PACiS SMT

SMT/EN O/D10

Operation Guide
PACiS SMT

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1. INTRODUCTION

The present document is a chapter of the PACiS SMT manual. It describes the safety, handling, packing and unpacking procedures applicable to PACiS SMT software tools.
2. **SAFETY**

**WARNING:** THIS SAFETY SECTION SHOULD BE READ BEFORE COMMENCING ANY WORK ON THE EQUIPMENT.

2.1 **Health and Safety**

The information in the Safety Section of the product documentation is intended to ensure that products are properly installed and handled in order to maintain them in a safe condition. It is assumed that everyone who will be associated with the equipment will be familiar with the contents of the Safety Section and all Safety documents related to the PC and Communication networks.

2.2 **Explanation of symbols and labels**

The meaning of symbols and labels may be used on the equipment or in the product documentation, is given below.

2.3 **Installing, Commissioning and Servicing**

**Equipment operating conditions**

The equipment (PC and communication network supporting PACiS SMT) should be operated within the specified electrical and environmental limits.

**Fibre optic communication**

Optical LED transceivers used in Switch boards are classified as IEC 825-1 Accessible Emission Limit (AEL) Class 1 and consequently considered eye safe.

Optical power meters should be used to determine the operation or signal level of the device.

2.4 **Decommissioning and Disposal**

**Disposal:**

It is recommended to avoid incineration and disposal of the PACiS SMT CD-ROM. The product should be disposed of in a safe manner.
3. GUARANTEES

The media on which you received Schneider Electric software are warranted not to fail executing programming instructions, due to defects in materials and workmanship, for a period of 90 days from date of shipment, as evidenced by receipts or other documentation. Schneider Electric will, at its option, repair or replace software media that do not execute programming instructions if Schneider Electric receives notice of such defects during the guaranty period. Schneider Electric does not guaranty that the operation of the software shall be uninterrupted or error free.

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In any application, including the above reliability of operation of the software products can be impaired by adverse factors, including -but not limited- to fluctuations in electrical power supply, computer hardware malfunctions, computer operating system, software fitness, fitness of compilers and development software used to develop an application, installation errors, software and hardware compatibility problems, malfunctions or failures of electronic monitoring or control devices, transient failures of electronic systems (hardware and/or software), unanticipated uses or misuses, or errors from the user or applications designer (adverse factors such as these are collectively termed "System failures").

Any application where a system failure would create a risk of harm to property or persons (including the risk of bodily injuries and death) should not be reliant solely upon one form of electronic system due to the risk of system failure to avoid damage, injury or death, the user or application designer must take reasonably steps to protect against system failure, including -but not limited- to back-up or shut-down mechanisms, not because end-user system is customised and differs from Schneider Electric testing platforms but also a user or application designer may use Schneider Electric products in combination with other products.

These actions cannot be evaluated or contemplated by Schneider Electric; Thus, the user or application designer is ultimately responsible for verifying and validating the suitability of Schneider Electric products whenever they are incorporated in a system or application, even without limitation of the appropriate design, process and safety levels of such system or application.
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1. INTRODUCTION TO PACiS

The PACiS range will continue to be expanded. The general features of PACiS will also be enhanced, as we are able to adopt new technology solutions.

For up-to-date information on any PACiS product, visit our website: www.schneider-electric.com
2. INTRODUCTION TO PACiS GUIDES

This version of the PACiS SMT documentation refers to version PACiS V4.8. The guides provide a functional and technical description of the PACiS System Management Tools (SMT) and a comprehensive set of instructions for the PACiS SMT’s use and application.

PACiS SMT guides are divided into two volumes, as follows:

- Operation Guide: includes information on the application of the PACiS SMT and a technical description of its features. It is mainly intended for protection & control engineers concerned with the selection and application of the PACiS SMT for the Management of PACiS solution or of any of the PACiS equipment.

- Technical Guide: contains information on the installation and commissioning of the PACiS SMT, and also a section on fault finding. This volume is intended for site engineers who are responsible for the installation, commissioning and maintenance of the PACiS SMT application.

2.1 Chapters description

2.1.1 Chapter Safety (SA)
This chapter contains the safety instructions, handling and reception of electronic equipment, packing and unpacking parts, Copyrights and Trademarks.

2.1.2 Chapter Introduction (IT)
This is this document containing the description of each chapter of the PACiS SMT guides. It is a brief introduction to PACiS SMT capabilities.

2.1.3 Chapter Functional Description (FT)
This chapter contains a description of the product. It describes functions of the PACiS SMT.

2.1.4 Chapter Technical Data (TD)
This chapter contains the technical data including, accuracy limits, recommended operating conditions, ratings and performance data.

It also describes environment specification, compliance with technical standards.

2.1.5 Chapter HMI, Local control and user interface (HI)
This chapter contains the operator interface description, Menu tree organisation and navigation, Setting/configuration software.

2.1.6 Chapter Installation (IN)
This chapter contains the installation procedures.

2.1.7 Chapter Commissioning (CM)
This chapter contains instructions on how to commission PACiS SMT, comprising checks on the settings and functionalities.

2.1.8 Chapter Commissioning record sheet (RS)
This chapter provides detailed record sheets to commission PACiS SMT.

2.1.9 Chapter Logical Diagrams (LG)
This chapter describes the Logical functions and automations of PACiS SMT.

2.1.10 Chapter Applications (AP)
Comprehensive and detailed description of the features of the PACiS SMT.

2.1.11 Chapter Settings (ST)
This chapter contains the list of the setting with defaults values and range.
2.1.12 Chapter Maintenance, Fault finding, Repairs (MF)
This chapter advice on how to recognise failure modes, fault codes and describes the recommended actions to repair.

2.1.13 Chapter Problem analysis (PR)
This chapter advice on practical examples of problem solving and the company contact information. It includes all information on the self-checking features and diagnostics of PACIS SMT.

2.1.14 Chapter Lexical (LX)
This chapter contains lexical description of acronyms and definitions.

2.2 Operation guide
This manual contains the following chapters:
SA, IT, TD, FT, HI, AP, LX

2.3 Technical guide
This manual contains the following chapters:
SA, IT, TD, FT, IN, HI, ST, LG, CM, RS, MF, PR, LX
3. INTRODUCTION TO PACiS SMT APPLICATIONS

The PACiS System Management Tool (PACiS SMT) is in charge of:

- The downloading of the configuration provided by the PACiS System Configuration Editor (PACiS SCE) into the PACiS applications,
- The management of the running modes for these PACiS applications,
- Automatic uploading of disturbance files from IEC 61850 IEDs (PACiS or non-PACiS) and legacy IED through PACiS computer,
- The monitoring of non PACiS IEC 61850 applications,
- Launching MiCOM S1 Studio in order to have a direct connection between the MiCOM S1 and the IED. This facility is available for IEC61850 IEDs and legacy IEDs.

![Figure 1: Context Diagram](image)

3.1 Definitions

<table>
<thead>
<tr>
<th>Device/Equipment</th>
<th>A physical equipment on the station bus, which location is defined by an IP address.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Application</td>
<td>A part of a device, which has its own database, running mode, …</td>
</tr>
<tr>
<td>Vdbs</td>
<td>It represents the version of System Database (two integers separated by a dot). These two integers represent major and minor evolution.</td>
</tr>
<tr>
<td>ApplicationDataBag</td>
<td>A single file which contains all the data for an application. Content of this file is application dependent. It can be a zip file. The filename can be the application name, following by a Vdbs (mandatory).</td>
</tr>
<tr>
<td>SystemDataBag</td>
<td>A zip file. It contains all the data of a given System Database. It represents the vector to move the data from the Configurator System to the PACiS System. The filename is the PACiS System name followed by the Vdbs of the corresponding System Database.</td>
</tr>
<tr>
<td>System Database</td>
<td>All the application databases which compose the system.</td>
</tr>
</tbody>
</table>
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1. **SCOPE OF THE DOCUMENT**

This document is a chapter of the PACiS SMT manual, describing the Technical data of this software application.
## 2. HARDWARE REQUIREMENTS

The minimum hardware requirements to correctly operate the PACiS SMT applications show in the table that follows:

<table>
<thead>
<tr>
<th></th>
<th>Windows 2003 Server (SP2)</th>
<th>Windows Seven / XP</th>
<th>Windows XP Embedded</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>CPU</strong></td>
<td>PC Core II duo 2.66 GHz (or more)</td>
<td>Pentium IV – 3 GHz (or more)</td>
<td></td>
</tr>
<tr>
<td><strong>RAM</strong></td>
<td>1024 Mbytes</td>
<td>2048 Mbytes</td>
<td>2048 Mbytes</td>
</tr>
<tr>
<td><strong>Hard disk</strong></td>
<td>80 Gbytes</td>
<td>120 Gbytes</td>
<td>80 Gbytes</td>
</tr>
<tr>
<td><strong>CD Reader</strong></td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
</tr>
<tr>
<td><strong>Ethernet port</strong></td>
<td>100 Mbytes</td>
<td>100 Mbytes</td>
<td>100 Mbytes</td>
</tr>
</tbody>
</table>
3. **CAPABILITIES**

<table>
<thead>
<tr>
<th>Capability</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of servers</td>
<td>96 max</td>
</tr>
<tr>
<td>Disk space for system database</td>
<td>configurable (default: 100 Mo) max: 20% Hard disk size</td>
</tr>
<tr>
<td>Disk space for disturbance file storage</td>
<td>configurable (default: 50 Mo) max: 20% Hard disk size</td>
</tr>
<tr>
<td>Max number of log events</td>
<td>configurable (default: 1000) max: 10% Hard disk size</td>
</tr>
<tr>
<td>Number of PACiS SMT clients</td>
<td>Only 1 PACiS SMT HMI on a PC, Max: 8</td>
</tr>
</tbody>
</table>
## 4. SPECIFICATIONS

<table>
<thead>
<tr>
<th>Action</th>
<th>Conditions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Downloading an application databag into 1 server</td>
<td>• Hardware configuration previously described</td>
</tr>
<tr>
<td></td>
<td>• PACiS SMT and PACiS OI installed on the same PC,</td>
</tr>
<tr>
<td></td>
<td>• Application databag PACiS OI: 22 modules, 5000 objects, 2800 links, size: 9 Mbytes</td>
</tr>
<tr>
<td></td>
<td>Downloading time: 30 seconds up to 2 minutes in OI, 30 seconds in MiCOM C264</td>
</tr>
<tr>
<td>Downloading an application databag into 5 servers</td>
<td>The downloading time is the sum of all the IEC 61850 server downloading times because the IEC 61850 agency serialises all the file transfers</td>
</tr>
<tr>
<td>Change an operating mode of 1 server (e.g. Run =&gt; Maintenance)</td>
<td>• Hardware configuration previously described</td>
</tr>
<tr>
<td></td>
<td>• PACiS SMT and PACiS OI installed on the same PC.</td>
</tr>
<tr>
<td></td>
<td>Setting a new PACiS OI mode: 4 seconds</td>
</tr>
</tbody>
</table>
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1. SCOPE OF THE DOCUMENT

This document is a chapter of the PACiS SMT manual. It is the functional description of PACiS software application dedicated to the management of the PACiS system and sub-systems.
2. **PACiS SMT ARCHITECTURE**

2.1 **PACiS SMT Logical Architecture**

PACiS SMT application is composed of two major software components:

- PACiS SMT
- IEC 61850 agency

The IEC 61850 agency is a generic component used in all PACiS devices. This component is described in [SBUS_AGENCY] reference document, from a user point of view. The IEC 61850 agency offers services to a set of applications. PACiS SMT is one of these applications. It just uses client side services. In the SMT software the IEC agency is a DLL.

Other applications can use the IEC 61850 agency. But there is no impact on PACiS SMT.

The IEC 61850 agency supports:

- The IEC 61850 device interface,
- The IEC 61850 protocol management function.

PACiS SMT supports all others functions (i.e. that are not communication related) and the other system external interfaces.

PACiS SMT sees the “IEC 61850 world” only through the “IEC 61850 agency”.

The following sections apply to describe the PACiS SMT component.
2.2 PACiS SMT Architecture

It is made of two software components:

- The System Management tool HMI (SysMntHMI).
- The System Management tool Kernel (SysMntKernel).

PACiS SMT is made up of only one PACiS SMT Kernel, which communicates with several PACiS SMT HMI.

PACiS SMT Kernel manages the global state of PACiS SMT.

It assumes the communication with the IEC 61850 agency, is responsible for the storage and access to SystemDataBag, and manages requests from all PACiS SMT HMI.

PACiS SMT HMI manages the User Interface.

PACiS SMT is distributed over two different hardware types:

- Desktop PC, for HMI part (on which PACiS SMT HMI software runs)
- Server PC, for kernel part (on which PACiS SMT Kernel software runs)

The following figure describes the link between the physical architecture and the logical architecture:

![Figure 2: Physical and Logical Architecture Relation](image)

The Desktop PC is a standard PC computer for HMI purpose:

- colour display,
- mouse,
- keyboard,
- network card.
The Server PC is a standard PC computer with data storage and data export and import feature:

- data file system,
- removable storage devices (CD-ROM, tape, floppy).

Some Desktop PC can be remote and uses public network like Internet to access the Server PC.

A PACiS system contains only one Server PC; this software does not limit the number of Desktop PC and IEC 61850 devices.
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1. SCOPE OF THE DOCUMENT

This document is a chapter of the PACiS SMT manual. It describes the User Interface (coded HMI for Human Machine Interface) of this software application: the PACiS SMT HMI.
2. PACiS SMT HMI

2.1 Launching Application

After a successful installation of SMT Kernel and SMT Hmi the two related icons are present on desktop.

![SMT Icons](image1.png)

FIGURE 1: SMT ICONS

It is mandatory to launch first PACiS SMT Kernel before launching PACiS SMT Hmi.

2.1.1 Launching SMT Kernel

As any Windows program the SMT Kernel can be launched with various ways:

- Double-click the **PACiS SMT Kernel** icon
- Click the "start" button (in the left-bottom corner of the screen) then select **Programs / PACiS / SMT / SMT Kernel**

![Start Menu](image2.png)

Then the icon (1) is displayed in the right-bottom corner of the screen indicating that the SMT kernel is running.

![Running Icons](image3.png)

FIGURE 2: RUNNING SBUS AGENCY AND SMT KERNEL ICONS
2.1.2 Setting passwords

The SMT has 4 profiles protected by password so 4 roles predefined. For each profile is associated with a set of SMT functions described as following:

<table>
<thead>
<tr>
<th>SMT function authorized</th>
<th>Corresponding profile</th>
</tr>
</thead>
<tbody>
<tr>
<td>Change password and set-up</td>
<td>Security administrator</td>
</tr>
<tr>
<td>Visualize security logs</td>
<td></td>
</tr>
<tr>
<td>Install a new database</td>
<td>System administrator</td>
</tr>
<tr>
<td>Switch of database</td>
<td></td>
</tr>
<tr>
<td>SMT kernel administration (configure, view traces, change trace option)</td>
<td></td>
</tr>
<tr>
<td>Download ICD</td>
<td>System engineer</td>
</tr>
<tr>
<td>Change operating mode</td>
<td>System administrator</td>
</tr>
<tr>
<td>Activate/deactivate disturbance monitoring</td>
<td></td>
</tr>
<tr>
<td>Display list of computer</td>
<td>Observer</td>
</tr>
<tr>
<td>Start CMT (not applicable for CAT)</td>
<td>system engineer</td>
</tr>
<tr>
<td>Display operating mode</td>
<td>System administrator</td>
</tr>
<tr>
<td>Display DB version</td>
<td></td>
</tr>
</tbody>
</table>

To one profile corresponds only one login / password. The login / password define the menu reachable.

The password length could be extended to 8 digits. The password is a NERC compliance with the following rules:

- Password has at least six characters in length.
- Contain characters of the following four categories:
  - 26 Upper case characters [A-Z]
  - 26 Lower case characters [a-z]
  - Base 10 digits (0-9)
  - Non-alphanumeric
- At least one character of each category with Non-alphanumeric char are:

  ! " # $ % & ' ( ) * + , - . / : ; < = > ? @ [ \ ] ^ _ `
The password creation is defined as following:

For the first using, after SMT installation, the user has to define password per profile:

- By right-clicking the **PACiS SMT kernel** icon, a contextual menu with the following items is displayed:
By clicking **Set password**, the authentication window is displayed with the login (Security administrator) and password.

**FIGURE 4: THE SMT AUTHENTICATION WINDOW**

**NOTE:** The default password for the Security administrator is the computer’s hostname. For example: Hostname is MYCOMPUTER123, The password will be: MYCOMPUTER123. The other accounts don’t have any password, and you can’t log in until the security administrator has set a password.

If password success, the SMT Authentication settings window is displayed:

**FIGURE 5: THE SMT AUTHENTICATION SETTING WINDOW**

**NOTE:** LogIn settings are common for all profiles.

The user (Security administrator) has to set password properties for each 3 other profiles defined on list:

**FIGURE 6: THE SMT AUTHENTICATION SETTING WINDOW PROFILE LIST**
By clicking **Change… button**, the new password is edited:

![Define password window](image)

**FIGURE 7: THE SMT DEFINE PASSWORD WINDOW**

The password is changed with the displaying of the information window:

![Define password confirmation window](image)

**FIGURE 8: THE SMT DEFINE PASSWORD CONFIRMATION WINDOW**

### 2.1.3 Launching SMT HMI

It is mandatory to launch first PACiS SMT Kernel before launching PACiS SMT HMI.

The SMT HMI can be launched with various ways:

- Double-click the PACiS SMT Hmi icon
- Click the "start" button (in the left-bottom corner of the screen) then select Programs / Pacis / SMT / SMT Hmi
- From the OI application click the SMT icon in the Tool banner (refer to chapter Human Interface of the OI Technical Guide).
A disclaimer popup is launched. The user must press the ‘I agree’ button to proceed to the next stage. Pressing ‘I disagree’ will cause the user to exit the program.

FIGURE 9: THE SMT DISCLAIMER POPUP

Then a login window is displayed and the user must enter a password with the login (profile) choised:

FIGURE 10: THE SMT LOGIN WINDOW

Login: [Observer / System engineer / System administrator] is the profile.

Enter password: password associated with the login (define on previous section Setting passwords). All password / profile have to be defined by the Security administrator, else the login is refused.

Once the password has been validated (by clicking the “OK” button), it is compared to the profile password. If the password is correct, and no other profile is currently logged, the user will be logged as profile.

If the password is not correct, the logging is refused, and the user has to try again.
2.1.4 Exit menu

The Exit menu is always available. A warning box asking to confirm this action is displayed.

![Exit Menu](image1)

FIGURE 11: THE EXIT MENU AND ASSOCIATED WARNING BOX

2.1.5 Databases menu

The Databases menu is only available when the Databases panel is selected.

![Databases Menu](image2)

FIGURE 12: THE DATABASES MENU

The items of this menu are:

- **Add Database** (Administrator only): this action is available from everywhere in the database list, even if there’s no selected line.

- **Delete database** (Administrator only): this action is not available if the corresponding database is the Current or Standby one.

- **Connect all equipment** and **Disconnect all equipment** (Administrator or Observer): these actions apply only to all the equipment included in the selected System database. A pop-up is displayed if a disturbance file upload is running, explaining that the execution of the request will be delayed. During the request the corresponding line in the table blinks. These requests are blocking: the user can’t do anything else until the request is finished (finished means that the connection is requested by the SBUS agency to the remote IEC 61850 equipment, but not that the remote equipment is really connected).
• **Set current** (Administrator only): this action is not available if the corresponding database is not the Standby one. If no equipment is selected, it just defines this database as the reference (the status bar is then updated). If at least one piece of equipment is selected, it implies a switch database order and a change operating mode order (= go to Run) for all the connected equipment for which it's necessary. A pop-up is displayed if a disturbance file upload is running, explaining that the execution of the request will be delayed. Agency is reconfigured if its current configuration is not the future Current database one. This command does not impact non-PACiS devices.

• **Set/Download standby** (Administrator only): this action is not available if the corresponding database is the Current one. If no equipment is selected, it just defines this database as the reference (the status bar is then updated). If at least one piece of equipment is selected, it implies the configuration downloading for all the connected equipment for which it’s necessary. A pop-up is displayed if a disturbance file upload is running, explaining that the execution of the request will be delayed. This command does not impact non-PACiS devices.

• **Connect**: this action is available as long as all selected database equipment are not selected for connection, with the right IP address (i.e. if an equipment is currently connected with an IP address different from its address in the selected database), or on Administrator if disturbance monitoring status is Standby and the selected database is the Current one and the agency configuration is not equal to the Current System database one (this to allow to reconfigure the agency, which allows disturbance monitoring to "restart"). This action is also available if at least one equipment of the selected database has diag or iedDiag(s) data different from the one available in the current agency configuration (this to allow to reconfigure the agency in order to be able to see the diag(s) and iedDiag(s) data defined in the selected database). When the user has Administrator rights, if the connection of all the equipment involves a reconfiguration of the IEC 61850 agency (means one IP address to connect is not available in the current agency configuration), a pop-up window explaining this will be displayed, asking a confirmation. When the user has Observer rights, only the equipment, which belongs to the IEC 61850 agency configuration, will be connected.

• **Disconnect**: this action is available as long as at least one piece of equipment of the selected database is selected for connection.

• **Abort all the ongoing requests**:

  NOTE: These items can be accessed too from the contextual menu displayed by right-clicking on line of the **System databases store** table.

2.1.6 **Disturbance menu**

The **Disturbance** menu is only available when the **Databases** panel is selected.

![System Management Tool - Administrator](image)

**FIGURE 13: THE DISTURBANCE MENU**

This menu has two items only available on administrator.

- **Disturbance on (off)** (shortcut: Ctrl + Alt + M): this action is available only if a current database exists. It allows starting or stopping the disturbance file upload, for all the chosen equipment of the database. This item is available, and the associated action taken into account even if no equipment of the database is selected for connection. **Disturbance on** involves an agency reconfiguration if its current configuration is not the one of the System Current database.
• **Choose equipment** (shortcut: Ctrl + Alt + I): this action is available if the selected database has equipment, which generates disturbance files. It displays the list of devices (IEC 61850 equipment or IED managed by this equipment) of the database which are able to produce disturbance files, and the user can select it or not (selected means SMT will listen to disturbance event of this device). The selection is immediately taken into account (but will have no immediate effect if the selected database is not the current one and disturbance function is not activated on this database). By default all devices are selected.

If disturbance bricks are redundant:

• the IED appears twice in the tree for each IEC 61850 server,
• the name of these IEDs is suffixed with a star (*),
• the name of the main IEC 61850 server is suffixed with a star (*),
• for the main server node, the name of the backup IEC 61850 server appears below the legacy bus nodes,
• for the backup server node, the name of the main IEC 61850 server appears below the legacy bus nodes.

The pop-up displayed at the end of each request (except disturbance stopping) indicates if starting disturbance monitoring has failed on some equipment: this means disturbance event is not monitored on these equipment (although device is ticked if the <choose equipment> list). If starting disturbance monitoring has failed it probably means at configuration problem in PACiS SMT or in the equipment. Stopping disturbance (globally or on a particular equipment) always succeed from PACiS SMT point of view (protocol failure if exists doesn’t prevent PACiS SMT to stop monitoring the device).

If disturbance is on, and the agency configuration is not equal to the Current System database one then disturbance status indicated in the status bar is "standby", which means disturbance events are not monitored. If a request leads to an agency reconfiguration with the Current System database agency configuration, disturbance monitoring will restart, and status indicated in the status bar will be "on".

![FIGURE 14: THE "CHOOSE EQUIPMENT" MENU](image-url)
2.1.7 Equipment menu

The **Equipment** menu is only available when the **Equipment** tab is selected.

![FIGURE 15: THE "EQUIPMENT" MENU](image)

This menu has the following items:

- **Switch** (Administrator only): this action implies a switch database order for the selected application(s).

- **Switch all equipment** (Administrator only): this action is applied to all equipment, among all equipment selected for connection, for which it is possible.

- **Download / Stand-by** (Administrator only): this action is available only if a "Standby" database has been selected in the **System databases store** list. It implies a configuration downloading for the selected application(s).

- **Download / Other...** (Administrator only): this action opens a dialog box which allows the user to select a database, among all the databases in which the application appears. Once a database is chosen, it implies a configuration downloading for the selected application(s).

- **Download all equipment / Stand-by** (Administrator only): this action is applied to all equipment, among all equipment selected for connection, for which it is possible.

- **Download all equipment / Other...** (Administrator only): this action opens a dialog box which allows the user to select a database, among all the databases in which the application appears. Once a database is chosen, downloading is performed, among all equipment selected for connection, for which it is possible.

- **Upload / Stand-by...** and **Upload / Current** (Administrator only): these actions are available if only one application is selected in the table. A dialog box is then displayed which allows to choose the destination of the uploaded file.

- **Set Maintenance** (Administrator only): this action is available for C264 only and also if the equipment is already in Operational mode or in Test mode. When available this action implies a change operating mode order for the selected equipment.

- **Set Operational** (Administrator only): this action is available if the equipment is already in Maintenance mode. It implies a change operating mode order for the selected equipment.
• **Set Test** (Administrator only): this action is not available for C264 only and also if the equipment is already in Operational mode. It implies a change operating mode order for the selected equipment.

• **Set all equipment in Maintenance** (Administrator only): this action is applied on all equipment which are not in Maintenance mode, whether they are selected or not. This action is not available for GTW-PC and OI.

• **Set all equipment in Operational** (Administrator only): this action is applied on all equipment which are in Maintenance mode, whether they are selected or not.

• **Set all equipment in Test** (Administrator only): this action is applied on all C264 equipment which are in Operating mode, whether they are selected or not.

• **Collapse Tree:**

• **Expand Tree:**

• **Download IEC61850 IEDs CID:** The SMT can launch from contextual menu in the equipment view the MiCOM S1 Studio with the targeted IED in parameter, in order to have a direct connection between the MiCOM S1 and the IED. This facility is available for IEC61850 IEDs.

• **Abort all the on going requests:**

  **NOTES:**
  1. These items can be accessed too from the contextual menu that is displayed by right-clicking on an equipment in the **Equipment** tab.
  2. An observer is informed of an application on-going request (switching, changing operating mode, downloading, uploading), he can see the corresponding line blinking.
  3. For all the requests, the end is signalled by a pop-up window that the user has to acknowledge (the end means that PACiS SMT HMI has sent all the mandatory requests to the IEC 61850 Agency and received the synchronous acknowledgement, but has not wait the complete result on the remote equipment). This pop-up window signals the success of the request, or the list of equipment on which the request has failed.
  4. A request can be refused if the IEC 61850 agency is not OK.

2.1.8 Log menu

The **Log** menu has one sub-menu:

![FIGURE 16: THE "LOG" MENU](image)

• **Kernel**: this sub-menu has two items:
  - **Edit** (shortcut Ctrl + E): the log file can be opened with a text editor (default editor is Notepad) and can be printed. The content of the file is the content corresponding to the moment of the **Edit** command; it is not updated in real time. If the user wants to see if the file has been modified ten minutes later, for example, he has to close the file, and to edit it once again.
- **Display** (shortcut Ctrl + L): each new entry (event which occurs after the Display command time) is printed in a list view, the lines scroll towards the top of the window at each new event, the lowest line of the list being the more recent one. This list is displayed in a dedicated window that can be iconified.

NOTE: The log edit and log display files are in the same language as PACIS SMT HMI.

### 2.1.9 Time menu

The **Time** menu has a unique item: **Set...** The related dialog box shows the current system date/time. You can modify any field. The current time shows in the status bar. It refreshes every two seconds. If there is no Current system database defined, then this menu item is not available.

![FIGURE 17: THE "TIME" MENU AND RELATED DIALOG BOX](image17)

### 2.1.10 Options menu

The **Options** menu has two items. The associated dialog boxes allow to configure kernel options and browser options.

![FIGURE 18: CONFIGURATION OF KERNEL OPTIONS](image18)
For the configuration of kernel options the user can choose the following options (a selected check box means yes, a cleared check box means no):

- **Always confirm before execution**: the default value is yes. Each modification is immediately taken into account, and backed-up on the disk. This option applies only to the concerned PACiS SMT HMI.

- **Display complete log**: the default value is yes. This option is used to filter the events for the log display (not for the log edit): yes means that all the log events will be displayed, no means that only the events concerning our connected equipment will be displayed (plus general events as IEC 61850 agency loss, Set Current request, etc). Each modification is immediately taken into account and backed-up on the disk. This option applies only to the concerned PACiS SMT HMI.

- **Always download the ApplicationDataBag** (Administrator only): the default value is no. Each modification is immediately taken into account, and backed-up on the disk. This option is used to force the downloading of the ApplicationDataBag, even if the application Vdbs is the same as the System Vdbs (it can be seen as the equivalent of the “rebuild all” option for a compiler, it’s useful if some IEC 61850 equipment were previously loaded with configuration of an other system which could have the same Vdbs, but not the good ApplicationDataBag).

- **Automatic disturbance starting** (Administrator only): the default value is yes. This option is used to decide if the automatic disturbance file upload is activated automatically on a database when this one becomes the Current one.

- **Keep previous disturbance equipment selection** (Administrator only): the default value is no. This option is used to decide if, when a database becomes the Current one, selected equipment is that previously defined with the <Choose equipment> menu, or are the same as the current database (as much as possible).

- **Log event number** (Administrator only): the maximum number of events to store in the log file. The default value is 1000. Each modification is immediately taken into account.

- **Agency Services** C/C++ C SMT calls to agency services, and callbacks are now visible in a “dbwin” window (as PACiS OI for example). The name of this debug window has to be defined in the key value “HKEY_LOCAL_MACHINE/Software/Smt/dbWinName”. This key is not defined after an installation, it must be added manually. If this value is not defined, or its content is empty, debug traces are not activated. The content of this value should be “dbwin”.

### 2.1.11 CMT menu

The CMT/Start menu launches the CMT application

![System Management Tool - Administrator](image)

FIGURE 19: THE CMT MENU
2.2 Databases display

The Databases are shown when the corresponding tab is selected.

Two tables are mainly displayed:

- the System databases store table
- the Equipment definition table

![FIGURE 20: THE DATABASES DISPLAY](image)

When a line is selected:

- The border of the line is black,
- The colour of the line is darkened.

2.2.1 System databases store table

The System database store table displays the following information about the available SystemDataBag:

- Version (static information)
- Version date (static information)
- Name (static information)
- Version comment (static information)
- Current flag (dynamic information, set by the Set Current action)
- Standby flag (dynamic information, set by the Set Standby action)

The following state chart shows the possible statuses of a SystemDataBag.
A click on one of these six fields of a table line selects the line.

The <current> (<standby>) toggles are ticked if:
- they were not ticked and the user requests a <Set current> (<Set/download standby>) action,
- they were ticked when the SMT was stopped.

The colour of the line can be:
- **White**: The database is not the Current nor the Standby one,
  - The database is the Current or the Standby one and no equipment is selected,
- **Grey**: connection with IEC 61850 agency is not available,
- **Green**:
  - For Current: all PACiS equipment of the system are connected, have the good <current> Vdbs (i.e. the same one as the System database) and are in Operational (run) mode, and all non PACiS equipment are connected
  - For Standby: all PACiS equipment of the system are connected and have the good <standby> Vdbs (i.e. the same one as the System database), and all non PACiS equipment are connected
- **Yellow**:
  - For current: all equipment of the system are selected for connection, at least one is not responding, and all responding PACiS equipment have the good <current> (<standby>) Vdbs (i.e. the same one as the System database) and are in Operational (run) mode,
  - For Standby: all equipment of the system are selected for connection, at least one is not responding, and all responding PACiS equipment have the good <current> (<standby>) Vdbs (i.e. the same one as the System database),

**FIGURE 21: SYSTEMDATABAG STATE CHART**

A click on one of these six fields of a table line selects the line.
• **Red:**
  - For current: at least one of the connected equipment has an incorrect Vdbs, or is not in Operational (run) mode,
  - For Standby: at least one of the connected equipment has an incorrect Vdbs,

• **Blue:** this colour can be modified and set to yellow or green in HMI initialisation file
  - For Current: all the selected for connection PACiS equipment of the system are connected, have the good <current> Vdbs (i.e. the same one as the System database) and are in Operational (run) mode, and all non PACiS equipment are connected, but not all the equipment of the system are selected for connection,
  - For Standby: all the selected for connection equipment of the system are connected and have the good <standby> Vdbs (i.e. the same one as the System database), and all non PACiS equipment are connected, but not all the equipment of the system are selected for connection,

• **Blinking:** a <Set current> (<Set/download standby>) or Connect all/Disconnect all request is on going.

**NOTE:** The colour of the line is updated according to the results of any user requests, the equipment behaviour (disconnected, etc…) and the IEC 61850 agency status.

2.2.2 **Equipment definition table**

The **Equipment definition** table displays equipment parameters and the user connection choice:

- Name (static information)
- IP address (static information)
- Connection requested (dynamic information, set by the <Connect> or <Disconnect> user action)

The content of this table depends on the filter value:

<table>
<thead>
<tr>
<th>Filter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>selected DB</td>
<td>the content of the table is the list of the equipment composing the database selected in the System databases store table.</td>
</tr>
<tr>
<td>all selected eqt in all DB</td>
<td>the content of the table is the list of all selected equipment. The IP address displayed is the current one (the one available in the IEC 61850 Agency configuration).</td>
</tr>
<tr>
<td>selected eqt for the selected DB</td>
<td>The content of the table is the list of selected equipment which belongs to the database selected in the System databases store table.</td>
</tr>
<tr>
<td>not selected equipment for the selected DB</td>
<td>the content of the table is the list of the not selected equipment which belong to the database selected in the System databases store table.</td>
</tr>
</tbody>
</table>
For an Administrator, if the IP address field is **red**, it means:

- for a connected equipment, that the equipment is no more available (it was connected before with this IP address but not now), or that the equipment is still connected but not with this IP address,

- for a not connected equipment, that this equipment is not available in the current IEC 61850 agency configuration.

For an Administrator, if the line is **grey** and IEC 61850 agency is OK, it means:

- for a connected equipment, that the equipment is not available in the current IEC 61850 agency configuration. This is only possible with filter set to "All selected equipment in all DB".

For an Observer, if the line is **grey** and IEC 61850 agency is OK, it means:

- for a connected equipment, that the equipment is no more available (it was connected before with this IP address but not now), or that the equipment is still connected but not with this IP address,

- for a not connected equipment, that this equipment is not available in the current IEC 61850 agency configuration.

If the IEC 61850 agency is not available, all the lines of the table are **grey**.

The following actions based upon the selected equipment can be initiated from the **Databases** menu of the menu bar or from the contextual menu (right click on the selected line), with the restrictions listed below:

- **Connect** (Administrator or Observer): this action is available on Administrator if an equipment is currently connected with an IP address different from its address in the selected database (the IP address colour is then red) or if disturbance monitoring is Standby and the selected equipment belongs to the Current database (Current System database selected in the System Database store table) and the agency configuration is not equal to the Current System database one (this to allow to reconfigure the agency, which allows disturbance monitoring to "restart"). **<Connect>** is also available if equipment has diag or iedDiag(s) data different from the one available in the current agency configuration (this to allow to reconfigure the agency in order to be able to see the diag(s) and iedDiag(s) data defined in the selected database for the equipment). **Connect** is not available if the line is grey on an Observer. A pop-up is displayed if a disturbance file upload is running, explaining that the execution of the request will be delayed.

- **Disconnect** (Administrator or Observer): this action is always available for a connected equipment, except in case of SBUS agency failure. A pop-up is displayed if a disturbance file upload is running, explaining that the execution of the request will be delayed.

**NOTES:**

1. It is possible to select several lines, but actions will be available according to the conditions listed above. In this case, if a confirmation has been requested, a global confirmation is available.

2. A request can be refused if the IEC 61850 agency is not OK.

3. Once **<Connect>** has been chosen, the **<Connection requested>** toggle is ticked (empty if **<Disconnect>**), whatever the real result is. The real status of the connection is available in the **Equipment** panel.

4. During the request the corresponding line(s) in the table blink. The connect/disconnect requests are blocking; the user can’t do anything else until they are finished (finished means that the connection/disconnection is requested by the IEC 61850 agency to the remote IEC 61850 equipment, but not that the remote equipment is really connected/disconnected).
2.3 Equipment panel

2.3.1 PACiS devices

The Equipment panel appears when the corresponding tabbed panel is selected; it contains the tree view of the status of each piece of equipment selected for connection.

If a global request has been previously issued (from the Databases panel, for example Set/download standby), this tree is updated with the results of the successive requests. In the same way, after each request on this tree the Databases panel is updated.

When a node in the tree is selected, the relevant equipment name appears in the contextual help field, and the equipment node changes:

- the colour of the node text becomes white,
- The background colour of the node is darkened.

2.3.1.1 Selected equipment status tree view

The tree view displays the following data:

- **Identity** extracted from “DI” brick including:
  - Model,
  - Serial Number (from “Vendor Identity”),
  - Hardware Version (from “Vendor Identity”),
  - Software Version (from “Vendor Identity”),
  - System Version (from “Communication Identity”),
- Databases including Standby and current versions, which are updated upon change; if the database has been modified within the equipment (ON line modification), a star appears behind the version.
- **Mode** which is updated upon change,
- **Hardware** (may not exist) including all the data points which are contained in the “DIAG” brick: the value of a data point is converted from a numeric value to a text value according to diag labels which are provided by the system databag,
• Fieldbus (may not exist) including all the IEDs, which are connected over a legacy bus. A colour is attached to each IED according to “CommSt” data extracted from “IEDDIAG” brick:
  − “green”: the IED is reachable through the legacy bus,
  − “red”: the IED is not reachable through the legacy bus.

The following displayed items:
• Root node name,
• Hardware and Fieldbus nodes,

are connected with the equipment diag and iedDiag(s) brick(s) description of the system databag with which the agency is configured.

Example: in system databag 1.0, appA has IED1, in system databag 2.0 appA has IED 1 and IED2. If PACiS SMT agency configuration is 1.0, only IED1 will appear in tree-view, if PACiS SMT agency configuration is 2.0 IED1 and IED2 will appear in tree-view. According to the equipment current configuration these nodes may be reachable or not: if they are not reachable hardware is present, but has no child node, and IED names are present but are in white.

If no diag brick is defined for a device (in the system databag), then the tree does not contain a “hardware” node for this device.

Also, if no fieldbus is defined (in the system databag), then the tree does not contain a “fieldbus” node for this device.

Recall: Current and Stand-by Database version are System Database Version and not an application version. Application version doesn’t exist inside PACiS SMT HMI.

The colour convention of the node label is:
• Grey: connection with IEC 61850 agency is not available, or the device is not available in the current agency configuration.
• White, without child node: the device can’t be reached (PACiS SMT HMI continuously attempts to connect) but the IEC 61850 agency is OK,
• White: the application is connected, but no Current and Standby System database are defined, or the application does not belong neither to the Current nor to the Standby System database.
• Blinking: a downloading database, switching database or change operating mode request is on-going on this application,
• Green:
  − Current and Standby System Vdbs are defined:
  − the application current Vdbs is the same as the system current Vdbs, the application standby Vdbs is the same as the system standby Vdbs and the application is in Operational (Run) mode,
  − Only Standby System Vdbs is defined:
  − the application standby Vdbs is the same as the system standby Vdbs,
  − Only Current System Vdbs is defined:
  − the application current Vdbs is the same as the system current Vdbs and the application is in Operational (Run) mode.
• **Red:**
  - The application is in Faulty mode
  - Current and Standby System Vdbs are defined:
    - the application current Vdbs is not the same as the system current Vdbs, or the application standby Vdbs is not the same as the system standby Vdbs, or the application is not in Operational (Run) mode (Maintenance, Test or Faulty),
  - Only Standby System Vdbs is defined:
    - the application standby Vdbs is not the same as the system standby Vdbs,
  - Only Current System Vdbs is defined:
    - the application current Vdbs is not the same as the system current Vdbs or the application is not in Operational (Run) mode

2.3.1.2 **Tree icons**

- Equipment node: two different icons can be defined by user, to indicate if an application is reachable or not (1 for reachable, 1 for not reachable)
- All other nodes: each node can have its own icon which is defined by the user with the 
  
  `<SMT installation dir>/exe/images/EqptStatus/icon.properties` file.

If the selected “equipment” node is Grey, White without child node or Red, the help field of the status bar displays a short textual information which give some precision about the problem/status.

2.3.1.3 **Contextual menu**

![Contextual Menu](image)

**FIGURE 24: THE “CONTEXTUAL” MENU**

It is possible to select several lines, only the equipment that is in the good mode will be concerned by the request. In this case, if a confirmation has been requested, a global confirmation is available. For all the requests, when selected, a pop-up is displayed if a disturbance file upload is running, explaining that the execution of the request will be delayed.
2.3.2 Non PACiS devices

2.3.2.1 Selected equipment status tree view

The tree view displays the following data:

- **Identity**: only “name”, “Serial number” and “Hardware version” are displayed,
- **Mode**.

If one of these data does not exist for a device, the node is displayed with no attached value.

The colour convention of the node label is:

- **Grey**: connection with IEC 61850 agency is not available, or the device is not available in the current agency configuration.
- **White, without child node**: the device can’t be reached (PACiS SMT HMI continuously attempts to connect) but the IEC 61850 agency is OK,
- **White**: the application is connected, but no Current and Standby System database are defined, or the application does not belong neither to the Current nor to the Standby System database.
- **Green**:
  - Current and Standby System Vdbs are defined: the application is in Operational (Run) mode if mode is available, or mode is not available and application belongs to the Current and/or to the Standby system database,
  - Only Standby System Vdbs is defined: application belongs to the Standby system database,
  - Only Current System Vdbs is defined: the application is in Operational (Run) mode if mode is available, or mode is not available and application belongs to the Current system database.
- **Red**:
  - The application is in Faulty mode,
  - Current System Vdbs is defined: if mode is available and is not Operational (Run) mode and application belongs to the Current system database.

2.3.2.2 Contextual menu

All the menu items are not enabled (except collapse and expand) because:

- its operating mode cannot be changed (mode control is a PACiS implementation),
- its configuration cannot be managed from PACiS SMT.

If the operator selects both PACiS devices and non-PACiS devices, the command does not impact non-PACiS devices.
2.4 Log printing interface

2.4.1 Log display

The log display window appears as follows:

![Log Display Window](image)

**FIGURE 25: THE "LOG DISPLAY" WINDOW**

The title indicates if all events are displayed (complete log), or only those concerning the connected applications (my log).

The user can clear the window with the **Clear** button, freeze or resume the display with the **Freeze/Resume** button.

A message is displayed if the freezing has been too long and then events have been lost.

2.4.2 Log description

The log file is managed in roll mode (when the maximum number of event is reached, the oldest event is replaced by the current one). The last event is in the last line of the file.

The format of a line is:

```
{date} ; {user name} ; {equipment name} ; {user request/request status} ; {event}
```

A line is always composed of this five columns, if a field is not relevant for the event it is empty.

with:

- **{date}**: date of the event.
- **{user name}**: user name, can be:
  - IP address or name (for observer),
  - ADMIN – IP address or name (for administrator),
  - KERNEL.
- **{equipment name}**: equipment name,
{user request/request status}: can be:

- User request:
  - ADD DB xx.yy , xx.yy is the Vdbs,
  - DELETE DB xx.yy , xx.yy is the Vdbs,
  - CONNECT,
  - DISCONNECT,
  - SET CURRENT xx.yy, xx.yy being the Vdbs,
  - SET/DOWNLOAD STANDBY xx.yy, xx.yy being the Vdbs,
  - DOWNLOAD xx.yy, xx.yy being the Vdbs,
  - UPLOAD CURRENT,
  - UPLOAD STANDBY,
  - SWITCH DB,
  - RUN, for a Run order,
  - MAINTENANCE, for a Maintenance order,
  - TEST, for a Test order,
  - SET TIME xxxx, xxxx being the date/time,
  - SET LOG SIZE,
  - CONFIG AGENCY STARTED,
  - SET DISTURBANCE MONITORING ON,
  - SET DISTURBANCE MONITORING OFF,
  - ENABLE DISTURBANCE MONITORING IN DB xx.yy, xx.yy being the Vdbs,
  - DISABLE DISTURBANCE MONITORING IN DB xx.yy, xx.yy being the Vdbs,
  - START DISTURBANCE MONITORING (always followed by a failure reason),
  - DISTURBANCE MONITORING STARTED,
  - DISTURBANCE MONITORING STOPPED,
  - UPLOAD DISTURBANCE FILE xxx, xxx being the file name,
  - DISTURBANCE FILE CONVERSION STARTED ON xxx, xxx being the disturbance file name,
  - DELETE DISTURBANCE FILE xxx,
  - SET DISTURBANCE MONITORING STARTING TO MANUAL,
  - SET DISTURBANCE MONITORING STARTING TO AUTOMATIC,
  - KEEP CURRENT EQUIPMENT SELECTION ON DISTURBANCE MONITORING STARTING,
  - IGNORE CURRENT EQUIPMENT SELECTION ON DISTURBANCE MONITORING STARTING
  - ENABLE DISTURBANCE MONITORING IN DB xx.yy, xx.yy being the Vdbs (enabling disturbance monitoring on an equipment)
  - DISABLE DISTURBANCE MONITORING IN DB xx.yy, xx.yy being the Vdbs (disabling disturbance monitoring on an equipment)
User request status:

- ENDED, only for SET CURRENT, SET/DOWNLOAD STANDBY or SET DISTURBANCE MONITORING xx requests,
- SUCCESSFUL, for each equipment request, except CONNECT and DISTURBANCE FILE CONVERSION STARTED ON xxx,
- FAILURE: reason of failure, for each equipment request, except CONNECT,
- CONFIG AGENCY xx.yy SUCCESSFUL, where xx.yy is the System Vdbs.

(event): can be:

- A Kernel event:
  - KERNEL START-UP,
  - KERNEL EXIT,
  - PASSWORD CHANGE.

- A user log in/log out event:
  - LOG IN,
  - LOG OUT, in this case all the following equipment disconnection are not recorded in the log file,
  - DISAPPEARANCE, when the user disappears without a log out request,

- An equipment event:
  - CONNECTED,
  - DISCONNECTED, on a volunteer user disconnection, or on a user disappearance (Log out or disappearance),
  - xx.yy STANDBY, when Stand-by Vdbs is modified (xx.yy = new Stand-by Vdbs),
  - xx.yy CURRENT when Current Vdbs is modified (xx.yy = new Current Vdbs),
  - RUNNING, when Mode has just switched to Run,
  - IN MAINTENANCE, when Mode has just switched to Maintenance,
  - IN TEST, when Mode has just switched to Test,
  - FAULTY, when Mode has just switched to Faulty,
  - DISTURBANCE FILE(S) TO UPLOAD, when a new disturbance file is available,
  - DISTURBANCE FILE Upload xxx SUCCESSFUL or FAILURE, xxx being the file name.

- An IEC 61850 agency event:
  - SBUS agency has disappeared, when connection with equipment disappears – note that when an IEC 61850 agency failure occurs the following equipment disconnections are not recorded in the log file,
  - SBUS agency is coming back, when agency becomes available again.

There's no global report for the connect/disconnect all, but all the elementary sequences will be recorded (in the log file will appear as many Connect requests as concerned applications).

All the fields are left aligned, they are separated by space-comma-space, and then Excel can easily process them for example.
2.5 Disturbance and waveform files

For a given device, once the file is read in the IEC 61850 equipment it is stored in a file called `<device_name>_yyyymmdd_hhmmss.dxx`, where xx ∈ [00,99] (but COMTRADE files are suffixed by ".dat" and ".cfg" extensions): a maximum of 10 files can be stored per device. These files are stored in the directory `<DisturbanceStoragePath>/DB<Current database Vdbs>/<device name>/<IED name>`.

NOTE: If the device generates itself disturbance files, then the `<IED name>` sub-directory does not exist.

The default DisturbanceStoragePath value is `<SMT installation dir>/disturbance` (can be modified in kernel.ini file). The maximum space available for storage in `<DisturbanceStoragePath>` is defined by the parameter MaxDisturbanceStorageSize in the kernel.ini file.

If specified in kernel.ini file, a special processing can be launched on a given file type once a file is created (PACiS SMT HMI responsibility is then only to launch the processing).

A storage policy is defined to avoid filling up the hard disk:

- this principle defines a storage area per DB.
- when disk space used in DisturbanceStoragePath reaches maxDisturbanceStorageSize the oldest DB record storage area is recursively deleted. It is under responsibility of maintenance people to make previous storage on other support. If only current DB remains, the two oldest files of each device directory are automatically deleted.

Each file upload, hard disk file creation or deletion is logged.

2.5.1 Behaviour of Choose equipment menu with disturbance options

- Default behaviour: when a database becomes the Current one disturbance function is automatically activated, on all devices.

- Keep previous disturbance equipment selection to false: if a selection of device has been done previously with the Choose equipment menu on a database, when this one becomes the Current one, disturbance function is automatically activated on selected devices.

- Keep previous disturbance equipment selection to true: supposing DB 1.0 is Current and only devices A and B are selected for disturbance, DB 2.0 is Standby and devices A, B and C are selected for disturbance - when 2.0 will become Current disturbance function will be activated only on A and B (and only A and B will appear selected in the Choose menu dialog box).
APPLICATIONS
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1. SCOPE OF THE DOCUMENT

This document is a chapter of the PACiS SMT documentation. It describes some examples of the PACiS SMT use.
2. ADD A NEW SYSTEM DATABAG

To add a new PACiS System databag issued from PACiS SCE, the administrator must:

- Copy the new databag on the same PC where the PACiS SMT server is installed or on a PC visible from the PACiS SMT (network connection)
- Select the menu "Databases/Add database…". (shortcut: CTRL + Alt + A)

![FIGURE 1: ADDITION OF A DATABASE](image1)

- Click the new system databag ("zip" extension) and then click the "Open" button

![FIGURE 2: SELECTION OF THE DATABASE TO ADD](image2)
• In the next pop-up dialog box click the "Yes" button

![FIGURE 3: DATABASE ADDITION CONFIRMATION](image1.png)

• While the addition of the DB is in progress the following dialog box is displayed

![FIGURE 4: DATABASE ADDITION CONFIRMATION](image2.png)

• When the addition of the DB is completed the following dialog box is displayed: click the "OK" button

![FIGURE 5: DATABASE ADDITION CONFIRMATION](image3.png)

• The new system databag appears in the "System databases store" frame

![FIGURE 6: NEW DATABAG](image4.png)

If you click this new databag, the list of configured equipment with their IP address will appear in the lower frame ("Equipment definition") of the "Databases" panel.
3. CONNECT ONE OR SEVERAL SERVERS

3.1 Connect all the servers

To connect all the servers of a system database, right-click the database version and then click "Connect all equipment" (shortcut: Ctrl + Maj + B).

![FIGURE 7: CONNECT ALL EQUIPMENT](image)

- A dialog box is displayed to confirm the connection action (by clicking the "Yes" button).

![FIGURE 8: CONNECTION CONFIRMATION](image)

- When the connection is performed, the next dialog box is displayed: click the "OK" button.

![FIGURE 9: CONNECTION COMPLETE](image)
3.2 Connect one server

To connect one server of a system databag, right-click the equipment in the list and then click "Connect" (shortcut: Ctrl + B).

- A dialog box is displayed to confirm the connection action (by clicking the "Yes" button)

- When the connection is performed the next dialog box is displayed: click the "OK" button
3.3 Connect several servers

To connect several servers of a system databag, select the chosen equipment by a «CTRL + left click» in the list and then connect them by clicking the "Connect" item (shortcut: Ctrl + B) of the contextual menu.

FIGURE 13: CONNECT SEVERAL SERVERS

Similar dialog boxes as the previous sections are displayed to confirm the connection and when the connection is complete.
4. **SET A SYSTEM DATABASE «STANDBY»**

To set a system database *standby*, the administrator right-clicks the database version in the list and then clicks "Set/Download standby" (shortcut: Ctrl + Alt + S).

If servers are connected, PACIS SMT downloads the application databags from this system database if necessary.

- A dialog box is displayed to confirm the action (by clicking the "Yes" button).

- When the system database is set as *Standby* the next dialog box is displayed: click the "OK" button.
5. **SET A SYSTEM DATABASE «CURRENT»**

To set a system database current, the administrator right-clicks the database version in the list and then clicks "Set Current" (shortcut: Ctrl + Alt + C).

If servers are connected, PACiS SMT switches their databags if necessary in order to align the current Vdbs of each server on the current system database.

A dialog box is displayed to confirm the action (by clicking the "Yes" button).

When the system database is set Current the next dialog box is displayed: click the "OK" button.

---

**FIGURE 17: SET A SYSTEM DATABASE CURRENT**

- A dialog box is displayed to confirm the action (by clicking the "Yes" button)

**FIGURE 18: CONNECTION CONFIRMATION**

- When the system database is set Current the next dialog box is displayed: click the "OK" button

**FIGURE 19: SYSTEM DATABASE IS SET CURRENT**
6. **DOWNLOAD AN APPLICATION DATABAG INTO A SERVER**

In the "Equipment" panel, the administrator right-clicks a piece of equipment and then clicks:

- "Download/Standby" (shortcut: Ctrl + Alt + S) if he/she wants to download the standby database
- "Download/Other..." (shortcut: Ctrl + Alt + O) if he/she wants to download another database version. In this case the list of available databases is displayed.

![FIGURE 20: DOWNLOAD A DATABAG INTO A SERVER](image)

- A dialog box is displayed to confirm the action (by clicking the "Yes" button)

![FIGURE 21: CONNECTION CONFIRMATION](image)

- When the standby database is downloaded the next dialog box is displayed: click the "OK" button

![FIGURE 22: SYSTEM DATABASE IS DOWNLOADED](image)
7. **SWITCH DATABAGS OF A SERVER**

To switch databags of a server enter the "Equipment" panel, the administrator right-clicks an equipment and then clicks "Switch" (shortcut: Ctrl + S).

![System Management Tool](image)

**FIGURE 23: SWITCH DATABAGS**

- A dialog box is display to confirm the action (by clicking the "Yes" button)

![Switch DB confirmation](image)

**FIGURE 24: SWITCH DB CONFIRMATION**

- When databases are switched the next dialog box is displayed: click the "OK" button

![System Management Tool: Information](image)

**FIGURE 25: SYSTEM DATABASES ARE SWITCHED**
8. CHANGE THE MODE OF A SERVER

To change the mode of a server enter the "Equipment" tab, the administrator right-clicks the equipment and then clicks the mode he/she wants the equipment to enter (non available mode is greyed).

![System Management Tool - Administrator](image)

**FIGURE 26: CHANGE THE MODE OF A SERVER**

- A dialog box is displayed to confirm the action (by clicking the "Yes" button)

![System Management Tool](image)

**FIGURE 27: CHANGE MODE CONFIRMATION**

- When the standby database is downloaded the next dialog box is displayed: click the "OK" button

![System Management Tool - Information](image)

**FIGURE 28: MODE IS CHANGED**
9. DISPLAY LOGS

To configure kernel options click "Options".

The meaning of all these options is given in section 2.6 of the chapter Human Interface (doc. PACiS SMT/EN HI/C50).
10. REAL TIME FLOW LOGGING

An empty window is displayed.

Then the new logs are displayed:
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1. SCOPE OF THE DOCUMENT

This document is the last chapter of each PACiS documentation. It is the glossary.
2. GLOSSARY

<table>
<thead>
<tr>
<th>AC</th>
<th>Alternating Current</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accl</td>
<td>Accumulator Input</td>
</tr>
<tr>
<td>ACSI</td>
<td>Abstract Communication Service Interface</td>
</tr>
<tr>
<td></td>
<td>Mapping from the standard IEC 61850 abstract specification of communication service to a concrete communication infrastructure based on CORBA.</td>
</tr>
<tr>
<td>A/D</td>
<td>Analog/Digital</td>
</tr>
<tr>
<td>ADC</td>
<td>Analog to Digital Converter</td>
</tr>
<tr>
<td>AE qualifier</td>
<td>Application Entity qualifier</td>
</tr>
<tr>
<td></td>
<td>Used internally by IEC 61850 to identify a server application</td>
</tr>
<tr>
<td>AI</td>
<td>Analog Input (Measurement Value including state attribute)</td>
</tr>
<tr>
<td></td>
<td>Commonly Voltage or current DC signals delivered by transducers, and representing an external value (refer to CT/VT for AC).</td>
</tr>
<tr>
<td>AIS</td>
<td>Air Insulated Substation</td>
</tr>
<tr>
<td>AIU</td>
<td>Analog Input Unit (C264 Bay Computer board name for DC Analog Input)</td>
</tr>
<tr>
<td>Alarm</td>
<td>An alarm is any event tagged as an alarm during the configuration phase</td>
</tr>
<tr>
<td>AO</td>
<td>Analog Output</td>
</tr>
<tr>
<td></td>
<td>Value corresponding to a desired output current applied to a DAC.</td>
</tr>
<tr>
<td>AOU</td>
<td>Analog Output Unit (C264 Bay Computer board name for Analog Output)</td>
</tr>
<tr>
<td>API</td>
<td>Application Programming Interfaces</td>
</tr>
<tr>
<td>AR</td>
<td>Auto-Reclose</td>
</tr>
<tr>
<td>ARS</td>
<td>Auto-Recloser</td>
</tr>
<tr>
<td>ASCII</td>
<td>American Standard Code for Information Interchange</td>
</tr>
<tr>
<td>ASDU</td>
<td>Application Specific Data Unit</td>
</tr>
<tr>
<td></td>
<td>Name given in the OSI protocol for applicable data (T103, T101..)</td>
</tr>
<tr>
<td>ASE</td>
<td>Applied System Engineering</td>
</tr>
<tr>
<td>ATCC</td>
<td>Automatic Tap Change Control</td>
</tr>
<tr>
<td></td>
<td>Automation in charge of secondary voltage regulation, more specific than AVR</td>
</tr>
<tr>
<td>AVR</td>
<td>Automatic Voltage Regulator</td>
</tr>
<tr>
<td></td>
<td>Automatic system used to regulate the secondary voltage by automatic tap changer control (see ATCC). Set of features can be added, see chapter C264 FT.</td>
</tr>
<tr>
<td>Bay</td>
<td>Set of LV, MV or HV equipment (switchgears and transformers) and devices (Protective, Measurement...) usually encompassing a Circuit Breaker and ancillary devices, and controlled by a bay computer.</td>
</tr>
<tr>
<td>BCD</td>
<td>Binary Coded Decimal</td>
</tr>
<tr>
<td></td>
<td>One C264 supported coding on a set of Digital Inputs, that determine a Digital Measurement, then a Measurement value (with specific invalid code when coding is not valid). Each decimal digit is coded by 4 binary digits.</td>
</tr>
<tr>
<td>BCP</td>
<td>Bay Control Point</td>
</tr>
<tr>
<td></td>
<td>Name given to the device or part used to control a bay. It can be Mosaic Panel, C264 LCD, usually associated with Remote/Local control.</td>
</tr>
<tr>
<td>BCU</td>
<td>Bay Control Unit</td>
</tr>
<tr>
<td></td>
<td>Name given to the C264 controlling a bay. Usually in contrast to Standalone.</td>
</tr>
<tr>
<td>Acronym</td>
<td>Definition</td>
</tr>
<tr>
<td>---------</td>
<td>------------</td>
</tr>
</tbody>
</table>
| BI | Binary Input (or Information)  
Designation of already filtered data entered into the C264 Bay Computer before they become SPS, DPS with time tag and quality attributes |
| BIU | Basic Interface Unit  
C264 board for auxiliary power supply, watchdog relay, redundancy I/O |
| BNC | A connector for coaxial cable. |
| B-Watch | Monitoring and control device for GIS substation. |
| CAD | Computer Aided Design  
Computer application dedicated to the design of wiring, for example. |
| CAS | CASe  
C264 Bay Computer rack |
| CAT | Computer Administration Tool |
| CB | Circuit Breaker  
Specific dipole switch with the capability to make line current and break fault current. Some have isolation capability, i.e. nominal grounding (earthing) at each side. |
| CBC | Compact Bay Controller  
Small capacity Bay Computer for Medium Voltage applications, typically C264C |
| CC | Complemented Contact |
| CCU | Circuit breaker Control Unit  
C264 Bay Computer board dedicated to switch control with 8DI, 4 DO |
| CDM | Conceptual Data Modeling  
This is the modeling of system/devices data using a hierarchy of structured data (called object or class) with their attributes, methods or properties and the relations between each other. It maps common data to devices or components of devices, with guarantee of interoperability. |
| Class | Defined in IEC 61850 as: description of a set of objects that share the same attributes, services, relationships, and semantics |
| Client | Defined in IEC 61850 as: entity that requests a service from a server and that receives unsolicited messages from a server |
| CM | Commissioning |
| CMT | Computer Maintenance Tool |
| CO | Command, logic information Output (Functional Component) / Contact Open |
| COMTRADE | Common Format For Transient Data Exchange (international standard IEC 60255-24) |
| CPU | Central Processing Unit  
C264 Bay Computer main board based on a Power PC |
| CRC | Cyclic Redundancy Check  
Coding result sent with packet of transmitted data to guarantee their integrity. Usually result of a division of transmitted data by polynomial. |
| CSV | Character Separate Values  
ASCII values separated by a predefined character or string as in Excel or ASCII Comtrade. |
| CT | Current Transformer  
Basically the electric device connected to process and extract a current measurement. By extension, part of a device (C264) that receives an AC value and converts it into a numerical measurement value. |
| CT/VT (Conventional) | Current and Voltage transformers  
By extension, the C264 TMU board. |
| **CT/VT** (Non-Conventional or intelligent) | Current and Voltage transformers  
New generation of transducer based for example on light diffraction under an electric field. Without transformer, gives a direct numerical measurement of voltage and current as a communicating IED. |
| **CSV** | Character Separated Values  
ASCII values separated by predefined character or string as in Excel or ASCII Comtrade. |
| **DAC** | Data Acquisition component of the GPT |
| **DAC** | Digital to Analog Converter  
Used to generate an analog signal (usually DC) from a digital value. |
| **DB** | DataBase  
Tool or set of data that defines the entire configuration of a system or specific device such as a computer. In contrast to a setting or parameter, the DB has a structure that cannot be modified on-line. DBs are always versioned. |
| **DB-9** | A 9-pin family of plugs and sockets widely used in communications and computer devices. |
| **DBI** | Don’t Believe It  
Term used for an undefined state of a double point when inputs are not complementary. DBI00 signifies dynamic state or jammed. DBI11 signifies undefined. |
| **DBID** | Databases Identity Brick |
| **DC** | Direct Current |
| **DC, DPC** | Double (Point) Control  
Two digits and/or relay outputs used for device control with complementary meaning (OPEN, CLOSE). |
| **DCF77** | External master clock and protocol transmission  
LF transmitter located at Mainflingen, Germany, about 25 km south-east of Frankfurt/Main, broadcasting legal time on a 77.5 kHz standard frequency. |
| **DCO** | Double Control Output |
| **DCP** | Device Control Point  
Located at device level (electric device or IED). It should have its own Remote/Local switch. |
| **DCS** | Digital Control System  
Generic name of system based on numeric communication and devices, to be opposed to traditional electrically wired control. |
| **DCT** | Double Counter  
Counter based on 2 DI with complementary states (counting switching operations, for example) |
| **DE** | Direct Execute |
| **DELTA** | Phase-to-phase delta values |
| **Device** | Term used for one of the following units: Protective relays, metering units, IED, switchgear), disturbance or quality recorders.  
Switchgear: switching device such as a CB, disconnector or grounding (earthing) switch |
| **DHMI** | C264 Display HMI |
| **DI** | Digital Input  
Binary information related to the presence or to the absence of an external signal, delivered by a voltage source. |
<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Definition</th>
</tr>
</thead>
</table>
| DIN          | Deutsche Institut für Normung  
The German standardization body. |
| DIU          | DC Input Unit  
C264 Bay Computer board name for Digital Input |
| DLL          | Dynamic Link Library. Available on Windows XP.  
A feature that allows executable code modules to be loaded on demand and linked at run time. This enables the library-code fields to be updated automatically, transparent to applications, and then unloaded when they are no longer needed. |
| DM           | Digital Measurement  
A measurement value with acquisition by DI and a specific coding BCD, Gray, 1-out-of-n, and so on. |
| DNP3.0       | Distributed Network Protocol  
DNP3 is a set of communication protocols used between components in process automation systems. |
| DO           | Digital Output  
Used to apply a voltage to an external device via a relay, in order to execute single or dual, transient or permanent, commands. |
| DOF          | Degree Of Freedom  
Used for a template attribute that can be modified or not when used. An attribute has a degree of freedom if a user can modify its values on its instances |
| DOU          | Digital Output Unit  
C264 Bay Computer board name for Digital Output |
| DP           | Double Point  
Information/control derived from 2 digital inputs/output; usually employed for position indication of switching devices (OPEN, CLOSE). |
| DPC          | Double Point Control |
| DPS          | Double Point Status  
Position indication of switching devices (OPEN, CLOSE). |
| ECDD         | Coherent Extract of Distributed Data |
| ECU          | Extended Communication Unit.  
External module connected to the CPU board. This module converts non-insulated RS232 into optical signal or insulated RS485/RS422. |
| EMC          | Electro-Magnetic Compatibility |
| EPATR        | Ensemble de Protection Ampèremétrique de Terre Résistante (French legacy: very resistive earth current module) |
| Event        | An event is a time-tagged change of state/value, acquired or transmitted by a digital control system. |
| EWS          | Engineering Workstation |
| FAT          | Factory Acceptance Test  
Validation procedures execution with the customer at factory.(i.e. SAT) |
| FBD          | Functional Block Diagram  
One of the IEC 61131-3 programming languages (language used to define configurable automation). |
<p>| FIFO         | First In First Out |
| FO           | Fiber-Optic |
| FP           | Front Panel |</p>
<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>FTP</td>
<td>Foil Twisted Pair</td>
</tr>
<tr>
<td>FLS</td>
<td>Fast Load Shedding</td>
</tr>
<tr>
<td>FSS</td>
<td>Force Suppress Substitute</td>
</tr>
<tr>
<td>Gateway</td>
<td>Level 6 session of OSI, the gateway is any device transferring data between different networks and/or protocols. The RTU function of the C264 gives a gateway behavior to SCADA or RCP level. PACiS Gateway is separate PC base device dedicated to this function.</td>
</tr>
</tbody>
</table>
| GHU      | Graphic Human interface Unit  
C264 Bay Computer Front Panel digital part (LCD, buttons, Front RS)                                                                                                                                      |
| GIS      | Gas Insulated Substation                                                                                                                                                                                    |
| GLOBE    | GLOBE Brick                                                                                                                                                                                                |
| GMT      | Greenwich Mean Time  
Absolute time reference                                                                                                                                                                                  |
| GPS      | Global Positioning System  
Based on triangulation from satellite signals.  
Also transmits absolute GMT time used to synchronize a master clock                                                                                                                                           |
| GOOSE    | Generic Object Oriented Substation Event                                                                                                                                                                   |
| GPT      | Generic Protocol Translator software, supplied by ASE                                                                                                                                                      |
| Group    | Logical combination of BI (i.e. SP, DP, SI or other groups).                                                                                                                                                 |
| GSSE     | Generic Substation Status Event                                                                                                                                                                            |
| Hand Dressing | Facility for an operator to set the position of a device manually (position acquired by other means) from the HMI at SCP level; e.g. from OPEN to CLOSE (without any impact on the “physical” position of the electrical switching device). |
| HELPS    | Hostable Emulator for Load and Protocol Simulation. HELPS simulates an Intelligent Electronic Device (IED)                                                                                                 |
| HMGA     | Horizontal Measurement Graphical Area                                                                                                                                                                          |
| HMI      | Human Machine Interface  
Can be PACiS OI (Operator Interface) or C264 LCD (Local Control Display) or set of LEDs, mosaic...                                                                                               |
| HSR      | High Speed Auto-Recloser, first cycles of AR                                                                                                                                                                 |
| HTML     | Hyper Text Mark-up Language  
Used as standard format for web display                                                                                                                                                                    |
| HV       | High Voltage (for example 30kV to 150kV)                                                                                                                                                                     |
| I/O      | Input/Output                                                                                                                                                                                                |
| ICD      | IED Capability Description                                                                                                                                                                                   |
| IEC      | International Electro-technical Commission                                                                                                                                                                  |
| IED      | Intelligent Electronic Device  
General expression for a whole range of microprocessor based products for data collection and information processing                                                                                   |
<p>| IP       | Internet Protocol                                                                                                                                                                                           |
| IRIG-B   | Inter-Range Instrumentation Group standard format B. This is an international standard for time synchronization based on an analog signal.                                                                  |</p>
<table>
<thead>
<tr>
<th>Glossary Item</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>JAMMED</td>
<td>Invalid state of a Double Point: Occurs when two associated digital inputs are still in state 0 after a user-selected delay, i.e. when the transient state “motion” is considered as ended</td>
</tr>
<tr>
<td>Kbus (Kbus Courier)</td>
<td>Term used for the Courier protocol on a K-Bus network (RS 422 type).</td>
</tr>
<tr>
<td>LAN</td>
<td>Local Area Network</td>
</tr>
<tr>
<td>L-BUS</td>
<td>Legacy Bus. Generic name of Legacy or field networks and protocols that are used to communicate between C264 (Legacy Gateway function) and IED on field bus. Networks are based on (RS232,) 422, 485. Protocols are IEC 60850-5-103 (T103 or VDEW), Modbus Schneider Electric or MODICON</td>
</tr>
<tr>
<td>LCD</td>
<td>Liquid Crystal Display or Local Control Display (on C264)</td>
</tr>
<tr>
<td>LD</td>
<td>Ladder Diagram, one of the IEC 1131-3 programming languages (language used to define configurable automation).</td>
</tr>
<tr>
<td>LED</td>
<td>Light Emitting Diode</td>
</tr>
<tr>
<td>LF</td>
<td>Low Frequency</td>
</tr>
<tr>
<td>LOC</td>
<td>Local Operator Console Dedicated to maintenance operation</td>
</tr>
<tr>
<td>L/R</td>
<td>Local / Remote Control Mode</td>
</tr>
<tr>
<td>L/R</td>
<td>Local / Remote Control Mode</td>
</tr>
<tr>
<td>Local / Remote Control Mode</td>
<td>When set to local for a given control point, it means that the commands can be issued from this point, or in remote control from higher-level devices.</td>
</tr>
<tr>
<td>LSB</td>
<td>Least Significant Bit</td>
</tr>
<tr>
<td>LSP</td>
<td>Load Shedding Pre-Selection</td>
</tr>
<tr>
<td>LV</td>
<td>Low Voltage</td>
</tr>
<tr>
<td>MAFS</td>
<td>Marketing And Functional Specification</td>
</tr>
<tr>
<td>MC</td>
<td>Modular Computer</td>
</tr>
<tr>
<td>MCB</td>
<td>Mini Circuit Breaker. Position associated to the tap changer.</td>
</tr>
<tr>
<td>MDIO</td>
<td>Management Data Input/Output. A standard driven, dedicated-bus approach that is specified in IEEE 802.3</td>
</tr>
<tr>
<td>Measurements</td>
<td>Values issued from digital inputs or analog inputs (with value, state, time tag)</td>
</tr>
<tr>
<td>Metering (non-tariff)</td>
<td>Values computed depending on the values of digital or analog inputs during variable periods of time (time integration).</td>
</tr>
<tr>
<td>Metering (tariff)</td>
<td>Values computed depending on the values of digital or analog inputs during variable periods and dedicated to the energy tariff. These values are provided by dedicated “tariff computers” external to the MiCOM Systems.</td>
</tr>
<tr>
<td>MIDOS</td>
<td>Schneider Electric Connector: Used for CT/VT acquisition</td>
</tr>
<tr>
<td>MMC</td>
<td>Medium Modular Computer</td>
</tr>
<tr>
<td>MMS</td>
<td>Manufacturing Message Specification (ISO 9506)</td>
</tr>
<tr>
<td>Modbus</td>
<td>Communication protocol used on secondary networks with IED or with SCADA RCP. 2 versions. Standard MODICON or Schneider Electric.</td>
</tr>
<tr>
<td>Module</td>
<td>Word reserved in PACiS SCE for all electric HV devices. It groups all switch-gear devices, transformers, motors, generators, capacitors, …</td>
</tr>
<tr>
<td>Term</td>
<td>Definition</td>
</tr>
<tr>
<td>----------</td>
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</tr>
<tr>
<td>MOTION</td>
<td>Transient state of a Double Point Occurs when the two associated digital inputs are momentarily in state 0 (e.g. position indication when an electrical device is switching). The concept of “momentarily” depends on a user-selectable delay.</td>
</tr>
<tr>
<td>MPC</td>
<td>Protection Module for Computer</td>
</tr>
<tr>
<td>MV</td>
<td>Medium Voltage</td>
</tr>
<tr>
<td>MVAR</td>
<td>Mega Volt Ampere Reactive</td>
</tr>
<tr>
<td>NBB</td>
<td>Numerical Busbar Protection</td>
</tr>
<tr>
<td>NC</td>
<td>Normally Closed (for a relay)</td>
</tr>
<tr>
<td>NO</td>
<td>Normally Open (for a relay)</td>
</tr>
<tr>
<td>OBS</td>
<td>One-Box Solution Computer that provides protection and control functions with local HMI. The prime application of this device is intended for use in substations up to distribution voltage levels, although it may also be used as backup protection in transmission substations. Likewise, the OBS may be applied to the MV part of a HV substation that is being controlled by the same substation control system.</td>
</tr>
<tr>
<td>OI</td>
<td>Operator Interface</td>
</tr>
<tr>
<td>OLE</td>
<td>Object Linking and Embedding OLE is a Microsoft specification and defines standards for interfacing objects.</td>
</tr>
<tr>
<td>OLTC</td>
<td>On Line Tap Changing</td>
</tr>
<tr>
<td>OMM</td>
<td>Operating Mode Management</td>
</tr>
<tr>
<td>OPC</td>
<td>OLE for process control OPC is a registered trademark of Microsoft, and is designed to be a method to allow business management access to plant floor data in a consistent manner.</td>
</tr>
<tr>
<td>Operation hours</td>
<td>Sum of time periods during which, a primary device is running in the energized state. For example, a circuit breaker is in Closed state and the current is not equal to 0 A.</td>
</tr>
<tr>
<td>OSI</td>
<td>Open System Interconnection Split and define communication in 7 layers: physical, link, network, transport, session, presentation, application</td>
</tr>
<tr>
<td>OWS</td>
<td>Operator WorkStation (PACiS OI)</td>
</tr>
<tr>
<td>PACiS</td>
<td>Protection, Automation and Control Integrated Solutions</td>
</tr>
<tr>
<td>PLC</td>
<td>Programmable Logic Control/Chart. Includes PSL and ISaGRAF. The configurable control sequences or automations taken into account by the MiCOM Systems are defined within the PLC program.</td>
</tr>
<tr>
<td>POW</td>
<td>Point On Wave Point on wave switching is the control process of the three poles of an HV-circuit breaker in a manner that to minimizes the effects of switching.</td>
</tr>
<tr>
<td>PSL</td>
<td>Programmable Scheme Logic</td>
</tr>
<tr>
<td>PSTN</td>
<td>Public Switched Telephone Network</td>
</tr>
<tr>
<td>RCC</td>
<td>Remote Control Centre Computer or system that is not part of a MiCOM system. RCC communicates with and supervises a MiCOM system using a protocol.</td>
</tr>
<tr>
<td>Abbreviation</td>
<td>Description</td>
</tr>
<tr>
<td>--------------</td>
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</tr>
<tr>
<td>RCP</td>
<td>Remote Control Point&lt;br&gt; Name given to the device or part used to control remotely several bays or sub-stations. Usually associated with Remote/Local sub-station control. It is a SCADA interface managed by the MiCOM system through the Telecontrol BUS. Several RCPs can be managed with different protocols.</td>
</tr>
<tr>
<td>Remote Control Mode</td>
<td>When set for a control point, it means that the commands are issued from an upper level and are not allowed from this point.</td>
</tr>
<tr>
<td>Remote HMI</td>
<td>Remote HMI is a client of the substation HMI server. The client may provide all or part of functions handled by the substation HMI.</td>
</tr>
<tr>
<td>RI</td>
<td>Read Inhibit&lt;br&gt; This output indicates the availability of an analog output (e.g. during DAC converting time)</td>
</tr>
<tr>
<td>RJ-45</td>
<td>Registered Jack-45&lt;br&gt; A 8-pin female connector for 10/100 Base-T Ethernet network</td>
</tr>
<tr>
<td>RMS</td>
<td>Root Mean Square</td>
</tr>
<tr>
<td>RRC</td>
<td>Rapid ReClosure</td>
</tr>
<tr>
<td>RSE</td>
<td>Régime Spécial d’Exploitation&lt;br&gt; French grid function when work is being done on an HV feeder</td>
</tr>
<tr>
<td>RSVC</td>
<td>Re-locatable Static VAR Compensator</td>
</tr>
<tr>
<td>RS-232</td>
<td>Recommended Standard 232&lt;br&gt; A standard for serial transmission between computers and peripheral devices.</td>
</tr>
<tr>
<td>RS-422</td>
<td>A standard for serial interfaces that extends distances and speeds beyond RS 232. Is intended for use in multipoint lines.</td>
</tr>
<tr>
<td>RS-485</td>
<td>A standard for serial multipoint communication lines.&lt;br&gt; RS 485 allows more nodes per line than RS 422.</td>
</tr>
<tr>
<td>RTU</td>
<td>Remote Terminal Unit&lt;br&gt; Stand-alone computer that acquires data and transmits them to RCP or SCADA. Typically it is the C964. RTU link is the TBUS.</td>
</tr>
<tr>
<td>SAT</td>
<td>Site Acceptance Test&lt;br&gt; Validation procedures executed with the customer on the site.</td>
</tr>
<tr>
<td>SBMC</td>
<td>Site Based Maintenance Control mode&lt;br&gt; A bay in SBMC mode does not take into account the commands issued from RCP. Moreover, some of its digital points &amp; measurements (defined during the configuration phase) are not sent to the RCP anymore (they are “automatically” suppressed).</td>
</tr>
<tr>
<td>SBO</td>
<td>Select Before Operate&lt;br&gt; A control made in two steps, selection and execution. The selection phase gives a feedback. It can be used to prepare, reserve during time, configure a circuit before execution. Controls are done into a protocol, or physically (select with DI Select then DO execute).</td>
</tr>
<tr>
<td>S-BUS</td>
<td>Station Bus, network between PACIS devices.</td>
</tr>
<tr>
<td>SCADA</td>
<td>Supervisory Control And Data Acquisition&lt;br&gt; Equivalent to RCC</td>
</tr>
<tr>
<td>SCD</td>
<td>Description file extension</td>
</tr>
<tr>
<td>SCE</td>
<td>System Configuration Editor</td>
</tr>
<tr>
<td>SCL</td>
<td>Substation automation system Configuration Language ( IEC 61850-6)</td>
</tr>
<tr>
<td>Term</td>
<td>Definition</td>
</tr>
<tr>
<td>----------------</td>
<td>-------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
</tbody>
</table>
| SCP            | Substation Control Point  
Name given to the device or part used to control several bays or substation locally. Usually associated with Remote/Local substation control. It is commonly the PACiS Operator Interface. |
| SCS            | Substation Control System                                                                                                                                                      |
| SCSM           | Specific Communication Service Mapping                                                                                                                                       |
| SCT            | Single Counter                                                                                                                                                               |
| SER            | Sequence of Event Recorder  
Combines SOE with accurate Time synchronization and Maintenance facilities over Ethernet communication                                                                 |
| Server         | Defined in IEC 61850 as: entity that provides services to clients or issues unsolicited messages                                                                                   |
| Setpoints (analog) | Analog setpoints are analog outputs delivered as current loops. Analog setpoints are used to send instruction values to the process or auxiliary device                                      |
| Setpoints (digital) | Digital values sent on multiple parallel wired outputs. Each wired output represents a bit of the value. Digital setpoints are used to send instruction values to the electrical process or to auxiliary devices. |
| SFC            | Sequential Function Chart  
One of the IEC 1131-3 programming languages (language used to define configurable automation).                                                                           |
| SI             | System Indication  
Binary information that does not come from an external interface. It is related to an internal state of the computer (time status, hardware faults, and so on). It is the result of all inner functions (AR, …), PSL, or IsaGRAF automation. |
| SICU 4         | Switchgear Intelligent Control Unit  
Control unit of an intelligent circuit breaker (fourth generation)                                                                                                             |
| SIG            | Status Input Group                                                                                                                                                           |
| SINAD          | Signal-plus-Noise-plus-Distortion to Noise-plus-Distortion ratio, in dB                                                                                                           |
| SIT            | Status Input Double Bit                                                                                                                                                      |
| SMT            | System Management Tool                                                                                                                                                        |
| SNTP           | Simple Network Time Protocol                                                                                                                                                  |
| SOE            | Sequence Of Events  
Other term for the event list.                                                                                                                                                |
| SP             | Single Point                                                                                                                                                                |
| SPS            | Single Point Status                                                                                                                                                           |
| SPC            | Single Point Control                                                                                                                                                          |
| ST             | Structured Text  
An IEC 1131-3 programming languages to define configurable automation                                                                                                         |
<p>| STP            | Shielded Twisted Pair                                                                                                                                                         |
| Substation computer | Bay computer used at substation level                                                                                                                                          |
| SUI            | Substation User Interface                                                                                                                                                     |
| Suppression (Automatic) | A binary information belonging to a bay in SBMC mode will be automatically suppressed for the remote control. However changes of state will be signaled locally, at SCP                                                      |
| Suppression (Manual) | A binary information can be suppressed by an order issued from an operator. No subsequent change of state on &quot;suppressed information &quot; can trigger any action such as display, alarm and transmission |</p>
<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>SWR</td>
<td>Switch Redundant C264 Bay Computer board Ethernet switch with redundant Ethernet</td>
</tr>
<tr>
<td>SWU</td>
<td>Switch Unit (C264 Bay Computer board Ethernet switch)</td>
</tr>
<tr>
<td>T101</td>
<td>Term used for IEC 60870-5-101 protocol</td>
</tr>
<tr>
<td>T103</td>
<td>Term used for IEC 60870-5-103 protocol</td>
</tr>
<tr>
<td>T104</td>
<td>Term used for IEC 60870-5-104 protocol</td>
</tr>
<tr>
<td>TBC / TBD</td>
<td>To Be Completed / Defined</td>
</tr>
<tr>
<td>T-BUS</td>
<td>Telecontrol Bus, generic name of networks and protocols used to communicate between PACiS Gateway or C264 Telecontrol Interface function and the RCP. Networks are based on RS 232, RS 485 or Ethernet (T104). Protocols are IEC 60850-5-101 (T101), Modbus MODICON</td>
</tr>
<tr>
<td>TC</td>
<td>True Contact</td>
</tr>
<tr>
<td>TCIP</td>
<td>Tap Change in Progress</td>
</tr>
<tr>
<td>TCU</td>
<td>Transformer Current Unit C264 Bay Computer CT/VT board : Current acquisition</td>
</tr>
<tr>
<td>TDD</td>
<td>Total Demand Distortion, similar to the THD but applied to currents and with a rated current (I_n) as reference</td>
</tr>
<tr>
<td>TG</td>
<td>Telecontrol Gateway</td>
</tr>
<tr>
<td>THD</td>
<td>Total Harmonic Distortion, sum of all voltage harmonics</td>
</tr>
<tr>
<td>TI</td>
<td>Tele Interface</td>
</tr>
<tr>
<td>TM</td>
<td>Analog Measurement</td>
</tr>
<tr>
<td>TMU</td>
<td>Transducer-Less Measurement Unit</td>
</tr>
<tr>
<td>Topological interlocking</td>
<td>Interlocking algorithm, based on evaluation of topological information of the switchgear arrangement in the HV network, the switchgear type and position, and defined rules for controlling this kind of switch (e.g. continuity of power supply)</td>
</tr>
<tr>
<td>TPI</td>
<td>Tap Position Indication (for transformers). Frequently acquired via a Digital Measurement</td>
</tr>
<tr>
<td>TS</td>
<td>Logic position</td>
</tr>
<tr>
<td>TVU</td>
<td>Transformer Voltage Unit C264 Bay Computer CT/VT board : Voltage acquisition</td>
</tr>
<tr>
<td>UCA</td>
<td>Utility Communications Architecture Communication standard (mainly US) used for PACiS SBUS communication</td>
</tr>
<tr>
<td>UPI</td>
<td>Unit Per Impulse Parameter of counter to convert number of pulses to Measurement value. Both data (integer and scaled floating) are in a common class UCA2 Accumulator.</td>
</tr>
<tr>
<td>UTC</td>
<td>Universal Time Co-ordinates (or Universal Time Code) This designation replaces GMT (but it is practically the same for our purposes).</td>
</tr>
<tr>
<td>VdBS</td>
<td>Versioned data Base System, databag generated by SCE &amp; ready to download</td>
</tr>
<tr>
<td>VDEW</td>
<td>Term used for IEC 60870-5-103 protocol</td>
</tr>
<tr>
<td>VDU</td>
<td>Visual Display Unit</td>
</tr>
<tr>
<td>VMGA</td>
<td>Vertical Measurement Graphical Area</td>
</tr>
<tr>
<td>Term</td>
<td>Description</td>
</tr>
<tr>
<td>--------------</td>
<td>-----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Voltage level</td>
<td>Set of bays, whose plants &amp; devices deal with the same voltage (for example, 275 kV)</td>
</tr>
<tr>
<td>VT</td>
<td>Voltage Transformer&lt;br&gt;Electric device connected to process and extract a voltage measurement. By extension, part of a device (C264) that receives this AC value and converts it to a numerical measurement value. VTs are wired in parallel.</td>
</tr>
<tr>
<td>WTS</td>
<td>Windows Terminal Server, Microsoft remote desktop connection</td>
</tr>
<tr>
<td>WYE</td>
<td>Three phases + neutral AI values</td>
</tr>
<tr>
<td>xPC</td>
<td>Single Point Control, Double Point Control</td>
</tr>
</tbody>
</table>