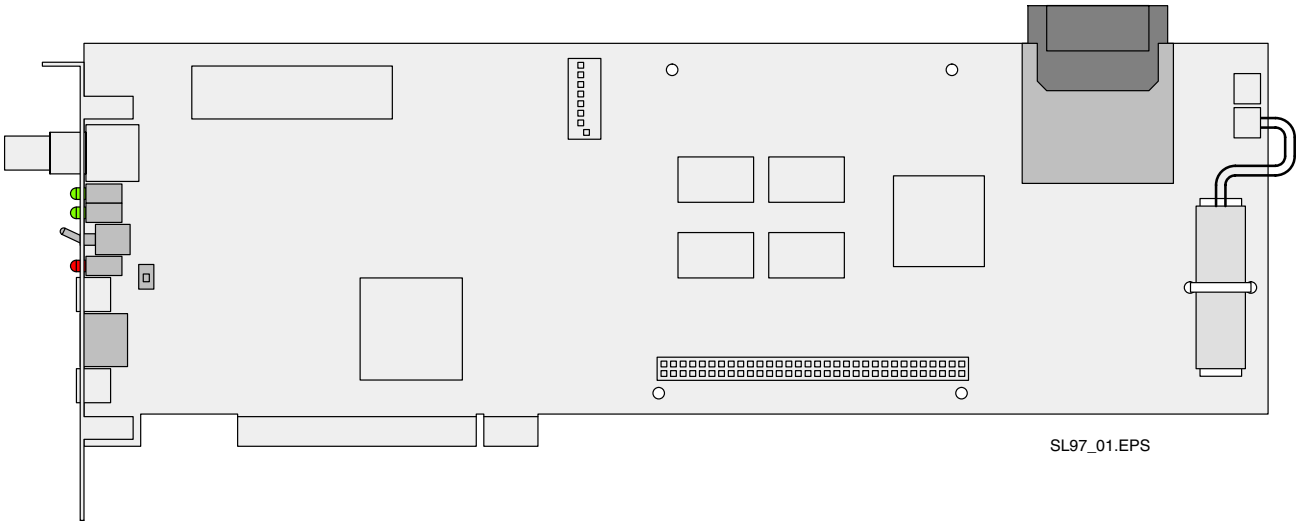
Hardware

Advant Controller 31

Intelligent Decentralized Automation System

Basic Unit
07 SL 97



2.3 Basic Unit 07 SL 97

Basic unit with max. 480 kB user program + 256 kB user data, CS31 system bus

The basic unit **07 SL 97** is a slot PLC and can be integrated into PCs with PCI interface. This plug-in card is designed as a standard PCI full-size card. The basic unit **07 SL 97 R0160** has a CS31 bus connection as well as an ARCNET coupling.

Optionally further couplings are possible for the following units:

PROFIBUS-DP **07 SL 97 R0162** and

DeviceNet **07 SL 97 R0165**.

A table listing the options is shown on the following page.

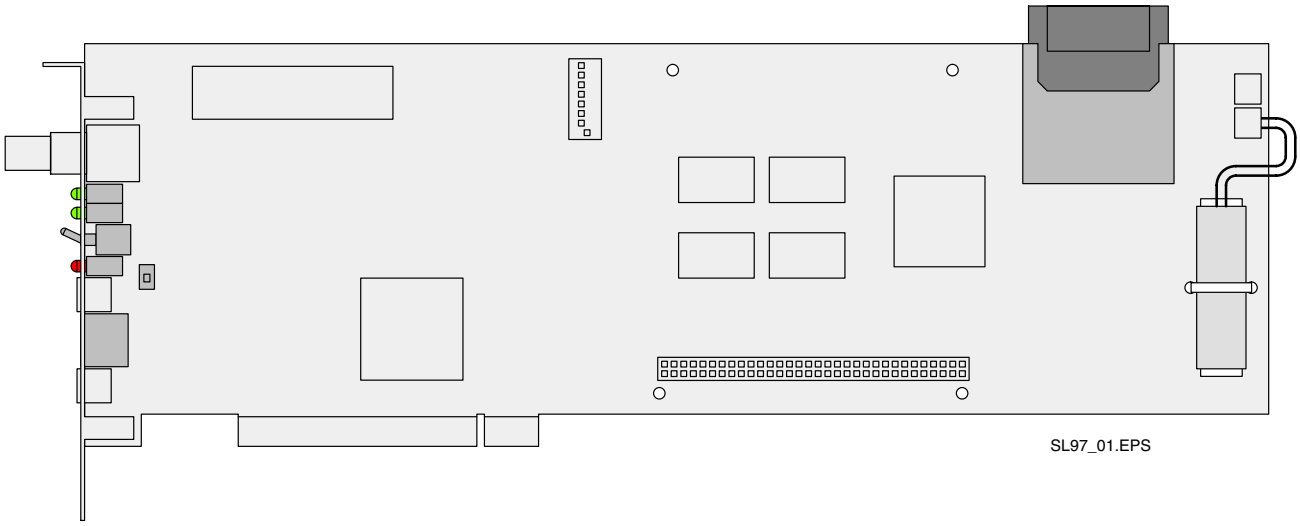


Fig. 2.3-1: Basic unit 07 SL 97 R0160

Contents

Functionality of the basic units 07 SL 97

User program	480 kB (Flash EPROM)
User data	256 kB
Serial interfaces	COM1 as MODBUS interface and for programming and test functions
Internal interface for connection to coupler	Optionally for PROFIBUS-DP coupling card or DeviceNet coupling card
System bus interface	CS31
Integrated couplers	ARCNET
PCI interface	Acc. to PCI interface specification V2.1 (PCI = Peripherial Component Interconnect) 32 bit bus / 33 MHz Self-configuring PCI card, designed in 5 V technology PCI interface realized using PLX chip 8 k memory range on PCI bus Interrupt processing as PCI target Interrupt setting depending on the PC
Real-time clock	integrated
SmartMedia Card	Storage medium for operating system, user program and user data
LED displays	for signal states, operating conditions and error messages
Power supply	24 V DC
Data buffering	with Lithium battery 07 LE 90
Programming software	907 AC 1131

Available basic units 07 SL 97

Basic unit	07 SL 97 **R0160**	07 SL 97 **R0162**	07 SL 97 **R0165**
Binary inputs	-	-	-
Binary outputs	-	-	-
Binary inputs/outputs	-	-	-
Analog inputs	-	-	-
Analog outputs	-	-	-
CS31 bus connection	yes	yes	yes
ARCNET interface	yes	yes	yes
PROFIBUS-DP interface	no	yes	no
DeviceNet interface	no	no	yes
Order number	GJR5 2534 00 R0160	GJR5 2534 00 R0162	GJR5 2534 00 R0165

2.3.1 Brief description

The basic unit 07 SL 97 can work as:

- Bus master basic unit on the CS31 system bus
- Bus master basic unit on the CS31 system bus with ARCNET networking
- Bus master basic unit on the CS31 system bus with ARCNET networking and coupling to PROFIBUS-DP or DeviceNet
- Basic unit with ARCNET networking
- Basic unit with ARCNET networking and coupling to PROFIBUS-DP or DeviceNet
- Basic unit with coupling to PROFIBUS-DP or DeviceNet
- Slave basic unit on the CS31 system bus

The supply voltage for the unit is 24 V DC.

2.3.1.1 Main features

- 1 PCI interface V2.1
- 1 ARCNET interface
- 1 CS31 system bus interface for system expansion
- 1 interface for connecting communication modules
- 1 serial interface COM1
  - as MODBUS interface and
  - for programming and test functions
- Real-time clock
- LEDs for displaying operating conditions and error messages
- Detachable screw-type terminal blocks
- Fastening inside the PC by inserting the slot PLC into the PCI direct plug connector
- A lithium battery 07 LE 90 can be inserted into the battery compartment in order to
  - store and backup data additionally contained in the RAM, e.g. states of the flags
  - backup the time and date (real-time clock)
- RUN/STOP switch for starting and aborting the program execution
- Extensive diagnosis functions
  - self-diagnosis of the basic unit
  - diagnosis of the CS31 system bus and the connected modules
- Integrated Flash EPROM for storing program and data
- Exchangeable SmartMedia Card 07 MC 90 for user data and for updating the operating system or the PLC program
- Separate 24 V DC power supply which is independent from the PC
- Diagnosis of the 07 SL 97 via the PC and via ARCNET diagnosis of further connected decentralized processors, such as 07 KT 97/98 (Routing)
- Remote diagnosis using 907 AC 1131 in connection with standard software (e.g. PC Anywhere)
- OPC interface

2.3.1.2 Project planning / Commissioning

The following has to be observed for project planning and commissioning:

- Programming
  is performed using the AC31 programming software which can be run on standard IBM compatible PCs with Windows NT and Windows 98 SE (refer to the documentation of the programming system 907 AC 1131).
- Online program modification
  Quick modification of the user program is possible without interruption of operation (refer to programming system 907 AC 1131).
- Buffering of data areas
  Buffering of data, i.e. saving of data during power OFF/ON, is only possible when a battery is available.

  Furthermore data can be stored on the SmartMedia Card in order to become voltage breakdown-safe.

2.3.2 Connections and operating elements

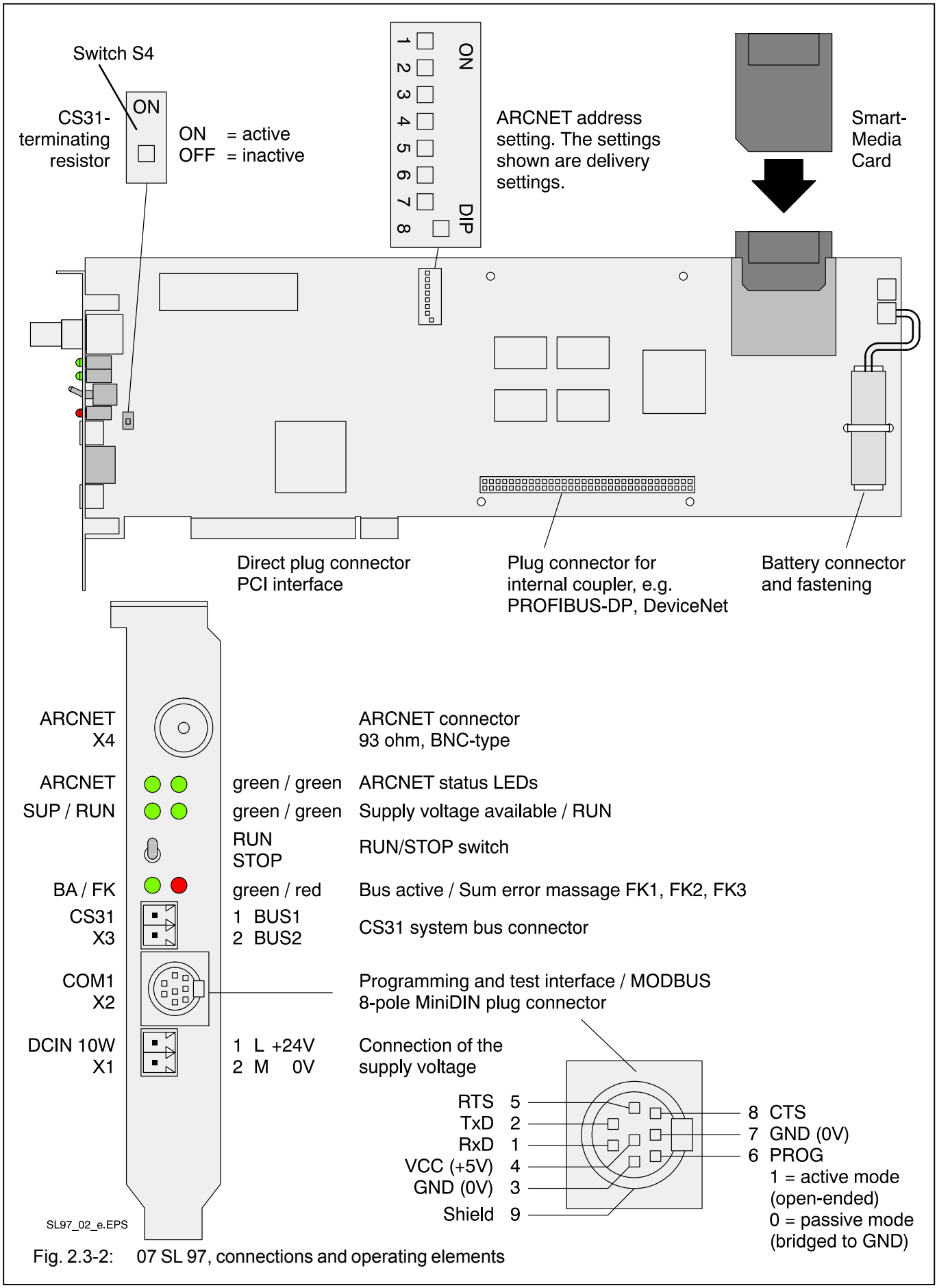


Fig. 2.3-2: 07 SL 97, connections and operating elements

2.3.3 Electrical connection / earthing concept

- Connect the earth connection (e.g. earth stud) of the PC housing to functional earth (switch-gear cabinet earth) using an 6 mm² earth lead which is as short as possible.
- Connect the CS31 bus according to chapter 1.2 „CS 31 system bus“ in part 1 „Hardware“ of the 907 AC 1131 system description.

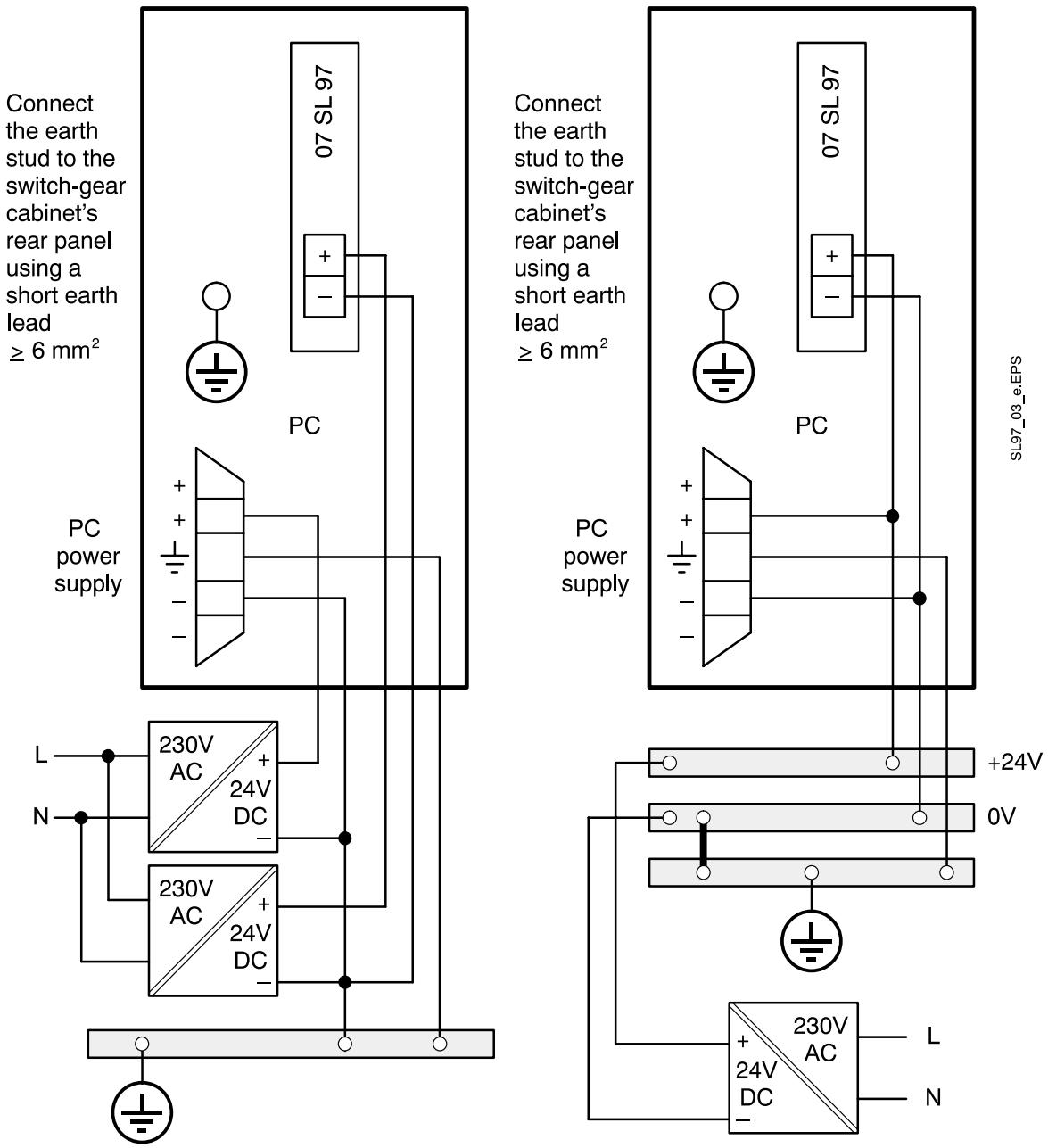
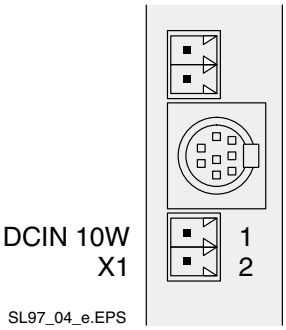


Fig. 2.3-3: Application example: Basic unit 07 SL 97

2.3.3.1 Connection of the supply voltage

The 24 V DC supply voltage is connected via a 2-pole detachable screw-type terminal block.

Caution: Plug and unplug the terminal block only when power is off!



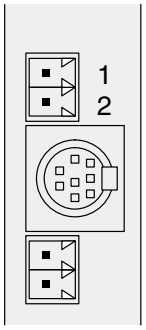
Terminal assignment:

Supply voltage
L+ +24 V DC
M Ground connection (0V)

Fig. 2.3-4: Assignment of the terminal block for the 24 V DC-IN supply voltage

Using a power supply for the 07 SL 97 which is separate from the PC provides high availability of the slot PLC. The PLC program of the slot PLC works independent from the PC. Therefore the communication with the CS31 bus modules and the ARCNET, PROFIBUS or DeviceNet subscribers is maintained. The communication between the slot PLC and the PC can be started after the power supply of the PC is switched on.

2.3.3.2 Connection for CS31 system bus



Terminal assignment:

BUS1 CS31 system bus
BUS2

Fig. 2.3-5: Assignment of the CS31 system bus interface

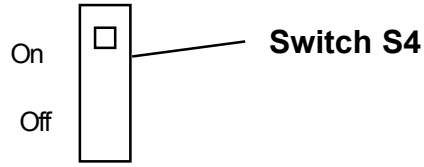
The connection to the CS 31 system bus is made via a 2-pole detachable terminal block. Please observe:

- All AC31 devices, no matter whether they are master or slave devices, are connected by a twisted-pair bus line as follows:
  - One core of the bus line is looped through via the BUS1 terminals of all devices to be connected to the CS31 system bus.
  - The other core of the bus line is looped through via the BUS2 terminals of all devices to be connected to the CS31 system bus.
- If the 07 SL 97 device is located at the beginning or at the end of the bus line, the bus terminating resistor (120 Ω) on the board has to be switched on using switch S4.

  The mounting position of switch S4 is shown in chapter 2.3.2 „Connections and operating elements“ on page 2.3-4.

Switch in „On“ position = Bus terminating resistor **active**

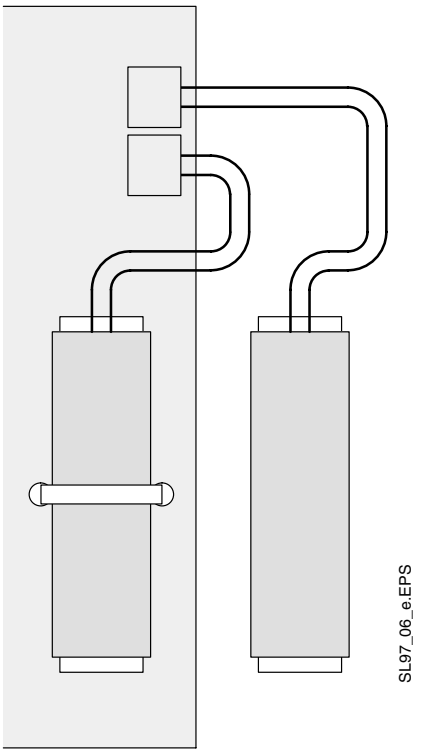
Switch in „Off“ position = Bus terminating resistor **inactive**



- The shield of the twisted-pair bus line is connected with a clamp to the metal housing of the PC.
- Handling of the CS31 system bus is described in detail in volume 2 „System data“.

2.3.3.3 Battery and battery replacement

- The lithium battery 07 LE 90 can be used for data backup purposes as follows:
  - Storage and backup of data additionally contained in the RAM memory, e.g. states of the flags
  - Backup of time and date



1. Connect the new battery to the unused connector
2. Remove the old battery and disconnect it
3. Fasten the new battery to the circuit board using a cable tie

Fig. 2.3-6: Battery and battery replacement

The battery lifetime is typically 5 years. The battery lifetime is the time during which the device remains operable in order to backup data while the supply voltage of the basic unit is switched off. As long as the supply voltage is available there is no more load on the battery other than its self-discharge.

Please observe the following handling notes:

- Use only lithium batteries approved by ABB.
- Replace the battery by a new one at the end of its life.
- **Observe the instructions of the PC manufacturer before opening the PC housing!**
- **Never short-circuit the battery!** There is danger of overheating and explosion. Avoid accidental short-circuits. Therefore do not store batteries in metallic containers or boxes and do not bring them into contact with metallic surfaces.
- **Never try to charge a battery!** Danger of overheating and explosion!
- **Replace the battery only with the supply voltage of the slot PLC switched on.** Otherwise you risk data being lost.
- **The battery condition is not indicated by a LED.** Checking whether the battery is available or not can only be done by performing a visual inspection of the slot PLC or by reading the status word

  EW07,15 / %IW1007.15 Bit 3

  Bit 3 = 0 Battery not available
  Bit 3 = 1 Battery available

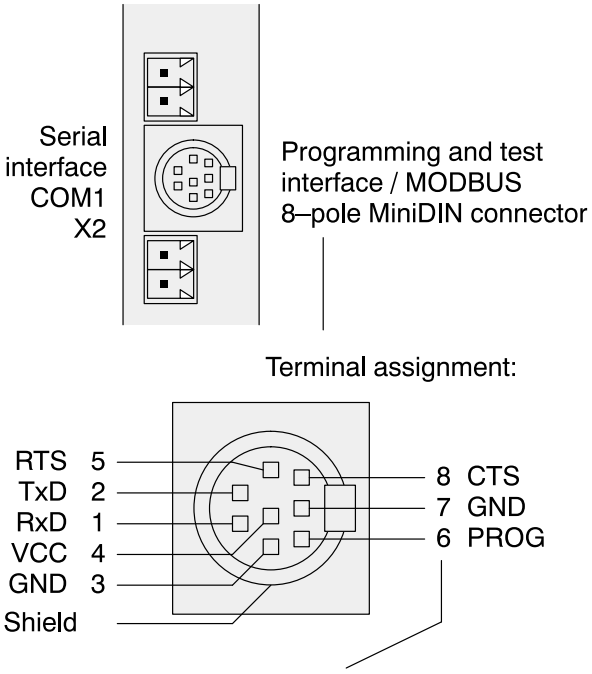
  See also volume 15 of the 907 AC 1131 description, „System Technology 90 Series“, System Technology Basic Units, 2.6.6 CS31 status word

2.3.3.4 Serial interface COM1

Interface standard: EIA RS-232

Assignment of the serial interface COM1

The pin assignment of the serial interface COM1 is as follows:



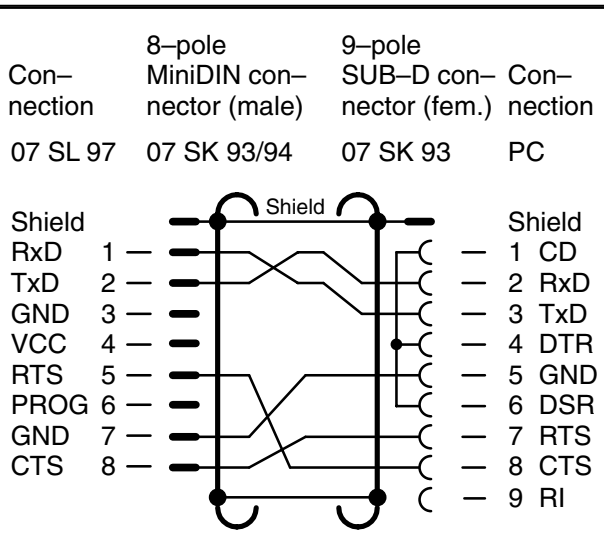
RxD	Receive Data
TxD	Transmit Data
VCC	reserved
RTS	Request To Send
CTS	Clear To Send
PROG	Active/Passive Mode Switching
Schirm	Cable Shield / Protective Ground
CD	Carrier Detect
DTR	Data Terminal Ready
DSR	Data Set Ready
GND	Ground / Signal Ground
RI	Ring Indicator

SL97_07_e.EPS

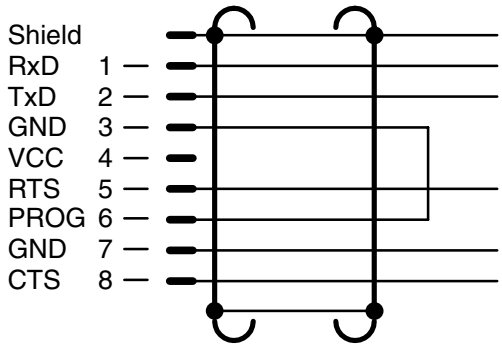
Fig. 2.3-7: Assignment of the serial interface COM1

Interface cables for COM1

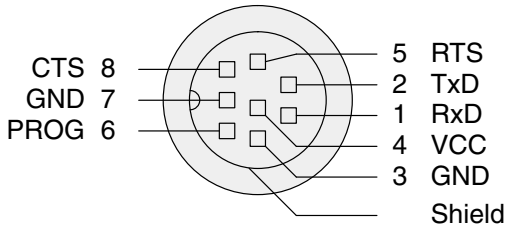
Figure 2.3-8 shows two system cables for the serial interface COM1 for active mode (programming and test) and passive mode (MODBUS).



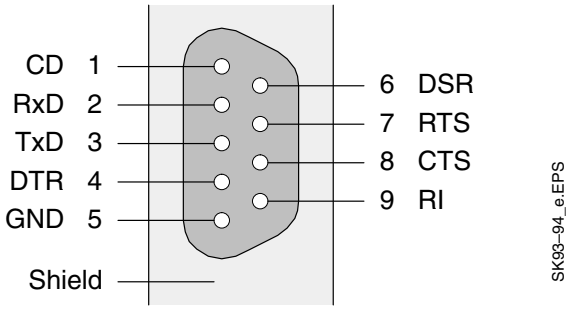
Connection diagramm 07 SK 93 for programming and test purposes (active mode)



Connection diagramm 07 SK 94 for MODBUS operation (passive mode)



Front view to the pins of the MiniDIN cable conn.



Front view to the sockets of the 9–pole SUB–D cable connector

Fig. 2.3-8: Interface cables 07 SK 93 and 07 SK 94

2.3.4 Networking / Couplers

2.3.4.1 Basic units with ARCNET coupler

07 SL 97 R160	Order No. GJR5 2534 00 R0160 (ARCNET)
07 SL 97 R162	Order No. GJR5 2534 00 R0162 (ARCNET and PROFIBUS-DP)
07 SL 97 R165	Order No. GJR5 2534 00 R0165 (ARCNET and DeviceNet)

2.3.4.1.1 Information about ARCNET

Refer to volume 15 „System Technology 90 Series“, Internal couplers, The ARCNET coupler

2.3.4.1.2 ARCNET - Connection and address assignment

The ARCNET coupler is integrated in the slot PLC of the basic unit. The DIL switch for setting the ARCNET address is located near the upper edge of the board (refer to page 2.3-4). The ARCNET coupler is supplied from the internal 24 V DC power supply.

The ARCNET coupler is designed as a bus with BNC connectors for coaxial cables. The ARCNET bus is earthed inside the module by a capacitor. As an EMC measure and for protection against dangerous contact voltages, the bus has to be earthed directly at a central place.

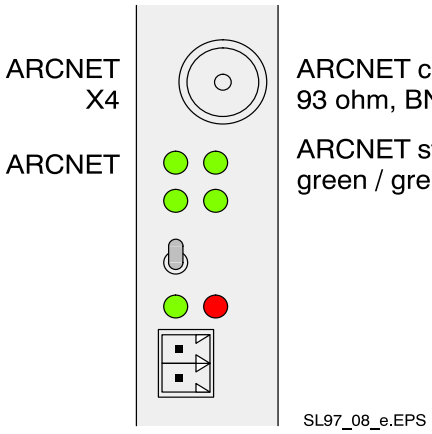


Fig. 2.3-9: BNC connector for ARCNET

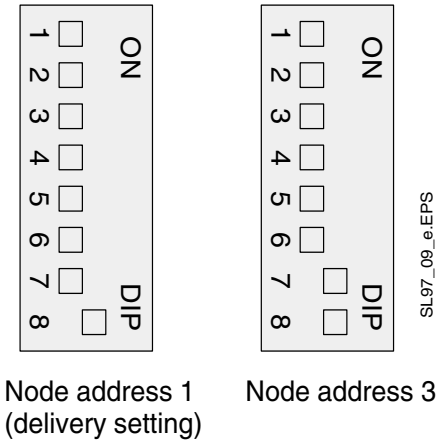


Fig. 2.3-10:
Setting the ARCNET node number (station address) at the basic unit (binary coded)

Signalling:

green LED (BS)	Operating condition „controller active“, i.e. the PLC performs write or read operations
green LED (TX)	Operating condition „transmit active“, i.e. the PLC is sending via the ARCNET

2.3.4.2 Basic units with integrated PROFIBUS-DP coupler

07 SL 97 R162 Order No. GJR5 2534 00 R0162

2.3.4.2.1 Information about PROFIBUS

Refer to volume 15 „System Technology 90 Series“, Internal couplers, The PROFIBUS-DP coupler

2.3.4.2.2 Installing the PROFIBUS-DP coupler

The PROFIBUS-DP master coupler is mounted on the 07 SL 97. In order to provide the bus interface at the exterior of the PC housing the bus interface is connected to an assembly board by using a flat cable. This assembly board additionally contains 4 LEDs for indicating the coupler states.

The slot PLC 07 SL 97 together with the mounted coupler occupies two partitions inside the PC.

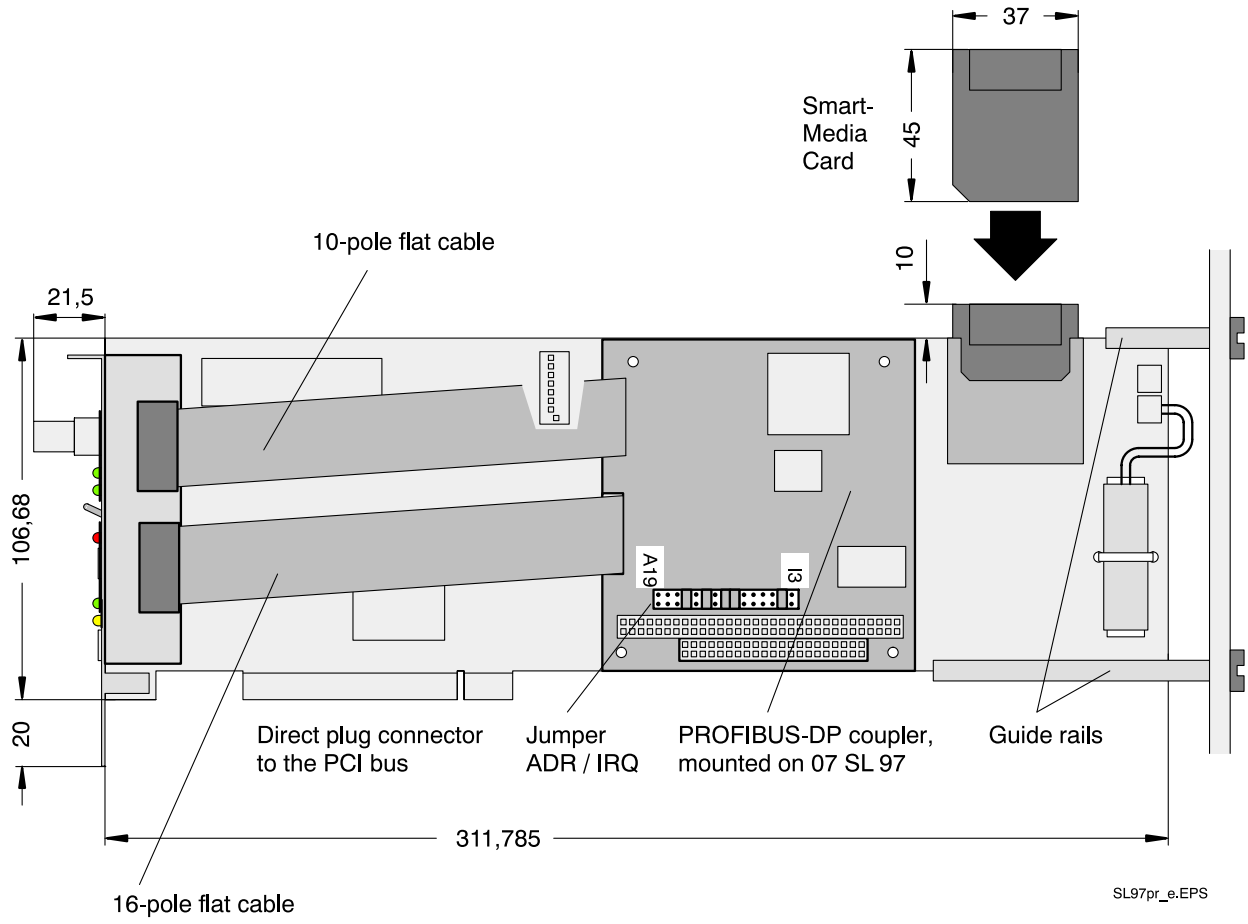


Fig. 2.3-11: 07 SL 97 with PROFIBUS-DP coupler

Caution:
Jumpers for setting the basic address and the interrupts are located on the coupler right next to the connector for internal couplers.
The positions of these jumpers (open-ended or plugged) must not be changed.
See also section „Jumper settings“ on page 2.3-12.

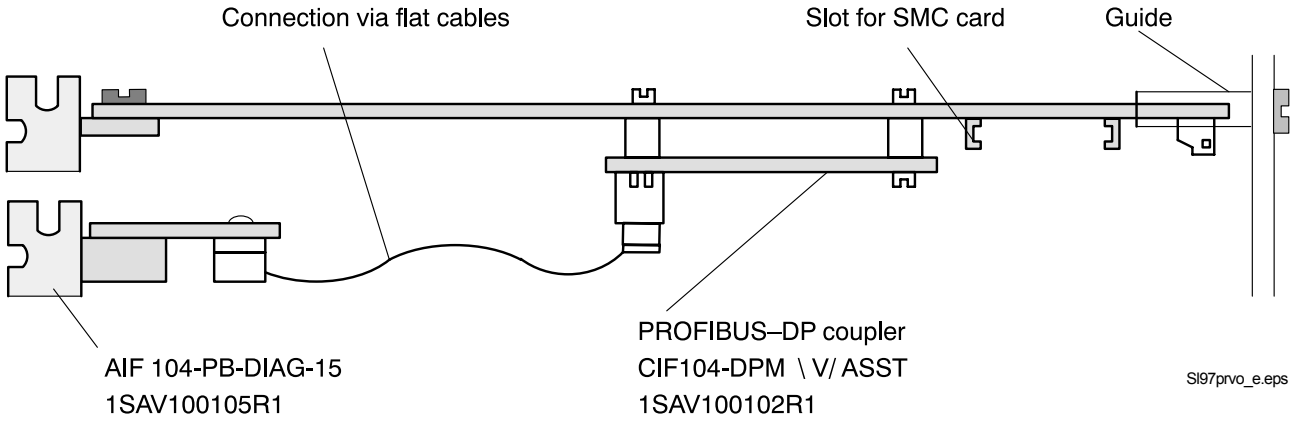


Fig. 2.3-12: 07 SL 97 with PROFIBUS-DP coupler, top view

2.3.4.2.3 Pin assignment, meaning of the LEDs and jumper settings

The following figure shows the pin assignment of the PROFIBUS-DP interface as well as the names of the 4 LEDs.

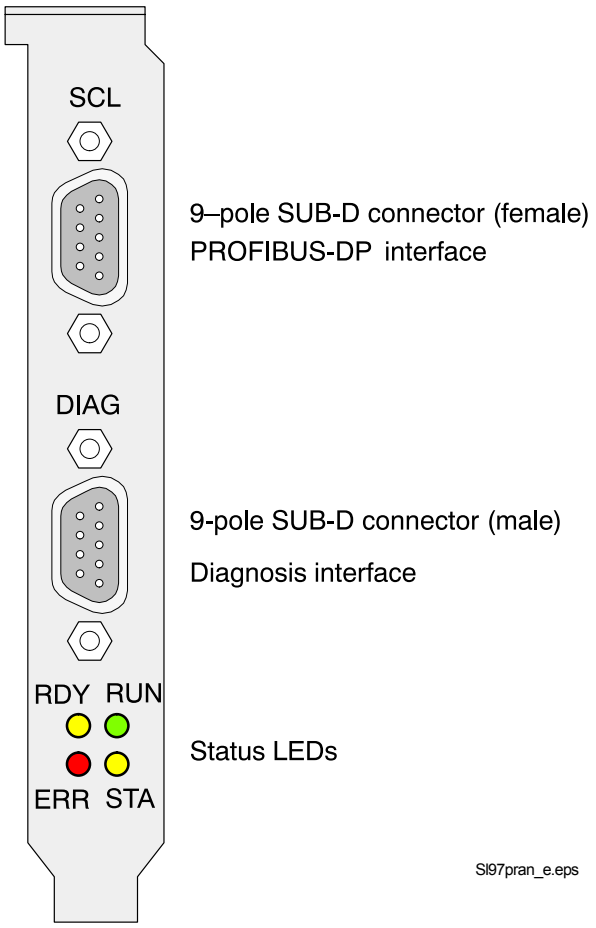


Fig. 2.3-13: PROFIBUS-DP interface, connection, status LEDs

Pin assignment for the PROFIBUS-DP connector

9-pole SUB-D female

Pin No.	Signal	Meaning
1	Shield	Shielding, protection earth
2	Unused	
3	RxD/TxD-P	Receive/transmit line, positive
4	CNTR-P	Control signal for repeater, positive (optional)
5	DGND	Reference potential for data exchange and +5 V
6	VP	+5 V (power supply for bus terminating resistors)
7	Unused	
8	RxD/TxD-N	Receive/transmit line, negative
9	CNTR-N	Control signal for repeater, negative (optional)

Caution:

The 9-pole SUB-D male connector "Diagnosis interface" is intended only for service purposes and must not be wired-up from outside.

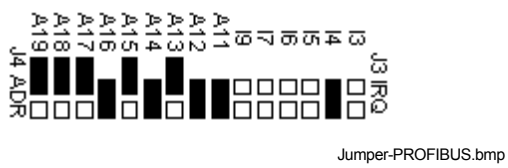
Meaning of the LEDs

LED	Color	Status	Meaning
READY	yellow	on flashes cyclic flashes irregularly off	coupler ready bootstrap loader active hardware or system error defective hardware
RUN	green	on flashes cyclic flashes irregularly off	communication is running communication stopped missing or erroneous configuration no communication
STATUS	yellow	on off	sending data or token no token
ERROR	red	on off	PROFIBUS error no error

Jumper settings PROFIBUS-DP

The positions of these jumpers (open-ended or plugged) must not be changed.

The following figure shows the valid settings.



Jumper-PROFIBUS.bmp

Fig. 2.3-14: Jumpers

2.3.4.3 Basic units with integrated DeviceNet master coupler

07 SL 97 R165 Order No. GJR5 2534 00 R0165

2.3.4.3.1 Information about DeviceNet

Refer to volume 15 „System Technology 90 Series“, Internal Couplers, The DeviceNet coupler

2.3.4.3.2 Installing the DeviceNet master coupler

The DeviceNet master coupler is mounted on the 07 SL 97. In order to provide the bus interface at the exterior of the PC housing the bus interface is connected to an assembly board by using a flat cable. This assembly board additionally contains 4 LEDs for indicating the coupler states.

The slot PLC 07 SL 97 together with the mounted coupler occupies two partitions inside the PC.

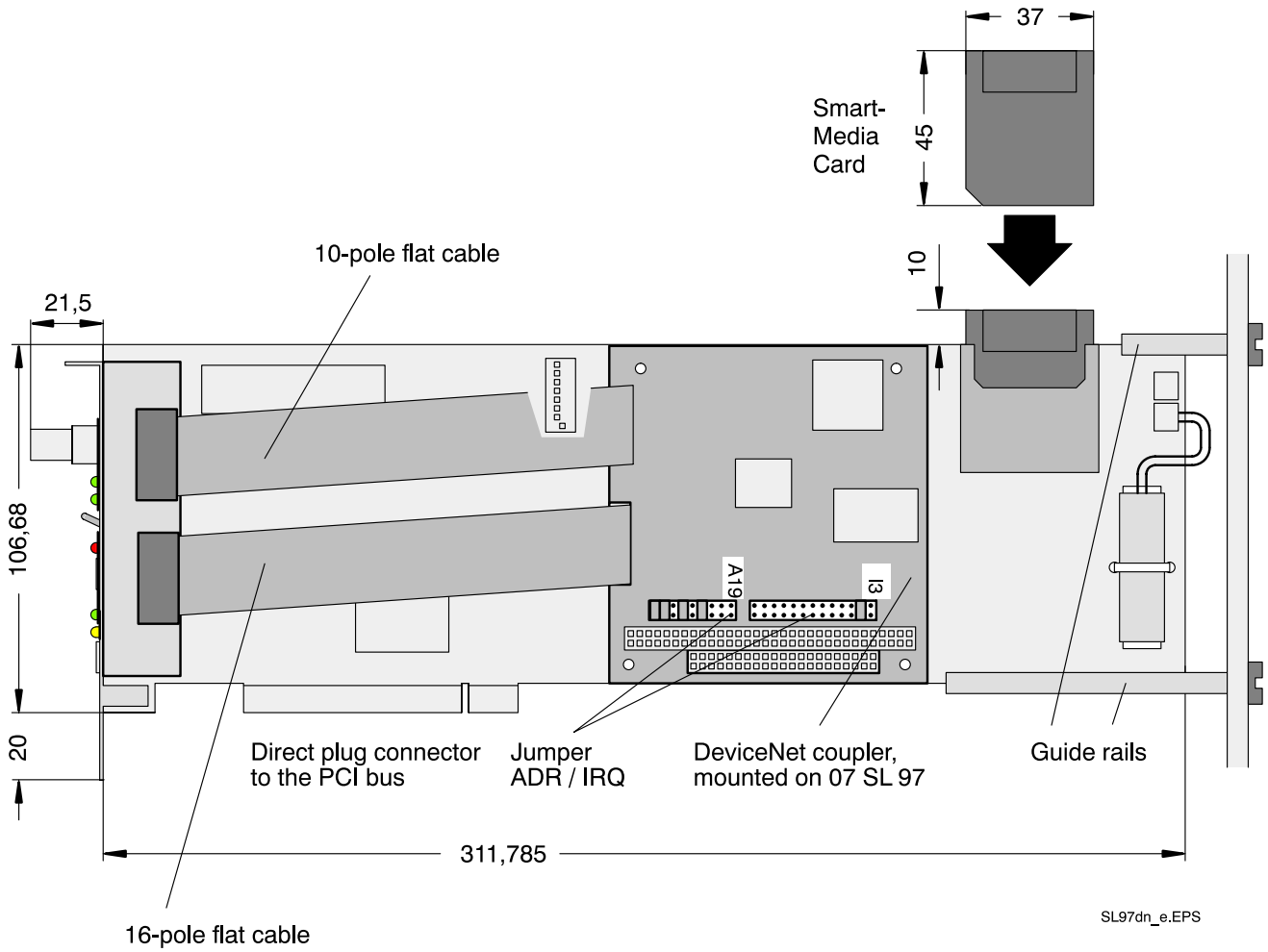


Fig. 2.3-15: 07 SL 97 with DeviceNet Master coupler

Caution:
Jumpers for setting the basic address and the interrupts are located on the coupler right next to the connector for internal couplers.
The positions of these jumpers (open-ended or plugged) must not be changed.
See also section „Jumper settings“ on page 2.3-15.

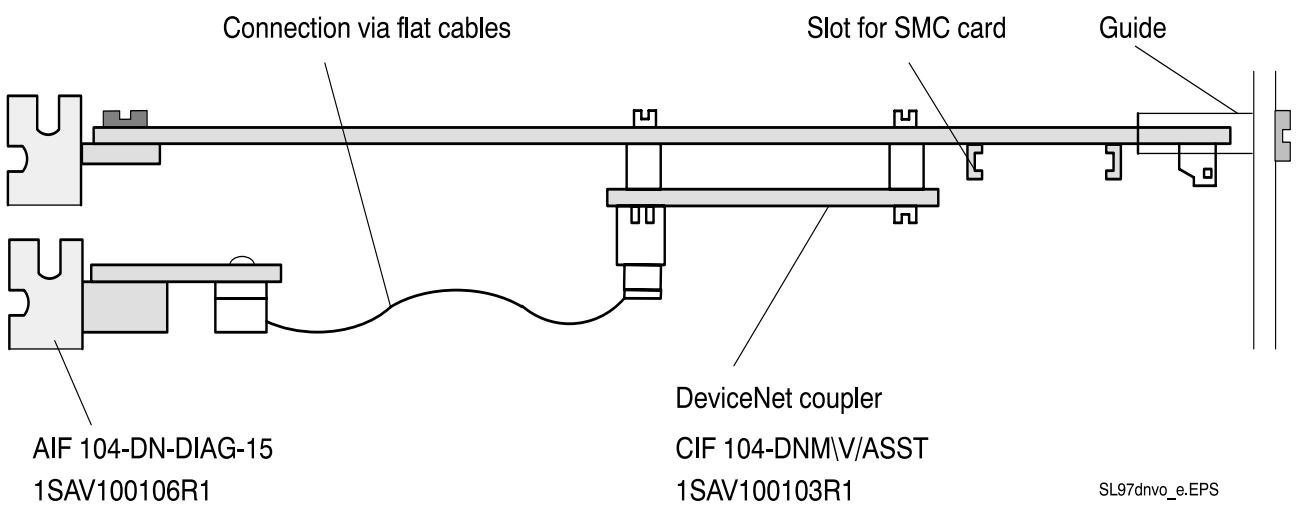


Fig. 2.3-16: 07 SL 97 with DeviceNet Master coupler, top view

2.3.4.3.3 Pin assignment, meaning of the LEDs and jumper settings

The following figure shows the pin assignment of the DeviceNet interface as well as the names of the 4 LEDs.

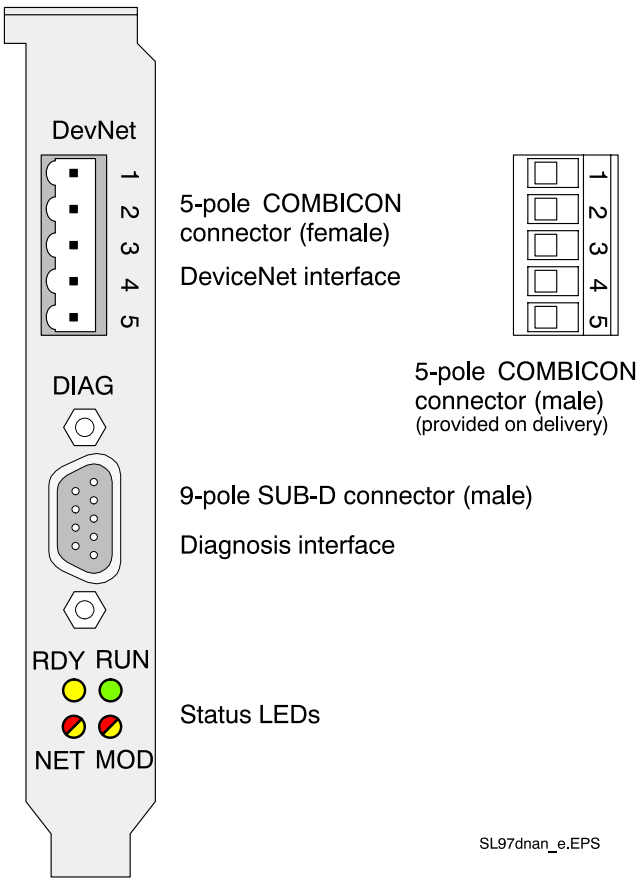


Fig. 2.3-17: DeviceNet interface, connections, status LEDs

Pin assignment for the DeviceNet connector

COMBICON socket (female)

Pin No.	Signal	Meaning
1	-V	Reference potential for external power supply +24 V
2	CANL	Receive/transmit line, low
3	Shield	Shield of the bus line
4	CANH	Receive/transmit line, high
5	+V	+24 V external power supply

It is absolutely necessary that all lines (i.e. the data lines CANH / CANL, the external 24 V power supply +V / -V and the shielding) are connected.

Caution:

The 9-pole SUB-D male connector on the assembly board is intended only for service purposes and must not be wired-up from outside.

Status LEDs

LED	Color	Status	Meaning
RDY	yellow	on	coupler ready
		flashes cyclic	bootstrap loader active
		flashes irregularly	hardware or system error
		off	defective hardware
RUN	green	on	communication is running
		flashes cyclic	communication stopped
		flashes irregularly	missing or erroneous configuration
		off	no communication
NET	green/red	green on	connected to the bus, communication established
		flashes green	connected to the bus, no communication
		off	no supply voltage, not connected to the bus
		red on	critical connection error
		flashes red	timing supervision error
MOD	green/red	green on	coupler running
		flashes green	coupler ready for operation
		off	no supply voltage
		red on	uncorrectable error
		flashes red	minor error

Jumper settings DeviceNet master

The positions of these jumpers (open-ended or plugged) must not be changed.

The following figure shows the valid settings.

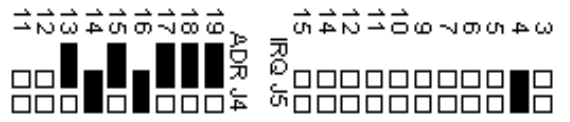


Fig. 2.3-18: Jumpers

Jumper-DeviceNet.bmp

2.3.5 SmartMedia Card 07 MC 90

The SmartMedia Card serves for storing data up to 2 MB to protect them against being lost while the power is off. It is inserted into the basic unit 07 SL 97. It is recommended only to use ABB-proven SmartMedia Cards.

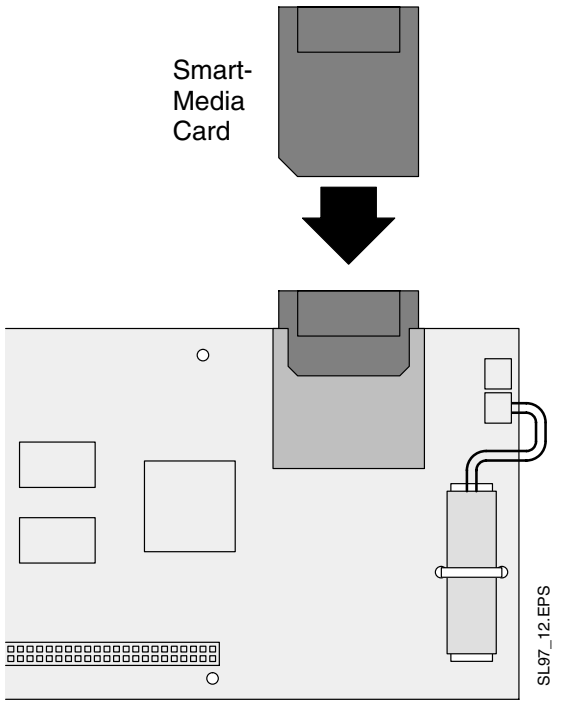


Fig.: Insertion of the SmartMedia Card

Field of application

- Storing and loading of PLC programs
- Storing and loading of user data
- Loading of firmware updates

Handling instructions

- **Observe the instructions of the PC manufacturer before opening the PC housing!**
- Insert or remove the SmartMedia Card only with the slot PLC switched off.
- The SmartMedia Card must be inserted with the contact field upwards (contacts are visible, see figure above).
- After a SmartMedia Card has been initialized once as user data memory it cannot be used any more as an user program card.
- The SmartMedia Card has to be protected against
  - mechanical damages (e.g. do not bend)
  - electrostatic discharge
  - contact pollution (do not touch the contacts)

Important note

SmartMedia Cards with a supply voltage of 3.3 V, e.g. GJR5 2526 **R0201**, cannot be used with 07 SL 97 basic units.

Access

- The SmartMedia Card can be accessed within the PLC program via function blocks. Refer to the documentation of the programming software 907 AC 1131.

Technical data

Weight	2 g
Dimensions	45 x 37 x 0.7 mm

Order number

07 MC 905 V	2 MB	GJR5 2526 00 **R0101**

2.3.6 Technical data for 07 SL 97

In general, the technical system data listed under „System data and system configuration“ in chapter 1 of volume 2 of the „AC31 with 907 AC 1131“ system description are valid. Additional data or data which are different from the system data are listed below.

2.3.6.1 General data

Number of binary inputs	onboard, none
Number of binary outputs	onboard, none
Number of binary in-/outputs	onboard, none
Number of analog inputs	onboard, none
Number of analog outputs	onboard, none
Expansion via CS31 system bus possible up to	992 binary inputs 992 binary outputs 224 analog input channels 224 analog output channels max. 31 remote modules altogether
Number of serial interfaces	1 (for programming or connection to man-machine communication)
Number of internal interfaces	1 interface for connecting a coupler card for networking with other bus systems e.g. PROFIBUS-DP or DeviceNet
Integrated memory	Flash EPROM 512 kB (480 kB program + configuration data) RAM 2 MB (480 kB program with online programming + 256 kB variables)
Resolution of the integrated real-time clock	1 second
Processing time, 65 % bits, 35 % words	typ. 0.3 ms/kB program
Number of software timers delay time of the timers	any 1 ms...24.8 days
Number of up/down counter software blocks	any
Number of bit flags in the addressable flag area	8192
Number of word flags „	8192
Number of double word flags „	1024
Number of step chains „	256
Number of constants KW „	1440
Number of constants KD „	384
Indication of operating states and errors	6 LEDs altogether
Wiring method supply terminals, CS31 system bus Phoenix-type terminals item no. 18 40366 MC 1,5/ 2-ST-3.81	detachable screw-type terminal blocks 2 x 0.08 mm^2 - 1.5 mm^2 AWG 28-16 line cross section 0.08 - 1.5 mm^2 rigid / flexible AWG 28-16

2.3.6.2 Power supply

Rated supply voltage	24 V DC
Current consumption at nominal voltage	max. 0.21 A
Protection against reversed polarity	yes

2.3.6.3 Lithium battery

Battery for backup of RAM data	battery module 07 LE 90
Lifetime at 25 °C	typ. 5 years

2.3.6.4 Connection of the serial interface COM1

Interface standard	EIA RS-232
Programming using 907 AC 1131	with IBM PC (or compatible)
Programming modifications using 907 AC 1131	with IBM PC (or compatible)
Man-Machine Communication	yes, e.g. with operating station
Electrical isolation	against CS31 system bus interface
Potential differences	In order to avoid potential differences between the 07 SL 97 basic unit and the peripheral devices connected to COM1, these devices are supplied by the same socket in the control cabinet.
Terminal assignment and description of the interface COM 1	refer to chapter 2.3.3.4

2.3.6.5 Connection to the CS31 system bus

Interface standard		EIA RS-485
Connection	as a master PLC	yes, transmit and receive areas are configurable
	as a slave PLC	yes, see „System constants“
Setting of the CS31 module address		yes, by system constant, stored in the Flash EPROM of the slave PLC
Electrical isolation		against supply voltage, inputs and outputs, against interface COM1
Terminal assignment and description of the CS31 system bus interface		refer to chapter 2.3.3.2

2.3.6.6 PCI interface

According to PCI interface specification V2.1
32 bit bus / 33 MHz
Self-configuring full-size PCI card, designed in 5 V technology
PCI interface realized using PLX chip
8 k memory range on PCI bus
Interrupt processing as PCI target
Interrupt setting depending on the PC

2.3.6.7 Connection to ARCNET

Coaxial cable of the type RG62/U, 93 Ω	data transfer rate 2.5 Mbits/s
Coaxial connector suitable for the coaxial cable	

2.3.6.8 LED displays

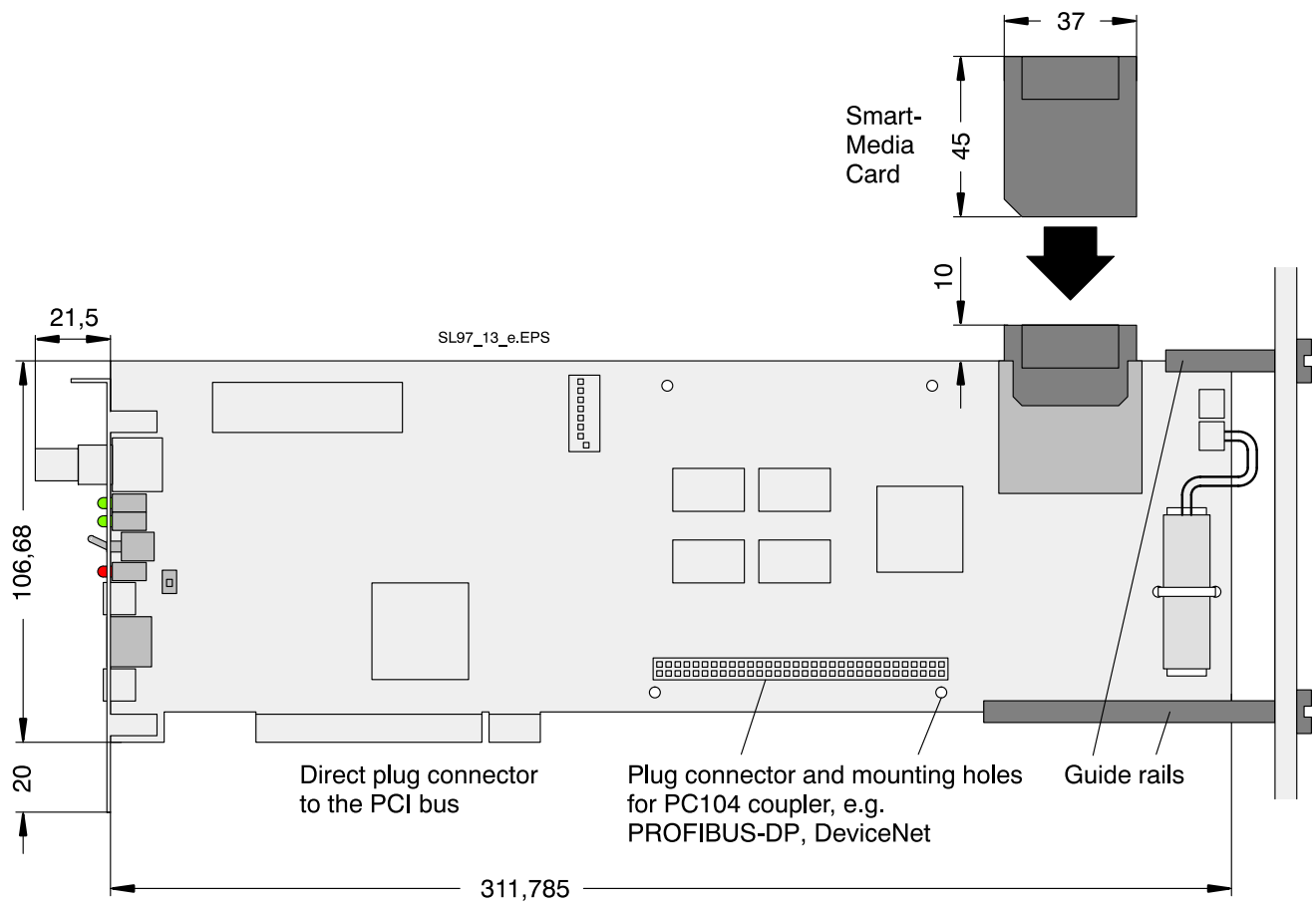
LEDs for signalling:

– supply voltage available (Supply)	1 green LED
– program is running (RUN)	1 green LED
– controller-specific errors (FK1, FK2, FK3)	sum error message 1 red LED
– CS31 bus initialized (BA)	sum error message 1 green LED
– ARCNET status LED	2 green LEDs

2.3.6.9 Mechanical data

Fastening in PCI direct plug connector

Fastening by screws	to the PC housing using 1 M4 screw
Board size width x height x depth	311.78 x 106.68 x 19 mm (without board holder)
Board size width x height x depth	311.78 x 126.68 x 19 mm (with board holder)
Wiring method	detachable screw-type terminal blocks
supply terminals, CS31 system bus	max. 0.08 - 1.5 mm²
all other terminals	max. 0.08 - 1.5 mm²
Combicon-type terminals item no. 189 4244 MC 1,5/ 2-ST-3.81 Gy	line cross section 0.08 - 1.5 mm² rigid / flexible AWG 28-16
Weight	1.0 kg
Dimensions for mounting	refer to the following figure



All dimensions in mm.

Fig. 2.3-20: Dimensions for mounting

2.3.6.10 Mounting hints

Mounting position	vertically, terminals on the left or on the right hand side
Vibration and shock resistance	To obtain the specified vibration and shock resistance the board edge opposite to the terminals has to be fixed to the PC housing by means of guide rails. The guide rails are provided as an accessory with the PC.
Cooling	The natural convection cooling must not be hindered by other mounted material.

2.3.6.11 Ordering data

Basic unit **07 SL 97 R0160 (ARCNET)**	**Order No. GJR5 2534 00 R0160**
Scope of delivery	Basic unit 07 SL 97 R0160 2 x 2-pole terminal block (3.81 mm grid space)
Basic unit **07 SL 97 R0162 (ARCNET with PROFIBUS-DP)**	**Order No. GJR5 2534 00 R0162**
Scope of delivery	Basic unit 07 SL 97 R0162 with integrated PROFIBUS-DP coupler 2 x 2-pole terminal block (3.81 mm grid space)
Basic unit 07 SL 97 R0165 (ARCNET with DeviceNet)	**Order No. GJR5 2534 00 R0165**
Scope of delivery	Basic unit 07 SL 97 R0165 with integrated DeviceNet coupler 2 x 2-pole terminal block (3.81 mm grid space)
PC programming cable 07 SK 93	**Order No. GJR5 2535 00 R0001**
MODBUS/ASCII communication cable 07 SK 94	**Order No. GJR5 2536 00 R0001**
Battery module 07 LE 90	**Order No. GJR5 2507 00 R0001**
SmartMedia Card 07 MC 90 5 V 2 MB	**Order No. GJR5 2526 00 R0101**

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