SIEMENS

SIMATIC PROFIBUS Interface Components

Product Brief

03/2000

Introduction

For manufacturers flexible and economic production is the only way of ensuring that products meet the rapidly changing needs of the customer.

Distributed automation structures are one of the factors needed for flexible and economic production. The required flow of information is ensured by interconnecting the various areas of the system over local area networks.

In the field of industrial communications, networks complying with national and international standards enable the exchange of information at all levels of the automation hierarchy.

PROFIBUS-DP fieldbus

The PROFIBUS-DP fieldbus has become established at the field level, where a high-speed response is required and small amounts of data are generally exchanged.

PROFIBUS-DP is an open fieldbus system and is standardized to European and international standards. This fieldbus system is also the basis for PROFIBUS-PA, the fieldbus for process automation.

Features

The PROFIBUS-DP fieldbus is characterized by the following features:

- Corresponds to the European standard EN 50 170, Volume 2
- Corresponds to IEC 61158-3, Ed. 2
- Comprehensive range of fieldbus components
- Data transmission via two-wire or fiber optic system

All designations in this product brief marked with are registered trademarks of Siemens AG. The other designations in this product brief might be trademarks, the use of which by third parties could infringe the rights of the respective owners.



- Flexible and modular design of the automation system possible
- Connection to actuator-sensor interface possible
- Reduction in wiring overhead
- Up to 125 nodes can be connected with up to 32 per bus segment
- Short response times thanks to transmission rates of up to 12 Mbit/s
- Coverage of distances up to 23.8 km/ 14.7 miles
- Simple connection of devices through the availability of ASICs[®] and interface modules
- PROFIBUS-DP is the system bus for "Totally Integrated Automation"
- Leading PLC vendors recognize PROFIBUS-DP as a standard interface for the field level.

ASICs and interface modules

The interface to the PROFIBUS-DP fieldbus is open.

The ASICs and interface modules described below provide third-party vendors with a simple and cost effective interface design for connecting their devices and systems to PROFIBUS-DP.

Various ASICs and interface modules are available for different functional needs (master function, both simple and intelligent slave stations).

ASICs and interface modules are described on the following pages.

PROFIBUS-DP, PROFIBUS-PA Fieldbus

Application

PROFIBUS is the network for the field and cell areas.

Three principle types are available depending on requirements:

- PROFIBUS-DP
- PROFIBUS-FMS
- PROFIBUS-PA.

PROFIBUS-DP

The PROFIBUS-DP fieldbus features high-speed communication with small amounts of data and high system availability.

It corresponds to the EN 50 170 standard, Volume 2 with the DP protocol variant. In addition, PROFIBUS-DP is the basis for PROFIBUS-PA.

PROFIBUS-FMS

PROFIBUS-FMS is designed for complex communications tasks at the cell level.

It corresponds to the EN 50 170 standard, Volume 2, with the FMS protocol variant.

PROFIBUS-PA

PROFIBUS-PA is the PROFIBUS version for process automation. PROFIBUS-PA complies with the EN 50170 standard, Amendment 2.

PROFIBUS-PA uses transmission technology in accordance with IEC 1158-2. This transmission process can also be used for intrinsically safe applications. The communication protocols of PROFIBUS-PA and PROFIBUS-DP are identical. PROFIBUS-DP communication protocol + IEC-1158-2 transmission technology = PROFIBUS-PA.

Design

PROFIBUS-DP is different for active bus participants and passive bus participants.

Active nodes (masters)

- Programmable controllers, e.g. S7-300[®]/S7-400[®], M7-300[®]/M7-400[®]
- PC-based Control Systems, e.g. WinAC[®]
- SIMATIC[®] programming devices and PCs
- HMI[®] devices
- Machine controllers, e.g. SINUMERIK[®]
- Control systems, e.g. SIMADYN[®]
- Third-party PLCs



Fig. 1 Typical configuration of a PROFIBUS-DP/PA fieldbus

Passive nodes (slaves)

- Distributed I/O stations SIMATIC ET 200[®];
- Controllers, e.g. S7-200[®]/S7-300[®] and S5-95U/DP;
- Field devices such as drives or human-machine interface units;
- Field devices of process technology, e.g. SITRANS[®]
- Third-party field devices

The PROFIBUS-DP fieldbus can be installed in two-wire cable, fiber optic or hybrid configurations

Mode of operation

he nodes in the network share the transmission medium. A system is therefore required to control access to the network.

PROFIBUS-DP operates according to the "master/slave token passing" access method, whereby only active nodes receive the right access the network. The right to access is transferred by passing a token from one master to the next. If there is no request to send, the token is passed on to the next master.

The passive bus nodes are polled directly by the master module assigned to them.

Open interfaces for PROFIBUS-DP/ PROFIBUS-PA

The communication performance required for the short response times cannot be achieved using the usual standard components.

Siemens has therefore developed several high-performance ASICs for interfacing the PROFIBUS-DP.

These ASICs handle a significant proportion of the communication. The interface modules supplied for master and slave applications are based on these ASICs.

Integration centers

The integration centers support field device vendors by providing advice prior to and during development, as well as performing the required integration tests.

They also provide additional information on ASICs, interfaces and development kits.

The addresses of the Integration Centers are shown in page 9.

PROFIBUS User Organization

The PROFIBUS User Organization (PNO), which represents users and manufacturers of PROFIBUS products, provides a platform for co-operation and exchange of information.

PROFIBUS User Organization (PNO) Haid-und-Neu-Straße 7 D-76131 Karlsruhe Germany Fax: 0721/96 58 589 www.profibus.com

Overview of PROFIBUS-ASICs

Application

The PROFIBUS ASICs facilitate the connection of third-party components and systems to the PROFIBUS field-bus.

Quick reaction times for the PROFIBUS-DP, which are required for transmission rates of up to 12 Mbit/s, can only be achieved by using these ASICs.

Various ASICs are available for different functional needs and applications.

Master-ASICs

The ASPC 2 (<u>Advanced Siemens</u> <u>PROFIBUS Controller</u>) is an intelligent communications chip for master applications. This ASIC is suitable for use in master interface modules for connection to PROFIBUS-DP and PROFIBUS-FMS. The maximum transmission rate is 12 Mbit/s for PROFIBUS-DP.

Intelligent Slave-ASICs

The SPC 3 (Siemens PROFIBUS Controller) is an intelligent communications chip for slave applications. It enables connection to PROFIBUS-DP. The maximum transmission rate is 12 Mbit/s.

Slave ASIC with processor core

The DPC 31[®] combines the functions of the SPC 3[®], SPC 41[®] and an 8031 processor in a single chip. The DPC 31 makes available a DP slave controller which is highly flexible and can therefore be used in an enormous variety of applications.

The DPC 31 is particularly suitable for use in intrinsically safe applications because of its low-power system. It enables connection to PROFIBUS-DP, PROFIBUS-FMS and PROFIBUS-PA.

With the SIM 1 the DPC 31 offers an integrated compact solution for connecting a PROFIBUS-PA using a transmission procedure according to IEC 1158-2.

The maximum transmission rate is 12 Mbit/s for PROFIBUS-DP and 31.25 kbit/s for PROFIBUS-PA.

Simple Slave-ASICs

The SPM 2 (<u>S</u>iemens <u>P</u>ROFIBUS <u>M</u>ultiplexer) is a single-chip solution for simple slave applications. The maximum transmission rate is 12 Mbit/s.

The LSPM 2 is, like the SPM 2, a singlechip solution for simple slave applications, but its compact package makes it particularly suitable for applications where space is at a premium. The maximum transmission rate is 12 Mbit/s.



Fig. 2 Classification of ASICs according to application and version

Operation

The ASICs handle a large part of the communications tasks between the bus node and the network.

The ASICs of the SPM range (SPM 2 and LSPM 2) handle all communications tasks completely independently. The correct signals only need to be applied to the pins. An additional processor or firmware is not required.

The ASICs of the SPC range (SPC 3, SPC 41, DPC 31 and ASPC 2) are equipped with a processor interface. They require additional firmware for the interface between the ASIC and the application.

Firmware

The firmware is installed in a processor on the interface module or in the field device. The functions of the field device are included via the call interface.

The scope of the firmware depends on the ASIC.

Delivery arrangements

The ASICs can be obtained through the worldwide distribution network of Siemens AG. Quantities of 5 ASICs or over can be ordered for testing.

For series production, only multiples of an ASIC packaging unit (tray) are possible. The number of ASICs per package depends on the type of ASIC. Please refer to the technical specifications on page 16 for more details on packaging units.

Documentation

Descriptions of the interface components are available on the Internet. The Internet address is:

http://www.ad.siemens.de/csi_e/dp Look under:

- Distributed I/O
- \rightarrow Others
- → Development components
- \rightarrow Manuals

ASICs SPM 2 und LSPM 2

Application

The ASICs SPM 2 (Siemens PROFIBUS Multiplexer) and LSPM 2 (Lean Siemens PROFIBUS Multiplexer) are single-chip solutions for simple slave applications. Examples include sensors and actuators such as switches, indicators and thermocouples. The ASICs enable connection to the PROFIBUS-DP fieldbus.

The smaller package makes the LSPM 2 particularly suitable for use in applications where space is at a premium.

The maximum transmission rate is 12 Mbit/s.

The IM 184 interface module is implemented with the ASIC LSPM 2.

Design

The SPM 2 has 64 input/output bits. It is accommodated in a PQFP package with 120 pins.

The subdivision of the input/output points into inputs and outputs is configurable. Pins are also provided on the ASICs for diagnostic information.

The SPM 2 handles the complete data traffic independently. An additional microprocessor and firmware are not required.

It is thus possible, using a small number of external components, to implement a simple connection to the PROFIBUS-DP fieldbus.

The LSPM 2 has the same functionality as the SPM 2, except that it only has 32 input/ output bits. It is accommodated in a compact MQFP package with 80 pins.

Operation

The SPM 2 and the LSPM 2 handle the bus protocol fully independently. The pins only need to be connected to the input /output signals and bus cables.

The SPM 2 and the LSPM 2 operate as slaves on the PROFIBUS-DP network. When they receive an error-free message frame from the master, they generate the requested reply frames independently.



Fig. 3 Integration of the LSPM 2 ASIC in a slave interface module

Features

- PROFIBUS-DP protocol
- Maximum transmission rate 12 Mbit/s
- Automatic detection of transmission rate
- RS 485 transmission protocol
- PQFP package with 120 pins for SPM 2 and
 MOFP package with 20 pins for
- MQFP package with 80 pins for LSPM 2
- Integrated ASIC circuit (glue logic)
- 64 input/output bits for SPM 2, of which up to 32 diagnostics inputs; 32 input/output bits for LSPM 2, of which up to 16 diagnostics inputs
- 8 separate diagnostics inputs
- User-specific allocation of input/output points to inputs and outputs
- Integrated watchdog timer
- External quartz port for 24 MHz and 48 MHz quartz/oscillator
- 5 V DC power supply.

Firmware

No firmware is required for operation of the SPM 2 and the LSPM 2.

The entire protocol handling is performed by the ASICs.

ASIC SPC 3

Application

The SPC 3 is an intelligent communications chip for slave applications. It enables connection to the PROFIBUS-DP fieldbus.

The IM 183-1 interface module is implemented with the SPC 3.

The maximum transmission rate is 12 Mbit/s.

Design

The SPC 3 has a 1.5 Kbyte message frame memory.

It is accommodated in a PQFP package with 44 pins.

Operation

The SPC 3 handles all communications tasks of the PROFIBUS-DP protocol completely independently.

This accelerates protocol handling and reduces the scope of the software in the microprocessor of the interface module.

Bus access is hardware driven. Data transfer takes place via a 1.5 Kbyte RAM. The interface to the application is a data interface. Therefore, the data can be transferred independent of the bus cycle.

Firmware with call interfaces for the application is provided for convenient operation with the microprocessor.



Fig. 4 Integration of the SPC 3 ASIC in a slave application

Features

- PROFIBUS-DP/-DPV1 protocol
- Maximum transmission rate 12 Mbit/s
- Automatic detection of transmission rate
- Support of microprocessors 80C32, 80X86, 80C166, 80C165, 80C167 and HC11, HC16 and HC916 types
- RS 485 transmission
- PQFP package with 44 pins
- Independent handling of communications functions including the PROFIBUS-DP protocol
- Integrated watchdog timer
- External quartz port for 48 MHz quartz
- 5 V DC power supply.

Firmware

Firmware (in "C" source code) is supplied as an interface between the registers of the SPC 3 and the application.

The firmware is operated on the processor of the field device and provides call interfaces for simple integration of the application.

The firmware consists of approximately 4 to 24 Kilobytes and can also be used for

IM 182-1 and IM 183-1 interface modules.

The firmware is not absolutely necessary for the operation of the SPC 3 with the DP standard functions, since the ASICs' registers are fully documented; however, the firmware enables the user to save time which he would otherwise be required to spend for development work.

The firmware is required for the use of the additional DP functions DPV1 (read/write data set).

DPC 31 Communications Chip

Application

DPC31 combines the different features of the ASICs SPC3 and SPC4 in one chip, which means that this chip is suitable for a wide range of applications. The DPC31 is an intelligent communications chip with an integrated processor core. It allows intelligent field devices to be connected to the PROFIBUS-DP. Because of the power management system and the 3.3 V technology, the DPC31 can also be used in process technology in connection with the PROFIBUS-PA.

The DPC31 allows a slave application to be realized with minimal expenditure on external components.

Design

In order to be connected to the physical bus, the DPC31 not only has an asynchronous interface for the RS485 interface, but also has a synchronous interface to the SIM1. This interface allows the DPC31 to be connected to the synchronous transmission technology of the IEC 1158-2 structure, which uses PROFIBUS-PA, via an energysaving interface.

The DPC31 has 6 Kilobytes of RAM, which serves as message frame memory, and an integrated 8031 core. 24 Kilobytes of firmware ROM has been integrated for the 8031 core.

The DPC31 is accommodated in a PQFP housing with 100 pins.

Operation

The DPC31 handles the entire DP slave protocol independently and relieves the application from all time-critical communication functions. All the necessary timer and monitoring functions are integrated in the DPC31.

The interface to the application is made up of 6 Kilobytes of RAM, through which the application communicates with the communication part of the DPC31. The interface takes the form of a data interface. Firmware with a call interface is also provided to facilitate operation with an external processor.

The integrated 8031 core is 100 % compatible to standard 8031 derivatives. This means that all standard developing environments can be used for programming and debugging.



Fig. 5 Block diagram of the DPC31

256 bytes of 'internal' RAM and the 'timer 2' of the 8032 derivatives are added to the integrated 8031 core, meaning that a genuine 8032 controller is available in the DPC31.

The firmware ROM for the 8031 core has the following functions:

- Read and write functions for SPI compatible E²PROM
- Boot loader for single-chip applications
- All system functions necessary for the realization of a 'DP slave'.

The DPC31 offers the following operation options:

- DPC31 as single-chip applications
- DPC31 with external ROM/RAM
- DPC31 with external microprocessor

Features

- PROFIBUS-DP/-DPV1 protocol (read / write data set)
- Maximum transmission rate 12 Mbit/s, using transmission method IEC 1158-2 31.25 kbit/s
- Automatic detection of transmission rate
- Asynchronous Interface according to PROFIBUS-DP

- Synchronous interface according to PROFIBUS-PA
- Integrated 8031 core
- SSC interface to connect SPI compatible components, such as E²PROMs or AD converters
- Standard 8031 interface
- External Intel and Motorola microprocessor interface
- Supply voltage 3.3 V DC
- PQFP housing with 100 pins

Firmware

There is firmware (C Code) for the DPC31 which makes using the component even simpler. The firmware is run on the processor of the field device and offers a simple function interface for simple linking of the application.

SIM 1 Interface Chip

Application

The SIM 1 (Siemens IEC Medium Attachment Unit) matches the signals for the connection of field devices to IEC 1158-2 and thus also to PROFIBUS-PA.

PROFIBUS-PA is the PROFIBUS version for process automation.

The transmission process matches IEC 1158-2, the communication protocol is PROFIBUS-DP.

PROFIBUS-PA can also be used for intrinsically safe applications.

Design

The SIM 1 is an expansion of the DPC 31. Only a few external components are required in addition to this ASIC, in order to connect PROFIBUS-PA field devices to an intrinsically safe network. The SIM 1 is accommodated in a TQFP housing with 44 pins.

Operation

The SIM 1 supports all send and receive functions as well as the highresistance tapping of the auxiliary power from the bus cable. It provides 2 stabilized power supplies and enables the installation of a galvanically isolated power supply. It can be connected to all IEC 1158-2 compliant Manchester encoders/decoders.



Fig. 6 Use of the PROFIBUS-PA fieldbus in process automation

Features

- IEC 1158-2 compliant and thus PROFIBUS-PA compliant transmission method
- Transmission rate is 31.25 kbit/s
- TQFP housing with 44 pins
- Extraction of auxiliary power of 3.3 V DC and 5 V DC or 5 V DC and 6.6 V DC (power loss up to 250 mW)
- Power consumption from the fieldbus to supply the unit can be set to up to 40 mA.



Fig. 7 Integration of the DPC 31 and SIM 1 ASICs in a slave application

ASPC 2 Communications Chip

Application

The ASPC 2 is an intelligent communications chip for master applications. It enables connection to PROFIBUS-DP and PROFIBUS-FMS.

It is also possible to connect to the PROFIBUS-PA via the DP/PA link.

These ASICs are used to off-load communications handling tasks from programmable controllers, personal computers, drive controls and humanmachine interfaces.

The IM 180 interface module is implemented with ASPC 2.

The maximum transmission rate is 12 Mbit/s.

Design

The ASPC 2 is accommodated in an MQFP 100 housing.

A DP/PA link is required for intrinsically safe transmission to PROFIBUS-PA, since the synchronous transmission method for IEC 1158-2 is not implemented in this ASIC.

Operation

The ASPC 2 handles the message frame and address codes and data backup sequences.

The PROFIBUS-DP and PROFIBUS-FMS protocols are handled completely by the firmware.

The ASPC 2 can address an external 1 Mbyte message frame memory. Bus access is hardware-driven.

A separate microprocessor and the appropriate firmware are required for operation. The ASPC 2 can be connected easily to all standard types of processor.



Fig. 8 Integration of the ASPC 2 ASIC in a master application

Features

- PROFIBUS-DP and PROFIBUS-FMS protocols
- Maximum transmission rate 12 Mbit/s
- RS 485 transmission
- Up to 125 active and passive nodes can be connected
- P-MQFP housing with 100 pins
- 16-bit data bus
- 1-Mbyte RAM addressable as external communications memory
- Services supported: Ident; request FDL status; SDN; SDA; SRD; SRD with distribution database; SM services
- 2 interrupt lines
- 5 V DC power supply
- Maximum power loss 0.9 W.

Firmware

The firmware for the ASPC 2 handles the entire protocol processing and all functions required for a PROFIBUS-DP master connection.

The firmware for PROFIBUS-DP is offered for device vendors within the framework of a license agreement. The firmware is suitable for the 80C165

processor and is approximately 80 Kilobytes in size.

Overview of Interface Modules, Development Kit

Application

Various interface modules, based on the PROFIBUS-DP ASICs described above, are available for master and slave applications.

PROFIBUS-DP interface modules provide third-party vendors with a simple means of connecting their products and systems to the PROFIBUS-DP fieldbus.

The advantage of these interface modules is that they obviate the need to develop an additional external circuit.

Different interface modules are available for various functional requirements and applications.

Master interface modules

The IM 180 enables the connection of a third-party device as master to PROFIBUS-DP. The maximum transmission rate is 12 Mbit/s.

A PC carrier board with the product description IM 181-1 is available for the IM 180 interface module. The board can be used as a short ISA card in a programming device or PC.

Slave interface modules

The IM 182-1 interface module is a simple PC card for slave applications. It is designed for PCs with ISA bus. The maximum transmission rate is 12 Mbit/s.

The IM 183-1 interface module enables the connection of a third-party device as a slave to PROFIBUS-DP. The maximum transmission rate is 12 Mbit/s.

The IM 184 interface module enables the connection of a simple slave to PROFIBUS-DP. The maximum transmission rate is 12 Mbit/s.

Design

The interface modules consist mainly of an ASIC, if necessary, a microprocessor for protocol handling as well as a memory.

The interface from the interface modules to the host system is implemented using a multi-row connector strip.

Operation

The interface modules handle communications tasks between the bus node (master or slave) and the PROFIBUS-DP network.



Fig. 9 Classification of the interface modules according to application areas

Data exchange between the interface module and the host system depends on the interface module, i.e. by using a dual-port RAM, the address and data bus, a serial interface or ports.

Development kits

The development kits let you develop and test PROFIBUS hardware and software applications that use PROFIBUS ASICs or Interface modules (IM) (see pages 14 and 15).

The comprehensive hardware and software components contained in the packages considerably reduce the effort required to develop a PROFIBUS device.

The packages feature a functional development environment, which is able to accept your special hardware and software requirements. Consequently our PROFIBUS know-how is made available to others.

Our development team will assist and support you in your development activities. This support is included in the development kit.

Subsequently you will be able to have your device certified in one of our specialized integration centers. Addresses of our integration centers: PROFIBUS Schnittstellencenter COMDec Würzburger Str. 121

D-90766 Fürth, Germany Tel.: 0911/750-2080, Fax: -21 00 Mailbox: 0911/737-972. E-Mail: COMDEC@fthw.siemens.de

PROFIBUS Integration Center 3000 Bill Garland Road Johnson City, TN 37605-1255, USA Tel.: (423)-461-2576, Fax. -2016 Mailbox: (423)-461-2751 E-Mail:

profibus.center@sea.siemens.com www.aut.sea.siemens.com/pic

IM 180 Master Interface Module

Application

The IM 180 interface module enables the connection of a third-party device as master to PROFIBUS-DP.

The IM 180 interface module handles the entire bus control independently.

The IM 180 takes the load of handling communications from programmable controllers, personal computers, drive controls and human-machine interfaces.

The maximum transmission rate is 12 Mbit/s.

Design

The IM 180 interface module consists mainly of an 80C165 microprocessor, the ASPC 2 ASIC, a Flash EPROM and RAM.

The ASPC 2 ASIC is controlled by a 48 MHz oscillator chip.

The interface module is 100×100 mm (3.9 x 3.9 in.) in size and suitable for face-to-face mounting.

For the IM 180 interface module, a carrier board is available. This board is called

IM 181 and can be used as a short ISA card in a programming device or PC.

Operation

The integrated ASPC 2 ASIC handles the bus protocol fully independently.

Communication with the host system takes place via a dual-port RAM interface. Data exchange is handled by the user program.

The host software for the power supply of the dual-port RAM must be created by the user.

Features

- Maximum transmission rate 12 Mbit/s
- PROFIBUS-DP protocol handling by
- ASPC 2 ASIC Module core 80C165 microprocessor, 40 MHz clock frequency; 2 x 128K x 8-bit RAM user memory; 256K x 16-bit flash EPROM program and parameter memory;
- 48 MHz oscillator chip for ASPC 2



Fig. 10 Block diagram for IM 180 master interface module

- Host interface 16/8-bit data bus can be connected; dual-port RAM (8K x 16 bit); 64-pin connector (4 rows); optional 8/16-bit data bus connectable
- High-integrity data exchange via dual-port RAM
- 5 V DC power supply
- 0 to 70 °C permissible ambient temperature
- Dimensions (W x H): 100 x 100 mm/ 3.9 x 3.9 in.

Firmware

The firmware is operated on the microprocessor and handles the entire protocol processing as well as all functions required for a master connection.

Driver

A corresponding driver is offered for Windows NT.

Demonstration software

The demonstration software for the IM 180 / IM 181-1 shows in exemplary manner how the dual-port RAM under the MS-DOS operating system of the IM 180 interface module is supplied and enables different operations of the IM 180 on the user interface.

Configuring

The IM 180 interface module can be easily configured with COM PROFIBUS configuring software. The user does not have to create his own configuring tool.

IM 184 Slave Interface Module

Application

The IM 184 interface module enables the simple connection of a third-party device as slave to PROFIBUS-DP. The maximum transmission rate is 12 Mbit/s.

IM 184 is designed for simple slave applications such as sensors and actuators.

Design

The IM 184 interface module consists mainly of the LSPM 2 ASIC, a socket for the EEPROM and an RS 485 interface for connection to PROFIBUS-DP.

LEDs are also provided for the operating states "RUN", "BUS ERROR" and "DIAGNOSTICS".

The LSPM 2 ASIC is controlled by a 48 MHz oscillator chip.

The interface is as small as a cheque card and suitable for face-to-face mounting.

Operation

The integrated LSPM 2 ASIC handles the PROFIBUS-DP bus protocol fully independently.

Communication with the host system takes place via a connector strip. For this purpose, the required input/output signals must be supplied to the connector strip.

Customized settings are implemented using jumpers.



Fig. 11 IM 184 slave interface module

Features

- Maximum transmission rate 12 Mbit/s
- Automatic detection of the transmission rate on the fieldbus
- PROFIBUS-DP protocol handling by LSPM 2 ASIC
- 48 MHz oscillator chip for LSPM 2
- 32 configurable inputs/outputs, of which up to 16 can be used as diagnostics inputs
- 8 separate diagnostics inputs
- Connection
 2 x 34-pin connectors for connection
 to host network
 - 10-pin connector for RS 485
- Floating RS 485 interface for PROFIBUS-DP
- Slot for EEPROM (64 x 16 bits)
- 5 V DC power supply
- Power consumption typ. 100 mA
- Polarity reversal protection
- 0 to 70 °C permissible ambient temperature
- Dimension (W x H): 85 x 64 mm/ 3.3 x 2.5 in. (modular design).

Firmware

No firmware is required for the operation of the IM 184 interface module.

The entire protocol processing is handled by the ASIC on the interface module.

IM 183-1 Slave Interface Module

Application

The IM 183-1 interface module enables the connection of a third-party device as slave to PROFIBUS-DP.

The maximum transmission rate is 12 Mbit/s.

The IM 183-1 is designed for intelligent slave applications.

Design

The IM 183-1 interface module consists mainly of the SPC 3 ASIC, the 80C32 microprocessor, an EPROM and RAM memory and an RS 485 interface for connection to PROFIBUS-DP.

An RS 232 interface is also provided on the module for the connection of devices with an RS 232 interface, such as PCs, to the PROFIBUS-DP fieldbus.

The SPC 3 ASIC is controlled by a 48 MHz oscillator chip.

The interface is as small as a cheque card and suitable for face-to-face mounting.

Operation

The integrated SPC 3 ASIC handles the bus protocol fully independently.

Communication with the host system takes place via the address and data bus which are routed to the connector strip. Data exchange is handled by the user program.

The 80C32 processor enables the additional integration of applications.

Features

- Maximum transmission rate 12 Mbit/s
- Automatic detection of the transmission rate on the fieldbus
- PROFIBUS-DP protocol handling by SPC 3 ASIC
- Module core CPU 80C32 microprocessor,
 - 20 MHz clock frequency;
 - 32 Kilobytes SRAM user memory;

32 Kilobytes of 64 Kilobytes EPROM program memory



Fig. 12 IM 183-1 slave interface module

- 48 MHz oscillator chip for SPC 3
- The host interface is the address and data bus on the interface module
- Connection
 50-pin connector for connection to host network;
 14-pin connector for RS 232;
 - 10-pin connector for RS 485
- Software reset for ASIC SPC 3
- 5 V DC power supply
- Power consumption typ. 100 mA
- Floating RS 485 interface for PROFIBUS-DP
- 0 to 70 °C permissible ambient temperature
- Dimensions (W x H): 86 x 76 mm/ 3.3 x 2.7 in. (modular design).

Firmware

Firmware (source code in C programming language) is supplied as an interface between the registers of the SPC 3 and the application.

The firmware is operated on the microprocessor and provides call interfaces for simple integration of the application.

The firmware contains approximately 4 to 24 kilobytes including examples.

The firmware is not absolutely necessary to operate the IM 183-1 interface module with the DP standard functions, since the registers of the ASICs' SPC 3 are precisely documented. The firmware enables the user to save time he would otherwise require for development work.

The firmware is required for the use of the additional DPV1 DP functions (read / write data set).

IM 182-1 Slave Interface Module

Application

The IM 182-1 interface module is a simple PC card for PROFIBUS-DP slave applications.

The 182-1 is designed for PCs with ISA bus.

The maximum transmission rate is 12 Mbit/s.

Design

In principle, the IM 182-1 consists of the SPC 3 ASIC as well as an RS 485 interface for connecting a PROFIBUS-DP.

SPC 3 ASIC is controlled by a 48 MHz oscillator chip.

Operation

The integrated ASIC SPC 3 carries out the PROFIBUS-DP bus protocol completely independently.

The RAM's ASIC or the firmware must be linked by the user into his/her application.



Fig. 13 Block diagram for IM 182-1 slave interface module

Features

- Maximum transmission rate 12 Mbit/s
- PROFIBUS-DP protocol handling by SPC 3 ASIC
- 48 MHz oscillator chip for SPC 3
- Isolated RS 485 interface for PROFIBUS-DP
- Isolated power supply for the RS 485 interface on board
- DIP switch for setting the address space of the I/O addresses and the interrupt cables
- 5 V DC power supply
- Power consumption typ. 250 mA
- 0 to 60 °C permissible ambient temperature.

Firmware

A firmware (in the ANSI C source code) is offered as an interface between the registers of the SPC 3 and the application.

The firmware is operated on the microprocessor of the host system and offers call interfaces for easy linking of the IM182-1.

The firmware contains approximately 4 to 24 Kilobytes including examples.

The firmware is not absolutely necessary to operate the IM 182-1 interface module with the DP standard functions, since the registers of the ASICs' SPC 3 are precisely documented. The user saves time which would otherwise be spent for the required development work.

The firmware is required for the use of the additional DPV1 DP functions (read / write data set).

Driver

A corresponding driver is offered for Windows NT.

Development Kit 4

Application

The development kit 4 offers you evaluation and development of Master and Slave applications for PROFIBUS-DP.

Supported target systems:

- Master interface module IM 180/181
- Slave interface module IM 183-1
- Slave interface module IM 184
- Slave-ASIC SPC3

Hardware components

- Master interface module IM 180 and carrier board IM181
- Slave interface module IM 183-1, (intelligent slave, with ASIC SPC3)
- Slave interface module IM 184, (simple slave, with ASIC LSPM2)
- Bus connector and bus cable

Software components

- COM PROFIBUS, (needed to configure the bus system and the interface module IM 180)
- Firmware for IM 183-1 (original firmware for ASIC SPC3, including development licence)
- Simulation software, (to test and operate the components)

Documentation

A complete English and German set is included on the accompanying CD.

Development of Slaves

The purpose of the development kit is to develop a PROFIBUS slaves with ASIC SPC3 and LSPM2.

Similarly, it is possible to develop PROFIBUS slaves directly with the IM 183-1 or IM 184 (as a piggy-back unit in your own electronics).

In order to establish a small, running PROFIBUS network, you must plug the master interface module IM 180 into the carrier plate IM 181, and install it in a PC (ISA slot). Then, connect it with the slave interface module IM 183-1.

The simulation software lets you assign parameters to the IM and control the slaves. As a result, you can quickly become acquainted with the design and functions of the field bus PROFIBUS-DP.



Fig. 14 Components of the development kit 4

The simulation software is installed on the PC and enables you to control and query the slaves through the Dual-Port-RAM of the IM 180. In the process, diagnostic data of the slaves and inputs can be read, and slave outputs be set.

The program examples exist in source code, and are well-documented.

Based on the examples, you can develop your own functioning software and hardware.

Master systems with IM 180

The IM 180, and the simulation software constitute an operative PROFIBUS master. Based on this, you can quickly develop a master application.

Proprietary master systems

If the hardware basis is not the IM 180 in its original condition (piggy back), then you need the ASPC2 master firmware set, with corresponding licence. This software is available in object code and in source code. The software was designed for the 80C165 processor.

The master licence and the firmware is not included in the development kit. Additional information is available in the integration centers.

Service

The cost-free support of our customers, performed by the integration centers, is a constituent of the development kits.

The addresses of our integration centers are shown in page 9.

PROFIBUS DP/PA Development Kit

Application

This development kit enables you to establish PROFIBUS slaves matching the following PROFIBUS standards:

- PROFIBUS DPV1 (RS 485)
- PROFIBUS PA (IEC 1158) and
- PROFIBUS based on fiber-optic cables

Supported target systems:

The development environment shows the realization of applications with the PROFIBUS-ASICs DPC31.

Also, the environment clarifies how the ASICs SIM1, acting as a Medium Attachment Unit, is used to adapt the system to PROFIBUS-PA technology according to IEC 1158-2t.

Hardware components

- DPC31 Development Board; for developing, testing your own applications
- CP5613[®] the master interface module for the PC (PCI board)
- Optical bus terminal to interface copper wires with optical cables
- PROFIBUS-DP cable, copper, preassembled, violet
- PROFIBUS-DP fiber optical cable; plastic, pre-assembled
- PROFIBUS-PA cable; blue

Software components

- Test and simulation software for PC use (under WinNT), in conjunction with master board CP5613
- Example program for the DPC31 board, with easy-to-use user interface
- DPC31 original DPV1 firmware, including development licence
- Parameter assignment software "COM PROFIBUS" for CP 5613, for DP operation
- PDM demo software (PDM = Process Device Manager) for PA operation

PDM is a compatible and open tool for configuration purposes, parameter assignment, commissioning, and diagnostics of intelligent process devices. The accompanying PDM demo software is a full version, with a 2 month runtime limitation. The licence can be bought later and will enable you to use the PDM software after the runtime limitation has run out.



Fig. 15 Block diagram of PROFIBUS DP/PA development board

Documentation

The complete English and German documentation is included on the accompanying CD.

Functions

The development kit contains all components required to develop a PROFIBUS slaves with ASICs DPC31 and SIM1.

The program examples exist in source code and are well documented. The hardware configuration is documented with circuit diagrams.

The CP 5613, which is included in the delivery, must be installed in a PCI slot in the PC. Then, install the demo software (WinNT 4.0 required), to obtain a functioning PROFIBUS-DP master. Use the configuration tool "COM PROFIBUS" to assign parameters to the

CP 5613 and to the PROFIBUS configuration (with DPC31 board)".

If you intend to develop a PROFIBUS-DP slave to RS 485, you must couple the DPC31 board to the PC master by using the copper PROFIBUS cable included in the delivery.

If the line consists of optical cables, use the optical bus terminal (also included in the delivery) in order to convert the interface to fiber optics. The accompanying fiber optic cable must be connected to the optical interface of the DPC31 board. If the line is a PROFIBUS-PA line, the DPC31-Board must be connected over a DP/PA coupler. To achieve this, the supplied PROFIBUS-DP cable must be plugged into the DP/PA coupler, and the supplied blue PROFIBUS-PA cable must be wired from the DP/PA coupler to the PA port of the DPC31 board. The PROFIBUS-PA devices must be configured with the supplied PDM software.

The PROFIBUS DP/PA coupler (required if you wish to develop PROFIBUS-PA applications) converts the PROFIBUS-DP technology to PROFIBUS-PA. It is not included in the kit and must be ordered separately.

The example application is stored in the firmware EPROM of the DPC31 boards, and starts to communicate with the master once the cables are connected properly.

the software enables you to edit the functions included in the example, e.g by changing the "limit values".

Based on this operative example you can develop your own hardware and software.

Service

The cost-free support of our customers, performed by the integration centers, is a constituent of the development kits.

The addresses of our integration centers are shown in page 9.

Technical Specifications

ASICs	LSPM 2	SPM	2	SPC 3		SPC 41	DF	PC31	SIM 1		ASPC 2
Application	Simple slave applications	Simple slave applications		Intelligent slave applications		Intelligent slave applications	Int ap	telligent slave oplications	Medium Man- agement Unit		Master applications
Transmission technology	RS 485	RS 485		RS 485		RS 485 IEC 1158-2	RS 485 IEC 1158-2		IEC 1158-2		RS 485
Transmission rate max.	12 Mbit/s	12 Mbit/s		12 Mbit/s		12 Mbit/s 31.25 kbit/s at IEC 1158-2	12 Mbit/s 31.25 kbit/s at IEC 1158-2		31.25 kbit/s		12 Mbit/s
Automatic detection of transmission rate	Yes	Yes		Yes		Yes	Yes		-		-
Protocols	PROFIBUS-DP	PROFIBUS-DP		PROFIBUS-DP/ DPV1		PROFIBUS-DP/ DPV1 PROFIBUS-FMS	PROFIBUS-DP/ DPV1				PROFIBUS-DP PROFIBUS- FMS
Bus access	in ASIC	in ASIC		in ASIC		in ASIC	in ASIC		-		in ASIC
Microprocessor reqd?	No	No		Yes		Yes	No/Yes		-		1 Mbyte (ext.)
Size of firmware	Not required	Not required		4 to 24 Kbytes		8 to 40 Kbytes (lic. agreem.)	4 to 24 Kbytes		Not required		80 Kbytes (lic. agreem.)
Msg. frame memory	-	-		1.5 Kbytes		2 Kbytes	6 Kbytes		-		Yes
Power supply	5 V DC	5 V DC		5 V DC		5 V / 3.3 V DC	3.3 V DC		5 V DC		5 V DC
Power loss max.	0.35 W	0.5 W		0.65 W		0.4 W (DP) 0.01 W (PA)	0.2 W (DP) 5 - 10 mW (PA)		0.009 W		0.9 W
Permissible ambient temperature	-40 to +55 °C	-40 to +55 °C (worst case with max. load)		-40 to +85 °C		-40 to +85 °C	-40 to +85 °C		-40 to +85 °C		-40 to +85 °C
Housing	MQFP, 80 pin	PQFP, 120 pin		PQFP, 44 pin		TQFP, 44 pin	PQFP, 100 pin		TQFP, 44 pin		MQFP, 100 pin
Housing size	4 cm ²	10 cm	1 ²	2 cm ²		2 cm ²	4 cm ²		2 cm ²		4 cm ²
Delivery quantities	5/40/200/ 5.000/10 000 items	5/24/1 5.000 items	100/ /10 000	5/96/576/ 4.608/ 9 792 items		5/96/960/4.800/ 10 560 items	5/60/300/ 5.100/ 10 200 items		5/96/960/ 4.800/10 560 items		5/66/660/ 4.620/ 9 900 items
Interface module	IM 184		IM 183-1		IM	M 182-1		IM 180	IM 18		1
Application	Simple slave applications		Slave applications		Sla ap	slave applications		Master applications		Carrier board for IM 180 master inter- face module	
Transmission rate max.	12 Mbit/s		12 Mbit/s		12	12 Mbit/s		12 Mbit/s		-	
Protocols	PROFIBUS-DP		PROFIBUS-DP		PF	PROFIBUS-DP		PROFIBUS-	P -		
ASIC	LSPM 2		SPC 3		SF	SPC 3		ASPC 2		-	
Microprocessor	Not required		80C32 (20 MHz)		Pr	Processor of PC/PG		80C165 (40 MHz)		-	
Size of firmware	Not required		4 to 24 Kbytes (incl. test program)		4 t tes	4 to 24 Kbytes (incl. est program)		80 Kbytes		-	
Memory capacity	-		32 Kbytes SRAM 64 Kbytes EPROM		-			2 x 128 Kbytes		-	
Host interface	-		-		-			Dual-port-RAM		-	
Permissible ambient temperature	0 to 70 °C		0 to 70 °C		0 t) to 60 °C		0 to 70 °C			
Power supply	5 V DC		5 V DC		5١	5 V DC		5 V DC		-	
Pwr consumption typ.	150 mA		250 mA		25	250 mA		250 mA		-	
Board size	85 x 64 mm / 3.3 x 2.5 in.		86 x 76 mm / 3.3 x 2.7 in.		16 6.6	68 x 105 mm 3.6 x 4.1 in.		100 x 100 mm / 3.9 x 3.9 in.		168 x 105 mm / 6.6 x 4.1 in.	

Siemens AG

Automation and Drives Group Industrial Automation Systems Postfach 4848, D-90327 Nürnberg Bundesrepublik Deutschland

Siemens Aktiengesellschaft

© Siemens AG 2000 Subject to change without prior notice

Order No. 6ZB5310-0CT02-0BA7 Printed in the Fed. Rep. of Germany 261/001250 SB 01002.

