BECKHOFF New Automation Technology

Manual | EN

TE1000

TwinCAT 3 | PLC Lib: Tc2_SUPS
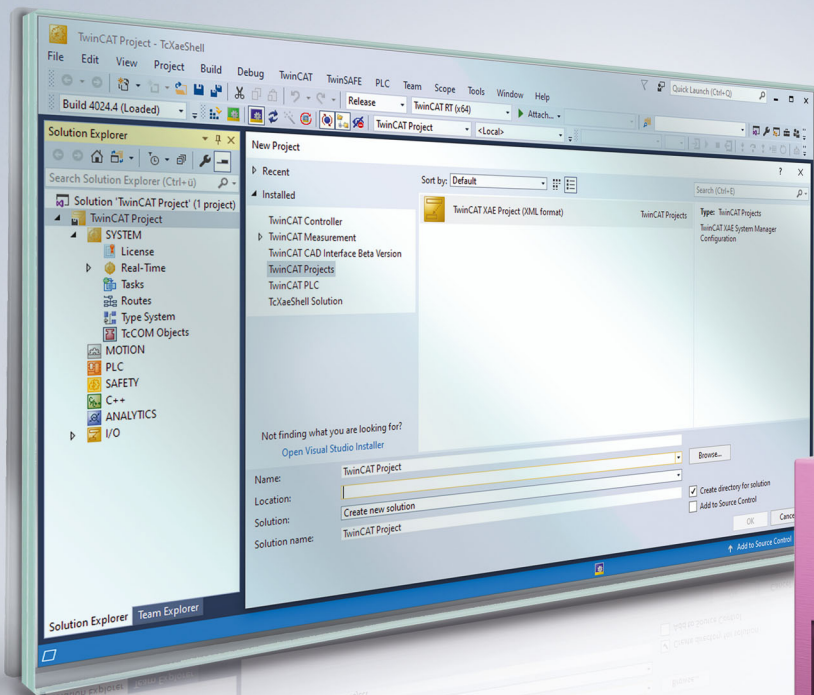
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BECKHOFF

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:
EP1590927, EP1789857, EP1456722, EP2137893, DE102015105702
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!

⚠ DANGER
Serious risk of injury!
Failure to follow the safety instructions associated with this symbol directly endangers the life and health of persons.

⚠ WARNING
Risk of injury!
Failure to follow the safety instructions associated with this symbol endangers the life and health of persons.

⚠ CAUTION
Personal injuries!
Failure to follow the safety instructions associated with this symbol can lead to injuries to persons.

NOTE
Damage to the environment or devices
Failure to follow the instructions associated with this symbol can lead to damage to the environment or equipment.

●
ⓘ   **Tip or pointer**

This symbol indicates information that contributes to better understanding.

1.3   Notes on information security

The products of Beckhoff Automation GmbH & Co. KG (Beckhoff), insofar as they can be accessed online, are equipped with security functions that support the secure operation of plants, systems, machines and networks. Despite the security functions, the creation, implementation and constant updating of a holistic security concept for the operation are necessary to protect the respective plant, system, machine and networks against cyber threats. The products sold by Beckhoff are only part of the overall security concept. The customer is responsible for preventing unauthorized access by third parties to its equipment, systems, machines and networks. The latter should be connected to the corporate network or the Internet only if appropriate protective measures have been set up.

In addition, the recommendations from Beckhoff regarding appropriate protective measures should be observed. Further information regarding information security and industrial security can be found in our https://www.beckhoff.com/secguide.

Beckhoff products and solutions undergo continuous further development. This also applies to security functions. In light of this continuous further development, Beckhoff expressly recommends that the products are kept up to date at all times and that updates are installed for the products once they have been made available. Using outdated or unsupported product versions can increase the risk of cyber threats.

To stay informed about information security for Beckhoff products, subscribe to the RSS feed at https://www.beckhoff.com/secinfo.

2 Introduction

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

Function blocks

Name	Description
FB_S_UPS [▶ 12]	Function block for controlling the 1-second UPS of CX50x0 Embedded PCs
FB_S_UPS_CB3011 [▶ 10]	Function block for controlling the 1-second UPS of PCs with CB3011 board
FB_S_UPS_CX51x0 [▶ 14]	Function block for controlling the 1-second UPS of CX51x0 Embedded PCs
FB_S_UPS_CX9020_U900 [▶ 16]	Function block for controlling the 1-second UPS of CX9020-U900 Embedded PCs
FB_S_UPS_BAPI [▶ 18]	Function block for controlling the 1-second UPS of devices with BIOS-API from version v1.15
FB_NT_QuickShutdown [▶ 20]	Internal function block for quick shutdown, which is used by the FB_S_UPS.

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.

i   In configurations with two or more PLC projects, only one PLC runtime system may trigger the quick shutdown.
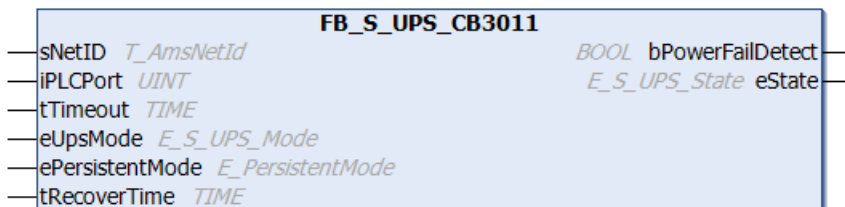
Example for CX51x0 Embedded PCs

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/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 [▶ 22] (standard setting) after the storage of the persistent data.

In the eSUPS_WrPersistData_NoShutdown mode [▶ 22] only the persistent data are saved, no QuickShutdown is performed.

In eSUPS_ImmediateShutdown mode [▶ 22] a quick shutdown is executed immediately, without saving data.

In the eSUPS_CheckPowerStatus mode [▶ 22] 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).

Inputs

```
VAR_INPUT
    sNetID          : T_AmsNetId:= ''; (* '' = local netid *)
    iPLCPort        : UINT; (* 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
```

Name	Type	Description
sNetID	T_AmsNetId	AmsNetId of the controller
iPLCPort	UINT	Port number of the PLC runtime system (851 for the first PLC runtime system, 852 for the second PLC runtime system, etc.). If you do not specify a port number, the function block then automatically determines the port of the PLC runtime system.
tTimeout	TIME	Timeout for writing the persistent data or the quick shutdown.
eUpsMode	E_S_UPS_Mode [▶ 22]	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.
ePersistentMode	E_PersistentMode	Mode for writing the persistent data. Default value is SPDM_2PASS.
tRecoverTime	TIME	Time after which the UPS returns to the PowerOK state in UPS modes without quick shutdown. The tRecoverTime must be greater than the maximum charging time for the UPS, otherwise the UPS may discharge too much in the event of short, consecutive power failures, which could result in its charge being insufficient for storing the persistent data.

![icon] **Outputs**

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

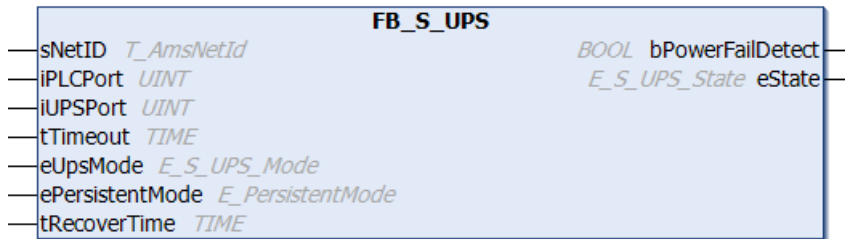| Name	Type	Description
bPowerFailDetect	BOOL	TRUE during power failure. FALSE if the supply voltage is present.
eState	E_S_UPS_State [▶ 22]	Internal state of the function block

Requirements

Development environment	Target platform	Hardware	PLC libraries to include
TwinCAT v3.1 B4016	ARM Panel PC with CB3011	1-second UPS	Tc2_SUPS

4.2   CX50x0

4.2.1   FB_S_UPS

```
                          FB_S_UPS
—sNetID    T_AmsNetId              BOOL  bPowerFailDetect—
—iPLCPort  UINT              E_S_UPS_State  eState—
—iUPSPort  UINT
—tTimeout  TIME
—eUpsMode  E_S_UPS_Mode
—ePersistentMode  E_PersistentMode
—tRecoverTime  TIME
```

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.

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 [▶ 22] (standard setting) after the storage of the persistent data.

In the eSUPS_WrPersistData_NoShutdown mode [▶ 22] only the persistent data are saved, no QuickShutdown is performed.

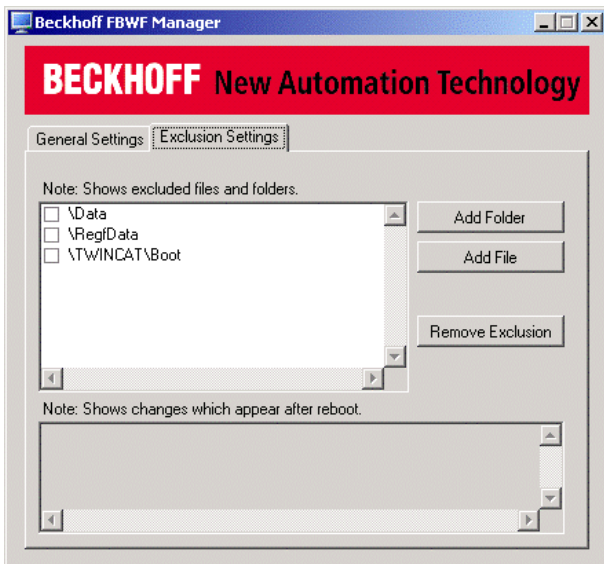In eSUPS_ImmediateShutdown mode [▶ 22] a quick shutdown is executed immediately, without saving data.

In the eSUPS_CheckPowerStatus mode [▶ 22] 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:

Inputs

```
VAR_INPUT
    sNetID          : T_AmsNetId:= ''; (* '' = local netid *)
    iPLCPort        : UINT; (* PLC Runtime System for writing persistent data *)
    iUPSPort        : UINT := 16#4A8; (* Port for reading Power State of UPS, dafault 16#4A8 *)
    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
```

Name	Type	Description
sNetID	T_AmsNetId	AmsNetId of the controller
iPLCPort	UINT	Port number of the PLC runtime system (851 for the first PLC runtime system, 852 for the second PLC runtime system, etc.). If you do not specify a port number, the function block then automatically determines the port of the PLC runtime system.
iUPSPort	UINT	Port number through which the UPS status is read. The default value is 16#4A8.
tTimeout	TIME	Timeout for writing the persistent data or the quick shutdown.
eUpsMode	E_S_UPS_Mode [▶ 22]	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.
ePersistentMode	E_PersistentMode	Mode for writing the persistent data. Default value is SPDM_2PASS.
tRecoverTime	TIME	Time after which the UPS returns to the PowerOK state in UPS modes without quick shutdown. The tRecoverTime must be greater than the maximum charging time for the UPS, otherwise the UPS may discharge too much in the event of short, consecutive power failures, which could result in its charge being insufficient for storing the persistent data.

Outputs

```
VAR_OUTPUT
    bPowerFailDetect  : BOOL; (* TRUE while powerfailure is detected *)
    eState            : E_S_UPS_State := eSUPS_PowerOK; (* current ups state *)
END_VAR
```
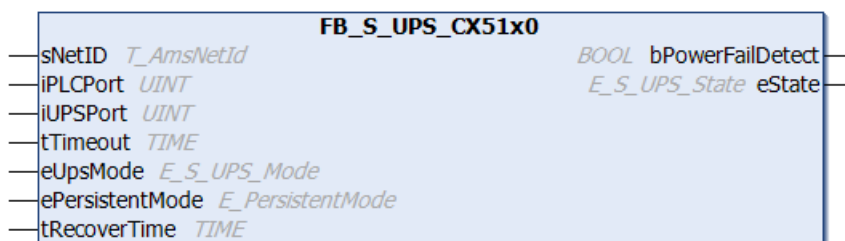
Name	Type	Description
bPowerFailDetect	BOOL	TRUE during power failure. FALSE if the supply voltage is present.
eState	E S UPS State [▶ 22]	Internal state of the function block

Requirements

Development environment	Target platform	Hardware	PLC libraries to include
TwinCAT v3.1 B4016	CX50x0	1-second UPS	Tc2_SUPS

4.3 CX51x0

4.3.1 FB_S_UPS_CX51x0

```
                      FB_S_UPS_CX51x0
 ─── sNetID    T_AmsNetId          BOOL  bPowerFailDetect ───
 ─── iPLCPort  UINT           E_S_UPS_State  eState ───
 ─── iUPSPort  UINT
 ─── tTimeout  TIME
 ─── eUpsMode  E_S_UPS_Mode
 ─── ePersistentMode  E_PersistentMode
 ─── tRecoverTime  TIME
```

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 [▶ 22] (standard setting) after the storage of the persistent data.

In the eSUPS_WrPersistData_NoShutdown mode [▶ 22] only the persistent data are saved, no QuickShutdown is performed.

In eSUPS_ImmediateShutdown mode [▶ 22] a quick shutdown is executed immediately, without saving data.
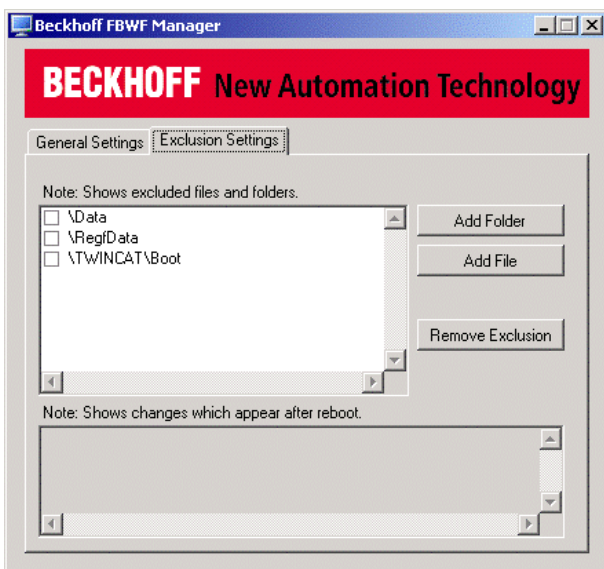
In the eSUPS_CheckPowerStatus mode [▶ 22] only a check is performed as to whether a power failure has occurred. If this is the case, the function block only switches back to the PowerOK state after the expiry of tRecoverTime (10s).

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:

➡ Inputs

```
VAR_INPUT
    sNetID          : T_AmsNetId:= ''; (* '' = local netid *)
    iPLCPort        : UINT; (* 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) *)
    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
```

Name	Type	Description
sNetID	T_AmsNetId	AmsNetID of the controller
iPLCPort	UINT	Port number of the PLC runtime system (851 for the first PLC runtime system, 852 for the second PLC runtime system, etc.). If you do not specify a port number, the function block then automatically determines the port of the PLC runtime system.
iUPSPort	UINT	Port number through which the UPS status is read. The default value is 16#588
tTimeout	TIME	Timeout for writing the persistent data or the quick shutdown
eUpsMode	E_S_UPS_Mode [▶ 22]	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.
ePersistentMode	E_PersistentMode	Mode for writing the persistent data. Default value is SPDM_2PASS.
tRecoverTime	TIME	Time after which the UPS returns to the PowerOK state in UPS modes without quick shutdown. The tRecoverTime must be greater than the maximum charging time for the UPS, otherwise the UPS may discharge too much in the event of short, consecutive power failures, which could result in its charge being insufficient for storing the persistent data.

⏩ Outputs

```
VAR_OUTPUT
    bPowerFailDetect   : BOOL; (* TRUE while powerfailure is detected *)
    eState             : E_S_UPS_State := eSUPS_PowerOK; (* current ups state *)
END_VAR
```
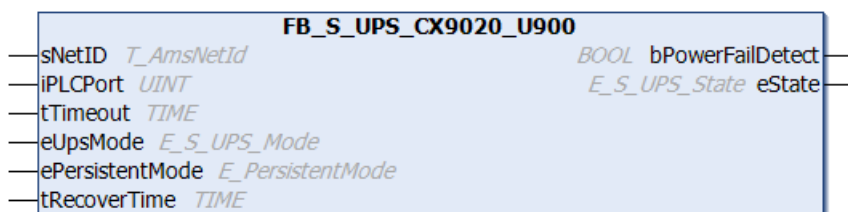
Name	Type	Description
bPowerFailDetect	BOOL	TRUE during power failure. FALSE if the supply voltage is present.
eState	E_S_UPS_State [▶ 22]	Internal state of the function block

Requirements

Development environment	Target platform	Hardware	PLC libraries to include
TwinCAT v3.1 B4016	CX51x0	1-second UPS	Tc2_SUPS

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 [▶ 22] (standard setting) after the storage of the persistent data.

In the eSUPS_WrPersistData_NoShutdown mode [▶ 22] only the persistent data are saved, no QuickShutdown is performed.

In eSUPS_ImmediateShutdown mode [▶ 22] a quick shutdown is executed immediately, without saving data.

In the eSUPS_CheckPowerStatus mode [▶ 22] 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).

Inputs

```
VAR_INPUT
    sNetID          : T_AmsNetId:= ''; (* '' = local netid *)
    iPLCPort        : UINT; (* 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
```

BECKHOFF

Name	Type	Description
sNetID	T_AmsNetId	AmsNetID of the controller
iPLCPort	UINT	Port number of the PLC runtime system (851 for the first PLC runtime system, 852 for the second PLC runtime system, etc.). If you do not specify a port number, the function block then automatically determines the port of the PLC runtime system.
tTimeout	TIME	Timeout for writing the persistent data or the quick shutdown
eUpsMode	E_S_UPS_Mode [▶ 22]	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.
ePersistentMode	E_PersistentMode	Mode for writing the persistent data. Default value is SPDM_2PASS.
tRecoverTime	TIME	Time after which the UPS reverts to the PowerOK status in the event of UPS modes without shutdown. tRecoverTime must be somewhat longer than the maximum holding time of the UPS in order to ensure that the capacitors are fully charged.

Outputs

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

Name	Type	Description
bPowerFailDetect	BOOL	TRUE during power failure. FALSE if the supply voltage is present.
eState	E_S_UPS_State [▶ 22]	Internal state of the function block

Requirements

Development environment	Target platform	Hardware	PLC libraries to include
TwinCAT v3.1 B4016	CX9020-U900	1-second UPS	Tc2_SUPS

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 [▶ 22] (standard setting) after the storage of the persistent data.

In the eSUPS_WrPersistData_NoShutdown mode [▶ 22] only the persistent data are saved, no QuickShutdown is performed.

In eSUPS_ImmediateShutdown mode [▶ 22] a quick shutdown is executed immediately, without saving data.

In the eSUPS_CheckPowerStatus mode [▶ 22] 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).

Inputs

```
VAR_INPUT
    sNetID          : T_AmsNetId:= ''; (* '' = local netid *)
    iPLCPort        : UINT; (* 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
```

Name	Type	Description
sNetID	T_AmsNetId	AmsNetID of the controller
iPLCPort	UINT	Port number of the PLC runtime system (851 for the first PLC runtime system, 852 for the second PLC runtime system, etc.). If you do not specify a port number, the function block then automatically determines the port of the PLC runtime system.
tTimeout	TIME	Timeout for writing the persistent data or the quick shutdown
eUpsMode	E_S_UPS_Mode [▶ 22]	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.
ePersistentMode	E_PersistentMode	Mode for writing the persistent data. Default value is SPDM_2PASS.
tRecoverTime	TIME	Time after which the UPS reverts to the PowerOK status in the event of UPS modes without shutdown. tRecoverTime must be somewhat longer than the maximum holding time of the UPS in order to ensure that the capacitors are fully charged.

Outputs

```
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
```

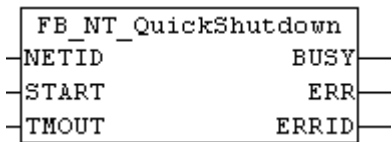| Name	Type	Description
bPowerFailDetect	BOOL	TRUE during power failure. FALSE if the supply voltage is present.
eState	E_S_UPS_State [▶ 22]	Internal state of the function block
nCapacity	BYTE	Current charge state of the capacitors in percent (0..100%)
bBusy	BOOL	TRUE, as long as the function block is active.
bError	BOOL	FALSE if an error has occurred.
nErrID	UDINT	Error number

Requirements

Development environment	Target platform	PLC libraries to include
TwinCAT v3.1 B4020.32	Platforms that support the BIOS API from v1.15	Tc2_SUPS

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!

```
┌─────────────────────────┐
│   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.

Inputs

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

Name	Type	Description
NETID	T_AmsNetId	AmsNetID of the controller
START	BOOL	Rising edge leads to immediate reboot of the controller.
TMOUT	TIME	Timeout time

Outputs

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

Name	Type	Description
BUSY	BOOL	Quick shutdown is executed.
ERR	BOOL	Becomes TRUE, as soon as an error occurs.
ERRID	UDINT	Supplies the error number when the ERR output is set.

Requirements

Development environment	Target platform	PLC libraries to include
TwinCAT v3.0.0	PC or CX (x86), 1-Second UPS	Tc2_SUPS (Version: 3.3.3.0)

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5 Data types

5.1 E_S_UPS_Mode

Data type	Description
eSUPS_WrPersistData_Shutdown	Write persistent data and then quick shutdown.
eSUPS_WrPersistData_NoShutdown	Only write the persistent data (no quick shutdown).
eSUPS_ImmediateShutdown	Quick shutdown only (no writing of persistent data)
eSUPS_CheckPowerStatus	Only determine status (does not write persistent data nor perform quick shutdown).

5.2 E_S_UPS_State

Data type	Description
eSUPS_PowerOK	In all modes: supply voltage is OK.
eSUPS_PowerFailure	In all modes: supply voltage faulty (applied for one cycle only)
eSUPS_WritePersistentData	In eSUPS_WrPersistData_Shutdown mode: writing is active for persistent data. In eSUPS_WrPersistData_NoShutdown mode: writing is active for persistent data.
eSUPS_QuickShutdown	In eSUPS_WrPersistData_Shutdown mode: quick shutdown is active. In eSUPS_ImmediateShutdown: quick shutdown is active.
eSUPS_WaitForRecover	In eSUPS_WrPersistData_NoShutdown mode: wait for voltage recovery. In eSUPS_CheckPowerStatus mode: wait for voltage recovery.
eSUPS_WaitForPowerOFF	In eSUPS_WrPersistData_Shutdown mode: wait for the UPS to perform shut down. In eSUPS_ImmediateShutdown mode: wait for the UPS to perform shutdown.

6   Global constants

6.1   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:

Global_Version

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

Name	Type	Description
stLibVersion_Tc2 _SUPS	ST_LibVersion	Version information of the Tc2_SUPS library (type: ST_LibVersion)

> **i** 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 outdated.

More Information:
www.beckhoff.com/te1000