

Specifications

** indicates a programmable feature*

TRANSMITTER

Configuration:	Quad (four channel) ARINC-429 Transmitter.
Processor:	1 - 80C186 (PLCC).
Coupling:	Connects directly to Mark 33 DITS bus.
RAM:	32K x 32-bit RAM memory associated with each channel for data and control instructions.
* Parity:	The VX4428 transmitter can generate odd or even parity, programmable on a frame-by-frame basis for each channel.
* DITS Word Format:	The transmitted DITS word can have 31, 32 or 33 bits, programmable on a frame-by-frame basis for each channel.
* Interword Gap:	Non-transmission time between words: two or four bit times, programmable on a frame-by-frame basis for each channel.
* Frame Interval:	Delay between the start of one frame and the start of the next frame: 5 ms to 4 s in 1-ms steps, programmable on a frame-by-frame basis for each channel.
	Accuracy: 1% - one bit-rate clock cycle $\pm 150 \mu\text{s}$, one channel transmitting; 1% - one bit-rate clock cycle $\pm 500 \mu\text{s}$, four channels transmitting.
* Bit-Rate Period:	8 μs to 8.19 ms in 250-ns steps, programmable independently for each channel.
* System Interrupts:	Programmable on a frame-by-frame basis for each channel to indicate the start of a frame.
* Output Triggers:	Programmable on a frame-by-frame basis for each channel to indicate the start of a frame.

ARINC Output (each channel)

Type Output: Differential, ARINC Specification 429 compliant.

Preprogrammed Voltage

Levels (no load): Logic High and Low Voltage Levels

Parametric Normal Levels

Line A or B to Ground $\pm 5 \pm \text{Accuracy.}$
 Line A to B $\pm 10 \pm \text{Accuracy.}$

Parametric High Levels

Line A or B to Ground $\pm 6.5 \pm \text{Accuracy.}$
 Line A to B $\pm 13 \pm \text{Accuracy.}$

Parametric Low Levels

Line A or B to Ground $\pm 3.25 \pm \text{Accuracy.}$
 Line A to B $\pm 6.50 \pm \text{Accuracy.}$

Parametric Null Levels

Line A or B to Ground $\pm 1.25 \pm \text{Accuracy.}$
 Line A to B $\pm 2.50 \pm \text{Accuracy.}$

Logic Null Voltage Level

Line A or B to Ground $0 \pm 0.25 \text{ V.}$
 Line A to B $0 \pm 0.50 \text{ V.}$

User Programmed Voltage

Levels (no load): Line A or B to ground; 0 to 9.25 volts (.03628 volt steps) \pm Accuracy.

Transmission Voltage

Accuracy: (3% of programmed voltage) + 60 millivolts.

NOTE: All voltage levels are specified at no load. Each additional ARINC receiver has a loading effect on the output voltage. A single ideal ARINC receiver (also assuming no cable losses) depresses the transmitter output level by approximately 0.62% of the no load voltage. At the maximum 20 ARINC receivers, the output voltage level will be depressed by approximately 10.84% of the no load voltage. Allow for these voltage losses from the no load value in determining the desired transmission voltage level.

Rise/Fall Time: 16 kb/s to 125 kb/s: $1.5 \pm 0.5 \mu\text{s.}$

122 kb/s to 15.936 kb/s: $10 \pm 5 \mu\text{s.}$

Output Impedance: $75 \pm 5 \text{ ohm, balanced.}$

Drive Capability: 20 ARINC receivers (400 ohm maximum load).

Backplane

Trigger Outputs: Type: TTL Open collector.
 Drive: 48 milliamps.
 Pulse width: 80 microseconds minimum; 120 microseconds maximum.

Front Panel

Trigger Outputs: Type: TTL Open collector.
 Drive: 48 milliamps.
 Pulse width: 80 microseconds minimum; 120 microseconds maximum.

NOTE: The front panel trigger outputs require a pull-up at the destination in order to function properly.

**Trigger Output To
 Transmission Start
 Delay:**

1.5 bit times minimum, 2.5 bit times maximum.
 A bit time is defined as the inverse of the bit rate frequency (1 / bit rate frequency).

Backplane

Trigger Inputs: Type: TTL
 Load: 0.2 milliamps maximum.
 Pulse width: 250 nanoseconds minimum. The VXI Specification requires 10 nanosecond minimum, and some VXI TTLTRG sources may not be compatible with this input.

Front Panel

Trigger Inputs: Type: TTL
 Load: 8 milliamps maximum.
 Pulse width: 250 nanoseconds minimum.

NOTE: The front panel trigger inputs have a 10,000 ohm pullup resistor installed on each input.

**Auxiliary Outputs
 (Channels 1 and 2)**

Sync Out*: Type output: TTL.
 Drive: 6 standard TTL loads.
 Sense: High while the channel is transmitting an ARINC-429 word.

CLK OUT *: Type output: TTL.
 Drive: 6 standard TTL loads.
 Sense: Free-running clock at the channel's ARINC-429 data-transmission bit rate.
 Duty cycle: 50%.

NRZ Data Out*: Type output: TTL.
 Drive: 6 standard TTL loads.
 Sense: The channel's ARINC-429 output data in NRZ, high-true format. Data is valid on the falling edge of Data Clock Out.
 Transmission order: LSB of ARINC-429 word first.

Data Clock Out*: Type output: TTL.
Drive: 6 standard TTL loads.
Sense: NRZ data is valid on the falling edge of Data Clock Out. One output pulse for each of the channel's data bits transmitted.
Duty Cycle: 50%.
Rate: Equal to ARINC-429 bit rate.

* These signals are intended for use by the 53A-427
ARINC-429/561 Converter Module.

Power-Up: The VX4428 transmitter powers up to the following states:
Interrupts disabled.
100-kb/s bit rate for all channels.
Transmitter outputs in null state.
Channel 1 is the active channel.
Power LED on.
XMIT1 LED off.
XMIT2 LED off.
XMIT3 LED off.
XMIT4 LED off.
FAIL LED off if no Fatal errors have occurred during the power-up self-test.
RFI LED off.
ERR LED off if no self test errors are found.
Channel-memory addresses at location 0.
Trigger outputs/inputs for all channels disabled.
Transmitters connected to the self-test data path.

Self Tests Performed: Memory, time-base, and output-data tests (data output wrapped around to one of the processor's input ports prior to differential drive amplifiers).

RECEIVER

Configuration: Quad ARINC-429 Receiver.

Processor: 1 - 80C186 (PLCC).
1 - 83C452 per channel.

Coupling: Connects directly to Mark 33 DITS bus.

Valid Received Data Transmission

Rates (ARINC-429): High-speed (90 Kb/s to 110 Kb/s); Slow speed (12 Kb/s to 14.5 Kb/s). Consult factory for other bit rates.

Storage Capacity/Channel

Monitor Mode: 32,000 ARINC-429 words without time-stamp/error storage;
16,000 ARINC-429 words with time-stamp/error storage.

Select-labels Mode:	32,000 ARINC-429 words without time-stamp/error storage; 16,000 ARINC-429 words with time-stamp/error storage.
Limit-check Mode:	32,000 ARINC-429 words without time-stamp/error storage; 16,000 ARINC-429 words with time-stamp/error storage.
All-label Mode:	1 ARINC-429 word per label with or without time-stamp/error storage; or 1 ARINC-429 word per label and SDI and/or SSM bits with or without time-stamp/error storage.
Time-stamp Resolution (programmable):	10 μ s to .65535 s in 10- μ s steps. 100 μ s to 6.5535 s in 100- μ s steps. 1 ms to 65.535 s in 1-ms steps. 10 ms to 655.35 s in 10-ms steps. 100 ms to 6553.5 s in 100-ms steps.
IWG Time:	High-speed (100-kb/s data rate): 35 μ s, nominal. Slow-speed (12-kb/s to 14.5-kb/s data rate): 266 μ s, nominal.
VXIbus TTLTRG Outputs:	Type: TTL Open collector. Drive: 48 milliamps. Pulse width: 150 nanoseconds minimum; 250 nanoseconds maximum.
Front Panel Trigger Outputs:	Type: TTL Open collector. Drive: 48 milliamps. Pulse width: 300 nanoseconds minimum; 500 nanoseconds maximum.

NOTE: The front panel trigger outputs require a pull-up at the destination in order to function properly.

Power-up:	The VX4428 receiver defaults to the following states on power-up:
General:	Interrupts disabled. Trigger outputs disabled. All channels in Monitor Mode. Data storage is time-stamp/error storage for all channels. All receivers are disabled. Power LED is on. ERR LED out if no errors are found during self-test. 1 ms time stamp resolution selected. <CR> <LF> appended to the end of data transfers. Slow bit rate is selected for all channels (12-14.5 Kb/s). All receivers are connected to the self-test data path.

Mode-Specific:	Select-labels Mode: Capture label is label 0. Capture on label only.
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Limit-check Mode:
Capture label is label 0.
Capture on label only.
Limit comparison is equal.
Limit parameter = 0.
Pre-trigger and post-trigger = 0.

All-label Mode:
Data is returned for label 0 only.

Self Tests Performed: Memory, front end processors test.

GENERAL

VXIbus Interface: Before the module's commander begins configuration of the module, it is in the following state:
FHS bit in the Response register is inactive (1).
Read Ready bit in the Response register inactive (0).
Request True interrupt enabled.
ERR bit in the Response Register inactive (1).
Logical address set to value on Logical Address switches.
VXIbus interrupt out disabled.

NOTE: The VXIbus interface state is prior to the module's commander beginning configuration of the module.

VXIbus Compatibility: Fully compatible with the VXIbus Specification for message-based instruments.

VXI Device Type: VXI message based instrument, Revision 1.4.

VXI Protocol: Word serial.

VXI Card Size: C size, one slot wide.

Module-Specific Commands: All module-specific commands and data are sent via the VXIbus Byte Available command. All module-specific commands are made up of ASCII characters. Module-specific data may be in either ASCII or binary format.

VMEbus Interface: Data transfer bus (DTB) slave - A16, D16 only.

Interrupt Level: Switch selectable, levels 1 (highest priority) through 7 (lowest).

Interrupt Acknowledge: D16; lower 8 bits returned are the logical address of the module.

VXIbus Commands

Supported:

All VXIbus commands are accepted (e.g. DTACK* will be returned). The following commands have effect on this module; all other commands will cause an Unrecognized Command event:

- ABORT NORMAL OPERATION
- ASYNCHRONOUS MODE CONTROL
- BEGIN NORMAL OPERATION
- BYTE AVAILABLE (with or without END bit set)
- BYTE REQUEST
- CLEAR
- CONTROL EVENT
- END NORMAL OPERATION
- PROTOCOL ERROR QUERY
- IDENTIFY COMMANDER
- READ PROTOCOL
- READ STATUS
- TRIGGER
- SET LOCK
- CLEAR LOCK

VXIbus Protocol

Events Supported:

VXIbus events are returned via VME interrupts. The following event is supported and returned to the VX4428 Module's commander:

REQUEST TRUE (In IEEE-488 systems, this interrupt will cause a Service Request (SRQ) to be generated on the IEEE-488 bus.)

VXIbus Registers:

- ID
- Device Type
- Status
- Offset
- Control
- Logical Address
- Protocol
- Response
- Data Low

See Appendix A for definition of register contents.

Power Requirements:

All required dc power is provided by the power supply in the VXIbus mainframe.

Voltage:

- +5 Volt supply: 4.75 V dc to 5.25 V dc.
- +24 Volt supply: +23.5 V dc to +24.5 V dc.
- 24 Volt supply: -23.5 V dc to -24.5 V dc.

Current (Peak Module, I_{PM}):

- 5 Volt supply: Transmitter - 2.5 amps; Receiver - 1.2 amps.
- +24 Volt supply: 220 mA.
- 24 Volt supply: 200 mA.

Section 1

Replacement Fuses:	+5V: Littlefuse P/N 273004 +24V: Littlefuse P/N 273001 -24V: Littlefuse P/N 273001
Cooling:	Provided by the fan in the VXIbus mainframe. Less than 10°C temperature rise with 1.97 liters/sec of air at a pressure drop of 0.22 mm of H ₂ O.
Temperature:	0°C to +50°C, operating. -40°C to +85°C, storage.
Humidity:	Less than 95% R.H. non-condensing, 0°C to +30°C. Less than 75% R.H. non-condensing, +31°C to +40°C. Less than 45% R.H. non-condensing, +41°C to +50°C.
VXIbus Radiated Emissions:	Complies with VXIbus Specification.
VXIbus Conducted Emissions:	Complies with VXIbus Specification.
Module Envelope Dimensions:	VXI C size. 262 mm x 353 mm x 30.5 mm (10.3 in x 13.9 in x 1.2 in)
Dimensions, Shipping:	When ordered with a Tektronix/CDS mainframe, the module is installed and secured in one of the instrument module slots (slots 1 - 12).
Weight:	1.76 kg (3.93 lbs.)
Weight, Shipping:	When ordered with a Tektronix/CDS mainframe, the module is installed and secured in one of the instrument module slots (slots 1 - 12). When ordered alone, shipping weight is: 2.21 kg (4.93 lb.)
Mounting Position:	Any orientation.
Mounting Location:	Installs in an instrument module slot (slots 1-12) of a C or D size VXIbus mainframe. (Refer to D size mainframe manual for information on required adapters.)
Front Panel Signal Connectors:	1 - 10-pin circular connector (socket) for the auxiliary outputs.
Recommended Cable or Connector:	1 - VX1786P Hooded Connector (10-pin circular, male). 1 - VX1783P Hooded Connector (15-pin D-type, male). 1 - VX1782P Hooded Connector (25-pin D-type, male).

Section 1

Equipment Supplied: 1 - VX4428 Quad ARINC-429 Transmitter/Receiver Module.

Software Revision: V2.1