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**Mx5 for MIL-STD-1553**

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**Mx5 for ARINC 429/717/708**

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**Mx5**  
XMC and PMC Interfaces  
to MIL-STD-1553

**Technical Data Sheet**  
**MIL-STD-1553 Interface**

**Features**

- Up to 32 MIL-STD-1553 Channels
- Various Device I/O
- 800 Kbit/s DMA and MM
- 64 MB ECC Data Memory
- Sensitive Built-in Test (BIT)
- ARINC 429/717 Channel Option

**Description**

The Mx5 family of XMC and PMC cards enable electronic systems to interface with up to eight (8) MIL-STD-1553 avionics databases. They provide extensive 1553 functionality and are used to communicate with, simulate, test, and monitor 1553 equipment and systems. These high-capacity, high-performance cards are suitable for applications ranging from test equipment to rugged deployable systems.

A wide selection of models is available: XMC and PMC, front and rear panel I/O, various 1553 channel counts and capabilities, and optional ARINC 429, 717, 708, and serial interfaces. They all include avionics databases, timers, RING synchronization/generation, and differential interfaces usable as discrete I/O. All models may be used in either conductor or connection coded systems. A separate brochure describes the ARINC protocol capabilities for the Mx5.

**Hardware**

Mx5 cards incorporate the latest 5th generation protocol engine and use bus mastering to yield high performance. They support maximum data throughput on all 1553 channels and have a large 64 MB built-in memory with error correction.

Depending upon the hardware model, 1553 channels may be either single-function or multi-function. Single-function channels can be configured in software as either a Bus Controller (BC), a Bus Monitor (BM), or an I/O Device Terminal (DT). All models include comprehensive error detection and reporting. Multi-function channels have protocol error reaction capability and can simultaneously be a BC, BM, and up to 32 DTs.

**Software**

Users can develop their own software applications with the included BTDriver API. With only a few function calls a program can operate an Mx5 and process messages to and from the avionics databases. Functions include routines for transmitting, receiving, scheduling, recording, time-tagging, and manipulating data. An Mx5 card can use applications developed for other Ballard devices. Code migrates seamlessly from BTDriver compatible devices or through a translation driver from other Ballard devices.



Labels: XMC or PMC Host Platform, 15-bit I/O Channels, Single or Multi-Function, Rear Panel or Front Panel I/O Connection

**MIL-STD-1553**

- Full MIL-STD-1553 functionality
- BC, BM, and/or Monitor
- Quad-redundant channels
- Model emulation (Single-function and Multi-function)
- Multi-function
- Error reaction (Multi-Function only)

**Software**

- Universe BTDriver™ API compatible
- Bitstream DMA monitoring
- Compatible with other Ballard hardware
- Transfer for other Ballard devices

**Benefits**

- Choice of XMC or PMC hardware
- Overseas protocol engine software host
- Shared protocol system system space
- Supports legacy MIL-STD-1553
- Free customer support for product life
- Avionics lifetime warranty
- RUVS compliant

**Applications**

- Rugged deployed systems
- Emulated test systems
- High performance simulators
- Timing synchronization
- Mixed protocol systems
- Avionics upgrade and retrofit
- Databus health monitoring



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**Mx5**  
XMC and PMC Interfaces  
to ARINC 429, 717, and 708

**Technical Data Sheet**  
**ARINC 429/717/708 Interface**

**Features**

- Up to 32 ARINC 429 Channels
- Up to 4 ARINC 717 Channels
- Up to 4 ARINC 708 Channels
- Various Device I/O
- 800 Kbit/s DMA and MM
- Extensive Built-in Test (BIT)
- MIL-STD-1553 Channel Available

**Description**

The Mx5 family of XMC and PMC cards enable electronic systems to interface with commercial and military avionics databases. They provide extensive functionality and are used to communicate with, simulate, test, and monitor ARINC 429, ARINC 717, ARINC 708 and MIL-STD-1553 equipment and systems. These high-capacity, high-performance cards are suitable for applications ranging from test equipment to rugged deployable systems.

A wide selection of models is available: XMC and PMC, front and rear panel I/O, various ARINC channel counts and capabilities, and optional MIL-STD-1553 and serial interfaces. They all include avionics databases, timers, RING synchronization/generation, and differential interfaces usable as discrete I/O. All models may be used in either conductor or connection coded systems.

Each card can be ordered with one or more avionics protocols, saving card space, while providing the most cost effective solution. The data sheet focuses on Mx5 capability for ARINC 429 (general purpose databus), ARINC 717 (flight data recorder databus), and ARINC 708 (smaller radar display databus). Mx5 capability for MIL-STD-1553 is described in a separate data sheet.

**Hardware**

Mx5 cards incorporate the latest 5th generation protocol engine and use bus mastering to yield high performance. They support maximum data throughput on all channels and have a large 64 MB built-in memory with error correction.

Once configured, the Mx5 hardware performs all protocol processing. It manages the reception, transmission, error checking, time-tagging and buffering of messages. This frees the host software to focus on high-level user-specific processing.

**Software**

Users can develop their own software applications with the included BTDriver API. With only a few function calls a program can operate an Mx5 and process messages to and from the avionics databases. Functions include routines for transmitting, receiving, monitoring, scheduling, recording, time-tagging, and manipulating data. An Mx5 card can use applications developed for other Ballard devices. Code migrates seamlessly from BTDriver compatible devices or through a translation driver from other Ballard devices.



Labels: XMC or PMC Host Platform, 15-bit I/O Channels, Available with ARINC 717, 708, and MIL-STD-1553, Rear Panel or Front Panel I/O Connection

**ARINC 429**

- Full ARINC 429 functionality
- BM or Monitor and transfer protocols
- Message flow and structures
- Standard and non-standard bit rates
- Four-redundant and separate function
- Models of avionics engines
- Several message filtering schemes
- Avionics DTG and TCAN support

**Software**

- Universe BTDriver™ API compatible
- Bitstream DMA monitoring
- Compatible with other Ballard hardware
- Transfer for other Ballard devices

**Benefits**

- Choice of XMC or PMC hardware
- Overseas protocol engine software host
- Shared protocol system system space
- Supports legacy ARINC 429
- Free customer support for product life
- Avionics lifetime warranty
- RUVS compliant

**Applications**

- Rugged deployed systems
- Emulated test systems
- High performance simulators
- Timing synchronization
- Mixed protocol systems
- Avionics upgrade and retrofit
- Databus health monitoring

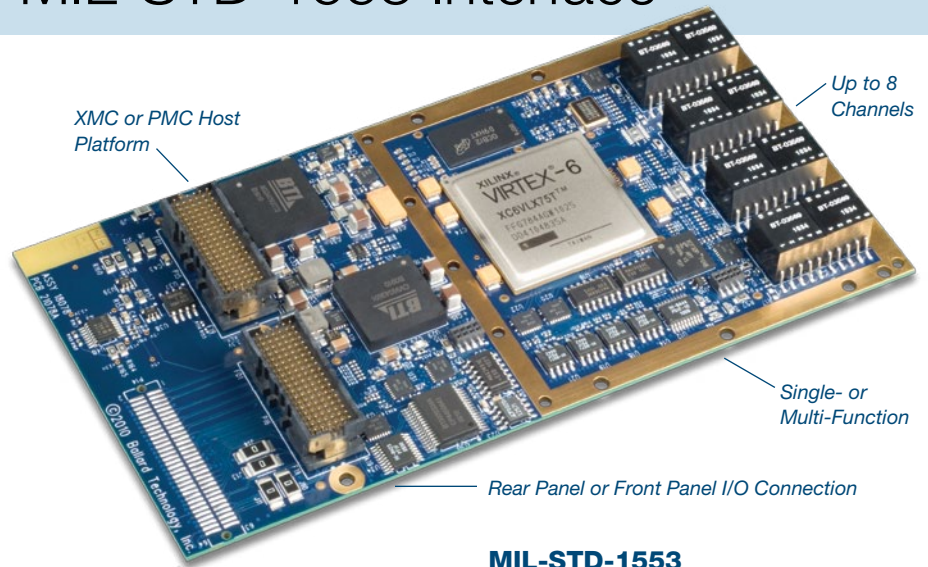


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# Mx5

# MIL-STD-1553 Interface

*XMC and PMC Interfaces  
to MIL-STD-1553*



## Features

- Up to 8 MIL-STD-1553 Channels
- Various Discrete I/O
- IRIG A/B PWM and AM
- 64 MB ECC Data Memory
- Extensive Built-in Test (BIT)
- ARINC 429/717 Channels Optional

## Description

The Mx5 family of XMC and PMC cards enable electronic systems to interface with up to eight (8) MIL-STD-1553 avionics databuses. They provide extensive 1553 functionality and are used to communicate with, simulate, test, and monitor 1553 equipment and systems. These high-density high-performance cards are suitable for applications ranging from test equipment to rugged deployable systems.

A wide selection of models is available: XMC and PMC, front and rear panel I/O, various 1553 channel counts and capabilities, and optional ARINC 429, 717, 708, and serial interfaces. They all include avionics discretes, timers, IRIG synchronization/generation, and differential interfaces usable as discrete I/O. All models may be used in either conduction or convection cooled systems. A separate brochure describes the ARINC protocol capabilities for the Mx5.

## Hardware

Mx5 cards incorporate the latest 5th generation protocol engine and use bus mastering to yield high performance. They support maximum data throughput on all 1553 channels and have a large 64 MB built-in memory with error correction.

Depending upon the hardware model, 1553 channels may be either single-function or multi-function. 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). All models include comprehensive error detection and reporting. Multi-function channels have protocol error injection capability and can simultaneously be a BC, BM, and up to 32 RTs.

## Software

Users can develop their own software applications with the included BTIDriver API. With only a few function calls a program can operate an Mx5 and process messages to and from the avionics databuses. Functions include routines for transmitting, receiving, scheduling, recording, time-tagging, and manipulating data. An Mx5 card can use applications developed for other Ballard devices. Code migrates seamlessly from BTIDriver compatible devices or through a translation driver from older Ballard devices.

## MIL-STD-1553

- Full MIL-STD-1553 functionality
- BC, RT, and/or Monitor
- Dual-redundant channels
- Models available: Single-function and Multi-function
- Error injection (Multi-function only)

## Software

- Universal BTIDriver™ API compatible
- Efficient DMA monitoring
- Compatible with other Ballard hardware
- Translator for older Ballard devices

## Benefits

- Choice of XMC or PMC backplane
- Powerful protocol engine relieves host
- Mixed protocol saves system space
- Rugged design (MIL-STD-810)
- Free customer support for product life
- Standard limited warranty
- RoHS compliant

## Applications

- Rugged deployed systems
- Embedded test systems
- High performance simulators
- Demanding requirements
- Mixed protocol systems
- Avionics upgrades and retrofits
- Databus health monitoring



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# Mx5 MIL-STD-1553 Interface

## MIL-STD-1553 Features

### 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  
 Multiple RT Map (Shadow) Monitor

### 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 to host

### Message Data

Comprehensive error detection  
 Guaranteed data integrity  
 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, or 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)

## Other Features

### Base Configuration

- Model dependent 1553 capability
- 6 Avionics Discrete I/O
- 2 In, 2 Out differential discretes
- 4 Virtual discretes
- IRIG A/B input and output
- 2 LED indicators
- 64 MB ECC (error correction) memory

### Discrete I/O

Avionics discretes: programmable, open/Gnd, input/output  
 Differential discretes: RS-422  
 Virtual discrete: synchronize events  
 Log transitions to sequential record

### Time-tag/IRIG

48-bit hardware time-tag (1 $\mu$ s resolution)  
 IRIG A or B, AM (input), PWM, and PPS  
 Generate or synchronize  
 Synchronize hardware time-tags

### Interrupts/Logging

Poll or use interrupts  
 Configurable event log  
 Programmable event logging/interrupts from messages, BC schedule, and buffers

### Channel Details

All channels dual redundant – Bus A and B  
 Single-function: BC, 32 RTs, or Bus Monitor  
 Multi-function: Error injection, BC, 32 RTs, and Bus Monitor simultaneously  
 Transformer coupling (direct optional)

## Specifications

Component temperature: -40 to + 85 deg C  
 Storage temperature: -55 to +100 deg C  
 I/O Connectors: SCSI-68 (front I/O), P14/P16 (rear I/O)  
 Dim: 74 x 143.75 mm

**ME5 (XMC)** PCI Express bus: x4 lane, bus mastering, power adapts to VPWR

**MP5 (PMC)** PCI-X bus: 33/66/133 MHz, 32/64 bit, 3.3 VIO

## Built-in Test Features

Power-on BIT (PBIT)  
 Continuous BIT (CBIT)  
 Initiated BIT (IBIT)

## 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  
*Call for latest language and OS support.*

## Ordering Information

### Hardware

Includes manuals and software CD.

Part Number Example: **ME5R/8M/FXY**

Form Factor \_\_\_\_\_  
**E** = XMC, **P** = PMC  
 I/O Panel Connection \_\_\_\_\_  
**R** = Rear I/O  
**F** = Front I/O  
 1553 Channel Count \_\_\_\_\_  
**1-8** = 1-8 channels  
 Functionality (for all channels) \_\_\_\_\_  
**S** = Single, **M** = Multi  
 Available Options \_\_\_\_\_  
**FXY** = Conformal Coating  
 (Call for details on other options)

ARINC and multi-protocol models are also available. Call for more information.

### Cables and Accessories

Order separately. Ballard offers a wide selection. Visit [www.ballardtech.com](http://www.ballardtech.com) or call for more information.

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Aerospace                      Interfaces  
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 Commercial                    Software

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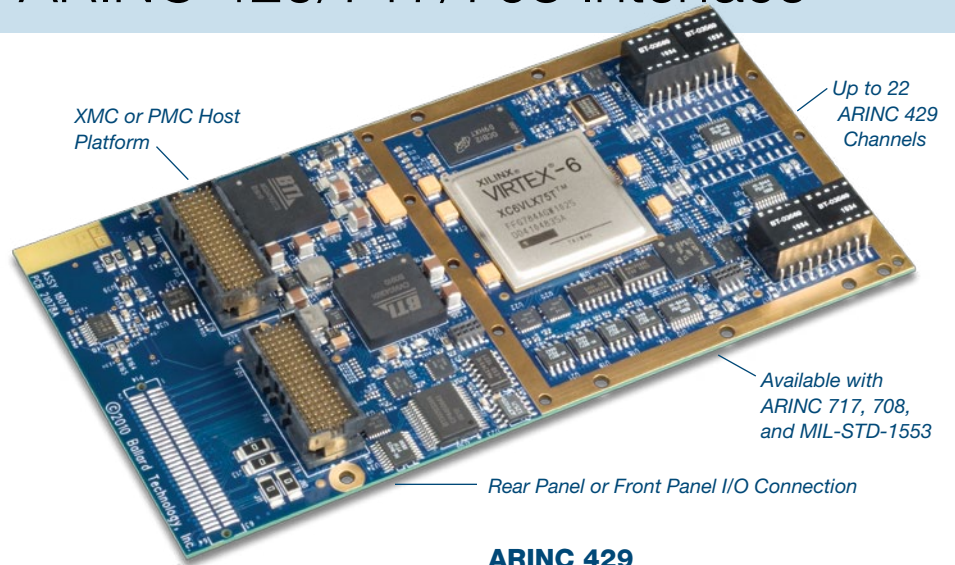


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# Mx5

# ARINC 429/717/708 Interface

*XMC and PMC Interfaces  
to ARINC 429, 717, and 708*



## Features

- Up to 22 ARINC 429 Channels
- Up to 4 ARINC 717 Channels
- Up to 4 ARINC 708 Channels
- Various Discrete I/O
- IRIG A/B PWM and AM
- Extensive Built-in Test (BIT)
- MIL-STD-1553 Channels Available

## Description

The Mx5 family of XMC and PMC cards enable electronic systems to interface with commercial and military avionics databuses. They provide extensive functionality and are used to communicate with, simulate, test, and monitor ARINC 429, ARINC 717, ARINC 708 and MIL-STD-1553 equipment and systems. These high-density high-performance cards are suitable for applications ranging from test equipment to rugged deployable systems.

A wide selection of models is available: XMC and PMC, front and rear panel I/O, various ARINC channel counts and capabilities, and optional MIL-STD-1553 and serial interfaces. They all include avionics discretes, timers, IRIG synchronization/generation, and differential interfaces useable as discrete I/O. All models may be used in either conduction or convection cooled systems.

Each card can be ordered with one or more avionics protocols, saving card space, while providing the most cost effective solution. This data sheet focuses on Mx5 capability for ARINC 429 (general purpose databus), ARINC 717 (flight data recorder databus), and ARINC 708 (weather radar display databus). Mx5 capability for MIL-STD-1553 is described in a separate data sheet.

## Hardware

Mx5 cards incorporate the latest 5th generation protocol engine and use bus mastering to yield high performance. They support maximum data throughput on all channels and have a large 64 MB built-in memory with error correction.

Once configured, the Mx5 hardware performs all protocol processing. It manages the reception, transmission, error checking, time-tagging and buffering of messages. This frees the host 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 an Mx5 and process messages to and from the avionics databuses. Functions include routines for transmitting, receiving, monitoring, scheduling, recording, time-tagging, and manipulating data. An Mx5 card can use applications developed for other Ballard devices. Code migrates seamlessly from BTIDriver compatible devices or through a translation driver from older Ballard devices.

## ARINC 429

- Full ARINC 429 functionality
- Mix of receive and transmit channels
- 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 and TACAN support

## Software

- Universal BTIDriver™ API compatible
- Efficient DMA monitoring
- Compatible with other Ballard hardware
- Translator for older Ballard devices

## Benefits

- Choice of XMC or PMC backplane
- Powerful protocol engine relieves host
- Mixed protocol saves systems space
- Rugged design (MIL-STD-810)
- Free customer support for product life
- Standard limited warranty
- RoHS compliant

## Applications

- Rugged deployed systems
- Embedded test systems
- High performance simulators
- Demanding requirements
- Mixed protocol systems
- Avionics upgrades and retrofits
- Databus health monitoring



*The Avionics Databus Innovators*

# Mx5 ARINC 429/717/708 Interface

## 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  
 Parametric frequency control

### 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

## Other Features

### Base Configuration

- Model dependent 429/717/708 capability
- 6 Avionics Discrete I/O
- 2 In, 2 Out differential discretes
- 4 Virtual discretes
- IRIG A/B input and output
- 2 LED status indicators
- 64 MB ECC (error correction) memory

### ARINC 717 and 708

**717:** Software selectable biphas/bipolar  
 Sub-frame and super-frame support  
 Data rates: 64 to 8192 words per second  
**708:** Each channel operates independently  
 Select between 2 buses for each channel  
 Support for custom radar protocols

### Sequential Monitor

A time-tagged record of selected activity  
 on 429, 717, 708, and discrete I/O  
 Filter 429 data by channel/label/SDI  
 Includes ARINC data, channel, speed,  
 errors, and time-tag  
 Efficient DMA monitor to host

### Discrete I/O

Avionics discretes: programmable,  
 open/Gnd, input/output  
 Differential discretes: RS-422  
 Virtual discrete: synchronize events  
 Log transitions to sequential record

### Time-tag/IRIG

48-bit hardware time-tag (1 $\mu$ s resolution)  
 IRIG A or B, AM (input), PWM, and PPS  
 Generate or synchronize  
 Synchronize hardware time-tags

## Specifications

Component temperature: -40 to + 85 deg C  
 Storage temperature: -55 to +100 deg C  
 I/O Connectors: SCSI-68 (front I/O),  
 P14/P16 (rear I/O)  
 Dim: 74 x 143.75 mm  
**ME5 (XMC)** PCI Express bus: x4 lane, bus  
 mastering, power adapts to VPWR  
**MP5 (PMC)** PCI-X bus: 33/66/133 MHz,  
 32/64 bit, 3.3 VIO

## Built-in Test Features

Power-on BIT (PBIT)  
 Continuous BIT (CBIT)  
 Initiated BIT (IBIT)

## 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  
*Call for latest language and OS support.*

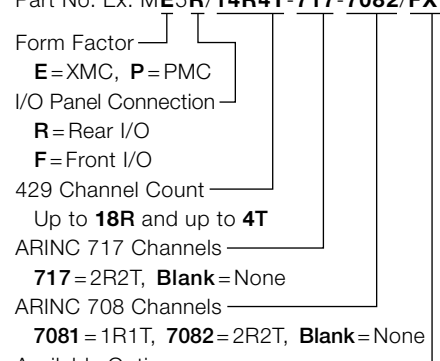
## Interrupts/Logging

Poll or use interrupts  
 Configurable event log  
 Programmable event logging/interrupts from  
 messages, transmit schedules, and buffers

## Ordering Information

### Hardware

Includes manuals and software CD.  
 Part No. Ex: **ME5R/14R4T-717-7082/FXY**



Form Factor —  
**E**=XMC, **P**=PMC  
 I/O Panel Connection —  
**R**=Rear I/O  
**F**=Front I/O  
 429 Channel Count —  
 Up to **18R** and up to **4T**  
 ARINC 717 Channels —  
**717**=2R2T, **Blank**=None  
 ARINC 708 Channels —  
**7081**=1R1T, **7082**=2R2T, **Blank**=None  
 Available Options —  
**FXY**=Conformal Coating

Call for available model configurations,  
 cables, accessories, and additional  
 options. Models are also available  
 with MIL-STD-1553 channels.

**Ballard** TECHNOLOGY

## The Avionics Databus Innovators

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 Military        Embedded Systems  
 Commercial    Software

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