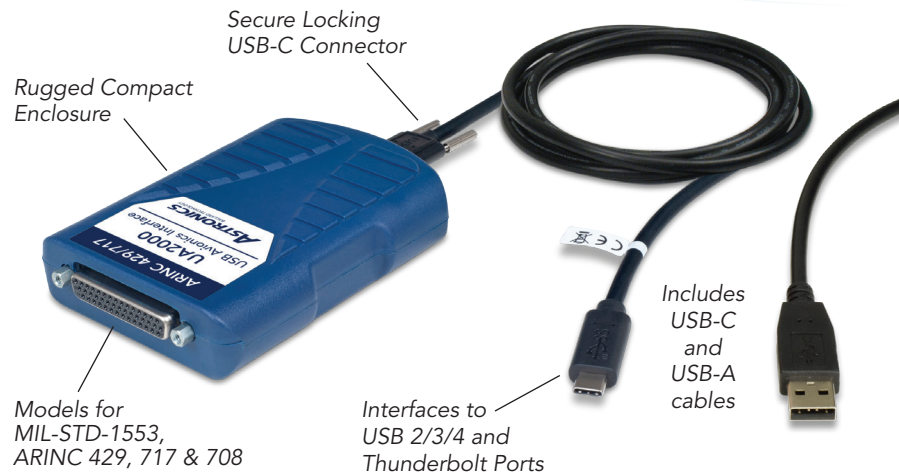# UA2000

Avionics Interfaces for SuperSpeed USB 3.1

These pocket-sized USB adapters are the easy and portable way to interface your computer to avionics databuses including: MIL-STD-1553, ARINC 429, ARINC 708, ARINC 717, and Discrete I/O. The UA2000 enables computers to communicate with, simulate, test, and monitor avionics equipment and systems.

Secure Locking USB-C Connector

Rugged Compact Enclosure

Includes USB-C and USB-A cables

Models for MIL-STD-1553, ARINC 429, 717 & 708

Interfaces to USB 2/3/4 and Thunderbolt Ports

The Best Just Got Better

Astronics Ballard Technology introduced our game-changing USB interfaces over 10 years ago. Since that time, these reliable and proven databus adapters have become the favorite avionics test tool for military and commercial customers around the world. The UA2000 family builds on that success with an all-new USB 3.1 design that will serve your interface needs for years to come.

The New Standard

The UA2000 is ready for today and for tomorrow. As a functional replacement for our first generation USB products, you can readily interchange them with your existing units and current software with no application modification typically required. The included USB-A cable makes that easy. As the need arises, simply switch to the USB-C cable for native connection to USB 3, 4 and Thunderbolt to operate flawlessly with the latest computer models available now and in the future.

Full-Featured Software

CoPilot® software, available as an option with special bundled pricing, provides easy-to-use, interactive tools for databus test, analysis, and simulation. CoPilot simplifies project development and provides added productivity through virtual instrument displays, flexible monitoring & analysis tools, and a powerful scripting engine.

The UA2000 includes our universal BTIDriver™ API, allowing you to quickly develop your own software applications. With only a few function calls, your program can operate the USB hardware and process messages to and from the avionics databuses. Functions include routines for transmitting, receiving, scheduling, recording, time-tagging, and manipulating data. With BTIDriver, application code migrates seamlessly to and from other Ballard devices, reducing development time and costs.
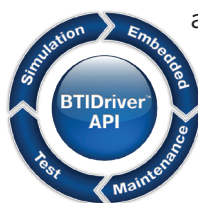
KEY FEATURES

- Interface USB to avionics databus protocols
- Small, portable, and rugged
- Easy Plug and Play installation
- Compatible with USB 2, USB 3, USB 4, and Thunderbolt™ ports
- Available Protocols
  - MIL-STD-1553
  - ARINC 429
  - ARINC 717
  - ARINC 429 & 717
  - ARINC 708
- 8 Avionics Discrete I/O
- IRIG A/B PWM and AM
- 64 MB Data Memory
- FCC, CE and RoHS compliant
- 3-year limited warranty standard

The UA2000 Family includes models for these avionics protocols:

MIL-STD-1553 Series

- 1 or 2 dual-redundant channels
- Full MIL-STD-1553 functionality
  - BC, RT, and/or Monitor
  - Single-function, Multi-function, and Bus Monitor-only models available
  - Error injection (Multi-function)
  - LEDs indicate bus traffic and errors

These models enable computers to interface with MIL-STD-1553 equipment and systems. Depending upon the hardware model, each 1553 channel may be either single-function, multi-function, or bus monitor only.

Single-function channels can be configured in software as either a Bus Controller (BC), a Bus Monitor (BM), or up to 32 Remote Terminals (RTs).

Multi-function channels have protocol error injection capability and can simultaneously be a BC, BM, and up to 32 RTs.

ARINC 429 & 717 Series

- Up to 16 ARINC 429 channels (12R4T)
- Up to 4 ARINC 717 channels (2R2T)
- Full ARINC 429 functionality
  - Handles periodic and transfer protocols
  - Message filters and schedules
  - Standard and non-standard bit rates
  - Error detection and selective injection
  - Variety of syncs and triggers
  - Several message buffering schemes
  - ARINC 575 support

These models enable computers to interface with ARINC 429 and 717 equipment and systems. Models are available with ARINC 429, ARINC 717, or a combination of both. They also provide useful non-standard functionality, such as a range of data rates, use of parity as data, and error injection.

ARINC 708 Series

- Up to 4 channels (2R2T)
- Full ARINC 708 functionality
  - Supports standard ARINC 708 and custom weather radar databuses
  - Receive, Transmit, and Monitor
  - Direct coupled channels per 708
  - Strappable on-board termination

These models enable computers to interface with ARINC 708 and similar weather radar display databuses. They feature extensive functionality for testing and simulating weather radar systems, CDUs (Control-Display Units), and T-R (Transmit-Receive) units. They support simultaneous operation on all available channels and provide software-selectable word lengths and pre-sync pulses for custom protocols that deviate from ARINC 708.

Ordering Information

Protocols & Channels	Hardware & CoPilot [1]	Hardware Only
MIL-STD-1553 (2 Multi-function)	CP-UA2133	UA2133
MIL-STD-1553 (1 Multi-function)	CP-UA2130	UA2130
MIL-STD-1553 (2 Single-function)	CP-UA2122	UA2122
MIL-STD-1553 (1 Single-function)	CP-UA2120	UA2120
MIL-STD-1553 (1 Multi-function, 1 Bus Monitor)	CP-UA2131	UA2131
MIL-STD-1553 (1 Single-function, 1 Bus Monitor)	CP-UA2121	UA2121
MIL-STD-1553 (2 Bus Monitor)	CP-UA2111	UA2111
MIL-STD-1553 (1 Bus Monitor)	CP-UA2110	UA2110
MIL-STD-1553 (4 Bus Monitor) [2]	CP-UA2140	UA2140
ARINC 429 (12R4T)	CP-UA2440	UA2440
ARINC 429 (8R4T)	CP-UA2430	UA2430
ARINC 429 (4R2T)	CP-UA2420	UA2420
ARINC 429 (1R1T)	CP-UA2410	UA2410
ARINC 429 (8R4T) and ARINC 717 (2R2T)	CP-UA2431	UA2431
ARINC 717 (2R2T)	CP-UA2401	UA2401
ARINC 708 (2R2T)	CP-UA2720	UA2720
ARINC 708 (1R1T)	CP-UA2710	UA2710

Notes:

1 - Includes optional CoPilot Test & Analysis Software at special bundled pricing

2 - Channels are non-redundant

(nRnT) - number of Receive/Transmit channels

Accessories Included (except /NE models)

1553 transformer-coupled I/O cable with PL-75 connectors (3 ft) - MIL-STD-1553 models only
USB-C and USB-A cables with screw-locks (5 ft)
Mating HD44P D-Sub I/O connector
Manuals (digital download) and software CD

UA2000 Options

Standard Blue Case

UA2000 interfaces come with a blue case as standard.

Flight Test Orange Case

UA2000 interfaces can be ordered with an optional high-visibility orange case for flight test use.

How to Order Options

To order, add the appropriate suffix to the part number. **Example: CP-UA2133/FTO**

/FTO	Flight Test Orange case
/NE	No Enclosure, Printed Circuit Board Assembly only, for embedded use
/FXY	Conformal coating (Parylene)

MIL-STD-1553 Features

All channels dual redundant – Bus A & B
Transformer and direct coupling
Jumper for direct coupled termination

Bus Controller

Automatic or custom scheduling
Programmable: frame times, intermessage gaps, conditional retries, and branches
Run modes: continuous, loop N times, single-step
Start on software or external trigger
Aperiodic and one-shot messages
Sync out on all or selected messages
Programmable BC timeout values

Remote Terminal

Multi-terminal simulation (32 RTs)
Configurable 1553A or B response time
Programmable response time and status word bits
Auto Busy Bit option
Support for all 1553B mode codes
Selectable mode code subaddress
Enable broadcast on a per-RT basis
RT 31 as broadcast or valid RT
Configure/legalize selected SA/MCs
RT "Shadow Monitor" mode

Bus Monitor

Capture all 1553 traffic or filter by RT/SA
Capture and time-tag discrete I/O
Sequential record includes: command/status/data words, time-tag, errors, bus, and response time(s)
Efficient DMA monitor pipe to host

Message Data

Comprehensive error detection
Buffering schemes facilitate data handling:
- Single buffers (default)
- Circular lists transmit a repeated pattern
- FIFO list buffers for sequential data
Data initialization options
Track activity by min, max, elapsed time

Error Injection (Multi-function only)

Trigger from software or an external signal
Inject errors in all or tagged messages
Parity, bit count, inverted sync, Manchester, gap, and word count (relative or absolute)

ARINC 429 Features

Numeric and file transfer protocols
Standard and custom bit rates
- 12.5 and 100 kb/s standard
- Configurable per channel
- Wide range of custom bit rates
Set parity per channel (odd/even/data)
Sync output on all or selected messages
Internal self-test bus

Message Data

Buffering schemes facilitate data handling:
- Current value buffers (default)
- Circular lists transmit a repeated pattern
- FIFO list buffers for sequential data
- Asynchronous list buffers
Message record contains the ARINC word, time-tag, channel, speed, error data, min/max elapsed time, hit counter, and/or gap time

Receivers

Automatic bit rate detection
Receive message filtering (Label/SDI)
Current value and list buffers
Error detection: gap, timing, length, parity
Log and/or interrupt on errors

Transmitters

Single, scheduled, and asynchronous messages
Tag messages for error injection, sync out, and logging/interrupts
Error injection: parity, inter-message gap
Externally trigger all or selected messages

Transmit Schedules

Schedules: automatic or explicit
Automatic based on repetition rates
Contain messages (labels), gaps, and controls for pausing, halting, pulsing discrete outputs, and event logging
Modes: Continuous or single step for debugging

ARINC 717 Features

Software selectable biphase/bipolar
Transmit and receive
Subframe and superframe support
64, 128, 256, 512, 1024, 2048, 4096, 8192 words per second

ARINC 708 Features

Standard ARINC 708 data
Internal self-test bus
Each channel switchable between 2 buses
Receive and transmit concurrently
Syncs – beginning and ending
1600 bits per word
- 64-bit header
- 512 3-bit range bins
Custom data options
Pre-sync pulses
Variable word length
- 1 to 1856 bits per word
Configurable bit order
- LSB or MSB first
Strappable bus termination
ARINC 453 characteristics

ARINC 708 Receive Channels

Wide frequency tolerance
Message record includes: data, bit-count, time-tag, channel number, detected errors
Error detection and logging:
- Sync, Manchester, Long word, Short word

ARINC 708 Transmit Channels

Configurable transmit repetition rate
Multiple message frames
Flexible frame triggering
Playback from file

Standard Features

All models share these standard features unless specified:

Interrupts/Logging

Poll or use interrupts

Configurable event log

Programmable event logging/interrupts from messages, schedules, and buffers

Sequential Monitor

A time-tagged record of selected activity on MIL-STD-1553, ARINC 429, 717, 708, and discrete I/O

Sequential record of selected activity

Filter by channel and other parameters

Efficient DMA monitor pipe to host

Avionics Discrete I/O

8 programmable inputs/outputs

Can be used as syncs and triggers

Type: Open/Gnd, 35 VDC (max)

Output: 200 mA (max), self monitoring, inductive load protected

Log transitions to sequential record

Time-tag/IRIG

48-bit hardware time-tag (1µs resolution)

IRIG A or B, AM, PWM, and PPS modes

Generate or synchronize (AM input only)

Synchronize hardware time-tags

Specifications

General

- USB 3.1 Gen 1 interface (fully compatible with USB 2, USB 3, USB 4, and Thunderbolt 3/4)
- 8 avionics discrete I/O
- IRIG A/B input and output
- 2 LED indicators
  Green: Power, databus activity
  Red: User controllable
- 64 MB on-board memory

Environmental

Component temp: -40° to +85° C

Storage temp: -55° to +100° C

MTBF: 5 million hours (MIL-STD-1553 & ARINC 708)

4.8 million hours (ARINC 429 & 717)

Mechanical

I/O Connector: HD44F D-Sub

Dimensions: 3.0 x 4.38 x 0.97 in (76 x 112 x 25 mm)

Weight: under 5 oz (140 g)

Power: Single USB port

USB Cables Included:

USB-C Locking to USB-C (5 ft/1.5 m)

USB-C Locking to USB-A (5 ft/1.5 m)

Software

Universal BTIDriver API for C/C++, C#, VB, VB.Net, and LabVIEW™

Windows® and Linux® OS drivers

Williamsburg protocol library

CoPilot analysis and test software (optional, see below)

Call for latest language and OS support.

CoPilot Software

CoPilot, available as an option, is an intuitive, graphical software program that allows you to easily monitor, record, replay, analyze, and simulate avionics bus data. With CoPilot you can interact directly with data on multiple buses using Astronics avionics interface hardware or work with previously recorded data. This advanced program features powerful tools for development, testing, troubleshooting and maintenance of avionics equipment and systems.

More info at: **astronics.com/CoPilot**