# Table of contents

1 Foreword .................................................................................................................................................... 5  
   1.1 Notes on the documentation ................................................................................................................... 5  
   1.2 Safety instructions ..................................................................................................................................... 6  

2 Introduction ............................................................................................................................................... 7  

3 Using the 1-second UPS with several PLC projects on a target system .................................................. 8  

4 Function blocks ........................................................................................................................................... 9  
   4.1 CB3011 .................................................................................................................................................. 9  
      4.1.1 FB_S_UPS_CB3011 ......................................................................................................................... 9  
   4.2 CX50x0 .................................................................................................................................................. 10  
      4.2.1 FB_S_UPS ...................................................................................................................................... 10  
   4.3 CX51x0 .................................................................................................................................................. 13  
      4.3.1 FB_S_UPS_CX51x0 ......................................................................................................................... 13  
   4.4 CX9020-U900 ...................................................................................................................................... 15  
      4.4.1 FB_S_UPS_CX9020_U900 ............................................................................................................ 15  
   4.5 BAPI ..................................................................................................................................................... 17  
      4.5.1 FB_S_UPS_BAPI ............................................................................................................................. 17  
   4.6 FB_NT_QuickShutdown .......................................................................................................................... 19  

5 Functions .................................................................................................................................................... 20  
   5.1 [Obsolete] .............................................................................................................................................. 20  
      5.1.1 F_GetVersionTcSUPS ................................................................................................................... 20  

6 Data types ..................................................................................................................................................... 21  
   6.1 E_S_UPS_Mode ...................................................................................................................................... 21  
   6.2 E_S_UPS_State ...................................................................................................................................... 21  

7 Global constants ....................................................................................................................................... 22  
   7.1 Library version ....................................................................................................................................... 22
1 Foreword

1.1 Notes on the documentation

This description is only intended for the use of trained specialists in control and automation engineering who are familiar with applicable national standards.
It is essential that the documentation and the following notes and explanations are followed when installing and commissioning the components.
It is the duty of the technical personnel to use the documentation published at the respective time of each installation and commissioning.

The responsible staff must ensure that the application or use of the products described satisfy all the requirements for safety, including all the relevant laws, regulations, guidelines and standards.

Disclaimer

The documentation has been prepared with care. The products described are, however, constantly under development.
We reserve the right to revise and change the documentation at any time and without prior announcement.
No claims for the modification of products that have already been supplied may be made on the basis of the data, diagrams and descriptions in this documentation.

Trademarks

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Patent Pending

The EtherCAT Technology is covered, including but not limited to the following patent applications and patents:
with corresponding applications or registrations in various other countries.

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1.2 Safety instructions

Safety regulations

Please note the following safety instructions and explanations!
Product-specific safety instructions can be found on following pages or in the areas mounting, wiring, commissioning etc.

Exclusion of liability

All the components are supplied in particular hardware and software configurations appropriate for the application. Modifications to hardware or software configurations other than those described in the documentation are not permitted, and nullify the liability of Beckhoff Automation GmbH & Co. KG.

Personnel qualification

This description is only intended for trained specialists in control, automation and drive engineering who are familiar with the applicable national standards.

Description of symbols

In this documentation the following symbols are used with an accompanying safety instruction or note. The safety instructions must be read carefully and followed without fail!

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Safety Instruction</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image" alt="DANGER" /></td>
<td>Serious risk of injury! Failure to follow the safety instructions associated with this symbol directly endangers the life and health of persons.</td>
</tr>
<tr>
<td><img src="image" alt="WARNING" /></td>
<td>Risk of injury! Failure to follow the safety instructions associated with this symbol endangers the life and health of persons.</td>
</tr>
<tr>
<td><img src="image" alt="CAUTION" /></td>
<td>Personal injuries! Failure to follow the safety instructions associated with this symbol can lead to injuries to persons.</td>
</tr>
<tr>
<td><img src="image" alt="NOTE" /></td>
<td>Damage to the environment or devices Failure to follow the instructions associated with this symbol can lead to damage to the environment or equipment.</td>
</tr>
</tbody>
</table>

Tip or pointer

This symbol indicates information that contributes to better understanding.
2 Introduction

The library Tc2_SUPS contains functions and function blocks required for controlling the 1-second UPS (SUPS).

Function blocks

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>FB_S_UPS</td>
<td>Function block for controlling the 1-second UPS of CX50x0 Embedded PCs</td>
</tr>
<tr>
<td>FB_S_UPS_CB3011</td>
<td>Function block for controlling the 1-second UPS of PCs with CB3011 board</td>
</tr>
<tr>
<td>FB_S_UPS_CX51x0</td>
<td>Function block for controlling the 1-second UPS of CX51x0 Embedded PCs</td>
</tr>
<tr>
<td>FB_S_UPS_CX9020_U900</td>
<td>Function block for controlling the 1-second UPS of CX9020-U900 Embedded PCs</td>
</tr>
<tr>
<td>FB_S_UPS_BAPI</td>
<td>Function block for controlling the 1-second UPS of devices with BIOS-API from version v1.15</td>
</tr>
<tr>
<td>FB_NT_QuickShutdown</td>
<td>Internal function block for quick shutdown, which is used by the FB_S_UPS.</td>
</tr>
</tbody>
</table>

Functions

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>F_GetVersionTcSUPS</td>
<td>Returns version information of the library</td>
</tr>
</tbody>
</table>
3 Using the 1-second UPS with several PLC projects on a target system

To use the 1-second UPS with several PLC projects on a target system (PC/CX), please note the following process description.

The process is the same for all supported 1-second UPS devices. Only the SUPS function block for controlling the 1-second UPS is different, depending on the target platform. The PLC runtime systems communicate via process data.

Process description:

• Both PLC runtime systems use their own instance of the SUPS function block to check whether the voltage has failed and then write the persistent data without quick shutdown.
• When the first PLC runtime system has completed the process of writing the persistent data, it notifies the second PLC runtime system.
• The second PLC runtime system also writes the persistent data and at the same time waits for the notification from the first PLC runtime system.
• When both PLC runtime systems have completed the writing process, the second PLC runtime system directly initiates the quick shutdown.

NOTE
In configurations with two or more PLC projects, only one PLC runtime system may trigger the quick shutdown.

Example for CX51x0 Embedded PCs

The example illustrates the application of the 1-second UPS with two PLC projects for 51x0 Embedded PCs.

Download: https://infosys.beckhoff.com/content/1033/TcPlcLib_Tc2_SUPS/Resources/zip/3714188299.zip
4 Function blocks

4.1 CB3011

4.1.1 FB_S_UPS_CB3011

The function block FB_S_UPS_CB3011 can be used on PCs with a CB3011 board with 1-second UPS, in order to control the 1-second UPS from the PLC. In the event of a power failure, this enables the persistent data to be saved and/or a quick shutdown to be executed, depending on the selected mode. The default input values of the FB_S_UPS_CB3011 should be retained.

The 1-second UPS does not have sufficient capacity for bridging power failures. Only the Compact Flash card can be used for data storage, in view of the fact that the UPS capacity is not sufficient for operating a hard disk.

The 1-second UPS can be used only for a few seconds in the event of a power failure in order, to save persistent data. The data must be saved in the fast “persistent mode” “SPDM_2PASS”, even though this can lead to real-time violations. Make sure you configure adequate router memory for saving the persistent data.

Irrespective of the mode and irrespective of whether data were saved or the quick shutdown was executed, the 1-second UPS switches off the mainboard after the discharging of the capacitors.

NOTE

Loss of data
If other applications or the PLC keep further files open or write to them, file errors may occur if the 1-second UPS switches off the controller.

Function block modes

A QuickShutdown is performed automatically in the eSUPS_WrPersistData_Shutdown mode (standard setting) after the storage of the persistent data.

In the eSUPS_WrPersistData_NoShutdown only the persistent data are saved, no QuickShutdown is performed.

In eSUPS_ImmediateShutdown a quick shutdown is executed immediately, without saving data.

In the eSUPS_CheckPowerStatus only a check is performed as to whether a power failure has occurred. If this is the case, the function block only switches back to the PowerOK state after the expiry of tRecoverTime (10s).

VAR_INPUT

<table>
<thead>
<tr>
<th>VAR_INPUT</th>
</tr>
</thead>
<tbody>
<tr>
<td>sNetID : T_AmsNetId:= ''; (* '' = local netid *)</td>
</tr>
<tr>
<td>iPLCPort : UINT := 0; (* PLC Runtime System for writing persistent data *)</td>
</tr>
<tr>
<td>tTimeout : TIME := DEFAULT_ADS_TIMEOUT; (* ADS Timeout *)</td>
</tr>
<tr>
<td>eUpsMode : E_S_UPS_Mode := eSUPS_WrPersistData_Shutdown; (* UPS mode (w/wo writing persistent data, w/wo shutdown) *)</td>
</tr>
<tr>
<td>ePersistentMode : E_PersistentMode := SPDM_2PASS; (* mode for writing persistent data *)</td>
</tr>
</tbody>
</table>
### Function blocks

#### tRecoverTime

- **Type**: TIME := T#10s; (* ON time to recover from short power failure in mode eSUPS_WrPersistData_NoShutdown/eSUPS_CheckPowerStatus *)

#### sNetId

- **Description**: AmsNetID of the controller (type: T_AmsNetID)

#### iPCLPort

- **Description**: Port number of the PLC runtime system (851 for the first PLC runtime system, 852 for the second PLC runtime system, …). If no port number is specified, iPCLPort is 0. The function block then automatically determines the port of the PLC runtime system.

#### tTimeout

- **Description**: Timeout for writing of the persistent data or the quick shutdown.

#### eUpsMode

- **Description**: Defines whether persistent data are written and whether a quick shutdown is executed. The default value is eSUPS_WrPersistData_Shutdown, i.e. a quick shutdown is executed automatically once the persistent data have been saved. (Type: E_S_UPS_Mode)

#### ePersistentMode

- **Description**: Mode for the writing of the persistent data. Default value is SPDM_2PASS.

#### tRecoverTime

- **Description**: Time after which the UPS returns to PowerOK state in UPS modes without quick shutdown. The tRecoverTime must be greater than the maximum charging time of the UPS, otherwise the UPS may discharge too much in the event of short, consecutive power failures, which could result in the charge being insufficient for storing the persistent data.

### VAR_OUTPUT

- **bPowerFailDetect**: TRUE during power failure. FALSE if the supply voltage is present.

- **eState**: Internal state of the function block (type: E_S_UPS_State)

### VAR_GLOBAL

- **eGlobalSUpsState**: Internal state of the function block as global copy of VAR_OUTPUT

### Requirements

<table>
<thead>
<tr>
<th>Development environment</th>
<th>Target platform</th>
<th>Hardware</th>
<th>PLC libraries to include</th>
</tr>
</thead>
<tbody>
<tr>
<td>TwinCAT v3.1 B4016</td>
<td>ARM Panel PC with CB3011</td>
<td>1-second UPS</td>
<td>Tc2_SUPS</td>
</tr>
</tbody>
</table>

### 4.2 CX50x0

### 4.2.1 FB_S_UPS

- **Description**: Function block for UPS functionality.
The function block FB_S_UPS can be used on CX50x0 Embedded PCs with 1-second UPS, in order to control the 1-second UPS from the PLC. In the event of a power failure, this enables the persistent data to be saved and/or a quick shutdown to be executed, depending on the selected mode. The default input values of the FB_S_UPS should be retained.

The 1-second UPS does not have sufficient capacity for bridging power failures. Only the Compact Flash card can be used for data storage, in view of the fact that the UPS capacity is not sufficient for operating a hard disk.

The 1-second UPS can be used only for a few seconds in the event of a power failure in order to save persistent data. The data must be saved in the fast "persistent mode" "SPDM_2PASS", even though this can lead to real-time violations. Make sure you configure adequate router memory for saving the persistent data.

Irrespective of the mode and irrespective of whether data were saved or the quick shutdown was executed, the 1-second UPS switches off the mainboard after the discharging of the capacitors.

### Function block modes

A QuickShutdown is performed automatically in the eSUPS_WrPersistData_Shutdown [mode](standard setting) after the storage of the persistent data.

In the eSUPS_WrPersistData_NoShutdown [mode] only the persistent data are saved, no QuickShutdown is performed.

In eSUPS_ImmediateShutdown [mode] a quick shutdown is executed immediately, without saving data.

In the eSUPS_CheckPowerStatus [mode] only a check is performed as to whether a power failure has occurred. If this is the case, the function block only switches back to the PowerOK state after the expiry of tRecoverTime (10s).

### Application under Windows Embedded Standard 7P

To protect Windows XP Embedded files on devices with 1-second UPS, either the Enhanced Write Filter (EWF) or the File Based Write Filter (FBWF) must be enabled.

- If the EWF is used, the TwinCAT\Boot folder must be located on an unprotected partition (see in the registry: HKEY_LOCAL_MACHINE\SOFTWARE\Beckhoff\TwinCAT\System\BootPrjPath).
- If the FBWF is used, must the TwinCAT\Boot folder must be excluded from the protection (see Beckhoff FBWF Manager, Exclusion Settings).

Beckhoff EBWF Manager:
VAR_INPUT

VAR_INPUT

sNetID : T_AmsNetId := ''; (* '' = local netid *)
iPLCPort : UINT := 0; (* PLC runtime System for writing persistent data *)
iUPSPort : UINT := 16#4A8; (* Port for reading Power State of UPS, default 16#4A8 *)
tTimeout : TIME := DEFAULT_ADS_TIMEOUT; (* ADS Timeout *)
eUpsMode : E_S_UPS_Mode := eSUPS_WrPersistData_Shutdown; (* UPS mode (w/ w/o writing persistent data, w/ w/o shutdown) *)
ePersistentMode : E_PersistentMode := SPDM_2PASS; (* mode for writing persistent data *)
tRecoverTime : TIME := T#10s; (* ON time to recover from short power failure in mode eSUPS_Wr PersistData_NoShutdown/eSUPS_CheckPowerStatus *)

END_VAR

sNetID: AmsNetID of the controller (type: T_AmsNetID)
iPLCPort: Port number of the PLC runtime system (851 for the first PLC runtime system, 852 for the second PLC runtime system, ...). If no port number is specified, iPLCPort is 0. The function block then automatically determines the port of the PLC runtime system.
iUPSPort: Port number through which the UPS status is read. The default value is 16#4A8.
tTimeout: Timeout for writing of the persistent data or the quick shutdown.
eUpsMode: Defines whether persistent data are to be written and whether a quick shutdown is to be executed. The default value is eSUPS_WrPersistData_Shutdown, i.e. a quick shutdown is executed automatically once the persistent data have been saved. (Type: E_S_UPS_Mode)
ePersistentMode: Mode for the writing of the persistent data. Default value is SPDM_2PASS.
tRecoverTime: Time after which the UPS returns to PowerOK state in UPS modes without quick shutdown. The tRecoverTime must be greater than the maximum charging time of the UPS, otherwise the UPS may discharge too much in the event of short, consecutive power failures, which could result in the charge being insufficient for storing the persistent data.

VAR_OUTPUT

VAR_OUTPUT

bPowerFailDetect : BOOL; (* TRUE while powerfailure is detected *)
eState : E_S_UPS_State := eSUPS_PowerOK; (* current ups state *)

END_VAR

bPowerFailDetect: TRUE during power failure. FALSE if the supply voltage is present.
eState: Internal state of the function block (type: E_S_UPS_State)
VAR_GLOBAL

VAR_GLOBAL

  eGlobalSUpsState : E_S_UPS_State; (*current ups state*)

END_VAR

eGlobalSUpsState: Internal state of the function block as global copy of VAR_OUTPUT

eState: For values see E_S_UPS_State [21]

Requirements

<table>
<thead>
<tr>
<th>Development environment</th>
<th>Target platform</th>
<th>Hardware</th>
<th>PLC libraries to include</th>
</tr>
</thead>
<tbody>
<tr>
<td>TwinCAT v3.1 B4016</td>
<td>CX50x0</td>
<td>1-second UPS</td>
<td>Tc2_SUPS</td>
</tr>
</tbody>
</table>

4.3 CX51x0

4.3.1 FB_S_UPS_CX51x0

The function block FB_S_UPS_CX51x0 can be used on CX51x0 devices with 1-second UPS, in order to control the 1-second UPS from the PLC. In the event of a power failure, this enables the persistent data to be saved and/or a quick shutdown to be executed, depending on the selected mode. The default input values of the FB_S_UPS_CX51x0 should be retained.

The 1-second UPS does not have sufficient capacity for bridging power failures. Only the Compact Flash card can be used for data storage, in view of the fact that the UPS capacity is not sufficient for operating a hard disk.

The 1-second UPS can be used only for a few seconds in the event of a power failure in order to save persistent data. The data must be saved in the fast "persistent mode" "SPDM_2PASS", even though this can lead to real-time violations. Make sure you configure adequate router memory for saving the persistent data.

Irrespective of the mode and irrespective of whether data were saved or the quick shutdown was executed, the 1-second UPS switches off the mainboard after the discharging of the capacitors.

NOTE

Loss of data

If other applications or the PLC keep further files open or write to them, file errors may occur if the 1-second UPS switches off the controller.

Function block modes

A QuickShutdown is performed automatically in the eSUPS_WrPersistData_Shutdown mode [21] (standard setting) after the storage of the persistent data.

In the eSUPS_WrPersistData_NoShutdown mode [21] only the persistent data are saved, no QuickShutdown is performed.

In eSUPS_ImmediateShutdown mode [21] a quick shutdown is executed immediately, without saving data.
In the eSUPS_CheckPowerStatus mode only a check is performed as to whether a power failure has occurred. If this is the case, the function block only switches back to the PowerOK state after the expiry of tRecoverTime (10s).

**Application under Windows Embedded Standard 7P**

To protect Windows XP Embedded files on devices with 1-second UPS, either the Enhanced Write Filter (EWF) or the File Based Write Filter (FBWF) must be enabled.

- If the EWF is used, the TwinCAT\Boot folder must be located on an unprotected partition (see in the registry: HKEY_LOCAL_MACHINE\SOFTWARE\Beckhoff\TwinCAT\System\BootPrjPath).
- If the FBWF is used, must the TwinCAT\Boot folder must be excluded from the protection (see Beckhoff FBWF Manager, Exclusion Settings).

**Beckhoff EBWF Manager:**

VAR_INPUT

```
VAR_INPUT
  sNetID : T_AmsNetId := ''; (* '' = local netid *)
  iPLCPort : UINT := 0; (* PLC Runtime System for writing persistent data *)
  iUPSPort : UINT := 16#588; (* Port for reading Power State of UPS *)
  tTimeout : TIME := DEFAULT_ADS_TIMEOUT; (* ADS Timeout *)
  eUpsMode : E_S_UPS_Mode := eSUPS_WrPersistData_Shutdown; (* UPS mode (w/ wo writing persistent data, w/wo shutdown) *)
  tRecoverTime : TIME := T#10s; (* ON time to recover from short power failure in mode eSUPS_Wr PersistData_NoShutdown/eSUPS_CheckPowerStatus *)
END_VAR
```

**sNetID:** AmsNetID of the controller (type: T_AmsNetId)

**iPLCPort:** Port number of the PLC runtime system (851 for the first PLC runtime system, 852 for the second PLC runtime system, ...). If no port number is specified, iPLCPort is 0. The function block then automatically determines the port of the PLC runtime system.

**iUPSPort:** Port number through which the UPS status is read. The default value is 16#588

**tTimeout:** Timeout for writing of the persistent data or the quick shutdown.

**eUpsMode:** The eUpsMode defines whether persistent data are to be written and whether a quick shutdown is to be performed. The default value is eSUPS_WrPersistData_Shutdown, i.e. a quick shutdown is executed automatically once the persistent data have been saved. (Type: E_S_UPS_Mode)

**ePersistentMode:** Mode for the writing of the persistent data. Default value is SPDM_2PASS.
tRecoverTime: Time after which the UPS returns to PowerOK state in UPS modes without quick shutdown. The tRecoverTime must be greater than the maximum charging time of the UPS, otherwise the UPS may discharge too much in the event of short, consecutive power failures, which could result in the charge being insufficient for storing the persistent data.

VAR OUTPUT

```plaintext
VAR_OUTPUT
  bPowerFailDetect : BOOL; (* TRUE while powerfailure is detected *)
  eState = E_S_UPS_State := eSUPS_PowerOK; (* current ups state *)
END_VAR
```

bPowerFailDetect: TRUE during power failure. FALSE if the supply voltage is present.

eState: Internal state of the function block (type: E_S_UPS_State [21])

VAR_GLOBAL

```plaintext
VAR_GLOBAL
  eGlobalSUpsState : E_S_UPS_State; (*current ups state*)
END_VAR
```

eGlobalSUpsState: Internal state of the function block as global copy of VAR_OUTPUT

eState: For values see E_S_UPS_State [21]

Requirements

<table>
<thead>
<tr>
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</thead>
<tbody>
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<td>CX51x0</td>
<td>1-second UPS</td>
<td>Tc2_SUPS</td>
</tr>
</tbody>
</table>

4.4 CX9020-U900

4.4.1 FB_S_UPS_CX9020_U900

The function block FB_S_UPS_CX9020_U900 can be used on CX9020-U900 devices with 1-second UPS, in order to control the 1-second UPS from the PLC. In the event of a power failure, this enables the persistent data to be saved and/or a quick shutdown to be executed, depending on the selected mode. The default input values of the FB_S_UPS_CX9020_U900 should be retained.

The 1-second UPS does not have sufficient capacity for bridging power failures. Only the Compact Flash card can be used for data storage, in view of the fact that the UPS capacity is not sufficient for operating a hard disk.

The 1-second UPS can be used only for a few seconds in the event of a power failure in order, to save persistent data. The data must be saved in the fast “persistent mode” “SPDM_2PASS”, even though this can lead to real-time violations. Make sure you configure adequate router memory for saving the persistent data.

Irrespective of the mode and irrespective of whether data were saved or the quick shutdown was executed, the 1-second UPS switches off the mainboard after the discharging of the capacitors.
NOTE

Loss of data
If other applications or the PLC keep further files open or write to them, file errors may occur if the 1-second
UPS switches off the controller.

Function block modes

A QuickShutdown is performed automatically in the eSUPS_WrPersistData_Shutdown mode [21]
(standard setting) after the storage of the persistent data.

In the eSUPS_WrPersistData_NoShutdown mode [21] only the persistent data are saved, no
QuickShutdown is performed.

In eSUPS_ImmediateShutdown mode [21] a quick shutdown is executed immediately, without saving
data.

In the eSUPS_CheckPowerStatus mode [21] only a check is performed as to whether a power failure has
occurred. If this is the case, the function block only switches back to the PowerOK state after the expiry of
tRecoverTime (10s).

VAR_INPUT

VAR_INPUT
  sNetID : T_AmsNetId: = ''; (* '' = local netid *)
  iPLCPort : UINT := 0; (* PLC Runtime System for writing persistent data *)
  tTimeout : TIME := DEFAULT_ADS_TIMEOUT; (* ADS Timeout *)
  eUpsMode : E_S_UPS_Mode := eSUPS_WrPersistData_Shutdown; (* UPS mode (w/
  wo writing persistent data, w/wo shutdown) *)
  ePersistentMode : E_PersistentMode := SPDM_2PASS; (* mode for writing persistent data *)
  tRecoverTime : TIME := T#10s; (* ON time to recover from short power failure in mode eSUPS_WrPersistData_NoShutdown/eSUPS_CheckPowerStatus *)
END_VAR

sNetID: AmsNetID of the controller (type: T_AmsNetID)
iPLCPort: Port number of the PLC runtime system (851 for the first PLC runtime system, 852 for the second
PLC runtime system, …). If no port number is specified, iPLCPort is 0. The function block then automatically
determines the port of the PLC runtime system.
tTimeout: Timeout for writing of the persistent data or the quick shutdown.
eUpsMode: Defines whether persistent data are to be written and whether a quick shutdown is to be
executed. The default value is eSUPS_WrPersistData_Shutdown, i.e. a quick shutdown is executed
automatically once the persistent data have been saved. (Type: E_S_UPS_Mode [21])
ePersistentMode: Mode for the writing of the persistent data. Default value is SPDM_2PASS.
tRecoverTime: Time after which the UPS reverts to the PowerOK status in the case of UPS modes without
shutdown. tRecoverTime must be somewhat longer than the maximum hold time of the UPS in order to
ensure that the capacitors are fully charged.

VAR_OUTPUT

VAR_OUTPUT
  bPowerFailDetect : BOOL; (* TRUE while powerfailure is detected *)
  eState : E_S_UPS_State := eSUPS_PowerOK; (* current ups state *)
END_VAR

bPowerFailDetect: TRUE during power failure. FALSE if the supply voltage is present.
eState: Internal state of the function block (type: E_S_UPS_State [21])

VAR_GLOBAL

VAR_GLOBAL
  eGlobalSUpsState : E_S_UPS_State; (*current ups state*)
END_VAR
eGlobalSUpsState: Internal state of the function block as global copy of VAR_OUTPUT

eState: For values see E_S_UPS_State [➔21]

Requirements

<table>
<thead>
<tr>
<th>Development environment</th>
<th>Target platform</th>
<th>Hardware</th>
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<tbody>
<tr>
<td>TwinCAT v3.1 B4016</td>
<td>CX9020-U900</td>
<td>1-second UPS</td>
<td>Tc2_SUPS</td>
</tr>
</tbody>
</table>

4.5 BAPI

4.5.1 FB_S_UPS_BAPI

The function block FB_S_UPS_BAPI can be used on devices with 1-second UPS and with BIOS-API from version v1.15, in order to control the 1-second UPS from the PLC.

When the function block is first called, the data for accessing the 1-second UPS are determined via BIOS-API. This process takes several cycles. This is followed by cyclic testing for power failure. When the persistent data are written next, the access data for the PLC are saved persistently, so that during subsequent boot operations the check for power failures can take place immediately after the PLC start.

In the event of a power failure the charge state of the 1-second UPS is checked every 50 ms, every 200 ms if voltage is present and the capacity is less than 90%, and every second if voltage is present and the capacity is more than 90%. This also takes place via BIOS-API access.

In the event of a power failure the function block FB_S_UPS_BAPI can be used to save the persistent data and/or execute a quick shutdown, depending on the selected mode. The default input values of the FB_S_UPS_BAPI should be retained.

The 1-second UPS does not have sufficient capacity for bridging power failures. Only the Compact Flash/CFast card/Micro SD can be used for data storage, in view of the fact that the UPS capacity is not sufficient for operating a hard disk.

The 1-second UPS can be used only for a few seconds in the event of a power failure in order, to save persistent data. The data must be saved in the fast "persistent mode" "SPDM_2PASS", even though this can lead to real-time violations. Make sure you configure adequate router memory for saving the persistent data.

Irrespective of the mode and irrespective of whether data were saved or the quick shutdown was executed, the 1-second UPS switches off the mainboard after the discharging of the capacitors.

**NOTE**

**Loss of data**

If other applications or the PLC keep further files open or write to them, file errors may occur if the 1-second UPS switches off the controller.

**Function block modes**

A QuickShutdown is performed automatically in the eSUPS_WrPersistData_Shutdown mode [➔21] (standard setting) after the storage of the persistent data.
In the eSUPS_WrPersistData_NoShutdown mode [21] only the persistent data are saved, no QuickShutdown is performed.

In eSUPS_ImmediateShutdown mode [21] a quick shutdown is executed immediately, without saving data.

In the eSUPS_CheckPowerStatus mode [21] only a check is performed as to whether a power failure has occurred. If this is the case, the function block only switches back to the PowerOK state after the expiry of tRecoverTime (10s).

VAR_INPUT

sNetID : T_AmsNetId := ''; (* '' = local netid *)
iPLCPort : UINT := 0; (* PLC Runtime System for writing persistent data *)
tTimeout : TIME := DEFAULT_ADS_TIMEOUT; (* ADS Timeout *)
eUpsMode : E_S_UPS_Mode := eSUPS_WrPersistData_Shutdown; (* UPS mode (w/ wo writing persistent data, w/wo shutdown) *)
ePersistentMode : E_PersistentMode := SPDM_2PASS; (* mode for writing persistent data *)
tRecoverTime : TIME := T#10s; (* ON time to recover from short power failure in mode eSUPS_Wr PersistData_NoShutdown/eSUPS_CheckPowerStatus *)
END_VAR

sNetID: AmsNetID of the controller (type: T_AmsNetID)
iPLCPort: Port number of the PLC runtime system (851 for the first PLC runtime system, 852 for the second PLC runtime system, ...). If no port number is specified, iPLCPort is 0. The function block then automatically determines the port of the PLC runtime system.
tTimeout: Timeout for writing of the persistent data or the quick shutdown.
eUpsMode: Defines whether persistent data are to be written and whether a quick shutdown is to be executed. The default value is eSUPS_WrPersistData_Shutdown, i.e. a quick shutdown is executed automatically once the persistent data have been saved. (Type: E_S_UPS_Mode [21])
ePersistentMode: Mode for the writing of the persistent data. Default value is SPDM_2PASS.
tRecoverTime: Time after which the UPS reverts to the PowerOK status in the case of UPS modes without shutdown. tRecoverTime must be somewhat longer than the maximum hold time of the UPS in order to ensure that the capacitors are fully charged.

VAR_OUTPUT

bPowerFailDetect : BOOL; (* TRUE while powerfailure is detected *)
eState : E_S_UPS_State; (* current ups state *)
nCapacity : BYTE; (* actual capacity of UPS *)
bBusy : BOOL; (* TRUE: function block is busy *)
bError : BOOL; (* FALSE: function block has error *)
nErrID : UDINT; (* FB error ID *)
END_VAR

bPowerFailDetect: TRUE during power failure. FALSE if the supply voltage is present.
eState: Internal state of the function block (type: E_S_UPS_State [21])
nCapacity: Current charge state of the capacitors in percent (0..100%)
bBusy: TRUE, as long as the function block is active.
bError: FALSE if an error has occurred.
nErrID: Error number

Requirements

<table>
<thead>
<tr>
<th>Development environment</th>
<th>Target platform</th>
<th>PLC libraries to include</th>
</tr>
</thead>
<tbody>
<tr>
<td>TwinCAT v3.1 B4020.32</td>
<td>Platforms that support the BIOS API from v1.15</td>
<td>Tc2_SUPS</td>
</tr>
</tbody>
</table>
4.6 FB_NT_QuickShutdown

**NOTE**

**Loss of data**
The function block FB_NT_QuickShutdown is used internally by the various FB_S_UPS blocks. It must not be used independently, because this could result in data loss!

```plaintext
FB_NT_QuickShutdown
  NETID    BUSY
  START    ERR
  TMOUT    ERRID
```

The function block FB_NT_QuickShutdown can be used to trigger an immediate reboot, without stopping TwinCAT or the Windows operating system.

**VAR_INPUT**

```plaintext
VAR_INPUT
  NETID : T_AmsNetId;
  START : BOOL;
  TMOUT : TIME := DEFAULT_ADS_TIMEOUT;
END_VAR
```

**NETID:** AmsNetID of the controller (type: T_AmsNetID)

**START:** Rising edge leads to immediate reboot of the control system.

**TMOUT:** Timeout time

**VAR_OUTPUT**

```plaintext
VAR_OUTPUT
  BUSY  : BOOL;
  ERR   : BOOL;
  ERRID : UDINT;
END_VAR
```

**BUSY:** Quick shutdown is executed.

**ERR:** Becomes TRUE, as soon as an error occurs.

**ERRID:** Supplies the error number when the ERR output is set.

**Requirements**

<table>
<thead>
<tr>
<th>Development environment</th>
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<td>PC or CX (x86),</td>
<td>Tc2_SUPS (Version: 3.3.3.0)</td>
</tr>
<tr>
<td></td>
<td>1-Second UPS</td>
<td></td>
</tr>
</tbody>
</table>
5 Functions

5.1 [Obsolete]

5.1.1 F_GetVersionTcSUPS

This function is obsolete and should not be used. Please use the global constant $stLibVersion_Tc2_SUPS$ [22] to read the PLC library version information.

FUNCTION F_GetVersionTcSUPS: UINT

VAR_INPUT

  nVersionElement : INT;

END_VAR

**nVersionElement**: Version element to be read. Possible parameters:

- 1: major number;
- 2: minor number;
- 3: revision number;

Requirements

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<td></td>
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<td></td>
</tr>
</tbody>
</table>
6 Data types

6.1 E_S_UPS_Mode

<table>
<thead>
<tr>
<th>Mode</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>eSUPS_WrPersistData_Shutdown</td>
<td>Writing of persistent data and then a QuickShutdown</td>
</tr>
<tr>
<td>eSUPS_WrPersistData_NoShutdown</td>
<td>Only writing of the persistent data (no QuickShutdown)</td>
</tr>
<tr>
<td>eSUPS_ImmediateShutdown</td>
<td>Only QuickShutdown (no writing of persistent data)</td>
</tr>
<tr>
<td>eSUPS_CheckPowerStatus</td>
<td>Only check status (neither writing of persistent data nor a QuickShutdown)</td>
</tr>
</tbody>
</table>

6.2 E_S_UPS_State

<table>
<thead>
<tr>
<th>State</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>eSUPS_PowerOK</td>
<td>in all modes: Power supply is OK</td>
</tr>
<tr>
<td>eSUPS_PowerFailure</td>
<td>in all modes: Power supply is faulty (only shown for one PLC cycle)</td>
</tr>
<tr>
<td>eSUPS_WritePersistentData</td>
<td>in mode eSUPS_WrPersistData_Shutdown: Writing of persistent data is active</td>
</tr>
<tr>
<td></td>
<td>in mode eSUPS_WrPersistData_NoShutdown: Writing of persistent data is active</td>
</tr>
<tr>
<td>eSUPS_QuickShutdown</td>
<td>in mode eSUPS_WrPersistData_Shutdown: QuickShutdown is active</td>
</tr>
<tr>
<td></td>
<td>in Mode eSUPS_ImmediateShutdown: QuickShutdown is active</td>
</tr>
<tr>
<td>eSUPS_WaitForRecover</td>
<td>in mode eSUPS_WrPersistData_NoShutdown: Wait for the reestablishment of the power supply</td>
</tr>
<tr>
<td></td>
<td>in mode eSUPS_CheckPowerStatus: Wait for the reestablishment of the power supply</td>
</tr>
<tr>
<td>eSUPS_WaitForPowerOFF</td>
<td>in mode eSUPS_WrPersistData_Shutdown: Wait for switching off of the PC by the UPS</td>
</tr>
<tr>
<td></td>
<td>in mode eSUPS_ImmediateShutdown: Wait for switching off of the PC by the UPS</td>
</tr>
</tbody>
</table>
7  Global constants

7.1  Library version

All libraries have a certain version. The version is indicated in the PLC library repository, for example. A
global constant contains the information about the library version:

```
VAR_GLOBAL CONSTANT
    stLibVersion_Tc2_SUPS : ST_LibVersion;
END_VAR
```

`stLibVersion_Tc2_SUPS`: Version information of the Tc2_SUPS library (type: ST_LibVersion)

To check whether the version you have is the version you need, use the function `F_CmpLibVersion` (defined
in the Tc2_System library).

- All other options for comparing library versions, which you may know from TwinCAT 2, are out-
dated!