



ADI driver (Windows)

User's manual

Date: January 3, 2018

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I Versions

Version	Date	Comment	Edited by
1.0	2017-06-22	First Edition	PAM
1.1	2017-09-21	Updated company name and logo. Added chapter "B&R Hypervisor".	PAM
1.2	2018-01-03	Document title changed to "ADI Driver User's Manual" Added APC2200 and PPC2200.	PAM

Table 1: Versions

II Safety Notices

Safety notices in this document are organized as follows:

Safety notice	Description
Danger!	Disregarding the safety regulations and guidelines can be life-threatening.
Warning!	Disregarding the safety regulations and guidelines can result in severe injury or heavy damage to material.
Caution!	Disregarding the safety regulations and guidelines can result in injury or damage to material.
Information:	Important information used to prevent errors.

Table 2: Safety notices

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1 Introduction

This document contains technical information about the universal B&R ADI driver. The description and figures refer to B&R ADI driver V1.3.

The Automation Device Interface (ADI) driver enables access to specific functions of B&R devices.

You can view and change the settings for B&R industrial PCs and Automation Panels with Control Center in the Control Panel.

Some functions of the ADI driver:

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

Information:

Some settings may be disabled depending on the B&R device being used.

1.1 Differences with the device-specific driver

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

- Display brightness and equalizer settings apply per user and no longer systemwide.
- While a firmware download/upload is active, another firmware download/upload cannot take place.
- A current version of ADI.DLL is necessary to support new device families and functions in customer applications. It is available in the ADI driver, ADI Development Kit and ADI .NET SDK.

2 Supported hardware

The B&R ADI driver supports the following device families:

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

Connected hardware:

- 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)

3 Supported operating systems

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

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

4 Installation

Procedure for installing this software:

- Close all applications.
- Launch the installer.
- Follow the instructions.

You must have administrator rights in order to perform the installation!

Execute the installer with parameter /S for a silent/unattended installation.
For a detailed description of parameters, see the NSIS website¹.

During the installation, an existing ADI driver is detected and removed automatically. If the ADI driver is still in use by an application or service, then it cannot be removed. In this case, close all applications and end all services accessing the ADI driver.

The following components are installed on the PC:

- MTCX driver
- ADI DLL
- DefaultSettingsRestore
- Control Center
- UPS service
- UPS monitor

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

5 Software development

In order to access ADI driver functions from your Windows application, you must use the ADI Development Kit or ADI .NET SDK.

Both of these can be downloaded at no cost from the B&R website (<http://www.br-automation.com>).

¹ <http://nsis.sourceforge.net/Docs/Chapter3.html#installerusage>

6 B&R Hypervisor

ADI must be switched to hypervisor mode in order use the B&R hypervisor. This mode is enabled from the registry, see Listing 1:

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

Listing 1: Registry entry for enabling hypervisor mode

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 in the registry, see Listing 2. Value `MtcxBusyWaitTime` specifies the amount of time ADI waits for the interface to be freed up by Automation Runtime Embedded (default: 500 ms). Value `MtcxSyncWaitTime` specifies the amount of time ADI waits for the interface to be freed up by another instance of ADI (default: 500 ms). If the interface is blocked by another ADI instance and by the MTCX, then these two waiting times are added together (default: 1 s).

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

Listing 2: Registry entries for configuring the hypervisor waiting time

Updating and backing up 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!

7 Control Center

You can use the Control Center (see Figure 1) to view and change the settings for a B&R industrial PC and Automation Panels. The Control Center can be opened from the Control Panel or Start menu.

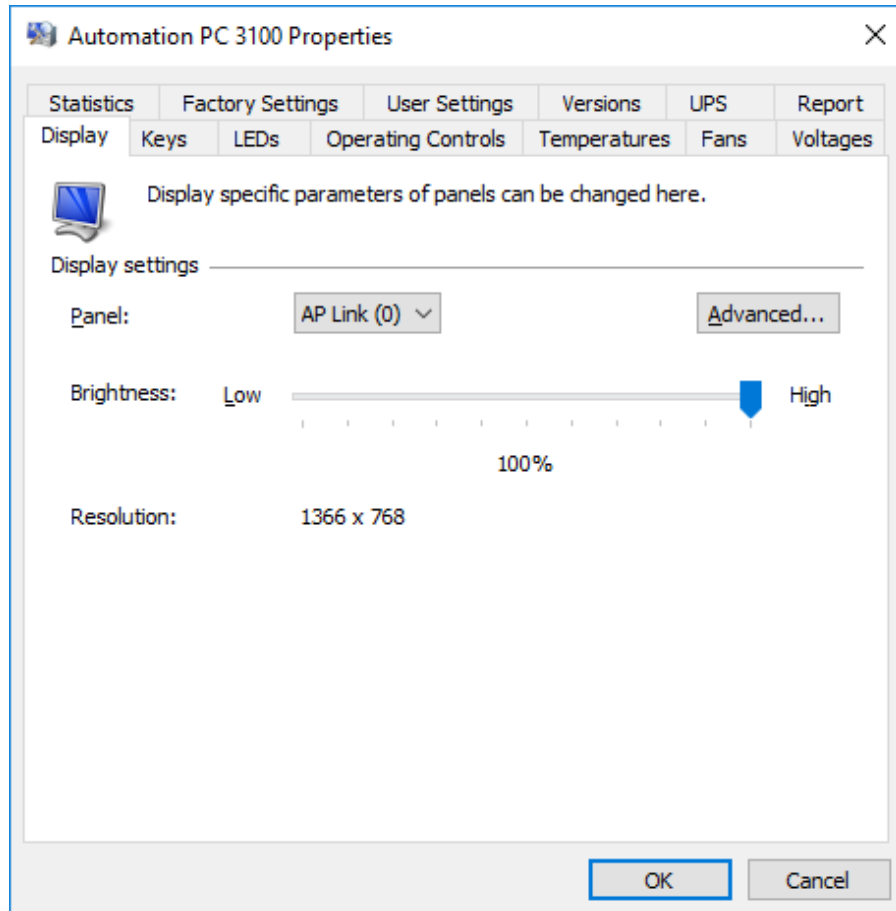


Figure 1: Control Center

7.1 Tabs

The following tabs can be selected:

- Display
- Keys
- LED status indicators
- Control elements
- Temperatures
- Fans
- Voltages
- Statistics
- Factory settings
- User settings
- Versions
- UPS
- Report

The individual tabs are described in the following sections.

7.1.1 Display

You can change the panel display brightness, view the resolution and make other display settings here.

Changing the display brightness

- Click on a panel in the list. Only the installed display (local) and panels connected via SDL are shown in the list.
- Set the slider to the brightness value that should be used to operate the display.

You can only set the brightness within the limit values specified for 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 used when the system is restarted) if the Control Center is closed with OK.

The configured brightness is user-specific and independent from the value set in BIOS Setup. The value set in BIOS will be used until Windows is booted. The value set in BIOS is only used the first time the Control Center is launched.

Changing other display settings

- Click on **Advanced**. This opens a dialog box.

You can then change the SDL equalizer settings for a connected panel in this dialog box. 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. It is possible to set a different equalizer value in order to obtain the best possible display quality (e.g. in the event of low-quality cables or poor DVI signal quality).

Information:

The equalizer setting is user-specific and can only be changed if the function is supported by the panel (panel firmware V1.04 or higher, not with SDL3 and SDL4). Otherwise, the dialog fields will be disabled.

Changing the display equalizer value

- Disable checkbox **Use automatic setting**.
- Set the slider to the equalizer value that should be used to operate the display.
- Close the dialog box with **OK**.

7.1.2 Keys

You can configure and test the device-specific keys on panels here.

The 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 Key Editor and stored permanently on the PC.

Information:

Some dialog fields are only enabled if the selected panel supports keys.

Updating the key configuration

- Under **Key configuration**, click on **Update**. This opens a file dialog box.
- Enter the name of the key configuration file under **Filename** or select a file.
- Click on **Open**. This opens the Transfer dialog box.

You can cancel the transfer by clicking on **Cancel** in the Transfer dialog box. **Cancel** is disabled when writing to flash memory.

Deleting the data in flash memory can take several seconds depending on the memory block being used. The progress indicator is not updated during this time.

Saving the installed key configuration

- Under **Key configuration**, click on **Save**. This opens a file dialog box.
- Enter the name of the key configuration file under **Filename** or select a file.
- Click on **Save**. This opens the Transfer dialog box.

You can cancel the transfer by clicking on **Cancel** in the Transfer dialog box.

Deleting the installed key configuration

- Under **Key configuration**, click on **Delete**.

Changing the active key layer

- Enter a layer number between 0 and 3 in field **Number** under **Key layer** and click on **Apply**. The current layer number will be displayed to the right of where the number is entered.

The key layer can only be changed if there is a valid key configuration.

Information:

The key layer will be set back to 0 when the system is restarted.

Changing advanced panel settings

- Click on a panel in the list. Only the installed display (local) and panels connected via SDL are shown in the list.
- Under **Panel**, click on **Advanced**.

Under **Lock time**, you can specify how long all other panels are locked when input is taking place on a panel using its keys or touch screen. The valid range is 0 (no lock) to 65535 ms. Enter a **locking time** of either 0 or a value greater than 500 ms.

Information:

The panel locking time is set back to the value configured in the key configuration when the system is restarted or the key configuration is updated.

Information:

The locking time only affects keys for which a key code is defined in the key configuration, touch screens on panel PCs and touch screens connected via SDL.

If you enable **Disable key codes**, no key codes from the keys on the selected panel will be transmitted to the system. You can still read out the state of the keys, however. If you enable **Manual panel lock**, then the selected panel will be locked. Key or touch screen input is then no longer possible.

Information:

Key codes and the panel are freed back up after the system is restarted.

Displaying the state of device-specific panel keys

- Click on a panel in the list. Only the installed display (local) and connected panels are shown in the list.
- The status next to the panel selection field indicates whether the panel is locked (key and touch screen input not possible).
- **Key switches** indicates the state of the optional key switches. The representation begins with switch 8 (bit 7) on the left side. This field is disabled if the panel does not support keys.
- Click on **Keys** to display the key states. 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 using format <Byte>.<Bit>. This display is updated automatically whenever a key is pressed.

Information:

The key codes do not have to be configured for key matrix display. Evaluating keys that have already been configured is disabled while the key matrix is displayed so that the keys can be pressed without Windows having to respond.

7.1.3 LEDs

You can test the device-specific LEDs on panels here.

LEDs can be switched across up to 4 layers (see also **Key layer** under tab "Keys" in section 7.1.2). The LED layer can only be changed if there is a valid key configuration.

Information:

These dialog fields are only enabled if the selected panel supports LEDs.

If a valid key configuration exists, only LEDs that have not been configured as a status LED (HDD, panel locking, etc.) can be switched on and off.

Displaying the state of an individual LED

- Click on a panel in the list. Only the installed display (local) and panels connected via SDL are shown in the list.
- Disable checkbox **Set all LEDs**.
- Enable checkbox **LPOS** if you want to specify the LED number in <Byte>.<Bit> format (Byte = 0 to 31, Bit = 0/2/4/6).
- Enter an LED **number** between 0 and 127 (or 0.0 and 31.6 if **LPOS** is enabled). When the number is changed, the current LED state is displayed.
- Enter a number between 0 and 3 for the **layer** in which the LED should be read. When the number is changed, the current LED state is displayed.

Setting an individual LED

- Click on a panel in the list. Only the installed display (local) and panels connected via SDL are shown in the list.
- Disable checkbox **Set all LEDs**.
- Enable checkbox **LPOS** if you want to specify the LED number in <Byte>.<Bit> format (Byte = 0 to 31, Bit = 0/2/4/6).
- Enter an LED **number** between 0 and 127 (or 0.0 and 31.6 if **LPOS** is enabled).
- Enter a number between 0 and 3 for the **layer** in which the LED should be set.
- In order for the new LED state to be displayed immediately when the entered layer is not the same as the active layer, enable checkbox **Automatic layer change**.
- Click on one of the LED states – **Off**, **Slow blinking**, **Fast blinking** or **On** – to change the state of the LED.

Setting all LEDs

- Click on a panel in the list. Only the installed display (local) and panels connected via SDL are shown in the list.
- Enable checkbox **Set all LEDs**.
- Click on one of the LED states – **Off**, **Slow blinking**, **Fast blinking** or **On** – to change the state of the LEDs.

Stepping through all LEDs

- Click on a panel in the list. Only the installed display (local) and panels connected via SDL are shown in the list.
- Enable checkbox **LPOS** if you want to specify the LED number in <Byte>.<Bit> format (Byte = 0 to 31, Bit = 0/2/4/6).
- Enable checkbox **Set all LEDs** or enter a LED **number** between 0 and 127 (or 0.0 and 31.6 if **LPOS** is enabled) and a number between 0 and 3 for the **layer** of the first LED that should be set.
- Click on **Start** to start the automatic LED test. The test begins with the specified LED number and layer and ends when it reaches LED number 127 or 31.6. Each LED is switched on for 2 seconds. If **Quick** is enabled, each LED is only switched on for 200 milliseconds.
- Click on **Stop** to end the automatic LED test.

Information:

The LEDs are switched back off after the system is restarted.

7.1.4 Operating controls

You can view operating elements such as handwheels and selector switches here. The displayed values are updated automatically.

7.1.5 Temperatures

You can view temperature values for the PC and panels here. The displayed values are updated automatically. If a temperature value cannot be read, it will be indicated by "****".

For information about assigning the temperature values to the sensor positions, see the PC's user's manual.

Information:

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

7.1.6 Fans

You can view the speed of the fans in the PC and connected panels here in addition to testing the PC fans. The displayed values are updated automatically.

Information:

Fan speeds of panels are only displayed for panels connected via SDL.

Testing the PC's fans

- Select between **Auto**, **Min.**, **25%**, **50%**, **75%** and **Max.** next to **System fan test** or **Bus fan test**.
With **Auto**, the fans operate normally 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.

Information:

The settings that can be selected here do not always have a linear relationship to the fan's speed. For example, 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 you want the fan to constantly operate at a certain minimum speed, change setting "Fan control" in BIOS Setup.

7.1.7 Voltages

You can view voltage values for the PC here. The displayed values are updated automatically.

7.1.8 Statistics

You can view statistical information about the PC and panels here, e.g. 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 "****".

Information:

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

7.1.9 Factory settings

You can view the factory settings of the PC or connected panel here. The factory settings include such things as the hardware revision and serial number of the device.

Information:

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

7.1.10 User settings

User-specific settings can be made here. A user serial ID can be entered. You can use your own identification number as this ID to identify the PC.

Specifying a user serial ID

- Enter a **user serial ID** in hexadecimal format between 0 and FFFFFFFF.

7.1.11 Versions

You can view the version of the Control Center and BIOS as well as the firmware installed on the PC and connected panels. You can also update and save the firmware being used by the PC and connected panels.

Displaying the Control Center version

- Click on **About**. This opens a dialog box displaying the version of the Control Center and the installed ADI driver modules.

Updating the PC's firmware

- Click under **PC firmware** on **Update** for **MTCX** or **SDL**. This opens a file dialog box.
- Enter the name of the firmware file under **Filename** or select a file.
- Click on **Open**. This opens the Transfer dialog box.

You can cancel the transfer by clicking on **Cancel** in the Transfer dialog box. **Cancel** is disabled when writing to flash memory.

Deleting the data in flash memory can take several seconds depending on the memory block being used. The progress indicator is not updated during this time.

Information:

You must switch off the PC's power supply and then switch it back on again in order for the new firmware to take effect and the updated version to be displayed. When you close the Control Center, a dialog box is displayed requesting you to do so.

If a UPS is installed, you will have to switch off the PC either from the operating system or with the power button or disconnect the UPS battery before switching off the power supply.

Saving the PC firmware

- Click under **PC firmware** on **Save** for **MTCX** or **SDL**. This opens a file dialog box.
- Enter the name of the firmware file under **Filename** or select a file.
- Click on **Save**. This opens the Transfer dialog box.

You can cancel the transfer by clicking on **Cancel** in the Transfer dialog box.

Updating panel firmware

- Click on a panel in the list. Only panels connected via SDL are shown in the list.
- Click under **Panel firmware** on **Update** for **SDL**, **SDL3 Converter** or **HDBaseT**. This opens a file dialog box.
- Enter the name of the firmware file under **Filename** or select a file.
- Click on **Open**. This opens the Transfer dialog box.

You can cancel the transfer by clicking on **Cancel** in the Transfer dialog box. **Cancel** is disabled when writing to flash memory.

Information:

If the transfer has been canceled on the Automation Panel 800 or Automation Panel 900, you must repeat the procedure until the firmware is updated successfully. Otherwise, the panel will not work after being switched on!

Deleting the data in flash memory can take several seconds depending on the memory block being used. The progress indicator is not updated during this time.

Information:

Automation Panel 900: Depending on the revision of the SDL card, updating can only be performed with a certain firmware version:

File 0016#0.fp if the existing firmware version is less than 1.00. File 0016#1.fp if the firmware version is greater than or equal to 1.00.

The Control Center provides a corresponding message in the event of a version conflict.

Information:

On an Automation Panel 800 or Automation Panel 900, you must switch off the panel's power supply and then switch it back on again in order for the new firmware to take effect and the updated version to be displayed. When you close the Control Center, a dialog box is displayed requesting you to do so.

On an Automation Panel 9x3, Automation Panel 9xD, Automation Panel 1000, Automation Panel 5000 and SDL3 Converter, the panel or SDL3 Converter is restarted automatically after the firmware is updated.

Saving a panel's firmware

- Click on a panel in the list. Only panels connected via SDL are shown in the list.
- Click under **Panel firmware** on **Save** for **SDL** or **SDL3 Converter**. This opens a file dialog box.
- Enter the name of the firmware file under **Filename** or select a file.
- Click on **Save**. This opens the Transfer dialog box.

You can cancel the transfer by clicking on **Cancel** in the Transfer dialog box.

7.1.12 UPS

You can view status values and operating data (e.g. battery voltage and charging current) for an installed UPS here in addition to changing settings for the UPS.

The 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 displayed values are updated automatically.

The Windows UPS service is responsible for monitoring the UPS status and shutting down the system after a power failure.

Changing the UPS shutdown time at low battery level

Default values are used if no user-defined settings have been made for the UPS. Changed settings are applied automatically by the UPS; the system does not have to be restarted.

Specify the **Low battery shutdown time** in seconds. This is the time that the UPS waits with a low battery level or other fault (e.g. overtemperature) before cutting off the power supply. 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.

Information:

The low battery shutdown time must be specified long enough for the UPS service to shut down the operating system properly in the event of error!

Information:

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

Information:

A shutdown initiated by the UPS has higher priority than a shutdown command from the UPS service (see also "Changing the UPS shutdown time at low battery level").

Changing the UPS system settings

- Under **UPS**, click on **Options**. This opens a dialog box.

You can change the maximum time for battery operation and the shutdown time of the UPS in this dialog box. You can also enable UPS notifications here.

Information:

Administrator rights are required to change these settings.

Changing the maximum time for battery operation

Under **UPS service**, specify how long the UPS should be operated using battery power before the system is shut down in field **Maximum time on battery**.

Information:

If the battery is nearly empty, then the UPS service will shut down the system before the specified time.

Changing the UPS shutdown time

Under **UPS service**, specify the shutdown time in seconds in field **Turn off UPS after**. This is the time waited until the UPS shuts down the power supply (so that the battery does not continue to discharge). The valid range of values is 10 to 1200 seconds.

If a critical alarm occurs (e.g. power failure), the UPS service sends a shutdown command with the shutdown time to the UPS and the system is shut down.

Information:

The UPS is always shut down automatically if the system switches to the standby state. The shutdown command also shuts down the UPS if the operating system is *not* shut down properly. The shutdown command is also necessary for the PC to restart automatically if the power supply begins working again while the system is shutting down.

Information:

The specified time must be greater than the time needed to shut down the operating system. See also "Changing the UPS shutdown time at low battery level"!

Enabling UPS notifications

- Enable checkbox "Enable shutdown notifications" under "UPS service".
The UPS service will then report when the system is being shut down.
- Under **UPS service**, enable checkbox **Show messages for UPS status**.
The UPS service will then output a message each time the UPS status changes.

Information:

A system shutdown is only reported by the UPS service.

If you also enable checkbox **Repeat messages after**, all warning and error messages relevant to battery operation will be re-output after the configured time.

Information:

All changes in the UPS status will be entered in the Windows event log (under "Application") regardless of these options.

Displaying the state of UPS monitoring

- Click on **Monitor** to display the changes in UPS state since the last time the system or UPS service was started.

The frequency of each state is displayed, as is the last occurrence, when the end of the state was reached and the total duration of the state. The dialog box is updated automatically whenever the state changes.

To remove the displayed states from the list, click on **Delete**. To completely reset the states, you must restart the UPS service.

Restarting the UPS service

- Under **UPS**, click on **Service**. This opens the Windows **services**. (You can also open the **services** directly from the **Control Panel**.)
- Select the UPS service.
- Restart the service.

Information:

Administrator rights are required to change and start services.

7.1.13 Report

You can create a report containing device-specific information here. This report can then be used for support purposes.

Creating a report

- Click on **Create** to create and display the report.
- You can edit, copy and paste the report or save it to a file.

Saving the report

- Click on **Save as**. This opens a file dialog box.
- Enter the name of a text file under **Filename** or select a file.
- Click on **Save**.

Accessing additional information

Some Control Center actions (or those of the ADI driver being used) are entered in the Windows event log (under "Application"):

- Firmware updates (downloads)
- System restarts via ADI
- Initial watchdog start
- Changing watchdog parameters

7.2 Customization options

Some functions of the Control Center can be blocked to the user by editing entries in the registry (see Listing 3).

```
[HKEY_CURRENT_USER\Control Panel\ADI]
"DisableFirmwareUpdate"=dword:00000000
"DisableKcfUpdate"=dword:00000000
; Key codes cannot be locked.
"DisableKeyLock"=dword:00000000
; The panel locking time cannot be modified.
"DisableLockTime"=dword:00000000
; Panels cannot be locked.
"DisablePanelLock"=dword:00000000
; Updating settings is locked.
"DisableSettingsUpdate"=dword:00000000
"DisableUserSerialId"=dword:00000000
```

Listing 3: Registry entries for blocking functions

All tabs and some dialog boxes can also be hidden using entries in the registry (see Listing 4):

```
[HKEY_LOCAL_MACHINE\Software\BR_Automation\Adi\Driver]
"ShowAdvancedPanel"=dword:00000000
"ShowDisplay"=dword:00000000
"ShowFactorySettings"=dword:00000000
"ShowFans"=dword:00000000
"ShowKeys"=dword:00000000
"ShowLeds"=dword:00000000
"ShowOperatingControls"=dword:00000000
"ShowReport"=dword:00000000
"ShowStatistics"=dword:00000000
"ShowTemperatures"=dword:00000000
"ShowUserSettings"=dword:00000000
"ShowUps"=dword:00000000
"ShowVersions"=dword:00000000
"ShowVoltages"=dword:00000000
```

Listing 4: Registry entries for hiding tabs and dialog boxes

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

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