FAQ C6 IPC

NV RAM usage

FAQ No.0003

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Content

Introduction
There are several possibilities existing in order to permanently store PLC runtime's data on a KEB IPC. The scope of this document is to make the end-user aware of the behaviour of the different solutions and their limits, restrictions and details.

Option without dedicated NvRam hardware
If no dedicated hardware is present (as systems with KEB part No. xxC6Ayy-zz**A**z), the build-in solution is, to store retain and persistent data on the CompactFlash storage. This is done, however, only, if the runtime is shut down properly, e.g. by using the sample given in the related sample project. On an unexpected power fail, the data will get lost. This may be an option in case the device is supplied by a second power supply and the mains availability is checked via a digital input.

Options with a dedicated NvRam hardware
There are two dedicated hardware solutions existing that offer the end-user a NvRam: The Can+NvRam board, provided with IPC systems with KEB part No. xxC6Ayy-zz**B** and the standalone NvRam board, provided with IPC systems with KEB part No. xxC6Ayy-zz**C**z.
Both boards need a suitable driver, which is preinstalled on the IPC system and a special component in the SoftPlc runtime that has to be enabled by the user.

Activating the necessary runtime component
For the latter, navigate to the runtime's installation folder (C:\Program Files\3S CoDeSys CoDeSys Control RTE3\) and use the correct .cfg file for your purpose. Therefore, delete the current CoDeSysControl.cfg file, copy the already present file with the 'NVR' tag in its filename (e.g. "Econ-SM-Can-NVR-CoDeSysControl.cfg") and rename the copied file back to CoDeSysControl.cfg by deleting the first part of the filename. You will then have to restart the runtime (or the complete system) to make these changes apply.

Known issues
When booting a system using a NvRam only extension board, you may face the situation that the system claims a driver for the extension card that is not present yet. In addition, you will see a message in the runtime's log (visible after connecting to the device using COMBIVIS studio 6) after activating the runtime component, like in the screenshot below:

In this case, you will need to update a set of files on your system. You can download the files from ftp://ftp.keb.de/combivis6/PLC/NvRamUpdate.zip. The archive's password is 'kebnvram'.
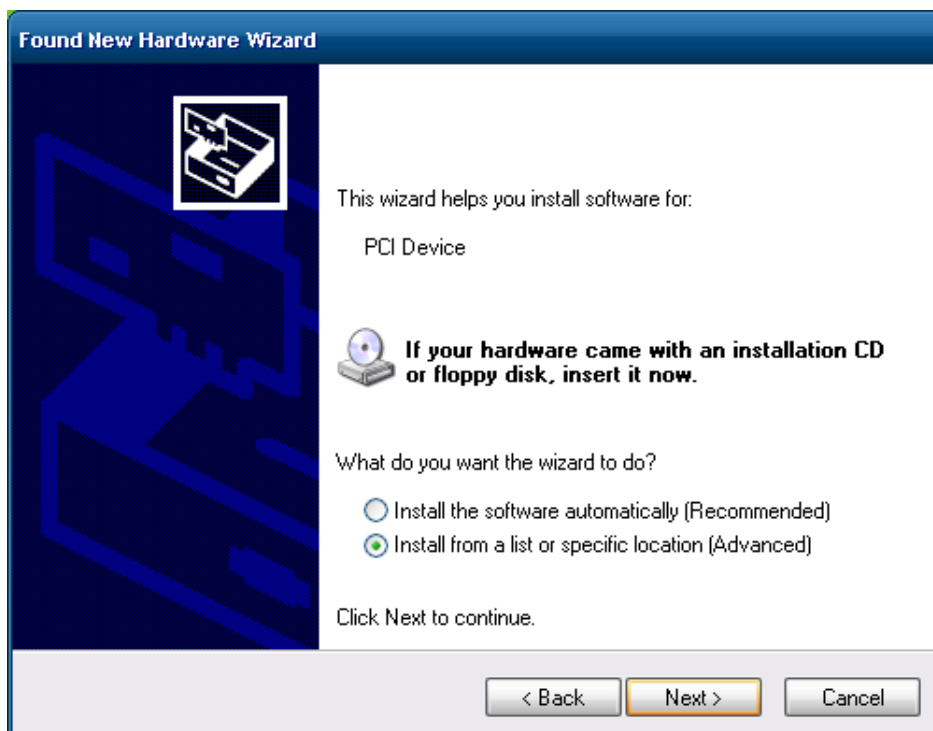Extract the files and copy them to any usb mass storage and attach it to the target system.
You will find a file KEB_NVR_Pci.inf that you can use to install the driver from the windows hardware installation wizard when asked for a driver.
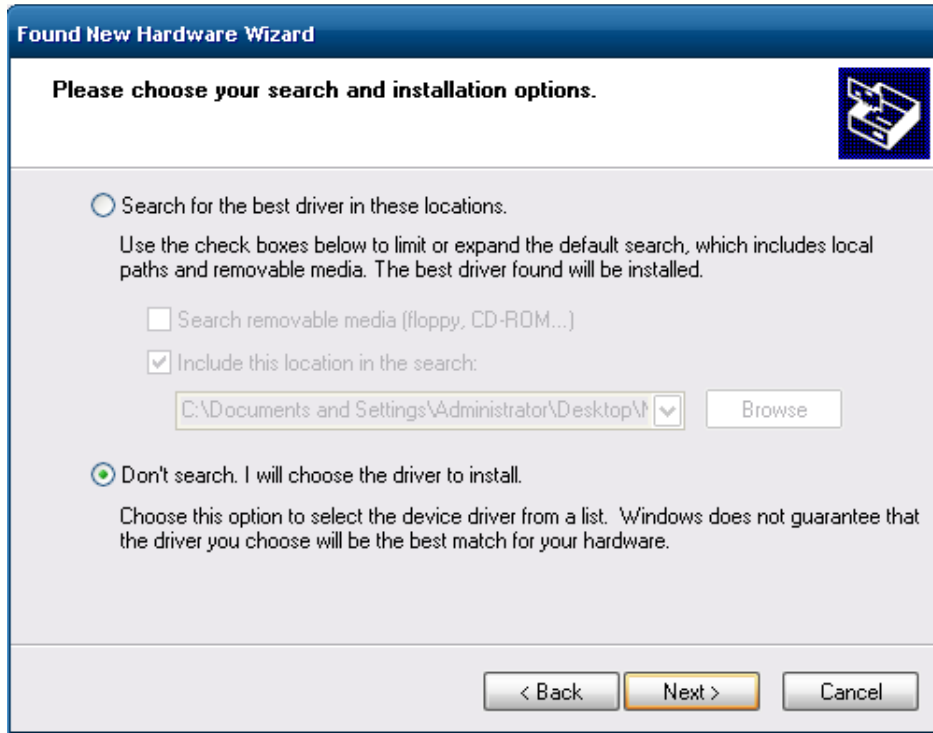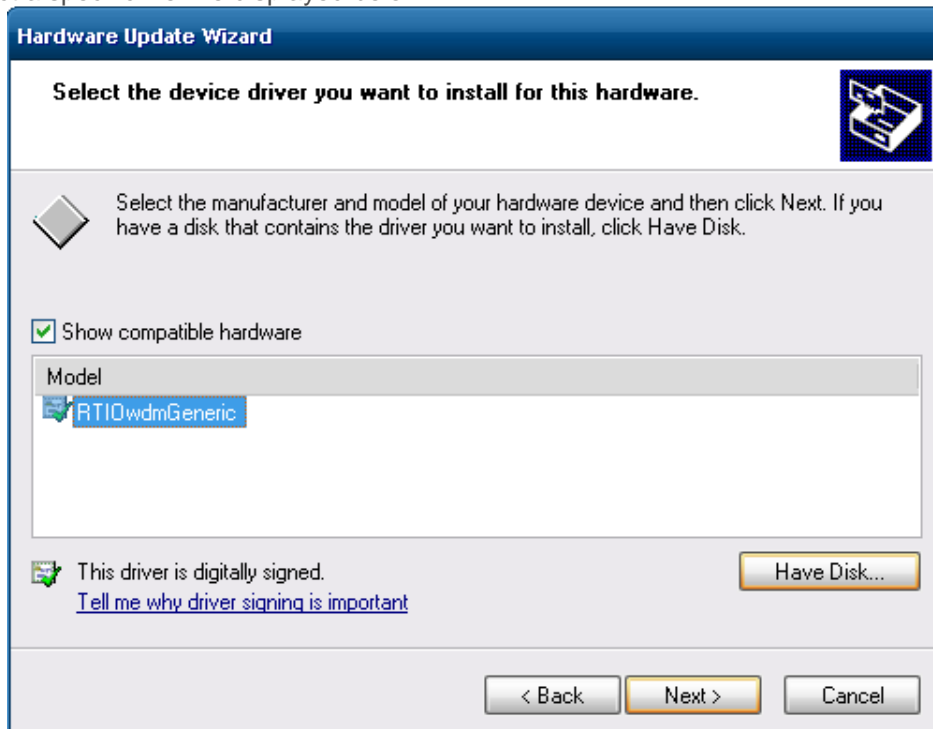Therefore, please perform the following operations:

In the installation wizard, select "No, not this time" and click next.

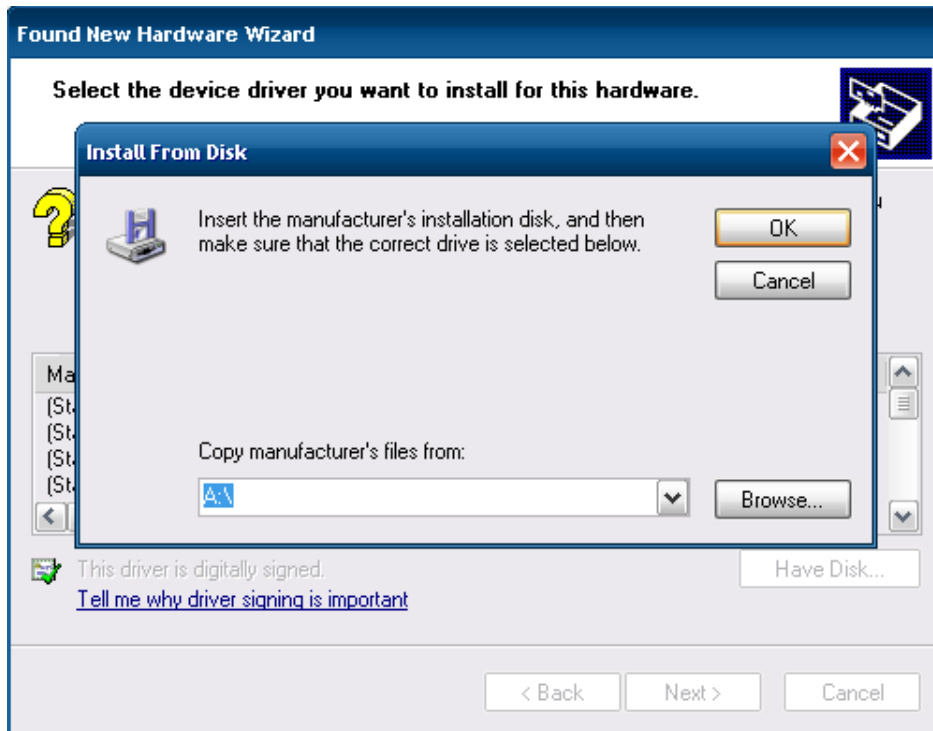Answer the next question with "Install from a specific location" and click next.

In the next dialog, choose "Don't search. I will choose the driver to install." and click next, until you are able to select a specific file like displayed below.

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Click on the "Have Disk…" button,

and browse for the file 'KEB_NVR_Pci.inf' and open it by clicking "OK".

Then, start the installation by clicking "Next" and close the dialog using the "Finish" button. The driver is the successfully installed.

As a second step, use the 'updateCmpNvr.bat' from the package to update the affected runtime component. Just execute it on the IPC system that is updated and reboot.

You should not see the above mentioned error anymore and the NvRam will work as expected. However, you will see a warning in the runtime's log at the first start, indicating that the "retain area changed or got corrupted". This is normal and indicates, that the new retain area is now accessible.

Implementation guideline for end-user NvRam usage

On using the IPC's non-volatile RAM in your PLC project, there is a key point the user needs to take care of during use: The NvRam is internally connected to the CPU using the PCI bus and the runtime will not optimize any access to the retain/persistent variables. Therefore, each (read or write) access to a retain or persistent variable will always result in a PCI bus telegram immediately. This may affect the general program's execution time as well as other PCI devices as there is no prioritization in any way existing on PCI level and therefore a lot of overhead might be generated.

Generally, the non-volatile Ram should be written at one single, defined position in the user code. This is most easily archived by defining a data structure for the retain and or persistent data. Any previously defined retain / persistent vars may be copied to the data structure. In the persistent vars definition, only on line remains in the definition, declaring one instance of the persistent data structure.
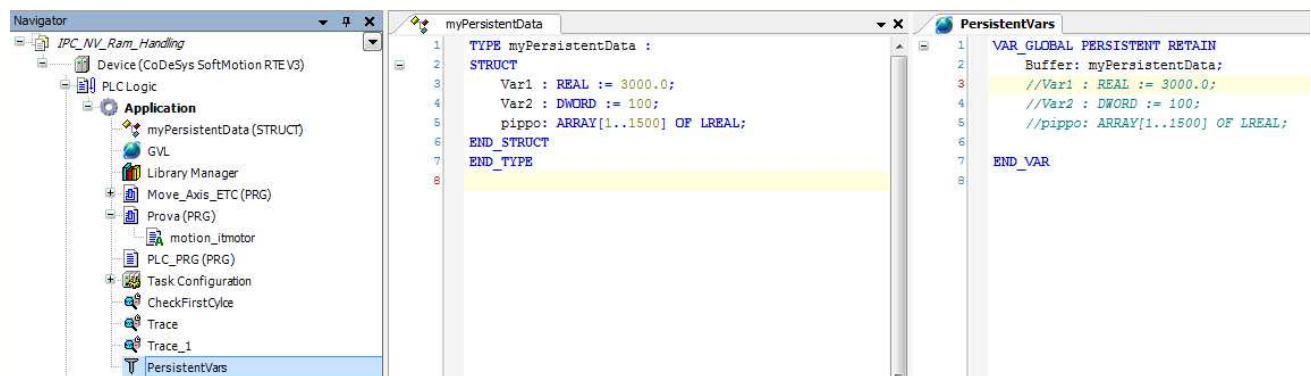
A second instance of the structure is used in the user's code.

The instance in the user's code is the 'working copy' of the persistent data and should be updated in a sensible cycle, depending on the application using a single codeline:

persistentData := UserBuffer;

All changes supposed to be stored in the persistent data should happen in the user buffer using

UserBuffer.Var1 := UserBuffer.Var1 + 1;

Remember to initialize the buffer on program start, like
```
        // copy from NVRam only at the first cycle
        IF NOT FirstCycle THEN
                UserBuffer:=persistentData;
                FirstCycle := TRUE;
        END_IF
```

If any further optimization becomes necessary, it could be sensible to implement a check, whether an update of the non-volatile data is reasonable (because data has changed since the last uptape) or not.

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