The USB 429 series of products are pocket-sized USB adapters that enable computers to interface with ARINC 429 and ARINC 717 avionics databuses. Having extensive functionality, they are used to communicate with, simulate, test, and monitor ARINC 429/717 equipment and systems. Several models are available with different channel counts and capabilities.

Being a USB peripheral, the USB 429 is compatible with virtually all modern PC laptop, desktop, tablet, and netbook computers. Plug and Play and Hot Swap features make it easy to install and move between computers. The USB 429 supports maximum data throughput on all ARINC channels and has a large 32 MB built-in memory. With all its capability and versatility the USB 429 is suitable for a wide range of applications in the lab and in the field.

Hardware
The USB 429 is small, lightweight, and rugged. All power necessary for operation is provided via the single USB port. The number and combination of ARINC 429 and 717 channels depends on the hardware model. All models include eight avionics level input/output discrete and IRIG time synchronization/generation. In addition, the USB 429 provides useful non-standard functionality, such as a range of data rates, use of parity as data, and error injection.

Once configured, the USB 429 hardware performs all the protocol processing. It manages the reception, transmission, error checking, time-tagging and buffering of messages. This frees the software to focus on high-level user-specific processing.

Software
Users can develop their own software applications with the included BTIDriver API. With only a few function calls a program can operate the USB 429 and process messages to and from the avionics databuses. Functions include routines for transmitting, receiving, scheduling, recording, time-tagging, and manipulating data. The USB 429 can use applications developed for other Ballard devices. Code migrates seamlessly from BTIDriver compatible devices or through a translation driver from older Ballard devices.

Alternatively, Ballard’s optional CoPilot software provides easy-to-use, interactive tools for ARINC 429 test, analysis, and simulation. CoPilot simplifies project development and provides added productivity through virtual instrument displays, flexible monitoring and analysis tools, and a powerful scripting engine.
# ARINC 429 Features

## General
- 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:
  - Guaranteed data integrity
  - 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 429 Features

## Other Features

### Base Configuration
- Model dependent 429/717 capability
- USB 2.0 interface
- 8 Avionics Discrete I/O
- IRIG A/B input and output
- 2 LED indicators
- 32 MB on-board memory

## Sequential Monitor
- A time-tagged record of selected activity on ARINC 429, 717, and discrete I/O
- Filter 429 data by channel/label/SDI
- Includes ARINC data, channel, speed, errors, and time-tag
- Efficient DMA monitor pipe to host

### ARINC 717
- Software selectable biphasic/bipolar
- Sub-frame and super-frame support
- Data rates: 64, 128, 256, 512, 1024, 2048, 4096, 8192 words per second
- ARINC 717 Monitor Utility software

### Avionics Discrete I/O
- 8 programmable inputs/outputs
- Can be used as syncs and triggers
- Output: Open/Gnd, 35 VDC, 200 mA (max)
- Self monitoring, inductive load protected
- Log transitions to sequential record

### Time-tag/IRIG
- 48-bit hardware time-tag (1us resolution)
- IRIG A or B, AM, PWM and PPS modes
- Generate or synchronize (AM input only)
- Synchronize hardware time-tags

### Specifications
- Component temperature: -40 to + 85 deg C
- Storage temperature: -55 to +100 deg C
- I/O Connector: HD44F D-Sub
- Dim: 3.0 x 4.45 x 0.97 inch (76 x 113 x 25 mm)
- Weight: under 5 oz (140 g)
- Power: USB bus-powered (325 mA max)
- MTBF: 1,200,000 hours

### USB 429 ARINC 429/717 Interface

### Other Features

#### Base Configuration
- Model dependent 429/717 capability
- USB 2.0 interface
- 8 Avionics Discrete I/O
- IRIG A/B input and output
- 2 LED indicators
- 32 MB on-board memory

#### Sequential Monitor
- A time-tagged record of selected activity on ARINC 429, 717, and discrete I/O
- Filter 429 data by channel/label/SDI
- Includes ARINC data, channel, speed, errors, and time-tag
- Efficient DMA monitor pipe to host

#### ARINC 717
- Software selectable biphasic/bipolar
- Sub-frame and super-frame support
- Data rates: 64, 128, 256, 512, 1024, 2048, 4096, 8192 words per second
- ARINC 717 Monitor Utility software

#### Avionics Discrete I/O
- 8 programmable inputs/outputs
- Can be used as syncs and triggers
- Output: Open/Gnd, 35 VDC, 200 mA (max)
- Self monitoring, inductive load protected
- Log transitions to sequential record

#### Time-tag/IRIG
- 48-bit hardware time-tag (1us resolution)
- IRIG A or B, AM, PWM and PPS modes
- Generate or synchronize (AM input only)
- Synchronize hardware time-tags

#### Specifications
- Component temperature: -40 to + 85 deg C
- Storage temperature: -55 to +100 deg C
- I/O Connector: HD44F D-Sub
- Dim: 3.0 x 4.45 x 0.97 inch (76 x 113 x 25 mm)
- Weight: under 5 oz (140 g)
- Power: USB bus-powered (325 mA max)
- MTBF: 1,200,000 hours

### Software
- Universal BTIDriver API for C/C++, C#, VB, VB.Net, and LabVIEW™
- MS Windows® and Linux® OS drivers
- Translation DLLs for older Ballard devices
- Williamsburg protocol library
- ARINC 717 Monitor Utility
- CoPilot analysis and test software (optional)
- Call for latest language and OS support.

### Interrupts/Logging
- Poll or use interrupts
- Configurable event log
- Programmable event logging/interrupts from messages, tx schedules, and buffers

### Ordering Information

#### USB Hardware
<table>
<thead>
<tr>
<th>Part No.</th>
<th>ARINC 429</th>
<th>ARINC 717</th>
</tr>
</thead>
<tbody>
<tr>
<td>UA1410</td>
<td>1R1T</td>
<td>–</td>
</tr>
<tr>
<td>UA1420</td>
<td>4R2T</td>
<td>–</td>
</tr>
<tr>
<td>UA1440</td>
<td>12R4T</td>
<td>–</td>
</tr>
<tr>
<td>UA1401</td>
<td>–</td>
<td>2R2T</td>
</tr>
<tr>
<td>UA1431</td>
<td>8R4T</td>
<td>2R2T</td>
</tr>
</tbody>
</table>

$nR =$ number of receive channels
$nT =$ number of transmit channels

Case color option: Black is standard. Add “/FTO” suffix for Flight Test Orange

### Accessories (Included)
- USB cable with screw-locks (5 ft)
- Mating HD44P D-Sub I/O connector
- Manuals and software CD

### CoPilot Systems
- To include CoPilot put “CP-” before the above Part No.
- Example: CP-UA1431

### The Avionics Databus Innovators
- Aerospace Interfaces
- Military Embedded Systems
- Commercial Software

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