

ADI driver (Windows)

User's manual

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Order no.: **ADI driver (Windows)**

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1 Introduction

Information:

B&R makes every effort to keep user's documents as current as possible. The most current versions can be downloaded from the B&R website (www.br-automation.com).

1.1 Manual history

Version	Date	Change
1.40	December 2019	<ul style="list-style-type: none"> Editorial revisions
1.30	December 2018	Updated for B&R ADI driver version 2.0. <ul style="list-style-type: none"> Added chapters "Display Brightness", "HMI Report" and "UPS Manager". Removed sections "UPS" and "Report" in chapter "Control Center". Added section "Tools" in chapter "Control Center". Renamed section "Factory settings" in chapter "Control Center" (German). Revised text in chapter "Control Center". Moved chapters "B&R Hypervisor" and "Software development" to chapter "Application notes". Renamed section "B&R Hypervisor" to "B&R Hypervisor operation". Applied data to SMC.
1.20	January 2018	Updated APC2200 and PPC2200.
1.10	September 2017	Updated company name and logo. Added chapter "B&R Hypervisor".
1.00	June 2017	First edition

1.2 Information about this document

This document is not intended for end customers! The safety guidelines required for end customers must be incorporated into the operating instructions for end customers in the respective national language by the machine manufacturer or system provider.

1.2.1 Organization of notices

Safety notices

Contain **only** information that warns of dangerous functions or situations.

Signal word	Description
Danger!	Failure to observe these safety guidelines and notices will result in death, severe injury or substantial damage to property.
Warning!	Failure to observe these safety guidelines and notices can result in death, severe injury or substantial damage to property.
Caution!	Failure to observe these safety guidelines and notices can result in minor injury or damage to property.
Notice!	Failure to observe these safety guidelines and notices can result in damage to property.

Table 1: Organization of safety notices

General notices

Contain **useful** information for users and instructions for avoiding malfunctions.

Signal word	Description
Information:	Useful information, application tips and instructions for avoiding malfunctions.

Table 2: Organization of general notices

2 System overview

2.1 Range of functions

This document contains technical information about the universal *B&R Automatic Device Interface (ADI) driver* (B&R ADI driver).

The descriptions and figures refer to B&R ADI driver V2.2.0 and later.

Information:

The latest versions of BIOS and the firmware must be installed for the full range of functions.

The B&R ADI driver makes it possible to access specific functions of B&R devices.

The settings for B&R industrial PCs and Automation Panels can be shown and changed with the Control Center in the Control Panel. Some settings may be disabled depending on the B&R device being used.

ADI driver functions:

- Changing the display brightness
- Reading device-specific keys
- Switching device-specific LEDs
- Reading operating hours
- Reading operating elements

2.2 Differences with the device-specific driver

There are several differences between the universal B&R ADI driver and the device-specific ADI driver (e.g. APC910/PPC900):

- Display brightness and equalizer settings apply up to V1.4 per user and no longer systemwide. In version 2.0 and later, the settings once again apply systemwide.
- During a firmware download/upload, another firmware download/upload cannot take place.
- A current version of the ADI DLL is necessary to support new devices and functions in customer applications. This is installed on the device by the ADI driver installer.

2.3 Compatibility

Supported hardware

The B&R ADI driver supports the following devices:

- Automation PC 910 (APC910)
- Automation PC 2100 (APC2100)
- Automation PC 2200 (APC2200)
- Automation PC 3100 (APC3100)
- Automation PC mobile 3100 (MPC3100)
- Panel PC 900 (PPC900)
- Panel PC 2100 (PPC2100)
- Panel PC 2200 (PPC2200)
- Panel PC 3100 (PPC3100)

The following panels are also supported:

- Automation Panel 800 (AP800)
- Automation Panel 830 (AP830)
- Automation Panel 900 (AP900)
- Automation Panel 9x3 (AP9x3)
- Automation Panel 9xD (AP9xD)
- Automation Panel 1000 (AP1000)
- Automation Panel 5000 (AP5000)

Supported operating systems

The B&R ADI driver supports the following operating systems:

- Windows 10 IoT Enterprise 2016 LTSC (64-bit)
- Windows 10 IoT Enterprise 2019 LTSC (64-bit)

3 Installation

The following points must be taken into account before installation:

- Administrator rights are required for the installation.
- An existing B&R ADI driver is detected and updated.
- All applications and services that use the B&R ADI driver must be closed before installation; otherwise, the installation cannot be carried out properly.

Components installed on the PC:

- MTCX driver
- ADI DLL
- ADI system service
- Control Center
- Display Brightness
- HMI Report
- UPS service
- UPS Manager

Perform the installation:

1. Start the installer.

The installer can be opened with parameter `/s` for a *silent* or *unattended* installation.

2. Follow the instructions.

The ADI driver is installed in category **System devices** under the name **Maintenance Controller Extended (MTCX)** in the Device Manager.

For a detailed description of parameters, see the NSIS website:

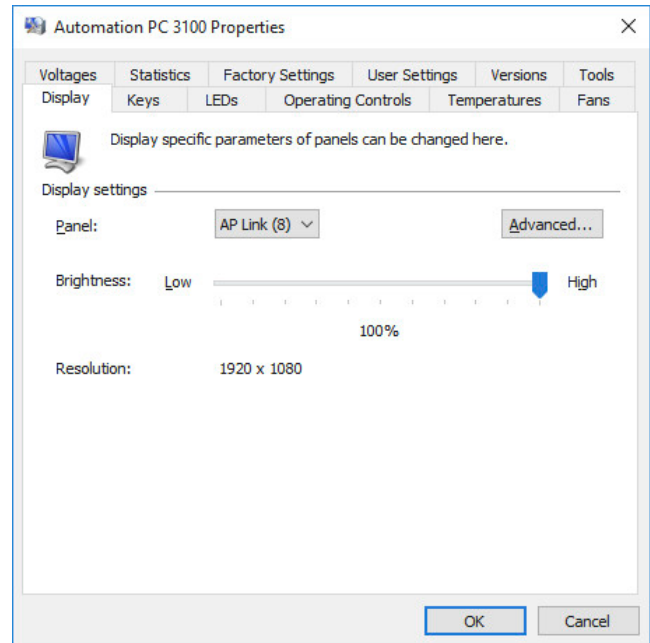
<http://nsis.sourceforge.net> (command line usage)

4 Control Center

The Control Center is used to change and display settings for a B&R industrial PC and Automation Panels. It can be opened from the Control Panel or Start menu.

The following chapters describe the setting options in the Control Center tabs. Tabs:

- Display
- Keys
- LEDs
- Operating elements
- Temperatures
- Fans
- Voltages
- Statistics
- Factory settings
- User settings
- Versions
- Tools



4.1 Tabs

4.1.1 Display

This makes it possible to change the display brightness and equalizer value of B&R Automation Panels and to read the native resolution of the display.

- *Panel:*
Selects the built-in display (local) or panels connected via SDL. It is important to note that only connected output devices are displayed.
- *Brightness:*
The brightness value of the display can be set with the slider. The limit values are based on the limit values specified by the display. This also means that changing by a certain percentage will have different effects on different display types.

Information:

A changed brightness value is only saved in the system (and applied when the system is restarted) if the Control Center is closed with OK.

The set brightness is independent of the value in BIOS Setup. The brightness value in BIOS is therefore used during the Windows boot procedure. This value is only used the first time the Control Center is launched.

- *Advanced display settings:*
Changes can be made to the SDL equalizer settings of a connected panel. The equalizer is built into the panel and adjusts the DVI signal for different cable lengths. The equalizer value is automatically calculated based on the cable length.
The equalizer value can be set manually to achieve the best visual representation on the display (e.g. with poor cable or DVI signal quality). To do this, disable option **Use automatic settings**. The equalizer value can now be adjusted using the slider.
The equalizer setting can only be changed on panels that are connected via SDL (not with SDL3 and SDL4). Otherwise, the dialog fields will be disabled.

4.1.2 Keys

This makes it possible to test and configure device-specific keys on B&R Automation Panels. Some dialog fields are only enabled if the selected panel supports keys.

- *Key configuration:*
Contains the key code for the device-specific keys, the mode for toggling between key layers and the definition of the key switches. The *key configuration* can be created as a KCF file with the B&R Key Editor or B&R KCF Editor and stored permanently on the PC. For additional information about both programs, see the B&R website.
 - **Update:** An appropriate key configuration file must be selected.
The transfer can be canceled in the transfer dialog box. This is no longer possible during the write procedure to the flash memory, however.
 - **Delete:** Erases data in flash memory. Depending on the memory module used, this may take several seconds. During this time, the progress indicator is not updated.
 - **Save:** Saves the installed key configuration on a data storage medium. To do this, specify the destination folder and filename in the dialog box. The transfer can be ended by clicking on **Cancel** in the transfer dialog box.
 - **Delete:** Deletes the key configuration installed on the PC.
- *Key layer:*
The currently set layer number (0 to 3) is displayed in the field on the right. To make a change, enter the desired layer number in the field on the left and confirm with **Apply**.
When the system is restarted, the value is reset to 0. The key layer can only be changed if there is a valid key configuration.
- *Panel settings and keys:*
 - *Panel:* Selects a built-in display (local) or panel connected via SDL. Displays the information *Locked* or *Enabled* (if the panel is locked, input via keys or touch operation is not possible).
 - *Key switch:* Indicates the state of the optional key switches. The display starts with switch 8 (left, bit 7). The field is disabled if no valid key configuration is available.
 - **Advanced panel settings:**
Panel lock time: Specifies how long all other panels are locked when input takes place on a panel via keys or touch screen. The valid range is either 0 (no lock) or 500 to 65535 ms. The panel lock time is set back to the value configured in the key configuration when the system is restarted or the key configuration is updated. The lock time only affects keys for which a key code is defined in the key configuration, single-touch on Panel PCs and single-touch on panels connected via SDL.
Disable key codes: If this option is enabled, no key codes from the keys on the selected panel will be transmitted to the system. It is still possible to read the state of the keys, however.
Manual panel locking: If this option is enabled, the selected panel is locked. Key or single-touch input is no longer possible. Key codes and the panel are freed back up after the system is restarted.
 - **Keys dialog box:**
The button states are displayed here. This field is disabled if the panel does not support keys. Pressed keys are indicated by "1"; released keys are indicated by "0".
First pressed key: Shows the number of the first pressed key in the matrix. The key codes do not have to be configured for key matrix display. Evaluating keys that have already been configured is disabled while the keys dialog box is displayed so that the keys can be pressed without Windows having to respond.

4.1.3 LEDs

Used to test device-specific LEDs on B&R Automation Panels.

These dialog fields are only enabled if the selected panel supports LEDs. If a valid key configuration exists, the LED state can only be set for LEDs that are not configured as LED status indicators (HDD, panel locking, etc.). The LEDs can only be set for testing purposes and are switched off again after restarting the system.

LED settings:

- **Panel:**
Selects the built-in display (local) or a panel connected via SDL. Only panels that are currently connected are displayed.
- **Set all LEDs:**
Selects whether the state of a single LED or of all LEDs should be set or displayed.
- **Number:**
For entering an LED number between 0 and 127. When the number is changed, the current state is displayed under *LED state*.
- **Layer:**
Selects a layer number between 0 and 3. When the number is changed, the current state is displayed under *LED state*. The layer can only be changed if there is a valid key configuration.
- **LED state:**
Shows the current state (**Off**, **Slow blinking**, **Fast blinking**, **On**) of an LED; if option **Set all LEDs** is enabled, it shows the state of all LEDs. Clicking on another state sets the state of the selected LED or of all LEDs. In order for the new LED state to be displayed immediately when the entered layer is not the same as the active layer, enable option **Automatic layer change**.
- **Automatic test:**
Starts an automatic LED test. The test begins with the specified LED number and layer and ends when it reaches LED number 127. Each LED is switched on for 2 seconds. If **Quick** is enabled, each LED is switched on for 200 milliseconds.

4.1.4 Operating elements

Displays operating elements, such as a handwheel, enable switch, selector switch or rotary encoder. The displayed values are updated automatically.

In order to display optional rotary encoders of Automation Panels, they must be enabled via the Windows registry. For more information, see "[Customization options](#)" on page 12.

4.1.5 Temperatures

Displays temperature values of B&R industrial PCs and B&R Automation Panels. The displayed values are updated automatically. Temperature values of panels are only displayed for the built-in display (local) and panels connected via SDL. If a temperature value cannot be read, it will be indicated by "****".

For the correlation between temperature values and sensor positions, see the respective user's manual for the B&R product.

4.1.6 Fans

Displays and tests fan speeds of a B&R industrial PC. The displayed values are updated automatically.

- **System fan test or bus fan test:**
Tests the respective fan. To do this, select a value (Auto, Min., 25%, 50%, 75% or Max.).
With **Auto**, the fans are operated in automatic mode. All other settings specify the minimum speed of the fans (as a percentage of the possible speed range). In automatic mode, the fans will increase in speed automatically if the temperature of the device increases.
The settings that can be selected here do not always have a linear relationship to the fan's speed, i.e. setting the speed to 50% does not mean that it is exactly between the minimum and maximum values.
The selected setting is only applied after the system is restarted. If the fans should be continuously operated at a certain minimum speed, setting *Fan control* in BIOS Setup must be changed.

4.1.7 Voltages

Displays the voltage values of a B&R industrial PC. The displayed values are updated automatically.

4.1.8 Statistics

Displays the statistical information of a B&R Industrial PC or B&R Automation Panel. This includes information such as operating hours and number of switch-on procedures. The displayed values are updated automatically. If a statistical value cannot be read, it will be indicated by "****".

Statistical values of panels are only displayed for the built-in display (local) and panels connected via SDL.

4.1.9 Factory settings

Displays factory settings from a B&R industrial PC or connected B&R Automation Panel. The factory settings include the material number, serial number and hardware revision of the device.

For a complete list of factory settings, see B&R HMI Report ("[HMI Report](#)" on page 14).

Factory settings of panels are only displayed for the built-in display (local) and panels connected via SDL.

4.1.10 User settings

Configures a user serial ID. This makes it possible to mark the B&R industrial PC with an individual identification number.

A value between 0 and hexadecimal FFFFFFFF can be entered under **User serial ID**.

4.1.11 Versions

Displays the version of the Control Center and BIOS as well as the firmware installed on the B&R industrial PC and connected B&R Automation Panels. The displayed values are updated automatically. If a version cannot be read, it will be indicated by "****". In addition, the firmware of PC and panel components can be updated and stored.

Information:

If "!" is displayed for the firmware in column **CRC error**, the firmware was not successfully updated. It is recommended to repeat the update process.

- **Info dialog box:**
Displays the version of the Control Center and installed ADI driver modules.
- **Update:**
Updates the firmware of a PC or panel component. To do this, select the corresponding firmware file in the file dialog box. The transfer can be stopped in the transfer dialog box with **Cancel**. This option is disabled while writing to flash memory.
Erasing the data in flash memory can take several seconds depending on the memory module used. During this time, the progress indicator is not updated.
The firmware update (download) is entered in the Windows event log (under **Application / ADI DLL**).
- **Save:**
Saves the installed firmware of a PC or panel component to a data storage medium. To do this, select the destination folder and filename in the file dialog box. The transfer can be stopped by clicking **Cancel** in the transfer dialog box.

Additional important information about updating the firmware:

- If the transfer on an Automation Panel 800 or Automation Panel 900 has been aborted due to an error, the procedure must be repeated until the firmware is updated successfully. Otherwise, the panel will not work after being switched on!
- After updating the firmware of a PC component (MTCX, SDL), the PC's power supply must be switched off and then switched back on again in order for the new firmware to take effect and the updated version to be displayed. When the Control Center is closed, a dialog box appears prompting to do so.
- After the firmware update on an Automation Panel 800 or Automation Panel 900, the panel's power supply must be switched off and then switched back on again in order for the new firmware to take effect and the updated version to be displayed. When the Control Center is closed, a dialog box appears prompting to do so.
- On an Automation Panel 9x3, Automation Panel 9xD, Automation Panel 1000, Automation Panel 5000 and SDL Converter, the panel or SDL Converter is restarted automatically after the firmware is updated.
- If a UPS is installed, the PC must be switched off via the operating system or power button or the UPS battery must be disconnected before switching off the power supply.

4.1.12 Tools

The following tools can be used to display/change settings or to create a report:

- *Display Brightness:*
Changes the display brightness for B&R Automation Panels (see "[Display Brightness](#)" on page 13).
- *HMI Report:*
Creates a report with device-specific information (see "[HMI Report](#)" on page 14).
- *UPS Manager:*
Displays the status values and operating data of the UPS and changes the settings (see "[UPS Manager](#)" on page 15).

4.2 Customization options

Some Control Center functions can be locked for the user by writing to entries in the Windows registry:

```
[HKEY_CURRENT_USER\Control Panel\ADI]
; Cannot update firmware
"DisableFirmwareUpdate"=dword:00000000
; Cannot update key configuration
"DisableKcfUpdate"=dword:00000000
; Cannot lock key codes
"DisableKeyLock"=dword:00000000
; Cannot change panel lock time
"DisableLockTime"=dword:00000000
; Cannot lock panels
"DisablePanelLock"=dword:00000000
; Cannot change user serial ID
"DisableUserSerialId"=dword:00000000
```

All tabs and some dialog boxes can also be hidden using entries in the Windows registry:

```
[HKEY_LOCAL_MACHINE\Software\BR_Automation\Adi\Driver]
"ShowAdvancedPanel"=dword:00000001
"ShowDisplay"=dword:00000001
"ShowFactorySettings"=dword:00000001
"ShowFans"=dword:00000001
"ShowKeys"=dword:00000001
"ShowLeds"=dword:00000001
"ShowOperatingControls"=dword:00000001
"ShowStatistics"=dword:00000001
"ShowTemperatures"=dword:00000001
"ShowTools"=dword:00000001
"ShowUserSettings"=dword:00000001
"ShowVersions"=dword:00000001
"ShowVoltages"=dword:00000001
```

The default value for all entries is 1, meaning display the tab or dialog box.

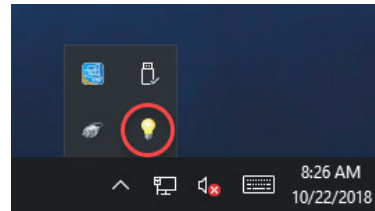
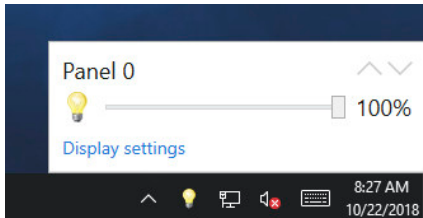
The display of the optional rotary encoder of Automation Panels in tab "Operating elements" can be enabled via the Windows registry.

```
[HKEY_LOCAL_MACHINE\Software\BR_Automation\Adi\Driver]
"ShowHandwheel"=dword:00000001
```

5 Display Brightness

This changes and displays the display brightness of connected B&R Automation Panels and also changes the display settings. Display Brightness can be opened by clicking on an icon in the notification area of the taskbar or from the Start menu.

The icon will be hidden after reinstallation, but it can be displayed using drag-and-drop or via the Windows settings.

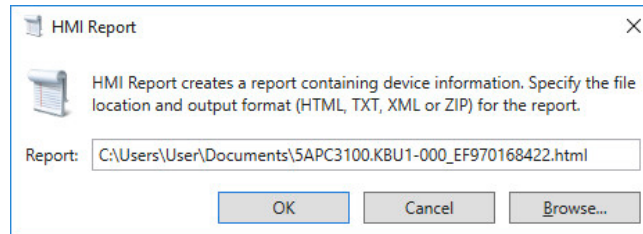


Display Brightness options:

- The icon can be disabled in the Windows *Task Manager* under tab *Autostart*.
- A panel can be selected with **^** and **v**. If no panel with a higher or lower panel number is connected, the corresponding button is disabled.
- The Control Center is opened via the **display settings**. If it is already open, it will be shown along with the last selected tab.

6 HMI Report

HMI Report can be used to create a report with device-specific information. This report can then be used for support purposes or system documentation. The program can be opened via the Start menu.



The following output formats are available:

- HTML Report (HTML) - Report in HTML format for display in the browser.
- Text Report (TXT) - Report in text format for display in the text editor.
- XML Report (XML) - Report in XML format for display in the browser.
- Diagnostic package (ZIP) - The diagnostic package contains a text report and log files for troubleshooting by B&R.

The following settings can also be made:

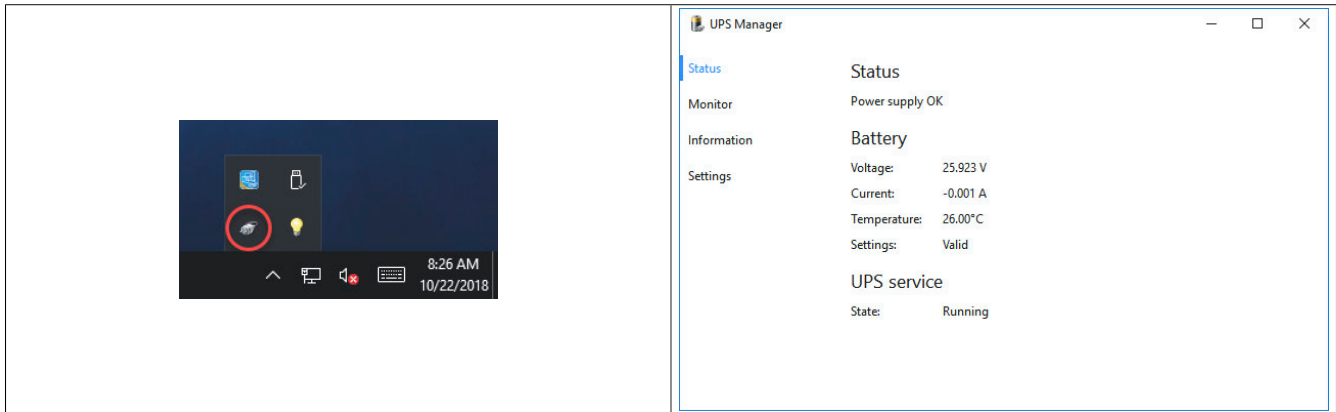
- **Report:**
Specifies the storage location, filename and output format for the report. Alternatively, the file dialog box can be used with **Browse**.
- **Command line:**
Enter the following command in the command line to create the report:
"C:\Program Files\BrAutomation\Adi\System\HmiReport\BR.Hmi.Report.Cli.exe <Filename>"
If the filename is missing, it is structured as follows:
"<Material number>_<Serial number>.txt"

Information:

Administrator rights are required to read SMART values from data storage media and add them to the report.

7 UPS Manager

This makes it possible to display status values and operating data (e.g. battery voltage, charging current or factory settings) and to change settings of a built-in UPS. The UPS Manager can be opened by clicking on a symbol in the taskbar or from the Start menu. The symbol is only displayed if a UPS exists.



The UPS Manager displays the UPS status (e.g. mains operation, battery operation) in the notification area symbol. The icon will be hidden after reinstallation, but it can be displayed using drag-and-drop or via the Windows settings.

The icon can be disabled in the Windows *Task Manager* under tab *Autostart*.

The following menu options are available in the UPS Manager and are described in more detail below:

- Status
- Monitor
- Information
- Settings

7.1 Status

Displays the status values of the UPS, battery and UPS service. The displayed values are updated automatically; critical values are displayed in red.

UPS status *Battery failure*, for example, indicates that the UPS battery is not properly connected, defective or has an impermissible voltage. *No backup possible* indicates that UPS battery operation is currently not possible.

The UPS status can also be read via a symbol in the notification area of the taskbar. An optional notification appears for each status change. This can be enabled or disabled via menu option **Settings**.

The UPS service is responsible for monitoring the UPS status and shutting down the system after a power failure. If a UPS exists, the UPS service is started automatically.

7.2 Monitor

Displays the changes to the UPS status and UPS service. The values can be updated with **Update** or the **[F5]** key. In addition, the displayed monitor values can be exported as a text file with **Save as**.

7.3 Information

Displays device information and statistical information of the UPS. The displayed values are updated automatically.

7.4 Settings

Displays and changes the settings of the UPS.

Option **Show notifications** displays a message each time the status changes. All changes made to the UPS status are also displayed independently of these options via a symbol in the notification area of the taskbar and entered in the Windows event log (under **Application, ADI UPS**).

The status changes can be displayed via menu option **Monitor**.

Advanced settings

Information:

Administrator rights are required to change the advanced settings!

The following advanced settings of the UPS can be made:

- **Display shutdown notification:**
Displays a notification when shutting down the system.
- **Limit maximum time in battery operation:**
Limits the maximum time in battery operation. The PC normally only shuts down automatically when the battery is low. The time that the PC should be operated on battery power before the system shuts down can be set here. The default value is 5 minutes but can be set between 0 and 180 minutes.

Information:

If the battery is nearly empty, then the system will shut down before the defined time.

- **Shut down UPS on shutdown after:**
The UPS is automatically switched off when the PC is shut down properly. This option can be used to limit the time the PC should be operated on battery power in the event of a fault before the UPS is shut down. The specified time must be greater than the time needed to shut down the operating system. The default value is 180 seconds; the valid range of values is between 10 and 1200 seconds.
Enabling this option is also necessary to restart the PC automatically if power is restored at shutdown. It is possible to change the value of the slider in single steps by clicking on the scale to the left and right of the slider.
- **UPS shutdown time:**
Shutdown time that the UPS waits in the event of low battery or errors (e.g. overtemperature) before switching off the power supply. The specified time must be greater than the time needed to shut down the operating system. The default value is 180 seconds; the valid range of values is between 10 and 1200 seconds.
This prevents the UPS battery from discharging too much if the UPS service is not active and the operating system thus does not shut down or does not shut down properly.
It is possible to change the value of the slider in single steps by clicking on the scale to the left and right of the slider.

Information:

It is important to note that a self-initiated shutdown by the UPS at a low battery level cannot be canceled, even if the power supply is restored.

A shutdown initiated by the UPS has higher priority than a corresponding command from the UPS service (see section "Shut down UPS on shutdown after" above).

8 Guidelines for use

This chapter describes application notes for the ADI driver.

8.1 B&R Hypervisor operation

ADI must be switched to hypervisor mode in order use B&R Hypervisor. This mode is enabled via the Windows registry:

```
[HKEY_LOCAL_MACHINE\Software\BR_Automation\Adi]
"Hypervisor"=dword:00000001
```

Information:

Hypervisor mode is automatically enabled by the hypervisor installation.

Hypervisor mode ensures that Windows and Automation Runtime Embedded do not access the MTCX interface at the same time. If the MTCX is blocked by Automation Runtime Embedded, ADI will wait a defined amount of time for the interface to be freed up. This waiting time can be adjusted via the registry. Value `MtcxBusyWaitTime` indicates the duration of how long ADI waits for the interface to be enabled by Automation Runtime Embedded (default value: 500 ms). Value `MtcxSyncWaitTime` specifies the length of time ADI waits for the interface to be enabled by another instance of ADI (default value: 500 ms). If the interface is blocked by another ADI instance and by the MTCX, then these two waiting times are added together (default value: 1 s).

```
[HKEY_LOCAL_MACHINE\Software\BR_Automation\Adi\Driver]
"MtcxBusyWaitTime"=dword:000001f4
"MtcxSyncWaitTime"=dword:000001f4
```

Updating firmware in hypervisor mode is not possible for performance and security reasons!

Information:

Hypervisor mode changes the timing for accessing the ADI interface and therefore the timing of the customer application!

8.2 Software development

In order to access ADI driver functions from the Windows application, the ADI Development Kit or ADI .NET SDK must be used. Both can be downloaded at no cost from the B&R website (www.br-automation.com).

Publishing information

B&R Industrial Automation GmbH

B&R Strasse 1

5142 Eggelsberg

Austria

Telephone: +43 7748 6586-0

Fax: +43 7748 6586-26

office@br-automation.com