



**Driver Manual**  
**cifX Device Driver**  
**IntervalZero RTX®**  
**V8.1 / 2009**

**Hilscher Gesellschaft für Systemautomation mbH**

**[www.hilscher.com](http://www.hilscher.com)**

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# 1 Introduction

## 1.1 About this Document

This manual describes the Hilscher cifX Device Driver for IntervalZero RTX® and its architecture. The driver offers access to the Hilscher netX based hardware with the same functional API as the cifX device driver for Windows® and offers transparent access to the different devices. IntervalZero's RTX® software is a **Real Time eXtension** for the Windows Vista, Windows 2000, Windows XP and Windows Server 2003 environment.

The Hilscher RTX® driver is represented as a dynamic loadable library, which supports different netX based hardware designs. First design is a cifX PCI/PCIe bus based PC card. This card is not using any FLASH memory and the driver is responsible to download the necessary firmware and configuration files during the startup phase of the hardware, to get the boards in operational mode. The second type of hardware, which is supported by the driver, is the NXSB-PCA and NX-PCA-PCI boards. These boards enable the connection of a NXSB 100 / NXHX board to the PCI bus. In addition, to the PCI based hardware, the driver also supports devices, connected via the ISA bus.

## 1.2 List of Revisions

Rev	Date	Name	Revisions
1	2009-07-23	SS	created
2	2009-09-08	SS	Chapter 'Frequently Asked Questions' added

## 1.3 Overview

The cifX Device Driver for IntervalZero RTX® is available as a dynamic library built around the cifX Toolkit. Any application which needs to access a cifX device can use the device specific functions provided by this driver library. The dynamic library is implemented as a RTDLL, which is the analog of an explicitly loaded Win32 DLL. User processes gain access to the cifX driver functions by using the *LoadLibrary()* and *GetProcAddress()* calls. The concept of the cifX device driver is illustrated in the following figure.

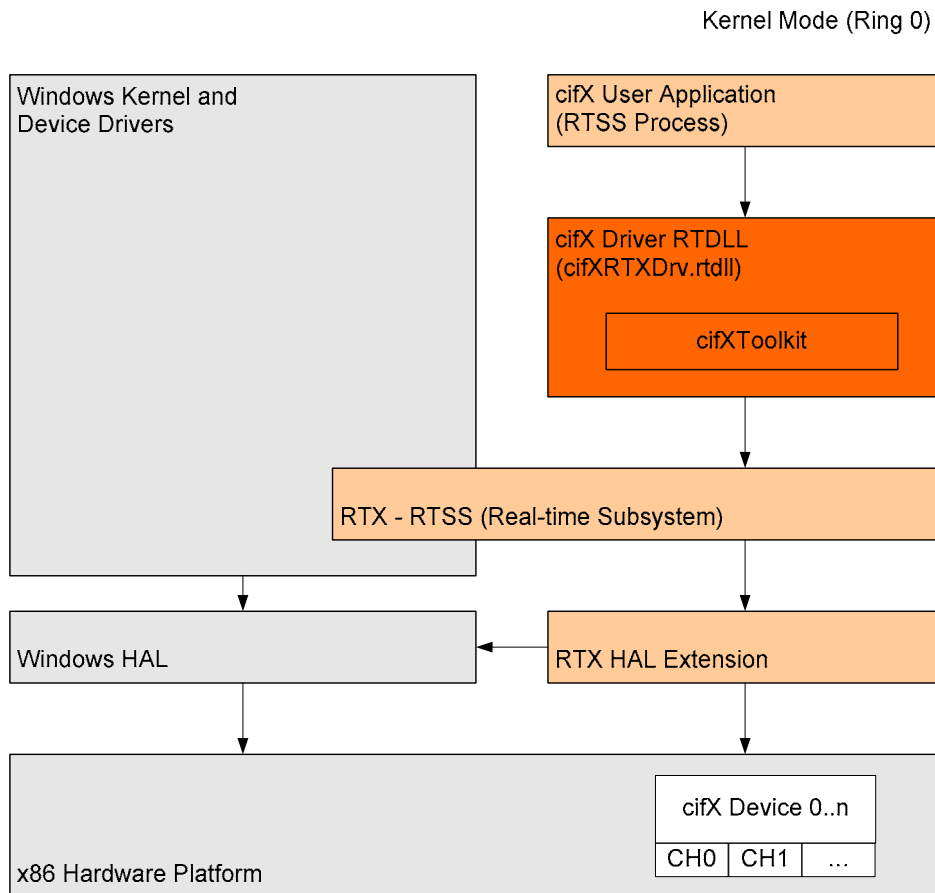


Figure 1: cifX Device Driver Architecture

## 1.4 Requirement

- IntervalZero RTX® version 8.1 or 2009
- cifX Device Driver for Windows® Vista/XP/2000
- Microsoft Visual Studio .NET 2003 or higher for driver test application

## 1.5 Supported Hardware

- cifX board (PCI)
- NXSB-PCA / NXSB100 / NXHX board
- NX-PCA-PCI / NXHX
- CIFX104 (ISA)

## 1.6 Features

- Based on the cifX Toolkit source (V0.945)
- Interrupt support for cifX boards

## 1.7 Limitations

- No Interrupt support for NXSB-PCA, NX-PCA-PCI
- Only one RTX® process can use the driver at the same time
- Only little-endian hosts supported
- No 64 bit support

## 1.8 CD Contents

Folder	Content
Documentation	Driver documentation
Driver	Driver runtimes
RTX 8.1	Driver runtimes for RTX 8.1
RTX 2009	Driver runtimes for RTX 2009
Examples	Examples
Example Configuration File	Example card configuration registry file
Test Application	Source code for driver test application
Tools	
Acrobat Reader	Adobe Acrobat Reader Setup

Table 1: CD Contents

## 1.9 Terms and Abbreviations

cifX	<b>C</b> ommunication <b>I</b> nterface based on netX
comX	<b>C</b> ommunication <b>M</b> odule based on netX
PCI	<b>P</b> eripheral <b>C</b> omponent <b>I</b> nterconnect
API	<b>A</b> pplication <b>P</b> rogramming <b>I</b> nterface
DPM	<b>D</b> ual- <b>P</b> ort- <b>M</b> emory Physical interface to all communication board (DPM is also used for PROFIBUS- <b>DP Master</b> ).

Table 2: Terms and Abbreviations

## 1.10 References

This manual is based on the following documents and specifications:

1	Hilscher GmbH: Driver Manual - cifX Device Driver (Edition 13)
2	Hilscher GmbH: Installation Instruction - cifX Device Driver (Edition 3)
3	Hilscher GmbH: netX Dual-Port Memory Interface Manual (Edition 7)
4	IntervalZero Inc.: Working with Hardware Resource Limitations Document Number: RTX-810-004
5	IntervalZero Inc.: RTX Documentation - Using RTX Runtime -> Managing Devices -> Converting a Windows Device to an RTX Device

Table 3: References

## 1.11 Legal Notes

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## 2 Installation

To use a cifX device in the RTX® environment, it must be explicitly removed from Windows® device manager and prepared for RTX® support. Several steps must be performed to install the Hilscher RTX® driver:

**Step 1:** Install the cifX Device Driver for Windows® 2000 / Windows® XP. Consult reference [2] for further installation instructions.

**Step 2:** Configure your cifX device (see section 2.1) with the *cifX Setup Tool*, included with the cifX device driver for Windows®.

---

**Note:** An online connection to a cifX device is not available if the cifX device is already converted to a RTX® device. Thus, configuration of the cifX device should be done in advance.

---

**Step 3:** Add RTX® support for a cifX device.

- Start the *RTX Properties* dialogue from Windows® start menu
- Open the 'Hardware' tab and enter the Plug and Play configuration via the 'Settings' button.
- Select the cifX device which should be controlled with the RTX® software, choose 'Add RTX INF support' and select 'Apply'.

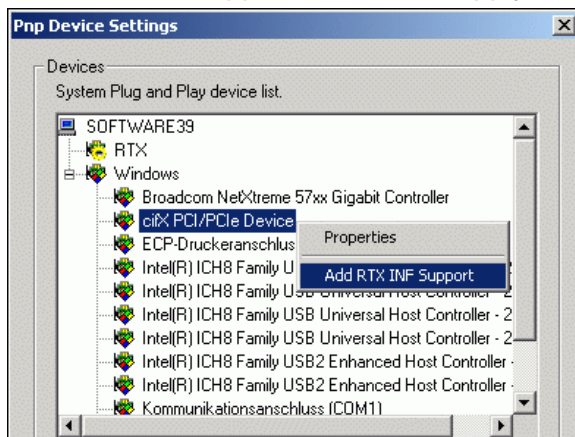


Figure 2: Add RTX® Support for a cifX Device

**Step 4:** Converting a Windows® Device to a RTX® Device (Windows® XP)

- Open the Windows® device manager
- Select the cifX device which should be converted and choose 'Update driver'
- Select 'Let me pick from a list of device drivers on my computer'
- To device drivers are listed: The standard cifX driver for Windows® and the cifX driver with RTX support. Select the cifX driver with RTX support to convert the selected cifX device to a RTX® device.

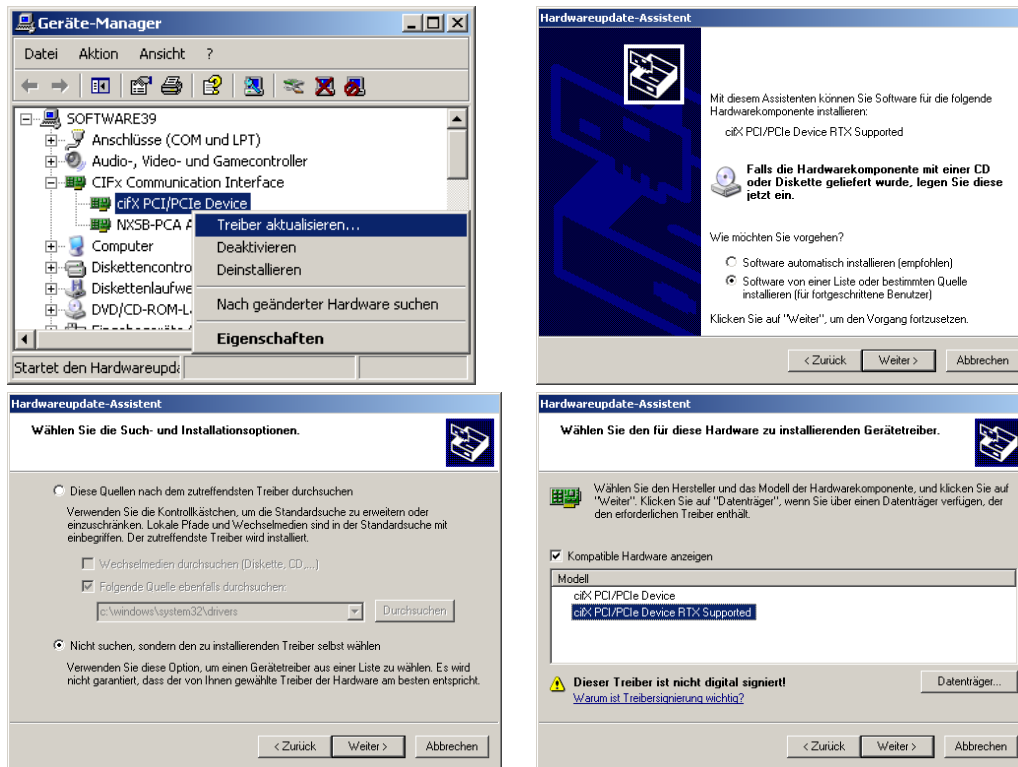


Figure 3: Convert the Windows® Device to a RTX® Device

**Note:** A detailed description of the conversion process for other Windows® systems is given in reference [5].

**Step 5:** Copy the cifX RTX® driver

- Copy the Hilscher RTX® driver DLL **cifXRTXDrv.rtdll** for your RTX® version from the installation CD to the local hard disk.

**Step 6:** Register the driver DLL

- The driver DLL **cifXRTXDrv.rtdll** must be registered within the RTX® environment. Therefore the RTX® program *RTSSrun* can be used. The RTX® environment will generate a local copy of the driver DLL and makes the driver DLL available for RTSS applications.

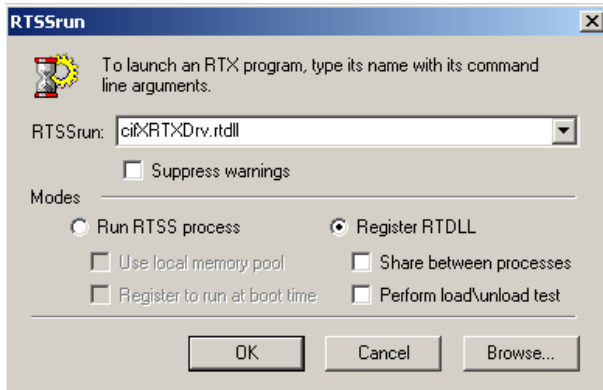


Figure 4: RTSSrun Program Example

---

**Note:** You have to repeat this step if you getting an updated driver DLL

---

---

**Note:** As the cifX driver DLL cannot be loaded by more than one RTX® process simultaneously, make sure that the option '*Share between processes*' is unchecked.

---

**Annotations to interrupt support**

The cifX device can be used in polling or interrupt mode. If interrupt mode should be used, IRQ resource limitations must be considered. As RTX® does not support sharing IRQ lines with Windows® devices, the interrupt line which RTX® uses must be available for exclusive use. Finding an exclusive IRQ often requires physically moving hardware around in the system or disabling other Windows® devices. If you have difficulty configuring your hardware for use with RTX® due to IRQ resource limitations, please consult reference [4] for further information.

## 2.1 Device Configuration

Each device has several parameters which can be configured, e.g. alias name or interrupt support. The configuration can be done with the *ciFX Driver Setup Utility*, included with the ciFX device driver for Windows®. If the ciFX device is already converted to a RTX® device, the online connection to the ciFX device is no longer available. Thus, the initial configuration of the device must be done in advance.

**Note:** Perform the initial device configuration before assigning your ciFX device to the RTX® environment, as the ciFX device is no longer accessible via a Windows® process.

The ciFX device driver for Windows® stores the device configuration in the registry. As the Windows® registry is not accessible in the RTX® environment, the device configuration must be exported to a '.reg' file. For this purpose the export function of the Windows® registry editor must be used. The location and the filename of this registry file must be supplied to the ciFX RTX® driver via the driver parameters (see section 3.1.1).

### Guideline for creation of a device configuration file:

- Configure your ciFX device with the *ciFX Driver Setup Utility*. Press the *Apply* Button and confirm the request to restart the device. This will store the device configuration in the Windows® registry and create the required directory tree for configuration and firmware file storage (see section 2.2).

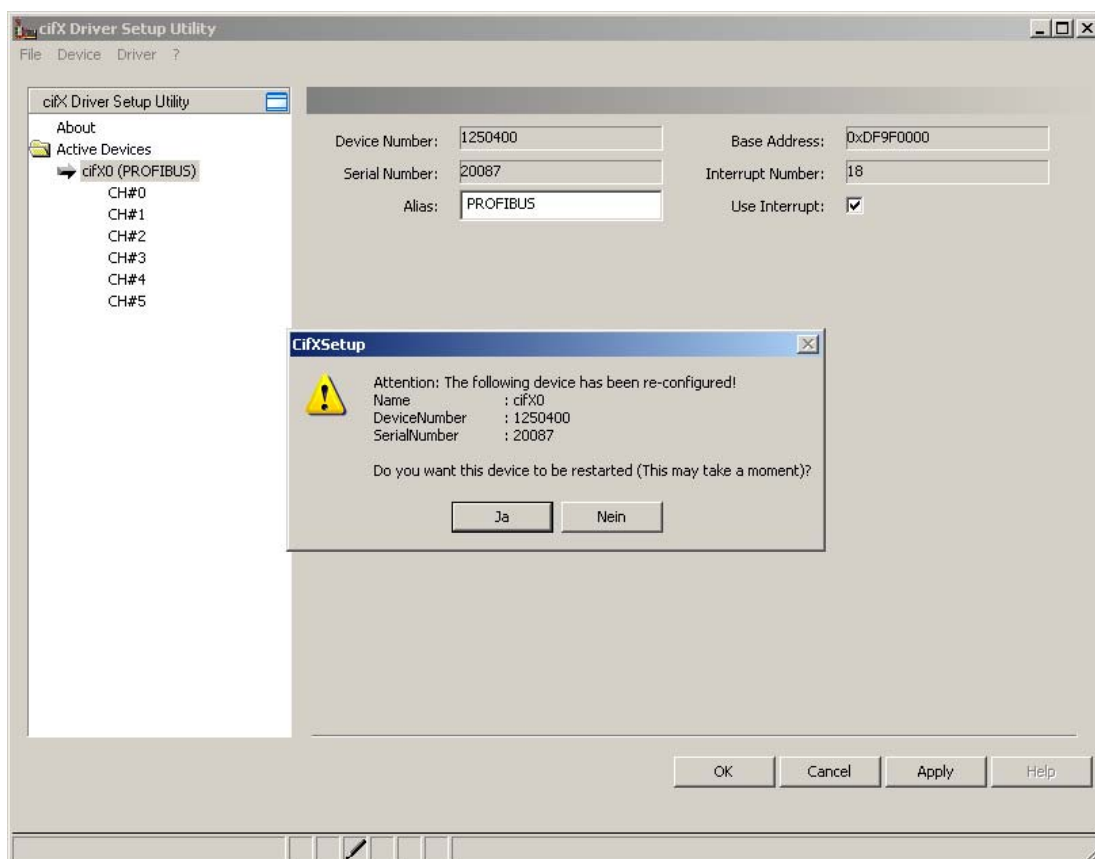


Figure 5: ciFX Driver Setup Utility

- Open the Windows® *Start* menu and select '*Run*'
- Execute the Windows® Registry Editor by entering the command 'regedit' and confirm via the OK button.
- In the Windows® Registry Editor navigate to the registry key: HKEY\_LOCAL\_MACHINE\SYSTEM\CurrentControlSet\Services\CIFxDrv
- In the file menu select export. Make sure that the file type is registration file or WIN9x/NT-4 registration file. Enter an arbitrary filename and select save. Remember the name and location of this file!

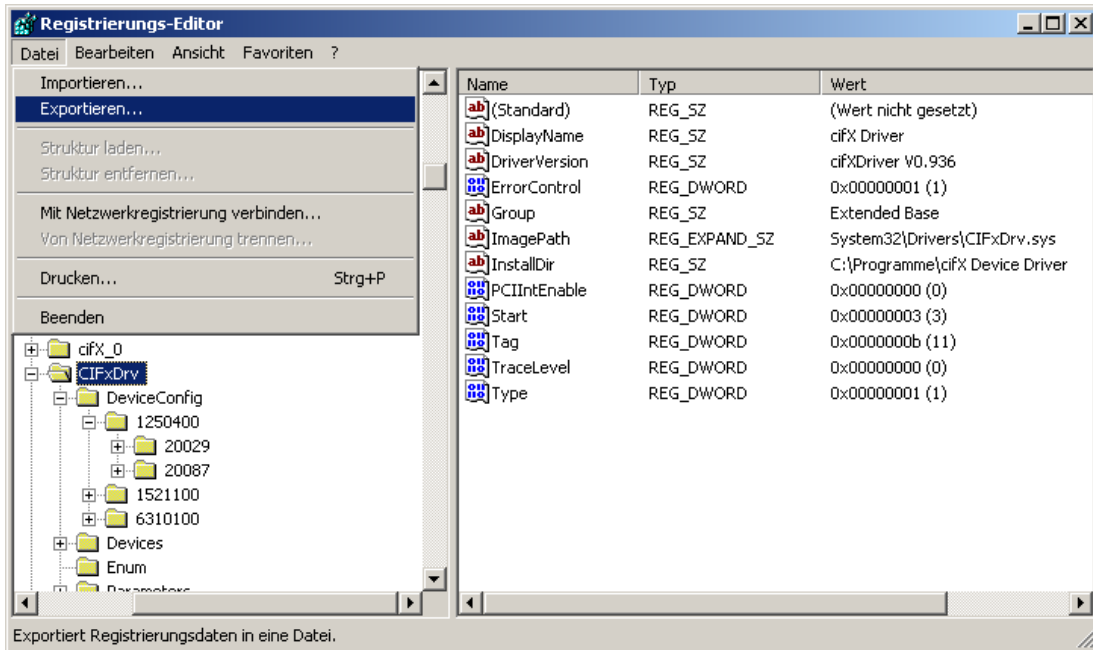


Figure 6: Export the Device Configuration with the Windows® Registry Editor

A sample configuration file is located on the installation CD. To modify the configuration file manually, the relevant configuration keys are listed below.

Key Value	Description
<b>[HKLM\ SYSTEM\CurrentControlSet\Services\CIFxDrv\DeviceConfig\&lt;Device Num.&gt;\&lt;Serial Num.&gt;]</b>	
InstallDir	Path to installation directory, created by the cifX device driver for Windows®
<b>[HKLM\ SYSTEM\CurrentControlSet\Services\CIFxDrv\DeviceConfig\&lt;Device Num.&gt;\&lt;Serial Num.&gt;]</b>	
Alias	Statically assigned alias name
InterruptEnable	Device interrupt handling enable/disable 0 = disable ( <b>default</b> ) 1 = enabled
<b>[HKLM\ SYSTEM\CurrentControlSet\Services\CIFxDrv\DeviceConfig\&lt;Device Num.&gt;\&lt;Serial Num.&gt;\Channel&lt;0..6&gt;]</b> NOTE: Currently the firmware only supports channel 0	
ModuleCount	Number of configured modules (firmware files)
Module<0..ModuleCount>	Each module (firmware file) gets an own entry with an index as suffix. This specifies the path to the module file relative to: <InstallationDir>\<Dev. Number>_<Serial Number>\Channel<0..6>
ConfigCount	Number of configured fieldbus databases (configuration files)
Config<0..ModuleCount>	Each database gets an own entry with an index as suffix. This specifies the path to the database file relative to: <InstallationDir>\<Dev. Number>_<Serial Number>\Channel<0..6>
WarmstartFile	Full file name to warmstart parameter file residing in directory: <InstallationDir>\<Dev. Number>_<Serial Number>\Channel<0..6> <b>Note:</b> Warmstart file support depends on the used firmware and is maybe not supported

Table 4: Device Configuration File Keys

## Sample configuration registry file:

```
[HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Services\CIFxDrv]
"InstallDir"="C:\Programme\CifX Device Driver"

[HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Services\CIFxDrv\DeviceConfig]

[HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Services\CIFxDrv\DeviceConfig\1250100]

[HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Services\CIFxDrv\DeviceConfig\1250100\20217]
"Alias"=""
"InterruptEnable"=dword:00000001

[HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Services\CIFxDrv\DeviceConfig\1250100\20217\Channel0]
"ModuleCount"=dword:00000001
"Module0"="cifXdps.nxf"
"ConfigCount"=dword:00000001
"Config0"="config.nxd"
"WarmstartFile"="warmstart.dat"

[HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Services\CIFxDrv\DeviceConfig\1250100\20217\Channel1]
"ModuleCount"=dword:00000000
"ConfigCount"=dword:00000000

[HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Services\CIFxDrv\DeviceConfig\1250100\20217\Channel2]
"ModuleCount"=dword:00000000
"ConfigCount"=dword:00000000

[HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Services\CIFxDrv\DeviceConfig\1250100\20217\Channel3]
"ModuleCount"=dword:00000000
"ConfigCount"=dword:00000000

[HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Services\CIFxDrv\DeviceConfig\1250100\20217\Channel4]
"ModuleCount"=dword:00000000
"ConfigCount"=dword:00000000

[HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Services\CIFxDrv\DeviceConfig\1250100\20217\Channel5]
"ModuleCount"=dword:00000000
"ConfigCount"=dword:00000000
```

## 2.2 Firmware and Configuration File Storage

cifX PCI cards are not using any flash memory to store a firmware or configuration on the card. Every time the card is powered-up the firmware and configuration must be downloaded to the hardware.

**Note:** Firmware and configurations are not stored on the hardware and must be downloaded each time the card is powered-up.

It is the task of the driver to initialize the card and therefore the driver has to know which files must be loaded to the hardware.

To allow device specific configuration, every file that needs to be downloaded must reside in the folder tree which is created by the cifX device driver for Windows® (or manually generates). The location of this folder tree is passed to the cifX RTX® driver via a configuration file (see section 2.1). The following table describes the different subdirectory levels created by the cifX device driver for Windows®:

Subdirectory	Description
<InstallDir>	Installation directory of the cifX device driver for Windows®. This directory must contain the second stage PCI bootloader (e.g. NXCIF50-RTE.bin)
<Device Number>_<Serial Number>	Device and serial number of the device File storage for cifX cards with a given device and serial number
Channel<#>	Channel specific files Note: Currently only channel 0 is supported

Table 5: Firmware and Configuration File Storage

Sample file structure for a cifX device with device number 1250100 and serial number 20217:

```
+ <InstallDir>
|
|-- NXCIF50-RTE.bin
|
|--+ 1250100_20217
|   |
|   |--+ Channel0
|   |   |
|   |   |-- cifXdps.nxf
|   |   |-- config.nxd
|   |
|   |--+ Channel1
|   |--+ Channel2
|   |--+ Channel3
|   |--+ Channel4
|   |--+ Channel5
```

## 3 Driver Specific Information

The cifX driver for RTX® needs some special initialization functions and structures.

### 3.1 Additional Structures

Some of the RTX® specific functions need parameters provided through structures. The structures and the meaning of the internal data are described in the following chapter.

#### 3.1.1 Structure RTX\_CIFXDRV\_PARAMETERS\_T

This structure is used to initialize the cifX driver.

Element	Data Type	Description
fScanPCI	int	Driver Initialization options: <b>0 = FALSE</b> Driver does not scan for PCI cards. Cards can be added manually by <i>ulUserDevCount</i> and <i>ptUserDevList</i> parameters. <b>1 = TRUE</b> Driver scans for all available PCI cards and adds them to the application.
ulTraceLevel	unsigned long	Set the trace level of the driver: <b>1 = TRACE_LEVEL_DEBUG</b> <b>2 = TRACE_LEVEL_INFO</b> <b>4 = TRACE_LEVEL_WARNING</b> <b>8 = TRACE_LEVEL_ERROR</b>
ulPollInterval	unsigned long	Polling interval in milliseconds [ms] for non-interrupt driven cards (used for Change of State (COS) signaling, see reference [3]) <b>0 = 500ms default</b>
szRegFile	const char*	Set the path to the Windows® registry file. Can be NULL to use the default of 'c:\CIFxDrv.reg'. Creation of this registry file is explained in section 2.1. <b>NULL = 'c:\CIFxDrv.reg' default</b>
ulUserDevCount	int	Number of user cards entries in the <i>ptUserDevList</i> to add to the driver (e.g. if a card is connected via DPM). <b>0 = none</b>
ptUserDevList	RTX_CIFXDRV_DEVICEENTRY_T **	Array of user added cards. Number of entries is defined by <i>ulUserDevCount</i> . See section 3.1.2.

Table 6: Structure RTX\_CIFXDRV\_PARAMETERS\_T Definition

### 3.1.2 Structure RTX\_CIFXDRV\_DEVICEENTRY\_T

This structure describes a cifX device which should be added to the driver. This structure can be acquired through *cifXFindDevice()* or filled by the user if a custom card should be added.

Element	Data Type	Description
ulPhysicalAddress	unsigned long	Physical address of the DPM (this value is used to detect the PCI card linked to the DPM)
blrqNumber	unsigned char	Interrupt number
pvDPMAAddress	void*	Virtual pointer to card DPM
ulDPMSize	unsigned long	Size of the DPM in bytes
fPCICard	int	<b>0 = FALSE</b> Device is connected via DPM. <b>1 = TRUE</b> Device is connected to PCI bus
tBusInfo	RTX_CIFXDRV_DEVICEBUSINFO_T	Bus information, see section 3.1.3

Table 7: Structure RTX\_CIFXDRV\_DEVICEENTRY\_T Definition

### 3.1.3 Structure RTX\_CIFXDRV\_DEVICEBUSINFO\_T

Bus information structure used to store bus specific information for cifX devices connected via PCI bus.

Element	Data Type	Description
ulBusNumber	int	Bus number
ulSlotNumber	int	Slot number

Table 8 : Structure RTX\_CIFXDRV\_DEVICEBUSINFO\_T Definition

## 3.2 Additional functions

This chapter describes functions which are only available for the RTX® version of the driver. These functions are used to initialize the cifX device driver.

### 3.2.1 cifXInitDriver()

This function must be called before accessing any driver function. The cifX driver initialization includes discovering all available cifX PCI devices and downloading the firmware and configuration files.

**Note:** *cifXInitDriver()* calls *cifXFindDevice()* internally to search for available cifX PCI cards (*fScanPCI* = TRUE). If the cards should be defined manually, *cifXFindDevice()* can be used to add cards manually (*fScanPCI* = FALSE).

**Note:** For none PCI cards, the application has to create a *RTX\_CIFXDRV\_DEVICEENTRY\_T* with the corresponding device information. Afterwards, the structure must be placed into the *RTX\_CIFXDRV\_PARAMETERS\_T* structure (see parameters *ulUserDevCount*, *ptUserDevList*, *fScanPCI* = FALSE) before *cifXInitDriver()* is called.

#### Function call:

```
long cifXInitDriver (RTX_CIFXDRV_PARAMETERS_T* ptDriverParams);
```

#### Arguments:

Argument	Data Type	Description
ptDevEntry	RTX_CIFXDRV_PARAMETERS_T*	Driver parameters, see section 3.1.1

#### Return Values:

Return Values	
CIFX_NO_ERROR	Driver initialization successful
CIFX_DRV_INIT_ERROR	Driver initialization failed (no cifX device available)

#### Example:

```
RTX_CIFXDRV_VTABLE          tvTable          = {0};
RTX_CIFXDRV_PARAMETERS_T    tDriverParams    = {0};
HANDLE                      hDll             = NULL;

/* Set driver parameters */
tDriverParams.fScanPCI      = TRUE;
tDriverParams.ulUserDevCount = 0;

/* Load cifXRTXDrv.rtdll */
hDll = LoadLibrary("cifXRTXDrv.dll");

/* Assign function pointer */
tvTable.cifXInitDriver = (RTXDRV_INIT) GetProcAddress( hDll, "cifXInitDriver");

/* Scan for all available cifX PCI devices and initialize the cifX device driver */
tvTable.cifXInitDriver (&tDriverParams);

FreeLibrary(hDll);
```

### 3.2.2 cifXDeinitDriver()

Un-initialize the driver and remove all devices from the control of the cifX driver library. After calling this function the application must not access any cifX driver API function any more.

Function call:

```
long cifXDeinitDriver ( void );
```

Arguments:

Argument	Data Type	Description
none		

Return Values:

Return Values	
CIFX_NO_ERROR	Driver deinitialization successful
CIFX_DEV_HW_PORT_IS_USED	Device is in use, so driver deinitialization is denied
CIFX_DRV_NOT_INITIALIZED	Driver was not initialized

### 3.2.3 cifXFindDevice()

This function scans for a cifX PCI device in the system and builds a `RTX_CIFXDRV_DEVICEENTRY_T` structure for each discovered device.

The function is used by `cifXInitDriver()` if PCI cards should be detected automatically (`RTX_CIFXDRV_PARAMETERS_T`, `fScanPCI` parameter = TRUE).

`cifXFindDevice()` can also be used by an application to manually define a cifX card. Therefore the function can be called with a fixed device number (`iNum`). If the given device is available, the function returns the `RTX_CIFXDRV_DEVICEENTRY_T` structure for the device.

Afterwards the application has to insert this structure into the `RTX_CIFXDRV_PARAMETERS_T` structure (see 3.1.1), setting the `fScanPCI` flag to FALSE and calling `cifXInitDriver()`.

#### Function call:

```
BOOL cifXFindDevice ( RTX_CIFXDRV_DEVICEENTRY_T*   ptDevEntry,
                    int                             iNum );
```

#### Arguments:

Argument	Data Type	Description
ptDevEntry	RTX_CIFXDRV_DEVICEENTRY_T*	Pointer to a <code>RTX_CIFXDRV_DEVICEENTRY_T</code> structure, to place returned values in
iNum	int	Number of the device in the system 0 = first device

#### Return Values:

Return Values	
TRUE	A device with number <code>iNum</code> was found
FALSE	A device with number <code>iNum</code> could not be found

#### Example:

```
RTX_CIFXDRV_VTABLE      tVTable      = {0};
RTX_CIFXDRV_PARAMETERS_T tDriverParams = {0};
RTX_CIFXDRV_DEVICEENTRY_T tDevEntry   = {0};
HANDLE                  hDll          = NULL;

/* Load cifXRTXDrv.rtdll */
hDll = LoadLibrary("cifXRTXDrv.dll");

/* Assign function pointer */
tVTable.cifXInitDriver = (RTXDRV_INIT) GetProcAddress( hDll, "cifXInitDriver");
tVTable.cifXFindDevice = (RTXDRV_FIND_DEVICE)
    GetProcAddress( hDll, "cifXFindDevice");

/* Find the first cifX PCI device */
if (tVTable.cifXFindDevice (&tDevEntry, 0))
{
    tDriverParams.fScanPCI      = FALSE;
    tDriverParams.ulUserDevCount = 1;
    tDriverParams.ptUserDevList = &tDevEntry;

    /* initialize the cifX device driver */
    tVTable.cifXInitDriver (&tDriverParams);
}

FreeLibrary(hDll);
```

### 3.2.4 cifXGetDriverVersion()

This function requests the version of the cifX driver for RTX®.

#### Function call:

```
long cifXGetDriverVersion ( char* szVersion, unsigned long ulSize )
```

#### Arguments:

Argument	Data Type	Description
szVersion	char*	String buffer to return the version of the cifX driver
ulSize	unsigned long	Maximum buffer size for the version string

#### Return Values:

Return Values	
CIFX_NO_ERROR	Driver version successfully copied to string buffer
CIFX_INVALID_BUFFERSIZE	Supplied buffer too small to hold the driver version string

#### Example:

```
RTX_CIFXDRV_VTABLE    tVTable          = {0};
char                  szDrvVersion[20]    = "";
HANDLE                hDll                = NULL;

/* Load cifXRTXDrv.rtdll */
hDll = LoadLibrary("cifxRTXDrv.dll");

/* Assign function pointer */
tVTable.cifXGetDriverVersion = (RTXDRV_GET_VERSION)
    GetProcAddress( hDll, "cifXGetDriverVersion");

/* Get driver version */
tVTable.cifXGetDriverVersion( szDrvVersion,
    sizeof(szDrvVersion)/sizeof(*szDrvVersion) );

/* Print driver version to screen */
RtPrintf("%s", szDrvVersion);

FreeLibrary(hDll);
```

### 3.3 Driver Startup Procedure

The driver startup procedure can be controlled by the user. The following two use cases are available:

- Automatically add all found cifX PCI devices and optionally add user specific devices
- Skip cifX PCI device scan and add user specific device manually

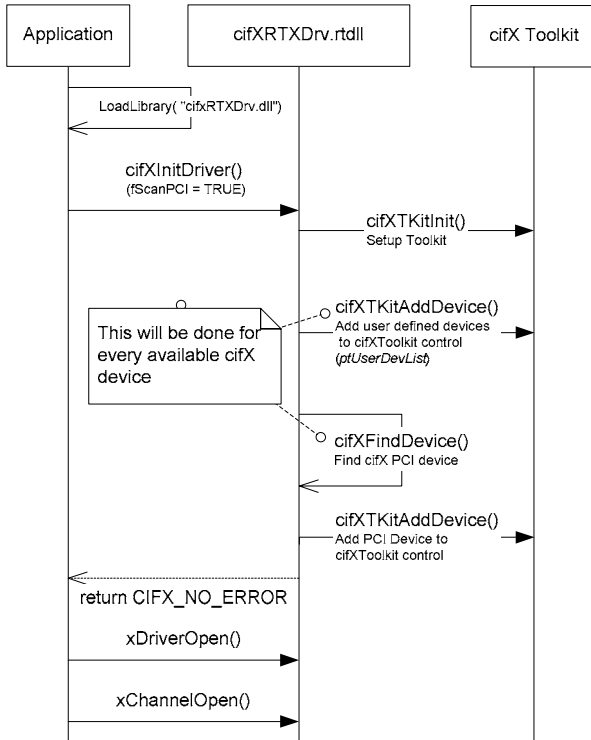


Figure 7: Initialization of the cifX Driver with fScanPCI = TRUE

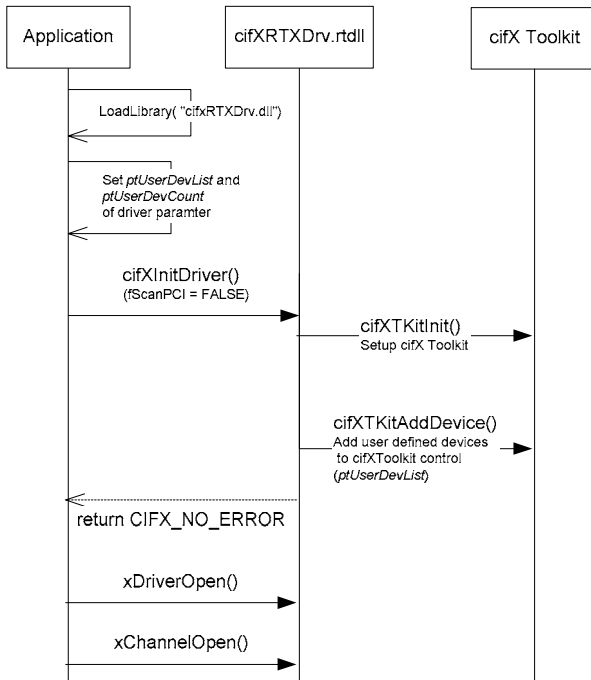


Figure 8: Initialization of the cifX Driver with fScanPCI = FALSE

## 4 Programming with the Driver

The Application Programming Interface (API) of the Hilscher RTX® driver is based on the already known cifX device driver Interface (reference [1]). Therefore the 'cifX Device Driver' manual can be used. This manual describes the driver functions (cifX API), error codes and shows some program examples. The installation CD also includes a 'Test Application' directory with a RTX® specific example.

The following C application demonstrates the minimum functions which must be called to enable an application to work with a cifX device

```
#include <windows.h>
#include <rtapi.h>
#include "cifXUser.h"
#include "cifXErrors.h"
#include "cifxRTXDrv.h"

/*****
/*! The main function
*   \return 0 on success
*/
*****/
int main(int argc, char* argv[])
{
    HANDLE                hDll          = NULL;
    CIFXHANDLE            hDriver        = NULL;
    RTX_CIFXDRV_VTABLE    tVTable       = {0};
    RTX_CIFXDRV_PARAMETERS_T tDriverParams = {0};
    long                  lRet          = CIFX_NO_ERROR;

    /* Set driver parameters */
    tDriverParams.fScanPCI      = TRUE;
    tDriverParams.ulUserDevCount = 0;

    /* Load cifxRTXDrv.rtdll */
    hDll = LoadLibrary("cifxRTXDrv.dll");

    /* Assign function pointer */
    tVTable.cifXInitDriver  =(RTXDRV_INIT)  GetProcAddress(hDll, "cifXInitDriver");
    tVTable.cifXDeinitDriver=(RTXDRV_DEINIT)GetProcAddress(hDll, "cifXDeinitDevice");
    tVTable.xDriverOpen     =(X_DRIVER_OPEN)GetProcAddress(hDll, "xDriverOpen");
    tVTable.xDriverClose    =(X_DRIVER_CLOSE)GetProcAddress(hDll, "xDriverClose ");
    /* TODO: assign further api function */

    /* Initialize and open the cifX device driver */
    if( (CIFX_NO_ERROR == (lRet = tVTable.cifXInitDriver (&tDriverParams))) &&
        (CIFX_NO_ERROR == (lRet = tVTable.xDriverOpen(&hDriver))) )
    {
        /* Work with the cifX API */

        /* Close the cifX driver */
        tVTable.xDriverClose(hDriver);
    } else
    {
        RtPrintf("Error opening driver. lRet=0x%08X\r\n", lRet);
    }

    /* Deinit the cifX device driver */
    tVTable.cifXDeinitDriver ();

    FreeLibrary(hDll);

    return 0;
}
```

## 5 Frequently Asked Questions

**Q:** The driver presents the following warning at startup: *'OS\_Memalloc: Not enough free memory in RTSS memory pool! Request from windows memory pool'*. What does that mean?

**A:** To fulfill RTSS applications memory requests, RTX deterministically allocates memory from a special memory pool (Local memory pool). RTSS applications that allocate memory from that pool don't have to initiate a Service Request Interrupt to request memory from Windows (This request would be non-deterministic). If the memory needs of the RTSS application exceeds the initial size of the local memory pool, RTX initiate a non-deterministic Service Request Interrupt to request memory from Windows. This action is signaled to the user via the drivers warning message. This scenario can be avoided, by increasing the initial local memory pool size to the memory needs of the driver and the RTSS application (see memory settings in the RTX properties application). If the creation of the local memory pool is not done at startup, but with the first call to a local memory pool allocation function the drivers warning message is also signaled. The creation of the local memory pool at startup is initiated, a) by executing the RTSS application with the parameter */local* or b) by modifying the memory settings in the RTX properties application (see RTX Manual).

**Q:** **Is it possible to develop a cifX application with Visual Studio 6.0?**

**A:** If RTX 8.1 is used, application development with Visual Studio 6.0 is supported. But with release of RTX 2009 the development of RTSS application with Visual Studio 6.0 is no longer supported (see <http://www.intervalzero.com/pdfs/OSCompatMatrixRTX.pdf>).

**Q:** **Is it possible to configure a cifX card, independently of its serial and device number?**

**A:** No, you have to configure each cifX card individually.

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