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ARINC 429 VXI INTERFACE MODULES

DESCRIPTION

The DD-42916X Series modules, available in B or C size, provide a high-performance communications link between a VXI host and an ARINC 429 Data Bus. This series of modules is factory configured as either register- or message-based devices.

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

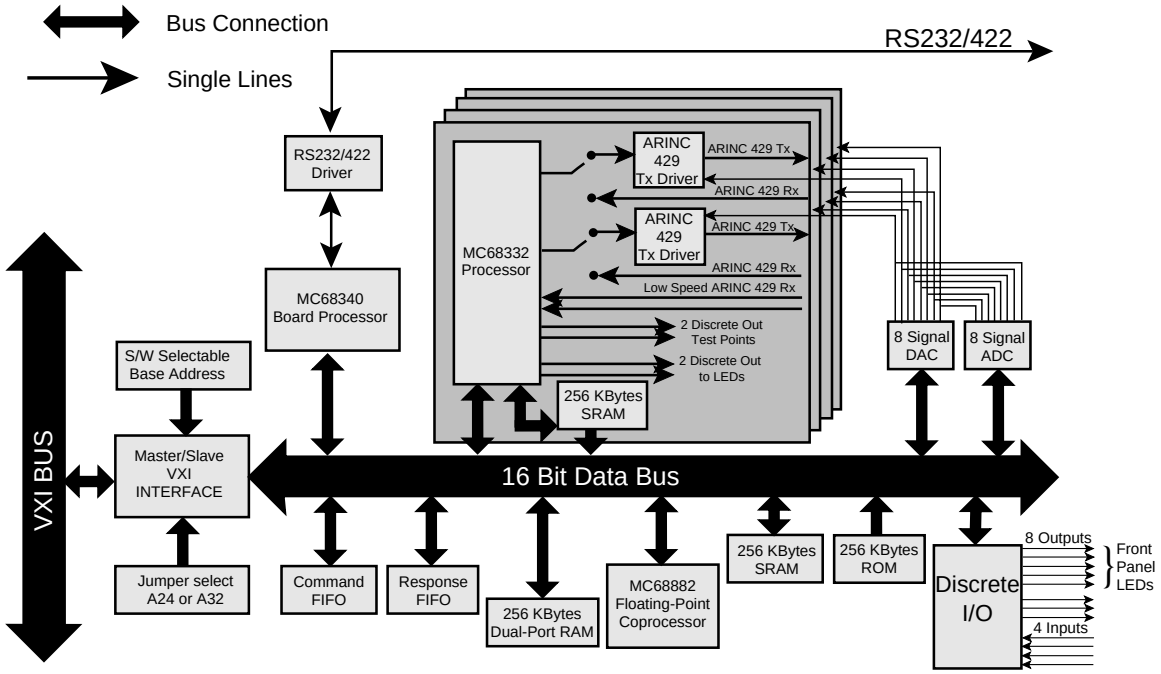
The modules conform with the Mark 33 Digital Information Transfer System 429-14 specifications. They are capable of parametric testing that handles communications which deviate from the standard specification. This is useful during the test and validation phases of Line Replaceable Unit (LRU) development and at repair depots for implementing 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 - 32 bits), appropriate parity (EVEN/ODD/NONE), variable frequency (5 KHz - 120 KHz), and variable bit gap.

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 transmitted data as determined by the host computer. All of the DD-42916X series modules have a floating-point coprocessor used to convert data to and from engineering units. This allows the host to communicate data to the module in engineering unit format.

FEATURES

- ***Eight Programmable Parametric Channels: Receive or Transmit; High, Low, and Variable Speed; Variable Voltage; Bit Gap; and Word Size***
- ***Eight Additional Low-Speed Receivers***
- ***On-Board Engineering Unit Conversion***
- ***256 Kilobytes-Dual Port RAM for Real-Time Data***
- ***Available in B or C Size***
- ***RS232/RS422 Port***
- ***Bus Master Capability***



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FIGURE 1. ARINC 429 VXI MODULE FUNCTIONAL BLOCK DIAGRAM

TABLE 1. DD-42916X GENERAL SPECIFICATIONS

ELECTRICAL

Operating Voltage:	+ 5 VDC and ± 12 VDC
Typical Operating Current:	1.4 A at 5 VDC 0.15 A at 12 VDC 0.1 A at - 12 VDC

ENVIRONMENT

Operating Temperature:	0° - +40° C at 99% relative humidity noncondensing
Storage Temperature:	-40° - +70° C at 99% relative humidity noncondensing

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" (28.37 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. (0.64 kg)
	Shipping:	28 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 Devices Uses 256 kbytes of A24 or A32 Space

TECHNICAL OVERVIEW

The DD-42916X module has five processors. One, called the board processor, maintains host communication, converts raw data to and from the engineering unit format, and transfers it to the four channel processors. The channel processors manage and control the 429 communication. Each channel processor handles two configurable receive or transmit channels (high or low speed) and two low-speed receive channels.

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

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.

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 module's firmware contains built-in tests which are performed on power-up. When these tests are passed, 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. The LEDs, including the main FAIL light on the module's front panel, are lit to indicate a failure code.

The following tests are performed during power up: processor tests, memory tests, math coprocessor 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 (DAC) 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.

HOST COMMUNICATIONS

Modules are available as message- or register-based devices.

Register-based modules communicate to the host via 256 KBytes of Dual-Port RAM, a Command First-In-First-Out (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.

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TABLE 2. EXAMPLES OF STANDARD FIRMWARE FUNCTIONS

- **CONFIGURATION**
  ConfigureSerialPort, SetInterruptConditions
- **CARD CONTROL**
  DequeueErrors, ResetClock, RunDiagnostic
- **CHANNEL CONTROL**
  HaltChannel, StartChannel
- **RECEIVING**
  DefineRxFilterWords, ModifyRxChannel
- **TRANSMITTING**
  DefineTxScheduleTable, ModifyTxChannel
- **ENGINEERING UNITS**
  LoadEngineeringConversion Table
- **DISCRETE CONTROL**
  ReadInputDiscrete, WriteOutputDiscrete

Message-based modules communicate using the communication registers in the 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 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 seven interrupt lines.

INDICATOR LEDS

There is a standard VXI fail light on the front panel which indicates the pass/fail status of the module's built-in-tests. Four more LEDs are used to provide detailed diagnostic information. All of these LEDs are connected to output discretes and are, therefore, also available on the module's 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 eight output discretes (TTL compatible) on the modules. These are used for a variety of purposes, including VXI trigger lines, indicating status, and general purpose use. These outputs can sink up to 40 mA of current. There are four 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 which supports an extensive set of ARINC 429 functions is supplied with each DD-42916X module. 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 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.

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

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. The firmware also allows the user to download and execute user-developed software on the module.

SUPPORT

ILC Data Device Corporation is committed to providing unsurpassed customer support. All hardware has a two-year limited warranty and software has a 90 day limited warranty. During this warranty period, all software updates are free.

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ORDERING INFORMATION

DD-42916XX-30X

Card Size
1 = B Size
2 = C Size

Temp Range
3 = 0° to 40°C

Device Type
M = Message Based
R = Register Based

Type
X = VXI

Number of Channels
16 = 8 Rx and 8 Rx/Tx (Configurable)

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