Models 7242, 7242D and 7342

Multichannel Transceivers with Virtex-4 FPGAs - 3U/6U cPCI

Model 7342 *Model 7242D*

GateFlow ReadyFlow Board Support Package

Features

- Complete software radio transceiver solution
- Four or eight 125 MHz 14-bit A/Ds
- One or two digital upconverters
- One or two 500 MHz 16-bit D/As
- 768 or 1536 MB DDR2 SDRAM
- Two or four Xilinx Virtex-4 FPGAs
- Up to 2.0 seconds of delay or data capture at 125 MHz
- Dual timing buses for independent input and output clock rates
- LVDS clock/sync bus for multiboard synchronization
- 32 or 64 pairs of LVDS connections to the Virtex-4 FPGAs for custom I/O
- Optional factory-installed IP Cores available

General Information

Models 7242 and 7342 are cPCI multichannel transceivers. They consist of one Model 7142 transceiver mounted on a cPCI carrier. The Model 7242 is a 6U cPCI board, while the Model 7342 is a 3U cPCI board. Model 7242D is the same as the Model 7242, except it contains two 7142's rather than one.

A/D Converter Stage

The front end accepts four or eight full scale analog HF or IF inputs on front panel MMCX connectors at +10 dBm into 50 ohms with transformer coupling into Linear Technology LTC2255 14-bit 125 MHz A/Ds.

The digital outputs are delivered into the Virtex-4 FPGAs for signal processing or for routing to other module resources.

Digital Upconverter and D/A Stage

One or two TI DAC5686 digital upconverters (DUC) and D/As accept baseband real or complex data streams from the FPGA with signal bandwidths up to 40 MHz.

When operating as upconverters, they interpolate and translate real or complex baseband input signals to any IF center frequency between DC and 160 MHz. They deliver real or quadrature (I+Q) analog outputs at up to 320 MHz to the 16-bit D/A converters. Analog outputs are through front panel MMCX connectors at +4 dBm into 50 ohms.

If translation is disabled, the DAC5686's act as interpolating 16-bit D/As with output sampling rates up to 500 MHz.

Virtex-4 FPGAs

The architecture includes two or four Virtex-4 FPGAs. All of the board's data and control paths are accessible by the FPGAs, enabling factory installed functions including data multiplexing, channel selection, data packing, gating, triggering and SDRAM memory control. In addition to the built-in functions, users can include their own custom IP for data processing. Pentek GateFlow FPGA Design Kits facilitate integration of user-created IP with the factory shipped functions.

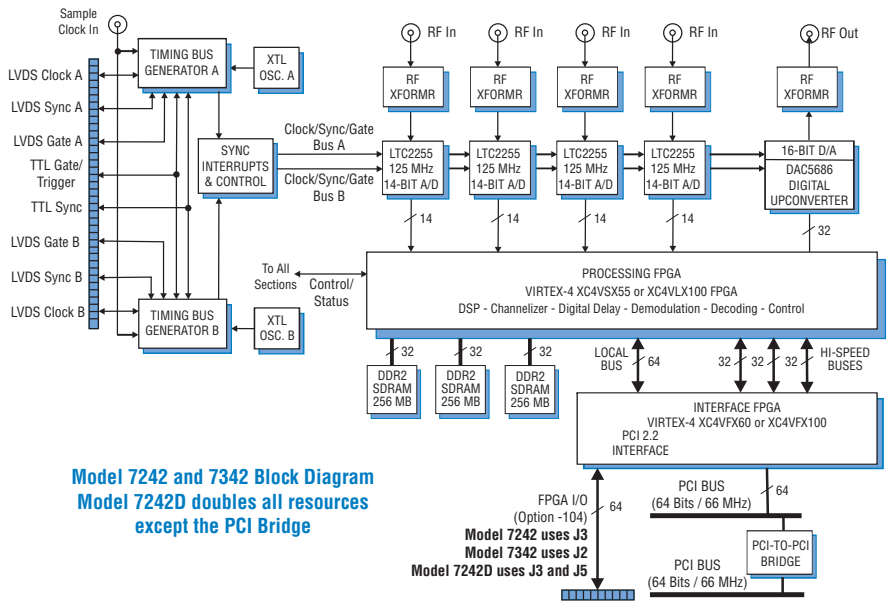
The Xilinx XC4VSX55 FPGA serves as a control and status engine with data and programming interfaces to each of the on-board resources including the A/D converters, DDR2 SDRAM memory, digital upconverters and D/A converters.

The XC4VSX55 features 512 DSP slices and is ideal for demodulation/modulation, decoding/encoding, decryption/encryption, digital delay and channelization of the signals between reception and transmission.

For applications requiring more FPGA logic cells, these Models can be optionally configured with an XC4VLX100 in place of the XC2VSX55 for 110,592 logic cells.

A second Virtex-4 FPGA provides board interfaces including PCI and serial I/O. The XC4VFX60 FPGAs also include two PowerPC cores which can be used as local microcontrollers to create complete application engines. These Models can be optionally configured with an XC4VFX100 in place of the XC4VFX60.

Option -104 installs the J3 connector (Model 7242) or the J2 connector (Model 7342) with 32 pairs of LVDS lines to the first XC4VFX60/100 FPGA for custom I/O. With Model 7242D, an additional 32 pairs of LVDS lines connect to the second XC4VFX60/100 FPGA through J5. ➤



Model 7242 and 7342 Block Diagram
Model 7242D doubles all resources except the PCI Bridge

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Pentek, Inc. One Park Way ◆ Upper Saddle River ◆ New Jersey 07458
Tel: 201·818·5900 ◆ Fax: 201·818·5904 ◆ Email: info@pentek.com
www.pentek.com

Multichannel Transceivers with Virtex-4 FPGAs - 3U/6U cPCI

Ordering Information

Model	Description
7242	Multichannel Transceiver with Virtex-4 FPGAs - 6U cPCI
7242D	Multichannel Transceiver with Virtex-4 FPGAs - 6U cPCI, with two 7142 modules
7342	Multichannel Transceiver with Virtex-4 FPGAs - 3U cPCI

Options:

-100	XC4VFX100 replaces XC4VFX60
-104	FPGA I/O through cPCI J3 for 7242; cPCI J2 for 7342; cPCI J3 and J5 for 7242D
-110	XC4VLX100 replaces XC4VSX55
-428	Four multiband DDCs and interpolation filter, factory-installed core

Clocking and Synchronization

Two independent internal timing buses can provide either a single clock or two different clock rates for the input and output signal paths.

Each timing bus includes a clock, a sync, and a gate or trigger signal. Signals from either Timing Bus A or B can be selected as the timing source for the A/Ds, the upconverters and the D/A. Two internal crystal oscillators and a front panel reference input or LVDS bus can drive the timing buses.

A front panel 26-pin LVDS Clock/Sync connector allows multiple boards to be synchronized. In the slave mode, it accepts differential LVDS inputs that drive the clock, sync and gate signals for the two internal timing buses.

In the master mode, the LVDS bus can drive one or both sets of timing signals from the two internal timing buses for synchronizing multiple boards.

Up to four slave 7242's and seven slave 7342's can be driven from the LVDS bus master, supporting synchronous sampling and sync functions across all connected boards. Up to forty 7242 boards or eighty 7342 boards may be synchronized with a Model 9190 Clock and Sync Generator.

Memory Resources

Three independent 256 MB banks of DDR2 SDRAM are available to each FPGA. Built-in memory functions include an A/D data transient capture mode with pre- and post-triggering and a D/A waveform generator. All memory banks can be easily accessed through the PCI interface.

Custom user-installed functions within the FPGA can take advantage of the SDRAM for many other purposes.

PCI Interface

These Models include an industry-standard interface fully compliant with PCI 2.2 bus specifications. The interface includes nine separate DMA controllers for efficient transfers to and from the board.

Data widths of 32 or 64 bits and data rates of 33 or 66 MHz are supported.

Specifications

Model 7242 or Model 7342: 4 A/D, 1 D/A
Model 7242D: 8 A/D, 2 DUC & 2 D/A
Model 7242D shown in the Specifications

Front Panel Analog Signal Inputs (8)
- **Input Type:** Transformer-coupled, front panel female MMCX connectors
- **Transformer Type:** Coil Craft WBC1-1TLB
- **Full Scale Input:** +10 dBm into 50 ohms
- **3 dB Passband:** 250 kHz to 300 MHz

A/D Converters (8)
- **Type:** Linear Technology LTC2255
- **Sampling Rate:** 1 MHz to 125 MHz
- **Internal Clock:** 125 MHz crystal osc.
- **External Clock:** 1 to 125 MHz
- **Resolution:** 14 bits
- **A/D Data Reduction Mode:** Data from the A/Ds can be written directly into the FPGAs at a rate equal to the A/D clock decimated by any value between 1 and 4096

Front Panel Analog Signal Outputs (2)
- **Output Type:** Transformer-coupled, front panel female MMCX connector
- **Full Scale Output:** +4 dBm into 50 ohms (other options available)
- **3 dB Passband:** 60 kHz to 300 MHz (other options available)

Digital Upconverters (2)
- **Type:** TI DAC5686
- **Input Bandwidth:** 40 MHz, max.
- **Output IF:** DC to 160 MHz
- **Output Signal:** Analog, real or quadrature
- **Sampling Rate:** 320 MHz max; 500 MHz max. with upconversion disabled
- **Resolution:** 16 bits

Clock Sources (4): Selectable from onboard crystal oscillators, external or LVDS clocks

External Clocks (4)
- **Type:** Front panel female MMCX connector, sine wave, 0 to +10 dBm, AC-coupled, 50 ohms
- **Sync/Gate Bus:** 26-pin connector, dual clock/sync/gate input/output LVDS buses; one sync/gate input TTL signal

Field Programmable Gate Array (4)
- **Type:** Two Xilinx Virtex-4 XC4VSX55 & Two Xilinx Virtex-4 XC4VFX60
- **Option -100:** XC4VFX100 replaces XC4VFX60
- **Option -110:** XC4VLX100 replaces XC4VSX55

Custom I/O
- **Option -104:** Installs J3 and J5 connectors with 32 pairs of lines to each XC4VFX60/100 FPGA

Memory
- **DDR2 SDRAM:** 1536 MB in six banks

PCI Interface
- **PCI Bus:** 64-bit, 66 MHz (also supports 32-bit and/or 33 MHz)
- **Local Bus:** 64-bit, 66 MHz
- **DMA:** 9 channel demand-mode and chaining controller

Environmental (Commercial version)
- **Operating Temp:** 0° to 50° C
- **Storage Temp:** –20° to 90° C
- **Relative Humidity:** 0 to 95%, non-cond.

Size: Standard 6U cPCI board