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ARINC 429 VXI Interface Modules

PAC-429C-X8 Series

- 8 Programmable Parametric Channels

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  Receive or Transmit
  High, Low, and Variable Speed
  Variable Voltage, Bit Gap & Word Size
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- 8 Additional Low Speed Receivers
- On-board Engineering Unit Conversion
- 256 KBytes of Dual-Port RAM for Real-time Data
- Available in B or C Size
- RS232/422 Port
- Bus Master Capability

Description

The PAC-429C-X8 Series modules are available in B or C size, to provide a high performance communications link between a VXI host and an ARINC 429 Data Bus. The X8 Series modules are factory configured as either register or message based devices.

The modules' architecture is a multiprocessor design that provides reliable high-integrity ARINC 429 reception and transmission. This module is designed for high performance applications, capable of off-loading tasks from the host computer that could not previously be performed by a single ARINC 429 interface module.

The X8 modules conform with the Mark 33 Digital Infor mation Transfer System 429-14 specifications, and are also capable of parametric testing that handles communications which deviate from the standard specification. This is useful during test and validation phases of LRU develop ment, and at repair depots for margin testing to detect "phantom" errors and failures.

The modules support eight "configurable" parametric channels that can be set as either receivers or transmitters. When acting as transmitters, these channels can output signals from 0 to 12 Volts.

Transmitters or receivers can be configured for variable word sizes (2 · bits), appropriate parity (EVEN/ODD /NONE), variable frequency (5 kHz 120 kHz), and variable bit gap.

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In addition to the eight configurable channels, the modules also provide eight low speed receiver channels, for a total of up to 16 independent ARINC 429 channels.

The modules can filter received data and schedule trans mitted data as determined by the host computer. All of the PAC-429 X8 modules have a Floating-Point Co-Processor used to convert data to and from engineering units, which allows the host to communicate data to the module in engineering unit format.

Module Models

All X8 VXI modules have eight configurable (transmit or receive) parametric channels and eight low speed receivers. The following model types are available:

PAC-429C-X8B/R

A register based B size VXI 429 module

PAC-429C-X8B/M

A message based B size VXI 429 module

PAC-429C-X8C/R

A register based C size VXI 429 module

PAC-429C-X8C/M

Module Features

ARINC 429 Reception

Each receiver channel independently time-stamps and buffers the incoming data. The data is then converted to engineering units (if desired), and sent to the VXI host. Received words are automatically checked for parity. A built-in error counter indicates the number of errors that have occurred during data reception. The module can also filter received words, thereby off-loading the host processor by only collecting data of interest.

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ARINC 429 Transmission

Each transmitter channel processes scheduled transmissions and transmits buffered sequential words. When the module gets a transmit word from the host, it is converted from engineering units to the ARINC 429 word and proper parity is automatically generated.

Time Stamping

The modules are capable of time-stamping all received data words. For applications that use multiple modules, the timer on each module used to time-stamp received words can be synchronized by connecting all the modules via a pin on the external connector.

Built-In-Testing

The modules' firmware contains built-in-tests which are performed on power-up. When these tests pass, the module indicates to the host that it successfully completed power-up self testing. If any test fails, this information is passed on to the host and LEDs, including the main "FAIL" light, on the module front panel are lit to indicate a failure code.

The following tests are performed during power up: proces sor tests, memory tests, math co-processor tests, a ROM checksum test, and channel processor communication tests. In addition, the module contains an Analog to Digital Converter (ADC) that allows testing of the Digital to Analog Converter controlling the variable voltage outputs of the ARINC 429 transmitters.

The host has the ability to perform a complete system test when the user connects an "external loopback" connector to the module. This connects input discretes to output discretes, and ARINC 429 transmitters to receivers. The host can then send data on the transmitters and verify that the data was received correctly by the ARINC 429 receivers.

A message based C size VXI 429 module

Host Communications

Modules are available as message or register based devices.

Register Based:

The modules communicate to the host via 256 KBytes of Dual-Port RAM, a Command FIFO, a Response FIFO, and optional interrupts. The Command and Response FIFOs are used to communicate commands to the module from the host, and responses to those commands back to the host. The 256 KBytes of Dual-Port RAM is used primarily to communicate large volumes of ARINC 429 real-time data.

Message Based:

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As message based devices, the modules communicate using the communication registers in A16 space. The message based modules provide the same functionality as the register based modules through "SCPI-like" commands.

Interrupt Generation

The robust interrupt generation capability in the PAC-429

X8 modules allows the modules to asynchronously signal the host (VXI system controller) when certain events occur. These events include receive and transmit events, error events, FIFO events, discrete I/O events, and board processor interrupts. Through program control, any of the interrupts

can be selectively enabled or masked. The modules can be configured to interrupt on any one of the 7 interrupt lines.

Indicator LEDs

There is a standard VXI fail light on the front panel which indicates the pass/fail status of the modules' built-in-tests. Four more LEDs are used to show detailed diagnostic information. All of these LEDs are connected to output discretes, and are therefore also available on the modules' external connector. There are eight additional LEDs on the front panel indicating channel activity and channel built-in -test status.

Input/Output Discretes

There are 8 output discretes (TTL compatible) on the mod -ules. These are used for a variety of purposes, including

VXI trigger lines, indicating status, and general purpose use. These outputs can sink up to 10 mA of current. There are 4 input discretes (TTL and CMOS compatible). Each input discrete accepts any input from 2.4 5 volts as a "true" voltage, and from 0 0.8 volts as "false."

Module Firmware

Firmware is supplied with each 429 VXI module which supports an extensive set of ARINC 429 functions. These functions allow users to program their module without specific knowledge of the module's architecture.

When transmitting, the host can request that the module send data sequentially from a First-In-First-Out (FIFO) queue, or that the module automatically send scheduled data and allow the host to update the data asynchronously. If both FIFO and scheduled modes are selected, the scheduled data always takes priority over the FIFO data, with the FIFO data words "filling-in" the gaps between scheduled data.

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When receiving, the host can get data sequentially from a FIFO, or get the most recent data for any label/SDI combination from a "mailbox" slot. The data placed in the

Examples of Standard Firmware Functions: DefineRxFilterWords, ModifyRxChannel

· **Transmitting**
DefineTxScheduleTable, ModifyTxChannel

· **Engineering Units**
LoadEngineeringConversionTable

· **Discrete Control**
ReadInputDiscrete, WriteOutputDiscrete

· ***Configuration***
ConfigureSerialPort, SetInterruptConditions

· ***Card Control***
DequeueErrors, ResetClock, RunDiagnostic

· ***Channel Control***
HaltChannel, StartChannel

· ***Receiving***

Technical Overview

The 429 VXI module has five processors. One processor, called the board processor, maintains host communication, converts raw data to and from engineering unit format, and transfers it to the four channel processors.

The channel processors manage and control the 429 communication. Each channel processor handles 2 configurable receive or transmit channels (high or low speed), and

2 low speed receive channels.

Since each channel processor can filter received data and schedule transmit data, the performance of the board processor is not depen dent on bus loading, but only on the amount of received data being transferred to the host, and the amount of transmit data the host generates. The receivers can not unknowingly lose data since each of the channel processors can buffer fully loaded buses.

receive FIFO is time-stamped by the module. The FIFO words can be filtered by label/SDI combination.

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The host can configure the size of the FIFOs in Dual-Port RAM to be from 16 words to 32K ARINC 429 words. The starting address for each FIFO is therefore dependent on how the host configures the module. Each routine that configures a FIFO returns the offset for that FIFO.

The host can download an Engineering Unit Conversion Table to the module that enables conversion between raw ARINC 429 words and engineering units. The format for all ARINC 429 data placed in Dual-Port RAM is determined by this table. If no table has been defined, all words default to "raw" format. When engineering unit conversion is enabled, both the engineering data and the raw data are available to the host.

*Specifications**

Physical Characteristics:
B size: *Height 9.2" (23.37 cm)*
Width 0.8" (2.03 cm)
Depth 6.2" (15.75 cm)

C size: *Height 9.2" (23.37 cm)*
Width 1.2" (3.05 cm)
Depth 13.4" (34.04 cm)

Weight:
B size: *Net 12 oz (0.34 kg)*
Shipping 28 oz (0.79 kg)

C size: *Net 22 oz (0.62 kg)*
Shipping 38 oz (1.07 kg)

Device Type:
Register or Message Based

Logical Address:
1 254, switch selectable

Interrupt Level:
1 7, switch selectable

Address Space:
A16/A32 or A16/A24, D16 Slave/Master Device
Uses 256 KBytes of A24 or A32 Space

***Specifications apply to all models of the PAC-429 VXI Modules unless otherwise noted.**

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Ordering Guide

Model Number Description

PAC-429C-X8B/R 429 B Size, register based VXI module
PAC-429C-X8B/M 429 B Size, message based VXI module
PAC-429C-X8C/R 429 C Size, register based VXI module
PAC-429C-X8C/M 429 C Size, message based VXI module

Optional Software

PAC-429S-X8/LVI VXI/VME LabVIEW driver
PAC-429S-X8/LWPP LabWindows Plug & Play driver

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