



# Documentation for BusTools/1553-API Version 8.28

## Introduction

This is the distribution for BusTools/1553-API Version 8.28. The different operating system distributions will contain the necessary drivers, an Application Programming Interface (API) library provided as source code and for Windows® a dynamic library, and example code for the BusTools/1553-API family of products. The following operating system versions are supported with this version of the API:

- 64-bit/32-bit Windows 8, 8.1, 10, and Windows Server 2012 R1/R2
- 64-bit/32-bit Windows 7 and Windows Server 2008 R2 (SP1 and KB3033929 are required for each)
- 32-bit Windows XP (uses an unsigned driver)
- Linux kernels 2.4.x, 2.6.x, 3.x, 4.x and 5.x
- VxWorks 6.x (support for DKM) and 7 (support for DKM and RTP)
- Integrity 5.10 and 11.0.4
- LynxOS v4 and v5 (PPC only)

The following products are supported with this version of the API: R15-USB, R15-USB-MON, R15-MPCIE, RAR15(X/XF/XT), RAR15-XMC-(IT/FIO/XT), RPCIE-1553, R15-EC, R15-LPCIE, RXMC2-1553, RXMC-1553, QPM-1553, QPCX-1553, QPCI-1553, QCP-1553, QPMC-1553 and Q104-1553-P. The RQVME2-1553, QVME-1553 and PCCARD-D1553 are supported but only on a 32-bit operating system.

For any questions on non-supported operating systems, non-listed products or other questions contact technical support with the contact information at the end of this document.

## Firmware Version 6 Changes Affecting Existing Applications

- Starting with BusTools/API-1553 v8.00, all time-tags transitioned from 48-bits having a 1 microsecond resolution to 64-bits having a 1 nanosecond resolution.
- Many on-board structures have changed. If you are directly reading data from these structures you will need to review these changes and update your code to access the correct addresses.
- Bus Monitor structures changed from fixed sized to variable size depending on the number of data words. This change has eliminated the routines BusTools\_BM\_MessageGetAddr and BusTools\_BM\_MessageGetid from the API. If your code depends on these functions you will need to redesign based on variable size BM buffers.
- The Bus Controller on-board structures have changed to accommodate multiple BC data buffers for each message. While this change is transparent to applications using existing Bus Controller functions; if you are reading data directly from these structures, your application must be altered to support multiple buffers.
- The structure and size of the interrupt queue was modified to contain two-word entries, and interrupt mode and message address, and the queue length was increased to 512 entries.
- Discrete channels are now shifted in the bit-wise register, where discrete 1 is assigned to bit 1 instead of bit 0 and so forth.

## Scope

This document covers the API software only. You should refer to the following documents for information on supported boards, kernels and prerequisites, and detailed installation and uninstall instructions.

INSTALL.PDF	Install, uninstall and configuration verification procedures for all supported Windows operating systems.
LINUX_INSTALL.TXT	Install, uninstall and configuration verification procedures for Linux.
LINUX_SUPPORT.TXT	Information for supported kernels, architectures and dependences.
INTEGRITY_INSTALL_PDF	Integrity installation instructions
LYNXOS_4_XXX_INSTALL_BT1553.TXT	Install, uninstall and configuration verification procedures for LynxOS Versions 4 and 5, where XXX = PPC or X86.
LYNXOS_5_XXX_INSTALL_BT1553.TXT	
BUSTOOLS1553-API VXWORKS USER MANUAL.PDF	VxWorks installation instructions
READ-VME-VXI.PDF	Documentation for VME/VXI 1553 product installation using the National Instruments PCI-MXI-2 interface.

## Development Notes

- The Windows distribution provides API dynamic libraries compiled with Visual Studio 2008 (64-bit/32-bit) and Visual Studio 6 (32-bit). It also provides the source to build the examples and the API source with object files (64-bit/32-bit compiled with Visual Studio 2008) to build the API library.
- The Linux distribution provides the source/makefiles to build the drivers, the 64-bit/32bit low-level/API shared libraries, and examples. The USB low-level 64-bit and 32-bit static libraries were compiled with GCC 4.8.3 and are dependent on the libUSB package starting with version 1.0.19.
- The VxWorks distribution provides the source/components to build the drivers, and the source for the API and examples.
- The Integrity distribution provides the source to build the driver, the API, and examples.
- The LynxOS distributions provides the source/makefiles to build the driver, the API static library, and examples.

## Visual Studio .Net 2008

For the convenience of users with Visual Studio 2008 or later, projects are included to aid using the .NET compiler and development environment. For C# development, BusTools/1553-API specifically supports the .NET Framework with a managed C# API library.

## BusTools/1553-API Revision Information

### Release Notes - Version 8.28 – December 30, 2019

1. Updated the Windows distribution to CEI-Install v4.91 which exclusively uses SHA-256 for signing the driver which only supports 32-bit/64-bit Windows 7/2008R2 (SP1 and KB3033929 required), 8, 8.1, Windows Server 2012 R1/R2 and 10. To support 32-bit Windows XP the distribution uses an unsigned driver.
2. Updated the Linux distribution to include Linux support package v1.36 which provides support for Linux kernel 5.x.
3. Updated the VxWorks distribution to include the VxWorks support package v4.01 which provides RTP support with the VxBus Gen 2 device driver.
4. Modified BusTools\_GetValidDiscrete to return API\_HARDWARE\_NOSUPPORT for boards with firmware v4/5.
5. Fixed API\_Init to continue when API\_CONT\_ON\_MEM\_FAIL flag is set.
6. Modified API\_Init when clearing the FW v6 hardware control register to preserve the RT31Bcst and sa32MC bits for HW RT address.
7. Modified BusTools\_ReadBoardTemp to increase the delay between writing and reading of the temp control register.
8. Fixed BusTools\_BC\_Checksum1760 when word count is 0.
9. Fixed BusTools\_GetDevInfo to use DEVINFO\_T for VME boards.
10. Modified vbtReadVMEConfigRegs and vbtWriteVMEConfigRegs to support Big Endian.
11. Fixed BusTools\_BIT\_TwoBoardWrap to execute two iterations of the test and added time delay waiting for the BC messages to transact.
12. Modified BusTools\_BIT\_CableWrap by adding a time delay waiting for the BC messages to transact.
13. Fixed v6\_RT\_AbufWrite when writing to the RT broadcast control buffers.
14. Updated with the latest version of "MIL-STD-1553 Hardware Installation and Reference Manual" and "UCA32 LPU Reference Manual" into the distributions.
15. Updated the API source in the LynxOS and Integrity distributions.

### Release Notes - Version 8.24A – June 21, 2019

1. Updated the "Hardware Platform Selection" section of the Windows installer to add a Thunderbolt™ option which allows selection of QPM-1553, RAR15XF, or RXMC-1553 on a Thunderbolt expansion adapter.
2. Updated the RAR15 device type selection in the Windows installer to include all associated device types (RAR15-XMC-XT, RAR15-XMC-IT, RAR15-XMC-FIO, RAR15X, RAR15XF, and RAR15XXT).
3. Added "TB3-TO-CMC-LP\_Users\_Guide.pdf", the User's Guide for Abaco's Thunderbolt 3 expansion adapter which contains important information about operating a QPM-1553-TB, RXMC-1553-TB, or RAR15XF-TB in a Windows Thunderbolt environment.
4. Integrated the latest version of "MIL-STD-1553 Hardware Installation and Reference Manual.pdf" into the Windows distribution.
5. Integrated the latest version of "UCA32 LPU Reference Manual.pdf" into the Windows distribution.
6. Updated the VxWorks distribution to v8.22A, which includes an updated CDF file for the VxBus Gen 2 driver.
7. No change to any API library source/binaries or example source/binaries since API v8.22.
8. All documentation references to API v8.22 within this distribution apply to the current v8.24A release as well.

**Release Notes - Version 8.24 – November 1, 2018**

1. Updated the Windows 10 driver packages and low-level interface libraries to resolve an intermittent crash issue on certain computers.
2. Added hardware interrupt support for 32-bit programs under 64-bit Windows 10.
3. Updated the Linux distribution to include the latest Linux driver/low-level support package.
4. No change to any API library source/binaries or example source/binaries since API v8.22 (only drivers and low-level interface libraries were updated for this release).

**Release Notes - Version 8.22 – February 23, 2018**

16. Added support for VxWorks 7 with the VxBus Gen2 Device Driver.
17. Fixed support for 64-bit real-time operating systems.

**Release Notes - Version 8.20 – July 19, 2017**

1. Added the API support for R15-USB-MON product.

**Release Notes - Version 8.18 – December 2, 2016**

1. Added the API support for R15-MPCie board.
2. Updated the BusTools\_RT\_AbufWrite() to improve performance.
3. Added Integrity X86 support.

**Release Notes - Version 8.16 – January 22, 2016**

1. Added the support for 32-bit and 64-bit Windows 8.0, 8.1, Server 2012 (R1 and R2), and Window 10.
2. Removed support for Window 2000.
3. Added the code to clear aperiodic registers for the BC\_Start supporting firmware version 6.
4. Fixed the BusTools\_BC\_ReadLastMessage, BusTools\_RT\_ReadLastMessage and BusTools\_BM\_ReadLastMessage with wrong size of the IQ\_block for firmware version 6.
5. Fixed end of file condition handling and initialized the variables of the playback function for both firmware version 5 and 6 supports.
6. Fixed the VxWorks Driver to support both 1553 and ARINC hardware interrupts.
7. Important note for Windows 10 users: Certain Microsoft processes may prevent you from launching our installer for a period of time after logging in to your computer. When running our installer shortly after logging in, you may notice our installer appears briefly, and then disappears completely for a period of time, after which it automatically appears again, starts up, and functions normally. At the time of this release, delays of two minutes or less have been commonly observed (although 5-7 minute delays were observed in some cases). There are currently no workarounds available to prevent this behavior, although disabling OneDrive has been shown to decrease the installer startup delay in some cases.
8. Important note for Windows users: After plugging in a new card and booting up, a subsequent reboot may be required on some systems in order for Windows to detect the new card. If you add a card to your system and it is not detected after booting up, reboot the system to complete installation.

**Release Notes - Version 8.14 – April 22, 2015**

1. Added a set of API functions: BusTools\_RT\_MessageBufferNext, BusTools\_FirmwareReload, BusTools\_FlashLogRead, BusTools\_FlashLogWrite, BusTools\_FlashLogErase
2. Fixed the BC rep\_rate and status to flips for the big endian processors.
3. Fixed BusTools\_RT\_CbufRead address error from vbtReadRAM32 to vbtReadRelRAM32.
4. Fixed vbtReadBMRAM32 to use RAM\_ADDR(cardnum,bmaddr).
5. Added to check hardware interrupt in the v6\_BM\_ReadLastMessageBlock.
6. Changed v6\_BM\_Init to handle disabled h/w interrupts.

7. Changed api\_int\_fifo structure from the BT\_FIFO reserved to int\_status in busapi.h
8. Updated QuikView1553
9. Added C# .NET example to start menu
10. Removed VB and CVI from start menu
11. Fixed CEI\_INTEGRITY\_INTERRUPT\_FUNCTION.c to use semaphore instead of connection
12. Corrected installation issue with VME boards
13. Added new BC function BusTools\_DataBufferWrite for firmware version 6.
14. Added dump of user defined memory

#### **Release Notes - Version 8.12 – 21 February 2014**

1. Changed API\_BC\_MBUF to add new parameter, next\_branch\_addr.
2. BusTools\_BC\_MessageRead returns next\_branch\_addr as part of the API\_BC\_MBUF for v6.03 firmware on conditional branches.
3. Changed BusTools\_BM\_Init to allow disabling of hardware interrupts.
4. Adds new suite of example programs.
5. Test Config is no longer supported or included in the distribution.
6. Channel sharing works for both v4/5 and v6 boards.
7. Updated VxWorks Interrupt processing to work on all channels.
8. BusTools\_ReadBoardTemp adds support for RAR15-XMC-FIO.
9. The #define for MAX\_BTA was moved to each target block in target\_defines.h. For Window MAX\_BTA is now 64.
10. The API\_INT\_FIFO now stores the interrupt status for the message in the “reserved” field.
11. Added support the R15-PMC.
12. Functions BusTools\_V6\_SetDiscreteOut, BusTools\_V6\_GetDiscreteOut and BusTools\_SetV6DiffTrigOut are not needed and were removed.

#### **Release Notes - Version 8.08 – 13 June 2013**

1. Added V6 support for most boards
2. Fix a variety bugs

#### **Release Notes - Version 8.06 – 24 October 2012**

1. Added support for RAR15-XMC-XT
2. Added new function for V6.01 BusTools\_GetValidDiscrete that return the valid discrete channels
3. Added functions BusTools\_BC\_SelectBufferRead and BusTools\_BC\_SelectBufferUpdate read specific BC data buffer when in multiple BC buffer mode.
4. Added function BusTools\_MemoryAvailable to return the amount of unused RAM for a channel.
5. Added PI\_TTD\_RELM\_NS, API\_TTD\_IRIG\_NS, API\_TTD\_DATE\_NS to specify nanosecond time tag resolution on calls the BusTools\_TimeGetString

#### **Release Notes - Version 8.00 – 24 May 2012**

1. Add support for R15-USB.
2. Combine support F/W v5.x (and earlier) and v6.0 into single API
3. New v6 Bus Monitor design.
4. New v6 Bus Controller design.
5. New v6 interrupt queue design.
6. 64-bit time tags with either micro- or nano-seconds resolution
7. New Bus Controller functions for multiple BC data buffers.
8. New interrupt events EVENT\_BM\_OVRFL, EVENT\_BC\_BSY\_OVFL, EVENT\_HP\_MF\_OVFL, EVENT\_LP\_MF\_OVFL.

## Contact Information

If you have any questions or need technical information, please contact:

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## Additional Resources

For more information, please visit the Abaco Systems website at:

[www.abaco.com](http://www.abaco.com)