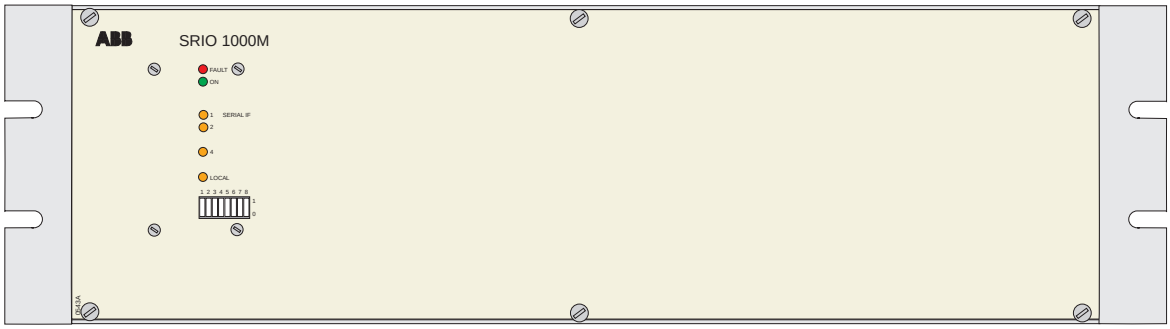
SRIO 1000M
Data communication and reporting unit

User´s manual and Technical description



1MRS 750533-MUM EN

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Checked MK
Approved OL

SRIO 1000M
Data communication and reporting unit

Contents

Features

Interface unit between a host level system and the SPACOM system

Host interface unit using the ANSI X3.28 or SACO 100M protocol

Local event reporting including decoding of the SPA bus event codes into clear text

Data base of max. 500 data items

Event buffer of max. 500 events

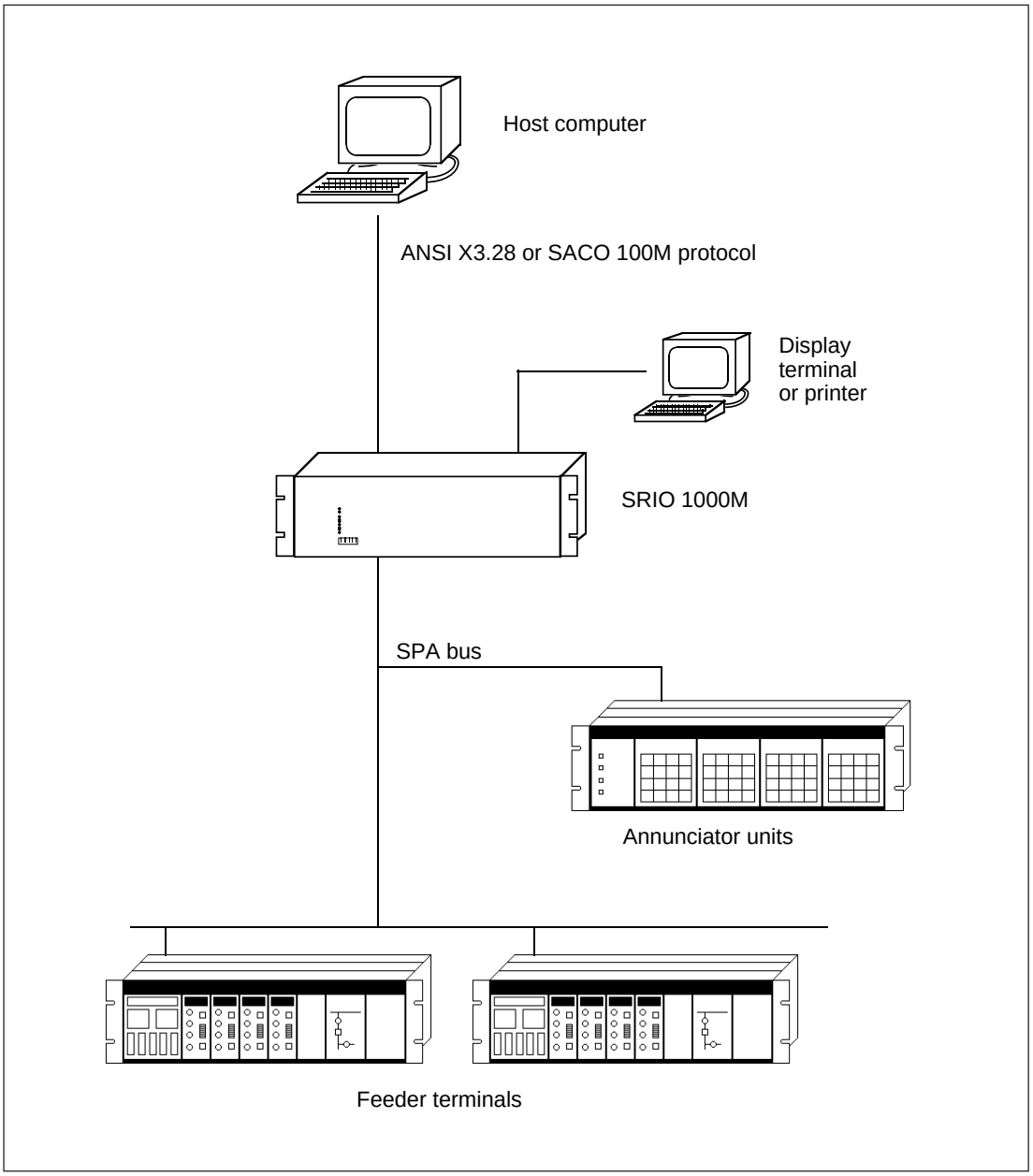
Four serial interfaces:
No 1: host computer or programming terminal interface
No 2: SPA-bus interface
No 3: SACO 100M interface or interface for host computer with SACO 100M protocol or LON interface or event printer or programming terminal
No 4: programming terminal or event printer interface

Introduction

SRIO 1000M is a data communication and reporting unit for the SPACOM system. The SPACOM system may incorporate slave devices such as protective relays, control units and annunciator units, capable of communicating via the SPA bus.

The task of the SRIO 1000M unit is to form the master unit of the SPA bus, to connect the SPACOM system to a host computer and to report event data to an event printer.

The SRIO 1000M unit connects to the host computer using the ANSI X3.28 or the SACO 100M protocol. The ANSI X3.28 protocol is used with the SCS 100 or S.P.I.D.E.R Micro-SCADA control systems. The SACO 100M protocol can be used for the communication with, for example, a personal computer or a control system of a foreign manufacturer.



Applications

Substation and remote control systems

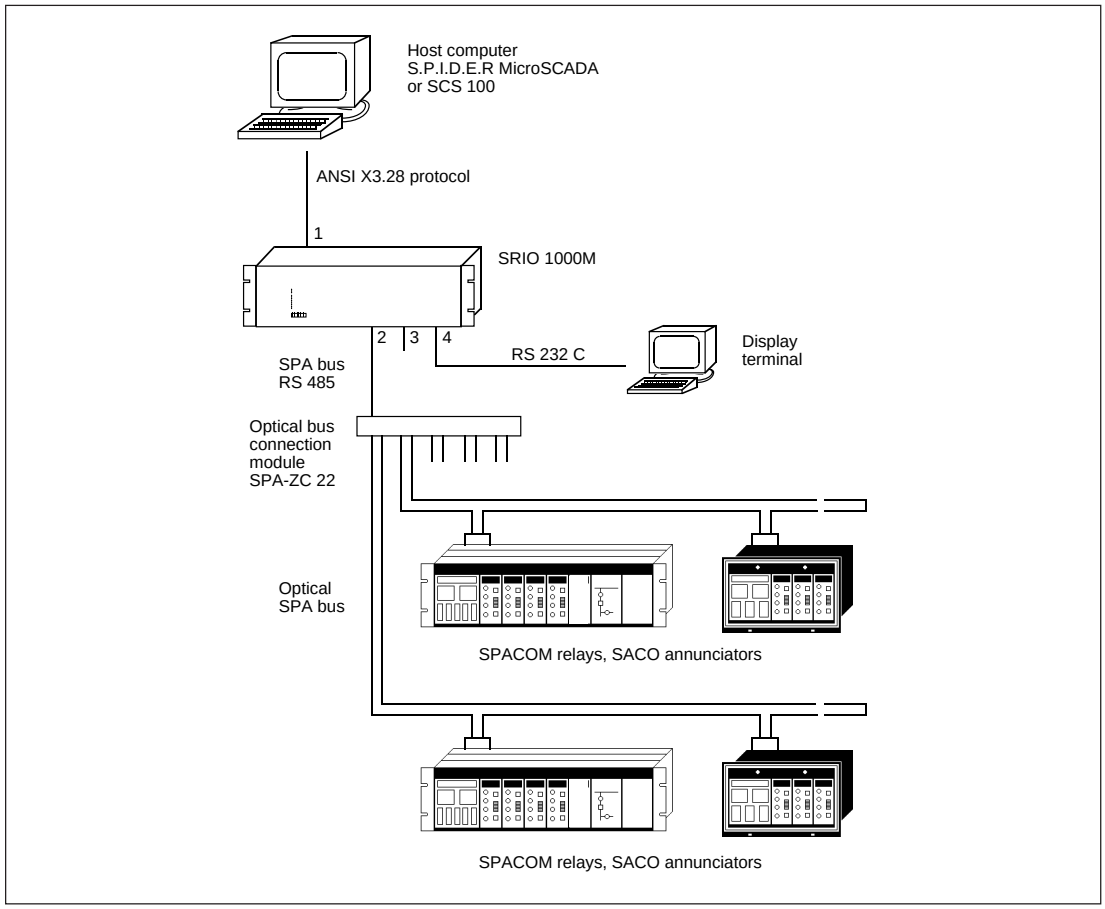


Figure 1. Basic system configuration.

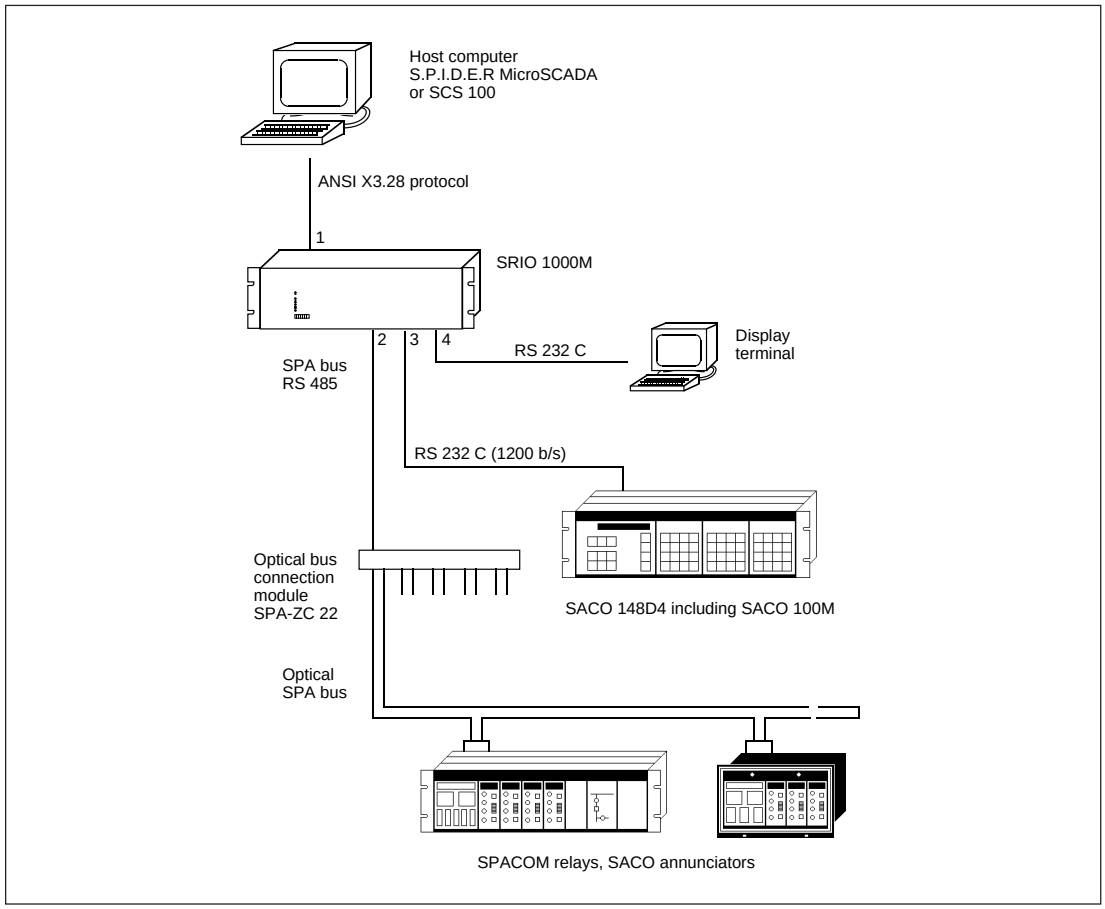


Figure 2. Connection of the SACO 100M/SACO 148D4 unit to the SRIO 1000M unit.

Substation and remote control with two different control systems

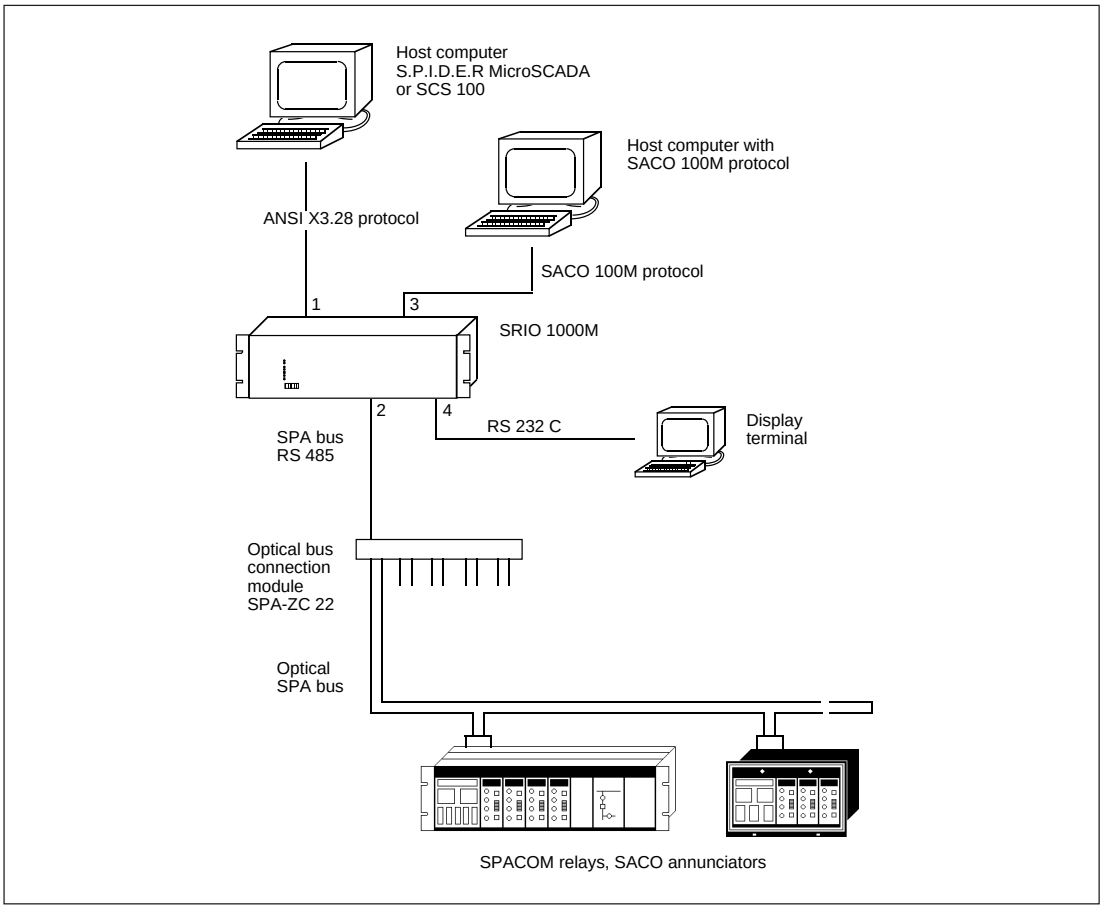


Figure 3. Connection to another control system with the SACO 100M protocol.

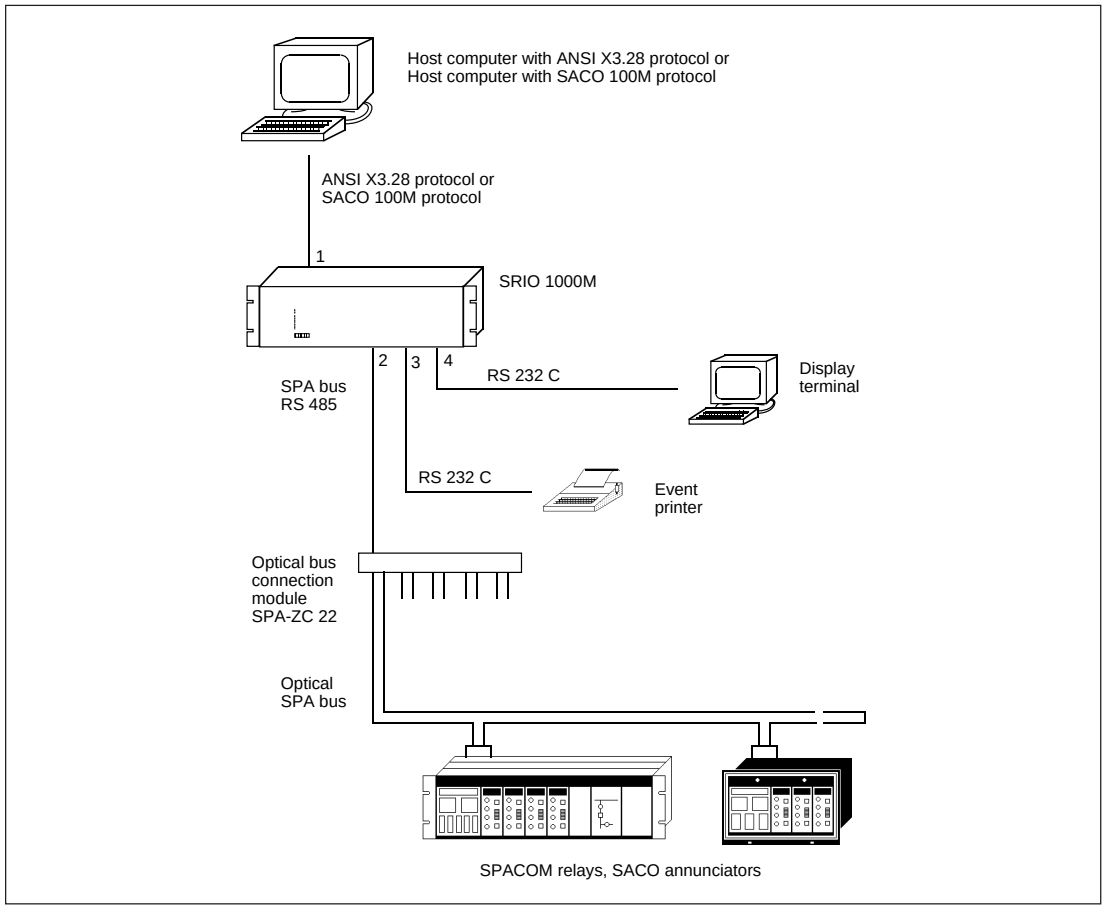


Figure 4. Connection to a local event printer with RS 232 C interface.

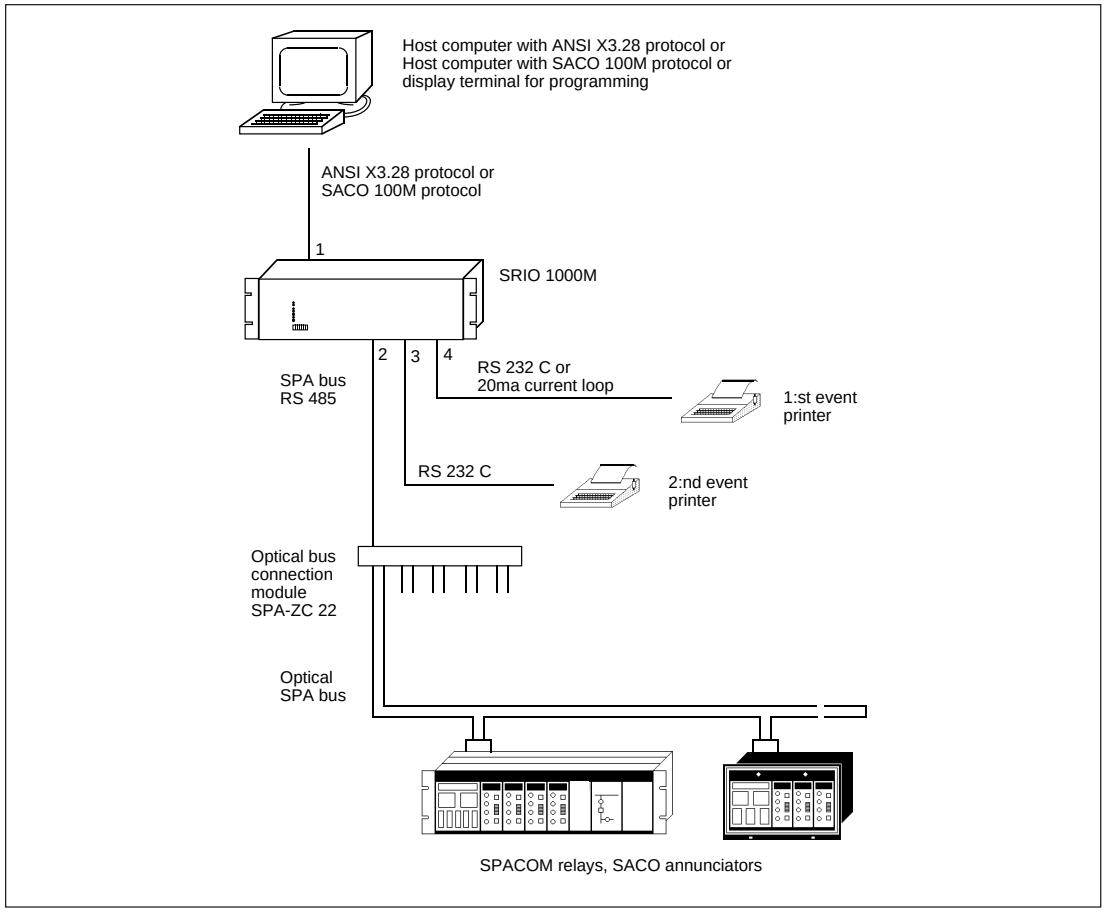


Figure 5. Connection to two event printers.

Functions

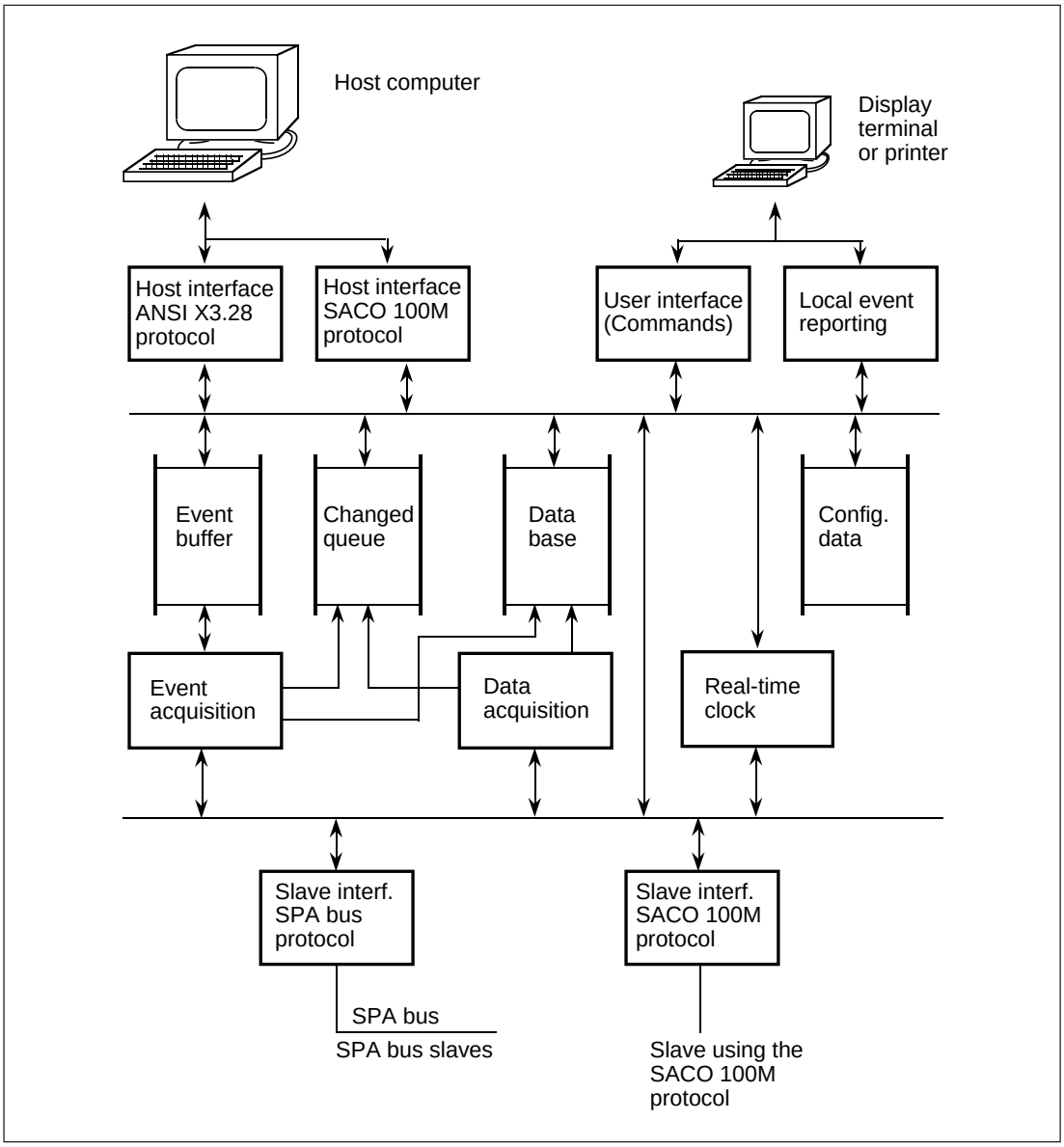


Figure 6. Functions of the SRIO 1000M unit.

Event logging

Using the SACO 100M protocol the SRIO 1000M unit polls the SPA bus units and the slave devices connected to the SRIO 1000M unit for event data including time markings. The events are sorted in time order and stored in the event buffer.

From the event buffer the events are delivered to the host computers or listed to a local event printer.

Data acquisition

The user can define up to 500 data items for the data base. A data item can be one of the following data types:
- DI: digital input data (digital status data)
- AI: analog input data (measured data)
- DO: digital output data (digital control data)
- AO: analog output data (analog control data)
- EV: event data (analog status data)

Cyclic data acquisition (polling):
The SRIO 1000M unit acquires DI and AI data for the data base by cyclic polling.

Event based data acquisition:
The EV data is acquired by converting slave event codes, acquired by the event acquisition, to analog data values.

Real-time clock

The SRIO 1000M unit includes a real-time clock. The clock contains the current time including time from years to milliseconds. A battery back-up clock chip is used to maintain time during power off situations.

The clock can be set by the user through the programming terminal or host interface. The clock can also be synchronized with an external minute pulse.

Host interface, ANSI X3.28 protocol

The ANSI X3.28 protocol is described, for example, in "Allen-Bradley: 1771-811 PLC-2-family/RS 232C Interface module 1771-KG; Users's Manual". With this protocol the SRIO 1000M can communicate with, for example ABB's Substation Control System SCS 100, ABB's Remote Control System S.P.I.D.E.R MicroSCADA and Allen-Bradley's PLC 2.

The protocol used by the SRIO 1000M unit is the same as that of Allen-Bradley, except that the ways of presenting have been extended.

Analog data base data is transferred in 32 bit integer format or in BCD format. Digital data base data is transferred in 16 bit binary format. EV-data from the data base is transferred using 16 bits for data and 32 bits for time stamps. Parameter data is transferred in ASCII format. The clock time is transferred in BCD format. Events with time markings are sent to the host using 32 bits transmitted for event identification and 32 bits for time stamps.

Data base data, i.e. process data, is transferred to the host either on request or spontaneously when there is a change in the data. Parameter data is transferred only on request. Events are transmitted spontaneously.

Host interface, SACO 100M protocol

The SACO 100M protocol used for the SRIO 1000M host interface is described in document: "SACO 100M communication protocol for data communicators SRIO 500M and SRIO 1000M".

LON-bus interface

The LON-bus interface used for the SRIO 1000 is described in document: "SRIO 1000M LON interface.

Local event reporting

The SRIO 1000M unit can be programmed to give local event reporting on one or two event printer devices (device 1 and device 2).

The event report of SRIO 1000M may consist of:
- time
- event text (consisting of group text, slave text, channel text and event code text)
- data from the slave units

Part of the event text may be printed in front of the text to show the priority of the event.

Example of a printout format of the event recording program:

```
Front text                                                  Event
:                          Group      Slave                 code
:  Time                    text       text                  text
:  :                       :          :                     :
:  :                       :          :                     :
**89-10-30 11.00:31.472    FEEDER 5   OVERCURRENT RELAY TRIP

                           Current before trip = 2.05 * In
                           :                    :   :
                           :                    :   :
                           Event          Data  Event
                           code           from  code
                           text           slave text
```

The maximum amount of text is about 50 000 characters. The text memory is used in sections of 50 characters and has a capacity of 1000 texts if the maximum length of the texts is 50 charaters. The maximum length of one text part is 250 characters.

The maximum number of channels for a digital alarm system is about 1000 channels (max. 50 characters text per channel), whereas an analog alarm system contains about 250 channels (max. 4 x 50 characters text per channel).

The event report may contain data from the slave units. The user defines the data to be displayed by embedding SPA bus messages in the event text. When the text is printed the message is sent to the SPA bus and the received data is printed out as part of the event report. The embedded SPA bus message can be any legal message, thus also data can be sent to the slaves. This feature can be used for instance for turning on an alarm lamp indicating that a certain event is received from a slave unit.

Programming

The SRIO 1000M unit is programmed from a display terminal or a PC provided with a terminal emulator program. The display terminal can be connected to the SRIO 1000M unit, serial interface 4. By turning the front panel switch 1 to ON position the communication parameters of the serial interface 4 are set at: 1200 b/s, 8 data bits, no parity, 1 stop bit. Switch 2–8 has no function.

The programming language is a command language based on ASCII characters. The programming is described in detail in the "PROGRAMMING MANUAL SRIO 1000M AND SRIO 500M".

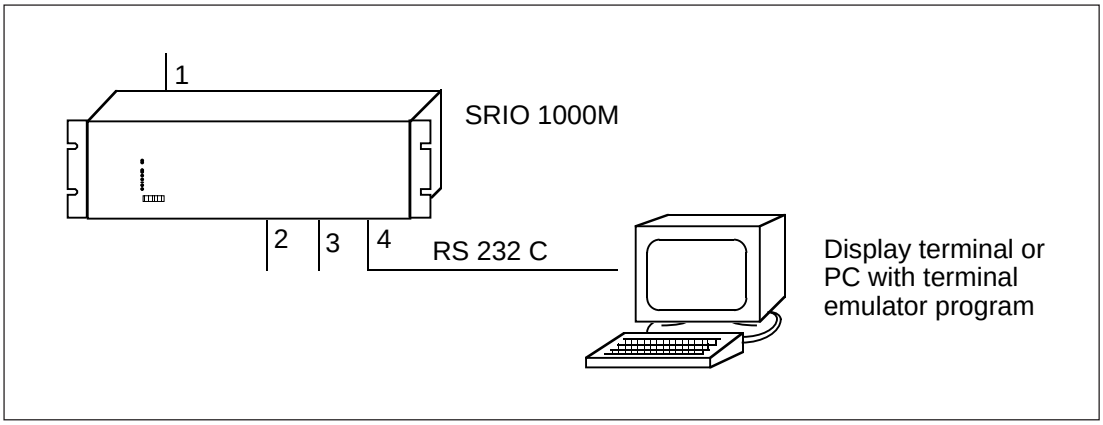


Figure 7. Connection to programming terminal.

Display terminal	SRIO 1000M	PC/AT serial port	SRIO 1000M
25- pin male D-connector	25- pin male D-connector	9- pin female D-connector	25- pin male D-connector
RXD 3	2 TXD	RXD 2	2 TXD
TXD 2	3 RXD	TXD 3	3 RXD
GND7	7 GND	GND5	7 GND
Cable between a display terminal and SRIO 1000M.		Cable between 9-pin serial port of a PC/AT and SRIO 1000M.	

Figure 8. Cables for connecting a terminal or PC to the SRIO 1000M unit.

The following programming commands are available:

General commands
- HELP command
- VERS command
- CLOCK command
- STORE command

Commands for serial interface setup
- BUS_MODE command
- SETUP command
- ANSI_SETUP command

Commands for settign general operating parameters
- SYSPAR command
- SIGNAL command
- LOCAL_REMOTE command

Commands for programming the event and data acquisition
- UNIT command
- DATA command
- DATA_CONVERSION command
- DATA_GROUP command

Commands for programming the ANSI X3.28 host interface
- ADDRESS_MAP command
- ANSI_DATA command
- ANSI_ADDR command

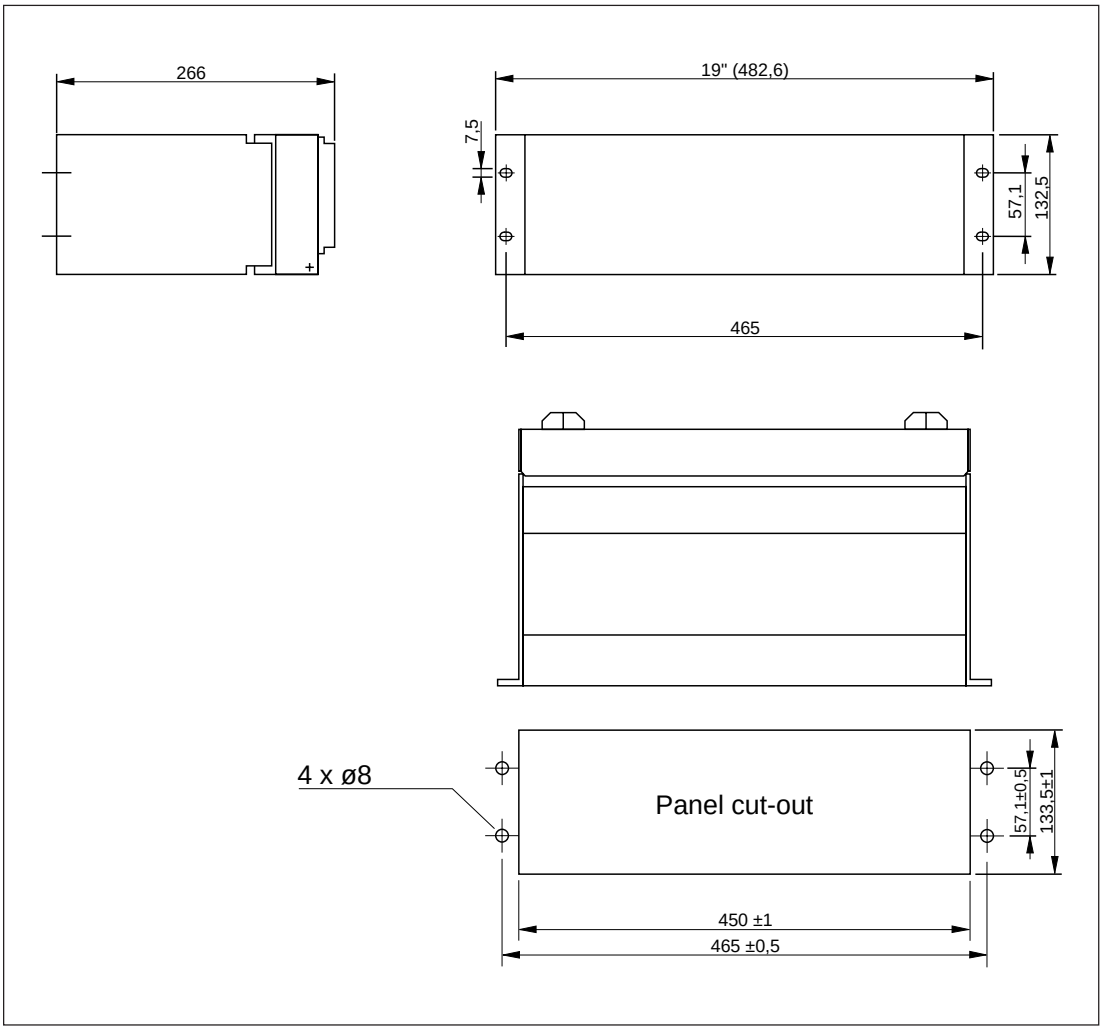
Control commands for local event reporting
- SET_PRINTER command
- DEVICE command
- PAGE_HEADER command
- T command (event text command)

Diagnostic commands
- DIAGNOSTIC command
- RESPONSE command
- ANSI_DIAGNOSTIC command

Utility commands
- Z command
- X command
- EVENT_MONITOR command
- IOTEST command
- EXEC_TIMES command
- RESET command
- PIC command
- A command
- EVENT_POINTER command

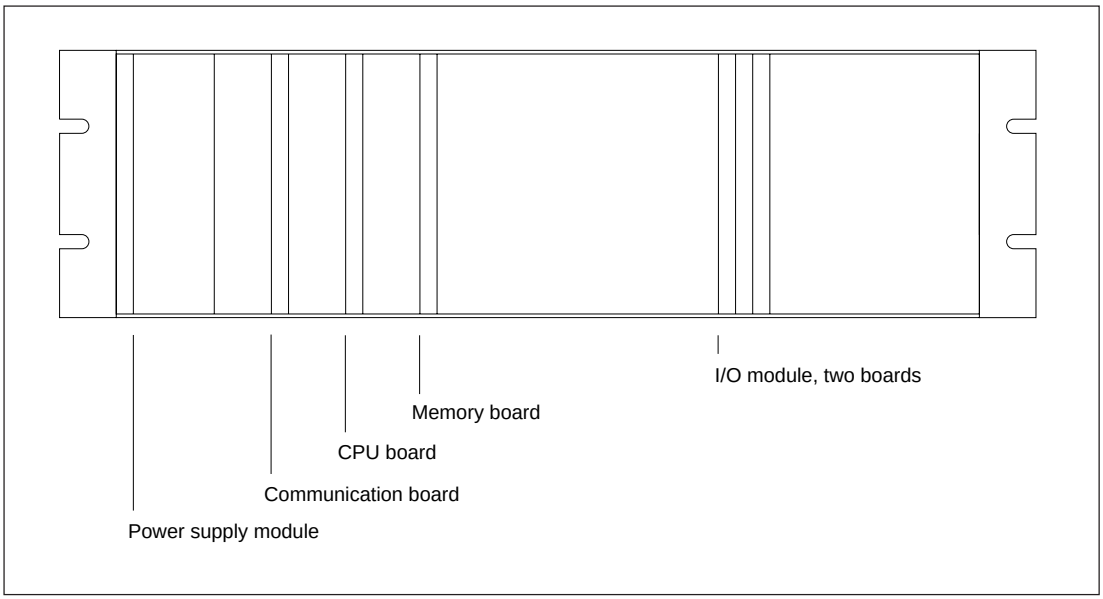
Mechanical and electrical design

Mechanical structure

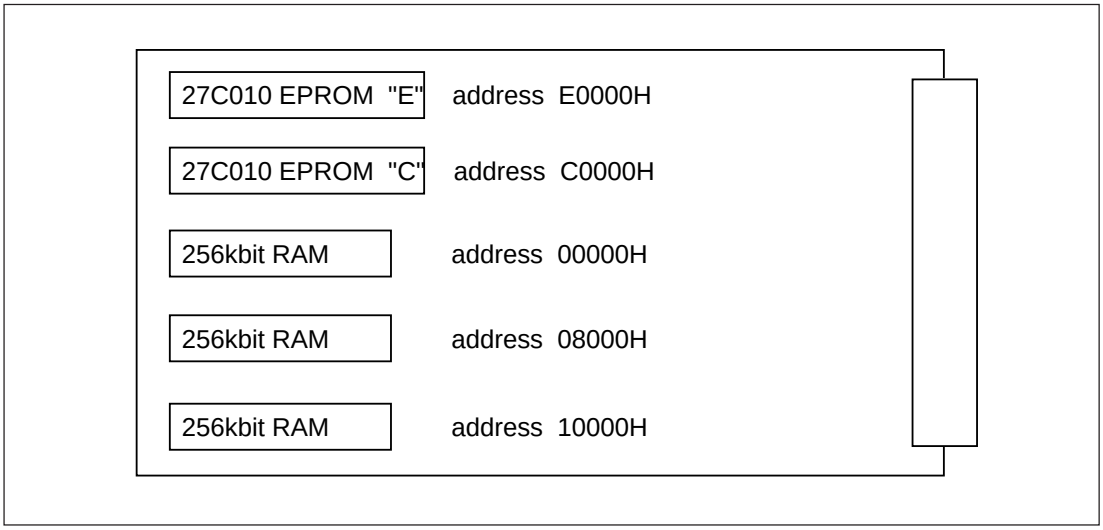


Printed circuit boards

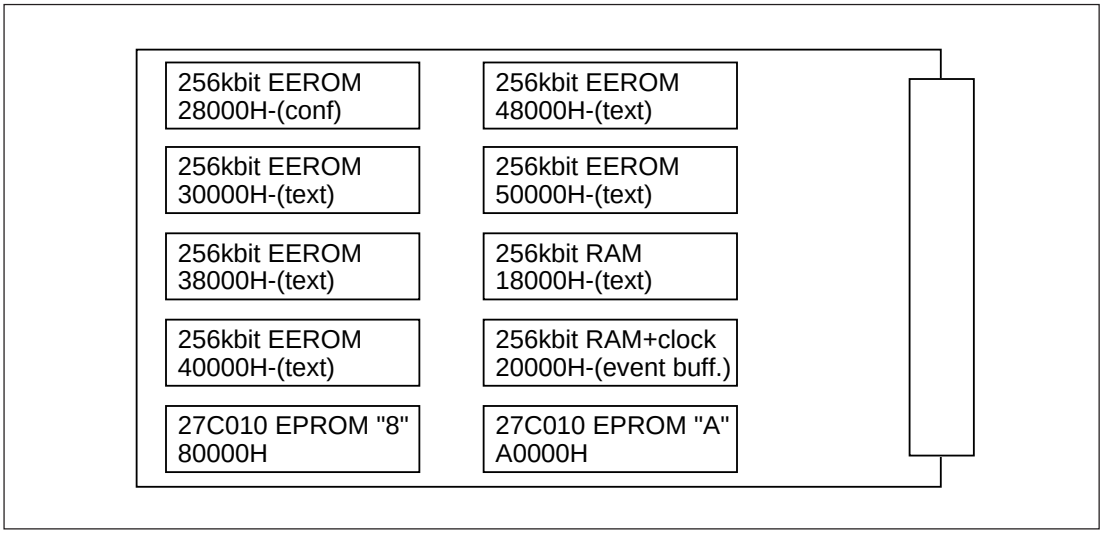
In addition to the boards mentioned in the figure below the SRIO 1000M unit includes a mother board, a connection board and a LED board.



Memory chips on CPU and memory boards



Memory chips on the CPU board



Memory chips on the memory board

Interfaces

Front panel

The front panel has seven LEDs and eight DIP switches.

Front panel LEDs

FAULT:
Red. When LED lit, the SRIO 1000M unit has detected a fault on at least one of the serial interfaces.

ON:
Green. When LED lit, the power is on.

SERIAL IF 1...4:
Yellow. Diagnostic LEDs for serial interfaces.
Blinking: Transmission in progress.
Steady light: Line error.

TEST:
Yellow. SRIO 1000M local mode indicator.
Flashing: Local mode.

Front panel DIP switches

SW1:
Selection of operating mode and communications parameters for serial interface 4.

When SW1 is switched ON:
Serial interface 4 changes its mode to terminal mode with default parameters. (1200 b/s, 8 bits per character, no parity, 1 stop bit).
When SW1 is switched OFF:
Serial interface 4 loads its mode and parameters from the EEROM memory.

Power up or reset situation:
If SW1 is ON, serial interface 1 starts up in terminal mode with default parameters, otherwise mode and parameters are loaded from the EEROM memory.

Serial interfaces

Connectors

The rear plate of the SRIO 1000M unit contains 7 connectors for four serial interfaces:

Serial interface 1:
25- pin RS 232/current loop connector
Serial interface 2:
25- pin RS 232 connector
9- pin RS 485 connector
Serial interface 3:
25- pin RS 232 connector
9- pin RS 485 connector
Serial interface 4:
25- pin RS 232/current loop connector
9- pin RS 485 connector

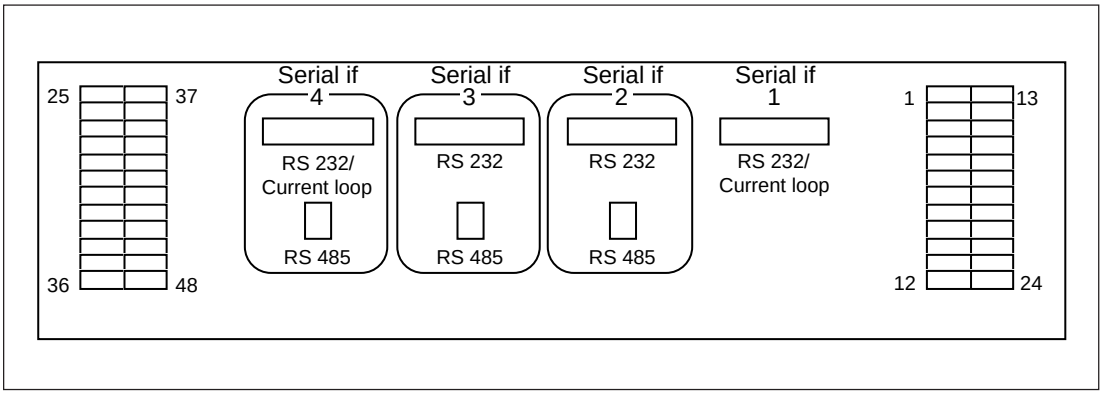


Figure 9. Connectors of the rear plate of the SRIO 1000M unit.

Serial interface connector pin assignment

Serial interface 1, RS 232/Current loop connector:

Pin	Direction	Name
2	out	TXD, Transmit data
3	in	RXD, Receive data
4	out	RTS, Request to send
5	in	CTS, Clear to send
6	in	DSR, Data set ready
7	-	GND, Signal ground
8	in	DCD, Data carrier detect
20	out	DTR, Data terminal ready
9	-	TX+, Current loop, transmit data +
10	-	TX-, Current loop, transmit data -
11	-	RX+, Current loop, receive data +
12	-	RX-, Current loop, receive data -
13	-	Ready+, Current loop, Ready (DCD) +
14	-	Ready-, Current loop, Ready (DCD) -

Serial interface 2, RS 232 connector:

Pin	Direction	Name
2	out	TXD, Transmit data
3	in	RXD, Receive data
4	out	RTS, Request to send
7	-	GND, Signal ground

Serial interface 3, RS 232 connector:

Pin	Direction	Name
2	out	TXD, Transmit data
3	in	RXD, Receive data
4	out	RTS, Request to send
5	in	CTS, Clear to send
7	-	GND, Signal ground
8	in	DCD, Data carrier detect
20	out	DTR, Data terminal ready

Serial interface 4, RS 232/Current loop connector:

Pin	Direction	Name
2	out	TXD, Transmit data
3	in	RXD, Receive data
4	out	RTS, Request to send
5	in	CTS, Clear to send
7	-	GND, Signal ground
8	in	DCD, Data carrier detect
20	out	DTR, Data terminal ready
9	-	TX+, Current loop, transmit data +
10	-	TX-, Current loop, transmit data -
11	-	RX+, Current loop, receive data +
12	-	RX-, Current loop, receive data -
13	-	Ready+, Current loop, Ready (DCD) +
14	-	Ready-, Current loop, Ready (DCD) -

Serial interfaces 2, 3 and 4, RS 485 connectors:

Pin	Name
1	DATA A, Data signal pair, signal A
2	DATA B, Data signal pair, signal B
3	RTS A, Request to send signal pair, signal A
4	RTS B, Request to send signal pair, signal B
7	GND, Power supply for optical bus connection module.
8	
9	+8V, Power supply for optical bus connection module.

User selectable options

The DIL switches on the communication board are used for selecting the operation modes of the serial interfaces.

Serial interface 1:

Mode	S1.1	S1.2
RS 232 *	OFF	OFF
Current loop	ON	ON

Serial interface 2:

Mode	S1.3	S1.4	S1.5	S1.6	S1.7	Note
RS 232	ON	ON	ON	ON	ON	RS 485 is also active
RS 485 *	ON	ON	OFF	OFF	OFF	Only RS 485 is active
	|	|				
	Supervision of RS 485 via RS 232 is enabled.					

Note:
The RS 232 interface can be used only to supervise communication in the RS 485 mode.

Serial interface 3:

Mode	S2.1	S2.2	S2.3	S2.4	S2.5
RS 232 * RS 485	ON OFF	OFF ON	OFF ON	OFF ON	OFF ON
		|		|	|
		|		DCD	CTS
		|		Short-circuited to DTR	
		|			
		Supervision of RS 485 via RS 232 is enabled.			

Serial interface 4:

Mode	S3.1	S3.2	S3.3	S3.4	S3.5	S3.6	S3.7	S3.8
RS 232 * RS 485 Current loop	ON OFF OFF	OFF ON OFF	ON OFF OFF	OFF OFF ON	OFF OFF ON	OFF ON OFF	OFF ON OFF	OFF ON OFF
		|					|	|
		|					DCD	CTS
		|					Short-circuited to DTR	
		|						
		Supervision of RS 485 via RS 232 is enabled.						

Power supply

The SRIO 1000M unit can be supplied from two sources:

Supply 1: 80...265 V DC or
(device type SRIO 1000M AA)
19...70 V DC
(device type SRIO 1000M BA)
Supply 2: 80...265 V AC or DC

The supply voltages are connected to the screw terminals 20...24 of the rear plate:

Screw terminal 20: supply 2 minus
Screw terminal 21: supply 2 plus
Screw terminal 22: shield ground
Screw terminal 23: supply 1 minus
Screw terminal 24: supply 1 plus

Special purpose I/O

The screw terminal block of the rear plate also includes terminals for some special purpose opto-isolated inputs and relay outputs. Output relay 1 can be used separately, but output relays 2-6 have to be used as one group with the same control voltage.

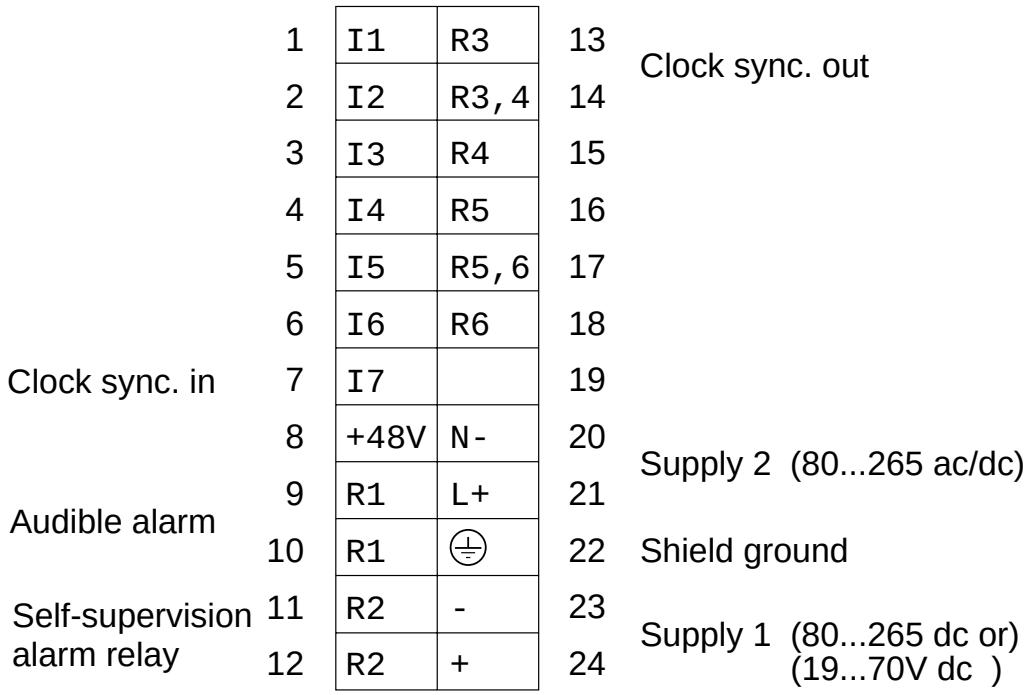
Inputs:

Screw terminal 1:	general input 1 (programmed with SIGNAL PRG)
Screw terminal 2:	general input 2 (programmed with SIGNAL PRG)
Screw terminal 3:	general input 3 (programmed with SIGNAL PRG)
Screw terminal 4:	general input 4 (programmed with SIGNAL PRG)
Screw terminal 5:	general input 5 (programmed with SIGNAL PRG)
Screw terminal 6:	general input 6 (programmed with SIGNAL PRG)
Screw terminal 7:	general input 7 (programmed with SIGNAL PRG) or MINUTE PULSE CLOCK SYNC INPUT (programmed with SYSPAR 18)

Outputs:

Screw terminal 8:	+48V contact loop voltage.
Screw terminal 9:	relay 1 (audible alarm)
Screw terminal 10:	relay 1 (audible alarm)
Screw terminal 11:	relay 2 (fault relay)
Screw terminal 12:	relay 2 (fault relay)
Screw terminal 13:	relay 3 (minute pulse output, programmed with SYSPAR 18)
Screw terminal 14:	relay 3 and 4 common
Screw terminal 15:	relay 4 (not used)
Screw terminal 16:	relay 5 (not used)
Screw terminal 17:	relay 5 and 6 common
Screw terminal 18:	relay 6 (not used)
Screw terminal 19:	not used

Screw terminal block of the SRIO 1000M unit:



Technical data
(modified 2002-10)

Serial interfaces

Serial interface 1: Interface to host computer or programming terminal	RS 232 C, max. 9600 b/s (also current loop if used as programming terminal)
Serial interface 2: Interface to SPA-bus	RS 485, max. 9600 b/s (RS 232 C for supervision)
Serial interface 3: Interface to SACO 100M or host computer with SACO 100M protocol or event printer or programming terminal	RS 232 C, max. 4800 b/s (optionally RS 485)
Serial inteface 4: Interface to programming terminal or event printer	RS 232 C or current loop, max. 9600 b/s.

Event polling

Maximum number of units in the event poll list	100
Capacity of event buffer	500 events
Accuracy of time markings	1 ms
Time resolution between events from one serial interface	10 ms
Time resolution between events from two different serial interfaces	50 ms

Data acquisition

Capacity of data base	500 data items
System response time:	
- EV-data from high priority slaves	amount of high priority slaves x 70 ms
- EV-data from normal priority slaves	amount of slaves x 200 ms
- AI- or DI-data from slaves	amount of cyclically polled data items x 200 ms
Weigth	about 8 kg

Power sources

Supply No. 1	80...265 V dc or 17...70 V dc
Supply No. 2	80...265 V ac/dc
Power consumptiont	30 W

Test voltages

- power supply inputs versus chassis
- relay outputs versus chassis
- opto-isolated inputs versus chassis

Dielectric test voltage as per IEC 60255-5 and SS 436 15 03	2 kV, 50 Hz, 1 min
Impulse test voltage as per IEC 60255-5 and SS 436 15 03	5 kV, 1.2/50 μs, 0.5J
High freguency test voltage as per IEC 60255-5 and SS 436 15 03	2.5 kV, 1 MHz
Rated contact current/max. breaking voltage of the relay outputs	3 A/250 V, 50 Hz

Environmental conditions

Service temperature range	0...+55 °C
Storage temperature range	-40...+70 °C
Maximum relative humidity (without condensation)	95 %

Self-diagnostics

If the self-supervision system of the SRIO 1000M unit detects a fault on one of the serial interfaces, the fault relay is activated and the "FAULT" indicator on the front panel and one of the "SERIAL IF" indicators are lit.

Fault localization

The fault can be localized and repair measures can be taken using the following table:

Fault type	Recognition	Repair step
Supply failing	Fault relay is activated. Front panel "ON" light dark	Check and repair the power supply
Line fault	Fault relay is activated. One of the front panel "SERIAL IF" ligths is on	Check the connections. Check the serial interface setup Check the data definitions Check the event poll list Check the devices connected to the serial interface line Check the DIL switches on communication board
Display terminal failure	No response, when a command is given or Return/Enter key is pressed	Check the cable Check the terminal Check the setup parameters of the terminal Check front panel switch 1

Service and spare parts

If the fault is found to be in the SRIO 1000M unit, the normal service operation is to replace the faulty printed circuit board or fibre optic connector module with a new one. Please refer to the spare part list.

If the improper function cannot be eliminated, please contact the manufacturer or his nearest representative for further information on measures to be taken.

List of spare parts:

Power supply module	SWSM 220A48
Power supply module	SWSM 220A220
Communication board	SRXM 2A1
CPU board	SWPM 4A2
Memory board	SRMM 1A1
I/O module	SROM 8A1 + SROM 8A2
Front panel LED board	SRDM 1A1
Rear lid connector board	SRCM 1A1
Fibre optic connector module (plastic transmitter, plastic receiver)	SPA-ZC 21BB
Fibre optic connector module (plastic transmitter, glass receiver)	SPA-ZC 21BM
Fibre optic connector module (glass transmitter, plastic receiver)	SPA-ZC 21MB
Fibre optic connector module (glass transmitter, glass receiver)	SPA-ZC 21MM
Fibre optic connector module (5 plastic loops)	SPA-ZC 22A 5B0M
Fibre optic connector module (4 plastic loops, 1 glass loops)	SPA-ZC 22A 4B1M
Fibre optic connector module (3 plastic loops, 2 glass loops)	SPA-ZC 22A 3B2M
Fibre optic connector module (2 plastic loops, 3 glass loops)	SPA-ZC 22A 2B3M
Fibre optic connector module (1 plastic loop, 4 glass loops)	SPA-ZC 22A 1B4M
Fibre optic connector module (5 glass loops)	SPA-ZC 22A 0B5M

Ordering information

When ordering, please state the following things:

	Example:
1. Quantity and type designation	1 pc SRIO 1000M data communicator
2. Auxiliary power supply voltages	Supply voltage No. 1 = 110 V dc, supply 2 = 220 V ac
3. Accessories	1 pc fibre optic connector module type SPA-ZC 22A 5B0M

Ordering numbers:

RS 822 001-AA	(80…265 V dc and 80…265 V ac/dc)
RS 822 001-BA	(17…70 V dc and 80…265 V ac/dc)

ABB Oy
Distribution Automation
P.O.Box 699
FI-65101 Vaasa
FINLAND
Tel. +358 (0)10 22 11
Fax.+358 (0)10 22 41094
www.abb.com/substationautomation

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