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SM/SPA_ units

for SMS 010
User's Guide
SMS 010 SPA_ library

Data subject to change without prior notice

This set of SM/SPA_ User's Guides comprises:

1. **SM/SPA_ User's Guide**
2. **SPC_ User's Guide**
3. **SPTO User's Guide**

CONTENTS Page

I The SMS 010 concept

SMS 010 software as a whole consists of parametrisation, reporting and disturbance evaluation software. The separate software products are combined according to the needed functionality. Furthermore is communication equipment needed according to the system built-up. REPORT is also requiring a SACO 100 M or a SRIO 500 /1000 M data communicator.

The complete SMS 010 software package provides setting, reporting and disturbance evaluation facilities. The separate software products are combined according to the needs.

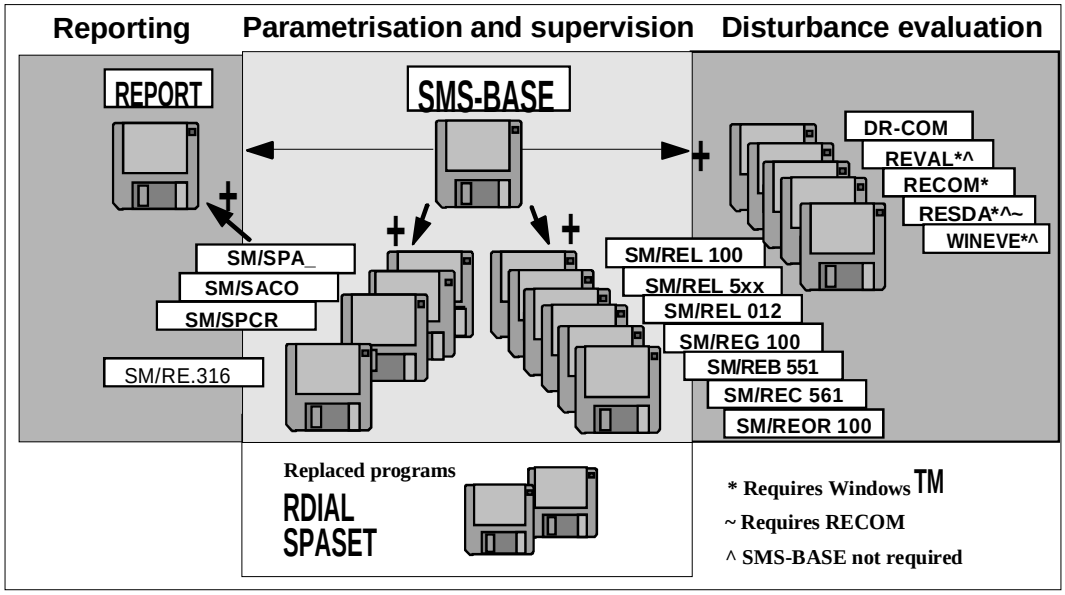

Fig. I.A SMS 010 software structure

SMS-BASE is the basic software that is always needed in order to run a SMS 010 application. It is a universal program for relays, disturbance recorders and annunciators. Other SMS 010 software modules are added to this program according to the requirements of the application. Depending on the types of protection in use, special software module/-s or programs are needed, e.g. SM/SPA_, SM/REL 100, SM/REC 561, REPORT, DR-COM, REVAL, etc.

SMS 010 enables the user to call a relay via a leased line, the public telephone system or, if he is in the station, via a direct optical fibre link to read relay data, events, disturbances and change settings. SMS 010 can also be made to communicate with a PC by connecting a cable to its serial port. For example, when using a SPAC 500/300 relay, it is possible to link SPAC to the PC by connecting the SPAC control module's RS-232 front panel interface to the PC's RS-232 port using the cable supplied with the SM/SPA_ package. The data read from the SPAC can then be examined in SMS 010.

The current power system load values, recorded values and relay settings can be viewed and the settings can also be changed.

The communication between the PC and the relay is based on the SPA protocol.

With the aid of the PC, it is also possible to create a file with relay settings which only takes a few minutes to download to the unit.

II SM/SPA_

SM/SPA_, ordering number RS 881 008-AA, consists of the following:

SM/SPA_	**1 Disk, 3 User's Guides, 2 Cables**
Disks	
Disk 1	**SM/SPA_ SPA_ units libraries for SMS 010**
Disk 2	**SM/SPA_ SPA_ units libraries for SMS 010**
User's Guides	
Program Guide	**SMS 010**
User's Guide	**SM/SPA_ units**
User's Guide	**SPC_ modules**
User's Guide	**SPTO modules**
Cables	
SPA-ZP 5A3	**TTL cable (PC RS232 serial port to the TTL connector on 100/300 series relays)**
SPA-ZP 17A3	**RS232 cable (PC RS232 serial port to the front RS232 connector on the SPTO)**

II.I Relays and modules added to SM/SPA_

Since relays and modules continuously have been added to the SPACOM range of protections, the SM/SPA_ installation disk has been updated regularly. SM/SPA_ now contains about 90 relays. Table II.I.A lists new relays and upgraded modules added to SM/SPA_ and from which version they are available. SM/SPA_ also contains all the other relays that were included already in SM/SPA_ v. 1.0, but these are not listed here.

SM/SPA_ version	Relay/module	Description and modules
v. 1.1	**SPEF 3A2C**	Medium voltage networks fault indicator, module: SPEF 3A2C.
v. 1.1	**SPAA 341**	Feeder protection relay, modules: SPCJ 4D28, SPCS 2D26 and SPCT 5D54
v. 1.1	**SPAD 346**	Stabilized differential relay, modules: SPCD 2D55, SPCD 3D53 and SPCJ 4D28.
v. 1.1	**SPAJ 160**	Capacitor protection relay, the module SPCJ 4D40 has been updated
v. 1.2	**SPAA 345**	Feeder protection relay, modules: SPCJ 4D28, SPCS 2D32, and SPCT 5D54.
v. 1.2	**SPAA 348**	Feeder protection relay, modules: SPCS 4D11, SPCS 2D26, and SPCT 5D54.
v. 1.2	**SPAJ 144**	Combined overcurrent & earth-fault relay, module SPCJ 4D28.
v. 1.2a	**SPAS 348**	Feeder protection unit, modules: SPCS 4D11, SPCS 4D12 and SPCS 2D26.
v. 1.2a	**SPAU 341**	Voltage regulator, modules: SPCU 1D50 and SPCN 1D56.
v. 1.2a	**SPTO** modules	Updated versions, modules: SPTO 1D2, 1D5, 1D6 and 6D3.
v. 2.0	**SPAA 342**	Feeder protection relay, modules: SPCJ 4D61, SPCS 2D26 and SPCT 5D54.
v. 2.0	**SPAF 140 C1**	Frequency relay, module: SPCF 1D15
v. 2.0	**SPAF 340 C3**	Frequency relay, module: SPCF 1D15
v. 2.1	**REC 501**	Remote monitoring and control unit, REC 501

Table II.I.A Relays and modules added to SM/SPA_ since version 1.0

III Summary of this User's Guide

This User's Guide instructs the user on the normal use of a SPACOM relay in conjunction with a SM/___ product using SMS-BASE. SMS-BASE with a SM/____ product provides the possibility of viewing the data and setting the parameters of the SPACOM series of relays using a personal computer (PC). The data of the units/modules are displayed on the PC in a structured way.

From a remote location, the PC communicates with the protection via either a leased line or the public telephone network, or within the same substation by a direct connection.

Examples are presented on how to view relay data and set the relay parameters. Exercises enable a quick start in entering a real protection configuration and taking SMS-BASE and SM/____ to practical use.

IV Application

This User's Guide is applicable to SM/SPA_ v. 2.2.

These User's Guides describes the normal application of the software product SM/SPA_.

Reference should be made to the specific documentation for details of communication hardware and its connection. Those mentioned in this guide are only by way of example.

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SM/SPA_	ABB Transmit Oy, Relays & Network Control Division, Finland
SM/SACO	ABB Transmit Oy, Relays & Network Control Division, Finland
SM/SPCR	ABB Transmit Oy, Relays & Network Control Division, Finland
IBM	International Business Machines Corporation
EGA	International Business Machines Corporation
VGA	International Business Machines Corporation

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VIII Conventions used in this guide

The following conventions are used in this guide:

A key on the keyboard	<A>
Special keys	<up-arrow>, <down-arrow>, <left-arrow>, <right-arrow> <Home>, <End>, <PgUp>, <PgDn> <Ins>, <Del> <NumLock>, <CapsLock> <Alt>, <Ctrl> <PrintScrn>
Keys pressed at the same time	<Alt>+<F2>

Texts quoted from the screen are written in 'Quotation' marks. If the position of the text on the screen is important, the whole or part of the screen is shown. Information from the screen is shown in a frame where it is not in quotation marks.

A part of the screen (a window) is shown as follows:

```
 RAW
 SPA
 SRIO
```

The selected option in a window is bold.

A quotation of the above information would read:

'**SPA**'

The response by the user to a request is set in double quotation marks, e.g.
"Station 1" or "009" or "xcopy a:\SMS\BASE*.* c:".

An interactive dialogue between the user and the computer is sometimes listed in the same way as a script of a play where U stands for user and C for computer. The following is an example of an interactive dialogue:

```
C - C:\>
U - C:\>xcopy *.* c:

C -
U -
```

IX Designations and definitions

Relay	SPACOM relays
SMS 010	A system for setting of parameters, measuring, monitoring, event reporting and disturbance uploading and evaluation
SMS-BASE	The basic software needed to run SMS 010 applications
Application structure	The configuration of stations, protected units, relays and parts of relays and data storage for the relay parts for a particular application
SPA	Data bus and protocol for communication between a ’Master’ and a number of ’Slaves’
Master	A unit requesting information
Slave	A unit responding to the requests from the ’Master’
Modem	Two-way converter at a signal interface
Phonemodem	Modem between RS-232 and teleline corresponding to the CCITT specification
Fibremodem	Modem between an electrical RS-232 interface and an optical fibre communication link
Dataset	A block of data transferred by a relay to a PC
Filename	8 characters or less followed by an extension
Extension	3 characters or less defining the type of file
.	The ’extension’ starts with ’.’ and is abbreviated as ’Ext’
.REC	’Ext’ for acquired ’received values’
.INS	’Ext’ for acquired ’installed values’
.VAL	’Ext’ for observed ’validated values’
Window	A part of the screen
Default value	Value used when no other value specified
Password	Personal code entered by a user to permit him to modify relay settings
Chapter	Principal part of this guide
Section	Part of a chapter
Logic diagram	Logic schematic diagrams consisting of inputs, outputs, gates, junctions and interconnections between objects. A logic schematic is stored in an ASCII text file.
Logic program	A list of SPACOM instructions transferred to a SPTO relay module. Instructions M200..M300 forms the logic program. Logic programs are stored in an ASCII text file called ’VALUES.VAL’.

1 WHAT IS SM/SPA_ ?

SM/SPA_ is the module package for SPACOM relays within the SPACOM relay family. SM/SPA_ is providing the SMS 010 user with the module software needed for parametrisation of the SPACOM relays, except from SACO annunciators and SPCR 8C19 and 8C27 disturbance recorder modules which are distributed in own SM/SACO and SM/SPCR packages. Further more is monitoring of received settings as well as measured and registered data encouraged. The registers and latched output relays can also be resetted.

1.1 Getting started

In addition to SM/SPA_ the SMS-BASE platform, with the tools for working in SMS 010, also has to be installed. SMS-BASE disk 2 contains a demo application structure with five levels. By installing this you will get an idea of how a "typical" application is built-up. However, this demo is seldom adapted to your power system, therefore we recommend you to create a new application.

Creating of a new application structure in SMS-BASE containing only those relays/terminals you need is described in the SMS-BASE User's Guide.
Briefly: Start by making a new application structure, (UTILITIES/Alter application structure/S=AS Handling and the A= Add function). There after when you have taken your brand new application into use, exit the S=AS Handling function and start adding the elements, (including the relays/modules), on the five levels in the application, (use the <A>. button and proceed to the next level with <Enter>). Don't forget the adressing of the modules !

1.2 Additional functionality

In order to obtain alarm, event and logging reporting by means of the additional **REPORT** program, the concerned relays/modules provided with SM/SPA_ need to be added to the application structure, if not already present. The same goes for handling of the disturbance recorders in SPAD 346, (SPCD 2D55 and SPCD 3D53) by means of the additional **DR-COM** program.

2 INSTALLATION

The basic principles for the installation of the SM/___ software packages will be shortly explained in following sections.
The installation of SM/SPA_ units is easy to perform and follows the installation shown in figure 2.A. The procedure for the installation of the SMS-BASE software is thoroughly described in the SMS-BASE User's Guide, section 2.2 'Installing the program'.

If you later on need to install more relays to your SMS 010 installation from the SM/SPA_ disk, you can install again and select the missing relays.

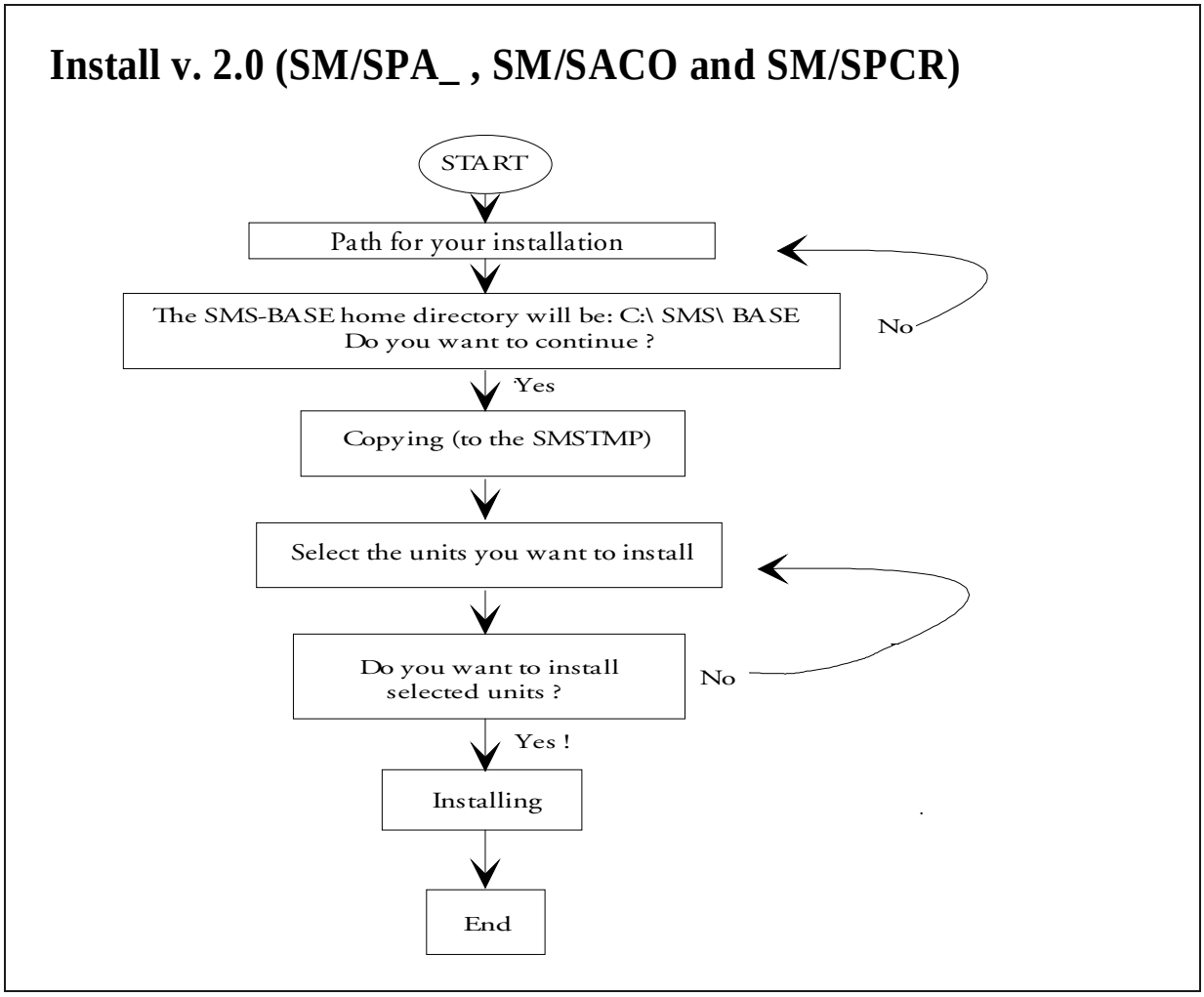

Fig. 2.A The procedure for installing SM/___ packages. SMSTMP is a temporary directory, used for installation purposes.

2.1 Conditions for installation

The relays provided with SM/SPA_ v. 2.0 or higher demands at least SMS-BASE v. 1.1 to work properly, except from the module SPCJ 4D28 which demands SMS-BASE v. 2.0 or higher. SPCJ 4D28 is a bit special while the measuring transformers are set from IN2 and I02. This is possible only from SMS-BASE v. 2.0 or higher. Another reason for upgrading SMS-BASE is the increased functionality in SMS-BASE. Hence you are if using SMS-BASE v. 1.0 or v. 1.1 recommended to upgrade your SMS-BASE into latest version. UPGRADES are available for this purpose.

IMPORTANT to know before installation of SMS 010 products !

If the harddisk of the PC is defect the installation program might perform an uncompleted installation. The DOS command **CHKDSK**, (**CHKDSK/F** can repair minor faults), can be used to clarify if the harddisk is defect. **SCANDISK** is another command possible to use.

Note! SMS-BASE must always be installed before SM/SPA_ !

2.2 The installation briefly

There are two starting situations for the installation:

1 Start totally from the beginning

2 An ongoing installation session, i.e. inserting of new installation disks without interrupting the installation session.

Starting situation 1:

START: (figure 2.A)

Change drive to your floppy disk drive A: or B:

Command: **A:**
At the A:\> drive type install
A:\>**install**
You will be asked for your SMS-BASE installation path.
Press <Enter> to confirm if standard path, otherwise type the correct path.

Select the units you want to install, and also if asked for, the type of the selected relay. Selecting a C version gives all modules for the actual relay. Later, when you are creating your application structure, you still have the possibility to select among the C versions if you have chosen the complete relay when installing, else you will get the version chosen e.g. SPAD 346 C4.

After finishing the relay selecting part the actual installation is started by the <F2> button.

The installation may be continued by another disk or ended by pressing <Escape>.

Starting situation 2 :

A continuos installation session means that the program queries about continuing or finishing the installation of SMS 010 software. In this case the installation program already knows the installation path for the SMS-BASE and proceeds directly to the 'Copying ' (to SMSTMP). You will, though, have to select relay units as usual, when it is a SM/___ package disk. Also refer to 'Starting situation 1' and the procedure showed in figure 2.A.

A DIRECTORIES AND FILES USED IN SM/SPA_

The SM/SPA_ software product is delivered on two 3½" high-density (1.44 Mbytes) floppy disks and contain the following:

NUMBER	DESCRIPTION
1	SM/SPA_ relay modules
2	SM/SPA_ relay modules

The files on the disk are compressed using the program 'pkzip' to minimise the number of installation disks. The contents of the disk are presented below as they appear when the disk is inserted into drive A: and are viewed using the program 'pkunzip':

A:\	Root directory of the system
MODULES\	Descriptions
DEMO\	Description of a demonstration module without communication
SPAM\	Descriptions of motor modules
SPCD\	Descriptions of differential modules
SPCF\	Descriptions of frequency modules
SPCJ\	Descriptions of current modules
SPCN\	Descriptions of voltage regulator modules
SPCP\	Descriptions of power modules
SPCS\	Descriptions of directional modules
SPCT\	Descriptions of auto-reclose modules
SPCU\	Descriptions of voltage modules
SPEF\	Descriptions of fault indicators
SPTO\	Descriptions of control modules

A.1 Disk 1 and 2

Disk 1 and 2 contains:

INSTALL.EXE	Installation program
INSTALL.LAN	Installation language texts
DRSPCD.ZIP	Archived configuration files
MODULES.ZIP	Archived configuration files
SPTOED.ZIP	Archived SPTO editor files
PKUNZIP.EXE	File decompression program
DEVICES	List of relay modules
README	Disk information

The compressed files 'MODULES.ZIP' contain:

MODULES\	Descriptions
SPCJ\	Descriptions of current modules
1C20*.*	SPCJ 1C20 files
1C7*.*	SPCJ 1C7 files
1C8*.*	SPCJ 1C8 files
2C30*.*	SPCJ 2C30 files
3C3*.*	SPCJ 3C3 files
3C48*.*	SPCJ 3C48 files
3D45*.*	SPCJ 3D45 files
4D29.SUP	Support selection of current module SPCJ 4D29
4D29.DEF	Default values of current module SPCJ 4D29
4D29.SPT	'Block to be edited' selection of SPCJ 4D29
4D29.SET	'Reset of...' selection of SPCJ 4D29
4D29.CHN	Channel descriptions for SPCJ 4D29
4D29.EVN	Event descriptions for SPCJ 4D29
4D29.LOG	Logging descriptions for SPCJ 4D29
4D29.CNF	Description of 'send/receive' for SPCJ 4D29
4D29_1.CNF	Description of 'block 1' for SPCJ 4D29
4D29_2.CNF	Description of 'block 2' for SPCJ 4D29
4D29_3.CNF	Description of 'block 3' for SPCJ 4D29
4D29_4.CNF	Description of 'block 4' for SPCJ 4D29
4D29_5.CNF	Description of 'block 5' for SPCJ 4D29
4D29_6.CNF	Description of 'block 6' for SPCJ 4D29
4D29_7.CNF	Description of 'block 7' for SPCJ 4D29
4D29_8.CNF	Description of 'block 8' for SPCJ 4D29
4D29_9.CNF	Description of 'block 9' for SPCJ 4D29
4D24*.*	SPCJ 4D24 files
4D28*.*	SPCJ 4D28 files
4D34*.*	SPCJ 4D34 files
4D36*.*	SPCJ 4D36 files
4D40*.*	SPCJ 4D40 files
4D44*.*	SPCJ 4D44 files
4D61*.*	SPCJ 4D61 files
SPAM\	Descriptions of motor modules
05X*.*	SPAM 050 files
05X*.*	SPAM 051 files
05X*.*	SPAM 052 files
SPCD\	Descriptions of differential modules
3D2X*.*	SPCD 3D21 files
3D2X*.*	SPCD 3D22 files
3D2X*.*	SPCD 3D23 files
2D55*.*	SPCD 2D55 files
3D53*.*	SPCD 3D53 files
SPCF\	Descriptions of frequency modules
1D15*.*	SPCD 1D15 files
SPCN\	Descriptions of voltage regulator modules
1D56*.*	SPCN 1D56 files
SPCP\	Descriptions of power modules
3C2*.*	SPCP 3C2 files

SPCS\	Descriptions of directional modules
2D26*.*	SPCS 2D26 files
2D32*.*	SPCS 2D32 files
2D37*.*	SPCS 2D37 files
3C4*.*	SPCS 3C4 files
4D11*.*	SPCS 4D11 files
4D12*.*	SPCS 4D12 files
4D13*.*	SPCS 4D13 files
SPCT\	Descriptions of autoreclose modules
2D38*.*	SPCT 2D38 files
2D46*.*	SPCT 2D46 files
2C17*.*	SPCT 2C17 files
2C5*.*	SPCT 2C5 files
5D54*.*	SPCT 5D54 files
SPCU\	Descriptions of voltage modules
1D39*.*	SPCU 1D39 files
1D47*.*	SPCU 1D47 files
1D50*.*	SPCU 1D50 files
1C1*.*	SPCU 1C1 files
1C6*.*	SPCU 1C6 files
3C14*.*	SPCU 3C14 files
3C15*.*	SPCU 3C15 files
3D45*.*	SPCU 3D45 files
SPEF\	Descriptions of medium network fault indicators
3A2C*.*	SPEF 3A2C files
SPTO\	Descriptions of control modules
1C1*.*	SPTO 1C1 files
1C4*.*	SPTO 1C4 files
2C2*.*	SPTO 2C2 files
1D2*.*	SPTO 1D2 files
1D5*.*	SPTO 1D5 files
1D6*.*	SPTO 1D5 files
6D3*.*	SPTO 6D3 files
12D4*.*	SPTO 12D4 files
REC\	Descriptions of monitor and control modules
501*.*	REC 501 files

The compressed file ’DRSPCD.ZIP’ contains (only on disk 2):	Files used for SPCD disturbance recording
SUPPORT\DRCOM.LAN	DR-COM translation texts
DR-COM.EXE	A special version used if DR-COM is not installed
SPCDEDIT.EXE	Edit parameters
SPCDSTAT.EXE	Monitor SPCD disturbance recorder
SPCDTIME:EXE	Synchronise time
SPCRDEL.EXE	DR-COM station editor

The compressed file 'SPTOED.ZIP' contains:

SUPPORT\PS.INI	Postscript initialisation
TEXT.INI	SPTO editor conf.
SPTODIS.EXE	Decompiler
SPTOED.EXE	SPTO editor
SPTOED.DOC	SPTOED information
SPTOCOMP.EXE	Diagram compilation
SPACFIXS.EXE	Control module program
CGA.BGI	CGA graphic driver
EGAVGA.BGI	EGA/VGA graphic driver
HERC.BGI	HERCULES graphic driver
IBM8514.BGI	8514 graphic driver
EXAMPLE1.DRW	Sample diagram
BITMAP\DEFAULT\AND2.BMZ	'AND' with 2 inputs
AND3.BMZ	'AND' with 3 inputs
AND4.BMZ	'AND' with 4 inputs
BUF.BMZ	'BUFFER'
NAND2.BMZ	'NAND'with 2 inputs
NAND3.BMZ	'NAND' with 3 inputs
NAND4.BMZ	'NAND' with 4 inputs
NOR2.BMZ	'NOR' with 2 inputs
NOR3.BMZ	'NOR' with 3 inputs
NOR4.BMZ	'NOR' with 4 inputs
NOT.BMZ	'NOT'
OR2.BMZ	'OR' with 2 inputs
OR3.BMZ	'OR' with 3 inputs
OR4.BMZ	'OR' with 4 inputs
XOR.BMZ	'XOR'

B THE SPECIFICATION OF SMS-BASE with SM/SPA_

The system requirements when using SM/SPA_ with SMS-BASE and the typical data of SM/SPA_ functions are given in this Appendix.

B.1 Hardware requirements

The hardware requirements which have to be fulfilled for SM/SPA_ and SMS-BASE to operate correctly are:

- Relay end
- SPACOM relay with a SPA communication option.
- Optical fibre SPA loop with an optical fibre modem or a direct connection to the relay from the PC's serial port.

- Remote communication
- A leased line equipped with modems or a telephone modem and automatic answering function at the station.
- A public telephone network conforming to CCITT.
- A telephone modem that which accepts "AT" commands at the PC end.

- PC

PC	A 286 processor at minimum, 100% IBM compatible. No special configuration. No special accessories for controlling serial or parallel ports.
Operating system	DOS 3.3 or higher
Main memory	500 kByte available
Hard disk	2.5 MByte for SMS-BASE shell. About 1 MByte of additional free disk space is recommended. 8 MByte if installing ALL the relays on the module disks plus 230 kByte for SPTOED 150-200 kByte per relay module Type 'D' (e.g. SPCJ 4D29) 40-60 kByte per relay module Type 'C' (e.g. SPCJ 3C3) 350 kByte for the SPTO 6D3 module 150 kByte for a typical application structure, 880 kByte for the example structure
Serial port	1 for the modem and 1 for the mouse if using the SPTOED logic editor with SPACOM control modules, COM1 or COM2
Parallel port	1 for the printer, LPT1
Floppy drive	1 3½" 1.44 MByte
Code page	437, 860, 863 or 865

B.2 Application structure and data memories

The application structure represents the actual physical structure of stations, bays and relays and enables the user to select relay and data memories of interest.

- Application structure
- No. of relays Unlimited
- No. of structures Unlimited
- No. of selections per level Unlimited

- Storage of SPACOM relay data on disk
- Data per relay module approx. 7 - 60 kByte
- No. of relays per disk approx. 25 (D-type) - 100 (C-type) on a 1.4 MByte disk.
- Storage of historic data Possible
- Storage of prepared settings Possible

B.3 Communication

- Communication settings	
- Serial port	COM1, COM2, COM3, COM4
- Baud rate	300, 1200, 2400, 4800, 9600 Baud
- Protocol	SPA, SRIO, (called SRIO in SMS-BASE)
- Data transmission time at 2400 baud	
- Remote acquisition	0.15 s/variable
- Remote send	0.3 s/variable
- Time to establish a modem link	10 s typical

C SPACOM RELAYS IN SM/SPA_

This Appendix includes two tables of the SM/SPA_ SPACOM relays and their modules and descriptions.

C.1 Relay packages and designations

```
REC 501,Remote Monitoring and Control Unit
      REC 501,Remote Monitoring and Control module
SPAJ 140 DEMO,Phase and neutral overcurrent relay: 0
      DEMO 4D29,nonsettable o/c and e/f module
SPAA 120,Feeder protection relay: 0
      SPCJ 4D44,Overcurrent and directional earth-fault module
SPAA 121,Feeder protection relay: 0
      SPCJ 4D44,Overcurrent and directional earth-fault module
SPAA 320,Feeder protection unit: 0 1 2 3 4 5
      SPCJ 3C3,Overcurrent module
      SPCS 3C4,Directional earth-fault module
      SPCT 2C5,Auto-reclose module
SPAA 321,Feeder protection unit: 0 1 2 3 4 5
      SPCJ 3C3,Overcurrent module
      SPCS 3C4,Directional earth-fault module
      SPCT 2C17,Auto-reclose module
SPAA 322,Feeder protection unit: 0 1 2 3 4 5
      SPCJ 3C3,Overcurrent module
      SPCS 3C4,Directional earth-fault module
      SPCT 2C17,Auto-reclose module
SPAA 323,Feeder protection unit: 0 1 2 3 4 5
      SPCJ 3C3,Overcurrent module
      SPCS 3C4,Directional earth-fault module
      SPCT 2C17,Auto-reclose module
SPAA 330,Feeder protection unit: 0 1 2 3 4 5
      SPCJ 3C3,Overcurrent module
      SPCJ 1C8,Earth-fault module
      SPCT 2C5,Auto-reclose module
SPAA 331,Feeder protection unit: 0 1 2 3 4 5
      SPCJ 3C3,Overcurrent module
      SPCJ 1C8,Earth-fault module
      SPCT 2C17,Auto-reclose module
SPAA 337,Feeder protection unit: 0 1 2 3 4 5
      SPCJ 4D36,Overcurrent and earth-fault module
      SPCS 2D37,Directional earth-fault module
      SPCT 2D46,Auto-reclose module
SPAA 341,Feeder protection unit: 0 1 2 3 4 5
      SPCJ 4D28,Combined overcurrent and earth-fault module
      SPCS 2D26,Directional and non-directional earth-fault module
      SPCT 5D54,Auto-reclose module
SPAA 342,Feeder protection unit: 0 1 2 3 4 5
      SPCJ 4D61,Combined overcurrent and earth-fault module
      SPCS 2D26,Directional and non-directional earth-fault module
      SPCT 5D54,Auto-reclose module
SPAA 345,Feeder protection unit: 0 1 2 3 4 5
      SPCJ 4D28,Combined overcurrent and earth-fault module
      SPCS 2D32,Transient measuring directional earth-fault module
      SPCT 5D54,Auto-reclose module
```

```
SPAA 348,Feeder protection unit: 0 1 2 3 4 5
      SPCS 4D11,Directional overcurrent module
      SPCS 2D26,Directional and non-directional earth-fault module
      SPCT 5D54,Auto-reclose module
SPAC 310,Feeder terminal: 0 1
      SPTO 1D2,Control module
      SPCJ 4D29,Overcurrent and earth-fault module
      *SPTOED.ZIP
SPAC 311,Feeder terminal: 0 1
      SPTO 1D2,Control module
      SPCJ 4D24,Overcurrent and earth-fault module
      *SPTOED.ZIP
SPAC 312,Feeder terminal: 0 1
      SPTO 1D2,Control module
      SPCJ 4D29,Overcurrent and earth-fault module
      *SPTOED.ZIP
SPAC 315,Feeder terminal: 0 1
      SPTO 1D6,Control module
      SPCJ 4D29,Overcurrent and earth-fault module
      *SPTOED.ZIP
SPAC 316,Feeder terminal: 0 1
      SPTO 1D6,Control module
      SPCJ 4D24,Overcurrent and earth-fault module
      *SPTOED.ZIP
SPAC 317,Feeder terminal: 0 1
      SPTO 1D6,Control module
      SPCJ 4D29,Overcurrent and earth-fault module
      *SPTOED.ZIP
SPAC 320,Feeder terminal: 0 1
      SPTO 1D5,Control module
      SPCJ 4D34,Motor protection module
      *SPTOED.ZIP
SPAC 330,Feeder terminal: 0 1
      SPTO 1D2,Control module
      SPCJ 4D44,Overcurrent and directional earth-fault module
      *SPTOED.ZIP
SPAC 331,Feeder terminal: 0 1
      SPTO 1D2,Control module
      SPCJ 4D44,Overcurrent and directional earth-fault module
      *SPTOED.ZIP
SPAC 335,Feeder terminal: 0 1
      SPTO 1D6,Control module
      SPCJ 4D44,Overcurrent and directional earth-fault module
      *SPTOED.ZIP
SPAC 336,Feeder terminal: 0 1
      SPTO 1D6,Control module
      SPCJ 4D44,Overcurrent and directional earth-fault module
      *SPTOED.ZIP
SPAC 510,Feeder terminal: 1 3 5 7 9 11 13 15
      SPTO 1C1,Control module
      SPCJ 3C3,Overcurrent module
      SPCS 3C4,Directional earth-fault module
      SPCT 2C17,Auto-reclose module
      SPCJ 1C8,Earth-fault module
      NONE
SPAC 520,Feeder terminal: 1 3 5 7 9 11 13 15
      SPTO 2C2,Control module
      SPCJ 3C3,Overcurrent module
      SPCS 3C4,Directional earth-fault module
      SPCT 2C17,Auto-reclose module
      SPCJ 1C8,Earth-fault module
      NONE
```

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SPAC 531,Feeder terminal: 1 3 5 7
      SPTO 6D3,Control module
      SPCJ 3C3,Overcurrent module
      SPCS 3C4,Directional earth-fault module
      NONE
      *SPTOED.ZIP
SPAC 533,Feeder terminal: 0 1 2 3 4 5
      SPTO 6D3,Control module
      SPCJ 3C3,Overcurrent module
      SPCJ 1C8,Earth-fault module
      SPCJ 1C20,Harmonics measuring module
      *SPTOED.ZIP
SPAC 534,Feeder terminal: 0 1 2 3 4 5 6
      SPTO 6D3,Control module
      SPCJ 3C3,Overcurrent module
      SPCU 1C6,Residual voltage module
      SPCU 3C14,Overvoltage and undervoltage module
      *SPTOED.ZIP
SPAC 535,Feeder terminal: 1 3 5
      SPTO 6D3,Control module
      SPCJ 4D29,Overcurrent and earth-fault module
      SPCS 3C4,Directional earth-fault module
      NONE
      *SPTOED.ZIP
SPAC 536,Feeder terminal: 1 3 5
      SPTO 6D3,Control module
      SPCJ 4D24,Overcurrent and earth-fault module
      SPCS 3C4,Directional earth-fault module
      NONE
      *SPTOED.ZIP
SPAC 537,Feeder terminal: 1 3 5
      SPTO 6D3,Control module
      SPCJ 4D34,Motor protection module
      SPCS 3C4,Directional earth-fault module
      NONE
      *SPTOED.ZIP
SPAC 538,Feeder terminal: 0 1 2 3
      SPTO 6D3,Control module
      SPCS 4D11,Directional overcurrent module
      SPCS 3C4,Directional earth-fault module
      SPCS 4D12,Directional overcurrent module
      *SPTOED.ZIP
SPAC 539,Feeder terminal: 0 1 2 3 4 5
      SPTO 6D3,Control module
      SPCJ 4D29,Overcurrent and earth-fault module
      SPCS 3C4,Directional earth-fault module
      SPCU 1C6,Residual voltage module
      *SPTOED.ZIP
SPAC 539/E263/E264,Feeder terminal: 0 1 2 3 4 5
      SPTO 6D3,Control module
      SPCJ 4D24,Overcurrent and earth-fault module
      SPCS 3C4,Directional earth-fault module
      SPCU 1C6,Residual voltage module
      *SPTOED.ZIP
SPAC 631,Feeder terminal: 1 3 5 7
      SPTO 6D3,Control module
      SPCJ 3C3,Overcurrent module
      SPCS 3C4,Directional earth-fault module
      NONE
      *SPTOED.ZIP
```

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SPAC 633,Feeder terminal: 0 1 2 3 4 5
      SPTO 6D3,Control module
      SPCJ 3C3,Overcurrent module
      SPCJ 1C8,Earth-fault module
      SPCJ 1C20,Harmonics measuring module
      *SPTOED.ZIP
SPAC 634,Feeder terminal: 0 1 2 3 4 5 6
      SPTO 6D3,Control module
      SPCJ 3C3,Overcurrent module
      SPCU 1C6,Residual voltage module
      SPCU 3C14,Overvoltage and undervoltage module
      *SPTOED.ZIP
SPAC 635,Feeder terminal: 1 3 5
      SPTO 6D3,Control module
      SPCJ 4D29,Overcurrent and earth-fault module
      SPCS 3C4,Directional earth-fault module
      NONE
      *SPTOED.ZIP
SPAC 636,Feeder terminal: 1 3 5
      SPTO 6D3,Control module
      SPCJ 4D24,Overcurrent and earth-fault module
      SPCS 3C4,Directional earth-fault module
      NONE
      *SPTOED.ZIP
SPAC 637,Feeder terminal: 1 3 5
      SPTO 6D3,Control module
      SPCJ 4D34,Motor protection module
      SPCS 3C4,Directional earth-fault module
      NONE
      *SPTOED.ZIP
SPAC 638,Feeder terminal: 0 1 2 3
      SPTO 6D3,Control module
      SPCS 4D11,Directional overcurrent module
      SPCS 3C4,Directional earth-fault module
      SPCS 4D12,Directional overcurrent module
      *SPTOED.ZIP
SPAC 901,Feeder terminal: 0
      SPTO 1C4,Control module
      SPCJ 3D35,Overcurrent module
      SPCS 2D37,Directional earth-fault module
      SPCT 2D38,Auto-reclose module
SPAC 902,Feeder terminal: 0
      SPTO 1C4,Control module
      SPCJ 3D35,Overcurrent module
      SPCS 2D37,Directional earth-fault module
      SPCT 2D38,Auto-reclose module
SPAC 903,Feeder terminal: 0
      SPTO 1C4,Control module
      SPCJ 3D35,Overcurrent module
      SPCS 2D37,Directional earth-fault module
SPAC 904,Feeder terminal: 0
      SPTO 1C4,Control module
      SPCJ 3D35,Overcurrent module
      SPCS 2D37,Directional earth-fault module
SPAC 907,Feeder terminal: 0
      SPTO 1C4,Control module
SPAC 925,Feeder terminal: 0
      SPTO 1C4,Control module
      SPCJ 3D35,Overcurrent module
      SPCU 1D39,Neutral current module
      SPCU 1D47,Residual voltage module
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SPAD 330,Transformer differential relay: 0
      SPCD 3C2x,Differential module
      SPCD 3C2x,Differential module
      SPCD 3C2x,Differential module
SPAD 346,Stabilized differential relay: 0 1 2 3 4 5
      SPCD 3D53,Differential module
      SPCD 2D55,Earth-fault module
      SPCJ 4D28,Combined overcurrent and earth-fault module
      *DRSPCD.ZIP
SPAF 140, Frequency relay: 0
      SPCF 1D15, Frequency module
SPAF 340, Frequency relay: 3
      SPCF 1D15, Frequency module
      NONE
      NONE
DRCOM STATION,Configuration:
      DRCOM STATION,Configuration
SPAG 310,Generator protection unit: 0
      SPCP 3C2,Overvoltage and reverse power module
      SPCJ 3C3,Overcurrent module
      SPCJ 3C3,Overcurrent module
SPAG 320,Generator protection unit: 0
      SPCJ 3C3,Overcurrent module
      SPCU 1C1,Overvoltage and undervoltage module
      SPCU 3C15,Undervoltage module
SPAG 330,Generator protection unit: 0
      SPCP 3C2,Overvoltage and reverse power module
      SPCJ 3C3,Overcurrent module
      SPCJ 1C8,Earth-fault module
SPAG 331,Generator protection unit: 0
      SPCP 3C2,Overvoltage and reverse power module
      SPCJ 3C3,Overcurrent module
      SPCU 1C6,Residual voltage module
SPAG 332,Generator protection unit: 0
      SPCP 3C2,Overvoltage and reverse power module
      SPCJ 3C3,Overcurrent module
      SPCS 3C4,Directional earth-fault module
SPAG 333,Generator protection unit: 0 2
      SPCP 3C2,Overvoltage and reverse power module
      SPCJ 3C3,Overcurrent module
      SPCJ 2C30,Earth-fault module
SPAJ 110,Earth-fault relay: 0
      SPCJ 1C8,Earth-fault module
SPAJ 111,Earth-fault relay: 0
      SPCJ 1C7,Neutral current module
SPAJ 115,Earth-fault relay: 0
      SPCJ 2C30,Earth-fault module
SPAJ 131,Overcurrent relay: 0
      SPCJ 3C3,Overcurrent module
SPAJ 135,Overcurrent relay: 0
      SPCJ 3C48,Overcurrent and earth-fault module
SPAJ 140,Phase and neutral overcurrent relay: 0
      SPCJ 4D29,Overcurrent and earth-fault module
SPAJ 141,Phase and neutral overcurrent relay: 0
      SPCJ 4D24,Overcurrent and earth-fault module
SPAJ 142,Phase and neutral overcurrent relay: 0
      SPCJ 4D29,Overcurrent and earth-fault module
SPAJ 144,Combined overcurrent and earth-fault relay: 0
      SPCJ 4D28,Combined overcurrent and earth-fault module
SPAJ 147,Phase and neutral overcurrent relay: 0
      SPCJ 4D36,Overcurrent and earth-fault module
SPAJ 160,Capacitor protection relay: 0
      SPCJ 4D40,Capacitor bank protection module
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SPAJ 320,Phase and neutral overcurrent relay: 0 1 2 3 4 5
      SPCJ 3C3,Overcurrent module
      SPCJ 1C7,Neutral current module
      SPCJ 1C20,Harmonics measuring module
SPAJ 321,Phase and neutral overcurrent relay: 0 1 2 3 4 5
      SPCJ 3C3,Overcurrent module
      SPCJ 1C8,Earth-fault module
      SPCJ 1C20,Harmonics measuring module
SPAM 050,Motor protection relay: 0
      SPAM 05X,Motor protection module
SPAM 051,Motor protection relay: 0
      SPAM 05X,Motor protection module
SPAM 052,Motor protection relay: 0
      SPAM 05X,Motor protection module
SPAM 150,Motor protection relay: 0
      SPCJ 4D34,Motor protection module
SPAS 120,Directional earth-fault relay: 0
      SPCS 3C4,Directional earth-fault module
SPAS 348,Feeder protection unit: 0 1 2 3 4 5
      SPCS 4D11,Directional overcurrent module
      SPCS 4D12,Directional overcurrent module
      SPCS 2D26,Directional and non-directional earth-fault module
SPAU 110,Residual voltage relay: 0
      SPCU 1C6,Residual voltage module
SPAU 121,Overvoltage and undervoltage relay: 0
      SPCU 1C1,Overvoltage and undervoltage module
SPAU 130,Overvoltage and undervoltage relay: 0
      SPCU 3C14,Overvoltage and undervoltage module
SPAU 140,Synchro-check relay: 0
      SPCU 3D45,Synchro-check module
SPAU 320,Voltage relay: 0 1 3 4 5
      SPCU 1C6,Residual voltage module
      SPCU 1C1,Overvoltage and undervoltage module
      SPCU 1C1,Overvoltage and undervoltage module
SPAU 330,Voltage relay: 0 1 2 3 4 5
      SPCU 1C6,Residual voltage module
      SPCU 3C14,Over/undervoltage module
      NONE
SPAU 331,Voltage relay: 1 3 5
      SPCU 1C6,Residual voltage module
      SPCU 3C15,Undervoltage module
      NONE
SPAU 341,Voltage regulator: 1 3
      SPCU 1D50,Automatic voltage regulating module
      SPCN 1D56,Manual voltage regulating module
SPEF 3A2C,Medium voltage networks fault indic.: 0
      SPEF 3A2C,Fault indicator
SPOC 110,Control and measuring module: 0
      SPTO 12D4,Input/output module
SPOC 111,Control and measuring module: 0
      SPTO 12D4,Input/output module
SPOC 112,Control and measuring module: 0
      SPTO 12D4,Input/output module
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C.2 Relay packages configurations and corresponding modules

97-10-15

Type	Description	Relay modules		
REC 501 C	Monitor and control.	REC 501		
SPAA 120 C	Feeder prot. relay	SPCJ 4D44		
SPAA 121 C	Feeder prot. relay	SPCJ 4D44		
SPAA 320 C	Feeder prot. unit	SPCJ 3C3	SPCS 3C4	SPCT 2C5
SPAA 320 C 1	Feeder prot. unit	SPCJ 3C3	SPCS 3C4	
SPAA 320 C 2	Feeder prot. unit	SPCJ 3C3		SPCT 2C5
SPAA 320 C 3	Feeder prot. unit	SPCJ 3C3		
SPAA 320 C 4	Feeder prot. unit		SPCS 3C4	SPCT 2C5
SPAA 320 C 5	Feeder prot. unit		SPCS 3C4	
SPAA 321 C	Feeder prot. unit	SPCJ 3C3	SPCS 3C4	SPCT 2C17
SPAA 321 C 1	Feeder prot. unit	SPCJ 3C3	SPCS 3C4	
SPAA 321 C 2/E170	Feeder prot. unit	SPCJ 4D29		SPCT 2C17
SPAA 321 C 2	Feeder prot. unit	SPCJ 3C3		SPCT 2C17
SPAA 321 C 3	Feeder prot. unit	SPCJ 3C3		
SPAA 321 C 3/E170	Feeder prot. unit	SPCJ 4D29		
SPAA 321 C 3/E171	Feeder prot. unit	SPCJ 3C3		
SPAA 321 C 4	Feeder prot. unit		SPCS 3C4	SPCT 2C17
SPAA 321 C 5	Feeder prot. unit		SPCS 3C4	
SPAA 322 C	Feeder prot. unit	SPCJ 3C3	SPCS 3C4	SPCT 2C17
SPAA 322 C /E136	Feeder prot. unit	SPCJ 3C3	SPCS 3C4	SPCT 2C17
SPAA 322 C /E177	Feeder prot. unit	SPCJ 3C3	SPCS 3C4	SPCT 2C17
SPAA 322 C /E191	Feeder prot. unit	SPCJ 3C3	SPCS 3C4	SPCT 2C17
SPAA 322 C 1	Feeder prot. unit	SPCJ 3C3	SPCS 3C4	
SPAA 322 C 1/E189	Feeder prot. unit	SPCJ 3C3	SPCS 3C4	
SPAA 322 C 2	Feeder prot. unit	SPCJ 3C3		SPCT 2C17
SPAA 322 C 3	Feeder prot. unit	SPCJ 3C3		
SPAA 322 C 3/E189	Feeder prot. unit	SPCJ 3C3		
SPAA 322 C 4	Feeder prot. unit		SPCS 3C4	SPCT 2C17
SPAA 322 C 5	Feeder prot. unit		SPCS 3C4	
SPAA 322 C 5/E189	Feeder prot. unit		SPCS 3C4	
SPAA 322 C 7	Feeder prot. unit			
SPAA 323 C	Feeder prot. unit	SPCJ 3C3	SPCS 3C4	SPCT 2C17
SPAA 323 C /E187	Feeder prot. unit	SPCJ 3C3	SPCS 3C4	SPCT 2C17
SPAA 323 C 1	Feeder prot. unit	SPCJ 3C3	SPCS 3C4	
SPAA 323 C 1/E187	Feeder prot. unit	SPCJ 3C3	SPCS 3C4	
SPAA 323 C 2	Feeder prot. unit	SPCJ 3C3		SPCT 2C17
SPAA 323 C 3	Feeder prot. unit	SPCJ 3C3		
SPAA 323 C 4	Feeder prot. unit		SPCS 3C4	SPCT 2C17
SPAA 323 C 5	Feeder prot. unit		SPCS 3C4	
SPAA 330 C	Feeder prot. unit	SPCJ 3C3	SPCJ 1C8	SPCT 2C5
SPAA 330 C 1	Feeder prot. unit	SPCJ 3C3	SPCJ 1C8	
SPAA 330 C 2	Feeder prot. unit	SPCJ 3C3		SPCT 2C5
SPAA 330 C 3	Feeder prot. unit	SPCJ 3C3		
SPAA 330 C 4	Feeder prot. unit		SPCJ 1C8	SPCT 2C5
SPAA 330 C 5	Feeder prot. unit		SPCJ 1C8	
SPAA 331 C	Feeder prot. unit	SPCJ 3C3	SPCJ 1C8	SPCT 2C17
SPAA 331 C /E195	Feeder prot. unit			
SPAA 331 C 1	Feeder prot. unit	SPCJ 3C3	SPCJ 1C8	
SPAA 331 C 2	Feeder prot. unit	SPCJ 3C3		SPCT 2C17
SPAA 331 C 3	Feeder prot. unit	SPCJ 3C3		
SPAA 331 C 4	Feeder prot. unit		SPCJ 1C8	SPCT 2C17
SPAA 331 C 5	Feeder prot. unit		SPCJ 1C8	
SPAA 341 C	Feeder. prot. unit	SPCJ 4D28	SPCS 2D26	SPCT 5D54
SPAA 341 C 1	Feeder. prot. unit	SPCJ 4D28	SPCS 2D26	
SPAA 341 C 2	Feeder. prot. unit	SPCJ 4D28		SPCT 5D54
SPAA 341 C 3	Feeder. prot. unit	SPCJ 4D28		
SPAA 341 C 4	Feeder. prot. unit		SPCS 2D26	SPCT 5D54
SPAA 341 C 5	Feeder. prot. unit		SPCS 2D26	
SPAA 342 C	Feeder. prot. unit	SPCJ 4D61	SPCS 2D26	SPCT 5D54
SPAA 342 C 1	Feeder. prot. unit	SPCJ 4D61	SPCS 2D26	
SPAA 342 C 2	Feeder. prot. unit	SPCJ 4D61		SPCT 5D54
SPAA 342 C 3	Feeder. prot. unit	SPCJ 4D61		
SPAA 342 C 4	Feeder. prot. unit		SPCS 2D26	SPCT 5D54
SPAA 342 C 5	Feeder. prot. unit		SPCS 2D26	
SPAA 345 C	Feeder. prot. unit	SPCJ 4D28	SPCS 2D32	SPCT 5D54
SPAA 345 C 1	Feeder. prot. unit	SPCJ 4D28	SPCS 2D32	
SPAA 345 C 2	Feeder. prot. unit	SPCJ 4D28		SPCT 5D54
SPAA 345 C 3	Feeder. prot. unit	SPCJ 4D28		
SPAA 345 C 4	Feeder. prot. unit		SPCS 2D32	SPCT 5D54
SPAA 345 C 5	Feeder. prot. unit		SPCS 2D32	

SPAA 348 C	Feeder. prot. unit	SPCS 4D11	SPCS 2D26	SPCT 5D54		
SPAA 348 C 1	Feeder. prot. unit	SPCS 4D11	SPCS 2D26			
SPAA 348 C 2	Feeder. prot. unit	SPCS 4D11		SPCT 5D54		
SPAA 348 C 3	Feeder. prot. unit	SPCS 4D11				
SPAA 348 C 4	Feeder. prot. unit		SPCS 2D26	SPCT 5D54		
SPAA 348 C 5	Feeder. prot. unit		SPCS 2D26			
SPAC 310 C	Feeder terminal	SPCJ 4D29				SPTO 1D2
SPAC 310 C 1	Feeder terminal					SPTO 1D2
SPAC 311 C	Feeder terminal	SPCJ 4D24				SPTO 1D2
SPAC 312 C	Feeder terminal	SPCJ 4D29				SPTO 1D2
SPAC 315 C	Feeder terminal	SPCJ 4D29				SPTO 1D6
SPAC 316 C	Feeder terminal	SPCJ 4D24				SPTO 1D6
SPAC 317 C	Feeder terminal	SPCJ 4D29				SPTO 1D6
SPAC 320 C	Feeder terminal	SPCJ 4D34				SPTO 1D2
SPAC 330 C	Feeder terminal	SPCJ 4D44				SPTO 1D2
SPAC 331 C	Feeder terminal	SPCJ 4D44				SPTO 1D2
SPAC 335 C	Feeder terminal	SPCJ 4D44				SPTO 1D6
SPAC 336 C	Feeder terminal	SPCJ 4D44				SPTO 1D6
SPAC 510 C 1	Feeder terminal	SPCJ 3C3	SPCS 3C4	SPCT 2C17	SPCJ 1C8	SPTO 1C1
SPAC 510 C 3	Feeder terminal	SPCJ 3C3	SPCS 3C4	SPCT 2C17		SPTO 1C1
SPAC 510 C 3/E	Feeder terminal	SPCJ 3C3	SPCS 3C4	SPCT 2C17		
SPAC 510 C 3/E165	Feeder terminal	SPCJ 3C3	SPCS 3C4	SPCT 2C17	SPCU 1C1	SPTO 1C1
SPAC 510 C 5	Feeder terminal	SPCJ 3C3	SPCS 3C4		SPCJ 1C8	SPTO 1C1
SPAC 510 C 7	Feeder terminal	SPCJ 3C3	SPCS 3C4			SPTO 1C1
SPAC 510 C 7/E164	Feeder terminal	SPCJ 3C3	SPCU 1C6			SPTO 1C1
SPAC 510 C 13	Feeder terminal	SPCJ 3C3			SPCJ 1C8	SPTO 1C1
SPAC 510 C 13/E	Feeder terminal	SPCJ 3C3			SPCJ 1C7	SPTO 1C1
SPAC 510 C 13/168	Feeder terminal	SPCJ 3C3			SPCJ 1C7	SPTO 1C1
SPAC 510 C 15	Feeder terminal	SPCJ 3C3				SPTO 1C1
SPAC 510 C 15/E	Feeder terminal	SPCJ 3C3				
SPAC 510 C 15/E165	Feeder terminal	SPCJ 3C3			SPCU 1C1	SPTO 1C1
SPAC 510 C 15/E167	Feeder terminal	SPCJ 3C3				
SPAC 520 C 1	Feeder terminal	SPCJ 3C3	SPCS 3C4	SPCT 2C17	SPCJ 1C8	SPTO 2C2
SPAC 520 C 3	Feeder terminal	SPCJ 3C3	SPCS 3C4	SPCT 2C17		SPTO 2C2
SPAC 520 C 3/E151	Feeder terminal	SPCJ 3C3	SPCS 3C4	SPCT 2C17		SPTO 2C2
SPAC 520 C 7	Feeder terminal	SPCJ 3C3	SPCS 3C4			SPTO 2C2
SPAC 520 C 13	Feeder terminal	SPCJ 3C3			SPCJ 1C8	SPTO 2C2
SPAC 520 C 15	Feeder terminal	SPCJ 3C3				SPTO 2C2
SPAC 520 C 15/E151	Feeder terminal	SPCJ 3C3				SPTO 2C2
SPAC 531 C /E196	Feeder terminal	SPCJ 3C3	SPCS 3C4	SPCJ 4D34		SPTO 6D3
SPAC 531 C 1	Feeder terminal	SPCJ 3C3	SPCS 3C4			SPTO 6D3
SPAC 531 C 2/E196	Feeder terminal	SPCJ 3C3		SPCJ 4D34		SPTO 6D3
SPAC 531 C 3	Feeder terminal	SPCJ 3C3				SPTO 6D3
SPAC 531 C 5	Feeder terminal		SPCS 3C4			SPTO 6D3
SPAC 531 C 7	Feeder terminal					SPTO 6D3
SPAC 533 C	Feeder terminal	SPCJ 3C3	SPCJ 1C8	SPCJ 1C20		SPTO 6D3
SPAC 533 C 1	Feeder terminal	SPCJ 3C3	SPCJ 1C8			
SPAC 533 C 3	Feeder terminal	SPCJ 3C3				
SPAC 533 C 4	Feeder terminal		SPCJ 1C8	SPCJ 1C20		
SPAC 533 C 5	Feeder terminal		SPCJ 1C8			
SPAC 534 C	Feeder terminal	SPCJ 3C3	SPCU 1C6	SPCU 3C14		SPTO 6D3
SPAC 534 C 1	Feeder terminal	SPCJ 3C3	SPCU 1C6			SPTO 6D3
SPAC 534 C 2	Feeder terminal	SPCJ 3C3		SPCU 3C14		SPTO 6D3
SPAC 534 C 3	Feeder terminal	SPCJ 3C3				SPTO 6D3
SPAC 534 C 4	Feeder terminal		SPCU 1C6	SPCU 3C14		SPTO 6D3
SPAC 534 C 5	Feeder terminal		SPCU 1C6			SPTO 6D3
SPAC 534 C 6	Feeder terminal			SPCU 3C14		SPTO 6D3
SPAC 535 C 1	Feeder terminal	SPCJ 4D29	SPCS 3C4			SPTO 6D3
SPAC 535 C 3	Feeder terminal	SPCJ 4D29				SPTO 6D3
SPAC 535 C 5	Feeder terminal		SPCS 3C4			SPTO 6D3
SPAC 535 C 7	Feeder terminal					SPTO 6D3
SPAC 536 C 1	Feeder terminal	SPCS 3C4	SPCJ 4D24			SPTO 6D3
SPAC 536 C 3	Feeder terminal	SPCS 3C4				SPTO 6D3
SPAC 536 C 5	Feeder terminal		SPCJ 4D24			SPTO 6D3
SPAC 537 C 1	Feeder terminal	SPCS 3C4	SPCJ 4D34			SPTO 6D3
SPAC 537 C 3	Feeder terminal	SPCS 3C4				SPTO 6D3
SPAC 537 C 5	Feeder terminal		SPCJ 4D34			SPTO 6D3

SPAC 538 C 1	Feeder terminal	SPCS 3C4	SPCS 4D1_		SPTO 6D3
SPAC 538 C 3	Feeder terminal	SPCS 3C4			SPTO 6D3
SPAC 538 C 5	Feeder terminal		SPCS 4D1_		SPTO 6D3
SPAC 539 C 1	Feeder terminal	SPCJ 4D29	SPCS 3C4		SPTO 6D3
SPAC 539 C 2	Feeder terminal	SPCJ 4D29		SPCU 1C6	SPTO 6D3
SPAC 539 C 3	Feeder terminal	SPCJ 4D29			SPTO 6D3
SPAC 631 C	Feeder terminal	SPCJ 3C3	SPCS 3C4	SPCJ 4D34	SPTO 6D3
SPAC 631 C /E196	Feeder terminal	SPCJ 3C3	SPCS 3C4	SPCJ 4D34	SPTO 6D3
SPAC 631 C 1	Feeder terminal	SPCJ 3C3	SPCS 3C4		SPTO 6D3
SPAC 631 C 2/E196	Feeder terminal	SPCJ 3C3		SPCJ 4D34	SPTO 6D3
SPAC 631 C 3	Feeder terminal	SPCJ 3C3			SPTO 6D3
SPAC 633 C	Feeder terminal	SPCJ 3C3	SPCJ 1C8	SPCJ 1C20	SPTO 6D3
SPAC 633 C 1	Feeder terminal	SPCJ 3C3	SPCJ 1C8		
SPAC 633 C 3	Feeder terminal	SPCJ 3C3			
SPAC 633 C 4	Feeder terminal		SPCJ 1C8	SPCJ 1C20	
SPAC 633 C 5	Feeder terminal		SPCJ 1C8		
SPAC 634 C	Feeder terminal	SPCJ 3C3	SPCU 1C6	SPCU 3C14	SPTO 6D3
SPAC 634 C 1	Feeder terminal	SPCJ 3C3	SPCU 1C6		SPTO 6D3
SPAC 634 C 2	Feeder terminal	SPCJ 3C3		SPCU 3C14	SPTO 6D3
SPAC 634 C 3	Feeder terminal	SPCJ 3C3			SPTO 6D3
SPAC 634 C 4	Feeder terminal		SPCU 1C6	SPCU 3C14	SPTO 6D3
SPAC 634 C 5	Feeder terminal		SPCU 1C6		SPTO 6D3
SPAC 634 C 6	Feeder terminal			SPCU 3C14	SPTO 6D3
SPAC 635 C 1	Feeder terminal	SPCJ 4D29	SPCS 3C4		SPTO 6D3
SPAC 635 C3	Feeder terminal	SPCJ 4D29			SPTO 6D3
SPAC 635 C 5	Feeder terminal		SPCS 3C4		SPTO 6D3
SPAC 635 C 7	Feeder terminal				SPTO 6D3
SPAC 636 C 1	Feeder terminal	SPCS 3C4	SPCJ 4D24		SPTO 6D3
SPAC 636 C 3	Feeder terminal	SPCS 3C4			SPTO 6D3
SPAC 636 C 5	Feeder terminal		SPCJ 4D24		SPTO 6D3
SPAC 637 C 1	Feeder terminal	SPCS 3C4	SPCJ 4D34		SPTO 6D3
SPAC 637 C 3	Feeder terminal	SPCS 3C4			SPTO 6D3
SPAC 637 C 5	Feeder terminal		SPCJ 4D34		SPTO 6D3
SPAC 638 C 1	Feeder terminal	SPCS 3C4	SPCS 4D1_		SPTO 6D3
SPAC 638 C 3	Feeder terminal	SPCS 3C4			SPTO 6D3
SPAC 638 C 5	Feeder terminal		SPCS 4D1_		SPTO 6D3
SPAC 639E263/E264	Feeder terminal	SPCJ 4D24	SPCS 3C4	SPCU 1C6	SPTO 6D3
SPAC 901	Feeder terminal	SPCJ 3D35	SPCS 2D37	SPCT 2D38	SPTO 1C4
SPAC 902	Feeder terminal	SPCJ 3D35	SPCS 2D37	SPCT 2D38	SPTO 1C4
SPAC 903	Feeder terminal	SPCJ 3D35	SPCS 2D37		SPTO 1C4
SPAC 904	Feeder terminal	SPCJ 3D35	SPCS 2D37		SPTO 1C4
SPAC 907	Feeder terminal				SPTO 1C4
SPAC 925	Feeder terminal	SPCJ 3D35	SPCU 1D39	SPCU 1D47	SPTO 1C4
SPAD 330 C	Transformer diff. relay	SPCD 3C21	SPCD 3C22	SPCD 3C23	
SPAD 346 C	Stab. diff. relay	SPCD 3D53	SPCD 2D55	SPCJ 4D28	
SPAD 346 C 1	Stab. diff. relay	SPCD 3D53	SPCD 2D55		
SPAD 346 C 2	Stab. diff. relay	SPCD 3D53		SPCJ 4D28	
SPAD 346 C 3	Stab. diff. relay	SPCD 3D53			
SPAD 346 C 4	Stab. diff. relay		SPCD 2D55	SPCJ 4D28	
SPAD 346 C 5	Stab. diff. relay		SPCD 2D55		
SPAF 140 C	Frequency relay	SPCF 1D15			
SPAF 340 C 3	Frequency relay	SPCF 1D15			
SPAG 310 C	Generator prot. unit	SPCP 3C2	SPCJ 3C3		
SPAG 320 C	Generator prot. unit	SPCJ 3C3	SPCU 1C1	SPCU 3C15	
SPAG 330 C	Generator prot. unit	SPCP 3C2	SPCJ 3C3	SPCJ 1C8	
SPAG 331 C	Generator prot. unit	SPCP 3C2	SPCJ 3C3	SPCU 1C6	
SPAG 332 C	Generator prot. unit	SPCP 3C2	SPCJ 3C3	SPCS 3C4	
SPAG 333 C	Generator prot. unit	SPCP 3C2	SPCJ 3C3	SPCJ 2C30	
SPAG 333 C 2	Generator prot. unit	SPCP 3C2		SPCJ 2C30	
SPAJ 110 C	Earth-fault relay	SPCJ 1C8			
SPAJ 111 C	Earth-fault relay	SPCJ 1C7			
SPAJ 115 C	Restricted E/F relay	SPCJ 2C30			

SPAJ 131 C	Overcurrent relay	SPCJ 3C3			
SPAJ 135 C	Overcurrent relay	SPCJ 3C48			
SPAJ 140 C	Phase and neut. O/C prot.		SPCJ 4D29		
SPAJ 141 C	Phase and neut. O/C prot.		SPCJ 4D24		
SPAJ 142 C	Phase and neut. O/C prot.		SPCJ 4D29		
SPAJ 144 C	Overcurr. & E-F relay	SPCJ 4D28			
SPAJ 147 C	Phase and neut. O/C prot.		SPCJ 4D36		
SPAJ 160 C	Capacitor prot. relay	SPCJ 4D40			
SPAJ 320 C	Phase and neut. O/C prot.		SPCJ 3C3	SPCJ 1C7	SPCJ 1C20
SPAJ 320 C 1	Phase and neut. O/C prot.		SPCJ 3C3	SPCJ 1C7	
SPAJ 320 C 1/E172	Phase and neut. O/C prot.		SPCJ 4D29	SPCJ 1C7	
SPAJ 320 C 3	Phase and neut. O/C prot.		SPCJ 3C3		
SPAJ 320 C 5	Phase and neut. O/C prot.			SPCJ 1C7	
SPAJ 321 C	Phase and neut. O/C prot.		SPCJ 3C3	SPCJ 1C8	SPCJ 1C20
SPAJ 321 C 1	Phase and neut. O/C prot.		SPCJ 3C3	SPCJ 1C8	
SPAJ 321 C 2	Phase and neut. O/C prot.		SPCJ 3C3		SPCJ 1C20
SPAJ 321 C 3	Phase and neut. O/C prot.		SPCJ 3C3		
SPAJ 321 C 4	Phase and neut. O/C prot.			SPCJ 1C8	SPCJ 1C20
SPAJ 321 C 5	Phase and neut. O/C prot.			SPCJ 1C8	
SPAM 050 C	Motor prot. relay	SPAM 05X			
SPAM 051 C	Motor prot. relay	SPAM 05X			
SPAM 052 C	Motor prot. relay	SPAM 05X			
SPAM 150 C	Motor prot. relay	SPCJ 4D34			
SPAS 120 C	Dir. earth-fault relay	SPCS 3C4			
SPAS 348 C	Feeder. prot. unit	SPCS 4D11	SPCS 4D12	SPCS 2D26	
SPAS 348 C 1	Feeder. prot. unit	SPCS 4D11	SPCS 4D12		
SPAS 348 C 2	Feeder. prot. unit	SPCS 4D11		SPCS 2D26	
SPAS 348 C 3	Feeder. prot. unit	SPCS 4D11			
SPAS 348 C 4	Feeder. prot. unit		SPCS 4D12	SPCS 2D26	
SPAS 348 C 5	Feeder. prot. unit		SPCS 4D12		
SPAU 110 C	Residual voltage relay	SPCU 1C6			
SPAU 121 C	O/V and U/V relay	SPCU 1C1			
SPAU 130 C	O/V and U/V relay	SPCU 3C14			
SPAU 140 C	Synchro-check relay	SPCU 3D45			
SPAU 320 C	Voltage relay	SPCU 1C6	SPCU 1C1	SPCU 1C1	
SPAU 320 C /E	Voltage relay	SPCU 1C6	SPCU 1C1	SPCU 1C1	
SPAU 320 C /E146	Voltage relay	SPCU 1C6	SPCU 1C1	SPCU 1C1	
SPAU 320 C /E175	Voltage relay	SPCU 1C6	SPCU 1C1	SPCU 1C1	
SPAU 320 C 1	Voltage relay	SPCU 1C6	SPCU 1C1		
SPAU 320 C1/E	Voltage relay	SPCU 1C6	SPCU 1C1		
SPAU 320 C 3	Voltage relay	SPCU 1C6			
SPAU 320 C 4	Voltage relay		SPCU 1C1	SPCU 1C1	
SPAU 320 C 5	Voltage relay		SPCU 1C1		
SPAU 320 C 7	Voltage relay				
SPAU 330 C	Voltage relay	SPCU 1C6	SPCU 3C14	SPCR 8C19	
SPAU 330 C 1	Voltage relay	SPCU 1C6	SPCU 3C14		
SPAU 330 C 3	Voltage relay	SPCU 1C6			
SPAU 330 C 5	Voltage relay		SPCU 3C14		
SPAU 330 C 7	Voltage relay				
SPAU 331 C 5	Voltage relay	SPCU 3C15			
SPAU 341 C 1	Voltage regulator	SPCU 1D50	SPCN 1D56		
SPAU 341 C 3	Voltage regulator	SPCU 1D50			
SPEF 3A2C C	Med. netw. fault indic.	SPEF 3A2C			
SPOC 110 C	Contr. & meas. module	SPTO 12D4			
SPOC 111 C	Contr. & meas. module	SPTO 12D4			
SPOC 112 C	Contr. & meas. module	SPTO 12D4			