensor voltage	UB = 24 VDC (+/-40 %), 50 mA max. with DAP 252 UB = 110 VDC (+/-40 %), 30 mA max. with DAP 253
External input voltage for relay coils	UB = 22 VDC, +/-5 %, 70 mA max.
Reference potential M	M2
internal via I/O bus	5 V; 15 mA max., typically 10 mA
Inputs AS-BDAP 252	
Sensor supply	UB = 14.4 ... 33.6 VDC for all 8 inputs, residual ripple max. 20 % SS
Reference potential M	M1 for all 8 inputs
Number of inputs	8 (with LED indicators)
Type of networking	Optical coupler, isolation to I/O bus and to outputs
Rated signal value	+24 V
Signal level	1 signal: +12 ... +37 V 0 signal: -2 ... +5 V
Input current	4 mA at 24 V, 6 mA at 37 V
Input delay	typically 7 ms
Inputs AS-BDAP 253	
Sensor supply	UB = 66 ... 154 VDC for all 8 inputs, residual ripple max. 20 % SS
Reference potential M	M1 for all 8 inputs
Number of inputs	8 (with LED indicators)
Type of networking	Optical coupler, isolation to I/O bus and to outputs
Rated signal value	+110 V
Signal level	1 signal: +55 ... +170 V 0 signal: -2 ... +10 V
Input current	typically 2.2 mA
Input delay	typically 6 ms
Relay outputs	
Number	4 normally open contacts (with LED indicators)
Type of networking	Contacts, potential-free led through as normally open contacts
Operating delay	approx. 10 ms
Working voltages, load currents, service life of contacts	refer to the description of module AS-BDAP 258

Data interface	
Internal I/O bus	parallel I/O bus, refer to basic user manual ”Modicon TSX Compact”, chapter ”Specifications”
Physical characteristics	
Module	in standard-size case
Format	3 HE, 8 T
Weight	240 g
Type of connection	
Process	2 clip-on 11-pole screw/plug-in terminals
Systems bus (internal)	1/3 C30M
Environmental conditions	
Regulations	VDE 0160, LES-DB
Systems data	refer to the basic user manual ”Modicon TSX Compact”, chapter ”Specifications”
Authorized ambient operating temperature	-25 ... +70 degrees Celsius permanent -30 ... +85 degrees Celsius temporary (10 minutes)
Power dissipation	typically 2 W
Shock, vibration	according to LES-DB

AS-BDAP 258
Discrete Outputs

The **AS-BDAP 258** is an output module for rail-specific applications with 8 discrete relay outputs.
The relay contacts are led through potential-free as normally open contacts.

Enclosed you will find the following module-specific information:

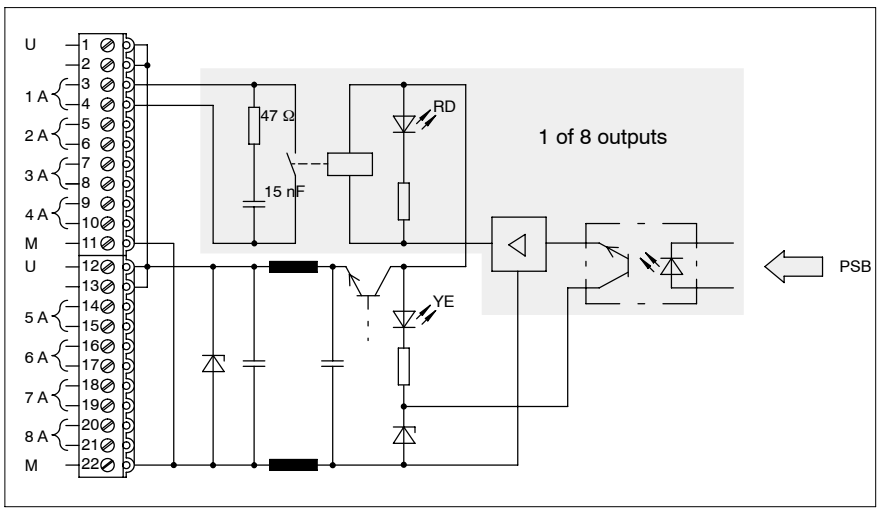
- Features and functions
- Configuration
- Diagnostics
- Technical specifications

1 Features and Functions

1.1 Features

The 22 VDC supply of the relay coils and the sensor supply must be provided externally.
The 5 V supply is provided internally through the I/O bus.
The operating temperature range was extended to –25 ... +70 degrees Celsius.

1.2 Operating mode



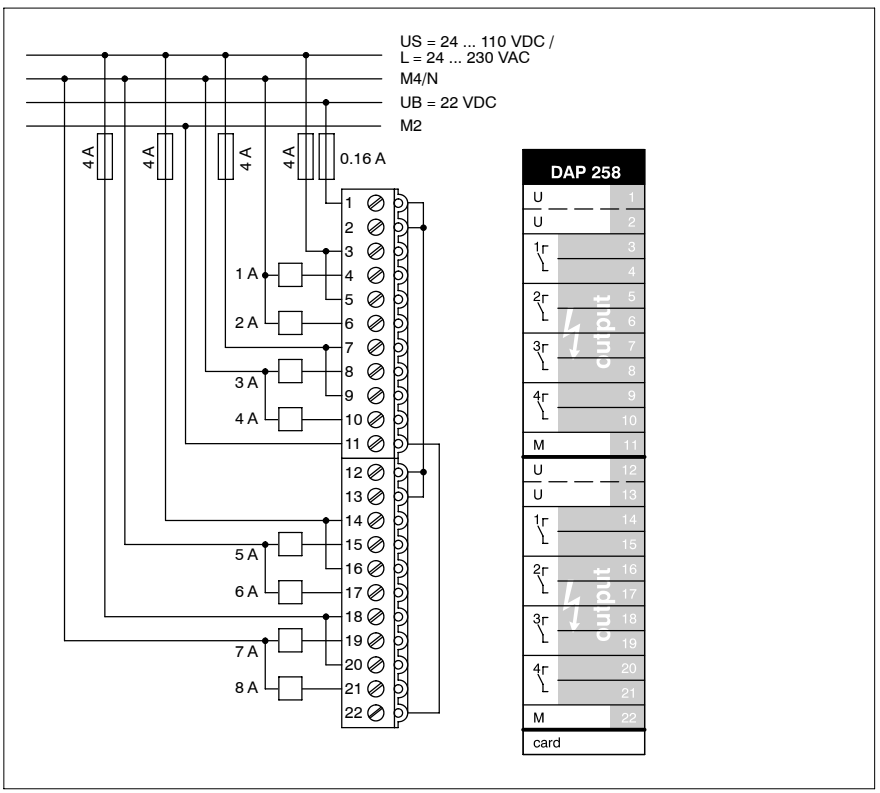
2 Configuration

Configure the following:

- Module's mounting location (slot) on the backplane (according to Concept list "I/O map").
  For each respective mounting location, use the software to select the module designation "DAP 2x8".
  For installation onto the backplane, refer to the enclosed user information.

- Peripheral connection (according to the Concept lists "I/O Map" and "Variable List").

Figure 47 Example of connection



The appropriate signal names or signal addresses should be entered on the label inlays.

In case of inductive loads for switching, perform a protective circuit locally parallel to the inductance (operating coil):

- In case of working voltages of L = 230 VAC an additional RC circuit of appropriate dimensions (according to the manufacturers specifications) is **required** to increase the service life and the EMC stability.
- In case of working voltages US = 24 to 110 VDC a freewheeling diode is **required** to increase the service life.

3 Diagnostics

The front of the module contains the following displays:

Table 21 Explanation of the LEDs

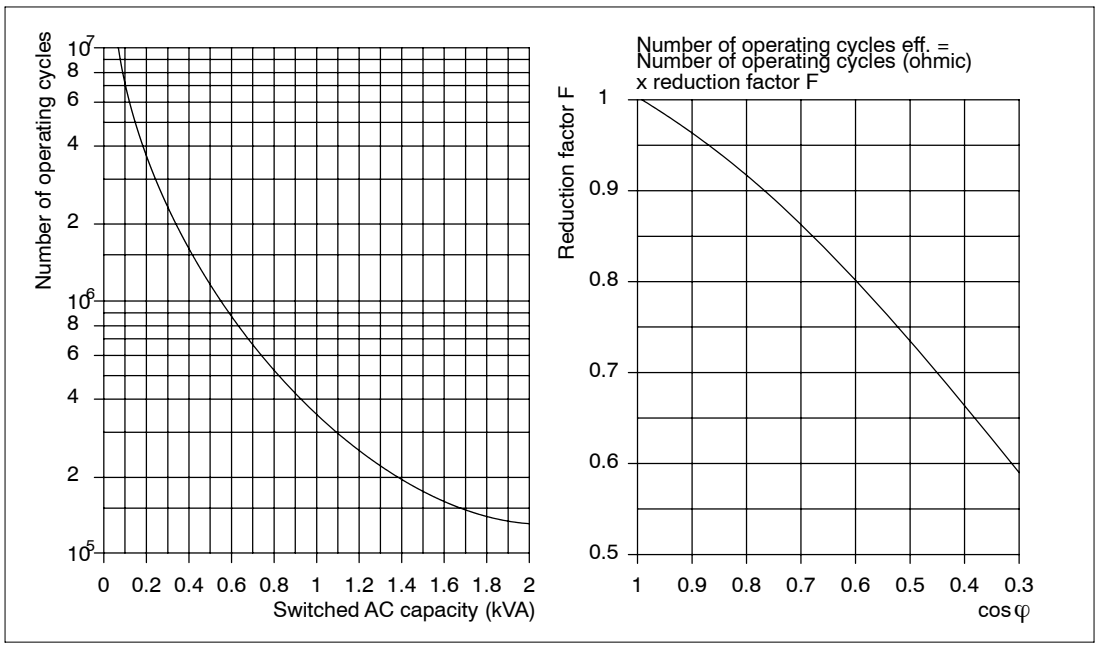
No.	Designation (label inlay)	Color	Function
1	U	yellow	for the supply of relay coils on: Supply voltage available off: Supply voltage not available
3, 5, 7, 9, 14, 16, 18, 20	1 ... 8	red	for the output signals on: Outputs carry ”1” signal off: Outputs carry ”0” signal

4 Technical Specifications

Allocation	
Device	TSX Compact (rail applications)
Structure	in I/O range
Power supply	
External input voltage for relay coils	UB = 22 VDC, +/-5 %, 70 mA max.
Reference potential M	M2
internal via I/O bus	5 V; 60 mA max., typically 50 mA

Data interface	
Internal I/O bus	parallel I/O bus, refer to basic user manual ”Modicon TSX Compact”, chapter ”Specifications”
Relay outputs	
Number	8 normally open contacts (with LED indicators)
Type of networking	Contacts, potential-free led through as normally open contacts
Operating delay	approx. 10 ms
Working voltages	US = 24 ... 110 VDC, L = 24 ... 230 VAC, 250 VAC max.
Minimum load current	10 mA for new contacts
Load currents of the relay contacts	
with 230 VAC	max. 2 A continuous with cos phi= 1 max. 4 A temporary with cos phi = 1 max. 1 A continuous with cos phi = 0.5 max. 1.5 A/ 240 V acc. to AC 11, VDE 0660, Section 200
with 24 VDC	max. 2 A continuous (ohmic load) max. 4 A temporary (ohmic load) max. 1.5 A pilot duty max. 1 A continuous (L/R = 20 ms) max. 0.5 A/ 24 V acc. to DC 11, VDE 0660, Section 200
with 60 VDC	max. 1 A continuous (ohmic load) max. 0.5 A (L/R = 20 ms)
with 110 VDC	max. 0.45 A continuous (ohmic load) max. 0.25 A (L/R = 20 ms)
with 140 VDC	max. 0.3 A continuous (ohmic load) max. 0.15 A (L/R = 20 ms)
Protective circuit	all normally open contacts are wired with 68 Ohm + 15 nF, residual current approx. 1 mA, also refer to chapter ”Configuration” page 156
Overload protection	to be planned externally
Service life of contacts	
mechanical	20 million switching cycles
electric (ohmic load)	10 million switching cycles (230 VAC/ 0.2 A) 7 million switching cycles (230 VAC/ 0.5 A) typ. 8 million switching cycles (30 VDC/ 2 A, with clamping diode) typ. 1 million switching cycles (60 VDC/ 1 A, with clamping diode and 3000 switching cycles/ h max.)
electric (cos phi = 0.5)	5 million switching cycles (230 VAC/ 0.5 A)

Figure 48 Left: Service life of contact with ohmic load Right: Reduction factor for inductive load



Physical characteristics	
Module	in standard-size case
Format	3 HE, 8 T
Weight	360 g
Type of connection	
Process	2 clip-on 11-pole screw/plug-in terminals
Systems bus (internal)	1/3 C30M
Environmental conditions	
Regulations	VDE 0160, LES-DB
Systems data	refer to the basic user manual "Modicon TSX Compact", chapter "Specifications"
Authorized ambient operating temperature	-25 ... +70 degrees Celsius permanent -30 ... +85 degrees Celsius temporary (10 minutes)
Power dissipation	typically 2 W
Shock, vibration	according to LES-DB

AS-BDAU 252
Analog Outputs

The **AS-BDAU 252** is an output module for rail-specific applications with 2 analog, isolated outputs for current or voltage output. Each output can be connected with actuators for +/-10 V or +/-20 mA.

Enclosed you will find the following module-specific information:

- Features and functions
- Configuration
- Diagnostics
- Technical specifications

Module elements:

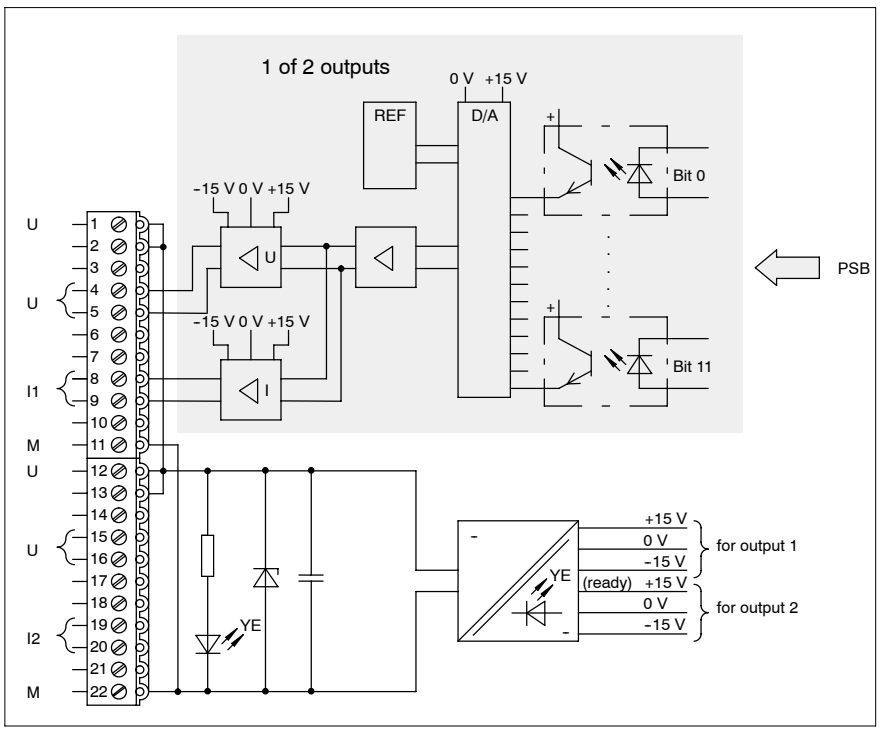
1
2
3

1 Features and Functions

1.1 Features

The 24 VDC supply voltage must be provided externally.
The 5 V supply is provided internally through the I/O bus.
The digital-analog converter works with a signed 11-bit resolution.
The operating temperature range was extended to -25 ... +70 degrees Celsius.

1.2 Operating mode



2 Configuration

Configure the following:

2.1 Mounting Location

Select the module's mounting location (slot) on the backplane according to the Concept list "I/O Map".
For each respective mounting location, use the software to select the module designation "DAU 2x2".
For installation onto the backplane, refer to the enclosed user information.

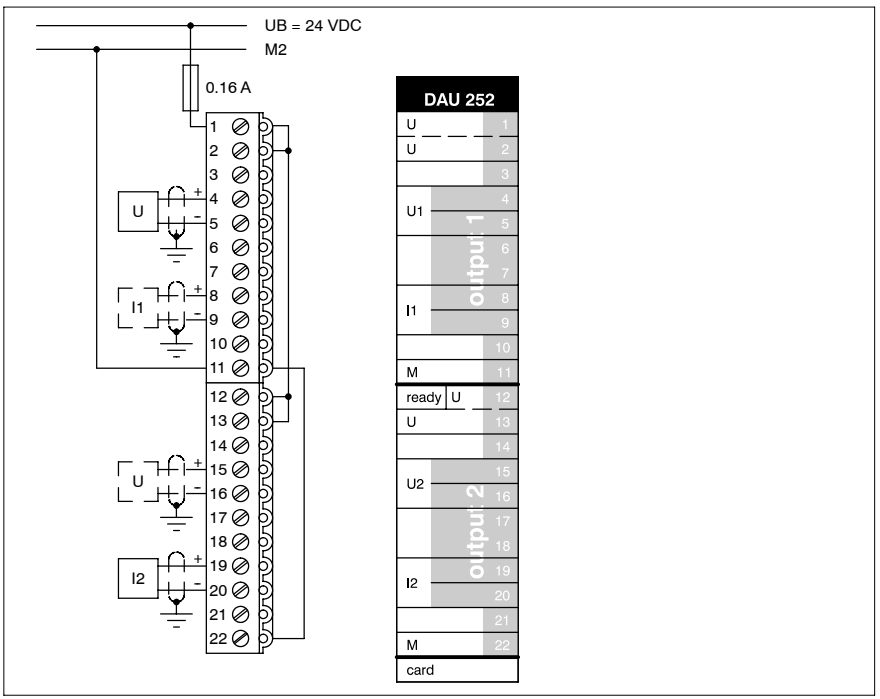
2.2 Wiring

Refer to chapter "Wiring" in the description of module AS-BADU 256.

2.3 Connection

Connect the peripherals according to the Concept lists "I/O Map" and "Variable List".

Figure 49 Example of connection



Each output can be used for current output (I) or voltage output (U).

After conversion in the DAU, the two decimal words in ref. 4x are forwarded to outputs 1 and 2 as analog values.

The appropriate signal names or signal addresses should be entered on the label inlays.

2.4 Translation Values for AS-BDAU 252

Analog value Current output in mA	Analog value Voltage output in V	Decimal value in Concept	Range
-20.48...	-10.24...	0	Under-range
-20.01	-10.005	47	
-20.00	-10.00	48	Normalrange
0	0	2048	
+20.00	+10.00	4048	
+20.01...	+10.005...	4049	Überrange
+20.48	+10.24	4095	
0	0	4096...	

3 Diagnostics

The front of the module contains the following displays:

Table 22 Explanation of the LEDs

No.	Designation (label inlay)	Color	Function
1	U	yellow	for the 24 V supply on: Supply available off: Supply not available
12	ready	yellow	for the isolated supply from the DC/DC converter on: Supply available off: Supply not available

4 Technical Specifications

Allocation	
Device	TSX Compact (rail applications)
Structure	in I/O range

Power supply	
external supply	UB = 24 VDC (20 ... 30 VDC), 150 mA max.
Reference potential M	M2
internal via I/O bus	5 V; 60 mA max., typically 40 mA
Outputs	
Number	2, optionally as current or voltage output
Type of networking	Isolation through optical coupler to I/O bus, 24 V supply and 2nd Output
Current output	+/-20 mA, <500 Ohm
Voltage output	+/-10 V, >5 kOhm, short circuit proof
Overload	approx. 2.4 %
Fault at 0 ... 60 degrees Celsius	approx. 0.6 %
Conversion time per output	approx. 11 ms
Translation values	refer to chapter "Translation values", page 162
Resolution	11 bits plus sign
Data interface	
Internal I/O bus	parallel I/O bus, refer to basic user manual "Modicon TSX Compact", chapter "Specifications"
Physical characteristics	
Module	in standard-size case
Format	3 HE, 8 T
Weight	300 g
Type of connection	
Process, supply cable to process Installation distance Cable length	2 clip-on 11-pole screw/plug-in terminals minimum cross section 0.5 sq. mm, twisted pair, reference conductor incorporated, shielded e.g. KAB-2205-LI (2 x 2 x 0.5 sq. mm) >0.5 m (to potential sources of electrical noise) 100 m max.
Systems bus (internal)	1/3 C30M
Environmental conditions	
Regulations	VDE 0160, LES-DB
Systems data	refer to the basic user manual "Modicon TSX Compact", chapter "Specifications"
Authorized ambient operating temperature	 -25 ... +70 degrees Celsius permanent -30 ... +85 degrees Celsius temporary (10 minutes)
Power dissipation	typically 4 W
Shock, vibration	according to LES-DB

AS-BDEP 254
Discrete Inputs

The **AS-BDEP 254** is a module for rail-specific applications with 16 discrete inputs for 24 to 48 VDC, isolated from the bus and from the second input group.

Enclosed you will find the following module-specific information:

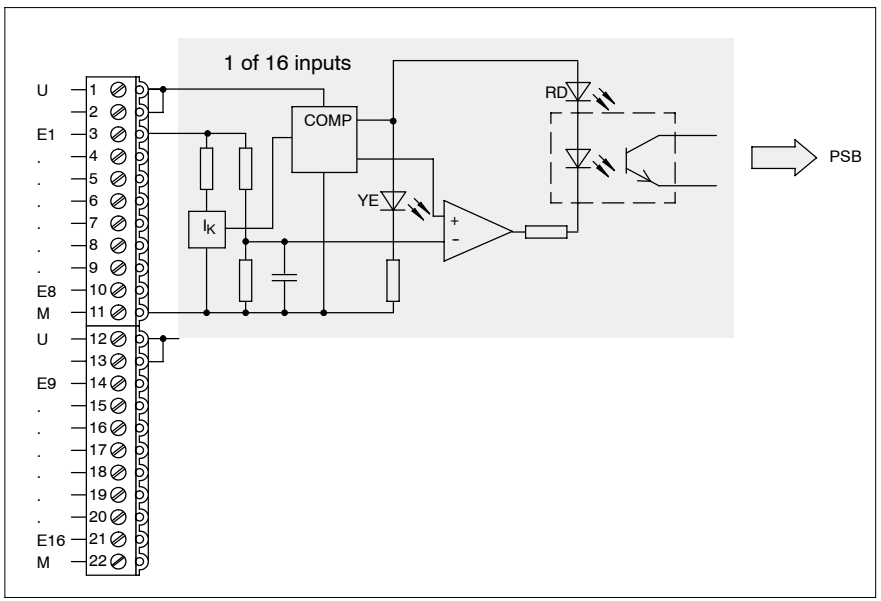
- Features and functions
- Configuration
- Diagnostics
- Technical specifications

1 Features and Functions

1.1 Features

The reference potential of the external 24 ... 48 VDC sensor supply extends to 8 inputs, respectively.
The 5 V supply is provided internally through the I/O bus.
The operating temperature range was extended to –25 ... +70 degrees Celsius.

1.2 Operating mode



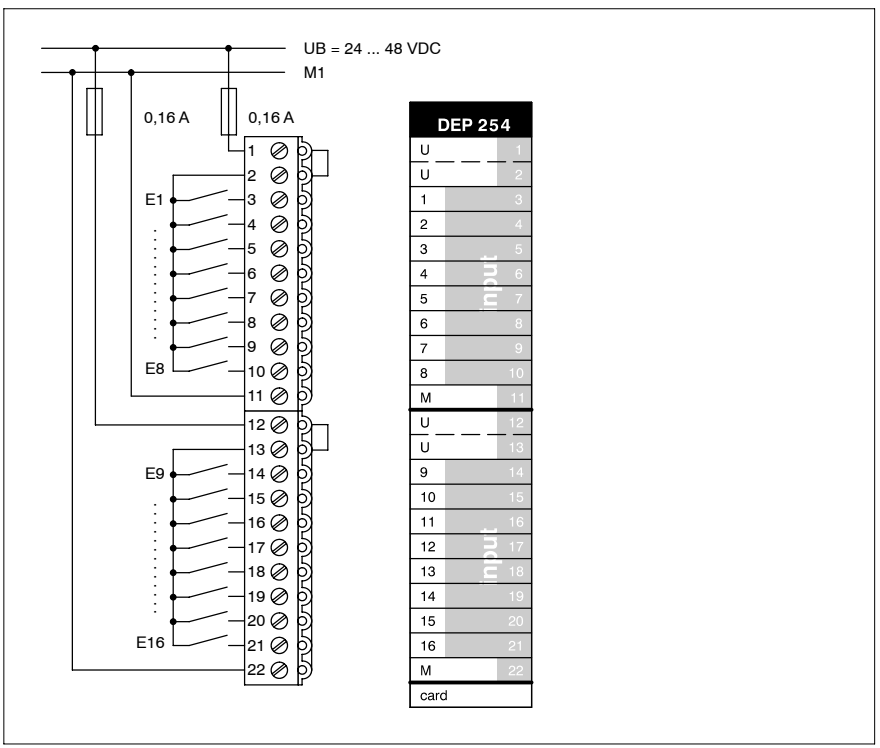
2 Configuration

Configure the following:

- Module's mounting slot (backplane slot) on the backplane (according to the Concept list "I/O Map").
  For each respective mounting location, use the software to select the module designation "DAP 2x4".
  For installation onto the backplane, refer to the enclosed user information.

- Connection of the peripheral device (according to the Concept lists "I/O Map" and "Variable List").

Figure 50 Example of connection



The appropriate signal names or signal addresses should be entered on the label inlays.

3 Diagnostics

The front of the module contains the following displays:

Table 23 Explanation of the LEDs

No.	Designation (label inlay)	Color	Function
1, 12	U	yellow	for external sensor supply on: Sensor supply available off: Supply not available
3 ... 10, 14 ... 21	1 ... 16	red	for input signals on: Input carries ”1” signal off: Input carries ”0” signal or is not connected Cause: - Sensor supply not available - Reference potential M1 interrupted

For simulation, the SIM 011 simulator can be plugged into each of the 8 inputs (11-pole screw/plug-in terminal).

4 Technical Specifications

Allocation	
Device	TSX Compact (rail applications)
Structure	in I/O range
Power supply	
external sensor voltage	UB = 24 / 48 VDC (+/-40 %)
internal via I/O bus	5 V; 22 mA max., typically 15 mA
Inputs	
Sensor supply	UB = 24 ... 48 VDC, +/-40 % for 8 inputs, respectively, residual ripple 20 % SS max.
Reference potential M	M1 for 8 inputs each
Number of inputs	2 x 8 in groups
Type of networking	Isolation through optical coupler to I/O bus and 2 stacked groups
Signal level at 24 VDC: Voltage/Current (IE) at 1 signal Voltage/Current at 0 signal Reference current (IR)	 +12 ... +33.6 V / +6.0 ... +7.1 mA -3 ... +5 V / -1.7 ... +2.9 mA 10.1 mA max.
Signal level at 48 VDC: Voltage/Current (IE) at 1 signal Voltage/Current at 0 signal Reference current (IR)	 +24 ... +72 V / +2.0 ... +2.5 mA -6 ... +10 V / -3.4 ... +2.5 mA 7.1 mA max.
Operating level (0 after 1 signal)	28 ... 33 % of Usch
Input delay	4 ms
Operating frequency	100 Hz max.
Input current per group IG = 8 x IE + IR	80 mA max.
Data interface	
Internal I/O bus	parallel I/O bus, refer to basic user manual "Modicon TSX Compact", chapter "Specifications"
Physical characteristics	
Module	in standard-size case
Format	3 HE, 8 T
Weight	approx. 260 g
Type of connection	
Process	2 clip-on 11-pole screw/plug-in terminals
Systems bus (internal)	1/3 C30M

Environmental conditions	
Regulations	VDE 0160, LES-DB
Systems data	refer to the basic user manual ”Modicon TSX Compact”, chapter ”Specifications”
Authorized ambient operating temperature	-25 ... +70 degrees Celsius permanent -30 ... +85 degrees Celsius temporary (10 minutes)
Power dissipation	typically 4 W
Shock, vibration	according to LES-DB

AS-BDEP 256, AS-BDEP 257
Discrete Inputs

The **AS-BDEP 256** is a module for rail-specific applications with 16 discrete, isolated inputs for 24 VDC (+/-40 %).

The **AS-BDEP 257** is a module for rail-specific applications with 16 discrete, isolated inputs for 110 VDC (+/-40 %).

Enclosed you will find the following module-specific information:

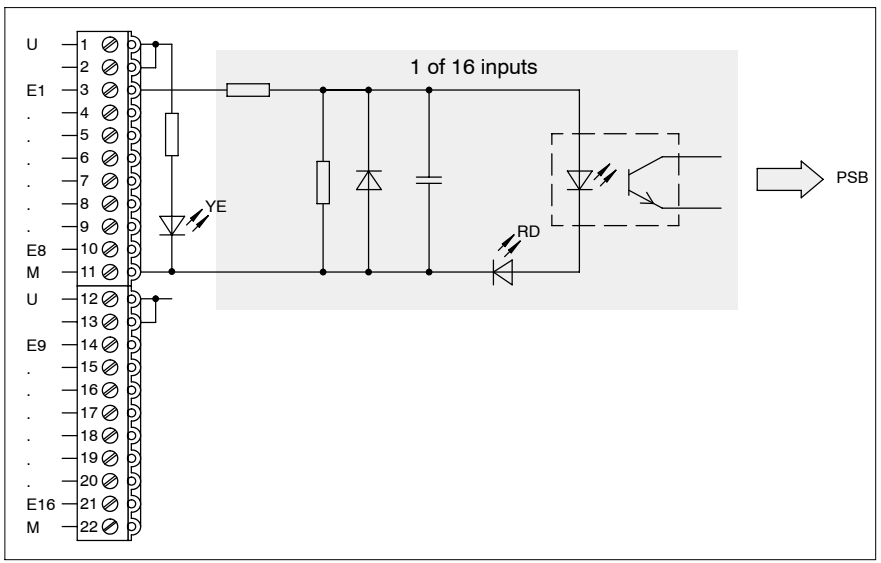
- Features and functions
- Configuration
- Diagnostics
- Technical specifications

1 Features and Functions

1.1 Features

The reference potential of the external 24 or 110 VDC sensor supply must be provided for each of the 8 inputs.
The 5 V supply is provided internally through the I/O bus.
The operating temperature range was extended to –25 ... +70 degrees Celsius.

1.2 Operating mode (AS-BDEP 256 and AS-BDEP 257)



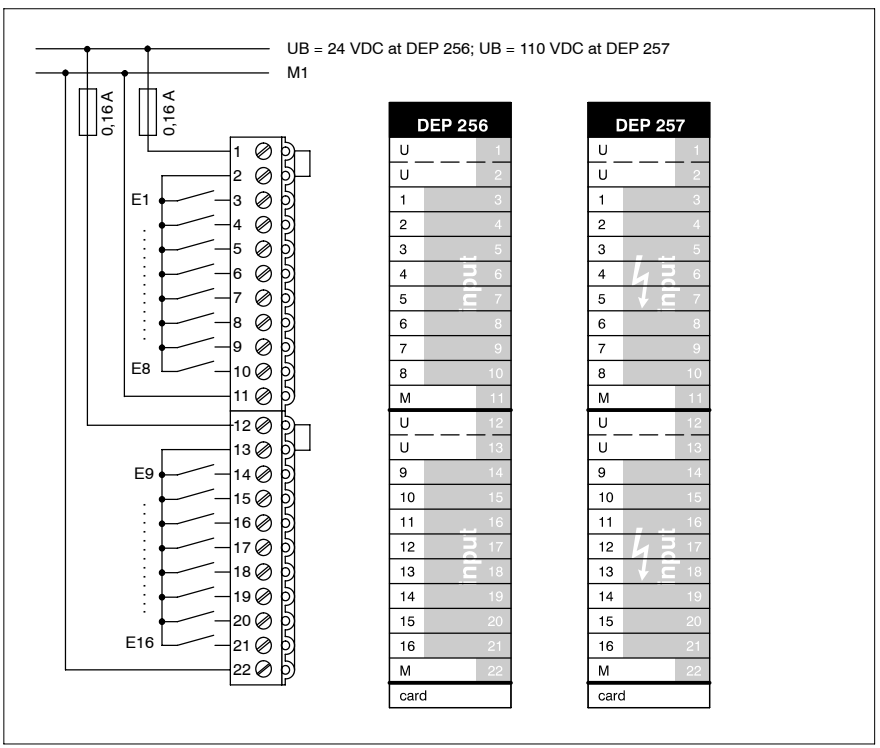
2 ## Configuration

Configure the following:

- Module's mounting slot (backplane slot) on the backplane (according to the Concept list "I/O Map").
  For each respective mounting location, use the software to select the module designation "DAP 2x6/2x7" for both modules.
  For installation onto the backplane, refer to the enclosed user information.

- Connection of the peripheral device (according to the Concept lists "I/O Map" and "Variable List").

Figure 51 Example of connection



The appropriate signal names or signal addresses should be entered on the label inlays.

3 Diagnostics

The front of the module contains the following displays:

Table 24 Explanation of the LEDs

No.	Designation (label inlay)	Color	Function
1, 12	U	yellow	for external sensor supply on: Sensor supply available off: Supply not available
3 ... 10, 14 ... 21	1 ... 16	red	for input signals on: Input carries ”1” signal off: Input carries ”0” signal or is not connected Cause: - Sensor supply not available - Reference potential M1 interrupted

For simulation, the SIM 011 simulator can be plugged into each of the 8 inputs (11-pole screw/plug-in terminal).

4 Technical Specifications

Allocation	
Device	TSX Compact (rail applications)
Structure	in I/O range
Power supply	
external sensor voltage	UB = 24 VDC (+/-40 %) with AS-BDEP 256; UB = 110 VDC (+/-40 %) with AS-BDEP 257
internal via I/O bus	5 V; 25 mA max., typically 20 mA

AS-BDEP 256 inputs	
Sensor supply	UB = 14.4 ... 33.6 VDC for 8 inputs each, residual ripple 20 % SS max.
Reference potential M	M1 for 8 inputs each
Number of inputs	2 x 8 in groups
Type of networking	Optical coupler, isolation to I/O bus and to second group
Rated signal value	+24 V
Signal level	1 signal: +12 ... +37 V 0 signal: -2 ... +5 V
Input current	4 mA at 24 V, 6 mA at 37V
Input delay	4 ms
AS-BDEP 257 inputs	
Sensor supply	UB = 66 ... 154 VDC for 8 inputs each, residual ripple 20 % SS max.
Reference potential M	M1 for 8 inputs each
Number of inputs	2 x 8 in groups
Type of networking	Optical coupler, isolation to I/O bus and to second group
Rated signal value	+110 V
Signal level	1 signal: +55 ... +170 V 0 signal: -2 ... +10 V
Input current	typically 2.2 mA
Input delay	4 ms
Data interface	
Internal I/O bus	parallel I/O bus, refer to basic user manual ”Modicon TSX Compact”, chapter ”Specifications”
Physical characteristics	
Module	in standard-size case
Format	3 HE, 8 T
Weight	approx. 220 g
Type of connection	
Process	2 clip-on 11-pole screw/plug-in terminals
Systems bus (internal)	1/3 C30M

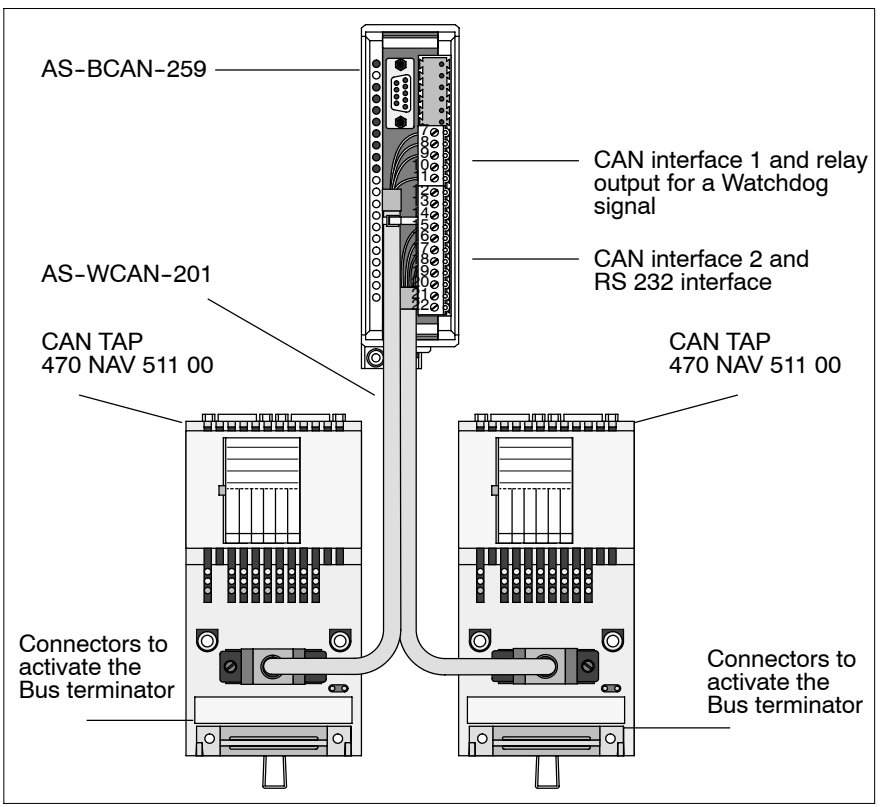
Environmental conditions	
Regulations	VDE 0160, LES-DB
Systems data	refer to the basic user manual ”Modicon TSX Compact”, chapter ”Specifications”
Authorized ambient operating temperature	-25 ... +70 degrees Celsius permanent -30 ... +85 degrees Celsius temporary (10 minutes)
Power dissipation	typically 3 W
Shock, vibration	according to LES-DB

AS-BCAN-259
Communications Module for CAN

AS-BCAN-259 is an interface module on the CAN as per CIA specification (CAN in Automation). It is used to link the "Modicon TSX Compact" to the CAN.

Enclosed you will find the following module-specific information:

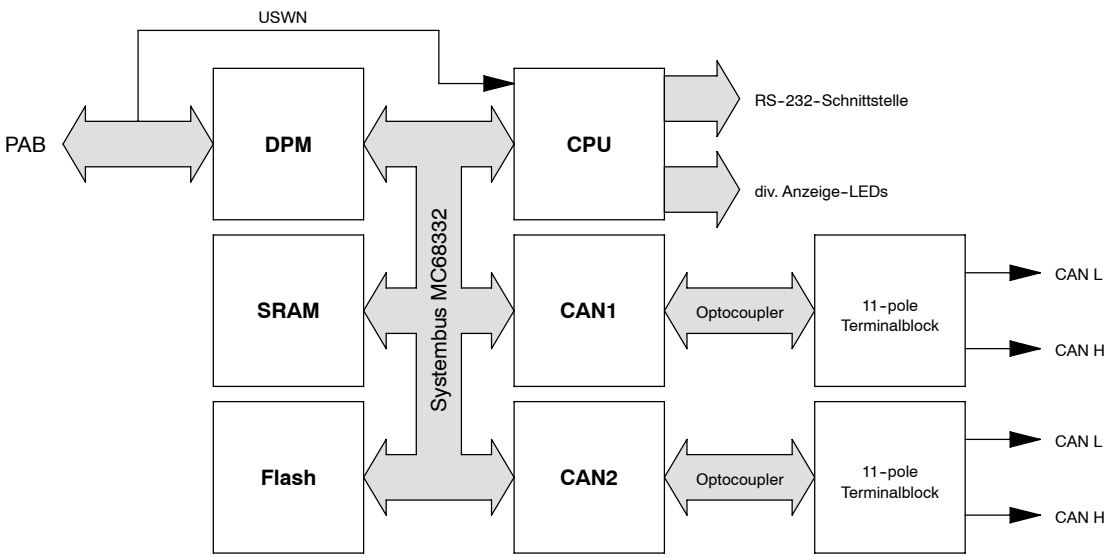
- Features and functions
- Hardware configuration
- Diagnostics
- Technical specifications



1 Features and Functions

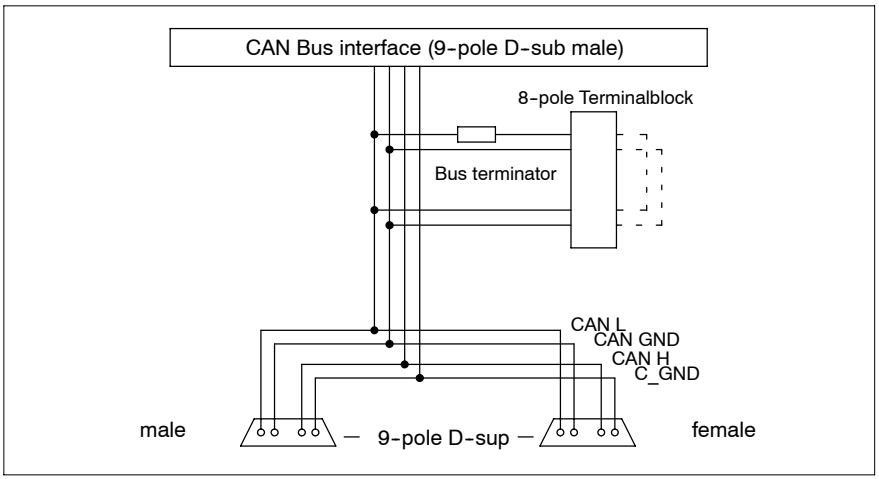
- Connection to the CAN via CAN-TAP (470 NAV 511 00) and module connecting cable (AS-WCAN-201)
- Compliance with the EN 50 155 standard (railway application)
- One CAN port for the CANopen protocol (CAN 1)
- CANopen Master and CANopen Slave functionality
- Address setting using the DIP switch
- One CAN interface for CAN layer 2 protocols based on V2.0A and V2.0B
- Three CAN modules can be configured in the rack AS-HDTA-200 of the Compact PLC

Figure 52 Function of the CPU part (CAN-259 CPU)



Motorola Processor 68332-16 (16 MHz)
64 K/ 16 Bit SRAM, 64 K/ 16 Bit FLASH, 8 K Byte DPM

Figure 53 Function of the CAN-TAP



2 Configuration

2.1 Setting Device Addresses

The DIP switch for address setting is located at the back of the module.

Figure 54 Rear view of the AS-BCAN-259

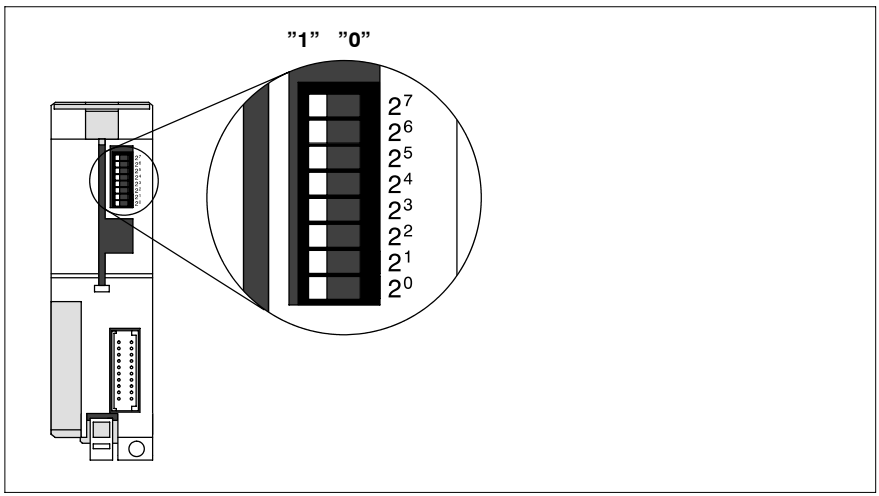


Table 25 Address settings

DIP switch	Address 1	Address 2	. . . . .	Address 254	Address 255
2 to 7	”0”	”0”		”1”	”1”
2 to 6	”0”	”0”		”1”	”1”
2 to 5	”0”	”0”		”1”	”1”
2 to 5	”0”	”0”		”1”	”1”
2 to 3	”0”	”0”		”1”	”1”
2 to 2	”0”	”0”		”1”	”1”
2 to 1	”0”	”1”		”1”	”1”
2 to 0	”1”	”0”		”0”	”1”

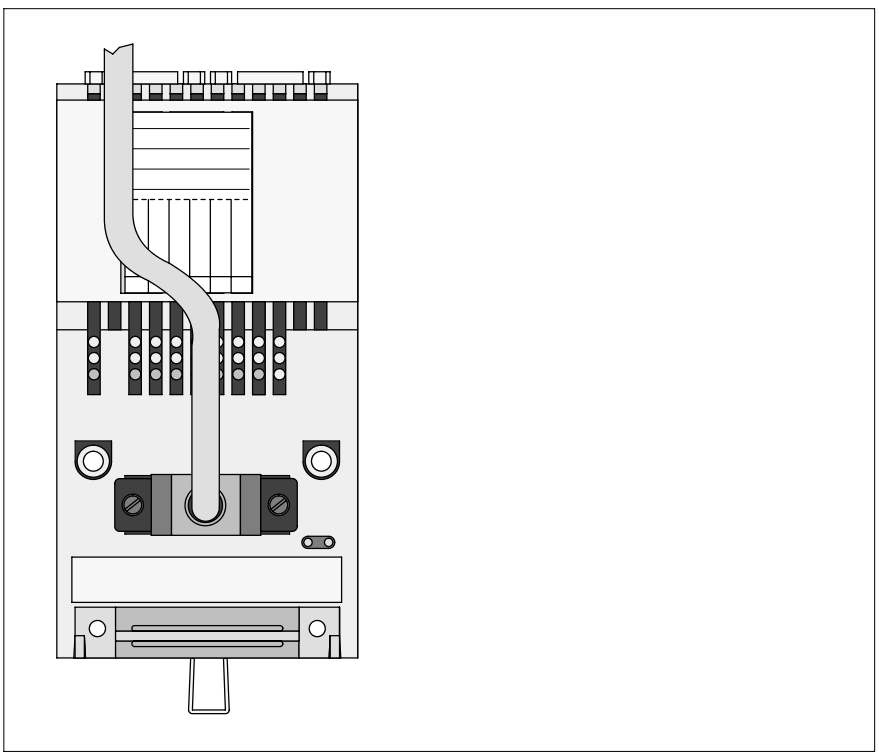
- Setting Device Adresses is only necessary for the CAN interface 1 (CANopen protocol)
- Please note that address 0 and address above 127 must not be used within CANopen networks.

2.2 Installation

- Mount the CAN module on one of the I/O slots (1-3, 1-4, 1-5) on primary backplane AS-HDTA-200 (related topics: chap. ”Installtion”, ”Modules” in the user manual).

- Mount the CAN-TAP below the backplane on a DIN top hat rail (bus tap, refer to Figure 55).

Figure 55 Mounting the CAN-TAP onto the top hat rail

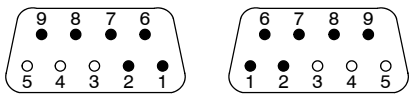


- Connect the terminal block of connecting cable AS-WCAN-201 to the lower pins of the CAN module.

- Establish the connection to the CAN-TAP (insert the connecting cable’s connector into the CAN-TAP).

2.3 Connection to the MVB Interface

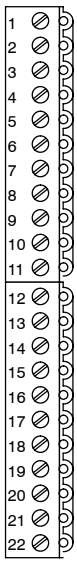
Figure 56 Pin assignment of the MVB interface on the MVB-TAP



2 CAN_L
3 CAN_GND
5 (CAN_SHLD)
6 (CAN_0V)
7 CAN_H
8 (ERR)
9 (CAN_VCC)

● Contact point occupied
○ Contact point not occupied

Figure 57 Terminal assignment of TAP connecting cable AS-WMVB-201



1	PE	(PE for the shield of the Drop cable)
2	CAN1_H	(CAN1_H)
3	CAN1_L	(CAN1_L)
4	CAN1_GND	(CAN1_GND)
5	RES1_L	
6	RES1_H	(Bus terminator to be bridged with 5)
7	RES2_L	
8	RES2_H	(Bus terminator for CAN2 to be bridged with 7)
9	REL1	(Watchdog Relay contact N.C.) not supported
10	REL2	(Watchdog Relay contact N.C.) not supported
11	PE	(PE for shield of the Drop cable)
12	PE	(PE for shield of the Drop cable)
13	CAN2_H	(CAN2_H)
14	CAN2_L	(CAN2_L)
15	CAN2_GND	(CAN2_GND
16	-	
17	TxD	(Send RS 232)
18	DTR	(Handshake)
19	RxD	(Receive RS 232)
20	DSR	(Handshake)
21	GND	GND RS 232
22	PE	(PE for the shield of the Drop cable)

3 Diagnostics

The front panel of the CAN module has the following LEDs:

Table 26 Explanation of the LEDs

LED	No.	Color	Function
Ready	1	yellow	Processor running
Error	2	red	General error (Hardware)
Rx0	3	yellow	Channel 0 receive
Tx0	4	yellow	Channel 0 transmit
Rx1	5	yellow	Channel 1 receive
Tx1	6	yellow	Channel 1 transmit
Init	7	yellow	Module has been initialized by PLC
Qovr	8	yellow	Queue overrun
Ovr	9	yellow	Internal overrun
Act0	10	yellow	Channel 0 operational
Relay	11	yellow	Status of internal relay
CMT	12	yellow	Module configured as CMT Master

If the modules configured to use layer 2 massages only LED Act0 on indicates that the CAN controller chip of channel 0 is initialized and will go off if the chip is in Bus Off state.

4 Technical Specifications

Allocation	
Device	TSX Compact (rail application)
Structure	I/O area (1-3, 1-4, 1-5) in AS-HDTA-200
Number	3 AS-BCAN-259 module per PLC
CAN device class	CANopen and CAN layer 2 (V2.0 A and V2.0B)
support interface	
internally	5 VDC, max. 500 mA
Data interface	
Internal I/O bus	parallel I/O bus, refer to basic User Manual, "Modicon TSX Compact" Ch. "Specifications"
Processor, memory capacity	
Type of processor	Motorola 68332 (16 MHz)
24 KB	128 K bytes
Flash	128 K bytes
CAN ports	2 x SJA 1000 according to ISO11898, optically isolated, internal terminating resistor (120 OHM) per channel
Maximum number devices	64 per channel
Supported Baudrates	10, 20, 50, 125, 250, 500, 800, 1000 kbps
Supported CAN Bus Spec.	2.0A and 2.0B (11 bit and 29 bit identifires)
Protocol	CANopen (channel 0) Slave, CANopen (channel 0) NMT Master, simple Layer 2 (channel 0 and 1). 16 Kbyte Flash 1 x RS 232 for firmware download
Physical characteristics	
Module	in standard case
Format	3 HE, 8 T
Weight	approx. 400 g
Indicators	refer to Chapter "Diagnostics", page 183
Type of connection	
CAN interface	9-pole D-sub plug and 9-pole D-sub socket on CAN-TAP
RS 232C interface	11-pin screw/plug-in terminal
Systems bus (internal)	1/3 C30M

Environmental conditions	
Regulations	EN 50 155, EN 50 121-3-2
Systems data	refer to basic User Manual, ”Modicon TSX Compact” Chapter ”Specifications”
Authorized ambient operating temperature	-25 ... +70 degrees Celsius permanent -30 ... +85 degrees Celsius temporary (10 minutes)
Power dissipation	typically 2.5 W
Shock, vibration	as per EN 50 155

AS-BNUL-200, AS-BNUL-202
Dummy Modules

Dummy module **AS-BNUL-200** is used to prewire spare locations or to support lines that are not required.

Dummy module **AS-BNUL-202** is used to support supply lines for the process inputs (e.g., initiators).

In partially equipped backplanes, the dummy modules are also used as a support for the snap-in front cover.

Enclosed is the following module-specific information:

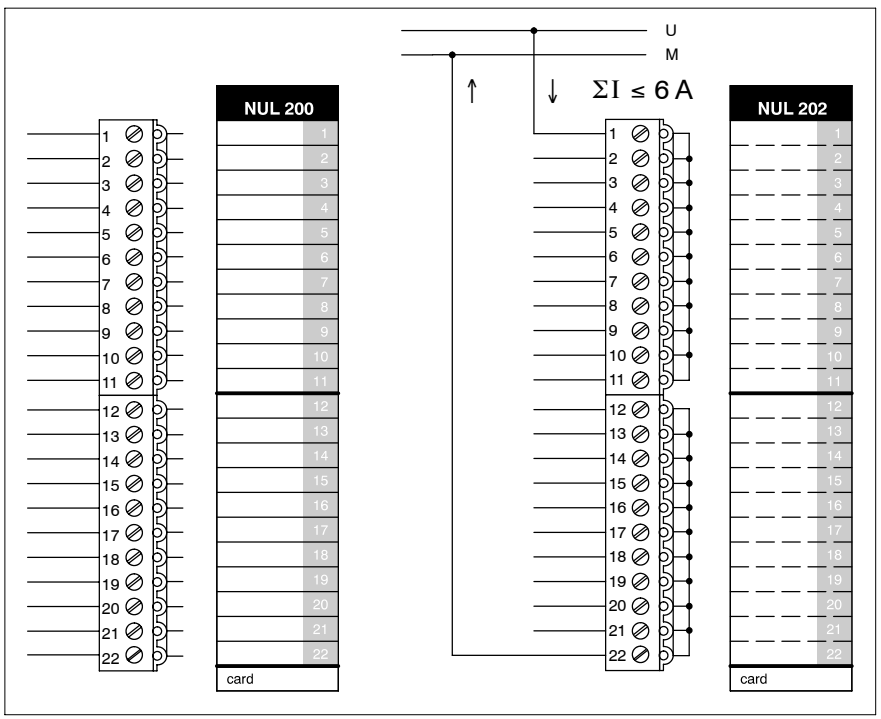
- Configuration
- Technical specifications

5 **Configuration**

Configure the following:

- Assignment of the terminals to the non-active peripheral signals
- Assignment of the power supply to each of the output modules

Figure 58 Connections AS-BNUL-200 (left) and AS-BNUL-202 (right)



The appropriate signal names or signal addresses should be entered on the label inlays.

6 Technical Specifications

Allocation	
Device	TSX Compact (A120, 984), Geadat 120, Micro
Structure	in I/O range
Physical characteristics	
Module	in standard-size case
Format	3 HE, 8 T
Ground	approx. 190 g
Connection	
Terminals	2 clip-on 11-pole screw/plug-in terminals
max. voltage for AS-BNUL 200	< 250 V between non-adjoining terminals, </= 50 V between adjoining terminals
max. voltage for AS-BNUL 202	</= 50 V, 6 A max. (total current per terminal group)

AS-HDTA-200 ... 202
Backplane

Racks AS-HDTA-200, 201 and 202 are backplanes mounted onto a top hat rail intended for each individual module. They are used for the installation of the Modicon TSX Compact programmable controller. In addition, they serve as a backplane for: Geadat 120, central process peripherals of the micro and remote process peripherals with Compact components via system field bus, INTERBUS, PROFIBUS-DP.

AS-HDTA-200 is the primary backplane. It has a width of 42 parts (T) and for equipment mounting it is designed with the 16T wide central unit, with three 8T wide I/O modules, and with the 2T wide diskette box.

AS-HDTA-201 serves as an expansion backplane. It has a width of 42 parts (T) and for equipment mounting it is designed with a max. of five 8T wide I/O modules, and with the 2T wide diskette box.

AS-HDTA-202 serves as a terminating backplane. It has a width of 18 parts (T) and for equipment mounting it is designed with a max. of two 8T wide I/O modules, and with the 2T wide diskette box. The I/O bus cannot be continued on the right side.

The module-specific information includes:

- Features and functions
- Configuration
- Technical specifications

Figure 59 Front view of the AS-HDTA-200 backplane

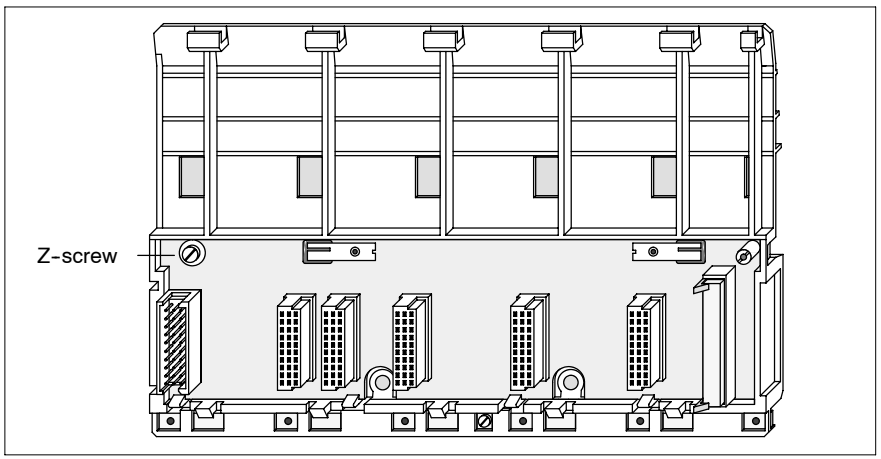


Figure 60 Front view of the AS-HDTA-201 backplane

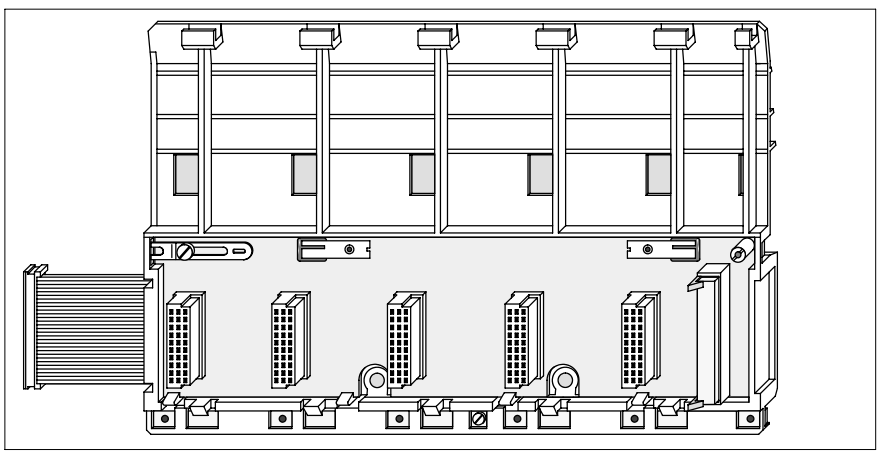
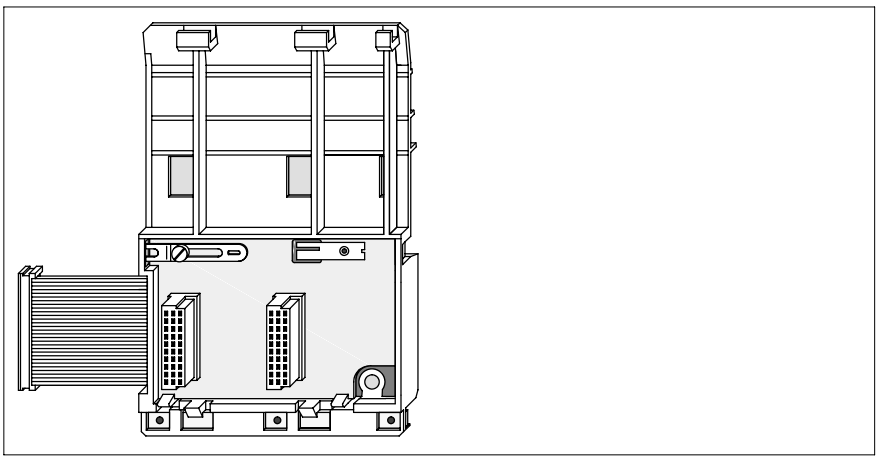


Figure 61 Front view of the AS-HDTA-202 backplane



1

Features and Functions

Backplanes AS-HDTA-200, 201, and 202 carry the individual modules which are inserted on the top edge and then latched tightly in a vertical position. Once they are in place, the contact to the I/O bus is established via a 30-pole connector.

The bus connects the central unit with the corresponding modules. Each module is connected with the frame potential of the mounting rail (top hat rail) through openings cut into the board.

The multiplexing of the I/O bus spanning up to 3 expansion backplanes is achieved using either of the following:

- The 30-pole bus connector (when multiplexing at the same frequency)
- Bus extension BXT 201 (when skipping lines).

2 Configuration

2.1 Z-screw

To achieve high EMC stability, the 0V reference potential and the DIN top hat rail (grounding) are connected with the Z-screw (factory settings). Doing this, will electrically short-circuit the connection between the 0V potential and the ground. The Z-screw is on the AS-HDTA-200 (see Figure 59).

For a potential-free installation, loosen the Z-screw in the AS-HDTA-200. This will ground the capacitance of the 0V potential (1 nF). For details on grounding, please refer to chapter ”Grounding” in the TSX Compact user manual.

The expansion backplanes AS-HDTA-201 and 202 do not have a Z-screw. The 0V only connection to the DIN top hat rail is strictly capacitive.

2.2 Equipment Mounting

Please perform the equipment mounting as required for this task.
The following applies:

Primary backplane AS-HDTA-200
The AS-HDTA-200 in slot 0 must be equipped with a CPU or a connection module (DEA).
The 3 remaining slots 1 ... 3 are free to be used for I/O modules and experts.

Expansion backplane AS-HDTA-201
The AS-HDTA-201 can be equipped with up to five 8T wide I/O modules and the corresponding amount of 16T wide modules.

Termination backplane AS-HDTA-202
The AS-HDTA-202 can be equipped with two 8T wide or one 16T wide I/O module.

You may leave single I/O slots free.

2.3 Installation

Use the enclosed user information to carry out the installation. You can also carry out the installation according to chapter ”Installation” → ”Backplane” in the TSX Compact User Manual.

All modules of each individual backplane are fitted with a front panel of the proper width which:

- covers the wiring
- contains a window for the signal LEDs underneath
- contains panels for insertable label inlays for indicator LEDs or terminals.

☞ **Note**

In order to be able to latch the front panel a module must be mounted onto both the first and the last slot of the DTA. If necessary, use a dummy as a base.

For increased mechanical use, the backplane can also be screwed to the DIN rail. In a rail application, the screw connection must be performed.

3 Technical Specifications

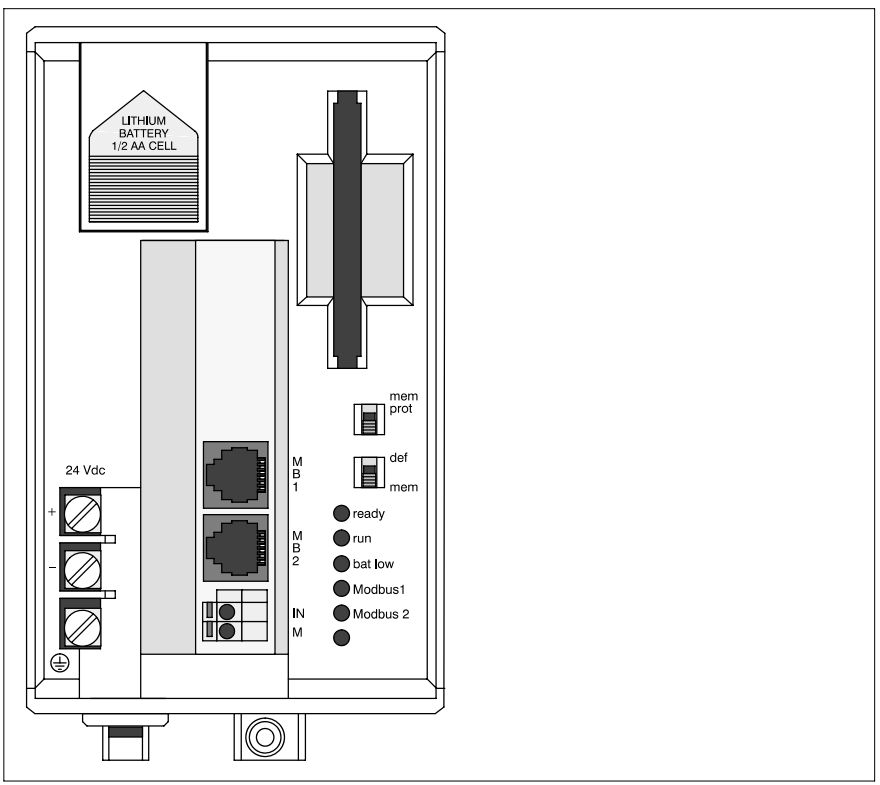
Allocation	
Device	TSX Compact (A120, 984), Geadat 120, Micro
Potentials	
0 V potential	insulated design, connection to DIN top hat rail in the AS-HDTA-200 possible via Z-screw
Shield potential	Ground connection via DIN top hat rail
Current for 5 V bus power supply	2 A max.
Physical characteristics	
Type of protection	IP 00 (backplane is not equipped)
Format AS-HDTA-200 AS-HDTA-201 AS-HDTA-202	(1 HE = 44.45 mm, 1 T = 5.08 mm) 3 HE, 16 T + 3 x 8 T + 2 T = 42 T 3 HE, 5 x 8 T + 2 T = 42 T 3 HE, 2 x 8 T + 2 T = 18 T
Dimensions (B x H x T) AS-HDTA-200 and 201 AS-HDTA-202	 213.4 x 142 x 31 mm 91.4 x 142 x 31 mm
Weight (weight, baseplate with front panel) AS-HDTA-200 and 201 AS-HDTA-202‹	 330 g 150 g
Port / Connector	
in the AS-HDTA-200 Slot 0 Slots 1 ... 3 Bus expansion	 $^1/_3$ R30M + 2 x $^1/_3$ C30F 3 x $^1/_3$ C30F 30-pole plug
in the AS-HDTA-201 I/O slots Bus expansion	 5 x $^1/_3$ C30F 30 pole plug
in the AS-HDTA-202 I/O slots	 2 x $^1/_3$ C30F
Environmental conditions	
Regulations	VDE 0160, UL 508
Systems data	refer to the basic user manual ”Modicon TSX Compact”, chapter ”Specifications”

PC-E984-258C
CPU

PC-E984-258C is the CPU of the programmable controller ”Modicon TSX Compact for rail applications”.

The module-specific information includes:

- Features and functions
- Configuration
- Diagnostics
- Technical specifications



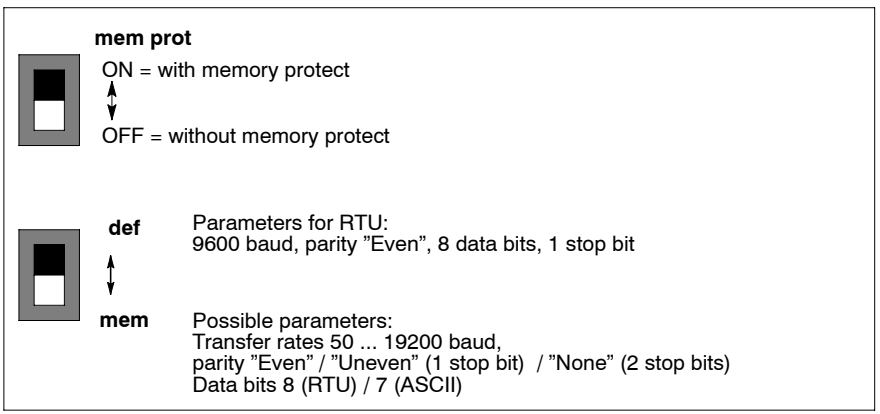
1 Features and Functions

Compliance with the EN 50 155 standard (rail application)

2 Configuration

2.1 Settings

Figure 62 Switches



The memory protect switch "mem prot" prevents modifications to the user program with a programming device (ON).

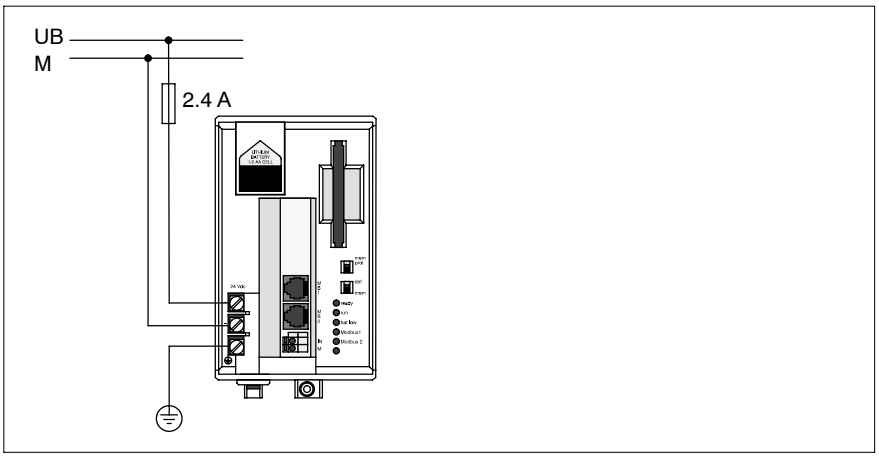
When the second switch is set to "def" (default, ↑) the default parameters apply. When it is set to "mem" (↓), the interface parameters that you specified using the configuration editor apply.

2.2 Backplane Mounting Slot

Mount the CPU onto slots 1-1 and 1-2 in the primary backplane AS-HDTA-200. The individual installation steps must be carried out according to the accompanying user documentation.

2.3 Connection

Figure 63 Power supply



RS 232C (Modbus interface MB1)
The connection between CPU and PC is established via the MB1 interface (Modbus 1).
The connection cable(s) to be used are:
Cable 110 XCA 282 01 (1 m)
Cable 110 XCA 282 02 (3 m)
Cable 110 XCA 282 03 (6 m).
These cables are equipped with 8-pin modular connectors (RJ45). Therefore, the PC side must also have the 9-pin adapter 110 XCA 203 00.

Figure 64 Pin assignment

Connection	Signal	Meaning
1	+5 V	Voltage from I/O bus, 150 mA max.
2	M1 (DSR)	Ready for operation (data set ready)
3	D1 (TXD)	Send data
4	D2 (RXD)	Receive data
5	E2 (GND)	Signal ground
6	S2 (RTS)	Request to send
7	M2 (CTS)	Clear to send
8		Device ground

3 Diagnostics

The front panel of the CPU has the following LEDs:

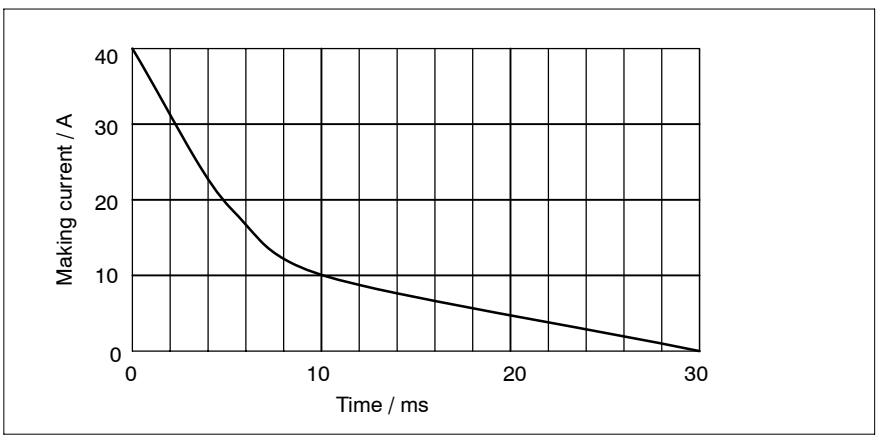
Table 27 Explanation of the LEDs

LED	No.	Color	Function
ready	1	yellow	Supply voltage available, processor running
run	2	yellow	User program running
bat low	3	red	Battery has low voltage or is missing
Modbus 1	4	yellow	Transfer in progress
Modbus 2	5	yellow	has no function

4 Technical Specifications

Allocation	
Device	TSX Compact (rail applications)
Structure	Slots1-1 and 1-2 in primary backplane AS-HDTA-200
support interface	
external input voltage	UB = 24 VDC, -30 % ... +25 % (16.8 ... 30 V, as per EN 50 155), 1.4 A max. at 16.8 V
Primary fusing	2.4 A medium time-lag
Reference potential M	M1
Protective ground	PE
Secondary voltage	5.15 VDC, +/-4 %, 2.3 A max. for I/Os, isolated
Ripple	typ. 50 mV peak-to-peak at IA = 1 A
Overshoot (load variation behavior)	typ. 120 mV at 1.5 A load impulse
Back-up time	10 ms max. at UE = 16.8 V and IA = 2 A
Power-up time of the output	0.1 s max. at UE = 16.8 V
Overload protection	through current limiting
Chopper frequency of the switched-mode power supply	50 ... 77 kHz
Efficiency level	typ. 0.725 at UE = 24 V, IA = 2 A
Parallel switching of power supply modules	not allowed

Figure 65 Startup surge current curve



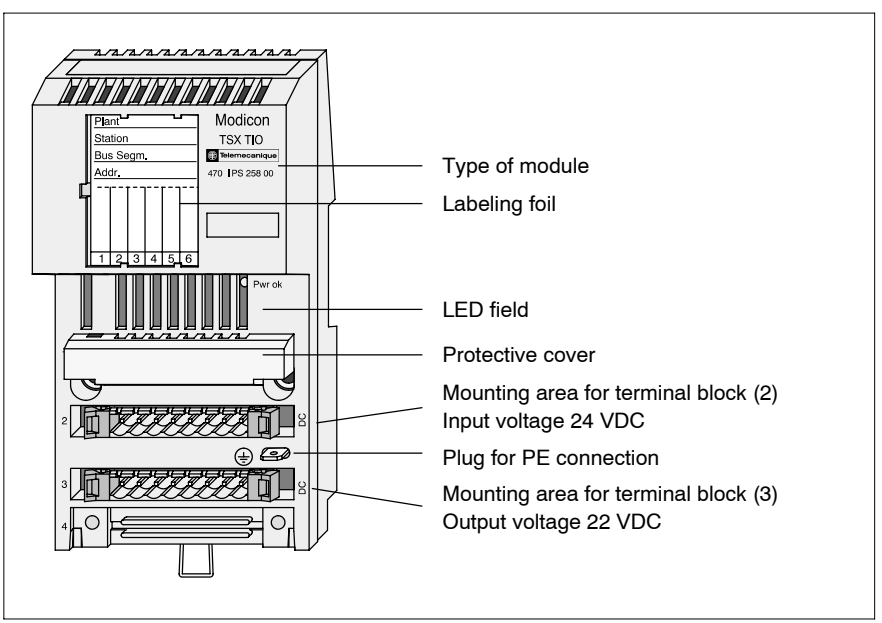
Data interface	
RS 232C	serial as per DIN 66 020, For pin assignment refer to Figure 64, page 200
Internal I/O bus	parallel I/O bus, refer to basic User Manual, "Modicon TSX Compact" Ch. "Specifications"
Processor	
Type of processor	Intel 386 EX
Memory capacity	
24 KB	512 KB
Flash	1 MB for basic software and user program
Backup battery (optional)	
Size	1/2 AA
Voltage (in no-load operation)	3.6 V
Physical characteristics	
Module	in double-size case
Format	3 HE, 16 T
Weight	550 g
Indicators	refer to Chapter "Diagnostics", page 200
Type of connection	
Power supply	3-pin screw terminal
RS 232C	Modular socket RJ45
Systems bus (internal)	2 plug connectors 1/3 C30M, 1 socket connector 1/3 R30F
Environmental conditions	
Regulations	EN 50 155, EN 50 121-3-2, UL 508
Systems data	refer to basic User Manual, "Modicon TSX Compact" Chapter "Specifications"
Authorized ambient operating temperature	-25 ... +70 degrees Celsius permanent, as per EN 50 155 T3
Internal power dissipation	typically 7 W
Shock, vibration	as per EN 50 155

470 IPS 258 00
Power Supply Module

According to the EN 50 155 standard, devices for rail applications must be resistant to supply deviations –30 % ... +25 %.
Output modules with relay and analog modules do not meet this standard. These modules must have a connected serial stabilizer (power supply module 470 IPS 258 00).
470 IPS 258 00 converts the supply from 24 VDC, –30 % ... +25 % to 22 VDC/0.7 A, +/– 5 %.

The module–specific information includes:

- Features and Functions
- Configuration
- Diagnostics
- Technical Specifications



1 Features and Functions

Physical characteristics
The power supply module has a flat plastic housing that is narrower than the other TIO modules.

Above and below the labeling foil are ventilation slits which provide natural convection for cooling that will be sufficient for vertical mounting.

In case of failure, the device can be easily exchanged, because the wired terminal blocks can be pulled out without using any tools.
The labeling foil can be exchanged using a screw driver.

Function
The input voltage (24 VDC) is clocked.
The 22 VDC output voltage is controlled directly.
Electronic current limiting protects the power supply module against overloads.
A Transzorb diode protects the output against overvoltages.

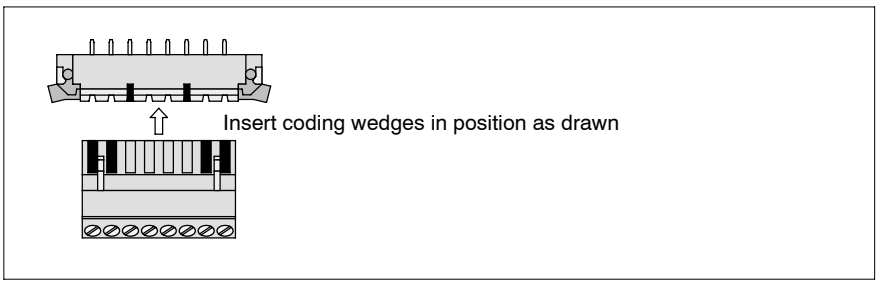
2 Configuration

2.1 Installing the Module

Install the module onto a DIN mounting rail or on a wall using 2 screws only. Mounting rail installation does not require any additional positioning measures because a stopper attached to the back of the housing will prevent side–shifting. A spring that is integrated into the back panel establishes the electric ground contact to the mounting rail.

2.2 Coding of Terminal Blocks

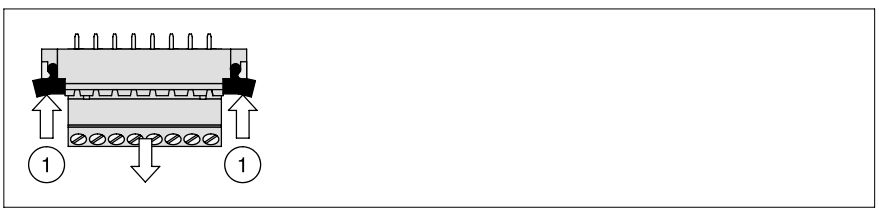
Code terminal block and counterpart on the module for 24 VDC.
Coding wedges and coding riders are included in the set (Order No.)
170 XCP 200 00. The module is also shipped with precoded pin connectors.
The terminal blocks (not coded by manufacturer) must be coded by the user.
Additional information, refer to chapter ”Terminal Block Selection of the TIO” in this manual



2.3 Mounting/Dismounting Terminal Blocks

The power supply and the output voltage each run through one 8-pin terminal block (rows 2 and 3).
The terminal blocks can be purchased as a screw/plug-in terminal set (3 each) under order No. 170 XTS 011 00.

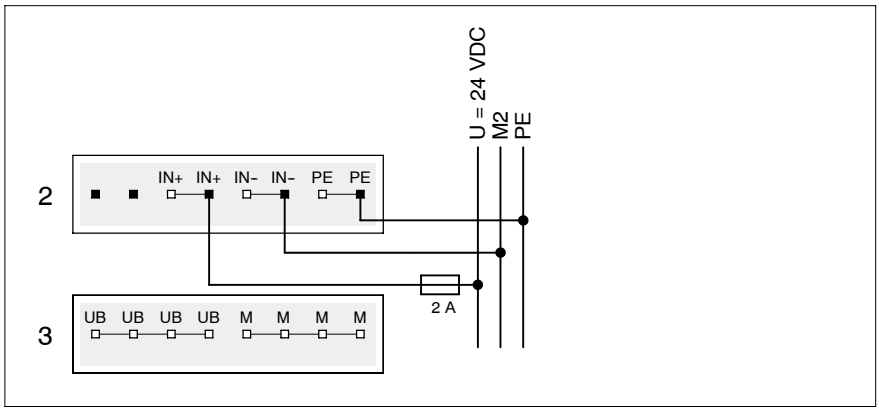
Figure 66 Mounting and dismounting terminal blocks



To mount, simply slide the terminal blocks into the pin connector of the module. To release the terminal blocks, push down on both ejectors (1).

Caution
The terminal blocks may only be mounted or dismounted in off-circuit state.

2.4 Connection



Note

The fast-on connector on the front side of the housing is intended to provide a safe and short support for the PE.

3 Diagnostics

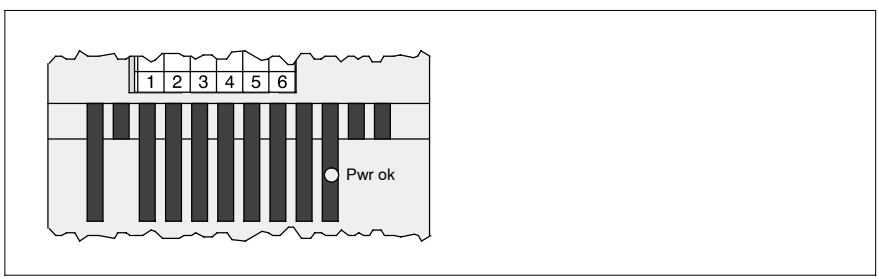


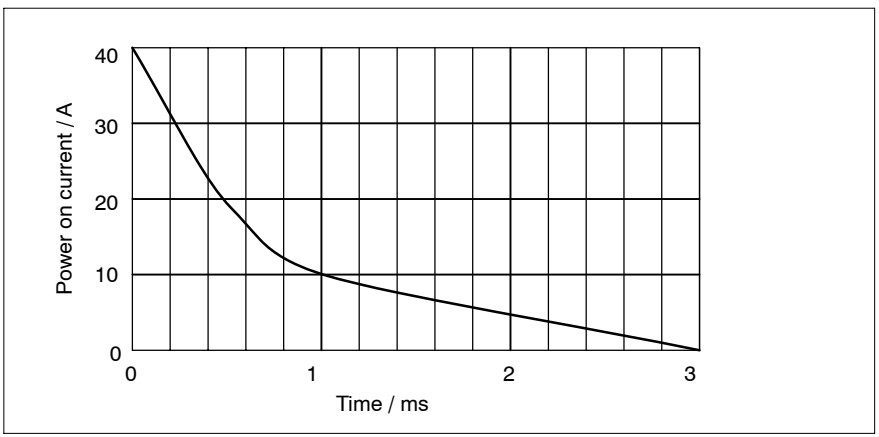
Table 28 Explanation of the LEDs

LED	Color	Function
Pwr ok	yellow	on: Power supply module is ready off: not ready

4 # Technical Specifications

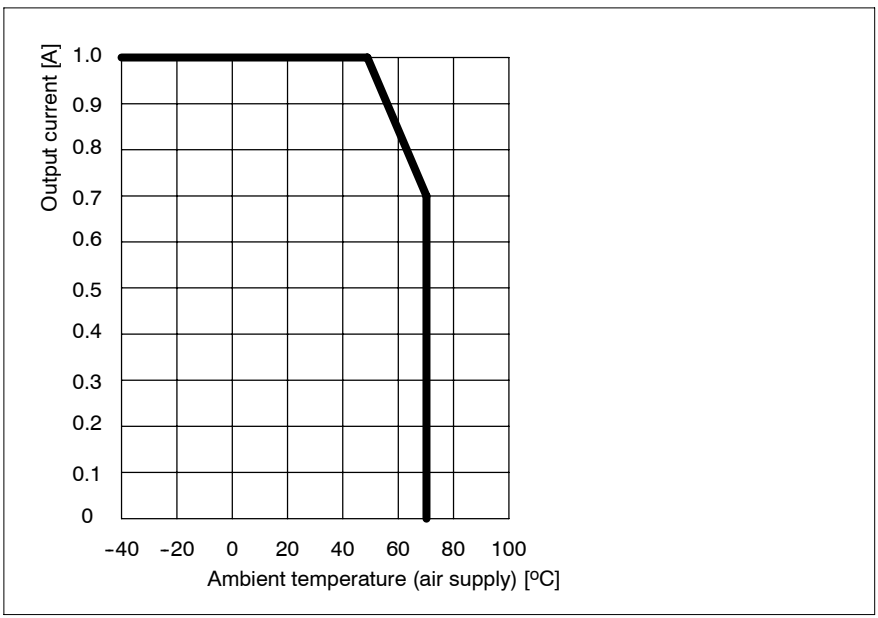
Allocation	
Device	TSX Compact (rail applications)
Supply (primary circuit)	
Voltage range as per EN 50 155, classes S2 and S3	U = 24 VDC, -30 % ... +25 % (16.8 ... 30 V)
Input current	1.4 A at 0.7 A output current (as per EN 50 155) 2 A at 1 A output current
Fusing	external with 2 A medium time-lag at 0.7 A output current external with at least 2.8 A medium time-lag at 1 A output current

Figure 67 Startup and surge current curve



Output data (secondary circuit)	
Output voltage	22 VDC, +/-5 % (21.0 ... 23.2 V) non-isolated
Output current	0 ... 0.7 A as per EN 50 155; 0 ... 1 A please observe derating!
Overvoltage protection	through TransZorb diode SM6T36A
Overload protection	through electronic current limiting
Ripple	typ. 40 mV peak-to-peak at IA = 0.7 A typ. 50 mV peak-to-peak at IA = 1 A
Overshoot (load variation behavior)	typ. 150 mV at 0.4 A load impulse, e.g. 0.8 A on 0.4 A
Standby behavior	at least 10 ms at UE = 24 V and IA = 0.7 A
Power-up time of the output	0.4 s max. at UE = 16.8 V

Figure 68 Derating of the output current



General information	
Chopper frequency of the switched-mode power supply	40 ... 60 kHz
Efficiency level	typ. 0.86 at UE = 24 V, IA = 1 A
Parallel switching of power supply modules	not allowed
Physical characteristics	
Housing	narrow TIO housing (4/7 of normal housing)
Dimensions (H x W x D)	150 x 74.2 x 60 (mm) also refer to User Guide, chapter "Dimension Drawing", page 70
Weight	230 g (with 2 terminal blocks)
Type of connection	
Supply (primary)	8-pin screw/plug-in terminal
Output (secondary)	8-pin screw/plug-in terminals
Environmental conditions	
Regulations	EN 50 155, EN 50 121-3-2
Systems data	refer to User Guide, chapter "Specifications"
Authorized ambient operating temperature	-25 ... +70 degrees Celsius permanently free convection, as per EN 50 155
Shipping and storage temperatures	-40 ... +85 degrees Celsius
Internal power dissipation	approx. 0.3 + 4.9 x IA (in W, IA in A)
Shock, vibration	as per EN 50 155

Appendix

You will find below a list of all the abbreviations and standards used.

The Object Dictionary of AS-BCAN 259 00

A

This chapter describes the Object Dictionary of the AS-BCAN 259 00.

Index, Sub-index	Meaning	Value/Comment
1000H	Device Type	302
1001H	Error Register	content defined by EFB CIA_EMCY else 0
1004H	Number of PDO's supported	
1004H,1	TxPDO's/RxPDO	144 Rx and 144 Tx
1004H,2	synch TxPDO's/RxPDO's	0 and 0
1004H,3	asynch TxPDO's/RxPDO's	144 Rx and 144 Tx
1008H	Device Name	AS BCAN 259: CAN Communication Adapter for PLC series TSX Compact
1009H	Hardware Version	"1.0"
100AH	Software Version	"1.37"
100BH	Node ID	defined by DIP-Switches, see Hardware installation
100CH	Guardtime	Guardtime and Lifetimefactor are provided for compatibility reasons only. If the module is guarded as an
100DH	Lifetime Factor	NMT slave the resulting timeout is defined using Relais Oeration mode 5
1010H	Store Parameters	
1010H,0	Largest supported Subindex	1
1010H,1	Store all Paremeters	supported
1011H	Restore Parameters	supported
1400H...	Receive PDO Parameter	
1600H...	Receive PDO Mapping	

Index, Sub-index	Meaning	Value/Comment
1800H...	Transmit PDO Parameter	
1A00H..	Transmit PDO Mapping	
1F22H	Concise DCF	Used for Configuration Manager
1F22H,0	Number of Elements	127 (max. Number of nodes on CANopen network)
1F22H,1...128	ConciseDCF_1...127	Domain for node 1 configuration
1F25H	ConfigureSlave	Used to control CMT operation
1F25H,0	Number of Elements	128 (max. Number of nodes on network + 1 entry for all nodes)
1F25H,1...127	Configure slave with node id of subindex	if 'conf' (666E6F63H) is written, to subindex n node n is configured
1F25H,128	Configure all nodes	same as subindex 1..127 but all nodes are configured
1F80H	SlaveInfo	CMT and NMT information
		the value consists of four bytes:
	byte 0: bit 0 0	this node is no slave
	1	this node is associated slave. It will be configured and set to operational state
	bit 1,2,3	describes guarding error behavior if bit 0 = 1
	0	stop guarding and notify PLC
	1	Set into operational mode and re-start guarding
	2	Set all nodes into pre-operational state and restart guarding
	3	Set all nodes into pre-operational then operational state and restart guarding
	4	notify PLC and restart guarding
	byte 0 (own node id)	
	bit 0 0	start associated slaves only
	1	send 'start all nodes' command after boot-up
	bit 1 0:	go into pre-operational state after 'reset communication' power on
	1	go into operational state after 'reset communication' power on
	byte 1	Lifetimefactor
	byte2,3	Guardtime in ms
1F81H	ForceNMT	Set nodes into specific state

Index, Sub-index	Meaning	Value/Comment
1F81H,0	Number of Elements	128 (max. Number of nodes on network + 1 entry for all nodes)
1F81H,1...127	Force slave with node id of subindex	Desired state 4 = prepared 5 = operational 6 = Reset node 7 = Reset Communication 127 = pre-operational
1F81H,128	Force all nodes	same as subindex 1..127 but all nodes are forced
1FA0H	Rtr Timer	Definition of transmission interval for RX_PDO's of transmission type 253
1FA0H,1	RtrTimer_Cycle	Rate of remote frames transmitted
1FA0H,2	RtrTimer_Jitter	This value defines the interval between two remote frames so that the network is not oveloaded. Make sure that the condition Number of RTR * Jitter < RTR cycle is met.

Index 5000 variables are used for Network Mode PDO's.

Index, Sub-index	Meaning	Value/Comment
5000H	Network output Variables	Type = 8 Bit
5000H,1	Number of Elements	254
5000H,2	First byte	
5100H	Network output Variables	Type = 16 Bit
5100H,1	Number of Elements	254
5100H,2	First word	
5200H	Network output Variables	Type = 32 Bit
5200H,1	Number of Elements	254
5200H,2	First doubleword	
5200H	Network input Variables	Type = 8 Bit
5200H,1	Number of Elements	254
5200H,2...	First byte	
5300H	Network input Variables	Type = 16 Bit
5300H,1	Number of Elements	254
5300H,2	First word	
5400H	Network input Variables	Type = 32 Bit
5400H,1	Number of Elements	254
5400H,2	First doubleword	

Index 6000 variables are used for High Density Mode (HDM) PDO's. The number of variables is derived from the parameters given in the CAN_CFG_DATA variable, e.g. if NUMDIGIN is set to 64, 8 variables named DigIn8_1 to DigIn8_8 will be available. If more subindexes are necessarry than given in the provided *.EDS file. Vector Informatik's tool pvovides an option that enables the automatic generation of these subindexes in the resulting device configuration file. This option is available by selecting the subindex 1 which states e.g. the number of analog Inputs and clicking on the device access dialog Adjust Arrray button.

Index, Sub-index	Meaning	Value/Comment
6000H	PLC digital inputs	Type = 8 Bit
6000H,1	Number of Modules	
6000H,2	DigIn8_1	I/O Data 10001-10008
6000H,3...	DigIn8_2	I/O Data 10009-10016
6100H	PLC digital inputs	Type = 16 Bit
6100H,1	Number of Modules	Number of 8 bit modules
6100H,2	DigIn16_1	I/O Data 10001-10016
6100H,3...	DigIn16_2	I/O Data 10017-10032
6120H	PLC digital inputs	Type = 32 Bit
6120H,1	Number of Modules	
6120H,2	DigIn32_1	I/O Data 10001-10032
6120H,3...	DigIn32_2	I/O Data 10033-10064
6200H	PLC digital outputs	Type = 8 Bit
6200H,1	Number of Modules	Number of 8 bit modules
6200H,2	DigOut8_1	I/O Data 00001-00008
6200H,3...	DigOut8_2	I/O Data 00009-00016
6300H	PLC digital outputs	Type = 16 Bit
6300H,1	Number of Modules	
6300H,2	DigOut16_1	I/O Data 00001-00016
6300H,3...	DigOut16_2	I/O Data 00017-00032
6320H	PLC digital outputs	Type = 32 Bit
6320H,1	Number of Modules	
6320H,2	DigOut32_1	I/O Data 00001-00032
6320H,3...	DigOut32_2	I/O Data 00033-00064
6401H	Analog Inputs	PLC analog input data 16 Bit
6401H,1	NrAnaIn	
6401H,2	AnaIn	Data 30001
6401H,3...	AnaIn2	Data 30002
6401H	AnalogInputs	PLC analog output data 16 Bit
6401H,1	NrAnaOut	
6401H,2	AnaOut	Data 40001
6401H,3...	AnaOut2	Data 40002

☞ **☞ Note**
The number of modules or channels resp. that are actually available is derived from the values stated in the CFG parameter of the CIA_SVR EFB.

EFB Error Codes

2

All errorcodes are given in hexadecimal format. Use the reference data editor to display the value in hex format.

?	?
1000	invalid slot number
1001	no module installed
1002	wrong type of module installed
1003	module unhealthy
1004	send queue full
1005	module firmware not running
1006	general CAN or API error see Network status information of node 0 of network 1
11XX	general hardware error where XX represents specific CAN chip states
2000	invalid baudrate
2001	invalid relais configuration
2002	invalid number of digital inputs
2003	invalid number of digital outputs
2004	invalid number of analog inputs
2005	invalid number of analog outputs
2006	invalid number of network variables
3000	invalid channel number
3001	invalid data length
4001	invalid identifier
4002	invalid receive table
4003	invalid number of receive messages
4004	no matching message in Message acceptance data field found
4005	received message has less bytes than size of DATA variable
5000	invalid device number
5001	invalid SDO data length
5002	invalid SDO entry
5003	general SDO errror see ERRORINF for details
5004	more data received than expected
5005	less data received than expected
5006	invalid NMT status value
5007	size of given DATA variable less than LENGTH value
6000	PLC running in simulator mode
7000	Module is initializing, no errror, information only

In the general hardware error XX represents a byte value whose meaning is as follows :

bit	meaning
0	channel 0 bus OFF
1	channel 0 error passive
2	channel 0 overrun
3	channel 1 bus OFF
4	channel 1 error passive
5	channel 1 overrun

Firmware Download

C

Using the RS232 port of AS-BCAN 259 00 it is possible to load the latest version of the module's firmware. Related files can be found in the directory \CAN259FW of the Concept installation directory. In order to do this you need to prepare a serial cable to connect your PC to the AS-BCAN 259 00. The cable pinout is as follows:

PC 9-pin DSUB connector	**AS-BCAN 259 00**
Pin 2	17
Pin 3	19
Pin 5	21

You may use any available terminal emulation software for your PC that supports ASCII file transfers and the stated communication parameters to perform the download. The communication parameters must be set to the following values:

Baudrate	38400 kbps
Data	8 Bit
Stopbit	1 Bit
Parity	No
Protocol	XON/XOFF

After connecting the cable and setting up the terminal software perform the following steps :

- connect to the module by typing 'x'. This will activate the RS232 communication and LED 1 is turned on
- type 'f' to prepare the module for firmware download operation
- type 'd' to activate the download procedure within the module. The module will send the message 'waiting for s-record (XON/XOFF)'
- Choose upload or send to transmit a text or ASCII file from your terminal software.
- Select the firmware file named co259fw.S19
- Start the download. While the download is active LED 1 is flashing
- When the download is completed the module will give the appropriate information
- Type 'r' to reset the module

To simplify firmware download the file asbcan.ht has been provided that can be used if Microsoft - Hyperterminal is available. It will set the communication parameters to the correct values.

Overview of Standards

D

The following list will provide an overview of currently applicable international standards for rail(way) applications.

CCITT V24

List of definitions for interchange circuits between data terminal equipment and data-circuit terminating equipment, CCITT Recommendation Fascicle VIII.1 Rec. V24.

CCITT Z1OO-104

Functional specifications and description language (SDL), Vol.VI, Fascile VI.11 (red book) 1985.

DIN 19 245 Part 1

Process Field Bus, August 1990 (Process Field Bus August 1990).

DIN 41 652

Connectors for Rack-mounted devices, Part 1, 1990.

EIA RS-485

Electronic Industries Assosiation standard for electrical characteristics of generators and receivers for use in balanced digital multipoint systems, April 1983.

EN 50 155

European Norm elaborated by CENELEC, extending IEC 571.

IEC 96-1

to be added

IEC 571

Rules for electronic equipment used on rail vehicles (GENELEC EN 50 155)

IEC 801

Electromagnetic compatibility for industrial process measurement and control equipment, Parts 1 through 5.

IEC 807-2 Sup-miniature connector standard (see DIN 41 652).

IEC 870-5-1

Telecontrol equipment and systems Part 5: Transmission protocols. Section 1: Transmission frame formats (formerly: TC 57).

IEC 1158-2

Fieldbus standard for use in industrial control systems Part 2: Physical layer specification and service definition.

ISO 3309

Information Processing Systems - Data communication - High-level data link control procedures - Frame strucure, 3rd edition 1984-10-01.

ISO 7498/1

Information Processing Systems - Open Systems Interconnection - Basic Reference Model.

ISO 8073

Information Processing Systems - Open Systems Interconnection - (Connection-oriented) Transport Service Specification, 1988.

ISO 8482

Transceiver standard - see EIA RS-485

ISO 8802.2

ANSI/IEEE Std 802.2-1985) Local Area Networks - Logical Link Control.

ISO 9506/1

Manufacturing Message Specification - Service Definition.

ISO 9506/2

Manufactoring Message Specification - Protocol Specification Definition.

ISO/IEC 9646-1

Information technology - Open Systems Interconnection - Conformance testing methodology and framework, Part 1:General concepts, 1991

UIC 556

ORE B 108.3 Fiche No. 556, Information transmission in the train-train bus, April 1992 ("Transmission d'informations dans le train bus de train," Avril 1992)

UIC 558 VE

UIC directive on the UEC-cable

Accessory Supplier References

E

In this appendix you will find an overview of accessory suppliers.

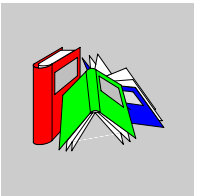
E.1

Reference Addresses

Table 29 Addresses for accessories

Item	Supplier Address	Chapter
Male plug kit (pins) type 748046-1 for outgoing MVB Female plug kit (sockets) 748047 for incoming MVB	AMP Deutschland GmbH Amperestr. 7-11 63202 Langen, Postfach 1240	3.3.5 on page 60
MVB-ESDB cable 1x4x0.5 sq. mm + 4x1x0.25 sq. mm, Radox GKW S	HUBER + SUHNER AG Geschäftsbereich Energie- und Signalübertragung CH-8330 Pfäffikon/ZH	3.3.5 on page 60
CAN cable UNITRONIC-Bus FD P LD 2 x 2 x 0.25 sq mm Material number: 2170214T	U.I.LAPP GmbH & Co. KG Schulze-Delitzsch-Straße 25 D-70565 Stuttgart Postfach 80 06 40 D-70506 Stuttgart	3.3.5 on page 60

Glossary



Here you will find a short description of the terms.

984LL
Refer to ladder logic 984

A

Active Window
The window that is currently selected. At any given moment there can only be one active window. When a window becomes active, the color of its title bar changes so that it may be distinguished form the other windows. Windows that are not selected are inactive.

Actual Parameter
Current online input/output parameter.

Addresses
(Direct) addresses are memory areas on the PLC. These are located in the signal memory and can have input/output modules assigned to them.

Analysis
The process through which the value of a function or of the outputs of a function block is determined during the execution of the program.

ANL_IN
ANL_IN stands for data type ”Analog input” and is used for analog value processing. The 3x references of the configured analog input module specified in the I/O map are automatically assigned to the data type and may therefore only be allocated by unlocated variables.

ANL_OUT
ANL_OUT stands for data type ”Analog output” and is used for analog value processing. The 4x references of the configured analog output module specified in the I/O map are automatically assigned to the data type and may therefore only be allocated by unlocated variables.

ANY
In the present version ”ANY” includes data types ANL_IN, ANL_OUT, BOOL, BYTE, DINT, INT, REAL, UDINT, UINT, TIME and WORD as well as derived data types.

ANY_BIT
In the present version ”ANY_BIT” includes data types BOOL, BYTE and WORD.

ANY_ELEM
In the present version ”ANY_ELEM” includes data types BOOL, BYTE, DINT, INT, REAL, UDINT, UINT, TIME and WORD.

ANY_INT
In the present version ”ANY_INT” includes data types DINT, INT, UDINT and UINT.

ANY_NUM
In the present version ”ANY_NUM” includes data types DINT, INT, REAL, UDINT and UINT.

ANY_REAL
In the present version ”ANY_REAL” includes data type REAL.

Application Window
The window containing the workspace, the menu bar and the toolbar for the application program. The name of the application program appears in the title bar. An application window may contain several document windows.

In Concept the application window corresponds to a project.

Argument
Synonymous with actual parameter.

Array Variables
Variables to which a derived data type defined with the ARRAY keyword is assigned.

An array is a collection of data elements of the same data type.

ASIC
Application Specific Integrated Circuit

Note:
The x, after the first digit of the reference type, represents a five-digit storage location in the user data memory, e.g., the reference 000201 signifies an output or marker bit at address 201 of the signal memory.

Note:
The x, after the first digit of the reference type, represents a five-digit storage location in the user data memory, e.g., the reference 400201 signifies a 16-bit output or marker word at address 201 in the signal memory.

ASCII Mode
American Standard Code for Information Interchange
The ASCII mode is used for the communication with various host devices. ASCII works with 7 data bits.

B

Backup File (Concept EFB)
The backup file is a copy of the last source code file. The name of the backup file is ”backup??.c” (this assumes that you never make more than 100 copies of your source code file). The first backup file is named ”backup00.c”.

In the event that you have carried out modifications on the definition file, which do not call for any interface changes on the EFB, you can avoid having to create a backup file, by editing your source code file (`Objects → Source`).

If a backup file is created, you can name it source file.

Base 2 Literals
Base 2 literals are used to declare integer values in the binary number system. The base must be marked with the prefix 2#. The values may not have any (+/-) signs. Single underscores (_) between the digits are not significant.

Example:
2#1111_1111 or 2#11111111 (decimal 255)
2#1110_0000 or 2#11100000 (decimal 224)

Base 8 Literals
Base 8 literals are used to declare integer values in the octal number system. The base must be marked with the prefix 8#. The values may not have any (+/-) signs. Single underscores (_) between the digits are not significant.

Example:
8#3_77 or 8#377 (decimal 255)
8#34_0 or 8#340 (decimal 224)

Base 16 Literals
Base 16 literals are used to declare integer values in the hexadecimal number system. The base must be marked with the prefix 16#. The values may not have any (+/–) signs. Single underscores (_) between the digits are not significant.

Example:
16#F_F or 16#FF (decimal 255)
16#E_0 or 16#E0 (decimal 224)

Bit String
A data element made up of one or several bits.

BOOL
BOOL stands for data type ”Boolean”. The length of the data elements is 1 bit (stored in 1 byte in the memory). The values for variables of this data type range from 0 (FALSE) to 1 (TRUE).

Bridge
A bridge is a facility connecting networks. It makes the communication between the nodes on either network possible. Each network has its own token rotation sequence – the token is not relayed via the bridges.

BYTE
BYTE stands for data type ”bit string 8”. It is entered as a base 2 literal, base 8 literal or base 16 literal. The length of the data elements is 8 bits. A numeric range of values cannot be assigned to this data type.

C

Call
The process through which the execution of the operations, specified by an FFB type, is triggered.

CAN
Controller Area Network

Coil
A coil is an LD component that transfers the status of the horizontal short on its left side unchanged to the horizontal short on its right side. The status is stored in the associated variable/direct address.

Compact Format (4:1)
The first digit in the reference is separated from the address by a colon (:). The leading zeros of the address are not specified.

Constants
Constants are unlocated variables that are assigned a value which cannot be modified by the program logic (write protected).

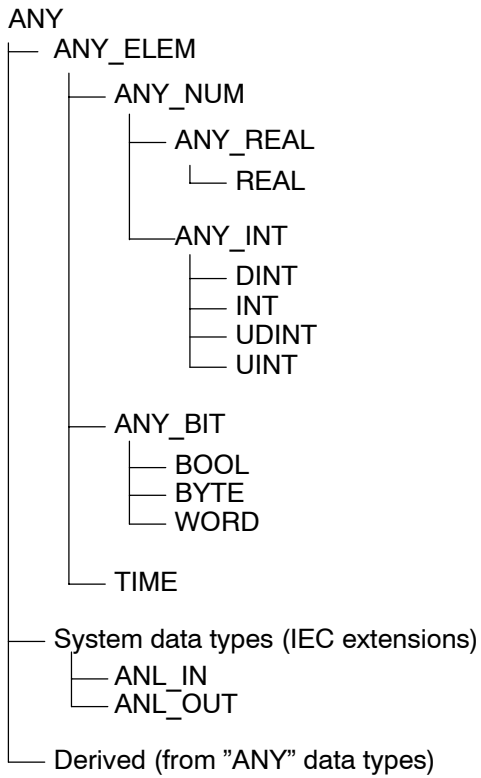
Contact
A contact is an LD component that provides a status on the horizontal short on its right side. This status results from the Boolean AND operation between the status of the horizontal short on its left side with the status of the associated variables / direct address. A contact does not modify the value of the associated variables / direct address.

Contact Diagram
Refer to
Ladder Diagram (LD),
Ladder Logic 984 (LL)

CPU
Central Processing Unit

D

Data Types



The overview shows the hierarchy of generic data types as they are used by the inputs and outputs of functions and function blocks. Generic data types are identified by the prefix ”ANY”.

Data Transfer Settings
Settings that specify how information is transferred from your programming unit to the PLC.

DCP Drop
With a Distributed Control Processor (D908) you can set up a decentralized network with a superset PLC. When implementing a D908 with a decentralized PLC, the superset PLC considers the decentralized PLC as a decentralized drop. The D908 and the decentralized PLC communicate over the system bus, thus providing high performance with a minimum effect on cycle time. The data exchange between the D908 and the superset PLC takes place over the decentralized I/O bus at 1.5 megabits per second. A superset PLC can support up to 32 D908 processors.

DDE (Dynamic Data Exchange)
The DDE interface allows dynamic data exchange between two programs in Windows.

Through the DDE connection between Concept and the Concept graphic tool, the signals of a configuration can be represented as a timing diagram.

DDT
Refer to Derived Data Type

Definition File (Concept EFB)
The definition file contains general descriptions concerning the selected EFB and its formal parameter.

Decentralized Network
Decentralized programming in the Modbus Plus network allows for maximum performances during data transfers and set particular demands on connections. The programming of a decentralized network is straight forward. There is no need to create an additional contact diagram logic when creating the network. All demands for the data transfer are dealt with the corresponding entries in the peer cop processor.

Declaration
Mechanism used to determine the definition of a language element. A declaration usually includes the connection of an identifier with a language element and the assignment of attributes such as data types and algorithms.

Derived Data Type
Refer to Derived Data Type

Derived Data Type
Derived data types are data types that were derived from the elementary data types and/or other derived data types. Derived data types are defined in the Concept data type editor.

A distinction is made between global data types and local data types.

Derived Function Block
Refer to Derived Function Block

Derived Function Block (DFB)
A derived function block represents the call to a derived function block type. You will find details concerning the graphic form of the call in the definition of ”Functional Block (Instance)”. In contrast to EFB-type calls, DFB-type calls are identified by double vertical lines on the left and right side of the rectangular block symbol.

The root of a derived function block type is designed in FBD language, but only in the current version of the programming system. Other IEC languages cannot be used to define DFB types as of yet, neither can derived functions be defined in the current version.

A distinction is made between local and global DFBs.

DFB
Refer to Derived Function Block

DINT
DINT stands for data type ”double integer”. It is entered as an integer literal, base 2 literal, base 8 literal or base 16 literal. The length of the data elements is 32 bits. The values for variables of this data type range from -2 exp (31) to 2 exp (31) -1.

Direct Representation
A method for representing variables in the PLC program from which the assignment to the logical storage location - and indirectly to the physical storage location - can be directly derived.

Discrete Connections
Connections between FFB outputs and inputs of data type BOOL.

Document Window
A window within an application window. Several document windows can be open at the same time within an application window. However, only one document window may be active at any given time.

Document windows in Concept are, for example, sections, the message window, the reference data editor and the configurator.

DPM
Dual Ported Memory

Dummy
A dummy file made up of a text header containing general information such as, for example, author, creation date, EFB identifier, etc. The user must complete this dummy file by entering additional data.

Duration Literals
Authorized units for a duration (TIME) is expressed in days (D), hours (H), minutes (M), seconds (S) and milliseconds (MS) or any combination thereof. The duration must be identified by prefix t#, T#, time# or TIME#. The ”overflow” of the highest unit value is allowed, e.g., the entry T#25H15M is allowed.

Example:
t#14MS, T#14.7S, time#18M, TIME#19.9H, t#20.4D, T#25H15M, time#5D14H12M18S3.5MS

DX Zoom
This feature allows you to connect with a programming object to observe and possibly modify its data values.

E

EFB
Refer to Elementary Functions/Function Blocks

Elementary Functions/Function Blocks (EFB)
Identifier for functions or function blocks whose standard definition is not expressed in any of the IEC languages, i.e., their roots cannot be modified using the DFB editor (Concept DFB). EFB types are programmed in ”C” and are made available precompiled in libraries.

EN / ENO (Enable / Error Indication)
In case the value of EN equals ”0” when the FFB is called, the algorithms defined by the FFB are not executed. The value of ENO is automatically set to ”0” in this case.

In case the value of EN equals ”1” when the FFB is called, the algorithms defined by the FFB are executed. Upon the error-free execution of these algorithms, the value of ENO is automatically set to ”1”.

If an error occurs during the execution of these algorithms, the value of ENO is automatically set to ”0”.

The output behavior of the FFBs is independent from whether the FFBs were called with EN/ENO or with EN=1.

If the display of EN/ENO is on, the EN input must be switched. Otherwise the FFB will never be executed.

The configuration of EN and ENO is switched on or off in the module properties dialog box. To open the dialog box choose the `Objects → Properties...` menu command or double click on the FFB.

EPROM
Erasable Progarmmable Read Only Memory

Error
If an error occurs during the processing of an FFB or of a step (e.g., invalid input value or time error), an error message is produced, which you can view via the `Online` → `Online events...` menu command. For FFBs the ENO output is set to ”0”.

Execution language (SFC)
The SFC language elements make it possible to subdivide a PLC program organization unit into a number of steps and transitions, that are connected one to another by one-way connections. For each step there is a number of actions and a transition condition is associated with each transition.

Expression
Expressions are made up of operators and operands.

F

FB
Refer to Function Block (Instance)

FBD
Refer to Function Block Language

FFB (Functions/Function Blocks)
Collective term for EFB (Elementary Functions/Function Blocks) and DFB (Derived Function Blocks)

FIR Filter
(**F**inite **I**mpulse **R**esponse Filter)
Filter with a finite impulse response.

Formal Parameter
Input/Output parameter used within the logic of an FFB and led out of the FFB as inputs/outputs.

Function (FUNK)
A program organization unit delivering exactly one data element at execution. A function has no internal status information. Multiple calls to the same function with the same input parameter values always deliver the same output values.

You will find details concerning the graphic form of the function calls in the definition of ”Function Block (Instance)”. In contrast to calls to function blocks, function calls only have a single unnamed output, since its name is the name of the function itself. In FBD each call is identified by a unique number through the graphic block. This number is created automatically and cannot be modified.

Function Block (Instance) (FB)
A function block is a program organization unit that calculates values for its outputs and internal variable(s), according to the functionality defined in its function block type description, when it is called as a specific instance. All output and internal variable values of a specific function block instance remain unchanged from one call to the function block to the next. Multiple calls to the same function block instance using the same arguments (input parameter values) therefore do not always deliver the same output value(s).

Each function block instance is graphically represented by a rectangular block symbol. The name of the function block type appears on top, in the middle, inside the box. The name of the function block instance also appears on top, but outside the box. It is generated automatically when an instance is created, but it can be modified by the user according to his or her needs. Inputs appear on the left side, outputs on the right side. The names of the formal input/output parameters are displayed inside the box at the corresponding places.

The above description of the graphic representation in principle also is valid for function calls and for DFB calls. Any differences are described in the corresponding definitions.

Function Block Type
A language element is made up of: 1. The definition of a data structure, subdivided into input, output and internal variables. 2. A set of operations that is carried out using the components of the data structure when an instance of the function block type is called. This set of operations can either be expressed in one of the IEC languages (DFB type) or in ”C” (EFB type).

A function block type can be instantiated several times.

Function Block Language (FBD)
One or several sections containing the graphically represented networks of functions, function blocks and connections.

Function Number
The function number is used to clearly identify a function in a program or DFB. The function number cannot be edited and is assigned automatically. The function number is always structured as follows: .n.m

n = section number (running number)
m = number of the FFB object in the section (running number)

G

Generic Data Type
A data type that can take the place of several other data types.

Global Derived Data Types
Global derived data types are available in all Concept projects and are stored in directory `DFB` directly under the Concept directory.

Global DFBs
Global DFBs are available in all Concept projects and are stored in directory `DFB` directly under the Concept directory.

Global Macros
Global macros are available in all Concept projects and are stored in directory `DFB` directly under the Concept directory.

Groups (EFBs)
Some EFB libraries (e.g., the IEC library) are broken down into groups. This makes it much easier to find EFBs, especially in very large libraries.

H

HU
19” height units (1 HU = 44.45 mm)

I

Icon
Graphic representation of different objects in Windows, e.g., drives, application programs and document windows.

Identifier
Refer to the IEC nomenclature

Icon
Refer to Icon

IEC
International Electronic Committee

IEC 1131-3
International standard: Programmable Logic Controllers - Part 3: Programming Languages. March 1993.

IEC Nomenclature (Identifier)
An identifier is a sequence of letters, digits, and underscores which must begin with a letter or an underscore (e.g., the name of a function block type, of an instance, of a variable or of a section). Letters from national character sets (e.g., ö, ü, é, õ) can be used, except in project and DFB names.

Underscores are significant in identifiers, e.g., ”A_BCD” and ”AB_CD” are interpreted as different identifiers. The use of several leading or of several consecutive underscores is not allowed.

Identifiers may not contain any blank characters.

Identifiers are not case sensitive, e.g., ”ABCD” and ”abcd” are interpreted as the same identifier.

Identifiers may not be keywords.

IIR Filter
(**I**nfinite **I**mpulse **R**esponse Filter)
Filter with an infinite impulse response.

IL
Refer to Instruction List (IL)

Initial Step
The starting step of a sequence. An initial step must be defined in each sequence. The sequence is started with the initial step upon the first call to it.

Initial Step
Refer to Initial Step

Initial Value
The value assigned to a variable when the program is started.

Input Bits (1x References)
The 1/0 status of input bits is controlled by the process data that reaches the CPU via the input device.

Note:
The x, after the first digit of the reference type, represents a five-digit storage location in the user data memory, e.g., the reference 100201 signifies an input bit at address 201 of the signal memory.

Input Parameter (Input)
Transfers the associated argument during a call to an FFB.

Input Words (3x References)
An input word contains information from an external source and which represents a 16-bit number. A 3x register may also contain 16 consecutive input bits that were uploaded to the register in binary or BCD (binary coded decimal) format.

Note:
The x, after the first digit of the reference type, represents a five-digit storage location in the user data memory, e.g., the reference 300201 signifies an 16-bit input word at address 201 of the signal memory.

Instance
Refer to Function Block (Instance)

Instance Name
An identifier that belongs to a specific function block instance.

The instance name is used to clearly identify a function block in a program organization unit. The instance name is created automatically, but it can be edited. The instance name is unique in the entire program organization unit and it is not case sensitive. If the name already exists, you will be warned of this and you will

have to choose another name. The name must be in accordance with the IEC nomenclature, otherwise an error message will appear. The instance name created automatically is always structured as follows: FBI_n_m

FBI = function block instance
n = section number (running number)
m = number of the FFB object in the section (running number)

Instancing
The creation of an instance.

Instruction (LL984)
When programming electrical controllers, the user must implement op coded instructions in the form of graphic objects divided into recognizable types of contacts. The program objects designed are converted to op codes usable by the computer during the loading process at the user level. The op codes are decoded in the CPU and processed by the firmware functions in such a way that the desired control is being implemented.

Instruction (IL)
Instructions are the ”commands” of the IL . Each instruction starts on a new line and is followed by an operator, possibly including modifiers, and by operands, if required for the operation. In case several operands are used, they are separated by commas.

A marker followed by a colon may appear in front of the instruction. The comment, if any, must be the last part of the line.

Instruction List (IL)
IL is a text language as per IEC 1131, in which operations such as conditional or unconditional calls to function blocks and functions, conditional or unconditional jumps, etc. are represented by instructions.

INT
INT stands for data type ”integer”. It is entered as an integer literal, base 2 literal, base 8 literal or base 16 literal. The length of the data elements is 16 bits. The values for variables of this data type range from –2 exp (15) to 2 exp (15) –1.

Integer Literals
Integer literals are used to declare integer values in the decimal number system. The values may be preceded by a (+/–) sign. Single underscores (_) between the digits are not significant.

Example:
–12, 0, 123_456, +986

Intermediate Storage
The intermediate storage is a temporary memory for cut or copied objects. These objects can be inserted into sections. Each time a new object is cut or copied, the contents of the intermediate storage is overwritten.

I/O Map
The drops of the various CPUs are configured in the I/O Map.

ISO
International Standardization Organization

J

Jump
Element of the SFC language. Jumps are used to skip areas in the sequence.

K

Keywords
Keywords are unique combinations of characters that are used as special syntactical elements, as defined in Appendix B of IEC 1131–3. All keywords used in IEC 1131–3 and thus used in Concept are listed in Appendix C of IEC 1131–3. The keywords listed may not be used for any other purpose, e.g., not as variable names, section names, instance names, etc.

KOP
Refer to
Ladder Diagram (LD),
Ladder Logic 984 (LL)

L

Ladder Diagram (LD)
Ladder diagram is a graphic programming language as per IEC1131, that is optically orientated according to the ”path of the current” on the contact diagram of a fuse.

Ladder Logic 984 (LL)
In the terms ladder logic and ladder diagram the word ladder (Contact) refers to execution. In contrast to a schematic circuit diagram, a contact diagram is used by electrical engineers to draw an electric circuit (using electrical symbols), intended to show the sequence of events and not the actual wires connecting the parts one to another. A standard user interface used to control the actions of automation devices allows for a contact diagram interface, that prevents electrical engineers from having to learn a programming language they are not familiar with when implementing a control program.

The construction of the actual contact diagram makes it possible to connect the electrical components in such a way as to produce a control output, dependent on the logical power flow through the electrical objects used, which represents the previously requested condition of a physical electrical device.

In simple terms, the user interface is a video display generated by the PLC programming application, that sets up a horizontal and vertical grid into which the programming objects are placed. The diagram obtains the current from the left side of the grid and as the connection is made with the active objects, the current flows from left to right.

Landscape Format
Landscape format means that the page is wider than it is high when you look at the printed text.

Language Element
Each basic element in one of the IEC programming languages, e.g., a step in SFC, a function block instance in FBD or the initial value of a variable.

LD
Refer to Ladder Diagram (LD)

Library
Collection of software objects intended to be reused while programming new projects, or to build new libraries. An example of this is the library of elementary function block types.

EFB libraries may be subdivided into groups.

Link
A control or data flow link between graphic objects (e.g., steps in the SFC editor, function blocks in the FBD editor) within a section, graphically represented as a line.

Literals
Literals are used to directly assign values to FFB inputs, transition conditions, etc. These values cannot be overwritten by the program logic (write protected).

LL
Refer to Ladder Logic 984 (LL)

Local Derived Data Types
Local derived data types are only available in a single Concept project and its local DFBs and are stored in directory `DFB` under the project directory.

Local DFBs
Local DFBs are only available in a single Concept project and are stored in directory `DFB` under the project directory.

Local Link
The local network link is the network that either links the local nodes with other nodes directly or through a bus amplifier.

Local Macros
Local macros are only available in a single Concept project and are stored in directory `DFB` under the project directory.

Local Network Node
The local node is the one currently being configured.

Located Variable
An address is assigned to the variables in the PLC. Located variables are used in the SFC and FBD editors, in order to read signal statuses from the PLC and to output them to the PLC. Located variables can also be exported and displayed via a DDE interface.

M

Macro
Macros are created using the Concept DFB software.

Macros are used to duplicate frequently used sections and networks (including their logic, variables and variable declarations).

A distinction is made between local and global macros.

Macros have the following characteristics:

- Macros can only be created using the FBD programming language
- Macros contain no more than one section
- Macros can contain any complex program
- In terms of programming there is no difference between an instantiated macro, i.e., a macro inserted into a section, and a section created conventionally.
- Call to a DFB in a macro
- Variable declaration
- Use of macro-specific data structures
- Variables declared in the macro are carried over automatically
- Init values for variables
- Multiple instantiation of a macro in the overall program using different variables
- The secition name, the variable names and the data struture name must contain the character ~ as an exchange marker.

MMI
Man Machine Interface

Module SA85
Module SA85 is a Modbus Plus adapter for IBM-AT or compatible computers.

Multi Element Variables
Variables to which is assigned a derived data type defined with STRUCT or ARRAY.

A distinction is made between array variables and structured variables.

MVB
Multifunction Vehicle Bus

N

Network
A network is the interconnection of devices on a common dataway, that use a common protocol to communicate one with another.

Node Address
The node address is used to clearly identify a network node in the routing path. The address is set directly in the node, e.g., using rotary switches on the back side of the modules.

Network Node
A node is a device with an address (1...64) on the Modbus Plus network.

O

OD
Object Directory

Operand
An operand is a literal, a variable, a function call or an expression.

Operator
An operator is a symbol for an arithmetic or Boolean operation to be executed.

OSI
Open System Interconnection

Output / **Marker Bits (0x References)**
An output / marker bit can be used to control real output data through the output unit of the control system, or to define one or several discrete outputs in the signal memory.

Output / **Marker Words (4x References)**
An output / marker word can be used to store numeric data (binary or decimal) in the signal memory, or to transmit data from the CPU to an output unit in the control system.

Output Parameter (Output)
A parameter used to return the result(s) of an FFB analysis.

P

PC
Personal Computer

Peer Processor
The peer processor processes the token cycles and the data flow between the Modbus Plus network and the PLC user logic.

PLC
Programmable Logic Controller

Portrait Format
Portrait format means that the page is higher than it is wide when you look at the printed text.

Program
The uppermost program organization unit. A program is exclusively loaded onto a single PLC. A program is refined using IEC language elements.

Programming Units
Hardware and software supporting the programming, configuring, testing, initial start-up and troubleshooting of PLC applications as well as decentralized system applications, to facilitate source documentation and archiving. The programming unit may also possibly be used for viewing processes.

Program Organization Unit
A function, a function block, or a program. This term may either refer to a type or to an instance.

Program Cycle
A program cycle includes the input of input data, the processing of the program logic and the output of output data.

Project
General term for the uppermost level of a software tree structure that determines the superset project name of a PLC application. Once the project name has been determined, you can save your system configuration and control program under this name. All data produced through the creation of the configuration and of the program, belong to the superset project for this specific automation task.

General term for the complete set of programming and configuration data in the project database, representing the source code, which describes the automation of a system.

Project Database
The database in the programming unit containing the configuration data of a project.

Prototype File (Concept EFB)
The prototype file contains all the prototypes of the assigned functions. Furthermore, a standard definition of the internal status structure is specified, if any.

PSB
Parallel Systems Bus

PV
Process Variable

Q

R

24 KB
Random Access Memory

REAL
REAL stands for data type ”floating point”. It is entered as a real literal or as a real literal with exponent. The length of data elements is 32 bits. The values for variables of this data type range from 8.43E–37 to 3.36E+38.

Real–Literals
Real literals are used to declare floating point values in the decimal number system. Real literals are identified through the declaration of the decimal point. The values may be preceded by a (+/–) sign. Single underscores (_) between the digits are not significant.

Example:
–12.0, 0.0, +0.456, 3.14159_26

Real Literals with Exponent
Real literals with exponent are used to declare floating point values in the decimal number system. Real literals with exponent are identified through the declaration

of the decimal point. The exponent indicates the decimal power by which the number must be multiplied to obtain the value to be represented. The values may be preceded by a (+/-) sign. Single underscores (_) between the digits are not significant.

Example:
-1.34E-12 or -1.34e-12
1.0E+6 or 1.0e+6
1.234E6 or 1.234e6

Reference
Every direct address is a reference, starting with an identification character specifying whether it is an input or an output and whether it is a bit or a word. References starting with code 6, represent registers in the extended memory of the signal memory.
0x range = Output / Marker bits
1x range = Input bits
3x range = Input words
4x range = Output / Marker words
6x range = Register in the extended memory

Note:
The x, after the first digit of each reference type, represents a five-digit storage location in the user data memory, e.g., the reference 400201 signifies an 16-bit output or marker word at address 201 in the signal memory.

RIO (Remote I/O)
Remote I/O indicates a physical place of the I/O positioning control system devices with respect to the processor controlling them. Remote inputs/outputs are linked to the controlling device via a wired communications cable.

Runtime Error
Error that occurs during the execution of the program on the PLC in SFC objects (e.g., steps) or FFBs. These are, for example, value range overflows in counters or time errors in steps.

RTU Mode
Remote Terminal Unit
The RTU mode is used for the communication between the PLC and an IBM compatible personal computer. RTU works with 8 data bits.

S

Statement (ST)
Statements are the ”commands” of the ST programming language. Statements must end with semicolons. There may be several statements (separated by semicolons) on the same line.

Step
SFC language element: Situation in which the behavior of a program, with respect to its inputs and outputs, follows the operations defined by the associated actions of the step.

Step Name
The step name is used to clearly identify a step in a program organization unit. The step name is created automatically, but it can be edited. The step name must be unique in the entire program organization unit, otherwise an error message is produced. The step name created automatically is always structured as follows: S_n_m

S = step
n = section number (running number)
m = number of the step in the section (running number)

Section
A section can be used, for example, to describe the mode of operation of a technological unit, such as an engine.

A program or DFB is made up of one or several sections. Sections can be programmed using the IEC programming languages FBD and SFC. Only one of the listed programming languages can be used within any given section.

Each section has its own document window in Concept. To get a good overview, it is best to breakdown a large section into several small ones. The scroll bar can be used to scroll through the section.

Serial Ports
Information is transferred bit by bit in serial ports (COM).

Separator Format (4:00001)
The first digit in the reference is separated by a colon (:) from the five digit address.

SFC
Refer to execution language

Signal Memory
The signal memory is the memory location of all items referred to by references (direct representation) in the user program. For example, input bits, output / marker bits, input words and output / marker words are located in the signal memory.

Source Code File (Concept EFB)
The source file is a standard C++ source file. Upon choosing the `Library → Produce files` menu command, this file contains an EFB code frame, into which you must enter a specific code for the selected EFB. To do this, choose the `Objects → Source` menu command.

ST
Refer to Structured Text (ST)

Standard Format (400001)
The five digit address appears right after the first digit of the reference.

Status Bits
For each node with global input or specific input/output of peer cop data there is a status bit. If a defined group of data is successfully transferred within the preset timeout, the corresponding status bit is set to 1. In the opposite case, the bit is set to 0 and all data belonging to this group is cleared (to 0).

Structured Text (ST)
ST is a text language as per IEC 1131, in which operations, such as calls to function blocks and functions, conditional execution of statements, repetition of statements, etc. are represented by statements.

Structured Variables
Variables to which a derived data type defined with STRUCT (Structure) is assigned.

A structure is a collection of data elements generally containing different data types (elementary data types and/or derived data types).

SY/MAX
In quantum controllers, Concept includes the preparation of the I/O map of SY/MAX I/O modules for RIO control through the quantum PLC. The SY/MAX remote backplane has a Remote I/O adapter in slot 1, which communicates over a Modicon S908 R I/O system. The SY/MAX I/O modules are listed for labeling and inclusion in the I/O map of the Concept configuration.

System Data Types
In the present version, system data types include data types ANL_IN and ANL_OUT.

T

T
19” width unit (! T = 5.08 mm)

TAP
Terminal Access Point

TCN
Train Communication Network

Template File (Concept EFB)
The template file is an ASCII file including layout information for the Concept FBD editor, and the parameters for the creation of the codes.

TIME
TIME stands for data type ”duration”. It is entered as a duration literal. The length of the data elements is 32 bits. The values for variables of this data type range from 0 to 2 exp (32) –1. The unit for data type TIME is 1 ms.

TIO
Terminal I/O

TM
Traffic Memory

Token
The network ”token” controls the ownership of the temporary permission to transmit through a node. The token runs through the nodes in the increasing order of their addresses. All nodes follow the token cycle and can contain any possible data sent along.

Traffic Cop
The traffic cop is an I/O map generated from user I/O maps. The traffic cop is managed in the PLC and, for example, also contains status information concerning the drops and modules, in addition to the user I/O map.

Transition
The condition in which the control of one or several predecessor step(s) is/are transferred to one or several successor step(s) along a one-way connection.

TS
Traffic Store

U

UDEFB (User Defined Elementary Functions/Function Blocks)
Functions or function blocks created in the C programming language and made available by Concept in libraries.

UDINT
UDINT stands for data type ”unsigned double integer”. It is entered as an integer literal, base 2 literal, base 8 literal or base 16 literal. The length of the data elements is 32 bits. The values for variables of this data type range from 0 to 2 exp (32) -1.

UINT
UINT stands for data type ”unsigned integer”. It is entered as an integer literal, base 2 literal, base 8 literal or base 16 literal. The length of the data elements is 16 bits. The values for variables of this data type range from 0 to 2 exp (16) -1.

Unlocated Variable
The variable is managed and stored by the system. The address assigned on the PLC is not revealed since the variable is only referred to by its symbolic name.

UP
User Program

V

Variables
Variables are used for the exchange of data within sections, between several sections and between the program and the PLC.

If a direct address (reference) is assigned to a variable, it is referred to as a located variable. If no direct address is assigned to the variable, it is referred to as an unlocated variable. If a derived data type is assigned to the variable, it is referred to as a multi element variable.

In addition, there also are constants and literals.

W

Warning
If a critical condition occurs during the processing of an FFB or of a step (e.g., critical input value or time limit exceeded), a warning is produced, which you can view via the `Online` → `Online events...` menu command. For FFBs the ENO output stays set to ”1”.

WORD
WORD stands for data type ”bit string 16”. It is entered as a base 2 literal, base 8 literal or base 16 literal. The length of the data elements is 16 bits. A numeric range of values cannot be assigned to this data type.

X

Y

Z

Index

You will find the index of keywords below.