OmniBus® 429

ARINC 429
for OmniBus Family Products

Features

- Up to 16 ARINC 429 channels per module (various R/T mixes)
- Parametric 429 modules provide variable transmit amplitude and programmable frequency
- Support for periodic and asynchronous messages
- Advanced scheduling options
- Capture all or selected traffic on fully loaded buses
- Error detection and injection
- IRIG time-tags/synchronization
- Event logging and interrupts

Description

Ballard's OmniBus® products connect computers or networks to one or more avionics databuses. OmniBus 429 refers to the ARINC 429 capabilities available for all OmniBus platforms. Separate brochures provide information on OmniBus platforms (PCI, cPCI, VME, USB, Ethernet) and protocols (ARINC 708/717, MIL-STD-1553).

OmniBus products are built around an intelligent platform that can host one or more protocol modules. This flexible architecture accommodates mixed protocols, high channel counts, and unsurpassed processing power. An onboard PowerPC® processor can be programmed by the user to off-load the host or for stand-alone operation. Each module has its own DSP dedicated to protocol processing.

OmniBus 429 modules are available with up to 16 channels in various receive/transmit combinations. Parametric 429 modules provide variable transmit amplitude and programmable frequency (to support equipment that varies from the ARINC 429 standard, such as some implementations of ARINC 575). ARINC 429 channels can be combined with ARINC 717 on the same module (see table of module part numbers on next page).

All ARINC 429 receive channels feature automatic speed detection and independent label and SDI filtering. Each transmit channel automatically maintains accurate label repetition rates and supports aperiodic transmissions (for data transfer protocols such as ARINC 615). Both receivers and transmitters offer programmable speed and parity.

Applications for OmniBus products include testing, simulation, and operational uses of avionics databuses. With its error detection and generation capability, OmniBus 429 is well suited to product development, production, and system testing. The high channel count, multi-terminal capability, and onboard PowerPC processor provide the power necessary for flight simulators and system integration laboratories. An OmniBus product may also be used as a data server or as a stand-alone converter from one protocol to another.

Software

The easiest way to use OmniBus 429 products in a Windows environment is with Ballard's graphical CoPilot® software. CoPilot can host multiple cards, channels, and databuses (ARINC 429, ARINC 708, and MIL-STD-1553), so it is the ideal tool for OmniBus products.

Alternatively, users can develop their own software using the included BTIDriver™ API. Although each OmniBus product can be easily configured and run with only a few API calls, the comprehensive library includes a broad range of functions for specialized needs.

An SDK is available for advanced users who are developing software to run on the PowerPC.

Ballard Technology

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ARINC 429 Functional Specifications

General
- Up to 16 ARINC 429 channels per module (various R/T mixes available)
- Available in parametric versions (programmable transmit amplitude and frequency)
- Programmable parity for each 429 channel (odd/even/data)
- Programmable speed options:
  - Auto-detect (on receive channels) or fixed
  - 12.5/100 Kbps (default) or custom speeds (on parametric channels)
- Buffering schemes facilitate data handling:
  - Single buffer is the default (receive/transmit)
  - Ping-pong double buffers ensure data integrity (receive/transmit)
  - Circular lists transmit a repeated pattern, such as a sine wave (transmit)
  - Asynchronous list buffers support protocols such as ARINC 615 (transmit)
  - FIFO list buffers can handle sequences of data (receive/transmit)
- Internal wrap-around self-test bus facilitates built-in test and diagnostics

Transmitters
- Transmit a single message, a schedule, or asynchronous messages (interleaved in schedule)
- Create automatic schedule (based on specified repetition rates) or explicit schedule with:
  - Messages (labels)
  - Conditional gaps (allow asynchronous transmissions)
  - Fixed gaps (do not allow asynchronous transmissions)
  - Branches and calls (control schedule sequencing)
- Schedule operation modes:
  - Continuous cycle
  - Specified number of loops
  - Single-step (for debugging)
- Messages can be tagged for error injection, sync out signaling, and logging/interrupts
- Error injection: parity (in all or tagged messages) and inter-message gap (0 to 3 bit times)
- Variable transmit amplitude for parametric transmitters
- Output a sync pulse on all or selected messages (multiple sync lines are available)
- Externally trigger all or selected messages (using any of multiple trigger lines)

Receivers
- Programmable filtering by label/SDI combinations
- Automatic error detection:
  - gap errors (less than 4 bit times)
  - bit timing (timing error in at least one bit)
  - long word (more than 32 bits)
  - short word (time out error)
  - parity
- Detected errors can be logged and can generate interrupts
- Generate a sync out signal on received messages (multiple sync lines available)

Sequential Monitor
- Create a sequential record in on-board memory or stream to file (with a simple program)
- Monitor concurrently with transmitter/receiver operation
- Monitor recording modes: circular or fill and halt
- Monitor sampling modes to reduce total record count: interval mode or delta mode
- Each monitored message includes the 32-bit word, plus channel number, bus speed, time-tag, and detected errors.

Time-Tags
- Use 32-bit board timer or 64-bit IRIG timer (displays day/hour/min/sec/ms/µs)
- IRIG timer options:
  - Select IRIG-B or IRIG-A format
  - Generate IRIG signal or sync up to an IRIG signal (on-board or external)
  - Initialize timer to time of day or other value

Interrupts/Logging
- Configurable event log can be polled and can generate interrupts to the host PC
- The following events may be user-selected for logging/interrupts:
  - When the monitor is full or halts
  - On a user-specified frequency of monitored messages
  - When a schedule halts or pauses
  - When a schedule encounters a user-inserted Log Event command
  - When tagged messages are sent or received
  - When a message error is detected
  - When a list buffer is empty or full

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OmniBus Products:
- OmniBus PCI
- OmniBus cPCI
- OmniBus VME
- OmniBusBox (Ethernet/USB)

OmniBus Protocols:
- MIL-STD-1553
- ARINC 429
- ARINC 708
- ARINC 717

OmniBus 429 Ordering Information:

OmniBus Order Numbers
The order number for an OmniBus product is a combination of the board part number (see table below) and module part number(s). For example, order number 111-427 is an OmniBus PCI with a 4R/4T ARINC 429 module.

	1 Core	*2 Cores*	*4 Cores*
PCI (short)	111	112	—
cPCI (3U)	121	122	—
VME (6U)	—	152	154
Ethernet/USB	—	162	—

ARINC 429 Module Part Numbers
The table below lists standard 429 modules. Additional configurations or protocols (such as CSDB) may be supported on request. Contact Ballard for details.

P/N	*Description*
421	16R/0T ARINC 429
422	12R/4T ARINC 429
423	8R/8T ARINC 429
424	4R/12T ARINC 429
425	0R/16T ARINC 429
426	8R/0T ARINC 429
427	4R/4T ARINC 429
428	0R/8T ARINC 429
434	4R/4T parametric 429
435*	4R/4T parametric 429 with 4R/4T ARINC 717*
438	8R/8T parametric 429

*On module P/N 435, ARINC 429 and bipolar ARINC 717 channels share the same receivers.

Example Configurations:

429 Configurations for 2 Modules
- Up to 32 ARINC 429 channels
- 8R/8T ARINC 429 channels
  plus 1 or 2 MIL-STD-1553 channels
- 4R/4T parametric 429 channels
  plus 4R/4T ARINC 717 channels
  and 2 ARINC 708 channels

429 Configurations for 4 Modules
- Up to 64 ARINC 429 channels
- 24R/24T parametric 429 channels
  plus 8R/8T ARINC 717 channels
- 32 ARINC 429 channels
  plus 2 ARINC 708 channels
  and 1 or 2 MIL-STD-1553 channels

BR152-070204