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Siemens Serial Communication Options

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Networking with SIMATIC Communication modules: an overview





Networking with SIMATIC and 3rd-party controllers Communication modules: an overview





EtherNet/IP and Modbus TCP to ET 200SP



Modbus TCP; Energy Meter; Energy Suite



3. Energy Management

2) In preparation

No PROFIsafe with EtherNet/IP and Modbus TCP

Product No: 6ES7 155-6MU00-0C Ordering: → Industry Mall Technical Slides

ТСР

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Ethernet/IP to PROFINET PN/MF coupler





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CAN and CANopen networks to PROFINET SIMATIC PN/CAN LINK





Delivery release: 24.04.2017 Product No.: 6BK1620-0AA00-0AA0 Order: → Industry Mall Sales Slides

Features

- PROFINET Device for connection to S7-1200; S7-1500; ET 200SP; Open Controller
- For 1 CAN network with up to 126 CAN Slaves
- Standardized .eds- File Im-/Export

Benefits

- SIMATIC CPU communication with CAN / CANopen
- Complete TIA integration/ no further Software tool required
- Flexible extension of the CAN network

Applications

1. Engineering	Integration of CAN sensors in SIMATIC environment		
2. Automotive	AGVs, logistics,		
3. E-Car Charging	CHADEMO charging procedure		

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CAN

CAN and CANopen networks to ET 200SP systems SIMATIC ET 200SP CM CAN



SIMATIC ET 200SP with

Complete TIA integration/

Flexible expansion of the

No third-party tools needed

CAN or CANopen

CAN network

Compact design

Permanent wiring

Benefits



Features

- For 1 CAN network with up to 60 CAN Slaves
- Standardized .eds- File Im-/Export
- 3 operating modes accor-ding to CiA 301 & 302:
 - CANtransparent 2.0A/B,
 - CANopen Manager
 - CANopen Slave

Applications

1. Engineering	Integration of CAN sensors in SIMATIC environment		
2. Automotive	AGVs, logistics,		
3. E-Car Charging	CHADEMO charging procedure		

CAN

Delivery release: 14.04.2020 Product No.: 6ES7137-6EA00-0BA0 Order: → Industry Mall **Technical Slides**

J1939 networks to PROFINET SIMATIC PN/J1939 LINK





Features

- PROFINET Device for connection to S7-1200/-1500; ET 200SP; Open Controller
- Up to 253 logical nodes
- Up to 30 addressable ECUs

Benefits

- SIMATIC CPU communication with SAE J1939
- Complete TIA integration/ no further Software tool required
- Broadcast Announce Message (BAM)
- Connection Mode Data Transfer (CMDT)

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Delivery release: 01.03.2019 Product No.: 6BK1623-0AA00-0AA0 Order: → Industry Mall Sales Slides

Applications

1. Engineering	Integration of J1939 sensors in SIMATIC environment
2. Automotive	AGVs, logistics, trucks, diesel engines

AS-Interface networks to SIMATIC S7-1200 CM 1243-2 AS-i Master



Benefits

installation

TIA Portal

Quick, flexible plug-in

Perfect integration in

Adjustable from small to

medium automation





Delivery release: 22 December 2011 Product No.: 3RK7243-2AA30-0XB0 Order: → Industry Mall

Features

- For AS-i networks with up to 62 AS-i slaves
- Optional data decoupling module DCM 1271 for AS-i power supply from DC 24V
- Applicable with MSS Modular Safety System ASIsafe
- SIPLUS version available

Applications

1. Compact systemsReduce cables and installation time2. Special machineryFlexible connection for sensors and actuators

AS-Interface networks to ET 200SP systems SIMATIC ET 200SP CM AS-i Master and F-CM AS-i Safety

Product No.: 3RK7137-6SA00-0BC1 3RK7136-6SC00-0BC1 → Industry Mall





→ Industry Mall

Benefits

- Quick, flexible plug-in installation
- Both standard and failsafe data via the AS-i two-wire cable
- Perfect integration into SIMATIC ET 200SP and **TIA Portal**
- The reliable wiring system for any applications

Order: Sales Slides

1. Machine building	Reduce cables and installation time			
2. Intralogistics	Flexible and scalable conveyor systems			
3. Process automation	Simple setup with AS-i library for PCS 7			

KNX networks to LOGO! Communication module KNX (CMK) 2000





DALI networks ET 200SP CM 1xDALI for controlling the lighting bus







Delivery release:01.09.2019Product No.:6ES7 137-6CA00-0BU0Order: \rightarrow Industry MallSales SlidesVideo

Features

- ET 200SP electronic module for BaseUnit type U0 (20 mm)
- 64 participants, 16 groups,16 scenes per DALI line
- Integrated power supply

Benefits

- SIMATIC CPU for lighting control
- Easy reconfiguration of groups and scenes
- Standard for conversion to LED

Applications

1. Tunnel automation

2. Factory lighting

Lighting as an essential component

SIMATIC in the hall as well as in the machine

Profibus Communication



There are two variations of PROFIBUS in use today; the most commonly used PROFIBUS DP, and the lesser used, application specific, PROFIBUS PA:

- PROFIBUS DP (Decentralized Peripherals) used to drive sensors and actuators via a central controller. Data speed up to 12 Mbit/s with twisted pair cables and fiber optic cables are an option.
- PROFIBUS PA (Process Automation) is used to monitor measuring equipment via a process control system. This Profibus variant is ideal for use in explosive areas (Ex-zone 0 and 1).

Communication Modules



Functionality PROFIBUS DP-Master for 32 DP-Slaves

- PG- / OP-Communication
- S7-Routing
- Activation/deactivation of DP slaves
- PROFIBUS DP-Slave
 - PG- / OP-Communication
 - S7-Routing

Type of interface

- Physics: RS 485
- electrically isolated
- Transmission rates: Up to 12 Mbaud
- Max. 1 module per CPU



Profibus DP
✓ Master
✓ Slave
data exchange
broadcast

ET 200SP CPU Optional PROFIBUS DP Master/Slave module "CM DP"



Functionality (like DP interface of CPU 1516-3 PN/DP)

- PROFIBUS DP-Master for 125 DP-Slaves
 - PG- / OP-Communication
 - S7-Routing
 - Activation/deactivation of DP slaves
- PROFIBUS DP-Slave
 - PG- / OP-Communication
 - S7-Routing

Type of interface

- Physics: RS 485
- electrically isolated
- Transmission rates: Up to 12 Mbaud
- Max. 1 module per CPU

Mounting dimensions (W x H x D) mm: 35 x 117 x 75



CM1542-5





2 Type plate

3 PROFIBUS interface: 1 x 9-pin D-sub female connector (RS-485)

Functionality (like DP interface of CPU 1516-3 PN/DP)

- **PROFIBUS DP-Master for 125 DP-Slaves** •
 - PG- / OP-Communication
 - S7-Routing
 - Activation/deactivation of DP slaves
- **PROFIBUS DP-Slave**
 - PG- / OP-Communication
 - S7-Routing

Type of interface

- Physics: RS 485
- electrically isolated
- Transmission rates: Up to 12 Mbaud
- Max. 8 modules per CPU

IE/PB LINK PN IO Functions

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Network transition between Industrial Ethernet / PROFINET and PROFIBUS

- Connection to Industrial Ethernet / PROFINET via integrated real-time switch with 100 Mbit/s¹⁾ full duplex
- Connection to PROFIBUS with 9,6 kBit/s bis 12 Mbit/s
- Use as a gateway from PROFIBUS to Industrial Wireless LAN in combination with SCALANCE W-700 including the support of IEEE 802.11n technology

PROFINET IO-Proxy

- Connection of PROFIBUS DP slaves to PROFINET controllers according to the PROFINET standard: From the perspective of the PN IO controller, all DP slaves are treated like PN IO devices with a PROFINET interface, i.e. the IE / PB LINK PN IO is their proxy
- Connection of up to 64 PROFIBUS DP-slaves

Additional functions

- PG/OP communication via S7-Routing, e.g. for loading programs and configuration data
- Data record routing: Use as a router for data records for parameterizing field devices via SIMATIC PDM (Process Device Manager) e.g. for remote maintenance
- Support of the Media Redundancy Protocol (as MRP-client) within an Ethernet network with ring topology
- Stand-alone use: Device replacement without PG by using the removeable media C-PLUG for backing up the configuration data
- PROFINET use: Support of the device replacement based on LLDP (Link Layer Discovery Protocol)
- Time synchronization via NTP and SIMATIC time sync procedure
- Firmware update from a central point using the configuration tool

Diagnostics

Online diagnostics using the configuration tool and using SNMP diagnostic data e.g. with SINEC NMS



¹⁾ 10 Mbit/s half duplex only in case of spare parts

Profibus PA Transitions

Network transition between Profibus DP and PROFIBUS PA

Network transition between Profinet and PROFIBUS PA

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Network transition between Profibus DP and PROFIBUS PA using DP/PA Coupler

DP/PA link



Cabling technology FastConnect (electric) for PROFIBUS



PROFIBUS:

Quick connection of

- Bus connector by means of insulation displacement method (using stripping tool) to bared PB FC bus cables
- M12 plug by means of insulation displacement method (using stripping tool) to bared PB FC bus cables

PROFIBUS PA (hazardous area):

 Quick setup of fieldbus segments according to IEC 61158-2; terminals can be connected with FC process cable or SpliTConnect M12 outlet/M12 jack



PtP Communication Modules in S7-1200, S7-1500 and ET 200SP

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Communication Modules





SIMATIC S7-1200

CM PtP Highlights at a Glance

Hardware

5 configurations CM PtP RS232 BA CM PtP RS422/485 BA CM PtP RS232 HF CM PtP RS422/485 HF ET 200SP CM PtP

Function

- Serial coupling with external partners
- Various physical interfaces
- Predefined protocols
- Uniform programming interface

Integrated protocols

- Freeport (ASCII)
- 3964 (R)
- Modbus RTU master (only HF)
- Modbus RTU slave (only HF)
- USS (via instructions with Freeport)





Assembly and mounting

- Sub-D front plug
- Availability of preassembled cables

Display and diagnostics LEDs

- 3 standard LEDs run, error, maint
- 2 LEDs for sending and receiving data

System integration

- Applicable with S7-1500
- Applicable with S7-300/400
- Applicable with standard PROFINET controller
- Uniform FBs for all modules

Compatibility

- FBs consistent with S7-1200
- Connection-compatible with S7-300/400

Universal coupling with various partners – easy integration

Serial Interfaces CM PtP

Overview



Technical data

- RS232, incl. secondary signals RTS, CTS, DTR, DSR, RI, DCD
- RS422 4-wire full duplex
- RS485 bus-capable
- Transfer rates from 300 to 115,200 bit/s
- Telegram length up to 4 kbyte
- Telegram buffer up to 8 kbyte

Protocols

- Freeport (previously ASCII)
- 3964(R)
- Modbus RTU master/slave
- USS

Programming

- Instructions for sending, receiving
- Instructions for Modbus RTU master or slave
- Instructions for USS
- Instructions for module configuration during the runtime
- Uniform instructions for PtP communication in S7-1500 and ET 200SP
- Support of distributed application

Serial Interfaces CM PtP Protocols



Freeport

- Freeport is referred to as ASCII in S7-300/400
- Free telegram parameterization
- Character frame
 - 7/8 bits per character
 - 1/2 stop bits
 - Parity
- Start condition
- Any character or start condition
- End conditions
 - Telegram length
 - End sequence
 - Break

3964(R)

- Procedure for secure data transfer
- Transfer repetition in case of problems
- Optionally with block check via the telegram
- Number of setup attempts
- Number of transfer attempts
- Priority

Serial Interfaces CM PtP Protocols



Modbus RTU

- Modbus master always has the initiative
- Slave replies to the master telegram
- Address range in Extended_Addressing up to 65535
- Max. 32 slaves on one master
- Supported function codes
 - 01: Read output bits
 - 02: Read input bits
 - 03: Read hold register
 - 04: Read input words
 - 05: Write one output bit
 - 06: Write one hold register
 - 15: Write output bits
 - 16: Write hold registers

USS

- Protocol for easy drive control
- Max. 31 drives per USS network
- Instruction USS_Drive_Control for drive monitoring and control
- USS_Port_Scan for data transfer
- Instructions for reading and writing of drive parameters

Serial Interface CM PtP Modules



S7-1500 CM PtP RS232 BA

- RS232, incl. secondary signals
- 9-pole Sub-D plugs for connection
- Transfer rates from 300 to 19,200 bit/s
- Telegram length of max. 1 kbyte
- Telegram buffer of 2 kbyte
- Protocols Freeport and 3964(R)
- Article No: 6ES7 540-1AD00-0AA0



- RS232, incl. secondary signals
- 9-pole Sub-D plugs for connection
- Transfer rates from 300 to 115,200 bit/s
- Telegram length of max. 4 kbyte
- Telegram buffer of 8 kbyte

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- Protocols Freeport, 3964(R), Modbus master/slave
- Article No : 6ES7 541-1AD00-0AB0



Serial Interface CM PtP Modules



S7-1500 CM PtP RS422/485 BA

- RS422 for full duplex
- RS485 for half duplex and bus connections
- 15-pole Sub-D socket
- Transfer rates from 300 to 19,200 bit/s
- Telegram length of max. 1 kByte
- Telegram buffer of 2 kByte
- Protocols Freeport and 3964(R)
- Article No: 6ES7 540-1AB00-0AA0



CM PUP RS422/485 HF

S7-1500 CM PtP RS422/485 HF

- RS422 for full duplex
- RS485 for half duplex and bus connections
- 15-pole Sub-D socket
- Transfer rates from 300 to 115,200 bit/s
- Telegram length of max. 4 kbyte
- Telegram buffer of 8 kbyte
- Protocols Freeport, 3964(R), Modbus master/slave
- Article No: 6ES7 541-1AB00-0AB0

Serial Interface CM PtP Modules

ET 200SP CM PtP

- RS232, incl. secondary signals
- RS422 for full duplex
- RS485 for half duplex and bus connections
- ET 200SP base unit for connection of individual signals
- Transfer rates from 300 to 115,200 bit/s
- Telegram length of max. 2 kbyte
- Telegram buffer of 4 kbyte
- Protocols:
- Freeport, 3964(R),
- Modbus RTU master/slave
- Article No: 6ES7 137-6AA00-0BA0





Advantages

SW interface consistent with S7-1500 Availability of USS protocol via instructions 1 module for all versions



PtP Communication Modules Functionality and Portfolio



	S7-1500 / ET 200MP				ET 200SP
Characteristic	CM PtP RS232 BA	CM PtP RS232 HF	CM PtP RS422/485 BA	CM PtP RS422/485 HF	CM PtP
Number of interfaces	1	1	1	1	1
RS232	\checkmark	\checkmark	-	-	\checkmark
RS422 / RS485	-	-	\checkmark	\checkmark	\checkmark
Connection system	•••••	•••••		000000000000000000000000000000000000000	ET 200SP BU
Max. transfer rate in bit/s	19,200	115,200	19,200	115,200	115,200
Max. telegram length in kByte	1	4	1	4	2
Receive buffer in kByte	2	8	2	8	4
Freeport	\checkmark	\checkmark	\checkmark	\checkmark	\checkmark
3964(R)	\checkmark	\checkmark	\checkmark	\checkmark	\checkmark
Modbus RTU (requires instructions)	-	\checkmark	-	\checkmark	\checkmark
USS (via instructions)	\checkmark	\checkmark	\checkmark	\checkmark	\checkmark





Scalable and integrated

Serial Interface

Communication Programming with Freeport and Procedure 3964



- Sending of data via CM PtP
- Port: Indication of the interface via which data are sent
- Buffer: Buffer of data being sent
- Length: Length of data being sent
- Status: Information regarding the status of ongoing communication

Instruction Receive_P2P

- Receiving of data via CM PtP
- Port: Indication of the interface via which data are received
- Buffer: Buffer of data being received
- NDR: Indication regarding the reception of new data and their saving in the "buffer"
- Status: Information regarding the status of ongoing communication
- Length: Length of data being received



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Serial Interface Communication Programming with USS

Instruction USS_Drive_Control

- For drive data operation and monitoring
- One call-up per drive

Instruction USS_Port_Scan

- For data transfer to and from the drives
- Cyclic call-up once per USS interface

Instructions USS_Read_Param and USS_Write_Param

- For reading and writing of parameters on the drive
- Call-up if required

USS can be used with any serial interface in S7-1500

%DB11 "USS_Drive_ Control DB* USS_Drive_Control EN ENO -FALSE - RUN NDR -----FALSE - OFF2 ERROR -----STATUS ----- Communication RUN EN -----Name Description Versio D DIR -----V1.3 S7 communication INHIBIT -----Open user communication V6.0 FAULT -----OPC UA V2.0 SPEED -----WEB Server V1.1 STATUS1 -----Others STATUS3 ------Communication processor STATUS4 ------PtP Communication V2.3 STATUS5 ------USS communication V4.0 STATUS6 -USS_Port_Scan Communication via USS network V2.5 STATUS7 -----USS_Drive_Control Data exchange with the drive V2.0 STATUS8 -----USS_Read_Param Read data from drive V1.5 USS_Write_Param Change data in drive V1.6 Communication via USS network for 31 slaves V1.2 0 USS Port Scan 31 Data exchange with the drive for 31 slaves USS Drive Control 31 V2.0 Scan USS_Read_Param_31 Read data from the drive for 31 slaves V1.1 USS_Write_Param_31 Change data in the drive for 31 slaves V1.1 Scan EN ENO -0 - PORT ERROR -16#00 - BAUD STATUS ------

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Serial Interface

Parameterization of the Serial Interface from the User Program

Modbus RTU (Remote Terminal Unit) communication





Serial Interface

Communication Programming via Modbus RTU

Instruction Modbus_Comm_Load

- Configuration of the CM for Modbus master or Modbus slave
- Setting of communication parameters
- Required once during start-up

Instruction Modbus_Master

- Communication as master with the Modbus slaves
- Writing or reading of Modbus data
- Call-up via REQ=TRUE if required

Instruction Modbus_Slave

- Communication as slave with the Modbus master
- Responding to queries by the Modbus master
- Cyclic call-up without condition
- Modbus RTU requires support of the interface module
- CM PtP RS232 HF, CM PtP RS422/485 HF



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The End



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