

**SACO 128R4  
Auxiliary Relay Unit  
SACO 64C5  
Signal Grouping Module**

**Technical Reference Manual**





We reserve the right to change data without prior notice.

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## 1. Features

- Compact design, 128 relay outputs incorporated in one rack
- The same unit suitable for group alarm, lamp follower and field contact follower signals
- Quickly and conveniently connected to SACO 64D4 and SACO 148D4
- Extended flexibility with the signal grouping module SACO 64C5

**2.****General**

The auxiliary relay unit SACO 128R4 and the signal grouping module SACO 64C5 are members of the SPACOM series, at integrated secondary equipment system for substations.

### 3. **Application**

The auxiliary relay unit is generally used together with the annunciator unit SACO 64D4 and the control data communicator SACO 148D4. The auxiliary relay unit extends the capacity of the annunciator system, by increasing the number of output relays. The relay unit is used for instance in applications where the annunciator system is to control a separate alarm indicator panel, or a separate relay reflash is to be established for each annunciator channel.

The signal grouping module SACO 64C5, which is to be mounted between the annunciator unit and the auxiliary relay unit, is used for grouping of signals and forming of group rearm signals according to the requirements of each particular application.

## 4. System lay-out

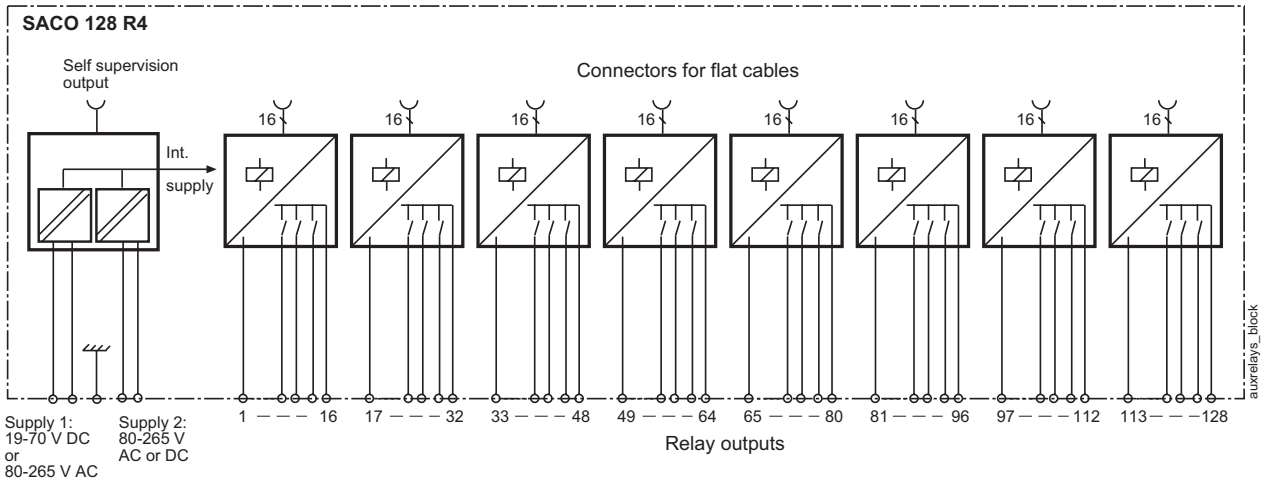


Fig. 4.-1 Block diagram for the auxiliary relay unit SACO 128R4

### 4.1. Construction and function

When fully equipped the auxiliary relay unit SACO 128R4 includes an auxiliary power supply module and eight 16 channel auxiliary relay modules, type SWOM 16A1. Each relay module is provided with a flat cable connector for connecting the incoming control signals for the auxiliary relays. The annunciator modules, which may control the auxiliary relay modules, have separate flat cable connectors for outgoing group reflash, parallel lamp control and field signal follower signals.

When used, the signal grouping module SACO 64C5 is mounted below the annunciator unit to which it is connected. SACO 64C5 has a height of 1 U(Unit) and so dimensioned as to allow it to be inserted between the annunciator units or between an annunciator unit and the auxiliary relay unit. The signal grouping module has 64 inputs and 64 outputs. The connections are made via flat cable connectors, four 16-pole connectors for the incoming signals and four for the outgoing signals. The grouping module is fitted with 64 programming pins on the input side and 64 programming pins on the output side. The signals can be freely grouped between the input and the output pins by means of the programming wires.

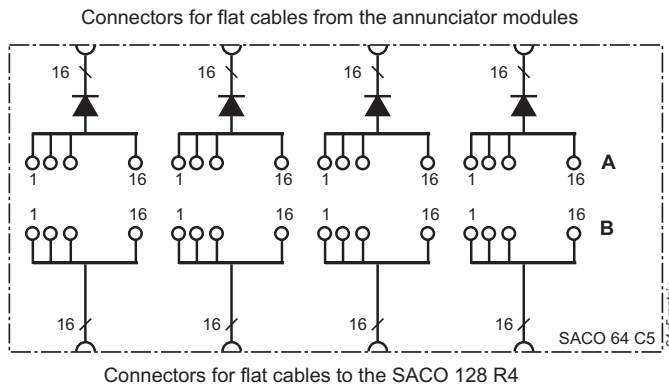


Fig. 4.1.-1 Principle diagram for the signal grouping matrix SACO 64C5

4.2. Application example 1

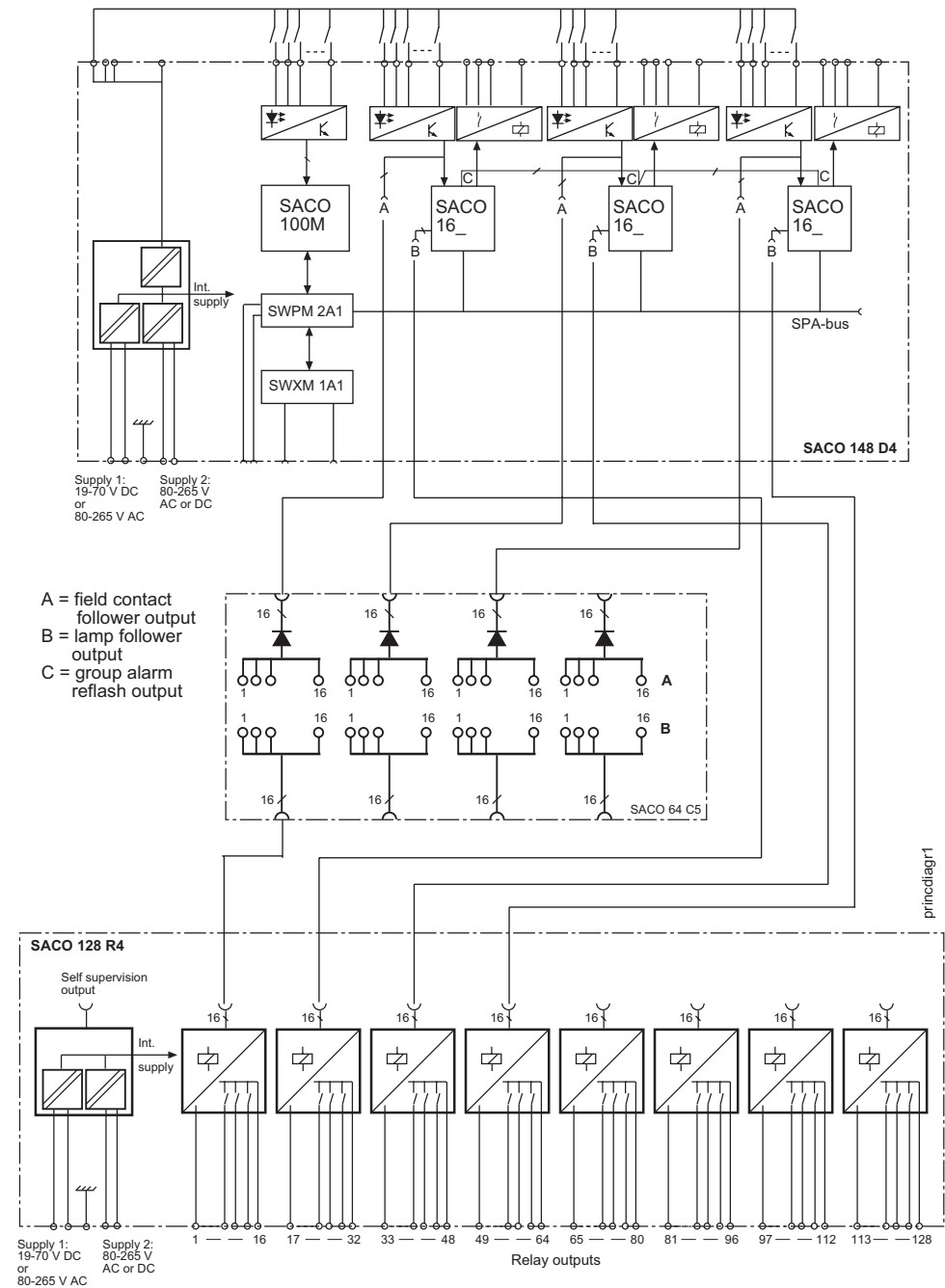


Fig. 4.2.-1 Principle diagram for the auxiliary relay unit SACO 128R4, showing it partly connected over signal grouping module SACO 64C5 to the control data communicator and annunciator unit SACO 148D4.

The signal follower signals (A) of each annunciator module are connected to separate input connectors of the signal grouping module. In the module the incoming signals can be grouped and limited to 1...6 outputs. The grouped output signals control the relays 1...16 of module 1 in the auxiliary relay unit.



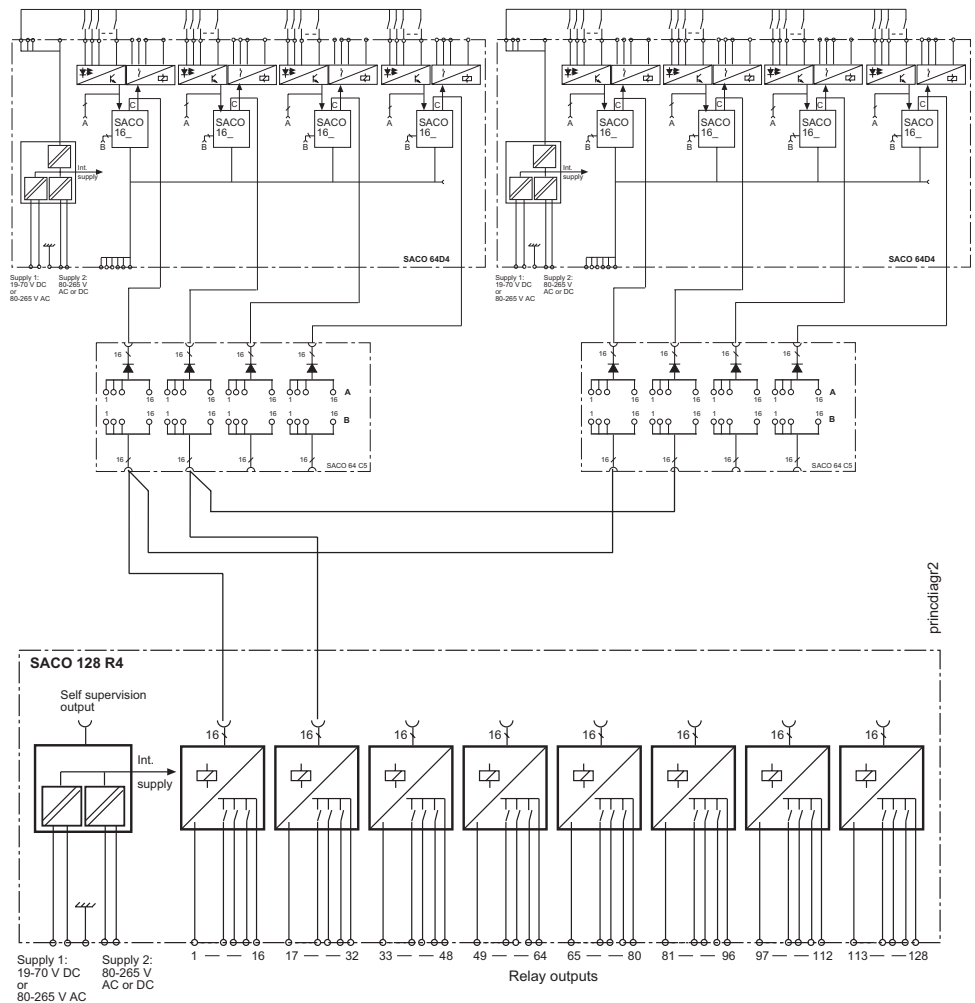
The lamp follower signals of the outputs (B) of the annunciator modules are connected to the following three end modules of the auxiliary relay unit. In this case the auxiliary relays are controlled individually by each annunciator channel.

As illustrated in the example the auxiliary relay unit SACO 128R4 can be connected to the annunciator unit via the signal grouping module SACO 64C5 or directly.

The group reflashes (C) from the annunciator system are obtained directly over the built-in reflash relays of SACO 148D4, where the signals are grouped in the software of the system.

All signals are connected in groups of 16 by means of flat cables.

**4.3. Application example 2**



*Fig. 4.3.-1 Principle diagram for the auxiliary relay unit SACO 128R4. The relay unit is connected to two annunciator units SACO 64D4 over two signal grouping modules SACO 64C5.*

The reflash signals (C) of all the annunciator modules are individually linked to the signal grouping modules, where they are grouped and reduced to a number of 1...32. The relays 1...32 of the auxiliary relay unit are controlled by the grouped signals.

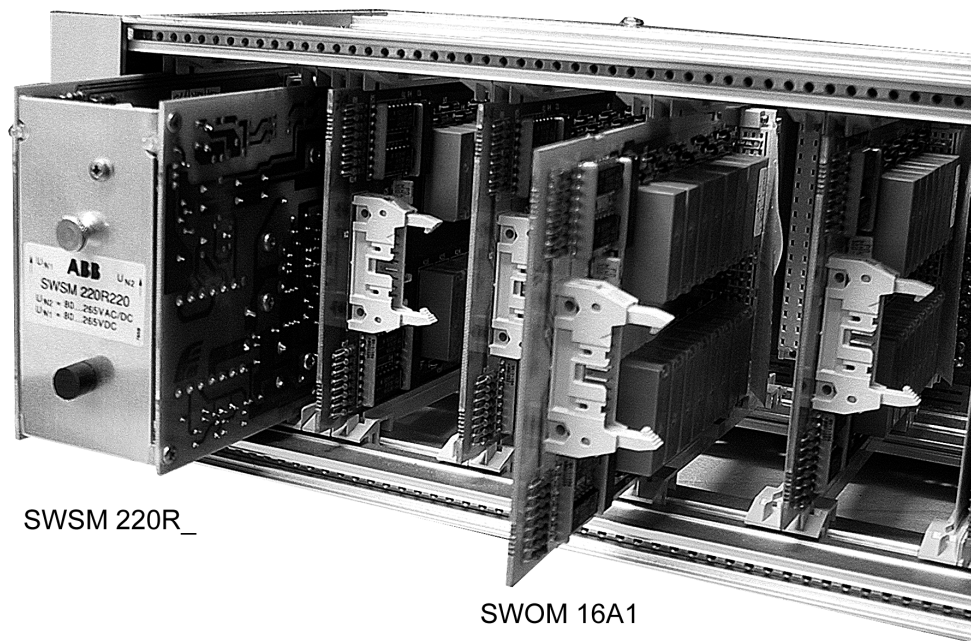
The signals are connected by using 16-pole flat cables.

The built-in group signal relays, located in the input/output modules of the SACO 64D4 unit, operate in parallel with the relays of the auxiliary relay unit, so that the relays 1...4 are activated exclusively by the reflashers 1...4 in module 1, the relays 5...8 by the reflashers 5...8 in module 2, etc.

## 5. Mechanical construction

The auxiliary relay unit is composed of the following Euro-size (100 mm x 160 mm) functional modules:

- power supply module SWSM 220R220 or SWSM 220R48
- auxiliary relay module SWOM 16A1



SWSM 220R\_

SWOM 16A1

saco128r4modules\_txr11bw

*Fig. 5.-1 Auxiliary relay unit*

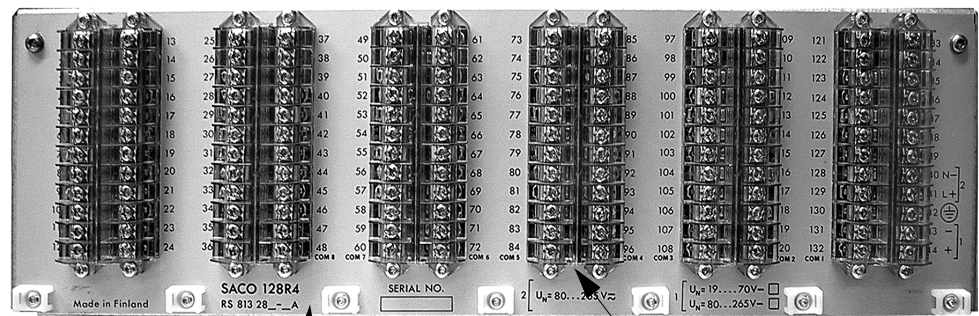
The modules are linked to each other over the common mother PC-board. The mother PC-board holds the card connectors for the plug-in modules and the wiring for the outputs. Further, the mother PC-board contains a flat cable connector, X16, for connecting the fault signal of the power supply module to the other modules of the system.

The subrack is a 19 inch Euro-size rack with a height of 3U (~133 mm).

When combining the subrack with other subracks of the SPACOM series, a space of 1 U (~44 mm) is to be left between the subracks.

The subrack is designed for flush-mounting or for mounting in a 19 inch equipment cabinet. At flush-mounting the mounting depth can be reduced by means of a 40 mm raising frame, type SRH-ZX1. The subrack and the front plates are made of anodized aluminium. The rear part and the grid are of galvanized sheet steel.

At panel mounting the degree of protection is IP 40.



Rating plate with type designation, serial no. and auxiliary voltage information

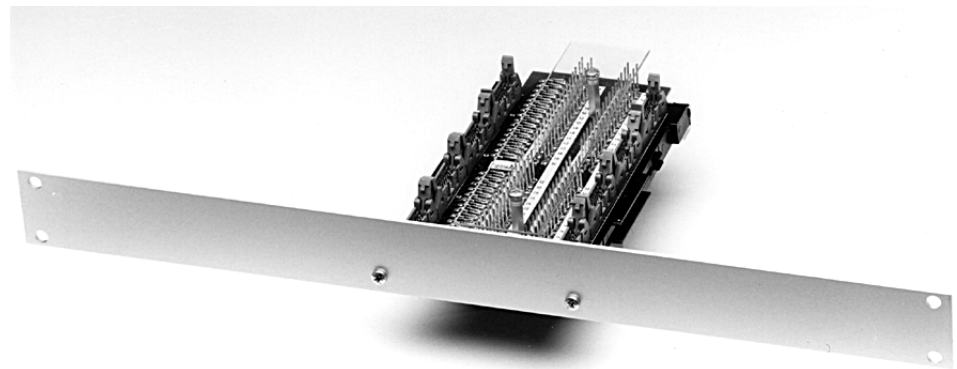
Screw terminals with terminal numbers

saco128r3back\_8bw

Fig. 5.-2 Rear view of the auxiliary relay SACO 128R4

The screw terminals for the relay outputs and the supply inputs are located at the rear of the subrack. The terminals are dimensioned for one or two multiwire conductors of max.  $2.5 \text{ mm}^2$ . To avoid too thick cable bundles however conductors of  $0.75 \text{ mm}^2$  are recommended.

The hinged rear part allows maintenance measures to be taken in the subrack without detaching any cables.



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Fig. 5.-3 Signal grouping module SACO 64C5

The signal grouping module consists principally of a PC-board sized  $96 \times 193 \text{ mm}$ . The PC-board is fitted to a 19 inch cover plate of anodized aluminium. The height of the cover plate is 1U, about 44 mm.

The signal grouping module is intended to be fitted between two subracks. The signal grouping module has the same height as the cover plate normally used between the subracks of the SPACOM series products.

The signal grouping module is provided with 16-pole flat cable connectors for connecting the signals. Both the input side and the output side have four connectors, which means that the total capacity is 64 signals

The grouping pins of the grouping module allows the signals to be linked and grouped by cross-connection. Wires with slip-on contacts are provided for the purpose of being slipped onto the pins. One pin can accommodate 2 wires. The wire-wrap type programming pins also allow a so called wire-wrap technique to be used for grouping. The programming pins are protected by a plexiglass cover, which has to be removed before programming.

## 5.1. Equipment

The type designation SACO 128R4 denotes a fully equipped auxiliary relay unit, that is a unit including a power supply module and eight auxiliary relay modules. On request the auxiliary relay unit is equipped with the required number of relay modules. In such a case the unit is provided for being fully equipped. The unit is extended by plugging in additional auxiliary relay modules. See the type designations, chapter 12.2.

### 5.1.1. Auxiliary relay module SWOM 16A1

The auxiliary relay module SWOM 16A1 incorporates 16 electro-mechanical relays. The auxiliary relay module is adapted for being used together with the annunciator module SACO 16D2. All the reflash signals of the annunciator module, such as the group alarm signals, the field contact follower signals and the lamp follower signals are directly, without changing the programming of the relay module, capable of controlling the output relays.

When using the auxiliary relay module together with the signal grouping module SACO 64C5, the jumper wire W1 on the relay module has to be cut.

The input signals are connected by means of a flat cable over the 16-pole flat cable connector X2.

The 12 V logic voltage of the auxiliary relay module and the 24 V dc operating voltage of the relays are received from the power supply module SWSM 220R\_.

The relay contacts are NO contacts. One side of the contacts has been made common to the 16 relays by linking; the contacts together on the module.

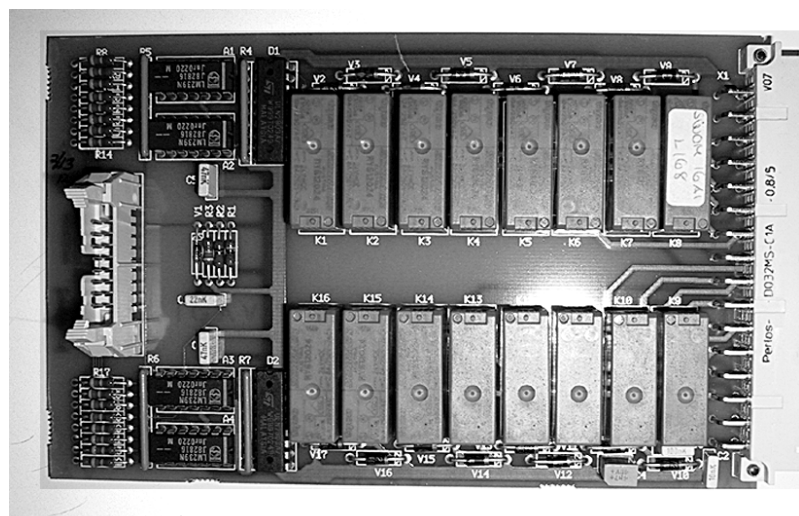


Fig. 5.1.1.-1 Auxiliary relay module SWOM 16A1

## 5.1.2.

**Power supply module SWSM 220R\_**

The auxiliary relay unit SACO 128R4 is provided with its own power supply module located to the left in the subrack. The power supply module has two auxiliary voltage inputs and is intended to be supplied from two voltage sources. The inputs are galvanically isolated from each other. Two standard versions are available, i.e. type SWSM 220R220 and SWSM 220R48. The voltage inputs of the modules are:

Power supply module type SWSM 220R220:

- supply 1: 80...265 V dc
- supply 2: 0...265 V dc or ac

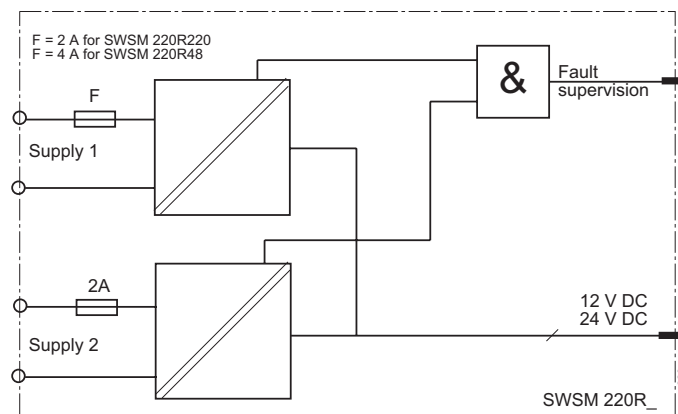
Power supply module type SWSM 220R48:

- supply 1: 19...70 V dc
- supply 2: 80 ...265 V dc or ac

The power supply modules are plug-in type units and as such easily exchanged.

The power supply modules are provided with electronic circuits for, the supervision of the supply voltages. A fault signal is received when the auxiliary supply voltage fails or disappears. The fault signal is transmitted over the mother PC-board to the flat cable connector X16, from which it is connected to the corresponding flat cable connector X16 in the nearest annunciator module.

The system is designed to operate on one supply voltage, too, but in this case the internal voltage supervision circuitry provides a fault signal. Power supply modules to be connected to one supply voltage, without a fault signal being delivered, are available on request.



*Fig. 5.1.2.-1 Principle diagram for the auxiliary power module type SWSM 220R\_*

Under normal operating conditions only one of the supply inputs is in use. The other input operates as a back-up supply input and is activated when there is a disturbance in the main supply. The power inputs are automatically shifted and no interruption of the supply is caused to the system.

The supply input to be used is easily selected by means of the programming pins on the PC-board of the power supply module, close to the operation indicator. The programming is illustrated in the figure 5.1.2.-2.

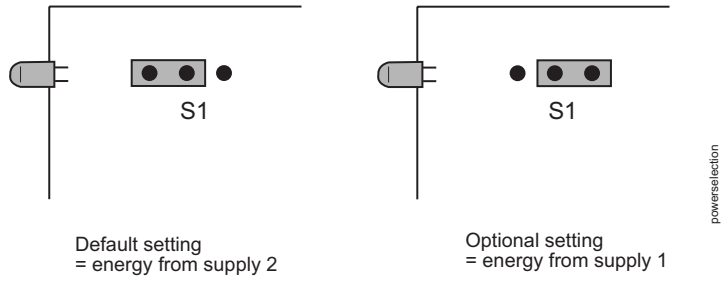


Fig. 5.1.2.-2 The programming of the power supply.

## 6. Application

### 6.1. Mounting

The auxiliary relay unit SACO 128R4 is intended for flush-mounting or mounting in a 19 inch cabinet frame. M6 screws are used for fastening. At flush-mounting the mounting depth can be reduced by 40 mm by means of a raising frame type SRH-ZX1.

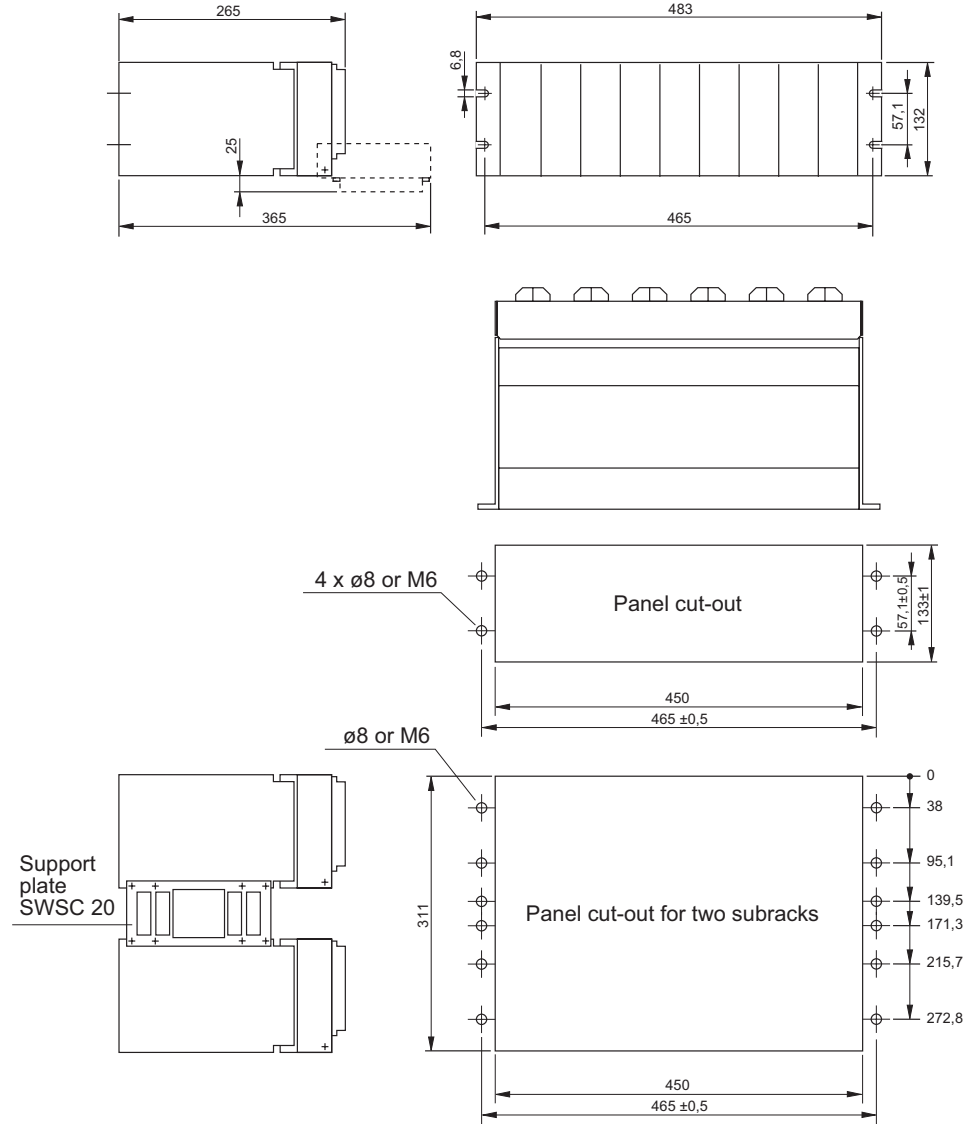
The auxiliary relay unit is generally used in conjunction with an annunciator unit of the SPACOM range. When fitting several units together, an empty space of 1U, about 44 mm, is to be left between the subracks. The two spacers, type SWSC 20, included in the standard delivery of the auxiliary relay unit, are recommended to be used for attaching the auxiliary relay unit to another subrack. The spacers which are to be bolted to the ends of the subracks provide the correct space and improves the mechanical stability of the assembly.

The signal grouping module SACO 64C5 is to be inserted between two SPACOM subracks, and the mounting principle is the same as for the auxiliary relay unit. The panel cutout is made as one large opening when several SPACOM subracks are incorporated in the assembly.

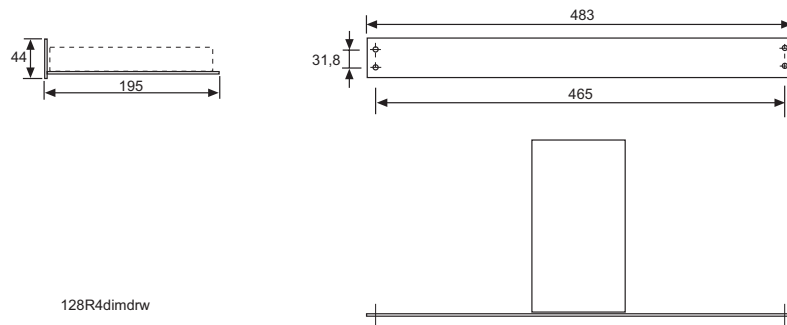


# 7. Dimension drawing

SACO 128R4:



SACO 64C5:



128R4dimdrw

Fig. 7.-1 Dimensions of SACO 128R4 and SACO 64C5.

# 8. Connections

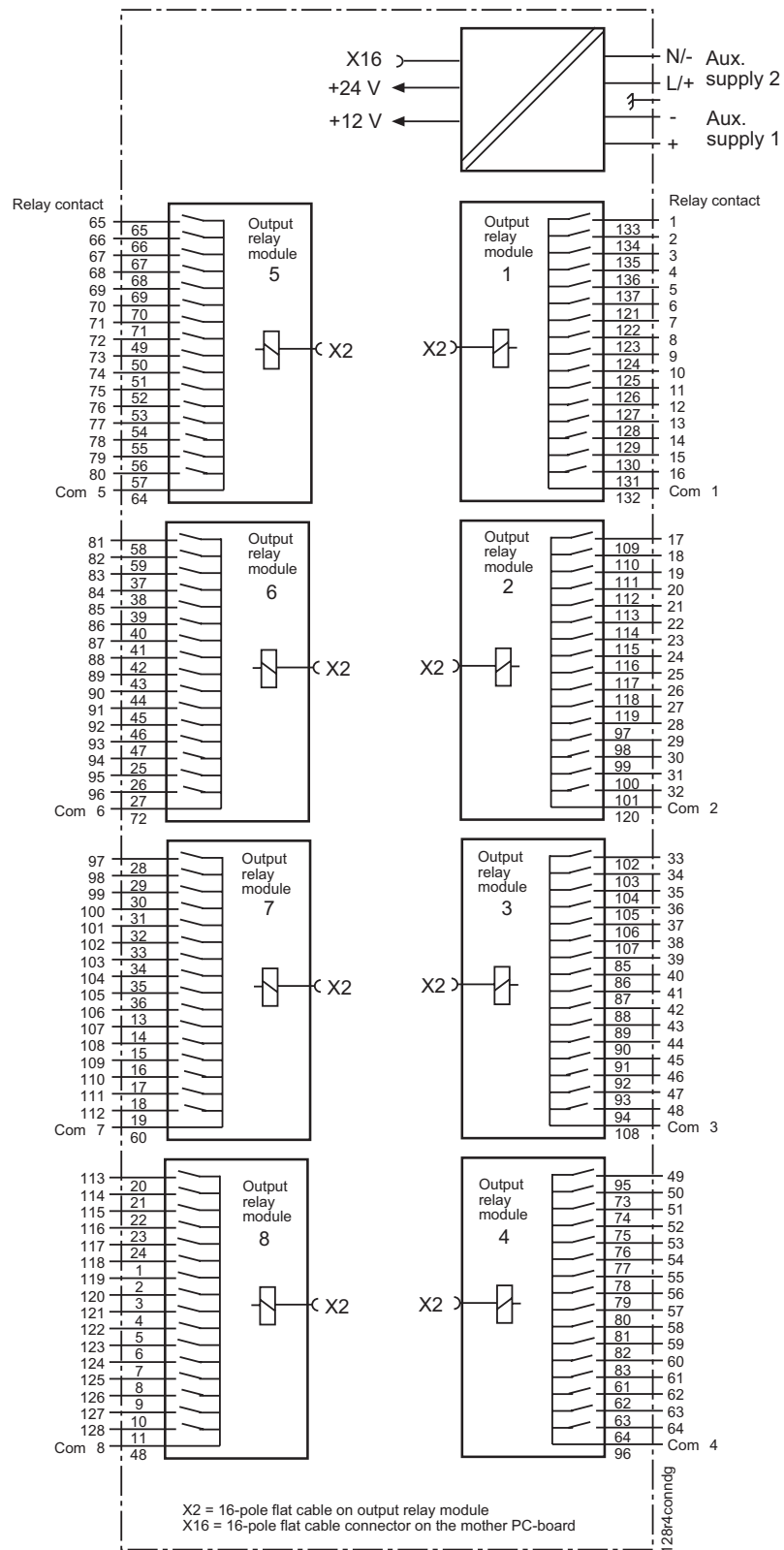


Fig. 8.-1 Connection diagram for SACO 128R4.

## 8.1. Connection terminals

The rear part of the auxiliary relay unit holds numbered screw terminal strips for the relay outputs and the supply inputs. Each terminal is dimensioned for one or two conductors with a max. area of 2.5 mm<sup>2</sup>. No cable lugs are required.

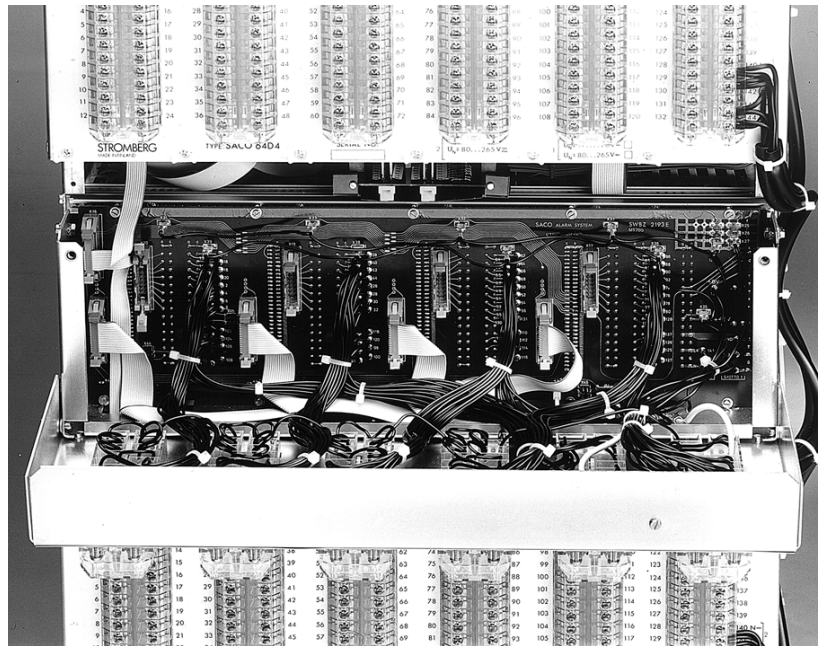
**IMPORTANT!** Check that the voltages to be connected to the unit comply with the values of the rating plate. Also make sure that the protective earth has been properly connected.

The control signals of the relays are connected by means of flat cables as described above. Physically, the cables can be routed in various ways depending on the number and location of the subracks. Some general instructions are given below.

In SACO 64D4 and SACO 148D4 the flat cable connectors for the group alarms and the field contact follower signals are located on the mother PC-board behind the rear part. From these connectors the flat cables can be brought down through the cuts in the rear part. In small systems where the subracks are placed close to each other, the flat cables can be brought through the spaces between the subracks and straight to the grouping module or relay module. In larger systems the flat cables are recommended to be routed towards one of the subrack ends where the flat cable bundle continues upwards or downwards. Four pairs of fixing holes for fastening the flat cable bundles are provided at the bottom part of the rear of the annunciator unit.

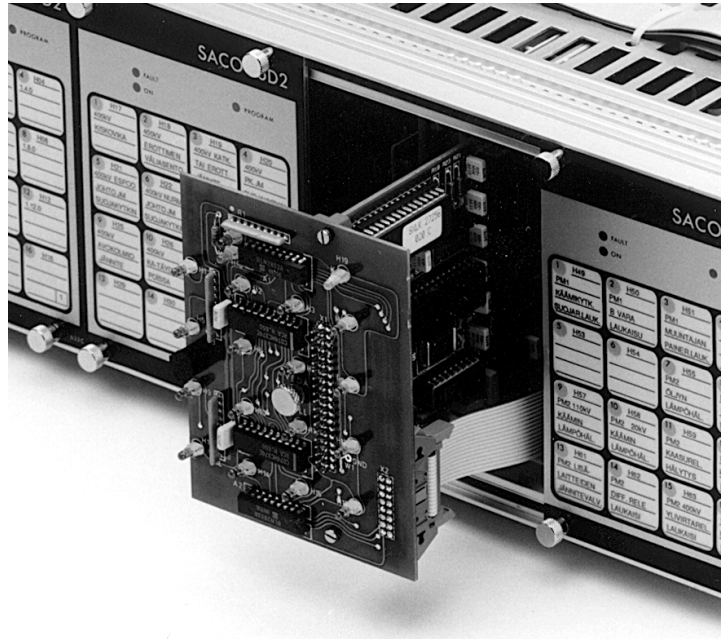
The flat cables for the lamp follower signals are brought through the bushings in the upper part of the grid of the subrack, to one of the subrack ends, and from there the flat cable bundle continues upwards or downwards. Various flat cable arrangements are illustrated in the figures below.

The flat cable table on page 22 is recommended to be used for selecting the correct flat cable types. If the auxiliary relay unit is ordered to be fitted together with an annunciator unit, the flat cables are selected by the manufacturer.



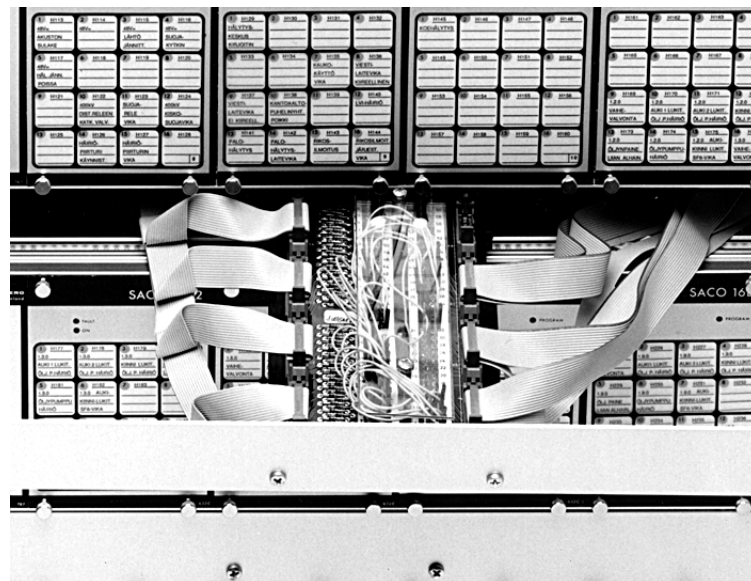
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Fig. 8.1.-1 Flat cable routes between the units



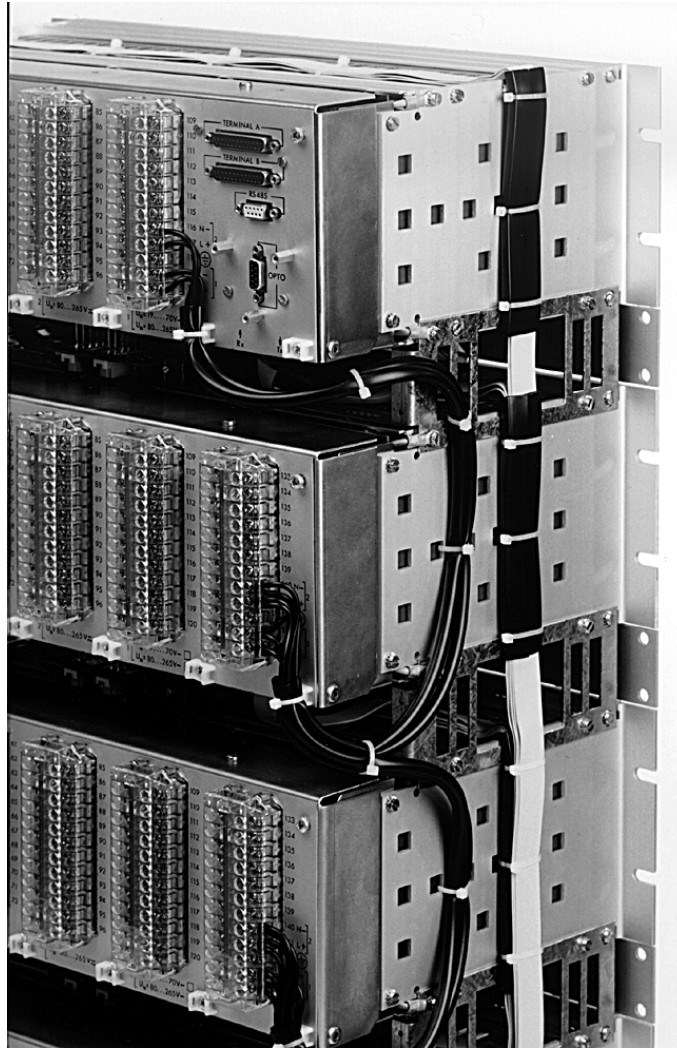
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Fig. 8.1.-2 The lamp follower signals of SACO 64D4 connected



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Fig. 8.1.-3 Flat cables connected to the signal grouping module SACO 64C5



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*Fig. 8.1.-4 Flat cable routes between the units*

A flat cable connector X16 is intended to be used for transmitting the fault signal from the power supply module. In a system incorporating several racks the fault signals from the different units are usually gathered and presented as a common internal system fault.

The following standard flat cables are available:

- SWIR 24            intermediate cable for 2 racks
- SWIR 25            intermediate cable for 3 racks
- SWIR 26            intermediate cable for 4 racks
- SWIR 27            intermediate cable for 5 racks
- SWIR 28            intermediate cable for 6 racks

It is, however, possible to connect the relay unit to an already existing multi-rack system without having to change the intermediate cable for the fault signalling. By using the extension module SWCM 8A1, the auxiliary relay unit can be connected by means of the intermediate cable SWIR 24 which is included in the standard delivery of the auxiliary relay unit.

Table 8.-1 Table for flat cable selection

Signal transfer				Type of flat cable			
From connector	To connector	Type of signal	Number of flat cables	Adjacent sub racks	One subrack in between	Two sub racks in between	Three sub racks in between
in alarm module X21...X24 X17...X20	in relay module X2 X2	Group alarm Contact doubling Parallel lamps	1...4 1...4 1...4	SWIR 35 SWIR 35 SWIR 30	SWIR 36 SWIR 36 SWIR 50	SWIR 37 SWIR 37 SWIR 51	SWIR 49 SWIR 49 SWIR 52
X2 X21...X24 X17...X20	X2 In grouping module X1...X4 X1...X4	Group alarm Contact doubling Parallel lamps	1...4 1...4 1...4	SWIR 30 SWIR 31 SWIR 31	SWIR 50 SWIR 36 SWIR 36	SWIR 51 SWIR 37 SWIR 37	SWIR 52 SWIR 49 SWIR 49
X~ In grouping module X5...X8	X1...X4 In relay module X2	Parallel lamps All	1...4 1...4	SWIR 30 SWIR 32	SWIR 50 SWIR 33	SWIR 51 SWIR 34	SWIR 52 SWIR 53
SACO 148D4 X21-X22 - X23	SACO 64D4 X21-X22 - X23-X24	Parallelling of group alarm outputs	1	SWIR 23			
SACO 148D4/ SAC064D4/ SACO 128R4 X16	SACO 64D4/ SAC0128R4 X16	SPA-bus, internal supervision, acknowl., blocking	1	SWIR 24 Four sub racks in between SWIR 28	SWIR 25	SWIR 26	SWIR 27

8.1. Grouping of signals

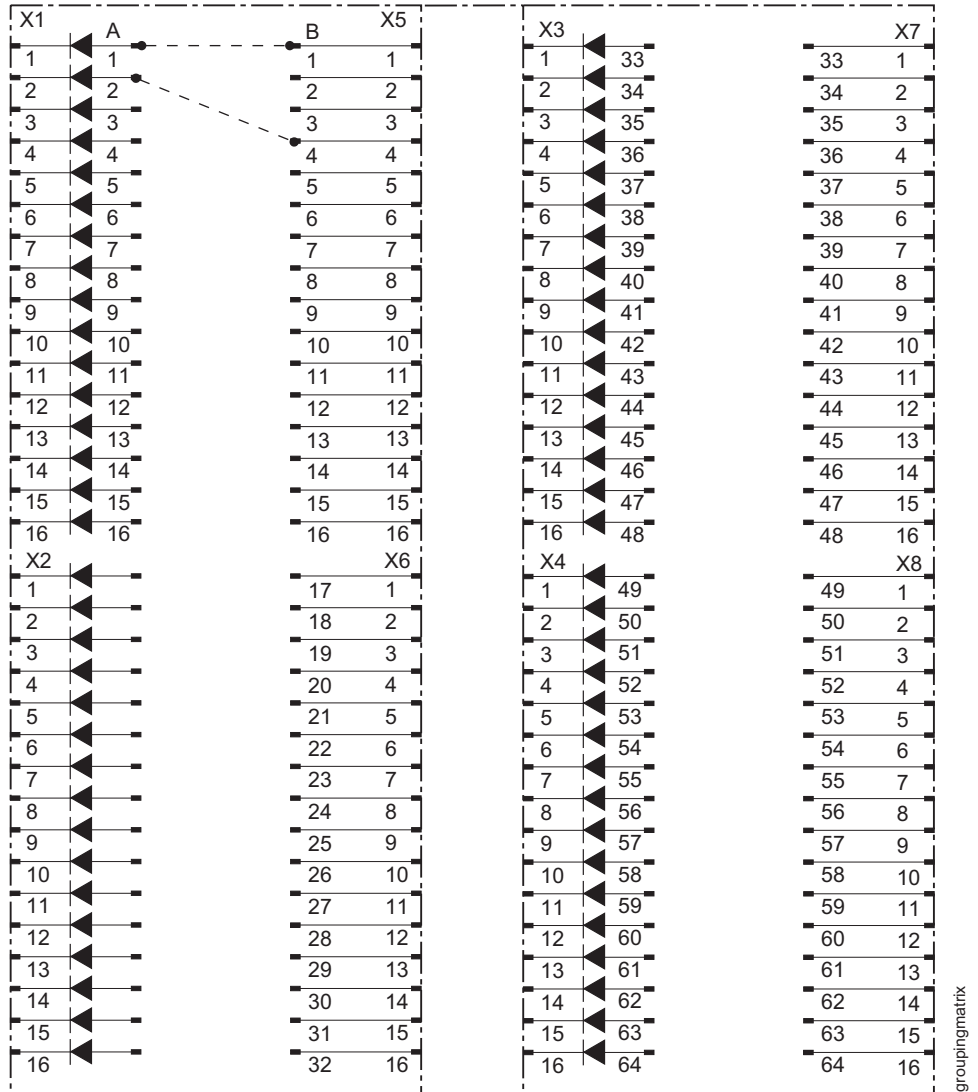


Fig. 8.1.-1 Connection diagram for the signal grouping matrix SACO 64C5

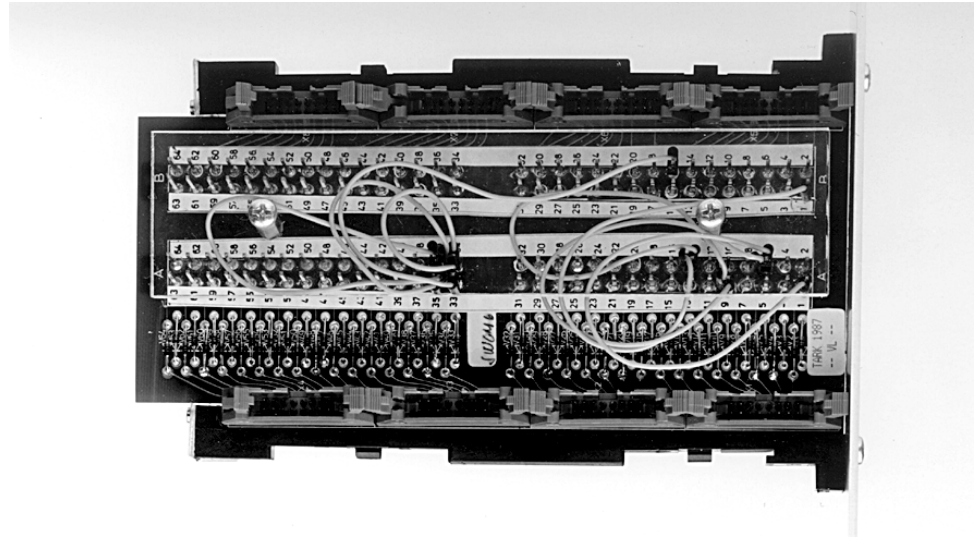
The incoming signals are brought to the four connectors X1...X4 over 16-pole flat cables.

The outgoing signals are connected in the same way to the connectors X5...X8.

The signal grouping module has 64 grouping pins for incoming signals and 64 pins for outgoing signals. The input pins are marked A 1...64 and the output pins B 1...64.

Short programming wires provided with slip-on contacts are used for grouping. The contacts are easily slipped onto the programming pins without tools. One pin can accommodate for 2 wires. A set of programming wires, type designation SWIR 39, of various lengths is included in the standard delivery of the grouping module.

The signals are interconnected on side A by linking from pin to pin and then the group thus formed is connected to one of the output pins on side B.



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*Fig. 8.1.-2 Example of grouping arrangement*



## 9. Start-up

When the unit has been assembled and connected as stated in the instructions above, the auxiliary voltages may be connected. Supply input 2 is programmed to operate as the main supply. Should the programming need to be changed, the programming instructions in the section "Power supply module SWSM 220R" have to be followed. In normal service conditions the indicators are hidden behind the cover plate of the power supply module.

No other settings or programminqs are needed for starting or operating the unit.

## 10. Technical data

Number of relays	Max. 8 x 16 relays = 128 relays
Output contacts	NO contacts, one common terminal for a group of 16 relays
Rated contact current/max. breaking voltage	3 A/250 V, 50 Hz
Breaking capacity for dc currents when the load time constant L/R <40 ms at the voltage levels 48/110/220 V dc	1A/0.25 A/10.15 A
Auxiliary power supplies:	
- supply 1	19...70 V dc or 80...265 V dc
- supply 2	80...265 V dc or ac
Power drain per activated relay	0.5 W
Degree of protection by enclosure at panel mounting	IP 40
Weight	7 kg
Tests:	
- voltage test relay outputs to the frame	
- voltage test supply inputs to the frame	
- voltage test between output and supply circuits	
Test voltages:	
Dielectric test voltage according to IEC 60255-5 and SS 436 15 03	2 kV, 50 Hz, 1 min
Impulse test voltage according to IEC 60255-5 and SS 436 15 03	5 kV, 1.2/50 $\mu$ s, 0.5 J
High-frequency interference test voltage according to IEC 60255-6 and SS 436 15 03	2.5 kV, 1 MHz
Environmental conditions:	
- service temperature range	-10...+55°C
- storage temperature range	-40...+70°C
- heat and damp according to IEC 60068-2-3	<95% max. 56 days/a at +40°C

## **11. Testing**

The auxiliary relay unit is recommended to be tested when testing the annunciator unit. When the auxiliary relay unit is used for controlling parallel lamps, the TEST push-buttons can be used for testing. If the relay unit is used for contact following net or group reflash, the contact inputs of the system should be submitted to primary tests.

## 12. Maintenance and repair

### 12.1. Maintenance

If the auxiliary relay unit and the signal grouping module are used under normal environmental conditions as specified in the section "Technical data", no specific maintenance is required.

If the operational conditions differ from those specified, for instance regarded to ambient temperature and relative humidity, or if the atmosphere contains dust or chemically active gases, a visual inspection of the equipment should be included in the testing programme. Under extremely severe environmental conditions the normal maintenance programme of the equipment should include a visual inspection focussed on:

- mechanical damage to the case, mounting accessories, plug-in modules or the contacts
- signs of corrosion on PC-boards, component leads and caps, screws and other metal parts
- signs of dust and dirt on the PC-boards or inside the cases

In the event of functional disorder the relay unit should be properly overhauled by an expert.

In most cases malfunction can be eliminated by replacing the faulty plug-in module, see spare part list.

### 12.2. Replacement parts, extension units and spare parts

<b>Name</b>	<b>Type designation</b>
Auxiliary relay unit, fully equipped	SACO 128R4
Auxiliary relay unit with 7 relay modules	SACO 128R4-7
Auxiliary relay Unit with 6 relay modules	SACO 128R4-6
Auxiliary relay unit with 5 relay modules	SACO 128R4-5
Auxiliary relay unit with 4 relay modules	SACO 12BR4-4
Auxiliary relay unit with 3 relay modules	SACO 12BR4-3
Auxiliary relay unit with 2 relay modules	SACO 128R4-2
Auxiliary relay unit with 1 relay module	SACO 128R4-1
Auxiliary relay module	SWOM 16A1
Auxiliary power module	SWSM 220R220
Auxiliary power module	SWSM 220R48
Raising frame, 40 mm	SRH-ZX1
Spacers, 1 pair	SWSC 20
Cover plate 1 U	B463505
Flat cables	See table on page 22
Extension module	SWCM 8A1
Grouping module	SACO 64C5
Programming wires, 1 set	SWIR 39

## 13. Ordering

### Information to be stated when ordering:

1. Number, type designation and order number
2. Auxiliary supply voltages
3. Accessories

### Example:

1 off, auxiliary relay unit SACO 128R4-6, with 96 auxiliary relays  
 $U_{n1} = 48 \text{ V dc}$ ,  $U_{n2} = 220 \text{ V, 50 Hz}$

1 off, signal grouping module SACO 64C5

4 off, flat cables SWIR 30

4 off, flat cables SWIR 35

2 off, flat cables SWIR 32

The auxiliary relay unit deliveries include the following standard accessories (do not have to be stated when ordering):

1 off, cover plate 1U

1 pair, spacers SWSC 20

1 off, flat cable SWIR 24

4 off, M6 x 20 fixing screws

The delivery of SACO 64C5 includes:

1 set, programming wires SWIR 39

4 off, M6 x 20 fixing screws







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