Electrical network protection

Sepam
IEC 61850 communication

For Sepam series 20/40/80

User's manual
06/2008

Schneider Electric

Safety instructions

Safety symbols and messages

Read these instructions carefully and look at the equipment to become familiar with the device before trying to install, operate, service or maintain it. The following special messages may appear throughout this bulletin or on the equipment to warn of potential hazards or to call attention to information that clarifies or simplifies a procedure.

ANSI symbol.

IEC symbol.

Risk of electric shock

The addition of either symbol to a “Danger” or “Warning” safety label on a device indicates that an electrical hazard exists, which will result in death or personal injury if the instructions are not followed.

Safety alert

This is the safety alert symbol. It is used to alert you to potential personal injury hazards and prompt you to consult the manual. Obey all safety instructions that follow this symbol in the manual to avoid possible injury or death.

Safety messages

⚠ DANGER

DANGER indicates an imminently hazardous situation which, if not avoided, **will result** in death, serious injury or property damage.

⚠ WARNING

WARNING indicates a potentially hazardous situation which, if not avoided, **could result in** death, serious injury or property damage.

⚠ CAUTION

CAUTION indicates a potentially hazardous situation which, if not avoided, **could result in** minor or moderate injury or property damage.

Important notes

Restricted liability

Electrical equipment should be serviced and maintained only by qualified personnel. No responsibility is assumed by Schneider Electric for any consequences arising out of the use of this manual. This document is not intended as an instruction manual for untrained persons.

Device operation

The user is responsible for checking that the rated characteristics of the device are suitable for its application. The user is responsible for reading and following the device’s operating and installation instructions before attempting to commission or maintain it. Failure to follow these instructions can affect device operation and constitute a hazard for people and property.

Protective grounding

The user is responsible for compliance with all the existing international and national electrical codes concerning protective grounding of any device.

Contents

Presentation

General

IEC 61850 is a standard for communication networks and systems in substation. Sepam units can be connected to an IEC 61850 station bus by one of the following way:

- the ECI850 Sepam server, for Sepam series 20, Sepam series 40 and Sepam series 80,
- the ACE850 communication interface, for Sepam series 40 and Sepam series 80 only (available soon).

Sepam units with ECI850 and ACE850 are compliant with:

- IEC 61850-6
- IEC 61850-7-1
- IEC 61850-7-2
- IEC 61850-7-3
- IEC 61850-7-4
- IEC 61850-8-1

Application and benefits

Based on the Ethernet protocol, the IEC 61850 communication standard ensures:

- high communication speeds and versatile communication architectures
- interoperability between manufacturers

With ECI850 Sepam server

The ECI850 Sepam server provides a high-performance, cost-effective, and versatile solution for connecting Sepam units to an IEC 61850-compliant system.
This provides:

- compatibility with the whole Sepam range (series 20, 40 and 80) to fit your needs perfectly,
- ability to upgrade existing Sepam units to ensure the durability of your assets,
- ability to connect up to 8 Sepam units to one ECI850, ensuring a cost-effective solution,
- IEC 61850 logical nodes and configurable data sets to fit the needs of your Scada system,
- high-performance because the ECI850 is not a generic gateway but a data server dedicated to Sepam.

With ACE850 communication interface

The Sepam series 40 and Sepam series 80 fitted with the ACE850 communication interface (available soon) provides a built-in solution for demanding IEC 61850 applications:

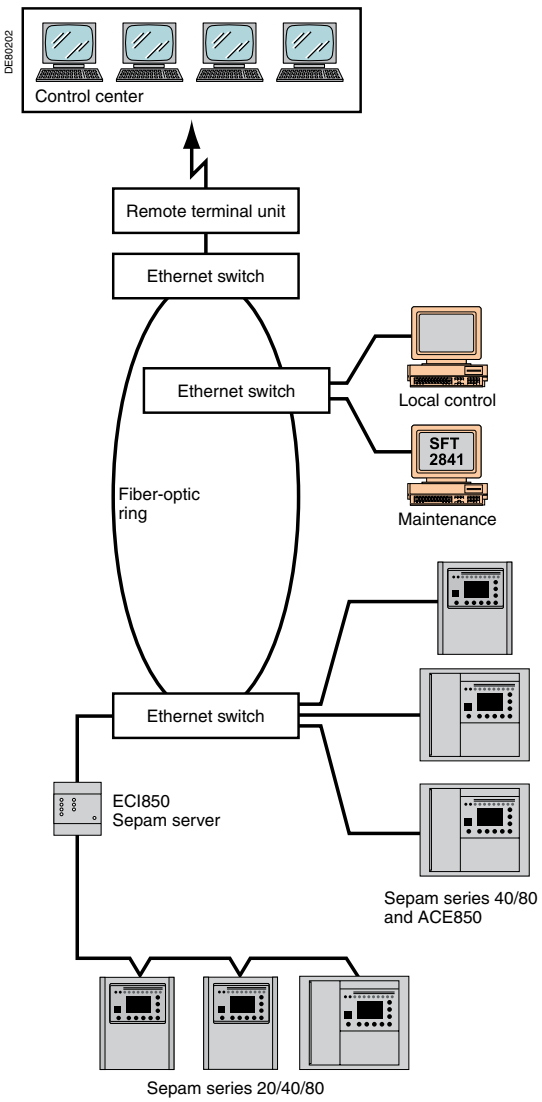
- IEC 61850 logical nodes and configurable data sets to fit the needs of your Scada system,
- Peer-to-peer communication capabilities on Sepam series 80 with GOOSE messages to enhance your protection and control system without additional wiring.

Implementation

The Sepam IEC 61850 solution can be configured in two ways:

- The SFT2841 setting and operating software ensures straightforward configuration and builds standard IEC 61850 configuration files.
- The SFT850 configuration tools adapt the communication profile of the devices to the precise needs of the system.

The Sepam E-LAN runs in parallel with the IEC 61850 S-LAN, allowing Ethernet connection of the SFT2841 setting and operating software to Sepam without any extra cost.
The Sepam series 40 and Sepam series 80 fitted with the ACE850 communication interface (available soon) also supports the Modbus TCP-IP communication protocol.



IEC 61850 architecture.

Typical architecture

■ The ECI850 Sepam server can be connected to an Ethernet switch using 10/100BASE-T copper wire (radial connection).

■ The Sepam series 40 and Sepam series 80 fitted with the ACE850 communication interface can be connected to an Ethernet switch using:

□ 10/100BASE-T copper wire (radial connection)

□ 100BASE-FX multi-mode fiber optic (radial connection) (available soon)

In order to optimize system performance, Schneider Electric recommends the following:

■ build a fault-tolerant backbone fiber-optic ring

■ use IEC 61850 compatible managed switches

A global approach for building an Ethernet infrastructure can be found in the "Transparent Factory Network Design and Cabling Guide" edited by Schneider Electric.

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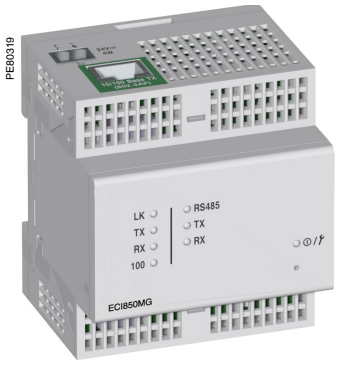
Communication implementation steps



ECI850: IEC 61850 Sepam server.

Prior to the use of IEC 61850 with Sepam and ECI850 Sepam server, the following configuration steps shall be performed:

1. Configuration of Sepam Modbus interface

Communication between ECI850 and Sepam is based on Modbus.
Two kinds of communication interface can be used on Sepam:
- ACE949-2 for 2-wire RS 485 network
- ACE959 for 4-wire RS 485 network

The first step deals with the configuration of the Sepam Modbus interface. It consists of installing the Modbus interface in the equipment, wiring it to the RS 485 network and configuring it, using SFT2841 software.
Refer to the relevant Sepam user's and operation manual for details.
- Sepam series 20 user's manual, reference PCRED301005EN
- Sepam series 40 user's manual, reference PCRED301006EN
- Sepam series 80 operation manual, reference SEPED303003EN
- Sepam series 80 Modbus manual, reference SEPED303002EN

The physical layer parameters have to be configured, with the authorized values. Remote control must be set in "direct" mode. With Sepam series 80, security features must be disabled.

Parameters	Authorized values
Sepam address	1 to 247
Speed	19200 or 38400 bps
Parity	Even or odd

2. Configuration of ECI850

The second step deals with the configuration of ECI850 Ethernet and Modbus layers.
Refer to “Configuration” section on page 5 of this document for details.

3. Configuration of IEC 61850 protocol

The third step deals with the configuration of IEC 61850 protocol. It produces a CID file which contains the configuration of the communication data for all the Sepam connected to an ECI850.

- SFT2841software is used for standard configuration of IEC 61850
(see “Configuration of IEC 61850 protocol” section on page 21 of this document). All communication data is defined in standard ICD files that are gathered in a CID file in function of Sepam type.
- SFT850 software is used for advanced configuration of IEC 61850
(see “With SFT850 configuration software” section on page 28 of this document).
The configuration can be modified to optimize the exchange between devices:
  - Suppress unused communication data
  - Gather relevant communication data
  - …

4. Transfer of the CID file to ECI850

The last step is to load CID file into ECI850 with SFT2841 software. The CID file is checked by ECI850 before being taken into account. See “Transfer of the CID file” section on page 32 for details.

Ethernet setup

Ethernet setup is required to enable access to the ECI850 over a network. If Ethernet setup has already been done at installation time, proceed directly to the section: **Accessing the ECI850 over a network** page 7.

Before configuring the ECI850, obtain a unique static IP address, subnet mask, and default gateway address from the network administrator. Use a Web browser or Hyper Terminal to configure the ECI850 with the information obtained from your network administrator, as described in the following sections.

Ethernet setup using Hyper Terminal

1. Connect to ECI850 RS 232 port using the TCSEAK0100 Configuration kit or any null modem cable.
2. Start Hyper Terminal (click **Start** > **Run**, then type `hypertrm`).
3. In the **Name** text box, type a name for the new connection (for example, `ECI config`), then click **OK**.
4. In the **Connect using** drop-down list, select the computer COM port you will be using, then click **OK**.
5. Set the **COM properties** as follows: Bits per second = 19200, Data bits = 8, Parity = None, Stop bits = 1, and Flow control = None. Click **OK**.
6. Start the ECI850 Setup Utility:
   - Cycle power or press the reset button on the ECI850 below the LED power status.
   - While the green Power/Status LED blinks rapidly, press Enter on the computer keyboard to access the setup utility.

Note: *the Power/Status LED stops blinking after 5 seconds.*

7. The following screen should appear:

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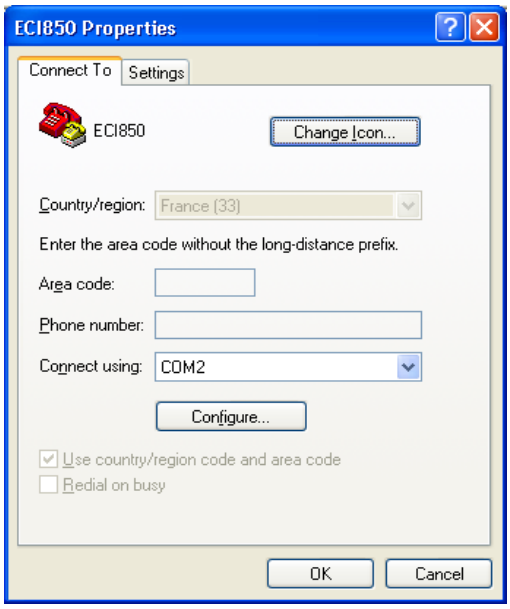

Hyper Terminal: choose connection port.

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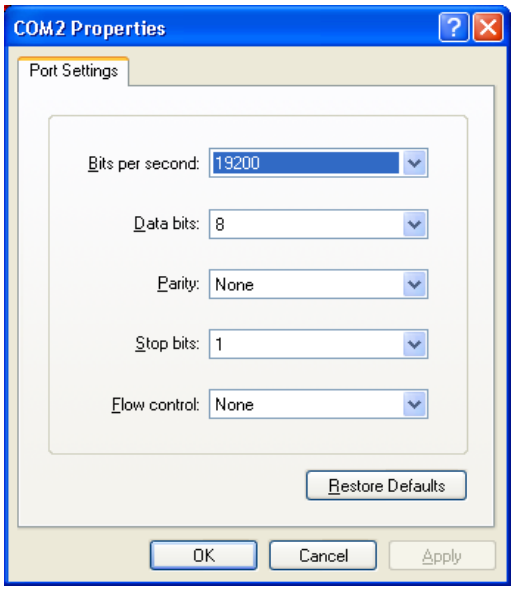

Hyper Terminal: configure serial port.

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```
**********************************************************************
*                    SETUP UTILITY                                   *
**********************************************************************
**********************************************************************
*  Model Number:     ECI850MG                                        *
*  Firmware Version: 0.02                                            *
*  Serial Number:    33003064                                        *
*  MAC Address:      00:80:67:80:67:E9                               *
*                                                                    *
*  (c) 2007 Schneider Electric. All Rights Reserved.                 *
**********************************************************************

Choose an option:

        1 = Change Language (English)
        2 = Change IP Address (10.195.132.115)
        3 = Change Subnet Mask (255.255.254.0)
        4 = Change Gateway Address (10.195.148.1)
        5 = Change Media Type (10T/100Tx Auto)
        6 = Quit
```

Hyper Terminal: access ECI850 setup utility.

ECI850 setup options

Option	Description	Setting
1	Used to select the language for the current Hyper Terminal session.	English, French, Spanish Default: English
2	Used to enter the static IP address of the EGX.	0.0.0.0 to 255.255.255.255 Default: 169.254.0.10
3	Used to enter the subnet mask of your network.	0.0.0.0 to 255.255.255.255 Default: 255.255.0.0
4	Used to enter the default gateway (router) IP address used for wide area network (WAN) communications.	0.0.0.0 to 255.255.255.255 Default: 0.0.0.0
5	Used to define the physical Ethernet connection.	■ 10T/100Tx Auto ■ 10BaseT-HDo 10BaseT-FD ■ 100BaseTx-HD ■ 100BaseTx-FD Default: 10T/100Tx Auto
6	Saves the settings and exits the setup utility.	-

Ethernet setup using a Web browser

1. Disconnect your computer from your network.

Note: *after disconnecting from your network, your computer should automatically use the default IP address 169.254.###.### (### = 0 to 255) and the default subnet mask 255.255.0.0. If the IP address is not automatically configured, contact your network administrator to set up a static IP address.*

2. Connect an Ethernet crossover cable (available in the kit TCSEAK0100) from the ECI850 to the computer.
3. Start Internet Explorer (version 6.0 or higher).
4. In the Address text box, type `169.254.0.10`, then press Enter. Type `Administrator` for your Username, type `ECI850` for your Password, then click **OK**. Usernames and Passwords are case sensitive.
5. Set up parameters as described in the “Ethernet and TCP/IP settings” section on page 8.
6. Reconnect your computer to your network. If you assigned a static IP address to your computer in step 1, you must restore your computer's original settings before reconnecting to your network.

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ECI850 home page.

Accessing the ECI850 over a network

After you have set up the Ethernet parameters, you can access the ECI850 over an Ethernet LAN using Internet Explorer 6.0 or higher.

Logging into the ECI850

Action	Result
1. Launch Internet Explorer 6.0 or higher.	Opens Internet Explorer.
2. In the Address text box, type the address of your ECI850 (`169.254.0.10` is the default), then press Enter.	Opens the Login dialog box.
3. Type your Username (`Administrator` is the default) and Password (`ECI850` is the default) into the text boxes, then click **OK**.	Enters the Username and Password, then opens the ECI850 home page.
4. Click **Setup** to access the ECI850 setup page, or click **Diagnostics** to access the ECI850 diagnostics page.	Opens the Setup or Diagnostics pages.

Logging Out

We recommend logging out whenever you do not need access to the ECI850. To log out of the ECI850 configuration session, click Log Out to end your session.

ECI850 user interface overview

The ECI850 ships with several pre-installed web pages used for ECI850 setup, configuration and diagnostics. See Table below for a description of each web page. Access to pages can be restricted (see Web Pages Access).

ECI850 Web Page	Description	See
Setup		
Ethernet & TCP/IP	Configure Ethernet and TCP/IP communication settings.	page 8
Serial Port	Set up or change serial communication parameters.	page 9
IP Filtering	Set up which IP addresses can access the ECI850.	page 10
SNMP Parameters	Enable and configure the Simple Network Management Protocol (SNMP), which allows the ECI850 to identify itself to network devices requesting SNMP data.	page 11
SNTP Parameters	Enable and configure the Simple Network Time Protocol (SNTP), which allows the ECI850 to be time synchronized.	page 12
User Accounts (1)	Create and edit groups and users.	page 9
Web Page Access (1)	Select web page access rights for each user group.	page 10
Diagnostics		
Communication statistics	Displays diagnostic data used to troubleshoot network problems.	page 14
ECI850 Summary	This page contains information about your specific ECI850, including the serial number, manufacturing date and Media Access Control (MAC) address.	page 16
Read Device Registers	Allows ECI850 administrators to read register data from a serial device connected to the ECI850.	page 17

(1) *Accessible by administrators only.*

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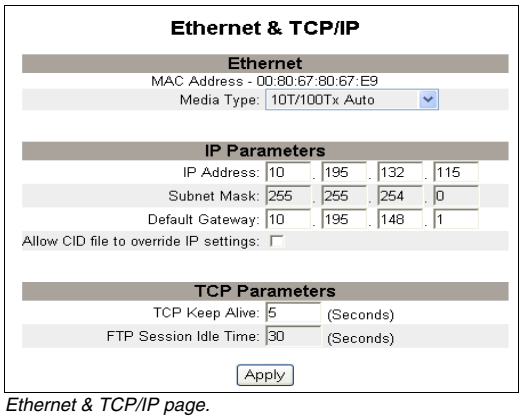

Ethernet & TCP/IP page.

Communications setup

Ethernet and TCP/IP settings

Procedure

Action	Result
1. From the Setup page, click **Ethernet & TCP/IP**.	Opens the Ethernet & TCP/IP page.
2. Select your media type. Contact your network administrator if you do not know.	Selects the media type.
3. Enter your IP address, subnet mask, and default gateway address assigned to your ECI850 by your network administrator.	Enters the Ethernet parameters for the ECI850. ***Note:*** *if you enter an IP address that is used by another device, you will be prompted to select a new IP address. See "Duplicate IP address detection".*
4. Click **Apply**.	Updates the ECI850 Ethernet and TCP/IP settings.

Note: *after making changes to the Ethernet parameters and clicking Apply, the ECI850 will reboot.*

Description of Ethernet and TCP/IP settings

Option	Description	Setting
Media Type	Used to define the physical Ethernet connection or media type.	■ 10T/100Tx Auto ■ 10BaseT-HD ■ 10BaseT-FD ■ 100BaseTX-HD ■ 100BaseTX-FD Default: 10T/100Tx Auto
IP Address	Used to enter the static IP address of the ECI850.	0.0.0.0 to 255.255.255.255 Default: 169.254.0.10
Subnet Mask	Used to enter the Ethernet IP subnet mask address of your network.	0.0.0.0 to 255.255.255.255 Default: 255.255.0.0
Default Gateway	Used to enter the gateway (router) IP address used for wide area network (WAN) communications.	0.0.0.0 to 255.255.255.255 Default: 0.0.0.0
Allow CID file to override IP parameters	Check this box if you want the IP parameters contained in the CID file to replace the above configuration.	Default: not checked
Keepalive	Timeout value used to test for session disconnection.	1 to 60 seconds Default: 30 seconds
FTP session inactivity timeout	Timeout value used to force disconnection of an inactive FTP session	30 to 900 seconds Default: 30 seconds

Duplicate IP address detection

While connected to your network, the ECI850 publishes its IP address. The IP address of the ECI850 must be unique on the network it is connected to. If it is not unique the Power/Status LED repeats a four blink-pause pattern. Assign a new IP address to the ECI850 or to the conflicting device.

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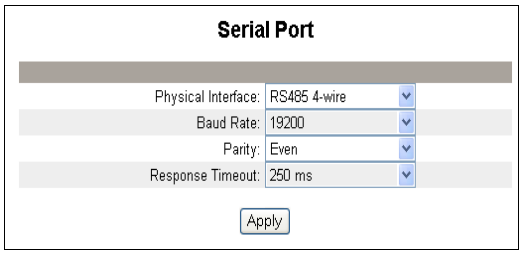

Serial Port page.

Serial port configuration

Procedure

Action	Result
1. From the Setup page, click **Serial Port**.	Opens the Serial Port page.
2. Select your mode, physical interface, transmission mode, baud rate, parity, and response timeout (see Table below).	Selects the serial port options.
3. Click **Apply**.	Updates the ECI850 Serial Port settings.

Description of serial port settings

Option	Description	Setting
Physical Interface	Used to select how the ECI850 serial port is physically wired.	RS 485 4-wire, RS 485 2-wire Default: RS 485 2-wire
Baud Rate	Used to select the data transmission speed over the serial connection.	19200, 38400 Default: 38400
Parity	Used to select which parity bit is used for checking data.	Even, Odd Default: Even
Response Timeout	Used to select how long the ECI850 will wait to receive a response from a device. Default value should usually be kept.	0.1 to 2 seconds Default: 0.3 second

Note: *the settings defined here must match the settings of the connected Sepam devices.*

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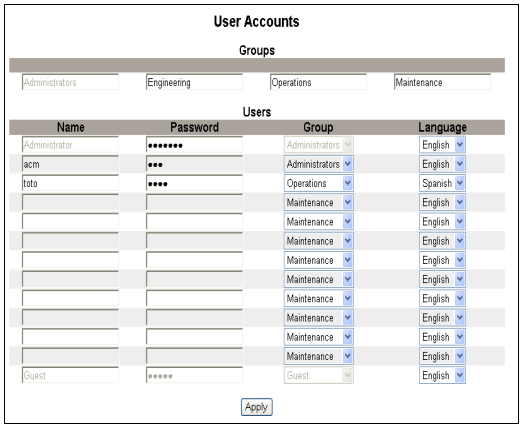

User Accounts page.

Access control configuration

User accounts

ECI850 users are assigned Usernames and Passwords. Each user belongs to a group, and each group has access rights to the ECI850 Web pages assigned by the ECI850 administrator.

Note: *there are two default user accounts: Administrator (password is ECI850) and Guest (password is Guest).*

Procedure

Action	Result
1. From the Setup page, click **User Accounts**.	Opens the User Accounts page.
2. If you want to change a group name, type a new name in one of the **Group** text boxes (the Administrator group name cannot be changed).	Enters a new group name.
3. In the **Users** section, enter a Name (1 to 24 characters) and Password (0 to 12 characters) for a new user. ***Note:*** *Usernames and Passwords are case-sensitive and can contain only alphanumeric characters.*	Enters the name and password for a user.
4. Select a group and the default language for the new user.	Selects the group and language for a user.
5. Repeat steps 3 and 4 for each additional user you want to add.	Continues adding users.
6. Click **Apply**.	Saves all of the user account settings.

ECI850 accounts and passwords description

Account	Default Password
Administrator (default account)	ECI850
Guest (default account)	Guest
User-defined accounts (up to 11 accounts possible)	No default – Password is user-defined

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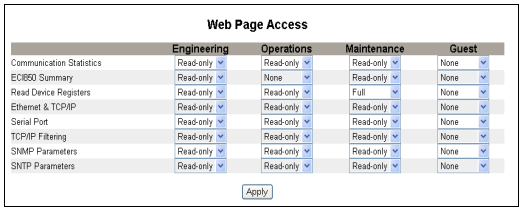

Web Page Access Page.

Web page access

Procedure

Action	Result
1. From the Setup page, click **Web Page Access**.	Opens the Web Page Access page.
2. In the **Ethernet & TCP/IP** row, select the access level (**None**, **Read-only**, or **Full**) that each user group will have for the Ethernet & TCP/IP web page.	See Table below for an explanation of access levels for each group.
3. To allow Guest access to the web page, select **Read-only** under the **Guest** column. if the Guest group is Read-only, other groups can only be set to Read-only or Full.	Allows the default Guest group to access the web page.
4. Repeat steps 2 and 3 for the **Serial Port**, **Device List**, **Statistics**, and **Read Device Registers** rows.	Selects the access level for each web page.
5. Click **Apply**.	Saves the password settings.

Group access

Group	Access
Administrator	Full access to all web pages. We recommend that you change the default administrator password for system security the first time you log in.
Guest	Read-only access to selected web pages.
Three user-defined groups	Choosing from the following options, the administrator assigns web page access for each group. Access levels are as follows: ■ None: a group has no access to selected web page ■ Read-only: password grants a group read-only access to the selected web page ■ Full: a group has the same access as the Administrator group to the selected web page

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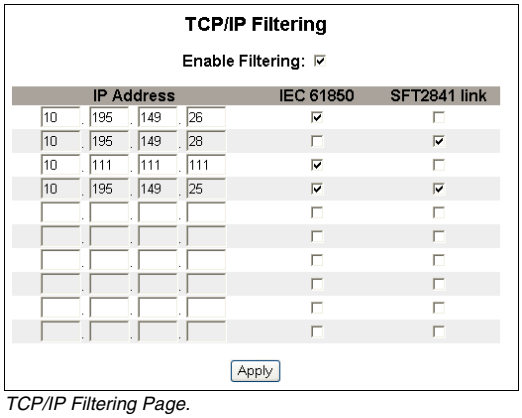

TCP/IP Filtering Page.

IP address filtering

This function allows the administrator to specify which IEC 61850 which IEC 61850 clients and SFT2841 have access to the ECI850 services.

Note: *if IP addresses filtering is enabled, access is forbidden to any device not in the filtered list.*

Procedure

Action	Result
1. From the Setup page, click **IP Address Filtering**.	Opens the **IP Address Filtering** page.
2. Check **Enable Filtering**.	Activates filtering.
3. In the **IP address** column, enter the TCP/IP client address	Enters an IP address for a TCP/IP client that will have access to the IEC 61850 server or to the SFT2841 link or both.
4. In the **IEC 61850** and **SFT2841 link** columns, check what applies.	Selects the access level for the corresponding IP address. SFT2841 link, IEC 61850 or both.
5. Repeat steps 3 and 4 to add more IP addresses.	Continues adding IP addresses for filtering.
6. Click **Apply**.	Saves the IP address filtering list.

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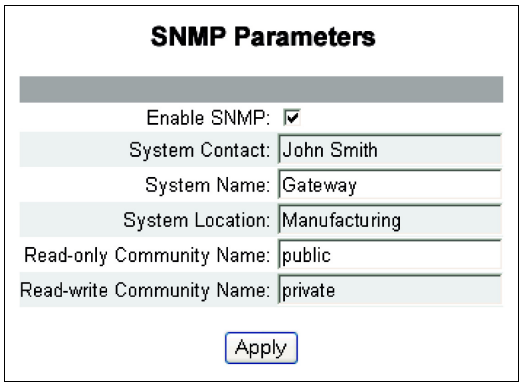


SNMP Parameters page.

Configuring additional features

SNMP parameters

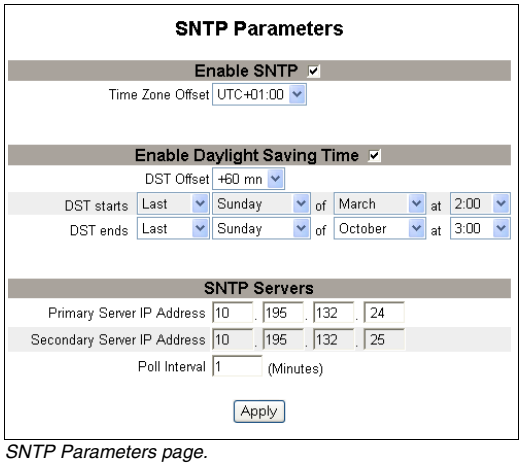
The ECI850 supports SNMP, allowing a network administrator to remotely access it with an SNMP manager (such as ConneXview™) and view the networking status and diagnostics in the MIB2 format.

Procedure

Action	Result
1. From the Setup page, click **SNMP Parameters**.	Opens the SNMP Parameters page.
2. Check **ENABLE SNMP** to turn ON the simple network management protocol. ***Note:*** *if you uncheck* ***Enable SNMP*** *and click* ***Apply****, the ECI850 will reboot and SNMP functionality will be turned OFF.*	Activates SNMP.
3. Enter the **system contact**, **system name**, **system location**, **read-only community name**, and the **read-write community name**.	Enters the SNMP system information and community access names.
4. Click **Apply**.	Saves the SNMP settings.

Settings description

Option	Description	Setting
Enable SNMP	Checking the check box enables SNMP. MIB II support	**Default**: not enabled
System Contact	Name of the administrative contact.	String (< 50 characters) **Default**: empty string
System Name	Name given to the ECI850 and Sepam subnet.	String (< 50 characters) **Default**: empty string
System Location	Location of the ECI850.	String (< 50 characters) **Default**: empty string
Read-only Community Name	SNMP community that has read-only access to the MIB. Acts as a password.	String (< 50 characters) **Default**: "public"
Read-write Community Name	SNMP community that has read-write access to the MIB. Acts as a password.	String (< 50 characters) **Default**: "private"



SNTP Parameters page.

SNTP parameters

SNTP is the time synchronization method required by IEC 61850. It is used in mode 3-4 (unicast mode).
The ECI850 supports SNTP to enable synchronization between the ECI850 and Sepam devices.

- If SNTP is not turned ON, time synchronization must be provided to the Sepam devices by other means (ECI850 time is meaningless in that case).
- If SNTP is turned ON, time synchronization must be set up on Sepam, to the communication channel linked to ECI850 (there are 2 communication channels on Sepam series 80).

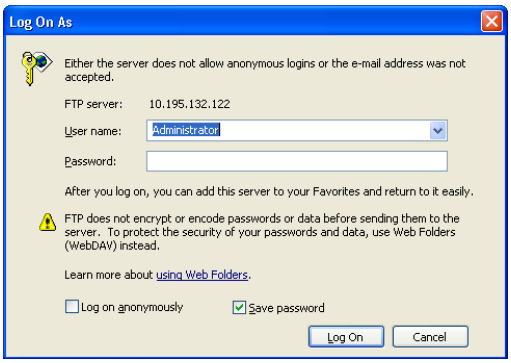
Procedure

Action	Result
1. From the Setup page, click **SNTP Parameters**.	Opens the **SNTP Parameters** page.
2. Check **Enable SNTP** to turn ON the simple network time protocol.	Activates SNTP.
3. Enter the time offset from UTC of your location.	Enters the time zone.
4. Check **Enable DST** to turn ON the Daylight Saving Time (summer Time) feature.	Activates Daylight Saving Time.
5. Enter the time offset for Daylight Saving Time and the start and end time.	Enters DST time offset: start time and end time.
6. Enter the IP address of the primary (or only) SNTP server. If available, enter the IP address of a secondary server to be used if the primary one is not responding.	Enters the address of the SNTP server(s).
7. Enter the poll interval between two requests to the server.	Enters poll interval
8. Click **Apply**. ***Note:*** *changes in the SNTP parameters can require the ECI850 to reboot. This is done automatically.*	Saves the SNTP settings.

Setting descriptions

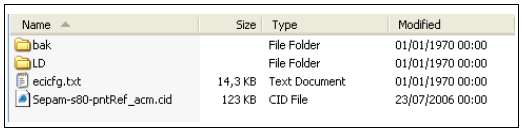
Option	Description	Setting
Enable SNTP	Enables the time and date of the ECI850 to be set by the Simple Network Time Protocol (SNTP) server.	**Default**: not enabled
Time Zone Offset	Determines the difference between local time and Coordinated Universal Time (UTC) (same as GMT).	UTC-12 to UTC+13 **Default**: UTC
Enable Daylight Saving Time	Enables the use of Daylight Saving Time (Summer time).	**Default**: not enabled
DST offset	Difference between standard time and Daylight Saving Time.	+ 30 or + 60 minutes **Default**: none
DST starts	If enabled, DST starts on the selected date.	**Default**: none
DST ends	If enabled, DST ends on the selected date.	**Default**: none
Primary Server IP Address	The IP address of the SNTP server the ECI850 contacts for the time message.	0.0.0.0 to 255.255.255.255 **Default**: 0.0.0.0
Secondary Server IP Address	The IP address of another SNTP server the ECI850 contacts in case the primary server is down.	0.0.0.0 to 255.255.255.255 **Default**: 0.0.0.0
Poll Interval	Controls how often the ECI850 contacts the SNTP server for the correct time.	10 minutes to 1 day **Default**: 1 hour.

PE80106



Logging into the FTP server.

PE80107



ECI850 directories view.

After you set up the Ethernet parameters, you can access the ECI850 FTP server, using Internet Explorer or another FTP client. The following description is made using Internet Explorer 6.

***Note:** access to the FTP server is restricted to accounts belonging to the Administrators group.*

Logging into the FTP server

Action	Result
1. Launch Internet Explorer, type `ftp://` and the IP address of the ECI850 in the Address text box (for example, `ftp://10.10.10.10`), then press **Enter**.	Opens the **Log On As** dialog box.
2. Type the Username and the Password in the text boxes, then click **Log On**.	Opens an FTP session with the ECI850 and displays the root directory of the ECI850.

ECI850 directories

Root directory

The root directory contains:

- the logical devices directory LD

It is structured as described by the IEC 61850 standard. There is one directory for each Sepam Logical Device. In each of these, a COMTRADE directory contains the disturbance files CFG and DAT These files can only be read. They can also be read using IEC 61850 file transfer.

- the backup directory BAK

It contains the backup IEC 61850 file, if any. This file can only be read. This file is only kept as an archive. It is not used by the ECI850.

- the ECI850 standard configuration file "ecicfg.txt". This file can be read or written. It is checksum protected and must not be modified. When written to the device, it updates the device parameters except the Ethernet settings.
- the IEC 61850 configuration file CID" (if loaded). This file can be read or written. It is protected and can be modified only with the SFT2841 or SFT850 tools.

Transferring files from the ECI850 to the computer

Action	Result
1. Right-click the file you want to download from the ECI850, then click **Copy**.	Copies the selected file.
2. Locate the folder you want to save the copied file, right-click in the folder's window, then click **Paste**.	Pastes the file into the folder.
3. Repeat steps 1 and 2 if you want to copy other files from the ECI850	Continues to copy files from the ECI850.
4. Click the **Close** button on the Internet Explorer window.	Closes Internet Explorer and ends the FTP connection to the ECI850.

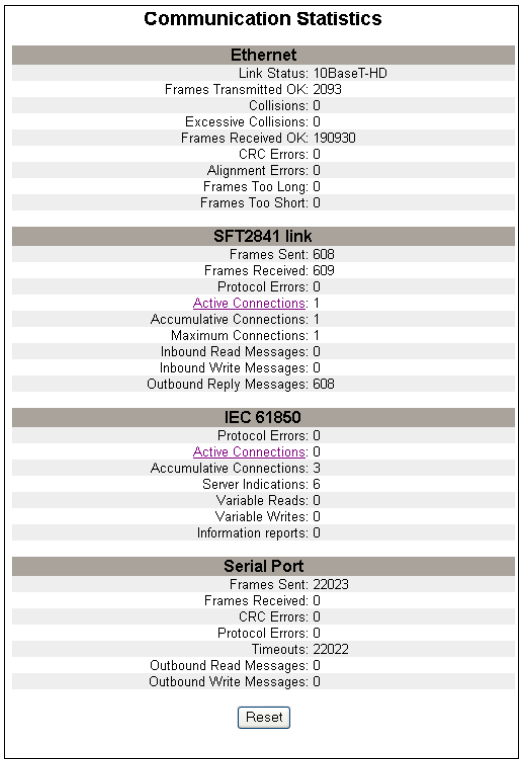
Transferring files from the computer to the ECI850

Write-able files are transferred to the ECI850 as described above, inverting source and destination folders.
IEC configuration files can also be transferred with the SFT2841 software (see page 25).

Introduction

Diagnostics pages provide useful information for network monitoring, tuning, and troubleshooting.
There are 3 diagnostics pages:

- Communication statistics page to troubleshoot Ethernet TCP/IP communication
- ECI850 summary page to display communication identification parameters
- Read device registers page to troubleshoot Modbus communication



Communication Statistics page.

Communication statistics

Procedure

Action	Result
1. From the **Diagnostics** page, click **Communication Statistics**.	Opens the **Communication Statistics** page.
2. View the data	See “Interpreting Statistics” below.
3. Click **Reset**.	Resets the ECI850 cumulative diagnostic data to 0.

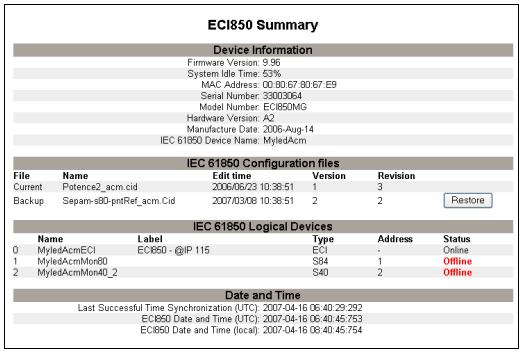
Interpreting statistics

Statistic	Description
Ethernet	
Link Status	A status string that represents the speed and duplex setting being used to communicate with the linking partner.
Frames Transmitted OK	A counter that increments each time a frame is successfully transmitted.
Collisions	A counter that increments each time a frame is retransmitted due to collision detection.
Excessive Collisions	A counter that increments each time a frame is not able to be sent due to reaching the maximum collision status based on the Truncated Binary Exponential Backoff algorithm.
Frames Received OK	A counter that increments each time a frame is successfully received.
CRC Errors	A counter that increments each time a frame is received that has a checksum/CRC that does not match what is calculated.
Alignment Errors	A counter that increments each time a frame is received that has a checksum/CRC error and does not end on an 8-bit frame boundary.
Frames Too Long	A counter that increments each time a frame is received that is larger than the allowed maximum size defined in the standards (frames larger than 1518 bytes).
Frames Too Short	A counter that increments each time a frame is received that is smaller than the allowed minimum size defined in the standards (frames smaller than 64 bytes).
SFT2841 link	
Frames Sent	A counter that increments each time a frame is sent.
Frames Received	A counter that increments each time a frame is received.
Protocol Errors	A counter that increments each time an ill-formed message is received.
Active Connections	A status value that represents the number of connections that are active at the moment the diagnostics page is refreshed. A maximum of 4 connections are supported. Clicking Active Connections opens a new window with a list of all of the active client connections.
Accumulative Connections	A counter that increments each time a connection is made to the ECI850.
Maximum Connections	A status value that represents the maximum number of connections that were active at any given moment.
Inbound Read Messages	A counter that increments each time a read request message is received.
Inbound Write Messages	A counter that increments each time a write request message is received.
Outbound Reply Messages	A counter that increments each time a reply message is sent.

Interpreting statistics (cont.)

Statistic	Description
IEC 61850	
Protocol Errors	A counter that increments each time a received request is incorrect or cannot be satisfied.
Active Connections	A status value that represents the number of connections that are active at the moment the diagnostics page is refreshed. A maximum of 6 connections are supported. Clicking Active Connections opens a new window with a list of all of the active client connections.
Accumulative Connections	A counter that increments each time a connection is made to the ECI850.
Server indications	A counter that increments each time the server receives a protocol indication.
Variable Reads	A counter that increments each time the server receives a read variable request.
Variable Writes	A counter that increments each time the server receives a write variable request.
Information reports	A counter that increments each time the server sends an information report message.
Serial port	
Frames Sent	A counter that increments each time a frame is sent.
Frames Received	A counter that increments each time a frame is received.
CRC Errors	A counter that increments each time a message is received that has a CRC that does not match what is calculated. Typically the result of wiring issues.
Protocol Errors	A counter that increments each time an ill-formed message is received.
Timeouts	A counter that increments each time a request message is sent without receiving a corresponding response message within the allowed time. Timeouts are typically the result of configuration errors or a non-responsive device.
Outbound Read Messages	A counter that increments each time a read request message is sent.
Outbound Write Messages	A counter that increments each time a write request message is sent.

PE80062



ECI850 Summary

Device Information

Firmware Version: 9.96
System Idle Time: 53%
MAC Address: 00:80:67:80:67:E9
Serial Number: 33003064
Model Number: ECI850MG
Hardware Version: A2
Manufacture Date: 2006-Aug-14
IEC 61850 Device Name: MyledAcm

IEC 61850 Configuration files

File	Name	Edit time	Version	Revision	
Current	Potence2_acm.cid	2006/06/23 10:38:51	1	3	
Backup	Sepam-s80-pntRef_acm.Cid	2007/03/08 10:38:51	2	2	Restore

IEC 61850 Logical Devices

	Name	Label	Type	Address	Status
0	MyledAcmECI	ECI850 - @IP 115	ECI	-	Online
1	MyledAcmMon80		S84	1	Offline
2	MyledAcmMon40_2		S40	2	Offline

Date and Time

Last Successful Time Synchronization (UTC): 2007-04-16 06:40:29:292
ECI850 Date and Time (UTC): 2007-04-16 06:40:45:753
ECI850 Date and Time (local): 2007-04-16 08:40:45:754

ECI850 Summary page.

ECI850 Summary

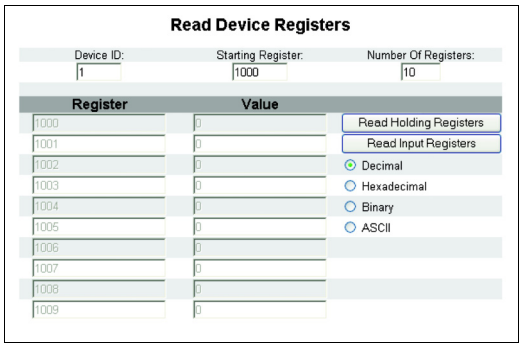
Procedure

Action	Result
1. From the **Diagnostics** page, click **ECI850 Summary**.	Opens the **ECI850 Summary** page.
2. View the data	See “Interpreting information” below.

Interpreting information

Information	Description
Device Information	
Firmware Version	The firmware version that is installed on the ECI850
System Idle Time	A percentage from 0% to 100% indicating the average processor time that is not being used
MAC Address	The unique Ethernet hardware address of the ECI850
Serial Number	The serial number of the ECI850
Model Number	The ECI850 model number
Hardware Version	The ECI850 hardware version
Manufacture Date	The date the ECI850 was manufactured
IEC 61850 Device Name	The name given to the ECI850 device in the IEC 61850 configuration file
IEC 61850 Configuration files	
File	"*Current*" is the last loaded CID file "*Backup*" is the archived CID file
Name	Name of the file as defined at loading
Edit time	Time at which the configuration file has been created
Version	Version of the file as defined in the file header
Revision	Revision of the file as defined in the file header
Restore	This button overwrites the content of the current file with the content of the backup file.
IEC 61850 Logical devices	
Name	Name of the logical device built from the configuration file
Label	Label of the device (Sepam label or ECI850 system name)
Type	Type of the device as declared in the configuration file
Address	Modbus address of the device as declared in the configuration file
Status	■ Offline: the declared device does not respond to ECI850 requests ■ Wrong type: the device at this address is not of the expected type ■ Init: the device database is being initialized ■ Online: the device is operational ■ Bad Conf.: there is an error in the configuration file, the device is ignored
Date and time	
Last Successful Time Synchronization (UTC)	Displays the last time the ECI850 successfully contacted the SNTP server (UTC time).
ECI850 Date and Time (UTC)	Current time and date of the ECI850 (UTC time).
ECI850 Date and Time (local)	Current time and date of the ECI850 (local time).

PE80054



Read Device Registers page.

Read Device Registers

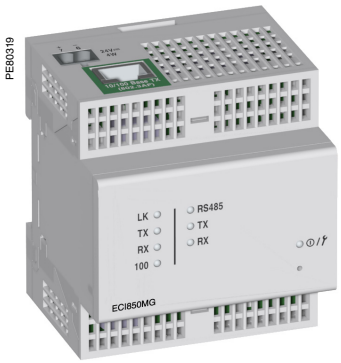
Read Device Registers page can be used to check Modbus communication between the ECI850 and Sepam devices.

Procedure

Action	Result
1. From the Diagnostics page, click **Read Device Registers**.	Opens the Read Device Registers page.
2. Enter the **Device ID**, **Starting Register** number, and the **Number of Registers** to read.	Enters the values to begin reading registers for the specified device.
3. Click **Read Holding Registers** or **Read Input Registers**.	Displays the values for the listed registers.
4. To change how the data is displayed in the **Value** column, select **Decimal**, **Hexadecimal**, **Binary**, or **ASCII**.	Selects how the data values are displayed.

ECI850 Read Device Register Settings

Option	Description	Default
Device ID	The address of the device that registers are read.	1
Starting Register	The first register to read.	1000
Number of Registers	The number of registers to read (1 to 10).	10
Register column	Lists the register numbers.	-
Value column	Lists the data stored in a register.	-
Decimal, Hexadecimal, Binary, or ASCII options	Select an option to specify how the Value column data is displayed.	Decimal



ECI850: IEC 61850 Sepam server.

Installation and operating instructions

The ECI850 Sepam server must be installed and connected in accordance with the instructions in the following documents:

- ECI850 installation guide (delivered with each ECI850), reference 63230-216-314A1,
- Sepam series 20 user's manual, reference PCRED301005EN,
- Sepam series 40 user's manual, reference PCRED301006EN,
- Sepam series 80 operation manual, reference SEPED303003EN.

To download these documents, follow the procedure below:

1. Go to www.merlin-gerin.com.
2. Select Products> Products Index.
3. Select Electrical Network Management.
4. Choose Sepam series xx.
5. Select Technical Publications.
6. Click on the manual you want to download.

Troubleshooting

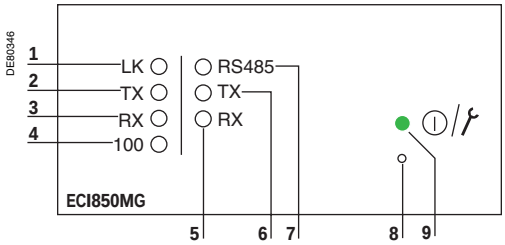
Troubleshooting makes use of:

- ECI850 front panel LED indicators
- ECI850 web diagnostics pages

It should be done in the following order:

1. Check the ECI850 connection to Ethernet.
2. Check the Modbus subnetwork.
3. Check the IEC 61850 configuration.

ECI850 front panel LED indicators



Ethernet status LEDs (green):

1 LK LED on: Ethernet link active
2 TX LED flashing: transmitting data
3 RX LED flashing: receiving data
4 100 LED
- On: 100 Mb link speed
- Off: 10 Mb link speed

Serial status LEDs (yellow):

5 RX LED flashing: receiving data
6 TX LED flashing: transmitting data
7 RS 485 link mode:
- On: RS 485 mode
- Off: RS 232 mode

8 Reset button
9 Power/status LED

ECI850 and Ethernet troubleshooting

Symptoms	Possible cause	Action/Remedy
Power/Status LED off	Source power is not applied or is not stable.	Apply power or check source.
	LED is burned out.	Check to see if other LEDs operate properly.
Ethernet LK LED off	Proper link is not established.	1. Make sure the proper cable is used and connected. 2. Make sure the proper media type is selected in the ECI850. 3. Check the communications setup configuration.
Power/Status LED repeats a four blink-pause pattern.	The IP address that the ECI850 was assigned is being used by another network device.	Assign a new IP address to the ECI850 or to the conflicting device. ***Note:*** *when a duplicate IP address is detected, the ECI850 resets its specified IP address to the default IP address. When the ECI850 detects the conflict no longer exists, it will use the specified IP address.*
Cannot browse the ECI850.	Incorrect network configuration.	1. Verify all IP parameters are correct. 2. Verify ECI850 receives requests: ping ECI850 by: ■ going to DOS prompt ■ typing `ping` and the ECI850 IP address ■ e.g., `ping 169.254.0.10`. 3. Verify that all browser internet connections settings are correct.

Modbus subnetwork troubleshooting

Symptoms	Possible cause	Action/Remedy
RS 485 LED off	ECI850 has not started correctly.	Check to see if there is an Ethernet connection problem.
Serial TX not flashing	The IEC 61850 server is not configured and there is no SFT2841 remote connection active.	This is a normal situation.
	The IEC 61850 server is not configured and there a SFT2841 remote connection active.	The SFT connection can be active on another ECI850. Check IP addresses.
	The IEC 61850 server is configured and there is no SFT2841 remote connection active.	Check the IEC configuration file.
Serial TX flashing Serial RX not flashing	Setting of ECI850 serial port does not match setting of Sepam devices.	Check and correct settings.
	Modbus addresses configured in the IEC file or in the SFT2841 do no match Sepam addresses.	Check and correct addresses.
	The RS 485 network is not wired properly.	Check and correct wiring.

IEC 61850 configuration troubleshooting

Symptoms	Possible cause	Action/Remedy
IEC 61850 clients can not connect to the ECI850	Ethernet setup is not correct.	See above.
	The maximum number of active connections is reached.	Check the active clients.
IEC 61850 clients connect to the ECI850, but no data is available	The IEC 61850 server is not configured or the configuration file is not valid.	Download a valid configuration file.
The IEC 61850 server is working, but some logical devices do not report data.	The actual Sepam type at a given address is not the type expected in the configuration file.	Check device address, correct the configuration file or replace device.
	The device is not communicating.	Check device, check its communication parameters, check wiring.

Configuration of IEC 61850 protocol
Introduction

Configuration files

The IEC 61850 configuration process uses and generates several types of Substation Configuration Languages (SCL) files:

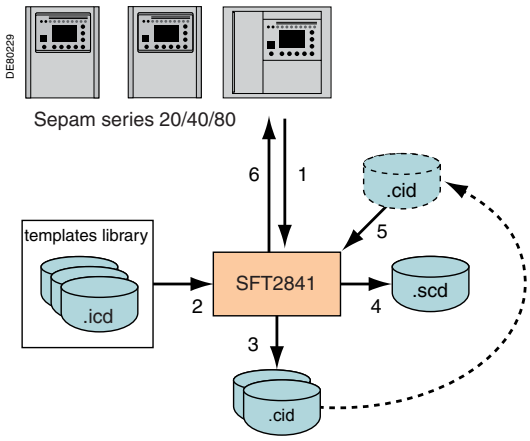
■ ICD files: ICD stands for "IED Capability Descriptions" (IED = Intelligent Electronic Device). An ICD file describes all the communication data available in a Sepam. There is a specific ICD file for each type of Sepam. They are delivered with software configuration tools as a library and are used as models for the configuration process.

■ CID files: CID stands for "Configured IED Description". The CID files are created by configuring the devices, and are then loaded on the devices that need to be configured. The devices could be a Sepam or an ECI850. In the latter case, the CID file contains the configuration of all the Sepam connected to the ECI850.

■ SCD files: SCD stands for "System Configuration Description". An SCD file contains the configuration of an IEC 61850 system, centralizing all the communication configuration data of all the Sepam of an IEC 61850 system.

SFT2841 for standard IEC 61850 configuration

The Sepam setting and operating software SFT2841 is used to produce a standard IEC 61850 configuration. The standard configuration enables the use of all the communication data of a Sepam, as described in the ICD files, without modification.



Exchanges with SFT2841.

The SFT2841 can be used to:

1 Get the information from Sepam and ECI850 connected to the IEC 61850 network. This can be done manually by keying the Sepam description (name, type, address) or automatically by the SFT2841 polling the network to find connected devices.

2 Extract ICD files from the library to build a configuration based on the Sepam description.

3 Build a CID file as a result of the configuration for each Sepam or ECI850 connected to the IEC 61850 network. For an ECI850, it contains the configuration of all the Sepam connected to the ECI850.

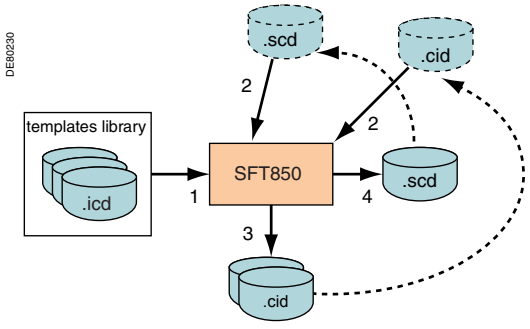
4 Generate an SCD file for use by other IEC 61850 configuration tools. It contains the configuration of all Sepam and ECI850 connected to the IEC 61850 network.

5 Import a CID file into SFT2841 to modify it: for example to add or remove a Sepam in the IEC 61850 network topology.

6 Download a CID file into Sepam or ECI850 with SFT2841.

SFT850 for advanced IEC 61850 configuration

IEC 61850 configuration software SFT850 is used to create, display, modify or optimize an IEC 61850 configuration.



Exchanges with SFT850.

The SFT850 can be used to:

1 Create an IEC 61850 configuration using an ICD file or add a Sepam to an existing configuration.

2 Import a CID or an SCD file to modify its contents:
- ■ Add or suppress a Sepam
- ■ Display the configuration
- ■ Modify communication parameter values
- ■ Optimize configuration by creating or modifying the Dataset and Report Control Block.

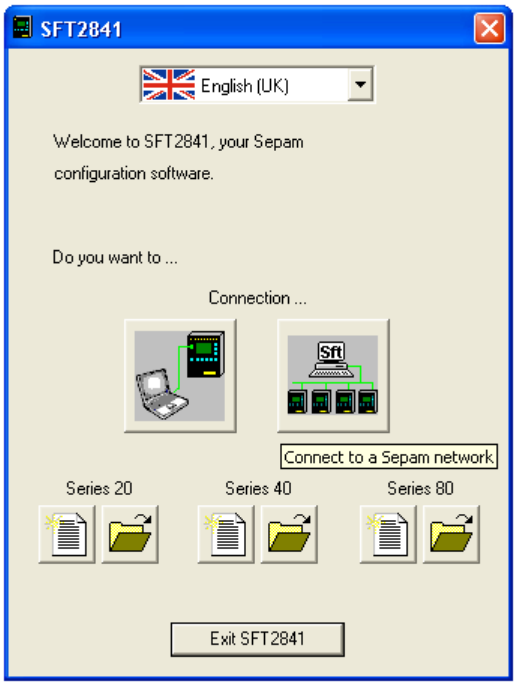
Note: *The CID or SCD file can come from the SFT2841.*

3 Generate a CID file for storing the configuration of one device which can then be downloaded to the Sepam or ECI850 using SFT2841 or by FTP with a standard Internet browser software.

4 Generate an SCD file for storing the configuration of an IEC 61850 system which can then be used by other IEC 61850 configuration tools.

Configuration of IEC 61850 protocol
With SFT2841 setting and operating software

PE80066



SFT2841 welcome window.

Introduction

The SFT2841 software provides a quick and easy way to generate all the standard configuration files that describe the IEC 61850 access to Sepam devices according to standard IEC 61850-6. These files are:

- The ECI850 CID file that describes the communication and data interface to all Sepam attached to the server as Logical Devices.
- The CID file for the Sepam series 40 and Sepam series 80 fitted with the ACE850 communication interface.
- The SCD file that gives the complete description of the whole IEC 61850 communication system and that can be used as input to configure the SCADA system.

The SFT850 configuration software provides all necessary functions for an advanced IEC 61850 configuration. SFT2841 supports only a standard IEC 61850 configuration with predefined device capabilities (predefined Datasets and Report Control Blocks).

To configure an IEC 61850 Sepam communication system using SFT2841, follow these steps:

1. Create a Sepam communication network
2. Add the Sepam and ECI850 devices to the network
3. Generate the CID files, and optionally, the SCD file
4. Load the CID files into the devices

Sepam communication network

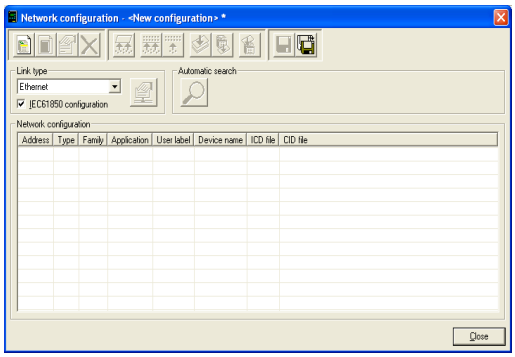
SFT2841 can be connected to Sepam either locally in point-to-point mode, or in multipoint mode via a communication network called E-LAN (Engineering Local Area Network).

First the definition of a Sepam communication network is described in a configuration file (NET file) with SFT2841.
Then the Sepam devices can be addressed by SFT2841 via the E-LAN and constitute a Sepam communication network.

In an IEC 61850 system based on Ethernet TCP/IP, the E-LAN uses the same Ethernet TCP/IP communication network. Therefore, this network configuration (defined in a NET file) can be successfully adapted to include the full description of the IEC 61850 Sepam devices profiles, thus creating their CID files.

SFT2841 is able to load into the Sepam devices and ECI850 their CID file via the Ethernet network.

PE80067



Network configuration.

Creating a Sepam communication network

When creating a Sepam communication network (NET file) with SFT2841, 3 types of communication link are possible:

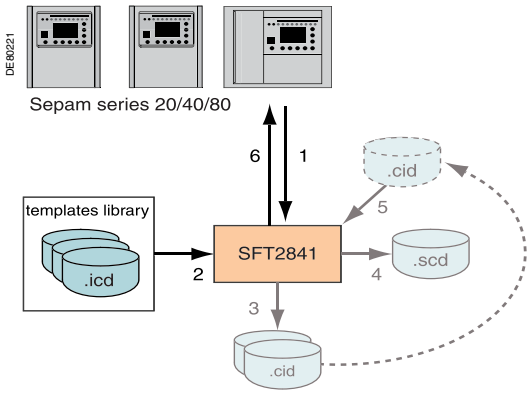
- Serial
- Phone modem
- Ethernet

To create an IEC 61850 Sepam network do the following steps:

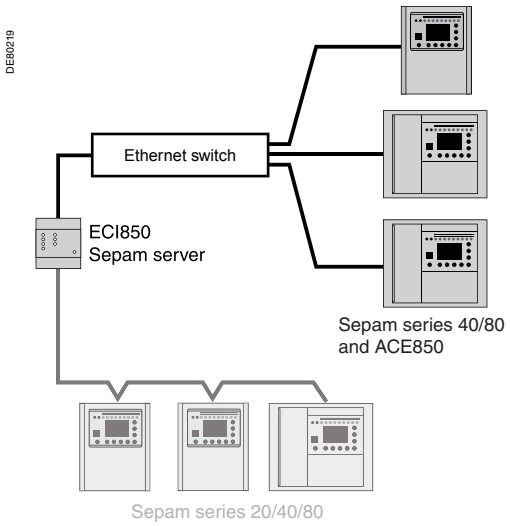
1. Select **Ethernet** because IEC 61850 is based on Ethernet TCP/IP protocol over Ethernet network.
2. Select the option **IEC 61850 configuration**.

This option enables a set of functions that are used during the IEC 61850 configuration process.

Configuration of IEC 61850 protocol
With SFT2841 setting and operating software

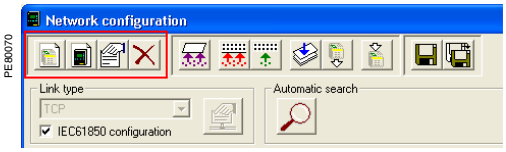


Adding devices to the network.



Adding an Ethernet TCP/IP device.

Adding devices



Device editing functions.

Device editing functions

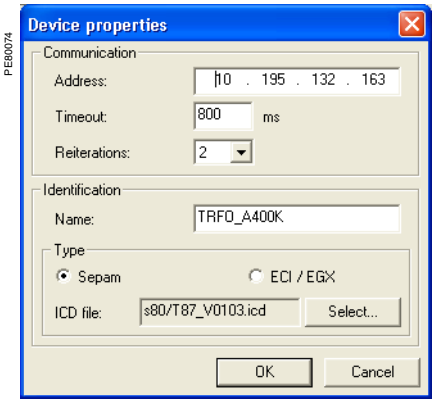
To define the devices to be connected on the network, 4 options are available:
- Add an Ethernet TCP/IP device
- Add a device on an ECI850
- Modify a device
- Remove a device from the configuration

These actions are also available from a contextual menu.

Adding an Ethernet TCP/IP device

To add an Ethernet TCP/IP device (ECI850 or Sepam series 40/80 and ACE850):

1. Click on the button  to display the following Device properties window.



2. Set the fields of the Device properties window according to following description.

Communication settings

- Address

Assign an IP address to the device.
This address is used by SFT2841 to access the device for loading the CID file. This address must match the IP address assigned locally to the device. It must be unique on the Ethernet TCP/IP network.

- Timeout and Reiterations

These parameters are related to the communication between SFT2841 and the device when SFT2841 is used in multi-point mode via the E-LAN. They have no impact on the IEC 61850 configuration. Default values should be kept.

Device identification

- Device name

The device name is the name of the IED in the IEC 61850 system. It must be unique in the IEC 61850 system.

- ICD file
- Device type

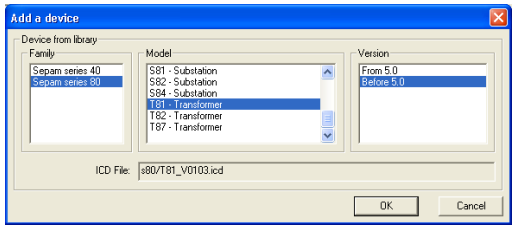
For a Sepam series 40 or Sepam series 80 device, set the type to Sepam. For an ECI850, set the type to ECI/EGX.

- ICD file

Select the ICD file that provides the IEC 61850 description of the device.
SFT2841 software is delivered with a library of ICD files for all types of Sepam devices and all Sepam applications. This library also includes the ICD file for the ECI850.

Configuration of IEC 61850 protocol
With SFT2841 setting and operating software

PE80075



Browsing the library and device selection.

Selecting a device in the library

SFT2841 displays the list of IEC 61850 devices available in the library.
To browse inside the ICD library, use the 3 access keys: Family, Model and Version.

1. Select the Family you wish.

Then the Model defines a device within the Family.
For instance, the Family Sepam series 80 includes the following Models:

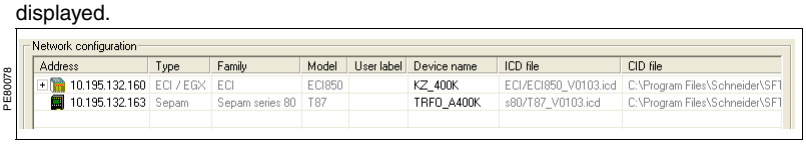
- Substation S80, S81, S82, S84
- Transformer T81, T82, T87
- Generator G82, G87, G88
- Motor M81, M87, M88
- Busbar B80, B83
- Capacitor C86

2. Select the Model you wish.
3. For a given Model, select the Version.

The correct ICD file associated with the device is automatically selected.

The new device is added to the devices table and all its main characteristics are displayed.

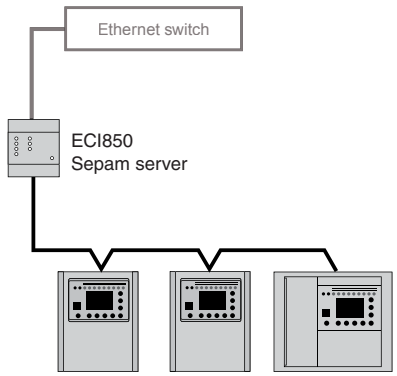
PE80078



Ethernet TCP/IP devices added on the devices table.

The ECI850 is represented by the following icon: .
A Sepam is represented by the icon: .

DE80222



Adding an Ethernet TCP/IP device.

Adding a Sepam on the ECI850

This option is enabled only if an existing ECI850 is selected in the devices table.

To add a Sepam:
1. Click on the button .
2. Set the fields of the device settings window according to following description.

Properties

- Address

Assigning a Modbus address to the device from 1 to 247.
This address is used by the ECI850 to access the device as a slave device via the Modbus subnetwork. It must be unique on the Modbus subnetwork.

- Device name

Assigning a name to the device.
Each Sepam attached to the ECI850 will be considered as a Logical Device (LD) according to the IEC 61850 standard. The name of the device will be the name of the LD inside the ECI850. It must be unique inside the server.

- ICD file

Selecting the ICD file that provides the IEC 61850 description of the device.

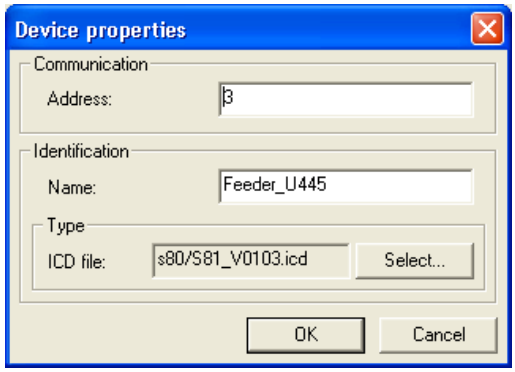
Selecting the device in the library

To select the ICD file that provides the IEC 61850 description of the device, follow the same process as described for an Ethernet TCP/IP device, browsing inside the ICD library with the 3 access keys: Family, Model and Version.

The Family depends on the device type so select the Model, then select the Version.

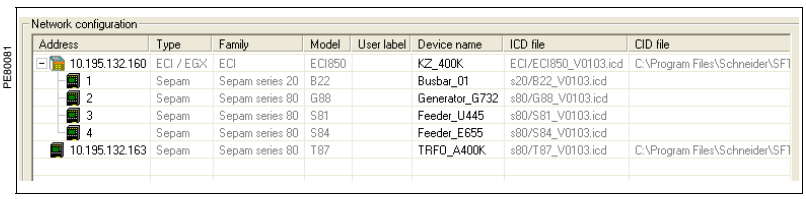
When the action is complete, the new Sepam is added to the devices table and all its main characteristics are displayed.

PE80080



Sepam device settings window.

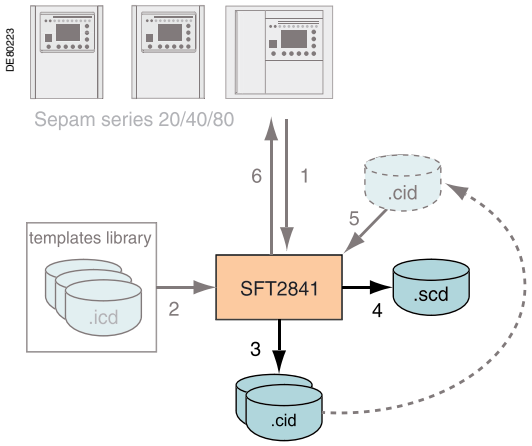
PE80081



Sepam devices added on the devices table.

The ECI850 is represented by the following icon: .
A slave Sepam connected to an ECI850 is represented by the icon and a link to the ECI850 icon.

Configuration of IEC 61850 protocol
With SFT2841 setting and operating software



Generating CID and SCD files.

Generating the CID files and the SCD file

After the devices have been added to the IEC 61850 communication network, SFT2841 can generate the CID file of a specific device or all the CID files for all IEC 61850 devices defined on the network. SFT2841 can also generate the SCD file that describes the Sepam communication network as an IEC 61850 communication system.

3 functions are available to generate the CID files and the SCD files.

To activate these functions, use the following 3 buttons in the toolbar:

Generating a specific CID file

To generate the CID file of a specific device, select the device in the devices table and click on the button  .

Note: *this button is enabled only when an Ethernet TCP/IP device is selected (ECI850, Sepam series 40 or Sepam series 80 directly connected to the Ethernet TCP/IP network).*

A dialog box requests the location and name of the CID file. By default, the name of the CID file is built from the IED name: <IED-name>.cid.

Generating all CID files

To generate all of the CID files for all IEC 61850 devices defined on the network, click on the button  .

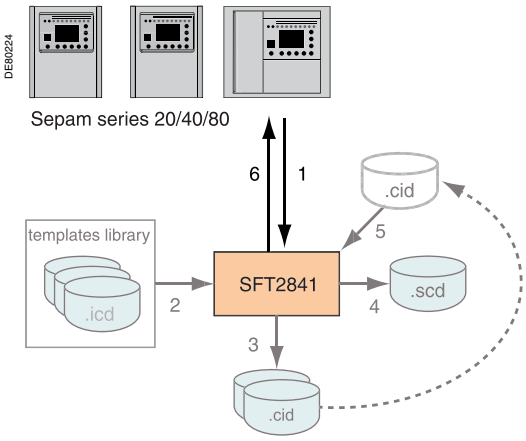
A dialog box requests you to provide the location of the CID files. The name of each CID file is built from the IED name: <IED-name>.cid.

Generating the SCD file

To generate the SCD files for all IEC 61850 devices defined on the network, click on the button  .

A dialog box requests the location and name of the SCD file. By default, the name of the SCD file is built from the name of the Sepam NET file: <NET file name>.scd.

Configuration of IEC 61850 protocol
With SFT2841 setting and operating software



Loading a CID file into a device.

Loading a CID file into a device

To load a CID file into a device, select the device from the devices table and click on the button  .

Note: *this button is enabled only when an Ethernet TCP/IP device is selected (ECI850, Sepam series 40 or Sepam series 80 directly connected to the Ethernet TCP/IP network).*

1. A dialog box requests to select the CID file to load.
2. The file transfer from SFT2841 to the device is based on FTP protocol. A dialog box requests your Username and Password in order to establish the FTP connection with the device.

The Username and Password should match those defined in the FTP server embedded in the remote device. Ask your IEC 61850 network administrator for the FTP Username and Password.

3. When the load of the CID file is complete, the connection with the remote device is automatically closed and the following result message "CID file downloaded successfully" is displayed.

Special transfer error cases

The transfer of the CID file is aborted by the device in the following cases:

- The content of the CID file is corrupted

To guarantee the integrity of the CID files, SFT2841 and Schneider Electric devices use a check key. If a CID file is modified using an XML editor or any other editor, the CID file will be considered as corrupted and refused by the device.

- Memory overflow

The device refuses the CID file if there is not enough memory to store it on the device.

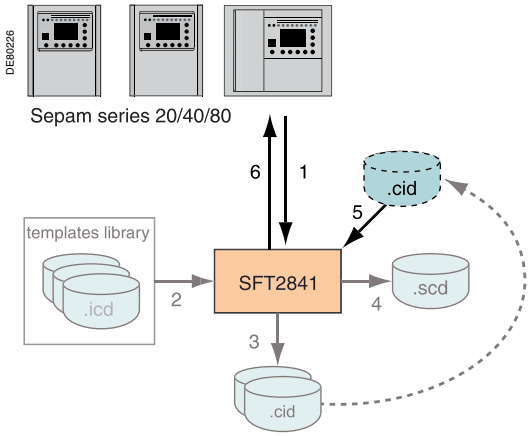
Configuration of IEC 61850 protocol
With SFT2841 setting and operating software

Importing a device configuration from an existing CID file

This function enables the creation of a Sepam communication network by importing CID files. In this case, descriptions of devices are provided by CID files, instead of ICD files.
If the CID file represents an ECI850 Sepam server, all associated Sepam devices will be automatically added to the Sepam communication network.
To import a device from a CID file, proceeds as follow:
1. Add an Ethernet TCP/IP device by clicking the button  .
2. Enter the IP address. The other parameters are not needed, as they will be taken automatically from the CID file.

Note: *to import a CID file from a remote device, the address must be the IP address of this device.*

3. When the device is created and appears in the devices table, select it.
4. Then, associate an existing CID file to the selected device. 2 cases are possible:
- The CID file is on the PC.
- The CID file is on the remote device.



Importing a device configuration.

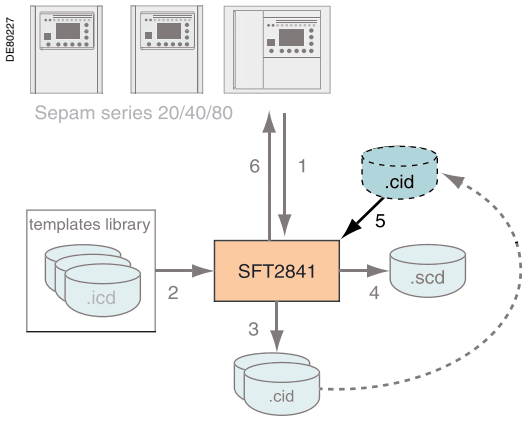
Importing a CID file from the PC

If the CID file is on the PC, click on the button 

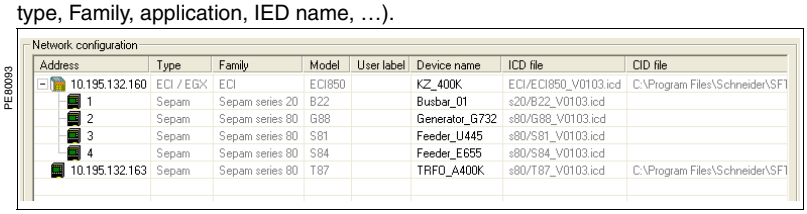
Note: *this button is enabled only when an Ethernet TCP/IP device is selected in the devices table.*

1. A dialog box asks you to select a CID file on the disk.
2. After the CID file has been selected, the description of the device in the devices table is automatically updated with the data taken from the CID file (device type, Family, application, IED name, …).

If the CID file represents an ECI850 Sepam server, all associated Sepam devices will be automatically added to the devices table with their own characteristics (device type, Family, application, IED name, …).



Importing a CID file from the PC.



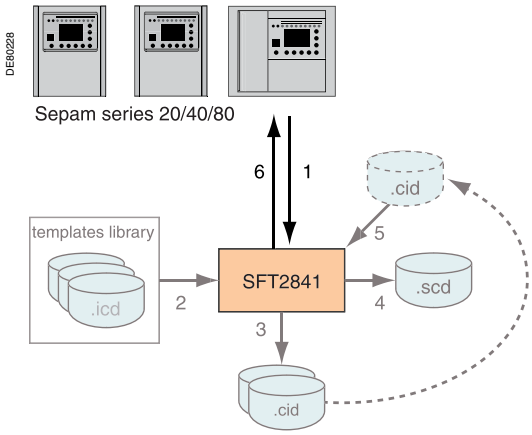
Devices table.

Importing a CID file from a remote device

If the CID file is on the remote device, click on the button 

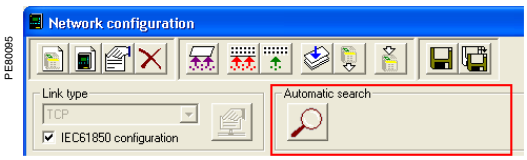
Note: *this button is enabled only when an Ethernet TCP/IP device is selected in the devices table.*

This will initialize a file transfer from the device to SFT2841. This transfer is based on FTP protocol. A dialog box requests your Username and Password.
The Username and the Password should match those defined in the FTP server embedded in the remote device.
When the FTP connection with the device is established, and if a CID file is found on the device, select in which folder the CID file is to be stored.



Importing a CID file from a device.

Configuration of IEC 61850 protocol
With SFT2841 setting and operating software



Creating an IEC 61850 standard configuration by automatic search and identification of Sepam devices

SFT2841 is able to display all information about a Sepam series 40, a Sepam series 80 or an ECI850 connected to the Ethernet TCP/IP network. SFT2841 is also able to display information about all Sepam connected to an ECI850. Using the parameters returned by each device, SFT2841 automatically retrieves its ICD files from the ICD library. The devices table is then updated and the entire Sepam network configuration is ready to build the CID files.

To activate this function click on the following button: 

Note: *this button is enabled only when an Ethernet TCP/IP device is selected in the devices table.*

When the function is activated, SFT2841 asks the selected Ethernet TCP/IP device to provide its identification.
When SFT2841 receives the response, it automatically updates the devices table with the data returned by the device (device type, Family, application …). Then, using the version of the Sepam firmware, SFT2841 automatically selects the associated ICD file in the ICD library.

In the devices table, the device identified by SFT2841 is displayed with the following different icons depending on the device type:

-  for a Sepam series 40 or a Sepam series 80
-  for an ECI850 Sepam server
-  for an unknown device

If SFT2841 identifies an ECI850, the function continues and SFT2841 launches the polling of all Sepam devices connected to the server as slave devices. Modbus addresses 1 to 247 are polled. SFT2841 asks each slave device to provide its identification. When SFT2841 receives a response, it automatically updates the devices table with the data returned by the slave device (device type, Family, application …). Then using the version of the Sepam firmware, SFT2841 automatically selects the associated ICD file in the ICD library.

In the devices table, a slave device identified by SFT2841 is displayed with different icons depending on its type:

-  for a Sepam device
-  for an unknown device

Configuration of IEC 61850 protocol
With SFT850 configuration software

Introduction

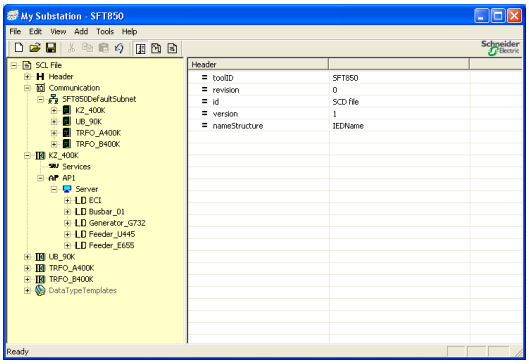
SFT850 software provides a way to create, edit, and display IEC 61850 configuration files which use the Substation Configuration Language (SCL).
In particular, it is used for creating or editing the following files:
- CID files: Configured IED Description
- SCD files: Substation Configuration Description

SFT850 enables editing of the CID and SCD files generated by SFT2841 so that the Sepam IEC 61850 configuration can be customized to the needs of the system with more options than SFT2841 provides.

Graphical SCL Editor

SFT850 is a graphical tool that enables to browse an SCL file using a tree view that displays the content of the file in a hierarchical format.

PE80100



Hierarchical tree format display.

Tree view

The following main sections are displayed in the tree view:
- Header and History
- Substation (optional)
- Communication
- List of IEDs
- Data Type templates

Expand each section to obtain more details.

Property view

When an item is selected in the tree view, the property view displays details of the selected item. You can activate editing operations from the toolbar and contextual menu. There are also specific dialog interfaces to help guide you.

General content of an SCL file

Header and History

This section contains the history of the file. SFT850 provides a specific function that allows you to add an entry whenever there is a need to track the modifications made to the file.

Substation

This section describes the functional structure of the electrical substation, identifies the primary devices and their electrical connections and defines the system functionality by attaching Logical Nodes to primary equipment. This section deals with the system configuration only; it is optional in an SCD file and not relevant to a CID file.
When present, the section is displayed by SFT850 but is not editable. It can be hidden using a specific option in the SFT850 User Preferences.

Communication

This section contains the definition of all sub-networks defined in the IEC 61850 system, with the list of the connected IEDs. Both Client/Server and Peer-to-Peer communication access points are displayed.
SFT850 provides specific functions to add, delete a subnetwork, add, remove an IED on a subnetwork, and to set, modify the communication addresses.

List of IEDs

This section contains the definition of all IEDs defined in the IEC 61850 system. Each IED is displayed with all its contents:
- Logical Devices (LD)
- Logical Nodes (LN)
- Datasets (DS)
- Report Control Blocks (RCB)
- GOOSE Control Blocks (GoCB)

Data Type templates

This section provides the description in detail of all types of data used by the IEDs defined in the configuration: Logical Node Types, Data Object types, Data Attribute types, Enumeration Types.
This section is intended for IEC 61850 experts and is hidden by default, using a specific option in the SFT850 User Preferences.

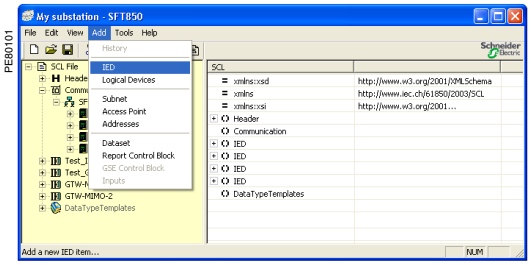
Configuration of IEC 61850 protocol
With SFT850 configuration software

Adding and removing a device in an IEC 61850 system

Adding and removing a device in an IEC 61850 system consists of making the change in the associated SCD file.

SFT850 manages 2 types of devices:

- IEC 61850 IEDs: ECI850 Sepam server, Sepam series 40 or Sepam series 80.
- Sepam devices as slave devices associated to an ECI850 Sepam server. Such devices are seen as Logical Devices inside the ECI850.



Adding an IED.

Adding an IED

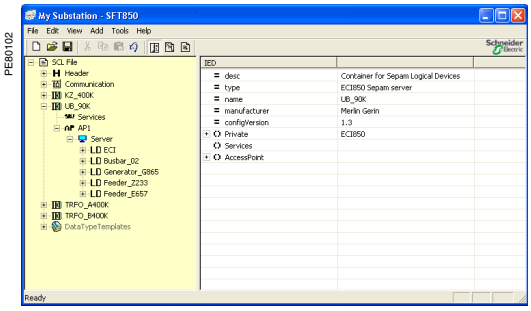
SFT850 enables the addition of an IED to an IEC 61850 system using its ICD description file, or the addition of a device already defined by a CID file.

A specific dialog interface requests a name for the IED and then its description. The description is provided from an ICD file, or from a CID file.

As with SFT2841, SFT850 software is delivered with a library of ICD files for all types of Sepam devices and all Sepam applications. This library also includes the ICD file for the ECI850.

You can add a Schneider Electric device identified in this library (as with SFT2841, browsing the ICD library is done using 3 characteristics of the device: Family, Model and Version), or add a third party device using an external ICD file.

When the IED is fully identified, the tree view is updated and the new IED appears in the list of IEDs. The content of the current SCD file is updated with all the description data concerning this device.



Removing an IED.

Removing an IED

An IED can be removed from an SCD file. This function is available when an IED is selected in the tree view. After you have confirmed that the IED is to be deleted, the tree view and the content of the SCD file are updated.

Adding a Logical Device (LD)

When an ECI850 Sepam server is selected in the tree view, SFT850 allows the addition of Sepam devices as Logical Devices.

A specific dialog interface requests a name for the LD and then its description. The description is provided from an ICD file of the ICD library. The ICD file is selected depending on the Family, Model and Version of the Sepam to be added.

After the Sepam device is fully identified, the tree view is automatically updated and the new Sepam appears inside the ECI850 as a new Logical Device.

The content of the current SCD file is updated with all the description data concerning this Sepam.

Removing a Logical Device

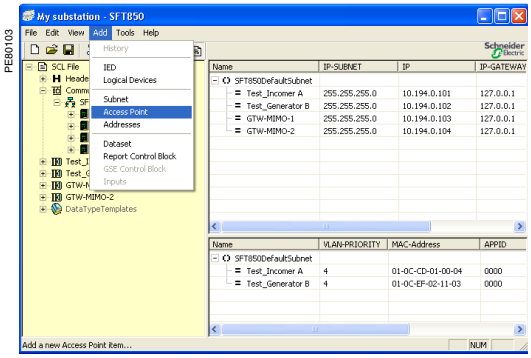
A Logical Device can be removed from an SCD file. This function is available when a LD is selected in the tree view. After you have confirmed the LD is to be deleted, the tree view and the content of the SCD file are updated.

Connecting a device in an IEC 61850 system

An IEC 61850 IED uses an Access Point (AP) to communicate. This AP should be connected to a subnetwork.

SFT850 provides the following set of functions to manage the communication architecture of an IEC 61850 System:

- Adding or removing a Subnet to the system
- Adding or removing an Access Point on a Subnet



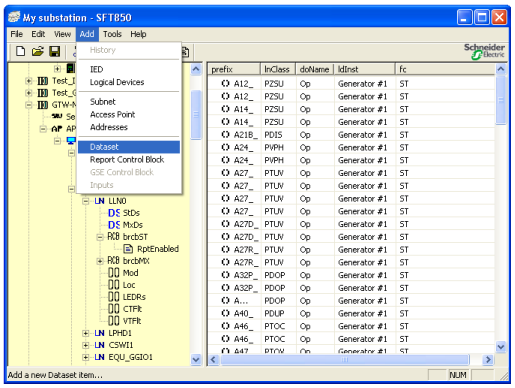
Adding an Access Point.

Editing an IED

The configuration of an IED described in an SCD file or a CID file can be modified so that its communication profile and behavior are adjusted to the needs of the system. SFT850 provides the following functions:

- Create, modify, delete a Dataset
- Create, modify, delete a Report Control Block
- Create, modify, delete a GOOSE Control Block
- Adjust a dead band

PE80104



Adding a Dataset.

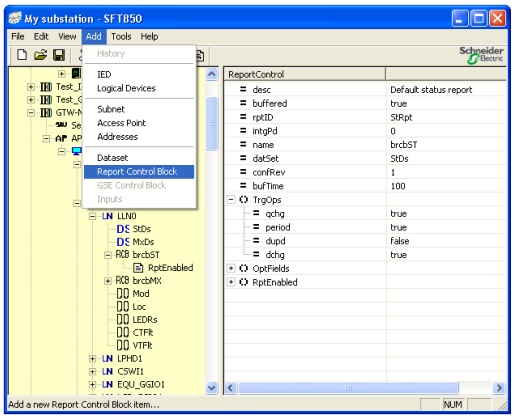
Create, modify, delete a Dataset

A Dataset is a grouping of different data or data attributes to increase the communication efficiency. In particular, it is used for reports and GOOSE messages. Any LN instance contains one or more Datasets.

SFT850 provides an easy way to create or edit a Dataset inside a Logical Node. When creating a Dataset, SFT850 prompts you for its name and description. A specific dialog interface allows you to select which data is to be added to, or removed from the Dataset. The available data that can be selected is displayed in a hierarchical tree with collapse and expand facilities, from their host Logical Node up to their final attributes. Individual and multiple selections are possible.

After you complete the dialog interface, the changes to the Dataset are reflected in the current SCL file and the SFT850 display is updated: a newly created Dataset is displayed in the tree view; a deleted Dataset is removed from the tree view. The content of the Dataset is updated in the property view.

PE80105



Adding a Control Block.

Create, modify, delete a Report Control Block (RCB)

A Report Control Block defines the way a Dataset is transmitted to a Client. An RCB can be created inside any Logical Node.

SFT850 provides a specific dialog interface for creating or modifying a Report Control Block. When creating an RCB, SFT850 prompts you for the name and description of the RCB. A specific dialog interface allows you to select the Dataset to be associated with the RCB and to define all settings concerning the way the report is generated.

You can define the most common trigger options:

- Data Change: the Report is triggered by changes to the data
- Quality Change: the Report is triggered by quality changes
- Periodic: the Report is triggered periodically, according to an Integrity period provided by you.

After you complete the dialog interface, the changes to the RCB are reflected in the current SCL file and the SFT850 display is updated: a newly created RCB is displayed in the tree view and a deleted RCB is removed from the tree view. The settings of the RCB are updated in the property view.

Create, modify, delete a GOOSE Control Block (GoCB)

The GOOSE message service is an efficient real-time communication service for peer-to-peer exchanges between IEDs.
A GOOSE Control Block defines the content of a GOOSE message and the way it is transmitted:

- maximum delay for sending the GOOSE message on data change
- maximum period of production (heartbeat cycle time)

A GOOSE Control Block can only be created inside the LN0 of an IED.
SFT850 provides a specific dialog interface to create or modify a GOOSE Control Block. When creating an GoCB, you are prompted for the name and description of the GoCB. A specific dialog interface allows you to select the Dataset to be transmitted as a GOOSE message.Then, you are asked to enter the multicast address the GOOSE message must be transmitted to.
After you complete the dialog interface, the changes to the GoCB are reflected in the current SCL file and the SFT850 display is updated: a newly created GoCB is displayed in the tree view and a deleted GoCB is removed from the tree view. The GoCB settings are displayed in the property view.

Adjusting the dead band of measurements

Sepam produces a lot of measurements that are accessible via the IEC 61850 communication interface as Measured Values (MV) and Complex measured values (CMV).
To optimize the network bandwidth, it is possible to create a Dataset of measurements and to send it on data changes only, rather than periodically.
Sepam and SFT850 use the dead band parameter (db) defined by the IEC 61850 Standard for the MV and CMV to control the conditions for generating reports.
SFT850 allows you to set the dead band of each value for MV and CMV data produced by Sepam. If the data is associated with a Dataset and an RCB with the Data change trigger option, a report will be generated only when the value of the data exceeds the dead band. If the data change is less than the dead band, no report will be generated.

Generating CID files

When an SCD file is open, SFT850 generates of the CID file of a specific IED or all the CID files for all IEDs defined in the SCD file.

Generating a CID file

This function is available only if an IED is selected in the tree view. A specific dialog interface box asks you to enter the location and the name of the output CID file. By default, the name of the CID file is based on the name of the IED.

Generating all CID files

This function is available when at least one IED exists in the SCD file. A specific dialog interface box asks you to enter the location of the output CID files.
The name of each CID file is based on the name of the IED.

Editing a CID file

SFT850 allows the editing of an existing CID file.
This CID file is an advanced configuration file generated during a previous use of SFT850, or a standard configuration file generated by SFT2841.

When editing the CID file of an ECI850, you can use all of the advanced editing functions described below:

- Add, remove a Logical Device inside the ECI850
- Create, modify, delete a Dataset
- Create, modify, delete a Report Control Block
- Adjust the dead band of the measurements

When editing the CID file of a Sepam series 40 or a Sepam series 80, you can use all of the advanced editing functions described below:

- Create, modify, delete a Dataset
- Create, modify, delete a Report Control Block
- Adjust the dead band of the measurements
- Create, modify, delete a GOOSE Control Block

Validating a SCL file

The Substation Configuration Language is based on XML.
The structure and the content of all SCL files are fully specified by the IEC 61850 Standard using an XML Schema (XSD files).
SFT850 is delivered with the set of XSD files defined by IEC 61850 Standard and checks the validity of SCL files against the IEC 61850 XML Schema.

SFT850 provides 3 ways to validate an SCL file against the XML Schema:

- Automatic validation at file opening
- Automatic validation at file saving
- Explicit validation triggered by you at any time

Automatic validation is enabled or disabled using a specific option in the SFT850 User Preferences.

Configuration of IEC 61850 protocol
Transfer of the CID file

Transferring a CID file

A CID file contains all the IEC 61850 configuration information needed for a Sepam or an ECI850. There are two ways to transfer a CID file to Sepam or ECI850:

- Transfer with SFT2841; the transfer is done using the function "load CID file to device".
- Simple copy with a standard Internet browser connected to the IP address of the Sepam or ECI850.

In both cases you have to log in on the device with an authorized Username and Password.

The CID file is copied at the root of the file system: `ftp://<ip address>/`.
A back-up copy of the previous CID file is automatically created in the directory `ftp://<ip address>/bak`. You can revert to the previous configuration by copying the back-up file to its previous location.

After the CID file has been correctly loaded it is automatically taken into account and used by the Sepam or ECI850.

Conformance statements

General

This chapter describes conformity with IEC 61850. It does not describes the standard itself, but only the choices that have been made in the Sepam implementation of the standard, in terms of services, modeling, exceptions, extensions and adaptations.

The conformance statement is made up of the following documents:

- ACSI conformance statement: this document describes the abstract services interface (which services are implemented). These services are mapped to specific communication services (SCSM) described in the PICS.
- MICS (Model Implementation Conformance Statement): describes how the information model is implemented.
- PICS (Protocol Implementation Conformance Statement): describes choices made in protocol implementation. Many of these choices are implied by the ACSI conformance statement.
- PIXIT (Protocol Implementation eXtra Information for Testing): gives any additional implementation specific information not found in the previous standardized documents. Despite the name, these informations are useful for operation of the devices.

Conformance statements
ACSI conformance statement

ACSI
*The **A**bstract **C**ommunication **S**ervices **I**nterface is defined by part 7-2 of IEC 61850.*
It provides:
- *the specification of a basic information model,*
- *the specification of information exchange service models.*

These conformance statement tables are as defined by Annex A of IEC 61850-7-2.

ACSI basic conformance statement

		Client / subscriber	Server / publisher	Value / comments
Client-server roles				
B11	**Server** side (of TWO-PARTY APPLICATION-ASSOCIATION)		■	
B12	**Client** side of (TWO-PARTY APPLICATION-ASSOCIATION)			
SCSMs supported				
B21	**SCSM**: IEC 61850-8-1 used		■	
B22	**SCSM**: IEC 61850-9-1 used			
B23	**SCSM**: IEC 61850-9-2 used			
B24	**SCSM**: other			
Generic substation event model (GSE)				
B31	**Publisher** side		■	ACE850 only
B32	**Subscriber** side	■		ACE850 only
Transmission of sampled value model (SVC)				
B41	**Publisher** side			
B42	**Subscriber** side			

ACSI service conformance statement

Services		AA: TP/MC	Client / subscriber	Server / publisher	Value / comments
Server (Clause 6)					
S1	ServerDirectory	TP		■	
Application association (Clause 7)					
S2	Associate			■	
S3	Abort			■	
S4	Release			■	
Logical device (Clause 8)					
S5	LogicalDeviceDirectory	TP		■	
Logical node (Clause 9)					
S6	LogicalNodeDirectory	TP		■	
S7	GetAllDataValues	TP		■	
Data (Clause 10)					
S8	GetDataValues	TP		■	
S9	SetDataValues	TP			
S10	GetDataDirectory	TP		■	
S11	GetDataDefinition	TP		■	
Data set (Clause 11)					
S12	GetDataSetValues	TP		■	
S13	SetDataSetValues	TP			
S14	CreateDataSet	TP			
S15	DeleteDataSet	TP			
S16	GetDataSetDirectory	TP		■	
Substitution (Clause 12)					
S17	SetDataValues	TP			
Setting group control (Clause 13)					
S18	SelectActiveSG	TP		■	
S19	SelectEditSG	TP			
S20	SetSGValues	TP			
S21	ConfirmEditSGValues	TP			
S22	GetSGValues	TP			
S23	GetSGCBValues	TP		■	

Note:
AA: Application Association
TP: Two Party
MC: Multi Cast
■: *supported*

ACSI service conformance statement (cont.)

Services		AA: TP/MC	Client / subscriber	Server / publisher	Value / comments
Reporting (Clause 14)					
Buffered Report Control Block (BRCB)					
S24	Report	TP		■	
S24-1	data-change (dchg)			■	
S24-2	quality-change (dchg)			■	
S24-3	data-update (dupd)			■	
S25	GetBRCBValues	TP		■	
S26	SetBRCBValues	TP		■	
Unbuffered Report Control Block (URCB)					
S27	Report	TP			
S27-1	data-change (dchg)				
S27-2	quality-change (qchg)				
S27-3	data-update (dupd)				
S28	GetURCBValues	TP			
S29	SetURCBValues	TP			
Logging (Clause 14)					
Log Control Block					
S30	GetLCBValues	TP			
S31	SetLCBValues	TP			
Log					
S32	QueryLogByTime	TP			
S33	QueryLogAfter	TP			
S34	GetLogStatusValues	TP			
Generic substation event model (GSE) (Clause 15)					
GOOSE Control Block					
S35	SendGOOSEMessage	MC		■	ACE850 only
S36	GetReference	TP		■	ACE850 only
S37	GetGOOSEElementNumber	TP		■	ACE850 only
S38	GetGoCBValues	TP		■	ACE850 only
S39	SetGoCBValues	TP		■	ACE850 only
GSSE Control Block					
S40	SendGSSEMessage	MC			
S41	GetReference	TP			
S42	GetGSSEElementNumber	TP			
S43	GetGsCBValues	TP			
S44	SetGsCBValues	TP			
Transmission of sampled values model (SVC) (Clause 16)					
Multicast SVC					
S45	SendMSVMessage	MC			
S46	GetMSVCBValues	TP			
S47	SetMSVCBValues	TP			
Unicast SVC					
S48	SendUSVMessage	TP			
S49	GetUSVCBValues	TP			
S50	SetUSVCBValues	TP			
Control (Clause 17)					
S51	Select	TP			
S52	SelectWithValue	TP		■	
S53	Cancel	TP		■	
S54	Operate	TP		■	
S55	CommandTermination	TP		■	
S56	TimeActivatedOperate	TP			
File transfer (Clause 20)					
S57	GetFile	TP		■	
S58	SetFile	TP			
S59	DeleteFile	TP			
S60	GetFileAttributeValues	TP		■	
Time (Clause 18)					
T1	clock resolution of internal clock (nearest value of 2^{-n} in seconds)			n = 10 (T1)	
T2	Time accuracy of internal clock				
T3	Supported TimeStamp resolution (nearest value of 2^{-n} in seconds)			n = 10 (T1)	

Note:
AA: Application Association
TP: Two Party
MC: Multi Cast
■: *supported*

ACSI model conformance statement

		Client / subscriber	Server / publisher	Value / comments
If server side (B11) supported				
M1	Logical device		■	
M2	Logical node		■	
M3	Data		■	
M4	Data set		■	
M5	Substitution			
M6	Setting group control		■	Active SG only
M7	Buffered report control		■	
M7-1	sequence-number		■	
M7-2	report- time-stamp		■	
M7-3	reason-for-inclusion		■	
M7-4	data-set-name		■	
M7-5	data-reference		■	
M7-6	buffer-overflow		■	
M7-7	EntryId		■	
M7-8	BufTm		■	
M7-9	IntgPd		■	
M7-10	GI		■	
M8	Unbuffered report control			
M8-1	sequence-number			
M8-2	report- time-stamp			
M8-3	reason-for-inclusion			
M8-4	data-set-name			
M8-5	data-reference			
M8-6	BufTm			
M8-7	IntgPd			
M8-8	GI			
M9	Log Control			
M9-1	IntgPd			
M10	Log			
M11	Control		■	
If GSE (B31/B32) supported				
M12	GOOSE	■	■	ACE850 only
M12-1	entryID	■	■	
M12-2	DataRefinc	■	■	
M13	GSSE			
If SVC (B41/B42) supported				
M14	Multicast SVC			
M15	Unicast SVC			
Other				
M16	Time		■	
M17	File Transfer		■	

Note:
■: *supported*

Conformance statements
MICS - Model implementation conformance statement

The information model is defined by parts 7-3 and 7-4 of IEC 61850.
It provides:
- *the specification of the Logical Nodes used to model substation devices and functions,*
- *the specification of Common Data Classes and Common Data Attribute Classes used in the Logical Nodes.*

Model conformance

The Model conformance of each particular Sepam device is described by its ICD file. The following descriptions are general descriptions that apply to all Sepam devices.

Common data attributes classes

The following tables list which fields is found in each Common Data Attribute Class (CDAC). Fields not found in these tables are optional (O) or conditional (C) fields not supported by Sepam devices. Mandatory fields (M) are always present.

Quality

Attribute name	Attribute type	Value/Value range	M/O/C	Comments
validity	CODED ENUM	good I invalid	M	Supported
detailQual	PACKED LIST		M	Supported
overflow	BOOLEAN	DEFAULT : FALSE	M	Defaulted
outOfRange	BOOLEAN	TRUE I FALSE	M	Supported
badReference	BOOLEAN	TRUE I FALSE	M	Supported
oscillatory	BOOLEAN	DEFAULT : FALSE	M	Defaulted
failure	BOOLEAN	TRUE I FALSE	M	Supported
oldData	BOOLEAN	DEFAULT : FALSE	M	Defaulted
inconsistent	BOOLEAN	TRUE I FALSE	M	Supported
inaccurate	BOOLEAN	TRUE I FALSE	M	Supported
source	CODED ENUM	process I substituted DEFAULT : process	M	Defaulted
test	BOOLEAN	DEFAULT : FALSE	M	Defaulted
operatorBlocked	BOOLEAN	DEFAULT : FALSE	M	Defaulted

Analogue value

Attribute name	Attribute type	Value/Value range	M/O/C
f	FLOAT32	floating point value	C

Configuration of analogue value

Common data attribute class not supported.

Range configuration

Common data attribute class not supported.

Step position with transient indication

Common data attribute class not supported.

Pulse configuration

Common data attribute class not supported.

Originator

Attribute name	Attribute type	Value/Value range	M/O/C
orCat	ENUMERATED	See IEC 61850-7-3	M
orIdent	OCTET STRING64		M

Unit definition

Common data attribute class not supported.

CtxInt

Context specific integer. The type depends on the data object.
For Mod, Beh, Health, PhyHealth, EEHealth and AutoRecSt data objects, the type is ENUMERATED, otherwise, the type is INT32.

Note:
M: mandatory field
O: optional field
C: conditional field

Vector definition

Attribute name	Attribute type	Value/Value range	M/O/C
mag	AnalogueValue		M
ang	AnalogueValue		O

Point definition

Common data attribute class not supported.

CtlModels definition

Attribute value	Comment
status-only	not controllable SPC, DPC and INC
direct-with-normal-security	controllable SPC and INC
direct-with-enhanced-security	not supported
sbo-with-normal-security	not supported
sbo-with-enhanced-security	controllable DPC

SboClasses definition

Attribute value	Comment
operate-once	
operate-many	not supported

Common data classes

The following tables list which attributes is found in each Common Data Class (CDC). Attributes not found in these tables are optional (O) or conditional (C) attributes not supported by Sepam devices. Mandatory attributes (M) are always present.

Single point status (SPS)

Attribute name	Attribute type	FC	M/O/C	Comments
stVal	BOOLEAN	ST	M	
q	Quality	ST	M	
t	TimeStamp	ST	M	
dataNs	VISIBLE STRING255	EX	C	for non standard data objects

Double point status (DPS)

Common data class not supported.

Integer status (INS)

Attribute name	Attribute type	FC	M/O/C	Comments
stVal	CtxInt	ST	M	
q	Quality	ST	M	
t	TimeStamp	ST	M	
dataNs	VISIBLE STRING255	EX	C	for non standard data objects

Protection activation information (ACT)

Attribute name	Attribute type	FC	M/O/C	Comments
general	BOOLEAN	ST	M	
q	Quality	ST	M	
t	TimeStamp	ST	M	

Note:
M: mandatory field
O: optional field
C: conditional field

Directional protection activation information (ACD)

Attribute name	Attribute type	FC	M/O/C	Comments
general	BOOLEAN	ST	M	
dirGeneral	ENUMERATED	ST	M	
q	Quality	ST	M	
t	TimeStamp	ST	M	

Security violation counting (SEC)

Common data class not supported.

Binary counter reading (BCR)

Attribute name	Attribute type	FC	M/O/C	Comments
actVal	INT128	ST	M	The range of such variables never exceeds 32 bits. They are therefore transmitted as INT32 values (as allowed by ASN.1 rules).
q	Quality	ST	M	
t	TimeStamp	ST	M	
units	Unit	CF	O	read-only
pulsQty	FLOAT32	CF	M	read-only

Measured value (MV)

Attribute name	Attribute type	FC	M/O/C	Comments
mag	AnalogueValue	MX	M	
q	Quality	MX	M	
t	TimeStamp	MX	M	
db	INT32U	CF	O	read-only
dataNs	VISIBLE STRING255	EX	C	for non standard data objects

Complex measured value (CMV)

Attribute name	Attribute type	FC	M/O/C	Comments
cVal	Vector	MX	M	
q	Quality	MX	M	
t	TimeStamp	MX	M	
db	INT32U	CF	O	read-only

Sampled value (SMV)

Common data class not supported.

WYE

Data name	Data class	FC	M/O/C	Comments
phsA	CMV		C	
phsB	CMV		C	
phsC	CMV		C	
neut	CMV		C	
res	CMV		C	
dataNs	VISIBLE STRING255	EX	C	for non standard data objects

Delta (DEL)

Data name	Data class	FC	M/O/C	Comments
phsAB	CMV		C	
phsBC	CMV		C	
phsCA	CMV		C	

Note:
M: mandatory field
O: optional field
C: conditional field

Sequence (SEQ)

Data name	Data class	FC	M/O/C	Comments
c1	CMV		M	
c2	CMV		M	
c2	CMV		M	

Harmonic value (HMV)

Common data class not supported.

Harmonic value for WYE (HWYE)

Common data class not supported.

Harmonic value for DEL (HDEL)

Common data class not supported.

Controllable single point (SPC)

Attribute name	Attribute type	FC	M/O/C	Comments
ctlVal	BOOLEAN	CO	C	
stVal	BOOLEAN	ST	C	
q	Quality	ST	C	
t	TimeStamp	ST	C	
ctlModel	CtlModels	CF	C	read-only
dataNs	VISIBLE STRING255	EX	C	for non standard data objects

Controllable double point (DPC)

Attribute name	Attribute type	FC	M/O/C	Comments
ctlVal	BOOLEAN	CO	C	
stVal	CODED ENUM	ST	M	
q	Quality	ST	M	
t	TimeStamp	ST	M	
ctlModel	CtlModels	CF	C	read-only

Controllable integer status (INC)

Attribute name	Attribute type	FC	M/O/C	Comments
ctlVal	CtxInt	CO	C	
stVal	CtxInt	ST	M	
q	Quality	ST	M	
t	TimeStamp	ST	M	
ctlModel	CtlModels	CF	C	read-only

Binary controlled step position information (BSC)

Common data class not supported.

Integer controlled step position information (ISC)

Common data class not supported.

Controllable analog set point information (APC)

Common data class not supported.

Single point setting (SPG)

Common data class not supported.

Note:
M: mandatory field
O: optional field
C: conditional field

Integer status setting (ING)

Common data class not supported.

Analogue setting (ASG)

Common data class not supported.

Setting curve (CURVE)

Common data class not supported.

Device name plate (DPL)

Attribute name	Attribute type	FC	M/O/C	Comments
vendor	VISIBLE STRING255	DC	M	
model	VISIBLE STRING255	DC	O	
location	VISIBLE STRING255	DC	O	

Logical node name plate (LPL)

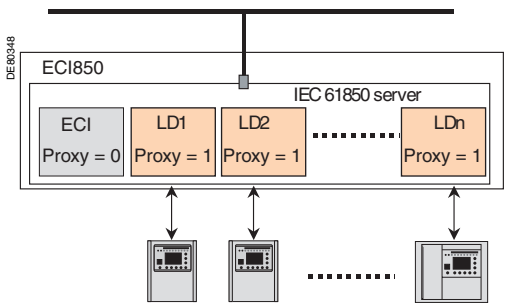
Attribute name	Attribute type	FC	M/O/C	Comments
vendor	VISIBLE STRING255	DC	M	
swRev	VISIBLE STRING255	DC	M	
d	VISIBLE STRING255	DC	M	
configRev	VISIBLE STRING255	DC	C	LLN0 only
ldNs	VISIBLE STRING255	EX	C	LLN0 only

Curve shape description (CSD)

Common data class not supported.

Note:
M: mandatory field
O: optional field
C: conditional field

Conformance statements
MICS - Model implementation conformance statement



ECI850 logical devices.

Logical device

ECI850

The IEC 61850 server inside the ECI850 contains the following logical devices:
- A logical device dedicated to the ECI850 unit itself. This logical device contains only LLN0 and LPHD logical nodes.
- A logical device for each Sepam unit connected to the ECI850.The content of this logical device is defined by the Sepam type, as described by its ICD file.

The PROXY attribute of the LPHD logical node is set to TRUE for Sepam logical devices.

ECI850 logical devices names

The name of the logical devices is freely assigned at configuration time, using SFT2841 or SFT850 tools, except for the ECI850 logical device which has a fixed name of "ECI".

Logical nodes

The following tables list possible attributes in Logical Node (LN).
Attributes not found in these tables are optional (O) or conditional (C) attributes not supported by Sepam devices. Mandatory attributes (M) are always present. Sepam devices also use extension attributes (E) for some LNs.
Logical nodes not found in this description are not supported.

System logical nodes: L group

Physical device information (LPHD class)

Attribute name	Attribute type	Explanation/Value	T	M/O/C/E	ECI850	Sepam series 20	Sepam series 40	Sepam series 80
LNName	Object Name	LPHD1		M	■	■	■	■
PhyName	DPL	Physical device name plate		M	■	■	■	■
PhyHealth	INS	Physical device health		M	■	■	■	■
Proxy	SPS	Indicates if this LN is a proxy		M	■	■	■	■
PwrSupAlm	SPS	Power supply alarm		O				■

Logical node zero (LLN0 class)

Attribute name	Attribute type	Explanation/Value	T	M/O/C/E	ECI850	Sepam series 20	Sepam series 40	Sepam series 80
LNName	Object Name	LLN0		M	■	■	■	■
Common logical node information								
Mod	INC	Mode		M	■	■	■	■
Beh	INS	Behaviour		M	■	■	■	■
Health	INS	Health		M	■	■	■	■
NamPlt	LPL	Name plate		M	■	■	■	■
Loc	SPS	Local operation		O		■	■	■
Controls								
LEDRs	SPC	LED reset (reset Sepam)	■	O		■	■	■
Status information								
CTFlt	SPS	CTs fault		E			■	■
VTFlt	SPS	VTs fault		E			■	■

Note:
M: mandatory data
O: optional data
C: conditional data
E: extension data
T: transient data (applies only to BOOLEAN attributes with FC=ST).
No event is generated for reporting when changing from TRUE to FALSE.

Logical nodes for protection functions: P group

Differential protections (PDIF class)

87T - Transformer differential							
Attribute name	**Attribute type**	**Explanation/Value**	**T**	**M/O/C/E**	**Sepam series 20**	**Sepam series 40**	**Sepam series 80**
LNName	Object Name	A87T_PDIF1		M			■
Common logical node information							
Mod	INC	Mode		M			■
Beh	INS	Behaviour		M			■
Health	INS	Health		M			■
NamPlt	LPL	Name plate		M			■
Status information							
Op	ACT	Operate	■	M			■
Measured values							
DifAClc	WYE	Differential Current		O			■
RstA	WYE	Restraint Current		O			■

87M - Machine differential							
Attribute name	**Attribute type**	**Explanation/Value**	**T**	**M/O/C/E**	**Sepam series 20**	**Sepam series 40**	**Sepam series 80**
LNName	Object Name	A87M_PDIF1		M			■
Common logical node information							
Mod	INC	Mode		M			■
Beh	INS	Behaviour		M			■
Health	INS	Health		M			■
NamPlt	LPL	Name plate		M			■
Status information							
Op	ACT	Operate	■	M			■
Measured values							
DifAClc	WYE	Differential Current		O			■
RstA	WYE	Restraint Current		O			■

64REF - Restricted earth fault differential							
Attribute name	**Attribute type**	**Explanation/Value**	**T**	**M/O/C/E**	**Sepam series 20**	**Sepam series 40**	**Sepam series 80**
LNName	Object Name	A64RF_PDIF1, A64RF_PDIF2		M			■
Common logical node information							
Mod	INC	Mode		M			■
Beh	INS	Behaviour		M			■
Health	INS	Health		M			■
NamPlt	LPL	Name plate		M			■
Status information							
Op	ACT	Operate	■	M			■

Note:
M: mandatory data
O: optional data
C: conditional data
E: extension data
T: transient data (applies only to BOOLEAN attributes with FC=ST).
No event is generated for reporting when changing from TRUE to FALSE.

Logical nodes for protection functions: P group (cont.)

Distance protections (PDIS class)

21B - Underimpedance

Attribute name	Attribute type	Explanation/Value	T	M/O/C/E	Sepam series 20	Sepam series 40	Sepam series 80
LNName	Object Name	A21B_PDIS1		M			■
Common logical node information							
Mod	INC	Mode		M			■
Beh	INS	Behaviour		M			■
Health	INS	Health		M			■
NamPlt	LPL	Name plate		M			■
Status information							
Str	ACD	Start		M			■
Op	ACT	Operate	■	M			■

Directional overpower (PDOP class)

32P - Directional active overpower

Attribute name	Attribute type	Explanation/Value	T	M/O/C/E	Sepam series 20	Sepam series 40	Sepam series 80
LNName	Object Name	A32P_PDOP1		M		■	
		A32P_PDOP1, A32P_PDOP2		M			■
Common logical node information							
Mod	INC	Mode		M		■	■
Beh	INS	Behaviour		M		■	■
Health	INS	Health		M		■	■
NamPlt	LPL	Name plate		M		■	■
Status information							
Str	ACD	Start		M		■	■
Op	ACT	Operate	■	M		■	■

32Q - Directional reactive overpower

Attribute name	Attribute type	Explanation/Value	T	M/O/C/E	Sepam series 20	Sepam series 40	Sepam series 80
LNName	Object Name	A32Q_PDOP1		M		■	■
Common logical node information							
Mod	INC	Mode		M		■	■
Beh	INS	Behaviour		M		■	■
Health	INS	Health		M		■	■
NamPlt	LPL	Name plate		M		■	■
Status information							
Str	ACD	Start		M		■	■
Op	ACT	Operate	■	M		■	■

Note:
M: mandatory data
O: optional data
C: conditional data
E: extension data
T: transient data (applies only to BOOLEAN attributes with FC=ST).
No event is generated for reporting when changing from TRUE to FALSE.

Conformance statements
MICS - Model implementation conformance statement

Logical nodes for protection functions: P group (cont.)

Directional underpower (PDUP class)

37P - Directional active underpower							
Attribute name	**Attribute type**	**Explanation/Value**	**T**	**M/O/C/E**	**Sepam series 20**	**Sepam series 40**	**Sepam series 80**
LNName	Object Name	A37P_PDUP1, A37P_PDUP2		M			■
Common logical node information							
Mod	INC	Mode		M			■
Beh	INS	Behaviour		M			■
Health	INS	Health		M			■
NamPlt	LPL	Name plate		M			■
Status information							
Str	ACD	Start		M			■
Op	ACT	Operate	■	M			■

40 - Field loss							
Attribute name	**Attribute type**	**Explanation/Value**	**T**	**M/O/C/E**	**Sepam series 20**	**Sepam series 40**	**Sepam series 80**
LNName	Object Name	A40_PDUP1		M			■
Common logical node information							
Mod	INC	Mode		M			■
Beh	INS	Behaviour		M			■
Health	INS	Health		M			■
NamPlt	LPL	Name plate		M			■
Status information							
Str	ACD	Start		M			■
Op	ACT	Operate	■	M			■

Rate of change of frequency (PFRC class)

81R - Rate of change of frequency							
Attribute name	**Attribute type**	**Explanation/Value**	**T**	**M/O/C/E**	**Sepam series 20**	**Sepam series 40**	**Sepam series 80**
LNName	Object Name	A81R_PFRC1		M	■		
		A81R_PFRC1, A81R_PFRC2		M			■
Common logical node information							
Mod	INC	Mode		M	■		■
Beh	INS	Behaviour		M	■		■
Health	INS	Health		M	■		■
NamPlt	LPL	Name plate		M	■		■
Status information							
Str	ACD	Start		M	■		■
Op	ACT	Operate	■	M	■		■

Ground detector (PHIZ class)

27TN/64G2 - Third harmonic undervoltage							
Attribute name	**Attribute type**	**Explanation/Value**	**T**	**M/O/C/E**	**Sepam series 20**	**Sepam series 40**	**Sepam series 80**
LNName	Object Name	A64G2_PHIZ1, A64G2_PHIZ2		M			■
Common logical node information							
Mod	INC	Mode		M			■
Beh	INS	Behaviour		M			■
Health	INS	Health		M			■
NamPlt	LPL	Name plate		M			■
Status information							
Str	ACD	Start		M			■
Op	ACT	Operate	■	M			■

Note:
M: mandatory data
O: optional data
C: conditional data
E: extension data
T: transient data (applies only to BOOLEAN attributes with FC=ST).
No event is generated for reporting when changing from TRUE to FALSE.

Logical nodes for protection functions: P group (cont.)

Instantaneous overcurrent (PIOC class)

50/27 - Inadvertent energizing							
Attribute name	**Attribute type**	**Explanation/Value**	**T**	**M/O/C/E**	**Sepam series 20**	**Sepam series 40**	**Sepam series 80**
LNName	Object Name	A5027_PIOC1		M			■
Common logical node information							
Mod	INC	Mode		M			■
Beh	INS	Behaviour		M			■
Health	INS	Health		M			■
NamPlt	LPL	Name plate		M			■
Status information							■
Op	ACT	Operate	■	M			■

Motor restart inhibition (PMRI class)

66 - Starts per hour							
Attribute name	**Attribute type**	**Explanation/Value**	**T**	**M/O/C/E**	**Sepam series 20**	**Sepam series 40**	**Sepam series 80**
LNName	Object Name	A66_PMRI1		M	■	■	■
Common logical node information							
Mod	INC	Mode		M	■	■	■
Beh	INS	Behaviour		M	■	■	■
Health	INS	Health		M	■	■	■
NamPlt	LPL	Name plate		M	■	■	■
Status information							
StrInh	SPS	Restart inhibited		O	■	■	■
StrInhTmm	INS	Restart inhibition time		O	■	■	■
NumStr	INS	Number of starts before inhibition		E	■	■	■

Motor starting time supervision (PMSS class)

48/51LR - Excessive starting time, locked rotor							
Attribute name	**Attribute type**	**Explanation/Value**	**T**	**M/O/C/E**	**Sepam series 20**	**Sepam series 40**	**Sepam series 80**
LNName	Object Name	A51LR_PMSS1		M	■	■	■
Common logical node information							
Mod	INC	Mode		M	■	■	■
Beh	INS	Behaviour		M	■	■	■
Health	INS	Health		M	■	■	■
NamPlt	LPL	Name plate		M	■	■	■
Measured Values							
StrAmp	MV	Starting current		E	■	■	■
Status information							
Op	ACT	Operate	■	O	■	■	■
StrTmms	INS	Starting time		E	■	■	■

Phase angle measuring (PPAM class)

78PS - Pole slip							
Attribute name	**Attribute type**	**Explanation/Value**	**T**	**M/O/C/E**	**Sepam series 20**	**Sepam series 40**	**Sepam series 80**
LNName	Object Name	A78PS_PPAM1		M			■
Common logical node information							
Mod	INC	Mode		M			■
Beh	INS	Behaviour		M			■
Health	INS	Health		M			■
NamPlt	LPL	Name plate		M			■
Status information							
Str	ACD	Start		M			■
Op	ACT	Operate	■	M			■

Note:
M: mandatory data
O: optional data
C: conditional data
E: extension data
T: transient data (applies only to BOOLEAN attributes with FC=ST).
No event is generated for reporting when changing from TRUE to FALSE.

Conformance statements
MICS - Model implementation conformance statement

Logical nodes for protection functions: P group (cont.)

Protection trip conditioning (PTRC class)

Attribute name	Attribute type	Explanation/Value	T	M/O/C/E	Sepam series 20	Sepam series 40	Sepam series 80
LNName	Object Name	PTRC1		M	■	■	■
Common logical node information							
Mod	INC	Mode		M	■	■	■
Beh	INS	Behaviour		M	■	■	■
Health	INS	Health		M	■	■	■
NamPlt	LPL	Name plate		M	■	■	■
Status information							
Tr	ACT	Trip		C	■	■	■
ExTr1	SPS	External Trip 1		E		■	■
ExTr2	SPS	External Trip 2		E		■	■
ExTr3	SPS	External Trip 3		E		■	■
BlkInd1	SPS	Block indication 1 sent (Logic discrimination)		E	■	■	■
BlkInd2	SPS	Block indication 2 sent (Logic discrimination)		E		■	■

Time overcurrent (PTOC class)

50/51 - Phase overcurrent

Attribute name	Attribute type	Explanation/Value	T	M/O/C/E	Sepam series 20	Sepam series 40	Sepam series 80
LNName	Object Name	A51_PTOC1 to A51_PTOC4		M	■	■	
		A51_PTOC1 to A51_PTOC8		M			■
Common logical node information							
Mod	INC	Mode		M	■	■	■
Beh	INS	Behaviour		M	■	■	■
Health	INS	Health		M	■	■	■
NamPlt	LPL	Name plate		M	■	■	■
Status information							
Str	ACD	Start		M	■	■	■
Op	ACT	Operate	■	M	■	■	■

50N/51N, 50G/51G - Earth fault

Attribute name	Attribute type	Explanation/Value	T	M/O/C/E	Sepam series 20	Sepam series 40	Sepam series 80
LNName	Object Name	A51N_PTOC1 to A51N_PTOC4		M	■	■	
		A51N_PTOC1 to A51N_PTOC8		M			■
Common logical node information							
Mod	INC	Mode		M	■	■	■
Beh	INS	Behaviour		M	■	■	■
Health	INS	Health		M	■	■	■
NamPlt	LPL	Name plate		M	■	■	■
Status information							
Str	ACD	Start		M	■	■	■
Op	ACT	Operate	■	M	■	■	■

46 - Negative sequence/unbalance

Attribute name	Attribute type	Explanation/Value	T	M/O/C/E	Sepam series 20	Sepam series 40	Sepam series 80
LNName	Object Name	A46_PTOC1		M	■	■	
		A46_PTOC1, A46_PTOC2		M			■
Common logical node information							
Mod	INC	Mode		M	■	■	■
Beh	INS	Behaviour		M	■	■	■
Health	INS	Health		M	■	■	■
NamPlt	LPL	Name plate		M	■	■	■
Status information							
Str	ACD	Start		M	■	■	■
Op	ACT	Operate	■	M	■	■	■

Note:
M: mandatory data
O: optional data
C: conditional data
E: extension data
T: transient data (applies only to BOOLEAN attributes with FC=ST).
No event is generated for reporting when changing from TRUE to FALSE.

Logical nodes for protection functions: P group (cont.)

Time overcurrent (PTOC class) (cont.)

51C - Capacitor bank unbalance

Attribute name	Attribute type	Explanation/Value	T	M/O/C/E	Sepam series 20	Sepam series 40	Sepam series 80
LNName	Object Name	A51C_PTOC1 to A51C_PTOC8		M			■
Common logical node information							
Mod	INC	Mode		M			■
Beh	INS	Behaviour		M			■
Health	INS	Health		M			■
NamPlt	LPL	Name plate		M			■
Status information							
Str	ACD	Start		M			■
Op	ACT	Operate	■	M			■

67 - Directional phase overcurrent

Attribute name	Attribute type	Explanation/Value	T	M/O/C/E	Sepam series 20	Sepam series 40	Sepam series 80
LNName	Object Name	A67_PTOC1, A67_PTOC2		M		■	■
Common logical node information							
Mod	INC	Mode		M		■	■
Beh	INS	Behaviour		M		■	■
Health	INS	Health		M		■	■
NamPlt	LPL	Name plate		M		■	■
Status information							
Str	ACD	Start		M		■	■
Op	ACT	Operate	■	M		■	■

67N/67NC - Directional earth fault

Attribute name	Attribute type	Explanation/Value	T	M/O/C/E	Sepam series 20	Sepam series 40	Sepam series 80
LNName	Object Name	A67N_PTOC1, A67N_PTOC2		M		■	■
Common logical node information							
Mod	INC	Mode		M		■	■
Beh	INS	Behaviour		M		■	■
Health	INS	Health		M		■	■
NamPlt	LPL	Name plate		M		■	■
Status information							
Str	ACD	Start		M		■	■
Op	ACT	Operate	■	M		■	■

Overfrequency (PTOF class)

81H - Overfrequency

Attribute name	Attribute type	Explanation/Value	T	M/O/C/E	Sepam series 20	Sepam series 40	Sepam series 80
LNName	Object Name	A81H_PTOF1		M	■		
		A81H_PTOF1, A81H_PTOF2		M		■	■
Common logical node information							
Mod	INC	Mode		M	■	■	■
Beh	INS	Behaviour		M	■	■	■
Health	INS	Health		M	■	■	■
NamPlt	LPL	Name plate		M	■	■	■
Status information							
Str	ACD	Start		M	■	■	■
Op	ACT	Operate	■	M	■	■	■

Note:
M: mandatory data
O: optional data
C: conditional data
E: extension data
T: transient data (applies only to BOOLEAN attributes with FC=ST).
No event is generated for reporting when changing from TRUE to FALSE.

Conformance statements
MICS - Model implementation conformance statement

Logical nodes for protection functions: P group (cont.)

Overvoltage (PTOV class)

59 - Overvoltage (L-L or L-N)							
Attribute name	**Attribute type**	**Explanation/Value**	**T**	**M/O/C/E**	**Sepam series 20**	**Sepam series 40**	**Sepam series 80**
LNName	Object Name	A59_PTOV1, A59_PTOV2		M	■	■	
		A59_PTOV1 to A59_PTOV4		M			■
Common logical node information							
Mod	INC	Mode		M	■	■	■
Beh	INS	Behaviour		M	■	■	■
Health	INS	Health		M	■	■	■
NamPlt	LPL	Name plate		M	■	■	■
Status information							
Str	ACD	Start		M	■	■	■
Op	ACT	Operate	■	M	■	■	■

59N - Neutral voltage displacement							
Attribute name	**Attribute type**	**Explanation/Value**	**T**	**M/O/C/E**	**Sepam series 20**	**Sepam series 40**	**Sepam series 80**
LNName	Object Name	A59N_PTOV1, A59N_PTOV2		M	■	■	■
Common logical node information							
Mod	INC	Mode		M	■	■	■
Beh	INS	Behaviour		M	■	■	■
Health	INS	Health		M	■	■	■
NamPlt	LPL	Name plate		M	■	■	■
Status information							
Str	ACD	Start		M	■	■	■
Op	ACT	Operate	■	M	■	■	■

47 - Negative sequence overvoltage							
Attribute name	**Attribute type**	**Explanation/Value**	**T**	**M/O/C/E**	**Sepam series 20**	**Sepam series 40**	**Sepam series 80**
LNName	Object Name	A47_PTOV1		M		■	
		A47_PTOV1, A47_PTOV2		M			■
Common logical node information							
Mod	INC	Mode		M		■	■
Beh	INS	Behaviour		M		■	■
Health	INS	Health		M		■	■
NamPlt	LPL	Name plate		M		■	■
Status information							
Str	ACD	Start		M		■	■
Op	ACT	Operate	■	M		■	■

Note:
M: mandatory data
O: optional data
C: conditional data
E: extension data
T: transient data (applies only to BOOLEAN attributes with FC=ST).
No event is generated for reporting when changing from TRUE to FALSE.

Logical nodes for protection functions: P group (cont.)

Thermal overload (PTTR class)

49RMS - Thermal overload

Attribute name	Attribute type	Explanation/Value	T	M/O/C/E	Sepam series 20	Sepam series 40	Sepam series 80
LNName	Object Name	A49_PTTR1		M	■	■	■
Common logical node information							
Mod	INC	Mode		M	■	■	■
Beh	INS	Behaviour		M	■	■	■
Health	INS	Health		M	■	■	■
NamPlt	LPL	Name plate		M	■	■	■
Loc	SPS	Local operation		O	■	■	■
Measured Values							
ThmRte	MV	Thermal capacity used		E	■	■	■
Controls							
InhThmPro	SPC	Inhibit thermal protection		E	■	■	■
Status information							
Op	ACT	Operate	■	M	■	■	■
AlmThm	ACT	Thermal alarm		O	■	■	■
TmResTr	INS	Operating time before tripping		E	■	■	■
WaitTm	INS	Waiting time after tripping		E	■	■	■

38/49T - Temperature monitoring

Attribute name	Attribute type	Explanation/Value	T	M/O/C/E	Sepam series 20	Sepam series 40	Sepam series 80
LNName	Object Name	A49T_PTTR1 to A49TPTTR8		M	■		
		A49T_PTTR1 to A49TPTTR16		M		■	■
Common logical node information							
Mod	INC	Mode		M	■	■	■
Beh	INS	Behaviour		M	■	■	■
Health	INS	Health		M	■	■	■
NamPlt	LPL	Name plate		M	■	■	■
Measured Values							
Tmp	MV	Temperature for thermal load		O	■	■	■
Status information					■	■	■
Op	ACT	Operate	■	M	■	■	■
AlmThm	ACT	Thermal alarm		O	■	■	■

Undercurrent (PTUC class)

37 - Phase undercurrent

Attribute name	Attribute type	Explanation/Value	T	M/O/C/E	Sepam series 20	Sepam series 40	Sepam series 80
LNName	Object Name	A37_PTUC1		M	■	■	■
Common logical node information							
Mod	INC	Mode		M	■	■	■
Beh	INS	Behaviour		M	■	■	■
Health	INS	Health		M	■	■	■
NamPlt	LPL	Name plate		M	■	■	■
Loc	SPS	Local operation		O		■	■
Controls							
ProRs	SPC	Protection reset		E		■	■
Status information							
Str	ACD	Start		M	■	■	■
Op	ACT	Operate	■	M	■	■	■

Note:
M: mandatory data
O: optional data
C: conditional data
E: extension data
T: transient data (applies only to BOOLEAN attributes with FC=ST).
No event is generated for reporting when changing from TRUE to FALSE.

Logical nodes for protection functions: P group (cont.)

Underfrequency (PTUF class)

81L - Underfrequency							
Attribute name	**Attribute type**	**Explanation/Value**	**T**	**M/O/C/E**	**Sepam series 20**	**Sepam series 40**	**Sepam series 80**
LNName	Object Name	A81L_PTUF1, A81L_PTUF2		M	■		
		A81L_PTUF1 to A81L_PTUF4		M		■	■
Common logical node information							
Mod	INC	Mode		M	■	■	■
Beh	INS	Behaviour		M	■	■	■
Health	INS	Health		M	■	■	■
NamPlt	LPL	Name plate		M	■	■	■
Status information							
Str	ACD	Start		M	■	■	■
Op	ACT	Operate	■	M	■	■	■

Undervoltage (PTUV class)

27- Undervoltage (L-L or L-N)							
Attribute name	**Attribute type**	**Explanation/Value**	**T**	**M/O/C/E**	**Sepam series 20**	**Sepam series 40**	**Sepam series 80**
LNName	Object Name	A27_PTUV1, A27_PTUV2		M	■	■	
		A27_PTUV1 to A27_PTUV4		M			■
Common logical node information							
Mod	INC	Mode		M	■	■	■
Beh	INS	Behaviour		M	■	■	■
Health	INS	Health		M	■	■	■
NamPlt	LPL	Name plate		M	■	■	■
Status information							
Str	ACD	Start		M	■	■	■
Op	ACT	Operate	■	M	■	■	■

27D - Positive sequence undervoltage							
Attribute name	**Attribute type**	**Explanation/Value**	**T**	**M/O/C/E**	**Sepam series 20**	**Sepam series 40**	**Sepam series 80**
LNName	Object Name	A27D_PTUV1, A27D_PTUV2		M	■	■	■
Common logical node information							
Mod	INC	Mode		M	■	■	■
Beh	INS	Behaviour		M	■	■	■
Health	INS	Health		M	■	■	■
NamPlt	LPL	Name plate		M	■	■	■
Status information							
Str	ACD	Start			■	■	■
Op	ACT	Operate	■	M	■	■	■

27R - Remanent undervoltage							
Attribute name	**Attribute type**	**Explanation/Value**	**T**	**M/O/C/E**	**Sepam series 20**	**Sepam series 40**	**Sepam series 80**
LNName	Object Name	A27R_PTUV1		M	■	■	
		A27R_PTUV1, A27R_PTUV2		M			■
Common logical node information							
Mod	INC	Mode		M	■	■	■
Beh	INS	Behaviour		M	■	■	■
Health	INS	Health		M	■	■	■
NamPlt	LPL	Name plate		M	■	■	■
Status information							
Str	ACD	Start		M	■	■	■
Op	ACT	Operate	■	M	■	■	■

Note:
M: mandatory data
O: optional data
C: conditional data
E: extension data
T: transient data (applies only to BOOLEAN attributes with FC=ST).
No event is generated for reporting when changing from TRUE to FALSE.

Logical nodes for protection functions: P group (cont.)

Undervoltage (PTUV class) (cont.)

27S - Phase to neutral undervoltage							
Attribute name	**Attribute type**	**Explanation/Value**	**T**	**M/O/C/E**	**Sepam series 20**	**Sepam series 40**	**Sepam series 80**
LNName	Object Name	A27S_PTUV1		M	■		
Common logical node information							
Mod	INC	Mode		M	■		
Beh	INS	Behaviour		M	■		
Health	INS	Health		M	■		
NamPlt	LPL	Name plate		M	■		
Status information							
Str	ACD	Start		M	■		
Op1	ACT	Operate on phase A	■	M	■		
Op2	ACT	Operate on phase B	■	M	■		
Op3	ACT	Operate on phase C	■	M	■		

Voltage controlled time overcurrent (PVOC class)

50V/51V - Voltage restrained overcurrent							
Attribute name	**Attribute type**	**Explanation/Value**	**T**	**M/O/C/E**	**Sepam series 20**	**Sepam series 40**	**Sepam series 80**
LNName	Object Name	A51V_PVOC1		M		■	
		A51V_PVOC1, A51V_PVOC2		M			■
Common logical node information							
Mod	INC	Mode		M		■	■
Beh	INS	Behaviour		M		■	■
Health	INS	Health		M		■	■
NamPlt	LPL	Name plate		M		■	■
Status information							
Str	ACD	Start		M		■	■
Op	ACT	Operate	■	M		■	■

Volts per Hertz (PVPH class)

24 - Overfluxing							
Attribute name	**Attribute type**	**Explanation/Value**	**T**	**M/O/C/E**	**Sepam series 20**	**Sepam series 40**	**Sepam series 80**
LNName	Object Name	A24_PVPH1, A24_PVPH2		M			■
Common logical node information							
Mod	INC	Mode		M			■
Beh	INS	Behaviour		M			■
Health	INS	Health		M			■
NamPlt	LPL	Name plate		M			■
Status information							
Str	ACD	Start					■
Op	ACT	Operate	■	M			■

Note:
M: mandatory data
O: optional data
C: conditional data
E: extension data
T: transient data (applies only to BOOLEAN attributes with FC=ST).
No event is generated for reporting when changing from TRUE to FALSE.

Logical nodes for protection functions: P group (cont.)

Zero speed or underspeed (PZSU class)

14 - Underspeed							
Attribute name	**Attribute type**	**Explanation/Value**	**T**	**M/O/C/E**	**Sepam series 20**	**Sepam series 40**	**Sepam series 80**
LNName	Object Name	A14_PZSU1, A14_PZSU2		M			■
Common logical node information							
Mod	INC	Mode		M			■
Beh	INS	Behaviour		M			■
Health	INS	Health		M			■
NamPlt	LPL	Name plate		M			■
Measured values							
RotSpd	MV	Rotation speed		E			■
Status information							
Str	ACD	Start		M			■
Op	ACT	Operate	■	M			■

12 - Overspeed							
Attribute name	**Attribute type**	**Explanation/Value**	**T**	**M/O/C/E**	**Sepam series 20**	**Sepam series 40**	**Sepam series 80**
LNName	Object Name	A12_PZSU1, A12_PZSU2		M			■
Common logical node information							
Mod	INC	Mode		M			■
Beh	INS	Behaviour		M			■
Health	INS	Health		M			■
NamPlt	LPL	Name plate		M			■
Measured values							
RotSpd	MV	Rotation speed		E			■
Status information							
Str	ACD	Start		M			■
Op	ACT	Operate	■	M			■

Note:
M: mandatory data
O: optional data
C: conditional data
E: extension data
T: transient data (applies only to BOOLEAN attributes with FC=ST).
No event is generated for reporting when changing from TRUE to FALSE.

Logical nodes for protection related functions: R group

Breaker failure (RBRF class)

Attribute name	Attribute type	Explanation/Value	T	M/O/C/E	Sepam series 20	Sepam series 40	Sepam series 80
LNName	Object Name	RBRF1		M	■	■	■
Common logical node information							
Mod	INC	Mode		M	■	■	■
Beh	INS	Behaviour		M	■	■	■
Health	INS	Health		M	■	■	■
NamPlt	LPL	Name plate		M	■	■	■
Status information							
OpEx	ACT	Breaker failure trip	■	C	■	■	■

Disturbance recorder function (RDRE class)

Attribute name	Attribute type	Explanation/Value	T	M/O/C/E	Sepam series 20	Sepam series 40	Sepam series 80
LNName	Object Name	RDRE1		M	■	■	■
Common logical node information							
Mod	INC	Mode		M	■	■	■
Beh	INS	Behaviour		M	■	■	■
Health	INS	Health		M	■	■	■
NamPlt	LPL	Name plate		M	■	■	■
Loc	SPS	Local operation		O	■	■	■
Controls							
RcdTrg	SPC	Trig recorder		O	■	■	■
RcdInh	SPC	Inhibit recorder		E	■	■	■
Status information							
RcdMade	SPS	Recording made		M	■	■	■
FltNum	INS	Fault number (not supported, always 0)		M	■	■	■

Autoreclosing (RREC class)

Attribute name	Attribute type	Explanation/Value	T	M/O/C/E	Sepam series 20	Sepam series 40	Sepam series 80
LNName	Object Name	RREC1		M	■	■	■
Common logical node information							
Mod	INC	Mode		M	■	■	■
Beh	INS	Behaviour		M	■	■	■
Health	INS	Health		M	■	■	■
NamPlt	LPL	Name plate		M	■	■	■
Loc	SPS	Local operation		O	■	■	■
Controls					■	■	■
BlkRec	SPC	Block reclosing		O	■	■	■
Status information							
Op	ACT	Operate	■	M	■	■	■
AutoRecSt	INS	Autoreclosing status		M	■	■	■

Note:
M: mandatory data
O: optional data
C: conditional data
E: extension data
T: transient data (applies only to BOOLEAN attributes with FC=ST).
No event is generated for reporting when changing from TRUE to FALSE.

Conformance statements
MICS - Model implementation conformance statement

Logical nodes for protection related functions: R group (cont.)

Synchronism-check or synchronizing (RSYN class)

Attribute name	Attribute type	Explanation/Value	T	M/O/C/E	Sepam series 20	Sepam series 40	Sepam series 80
LNName	Object Name	RSYN1		M			■
Common logical node information							
Mod	INC	Mode		M			■
Beh	INS	Behaviour		M			■
Health	INS	Health		M			■
NamPlt	LPL	Name plate		M			■
Loc	SPS	Local operation		O			■
Measured values							
DifVClc	MV	Calculated difference in Voltage		O			■
DifHzClc	MV	Calculated difference in Frequency		O			■
DifAngClc	MV	Calculated difference of Phase Angle		O			■
Controls							
InhSynChk	SPC	Inhibit synchronism-check		E			■
Status information							
Rel	SPS	Release		M			■
VInd	SPS	Voltage difference indicator		O			■
AngInd	SPS	Angle difference indicator		O			■
HzInd	SPS	Frequency difference indicator		O			■
SynPrg	SPS	Synchronizing in progress		O			■
SynStop	SPS	Synchronizing stop	■	E			■
SynFlt	SPS	Synchronizing failure	■	E			■
Syn	SPS	Synchronizing successful	■	E			■

Logical nodes for control: C group

Switch controller (CSWI class)

Attribute name	Attribute type	Explanation/Value	T	M/O/C/E	Sepam series 20	Sepam series 40	Sepam series 80
LNName	Object Name	CSWI1		M	■	■	■
Common logical node information							
Mod	INC	Mode		M	■	■	■
Beh	INS	Behaviour		M	■	■	■
Health	INS	Health		M	■	■	■
NamPlt	LPL	Name plate		M	■	■	■
Loc	SPS	Local operation		O	■	■	■
Controls							
Pos	DPC	Switch, general		M	■	■	■

Note:
M: mandatory data
O: optional data
C: conditional data
E: extension data
T: transient data (applies only to BOOLEAN attributes with FC=ST).
No event is generated for reporting when changing from TRUE to FALSE.

Logical nodes for generic reference: G group

Generic automatic process control (GAPC class)

Load shedding							
Attribute name	**Attribute type**	**Explanation/Value**	**T**	**M/O/C/E**	**Sepam series 20**	**Sepam series 40**	**Sepam series 80**
LNName	Object Name	LS_GAPC1		M			■
Common logical node information							
Mod	INC	Mode		M			■
Beh	INS	Behaviour		M			■
Health	INS	Health		M			■
NamPlt	LPL	Name plate		M			■
Status information							■
Str	ACD	Start		M			■
Op	ACT	Operate	■	M			■
MotStrRe	SPS	Motor restart		E			■

Generic process I/O (GGIO class)

MES114 Digital Inputs							
Attribute name	**Attribute type**	**Explanation/Value**	**T**	**M/O/C/E**	**Sepam series 20**	**Sepam series 40**	**Sepam series 80**
LNName	Object Name	M114_GGIO1		M	■	■	
Common logical node information							
Mod	INC	Mode		M	■	■	
Beh	INS	Behaviour		M	■	■	
Health	INS	Health		M	■	■	
NamPlt	LPL	Name plate		M	■	■	
Status information							
Ind11 to Ind14	SPS	Digital Input I11 to I14		O	■	■	
Ind21 to Ind26	SPS	Digital Input I21 to I26		O	■	■	

MES120 Digital Inputs							
Attribute name	**Attribute type**	**Explanation/Value**	**T**	**M/O/C/E**	**Sepam series 20**	**Sepam series 40**	**Sepam series 80**
LNName	Object Name	M120_GGIOn (n = 1 to 3)		M			■
Common logical node information							
Mod	INC	Mode		M			■
Beh	INS	Behaviour		M			■
Health	INS	Health		M			■
NamPlt	LPL	Name plate		M			■
Status information							
Ind1 to Ind14	SPS	Digital Input In01 to In14 (n = 1 to 3)		O			■

Logic equations							
Attribute name	**Attribute type**	**Explanation/Value**	**T**	**M/O/C/E**	**Sepam series 20**	**Sepam series 40**	**Sepam series 80**
LNName	Object Name	EQU_GGIO1		M		■	■
Common logical node information							
Mod	INC	Mode		M		■	■
Beh	INS	Behaviour		M		■	■
Health	INS	Health		M		■	■
NamPlt	LPL	Name plate		M		■	■
Status information							
Ind1 to Ind8	SPS	V1 to V8		O		■	■
Ind101 to Ind108	SPS	V_MIMIC_IN_1 to V_MIMIC_IN_8		O			■

Note:
M: mandatory data
O: optional data
C: conditional data
E: extension data
T: transient data (applies only to BOOLEAN attributes with FC=ST).
No event is generated for reporting when changing from TRUE to FALSE.

Logical nodes for generic reference: G group (cont.)

Generic process I/O (GGIO class) (cont.)

Logipam							
Attribute name	**Attribute type**	**Explanation/Value**	**T**	**M/O/C/E**	**Sepam series 20**	**Sepam series 40**	**Sepam series 80**
LNName	Object Name	LGP_GGIO1		M			■
Common logical node information							
Mod	INC	Mode		M			■
Beh	INS	Behaviour		M			■
Health	INS	Health		M			■
NamPlt	LPL	Name plate		M			■
Loc	SPS	Local operation		O			■
Controls							
SPCSO1 to SPCSO8	SPC	Logipam TC49 to TC56		O			■
DPCSO1	DPC	Logipam TC57/58 and TS41/42		O			■
DPCSO2	DPC	Logipam TC59/60 and TS43/44		O			■
Status information							
Ind1 to Ind8	SPS	Logipam TS33 to TS40		O			■
IntIn1 to IntIn8	INS	Logipam counter C1 to C8		O			■

Note:
M: mandatory data
O: optional data
C: conditional data
E: extension data
T: transient data (applies only to BOOLEAN attributes with FC=ST).
No event is generated for reporting when changing from TRUE to FALSE.

Logical nodes for metering and measurement: M group

Non phase related harmonics (MHAN class)

Attribute name	Attribute type	Explanation/Value	T	M/O/C/E	Sepam series 20	Sepam series 40	Sepam series 80
LNName	Object Name	MHAN1		M			■
Common logical node information							
Mod	INC	Mode		M			■
Beh	INS	Behaviour		M			■
Health	INS	Health		M			■
NamPlt	LPL	Name plate		M			■
Measured values							
Hz	MV	Basic frequency		C			■
ThdAmp	MV	Current total harmonic distortion		O			■
ThdVol	MV	Voltage total harmonic distortion		O			■

Metering (MMTR class)

Attribute name	Attribute type	Explanation/Value	T	M/O/C/E	Sepam series 20	Sepam series 40	Sepam series 80
LNName	Object Name	MMTR1 (Internal energy counters)		M		■	■
		MMTR2 (External energy counters)		M		■	■
Common logical node information							
Mod	INC	Mode		M		■	■
Beh	INS	Behaviour		M		■	■
Health	INS	Health		M		■	■
NamPlt	LPL	Name plate		M		■	■
Measured values							
SupWh	BCR	Real energy supply		O		■	■
SupVArh	BCR	Reactive energy supply		O		■	■
DmdWh	BCR	Real energy demand		O		■	■
DmdVArh	BCR	Reactive energy demand		O		■	■

Note:
M: mandatory data
O: optional data
C: conditional data
E: extension data
T: transient data (applies only to BOOLEAN attributes with FC=ST).
No event is generated for reporting when changing from TRUE to FALSE.

Logical nodes for metering and measurement: M group (cont.)

Measurement (MMXU class)

Main channels measurements (for Sepam series 40 and Sepam series 80)							
Attribute name	**Attribute type**	**Explanation/Value**	**T**	**M/O/C/E**	**Sepam series 20**	**Sepam series 40**	**Sepam series 80**
LNName	Object Name	MMXU1		M		■	■
Common logical node information							
Mod	INC	Mode		M		■	■
Beh	INS	Behaviour		M		■	■
Health	INS	Health		M		■	■
NamPlt	LPL	Name plate		M		■	■
Measured values							
TotW	MV	Total active power		O		■	■
TotVAr	MV	Total reactive power		O		■	■
TotVA	MV	Total apparent power		O		■	■
TotPF	MV	Average power factor		O		■	■
Hz	MV	Frequency		O		■	■
PPV	DEL	Phase to phase voltages		O		■	■
PhV	WYE	Phase to ground voltages		O		■	■
A	WYE	Phase currents		O		■	■
W	WYE	Phase active power		O			■
VAr	WYE	Phase reactive power		O			■
VA	WYE	Phase apparent power		O			■

Current channels measurements for Sepam series 20 and Sepam series 80 (additional channels)							
Attribute name	**Attribute type**	**Explanation/Value**	**T**	**M/O/C/E**	**Sepam series 20**	**Sepam series 40**	**Sepam series 80**
LNName	Object Name	MMXU2		M	■		■
Common logical node information							
Mod	INC	Mode		M	■		■
Beh	INS	Behaviour		M	■		■
Health	INS	Health		M	■		■
NamPlt	LPL	Name plate		M	■		■
Measured values							
A	WYE	Phase currents		O	■		■

Voltage channels measurements for Sepam series 20 (B2x applications) and Sepam series 80 (additional channels)							
Attribute name	**Attribute type**	**Explanation/Value**	**T**	**M/O/C/E**	**Sepam series 20**	**Sepam series 40**	**Sepam series 80**
LNName	Object Name	MMXU3		M	■		■
Common logical node information							
Mod	INC	Mode		M	■		■
Beh	INS	Behaviour		M	■		■
Health	INS	Health		M	■		■
NamPlt	LPL	Name plate		M	■		■
Measured values							
Hz	MV	Frequency		O	■		■
PPV	DEL	Phase to phase voltages		O	■		■
PhV	WYE	Phase to ground voltages		O	■		■

Note:
M: mandatory data
O: optional data
C: conditional data
E: extension data
T: transient data (applies only to BOOLEAN attributes with FC=ST).
No event is generated for reporting when changing from TRUE to FALSE.

Logical nodes for metering and measurement: M group (cont.)

Sequence and imbalance (MSQI class)

Main channels measurements							
Attribute name	**Attribute type**	**Explanation/Value**	**T**	**M/O/C/E**	**Sepam series 20**	**Sepam series 40**	**Sepam series 80**
LNName	Object Name	MSQI1		M	■	■	■
Common logical node information							
Mod	INC	Mode		M	■	■	■
Beh	INS	Behaviour		M	■	■	■
Health	INS	Health		M	■	■	■
NamPlt	LPL	Name plate		M	■	■	■
Measured values							
SeqV	SEQ	Positive, negative and zero sequence voltage		C	■ (1)	■	■

(1) *negative sequence voltage not available on Sepam series 20*

Additional voltage channels measurements							
Attribute name	**Attribute type**	**Explanation/Value**	**T**	**M/O/C/E**	**Sepam series 20**	**Sepam series 40**	**Sepam series 80**
LNName	Object Name	MSQI2		M			■
Common logical node information							
Mod	INC	Mode		M			■
Beh	INS	Behaviour		M			■
Health	INS	Health		M			■
NamPlt	LPL	Name plate		M			■
Measured values							
SeqV	SEQ	Positive, negative and zero sequence voltage		C			■

Metering statistics (MSTA class)

Attribute name	**Attribute type**	**Explanation/Value**	**T**	**M/O/C/E**	**Sepam series 20**	**Sepam series 40**	**Sepam series 80**
LNName	Object Name	MSTA1		M	■	■	■
Common logical node information							
Mod	INC	Mode		M	■	■	■
Beh	INS	Behaviour		M	■	■	■
Health	INS	Health		M	■	■	■
NamPlt	LPL	Name plate		M	■	■	■
Loc	SPS	Local operation		O	■	■	■
Metered values							
Max W	MV	Maximum real power		O		■	■
MaxVAr	MV	Maximum reactive power		O		■	■
AvAmps1	MV	Average current phase A		O	■	■	■
AvAmps2	MV	Average current phase B		O	■	■	■
AvAmps3	MV	Average current phase C		O	■	■	■
MaxAmps1	MV	Maximum current phase A		O	■	■	■
MaxAmps2	MV	Maximum current phase B		O	■	■	■
MaxAmps3	MV	Maximum current phase C		O	■	■	■
TrAmp1	MV	Last trip current phase A		E	■	■	■
TrAmp2	MV	Last trip current phase B		E	■	■	■
TrAmp3	MV	Last trip current phase C		E	■	■	■
TrAmp4	MV	Last trip current neutral		E	■	■	■
Controls							
RsMaxA	SPC	Reset peak demand current		E			■
RsMaxPwr	SPC	Reset peak demand power		E			■
RsMax	SPC	Reset peak demand values		E	■	■	

Note:
M: mandatory data
O: optional data
C: conditional data
E: extension data
T: transient data (applies only to BOOLEAN attributes with FC=ST).
No event is generated for reporting when changing from TRUE to FALSE.

Logical nodes for sensors and monitoring: S group

Insulation medium supervision (liquid) (SIML class)

Attribute name	Attribute type	Explanation/Value	T	M/O/C/E	Sepam series 20	Sepam series 40	Sepam series 80
LNName	Object Name	SIML1		M		■	■
Common logical node information							
Mod	INC	Mode		M		■	■
Beh	INS	Behaviour		M		■	■
Health	INS	Health		M		■	■
NamPlt	LPL	Name plate		M		■	■
Status information							
InsAlm	SPS	Insulation liquid critical (=Buchholz alarm)		M		■	■
GasInsTr	SPS	Buchholz trip		O		■	■
PresAlm	SPS	Pressure alarm		O		■	■
PresTr	SPS	Pressure trip		O		■	■
TmpAlm	SPS	Thermostat alarm		O		■	■
TmpTr	SPS	Thermostat trip		E		■	■
ThmAlm	SPS	Thermistor alarm		E		■	■
ThmTr	SPS	Thermistor trip		E		■	■

Note:
M: mandatory data
O: optional data
C: conditional data
E: extension data
T: transient data (applies only to BOOLEAN attributes with FC=ST).
No event is generated for reporting when changing from TRUE to FALSE.

Conformance statements
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Logical nodes for switchgear: X group

Circuit breaker (XCBR class)

Attribute name	Attribute type	Explanation/Value	T	M/O/C/E	Sepam series 20	Sepam series 40	Sepam series 80
LNName	Object Name	XCBR1		M	■	■	■
Common logical node information							
Mod	INC	Mode		M	■	■	■
Beh	INS	Behaviour		M	■	■	■
Health	INS	Health		M	■	■	■
NamPlt	LPL	Name plate		M	■	■	■
Loc	SPS	Local operation		M	■	■	■
EEHealth	INS	External equipment health		O	■	■	■
OpCnt	INS	Operation counter		M	■	■	■
Controls							
Pos	DPC	Switch position		M	■	■	■
BlkOpn	SPC	Block opening		M	■	■	■
BlkCls	SPC	Block closing		M	■	■	■
Metered values							
SumSwARs	BCR	Sum of switched amperes		O	■	■	■
Status information							
CBOpCap	INS	Circuit breaker operating capability		M	■	■	■
OpHrsCnt	INS	Operating hours counter		E	■	■	■
OpTmms	INS	Operating time		E	■	■	■
ChaTms	INS	Charging time		E	■	■	■
PhFltCnt	INS	Phase faults trip counter		E			■
EFTrCnt	INS	Earth faults trip counter		E			■
SumSwAAlm	SPS	Cumulative breaking current alarm		E			■
CBRkdOut	SPS	Circuit breaker racked out		E			■
RkdOutCnt	INS	Racking out operations counter		E			■
ESwPos	SPS	Earthing switch position		E			■

Logical nodes for further power system equipment: Z group

Capacitor bank (ZCAP class)

Attribute name	Attribute type	Explanation/Value	T	M/O/C/E	Sepam series 20	Sepam series 40	Sepam series 80
LNName	Object Name	ZCAP1 to ZCAP4		M			■
Common logical node information							
Mod	INC	Mode		M			■
Beh	INS	Behaviour		M			■
Health	INS	Health		M			■
NamPlt	LPL	Name plate		M			■
Loc	SPS	Local operation		O			■
EEHealth	INS	External equipment health		O			■
OpTmh	INS	Operation time		O			■
Controls							
CapDS	SPC	Capacitor bank device status		M			■
Status information							
DschBlk	SPS	Blocked due to discharge		M			■
Auto	SPS	Automatic operation		E			■

Note:
M: mandatory data
O: optional data
C: conditional data
E: extension data
T: transient data (applies only to BOOLEAN attributes with FC=ST).
No event is generated for reporting when changing from TRUE to FALSE.

Conformance statements
MICS - Model implementation conformance statement

Logical nodes per Sepam series 20 and Sepam series 40 types

Logical Node	S20	S23	T20	T23	M20	B21	B22	S40	S41	S42	T40	T42	M41	G40
System Logical Nodes - L group														
LPHD1	■	■	■	■	■	■	■	■	■	■	■	■	■	■
LLN0	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Logical Nodes for protection functions - P group														
A32P_PDOP1									■	■			■	■
A32Q_PDOP1													■	■
A81R_PFRC1							■							
A66_PMRI1					■								■	
A51LR_PMSS1					■								■	
A46_PTOC1	■	■	■	■	■			■	■	■	■	■	■	■
A51_PTOC1-4	■	■	■	■	■			■	■	■	■	■	■	■
A51N_PTOC1-4	■	■	■	■	■			■	■	■	■	■	■	■
A67_PTOC1-2										■		■		
A67N_PTOC1-2									■	■		■	■	
A81H_PTOF1/1-2						■	■	■	■	■	■	■	■	■
A47_PTOV1-2								■	■	■	■	■	■	■
A59_PTOV1-2						■	■	■	■	■	■	■	■	■
A59N_PTOV1-2						■	■	■	■	■	■	■	■	■
PTRC1	■	■	■	■	■	■	■	■	■	■	■	■	■	■
A49_PTTR1			■	■	■						■	■	■	■
A49T_PTTR1-8/16			■	■	■						■	■	■	■
A37_PTUC1					■								■	
A81L_PTUF1-2/4						■	■	■	■	■	■	■	■	■
A27_PTUV1-2						■	■	■	■	■	■	■	■	■
A27D_PTUV1-2						■	■						■	
A27R_PTUV1						■	■						■	
A27S_PTUV1						■	■							
A51V_PVOC1														■
Logical Nodes for protection related functions - R group														
RDRE1	■	■	■	■	■	■	■	■	■	■	■	■	■	■
RBRF1		■		■				■	■	■	■	■	■	■
RREC1	■	■						■	■	■				
Logical Nodes for control - C group														
CSWI1	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Logical Nodes for generic reference - G group														
EQU_GGIO1								■	■	■	■	■	■	■
M114_GGIO1	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Logical Nodes for metering and measurement - M group														
MMTR1-2								■	■	■	■	■	■	■
MMXU1								■	■	■	■	■	■	■
MMXU2	■	■	■	■	■									
MMXU3						■	■							
MSQI1						■	■	■	■	■	■	■	■	■
MSTA1	■	■	■	■	■			■	■	■	■	■	■	■
Logical Nodes for sensors and monitoring - S group														
SIML1											■	■		
Logical Nodes for switchgear- X group														
XCBR1	■	■	■	■	■	■	■	■	■	■	■	■	■	■

Conformance statements
MICS - Model implementation conformance statement

Logical nodes per Sepam series 80 types

Logical Node	S80	S81	S82	S84	T81	T82	T87	M81	M87	M88	G82	G87	G88	B80	B83	C86
System Logical Nodes - L group																
LPHD1	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
LLN0	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Logical Nodes for protection functions - P group																
A64RF_PDIF1-2					■	■	■				■		■			
A87M_PDIF1									■			■				
A87T_PDIF1							■			■			■			
A21B_PDIS1											■	■	■			
A32P_PDOP1-2		■	■	■	■	■	■	■	■	■	■	■	■			
A32Q_PDOP1								■	■	■	■	■	■			
A37P_PDUP1-2				■							■					
A40_PDUP1								■	■	■	■	■	■			
A81R_PFRC1-2				■												
A64G2_PHIZ1-2											■	■	■			
A5027_PIOC1											■	■	■			
A66_PMRI1								■	■	■						
A51LR_PMSS1								■	■	■						
A78PS_PPAM1								■	■	■	■	■	■			
A46_PTOC1-2	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
A51_PTOC1-8	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
A51C_PTOC1-8																■
A51N_PTOC1-8	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
A67_PTOC1-2			■	■		■	■				■	■	■			
A67N_PTOC1-2		■	■	■	■	■	■	■	■	■	■	■	■			
A81H_PTOF1-2	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
A47_PTOV1-2	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
A59_PTOV1-4	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
A59N_PTOV1-2	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
PTRC1	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
A49_PTTR1		■	■	■	■	■	■	■	■	■	■	■	■			■
A49T_PTTR1-16					■	■	■	■	■	■	■	■	■			■
A37_PTUC1								■	■	■						
A81L_PTUF1-4	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
A27_PTUV1-4	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
A27D_PTUV1-2	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
A27R_PTUV1-2	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
A51V_PVOC1-2											■	■	■			
A24_PVPH1-2							■				■	■	■			
A12_PZSU1-2								■	■	■	■	■	■			
A14_PZSU1-2								■	■	■	■	■	■			
Logical Nodes for protection related functions - R group																
RBRF1	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
RDRE1	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
RREC1	■	■	■	■												
RSYN1	■	■	■	■	■	■	■				■	■	■	■	■	
Logical Nodes for control - C group																
CSWI1	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Logical Nodes for generic reference - G group																
LS_GAPC1								■	■	■						
EQU_GGIO1	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
LGP_GGIO1	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
M120_GGIO1-3	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Logical Nodes for metering and measurement - M group																
MHAN1	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
MMTR1-2	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
MMXU1	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
MMXU2							■		■	■		■	■			
MMXU3															■	
MSQI1	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
MSQI2															■	
MSTA1	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Logical Nodes sensors and monitoring - S group																
SIML1					■	■	■	■		■	■		■			
Logical Nodes switchgear - X group																
XCBR1	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Logical Nodes for further power equipment - Z group																
ZCAP1-4																■

Conformance statements
PICS - Protocol implementation conformance statement

*The **Specific Communication Services Mapping** to MMS (ISO 9506) and to ISO/IEC 8802-3 is defined by part 8-1 of IEC 61850.*
It provides:
- *the mapping of the objects and services of the ACSI to MMS*
- *the mapping of time-critical information exchanges to ISO/IEC 8802-3*

These conformance tables are taken from chapter 24 of IEC 61850-8-1.

Profile conformance

A-Profile support

Profile		Client	Server	Comments
A1	Client/server		■	
A2	GOOSE/GSE Management	■	■	
A3	GSSE			
A4	Time sync	■		

T-Profile support

Profile		Client	Server	Comments
T1	TCP/IP profile		■	
T2	OSI T profile			
T3	GOOSE/GSE T profile	■	■	ACE850 only
T4	GSSE T profile			
T5	Time Sync T profile	■		

MMS conformance

MMS service supported CBB (server)	M/O/C/I	Supported
status	M	■
getNameList	C	■
identify	M	■
rename	O	
read	C	■
write	C	■
getVariableAccessAttributes	C	■
defineNamedVariable	O	
defineScatteredAccess	I	
getScatteredAccessAttibutes	I	
deleteVariableAccess	O	
defineNamedVariableList	O	
getNamedVariablesListAttributes	C	■
deleteNamedVariableList	C	
defineNamedType	I	
getNamedTypeAttributes	I	
deleteNamedType	I	
input	I	
output	I	
takeControl	I	
relinquishControl	I	
defineSemaphore	I	
deleteSemaphore	I	
reportPoolSemaphoreStatus	I	
reportSemaphoreStatus	I	
initialDownloadSequence	I	
downloadSegment	I	
terminateDownloadSequence	I	
initiateUploadSequence	I	
uploadSegment	I	
terminateUploadSequence	I	
requestDomainDownload	I	
requestDomainUpload	I	
loadDomainContent	I	
storeDomainContent	I	
deleteDomain	I	
getDomainAttributes	C	■

Note:
M: mandatory support
O: optional support
C: conditional support
I: out of scope
X: must not be supported (version compatibility)

MMS conformance (cont'd)

MMS service supported CBB (server)	M/O/C/I	Supported
createProgramInvocation	I	
deleteProgramInvocation	I	
start	I	
stop	I	
resume	I	
reset	I	
kill	I	
getProgramInvocationAttributes	I	
obtainFile	C	
defineEventCondition	I	
deleteEventCondition	I	
getEventConditionAttributes	I	
reportEventConditionStatus	I	
alterEventConditionMonitoring	I	
triggerEvent	I	
defineEventAction	I	
deleteEventAction	I	
alterEventEnrollment	I	
reportEventEnrollmentStatus	I	
getEventEnrollmentAttributes	I	
acknowledgeEventNotification	I	
getAlarmSummary	I	
getAlarmEnrollmentSummary	I	
readJournal	C	
writeJournal	O	
initializeJournal	C	
reportJournalStatus	I	
createJournal	I	
deleteJournal	I	
fileOpen	C	■
fileRead	C	■
fileClose	C	■
fileRename	I	
fileDelete	C	
fileDirectory	C	■
unsolicitedStatus	I	
informationReport	C	■
eventNotification	I	
attachToEventCondition	I	
attachToSemaphore	I	
conclude	M	■
cancel	M	■
getDataExchangeAttributes	X	
exchangeData	X	
defineAccessControlList	X	
getAccessControlListAttributes	X	
reportAccessControlledObjects	X	
deleteAccessControlList	X	
alterAccessControl	X	
reconfigureProgramInvocation	X	

Note:
M: mandatory support
O: optional support
C: conditional support
I: out of scope
X: must not be supported (version compatibility)

Conformance statements
PICS - Protocol implementation conformance statement

GOOSE service

GOOSE conformance	Subscriber		Publisher	
	M/O/C	Supported	M/O/C	Supported
GOOSE services	C	■ (ACE850)	C	■ (ACE850)
SendGOOSEMessage	M		M	■
GetGoReference	O		C	
GetGOOSEElementNumber	O		C	
GetGoCBValues	O		O	
SetGoCBValues	O		O	
GSENotSupported	C		C	
GOOSE Control Block (GoCB)	O		O	■ (read only)

GSSE conformance	Subscriber		Publisher	
	M/O/C	Supported	M/O/C	Supported
GSSE services	C		C	
SendGSSEMessage	M		M	
GetGsReference	O		C	
GetGSSEDataOffset	O		C	
GetGsCBValues	O		O	
SetGsCBValues	O		O	
GSENotSupported	C		C	
GSSE Control Block (GsCB)	O		O	

SCL services

SCL conformance			
		M/O/C	Supported
SCL.1	SCL file for implementation available (offline)	M	■
SCL.2	SCL file available from implementation online	O	
SCL.3	SCL implementation reconfiguration supported online	O	

Note:
M: mandatory support
O: optional support
C: conditional support
I: out of scope
X: must not be supported (version compatibility)

Conformance statements
PIXIT - Protocol implementation extra information for testing

Device configuration

The entire device configuration is read-only and can only be modified by the CID file. In particular, data objects with functional constraints of DC and CF can never be written.

ACSI models

Association model

Item	Value/Comments
Maximum simultaneous client associations	6
TCP Keepalive	1 to 60 seconds (default 30) (1)
Authentication	Not supported
Association parameters	
TSEL	Required, value defined in the CID file
SSEL	Required, value defined in the CID file
PSEL	Required, value defined in the CID file
AP-Title	Not required, ignored if present
AE-Qualifier	Not required, ignored if present
Maximum MMS PDU size	8000
Typical startup time after a power supply interrupt	20-100 seconds (depends on the CID configuration file). The status LED blinks quickly during startup.

(1) *This is the time between two keepalive probes during normal operation. The session time-out, in case of communication failure, is related to this value in a non-linear way and ranges from approximately 50 seconds to approximately 150 seconds. It is about 90 seconds for the default keepalive value.*

Server model

Item	Value/Comments
Quality bits for analog values (MX)	
Validity	Good, Invalid
OutofRange	Supported
Failure	Supported
Inconsistent	Supported
Source	Process
Other quality bits and values	Not supported
Quality bits for status values (ST)	
Validity	Good, Invalid
BadReference	Supported
Failure	Supported
Inconsistent	Supported
Inaccurate	Supported
Source	Process
Other quality bits and values	Not supported
Maximum number of data values in Get/SetDataValues requests	Limited only by the MMS PDU size

Setting group model

Item	Value/Comments
Number of setting groups	2

Dataset model

Item	Value/Comments
Predefined Datasets in the ICD files	■ 1 status Dataset **LLN0.StDs** ■ 1 measurand Dataset **LLN0.MxDs** in each Sepam Logical Device
Maximum number of data elements in one Dataset	No fixed limit, it depends on the available memory.
Maximum number of persistent Datasets	No fixed limit, it depends on the available memory.
Maximum number of non-persistent Datasets	Not supported

Conformance statements
PIXIT - Protocol implementation extra information for testing

Reporting model

Item	Value/Comments
Predefined RCBs in the ICD files	■ 2 status RCBs **LLN0.brcbST01** and **LLN0.brcbST02**, based on **LLN0.StDs** ■ 2 measurands RCBs **LLN0.brcbMX01** and **LLN0.brcbMX02**, based on **LLN0.StMx** in each Sepam Logical Device
Support of trigger conditions	
Integrity	Supported
Data change	Supported
Data update	Supported (can be set, but there is no process data to report for this condition)
Quality change	Supported
General interrogation	Supported
Support of optional fields	
Sequence number	Supported
Report time-stamp	Supported
Reason for inclusion	Supported
Dataset name	Supported
Data reference	Supported
Buffer overflow	Supported
EntryID	Supported
Conf-rev	Supported
Segmentation	Supported
Sending of segmented reports	Supported
EntryID	Only the first 4 octets are used. Remaining octets must be 0.
Buffer size for each BRCB	30000 octets

Control model

Item	Value/Comments
Control models supported	
Status only	Supported
Direct with normal security	Supported
Direct with enhanced security	Not supported
SBO with normal security	Not supported
SBO with enhanced security	Supported
Time activated operate (operTm)	Not supported
Test mode	Not supported, ignored
Check conditions	Not supported, must be 0
Operate many	Not supported
Pulse configuration	Not supported
Command Termination timeout	15 seconds
Service error types	■ instance-not-available ■ access-violation ■ parameter-value-inappropriate ■ instance-locked-by-another-client ■ failed-due-to-server-constraint ■ generic-error

SBO controls

The value contained in the SBOw structure is ignored. It is possible to select several times the same control object. The select/operate timeout is restarted with each selection. The value contained in the Cancel structure is ignored. Controls with same ctlVal as current status are accepted.

Time and time synchronization model

Item	Value/Comments
Time quality bits	
LeapSecondsKnown	Not Supported
ClockFailure	Supported
ClockNotSynchronized	Supported
Maximum time to wait for time server responses	5 seconds
Meaning of ClockFailure bit	This bit is set when it is not possible to get time from any time server (or when the SNTP synchronization is not enabled).
Meaning of ClockNotSynchronized bit	This bit is set when the time server sets the alarm condition (clock not synchronized) in the SNTP frame (LI field).

Time stamps

Time stamping is performed in Sepam devices for process status values such as protection tripping, digital inputs changes…
It is performed in the ECI850 unit for any other data such as deadbanded analog values.

ECI850 clock

At power-up, the ECI850 clock is reset to 2007/01/01 00:00.000. It is then synchronized to the SNTP servers if the feature is enabled and the servers are running. Sepam units are synchronized from the ECI850 module only if the ClockFailure status is not set.

File transfer model

Item	Value/Comments
Separator for files and directories path	'/'
Structure of files and directories	ECI850: LD/LDName/COMTRADE/filename ACE850: COMTRADE/filename
Maximum length of names (incl. path)	64
Case sensitivity	Case sensitive

Conformance statements
PIXIT - Protocol implementation extra information for testing

Impact of Sepam settings

Logical device mode
Provided that the Sepam unit is of the correct type and communicates correctly with the ECI850, the corresponding logical device mode (given by LLN0.Mod) is always ON. The only exception is when a Sepam series 80 device is set in "test mode" in which case it is reported as BLOCKED (the closest IEC 61850 mode).

Protection logical nodes
Protection logical nodes are OFF (**Mod** attribute), if the corresponding protection function is turned OFF in the Sepam unit.

Some Protection Logical Nodes require a mandatory **Str** (Start) attribute. Such an information being unavailable in Sepam devices, it is always provided as an OFF state and invalid quality.

Breaker-related Logical Nodes
Breaker-related logical nodes CSWI1 and XCBR1 rely on the breaker control function being turned ON in the Sepam device.

Setting groups
IEC 61850 setting group 1 corresponds to Sepam setting group A.
IEC 61850 setting group 2 corresponds to Sepam setting group B.
Selection of active setting group is only possible if "Choice (of setting group) by remote control" is selected on the Sepam device.

Controls
In order to be executed, controls must be enabled in the Sepam unit. This is the case if the **Loc** attribute (available in every logical node containing controls) is OFF.

Analog values

Measurements

Units
Measurements are provided as floating point values with the following units:

Measurement type	Units
Current	1 A
Voltage	1 V
Power	1 kW, 1 kVA, 1 kvar
Energy	1 MWh, 1 Mvarh
Temperature	1 °C
Angle	1 °
Rate	1 %

Deadbands
Default deadband values are provided in the CID file. These values can be changed. Unlike specified in IEC 61850-7-3, deadband values are not expressed as % but they are integer values in physical units, which are described in the CID file.

Integer statuses
Integer statuses are transmitted with the following units:

Logical Node	Attribute	Sepam series 20	Sepam series 40	Sepam series 80
A66_PMRI1	StrInhTmm	1 min	1 min	1 min
A51LR_PMSS1	StrTmms	100 ms	100 ms	10 ms
A49_PTTR1	TmResTr	1 min	1 min	1 min
A49_PTTR1	WaitTm	1 min	1 min	1 min
XCBR1	OpHrsCnt	1 hr	1 hr	1 hr
XCBR1	OpTmms	1 ms	1 ms	1 ms
XCBR1	ChaTms	1 ms	100 ms	1 second
Miscellaneous	Counters	1	1	1

Notes

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