

WDF CAN/LIN Driver for Windows 10/11

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Release notes for the WDF (KMDF) based CAN/LIN driver supporting Windows 10 (x86), Windows 10/11 (x64) and Windows 10/11 on ARM64 . The driver releases are organized as packages. A package contains the driver itself, driver related libraries and files for the driver configuration. The package release version is coupled with the version of the device driver. A detailed list which hardware is supported by a WDF driver and a table which files get installed with a driver package can be found at the end of this document.

Note: For security reasons Microsoft enforces the *Driver Package Isolation* which discourages the installation of shared libraries together with a device driver. Starting with V4.3.0 the INF file will no longer support the co-installer for the WDF framework or copy shared libraries to the system !

Revision History

Changes which are considered to be very important are **highlighted**.

Driver Package 4.3.0

*Release date: 2025-11-14

- **Initial support for Windows on ARM64:** Support for the U400 and ESDVCAN device driver for Windows on ARM64 (Requires Windows 10, Version 2004 or later).
- **All drivers/devices:** The referenced KMDF framework is updated to V1.15. As this KMDF framework is part of all Windows 10/11 versions, a KMDF co-installer (DLL) is no longer shipped and/or installed with the device driver.
- **All drivers/devices:** Improved timer accuracy (minimized latency) by using High Resolution Timers.
- **All drivers/devices:** Adapted INF files to changed Microsoft requirement for driver attestation signing. The revised INF files are limited to install just the device driver (binary) and no longer shared libraries.

Driver Package 4.2.2 (Not publicly released)

*Release date: 2025-06-11

- **Support for new devices:** Added support for the XMC-CAN/404-LIN-DIO-IRIG-B-T with one additional LIN-bus interface, General Purpose I/Os and IRIG-B to the C402 driver family.
- **All drivers/devices:** Support to configure the yet unsupported CAN FD arbitration/data phase bitrate combinations 250K/250K and 500K/500K via `canSetBaudrateX()` with mode `NTCAN_BAUDRATE_MODE_INDEX`.
- **All drivers/devices:** Adapted INF files to changed Microsoft requirement for driver attestation signing.
- **C402:** Support for 64-Bit DMA memory.
- **C402:** Fix very unlikely corruption of CAN FD data in combination with an active IRIG-B time reference.
- **Configuration:** Added support to enable/disable indication of 64-Bit DMA memory device capability for supported hardware via driver/system settings expert dialog (32-Bit DMA addresses remain the default).

Driver Package 4.2.1

*Release date: 2025-02-18

- **Support for new devices:** Added support for the CAN/402-FD-LIN-DIO (available as PMC and XMC interface) with two additional LIN-bus interfaces and four General Purpose I/Os to the C402 driver family.
- **Support for new devices:** Added support for the CAN-PCleMiniHS/402-FD.
- **All drivers/devices:** Added support to control *General Purpose Input/Output* ports (which availability is indicated with the new feature flag `NTCAN_FEATURE_GPIO`) via `canIoctl()`. The IO is configured and controlled with `NTCAN_IOCTL_SET_GPIO_CFG` and the current state is returned with `NTCAN_IOCTL_GET_GPIO_CFG`.
- **All drivers/devices:** Added support to control a *Switchable Bus Termination* (which availability is indicated with the new feature flag `NTCAN_FEATURE_PROG_TERM`) via `canIoctl()`. It is enabled/disabled with `NTCAN_IOCTL_SET_TERM_CFG` and the current state is returned with `NTCAN_IOCTL_GET_TERM_CFG`.
- **All drivers/devices:** Fixed counting CAN events as RX data in CAN statistic.
- **All drivers/devices:** Fixed issue that certain *Smart ID Filter* configurations lead to a internal filter which is too permissive.
- **U400:** Added support for *Disable Automatic Retransmission* (DAR) mode on a single frame base with new bit for the 'len' field `NTCAN_DAR` indicated with the feature flag `NTCAN_FEATURE_DAR_FRAME` (Requires an ESDACC firmware of V00.72 or later).
- **C402/U400:** Added support to return the order number in `NTCAN_INFO` which allows a better hardware distinguishability compared to the board string.
- **C402/U400:** Fixed available self-test support not indicated via feature `NTCAN_FEATURE_SELFTEST`.
- **C402/U400:** Fixed invalid timestamps assigned to some CAN events.
- **C402:** Fixed regression introduced with V4.2.0 that CAN autoanswer frames with 0 bytes are internally discarded.
- **C402:** Fixed `canGetBaudrateX()` does not return the flags `NTCAN_BAUDRATE_FLAG_TXP`, `NTCAN_FEATURE_TX_PAUSE` and `NTCAN_FEATURE_DAR` if previously configured via `canSetBaudrateX()`.
- **C402:** New flag `NTCAN_BITRATE_FLAG_TOV` for member `tq_pre_sp` in struct `NTCAN_BITRATE_DETAILS` to indicate an overflow situation for this value.
- **C402:** Fixed LIN TX objects not sent if LIN master is using the same handle.
- **C402:** Fixed LIN RX objects were not updated without a respective previous `linIdAdd()`.
- **C402:** Fixed a potential BSOD if a requested LIN bitrate exceeds the allowed limits.
- **C402:** Fixed invalid calculation of indicated deviation for LIN bitrates.
- **U400:** Fixed BSOD in RTR handling with `DLC > 8`.
- **All drivers/devices:** Increased driver performance and robustness.
- **Configuration:** Added support to indicate the *GPIO* and *PROGTERM* capability of the CAN board in the device manager settings dialog.

Driver Package 4.2.0

*Release date: 2022-12-20

- **Support for new devices:** Added support for the CAN/402-Slot2-LIN Adapter which extend the CAN-PCIe/402-2-FD and CAN-PCI/402-2-FD interfaces with two additional LIN-bus interfaces (Requires an ESDACC firmware of V00.72 or later).
- **C402:** Added support to set/get the *Disable Automatic Retransmission* (DAR) mode behavior individually for re-arbitration and re-transmission, calling *canioctl()* with `NTCAN_IOCTL_SET_DAR_MODE / NTCAN_IOCTL_GET_DAR_MODE` (Requires an ESDACC firmware of V00.73 or later).
- **All drivers/devices:** Resolved a potential issue that deleting Extended Frame Format CAN-IDs from a configured acceptance filter may result in an incorrect filter configuration that does not properly handle all CAN messages which are configured to be discarded.
- **All drivers/devices:** Increased driver performance and robustness.
- **Configuration:** Added support to indicate the *DAR* and *LIN* capability of the CAN controller in the device manager settings dialog.

Driver Package 4.1.0

*Release date: 2022-08-29

- **Support for new devices:** CAN-M.2/402-2-FD is added to the C402 driver family.
- **All drivers/devices:** Microsoft ended the support to allow in-house cross-signing of device driver code. For this reason it is no longer possible for esd to release new or updated device drivers for Windows 7, Windows 8 and Windows 8.1 based systems starting with this driver package.
- **All drivers/devices:** Support for Windows 11.
- **All drivers/devices:** Increased timestamp accuracy.
- **All drivers/devices:** Added support to return internal driver timestamp frequency.
- **All drivers/devices:** Fixed sending timestamped CAN FD messages failed.
- **All drivers/devices:** Fixed NTCAN_IOCTL_GET_TX_MSG returned invalid values.
- **All drivers/devices:** Added support for NTCAN_IOCTL_OBJ_DESTROY_X.
- **All drivers/devices:** No MARK_INTERACTION flag in RX object.
- **All drivers/devices:** The yet unsupported 'msg_lost' field of CAN messages received in *Rx Object Mode* now contains a revolving counter which gets increased each time the object is updated.
- **All drivers/devices:** Fixed endless loop calling *canIoctl()* with NTCAN_IOCTL_TX_OBJ_SCHEDULE_STOP with a scheduling set containing identical Tx timestamps.
- **All drivers/devices:** Added support to decode the error counters embedded in the event NTCAN_EV_CAN_ERROR in *canFormatEvent()*.
- **C402/U400:** Fixed erroneous configuration of bitrates < 50 KBit/s for CAN FD capable devices.
- **C402/U400:** Allow 1000 KBit/s for arbitration and data phase bitrate for CAN FD capable devices.
- **C402:** Added support to add a small delay after each frame transmission in the new *TX Pause* mode enabled with the new flag NTCAN_BAUDRATE_FLAG_TXP for *canSetBaudrateX()* indicated with the feature flag NTCAN_FEATURE_TX_PAUSE (Requires an ESDACC firmware of V00.72 or later).
- **C402:** Added support for *Disable Automatic Retransmission* (DAR) mode on a single frame base with new bit for the 'len' field NTCAN_DAR indicated with the feature flag NTCAN_FEATURE_DAR_FRAME (Requires an ESDACC firmware of V00.72 or later).
- **C402:** Added support to configure the built-in TDC (glitch) filter for CAN FD capable devices via *canSetBaudrateX()* (Requires an ESDACC firmware of V00.72 or later).
- **C400:** Updated ESDACC core (V 00.72).
- **All drivers/devices:** Fixed crash in *canFormatEvent()* with NTCAN libraries before V5.0.9 if the NTCAN_DAR bit is set.
- **All drivers/devices:** Increased driver performance and robustness.
- **Configuration:** Added support to indicate the *Self-test* and *Tx Pause* capability of the CAN controller in the device manager settings dialog.

Driver Package 4.0.5

Release date: 2019-10-08

- **All drivers/devices:** All device driver binaries are now digitally signed with our SHA2 (EV) code signing certificate and countersigned by Microsoft, so it supports the strict driver signing requirements for Windows 10. As a consequence Windows XP and Windows Vista, which do not support SHA2 kernel mode code driver signatures, are no longer supported from this device driver release on.
- **Support for new devices:** CAN-PCIe/402-Mini-FD, CPCI-CAN/402-FD and CPCIs-serial-CAN/402-4-FDX are added to C402 driver family (x86/x64).
- **All drivers/devices:** Fixed timestamps are not always applied correctly to CAN events.
- **All drivers/devices:** Increased driver performance and robustness.

Driver Package 4.0.4 (Not publicly released)

Release date: 2018-08-01

- **Support for new devices:** XMC-CAN/402-FD and PMC-CAN/402-FD are added to C402 driver family (x86/x64).
- **Support for new devices:** All devices of the C402 family (x86/x64) as Classical CAN as well as CAN FD version are now supported by this device driver which supersedes the 3.x.y WDM driver for the Classical CAN C402 devices.
- **All drivers/devices:** Increased timestamp accuracy.
- **All drivers/devices:** Increased driver performance and robustness.
- **C402/U400:** Fixed sending timestamped CAN FD messages failed.

Driver Package 4.0.3

Release date: 2017-01-25

- **All drivers/devices:** CAN-PCIe/402-FD added to C402 driver family (x86/x64). Classical CAN C402 support removed for the time being.
- **Support for new devices:** CAN-USB/400-FD and CAN-USB/400-FD IRIG-B added to U400 driver family (x86/x64).
- **All drivers/devices:** Complete support for the CAN FD enabled NTCAN-API.
- **All drivers/devices:** Fixed driver returns NTCAN_ERROR_LOM instead of NTCAN_ERROR_NO_BAUD if no bit rate is configured.
- **All drivers/devices:** Driver disables the CAN controller before the system changes from S0 into a lower power state and does not restore the bit rate after return to S0 to prevent errors on the CAN bus if the configuration has changed in the meantime.
- **All drivers/devices:** The NTCAN_INFO structure now contains the number of open handles.
- **C400/C402/U400:** Fixed situation where an invalid bit rate is reported.
- **C400/C402/U400:** Fixed internal error situation which might cause a hanging process that could not be terminated.
- **C400/C402/U400:** Fixed possible internal overload situation in situations of very high bus load.
- **VCAN:** Device driver now emulates a CAN FD enabled ESDACC.
- **Configuration:** Added support to indicate the triple sampling capability of the CAN controller in the device manager settings dialog.

Driver Package 4.0.2

Release date: 2016-01-26

- **All drivers/devices:** CAN-PCI/402 and CPCISerial-CAN/402 added to C402 driver family (x86/x64).
- **Support for new devices:** Virtual device driver ESDVCAN (no hardware) emulating a Classical CAN SJA1000 CAN controller.
- **All drivers/devices:** Support for Windows 10.
- **All drivers/devices:** Extended the indication of error situations in the event log during startup.
- **All drivers/devices:** Internal performance improvements.
- **All drivers/devices:** Fixed x64 version of NTCAN library could not be used on Windows XP x64 because of a missing symbol.
- **C400:** Updated ESDACC core (V 00.61).
- **C400/C402:** Fixed issues where timestamps are not be applied correctly to CAN messages and events in error situations.
- **C400/C402:** Fixed CAN driver aborted a failed Tx I/O request if the CAN controller is in *error passive* state.
- **C400:** Implicit CAN clock divider in BTR pre-scaler removed. This change is handled internally backward compatible for exiting applications.
- **C400:** Fixed issues handling bus error situations.
- **C400:** Fixed issue with high speed scheduling configurations.
- **U400:** Internal message handling completely rewritten to increase performance and to deal with situations where messages might get lost due to high DPC latencies caused by other device drivers.
- **U400:** Support for a backward compatible reduction up to 30% of the USB busload (requires FW V00.62) which in turn leads to a reduced CPU load.
- **U400:** Fixed wrong tick frequency in IRIG-B mode after resume from standby/hibernate.
- **U400:** Fixed several issues after resume from standby/hibernate.
- **U400:** Fixed a rare BSOD if the device is connected to a powered USB hub while the PC is rebooted.
- **PMC-CAN/400:** Added support for 1 PPS signal.
- **Configuration:** Improved UI of device manager settings dialog and the adaption to a configured UI theme.
- **Configuration:** Added tool tips for configuration/settings options.
- **Configuration:** Added support for a driver/system settings expert dialog to configure the thread priority of the CAN message handler, decrease the system tick period and enable driver trace messages.
- **Configuration:** Added support to start the event viewer with a driver specific filtered view by double-click on a fail reason code.

Driver Package 4.0.0

Release date: 2015-06-02

- **All drivers/devices:** Initial release as WDF based driver with an identical functional range as the latest WDM based driver for this CAN hardware.
- **All drivers/devices:** Drivers are based on the KMDF framework 1.9 which requires Windows XP or later to run. A respective KMDF co-installer (DLL) is shipped and optionally installed with the device driver in case it is not already installed on the target.
- **All drivers/devices:** All drivers support power management (in comparison to the WDM based V3.x.y CAN drivers).
- **All drivers/devices:** The drivers are ready to process CAN messages with up to 64 bytes for the forthcoming CAN FD support.
- **All drivers/devices:** The main internal CAN message processing is performed (in comparison to the WDM based CAN drivers) on `PASSIVE_LEVEL` instead on the standard `DPC_LEVEL`. This approach reduces the overall system latency.
- **C400/C402:** Initial release.
- **C402:** The driver requires an ESDACC firmware of V00.53 or later.

Supported CAN hardware:

Several driver support more than one esd CAN device. The following table gives an overview on how many and which different CAN devices are supported by a single CAN family device driver.

Driver Family Name	Supported CAN Hardware	Driver Binary (x86/x64)
C400	CAN-PCI/400 CPCI-CAN/400 CAN-PCIe/400 PMC-CAN/400	c400k.sys c400ak.sys
C402	CAN-PCIe/402 CAN-PCI/402 CAN-PCIe/402-Mini CPCI-CAN/402 CPCIserial-CAN/402-2 CAN-PCIe/402-FD CAN-PCI/402-FD PMC-CAN/402-4-FD XMC-CAN/402-4-FD CAN-PCIe/402-Mini-FD CPCI-CAN/402-FD CPCIserial-CAN/402-4-FD CAN-M.2/402-2-FD CAN-PCIeMiniHS/402 PMC-CAN/402-FD-LIN-DIO XMC-CAN/402-FD-LIN-DIO XMC-CAN/404-LIN-DIO-IRIG-B-T	c402k.sys c402ak.sys
U400	CAN-USB/400 CAN-USB/400 IRIG-B CAN-USB/400-FD CAN-USB/400-FD IRIG-B	u400k.sys u400ak.sys u400xk.sys
VCAN	Virtual CAN Device Driver (No hardware)	esdvcank.sys esdvcanak.sys esdvcanxk.sys

Package content

The following table gives an overview which version of the binaries is distributed in a released driver package. As driver packages for the different CAN driver families are not released at the same time it is possible that a package with a newer release date contains a newer version of a library. In that case the version is written in the table below as x.y.[a|b] to indicate that one package was released with version x.y.a and another package with x.y.b of the library. A package might also be re-released with the unchanged device driver and just updated libraries.

Package/ File	4.1.0	4.2.0	4.2.1	4.2.2	4.3.0	Description
c400k.sys	4.1.0	-	-	-	-	C400 driver (x86)
c402k.sys	4.1.0	4.2.0	4.2.1	4.2.2	-	C402 driver (x86)
esdvcank.sys	4.1.0	4.2.0	4.2.1	-	-	ESDVCAN driver (x86)
u400k.sys	4.1.0	-	4.2.1	-	-	U400 driver (x86)
c400ak.sys	4.1.0	-	-	-	-	C400 driver (x64)
c402ak.sys	4.1.0	4.2.0	4.2.1	4.2.2	-	C402 driver (x64)
esdvcanak.sys	4.1.0	4.2.0	4.2.1	-	-	VCAN driver (x64)
u400ak.sys	4.1.0	-	4.2.1	-	-	U400 driver (x64)
esdvcanxk.sys	-	-	-	-	4.3.0	VCAN driver (ARM64)
u400xk.sys	-	-	-	-	4.3.0	U400 driver (ARM64)
ntcan.dll	5.0.[8 9]	5.1.1	5.1.4	5.1.6	-	NTCAN library (x86/x64/ARM64)
canui32.dll	1.6.[6 7]	1.6.8	1.6.9	1.7.0	-	Property Sheet (x86)
calcan32.dll	2.6.11	2.6.13	2.7.5	2.7.5	-	CANopen SDO Support (x86)
canui64.dll	1.6.[6 7]	1.6.8	1.6.9	1.7.0	-	Property Sheet (x64/ARM64)
calcan64.dll	2.6.11	2.6.13	2.7.5	2.7.5	.	CANopen SDO Support (x64/ARM64)

Package/ File	4.0.0	4.0.2	4.0.3	4.0.4	4.0.5	Description
c400k.sys	4.0.0	4.0.2	4.0.3	-	-	C400 driver (x86)
c402k.sys	4.0.0	4.0.2	4.0.3	-	4.0.5	C402 driver (x86)
esdvcank.sys	-	4.0.2	4.0.3	-	-	VCAN driver (x86)
u400k.sys	4.0.0	4.0.2	4.0.3	-	4.0.5	U400 driver (x86)
c400ak.sys	4.0.0	4.0.2	4.0.3	-	-	C400 driver (x64)
c402ak.sys	4.0.0	4.0.2	4.0.3	4.0.4	4.0.5	C402 driver (x64)
esdvcanak.sys	-	4.0.2	4.0.3	-	-	VCAN driver (x64)
u400ak.sys	4.0.0	4.0.2	4.0.3	-	4.0.5	U400 driver (x64)
ntcan.dll	4.8.7	4.8.8	5.0.1	5.0.1	5.0.[5 6]	NTCAN library(x86/x64/ARM64)
canui32.dll	1.5.[0 1]	1.6.0	1.6.1	-	1.6.[3 4]	Property Sheet (x86)
calcan32.dll	2.6.3	2.6.3	2.6.4	2.6.4	2.6.11	CANopen SDO Support (x86)
canui64.dll	1.5.[0 1]	1.6.0	1.6.1	1.6.1	1.6.[3 4]	Property Sheet (x64)
calcan64.dll	2.6.3	2.6.3	2.6.4	2.6.4	2.6.11	CANopen SDO Support (x64)