

New!

Models 57670 & 58670

4- or 8-Channel 1.25 GHz D/A with DUC and Virtex-6 FPGA - 6U OpenVPX



Model 58670



Features

- Supports Xilinx Virtex-6 LXT and SXT FPGAs
- Four or eight 1.25 GHz 16-bit D/As
- Four or eight digital upconverters
- Programmable output levels
- 250 MHz max. output bandwidth
- 2 or 4 GB of DDR3 SDRAM
- PCI Express (Gen. 1 & 2) interface up to x8
- Sample clock synchronization to an external system reference
- Dual-or Quad μ Sync clock/sync bus for multiboard synchronization
- Optional user-configurable gigabit serial interface
- Optional LVDS connections to the Virtex-6 FPGA for custom I/O
- Ruggedized and conduction-cooled versions available

General Information

Models 57670 and 58670 are members of the Cobalt® family of high-performance 6U OpenVPX boards based on the Xilinx Virtex-6 FPGA. They consist of one or two Model 71670 XMC modules mounted on a VPX carrier board.

Model 57670 is a 6U board with one Model 71670 module while the Model 58670 is a 6U board with two XMC modules rather than one.

These models include four or eight D/As, four or eight DUCs, and four or eight banks of memory.

The Cobalt Architecture

The Pentek Cobalt Architecture features a Virtex-6 FPGA. All of the board's data and control paths are accessible by the FPGA, enabling factory-installed functions including data multiplexing, channel selection, data packing, gating, triggering and memory control. The Cobalt Architecture organizes the FPGA as a container for data processing applications where each function exists as an intellectual property (IP) module.

Each member of the Cobalt family is delivered with factory-installed applications ideally matched to the board's analog interfaces. The factory-installed functions in these models include four or eight D/A waveform playback IP modules, to support waveform generation through the D/A converters. IP modules for DDR3 SDRAM memories, controllers for all data clocking and synchronization functions, test signal generators, and a PCIe interface complete the factory-

installed functions and enable these models to operate as complete turnkey solutions, without the need to develop any FPGA IP.

Extendable IP Design

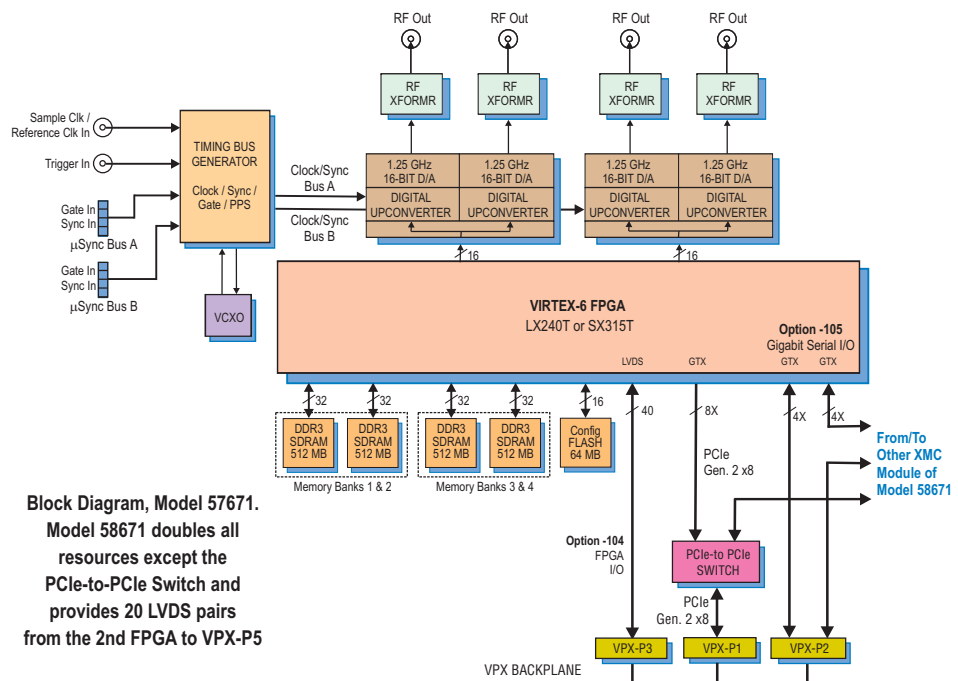
For applications that require specialized functions, users can install their own custom IP for data processing. Pentek GateFlow FPGA Design Kits include all of the factory-installed modules as documented source code. Developers can integrate their own IP with the Pentek factory-installed functions or use the GateFlow kit to completely replace the Pentek IP with their own.

Xilinx Virtex-6 FPGA

The Virtex-6 FPGA site can be populated with a variety of different FPGAs to match the specific requirements of the processing task. Supported FPGAs include: LX130T, LX240T, or SX315T. The SXT part features 1344 DSP48E slices and is ideal for modulation/demodulation, encoding/decoding, encryption/decryption, and channelization of the signals between transmission and reception. For applications not requiring large DSP resources, one of the lower-cost LXT FPGAs can be installed.

Option -104 provides 20 LVDS pairs between the FPGA and the VPX P3 connector, Model 57670; P3 and P5, Model 58670.

Option -105 supports serial protocols by providing a 4X gigabit link between the FPGA and VPX P2, Model 57670; or one 4X link from each FPGA to P2 and an additional 4X link between the FPGAs, Model 58670. ➤



Block Diagram, Model 57671.
Model 58671 doubles all resources except the PCIe-to-PCIE Switch and provides 20 LVDS pairs from the 2nd FPGA to VPX-P5

► **Digital Upconverter and D/A Stage**

Two or four Texas Instruments DAC3484s provide four or eight DUC (digital upconverter) and D/A channels. Each channel accepts a baseband real or complex data stream from the FPGA and provides that input to the upconvert, interpolate and D/A stage.

When operating as a DUC, it interpolates and translates real or complex baseband input signals to a user selectable IF center frequency. It delivers real or quadrature (I+Q) analog outputs to a 16-bit D/A converter.

If translation is disabled, each D/A acts as an interpolating 16-bit D/A with output sampling rates up to 1.25 GHz. In both modes, the D/A provides interpolation factors of 2x, 4x, 8x and 16x. Analog output is through four or eight front panel SSMC connectors.

Clocking and Synchronization

An internal timing bus provides all required D/A clocking. The bus includes a clock, sync and a gate or trigger signal. An on-board clock generator receives a sample clock either from the front panel SSMC connector or from an on-board programmable VCXO (Voltage-Controlled Crystal Oscillator). In this latter mode, the front panel SSMC connector can be used to provide a 10 MHz reference clock to phase-lock the VCXO. Either clock source (front panel or VCXO)

can be used directly or can be divided by 2, 4, 8, or 16 to provide lower frequency D/A clocks.

A pair of front panel µSync connectors allows multiple boards to be synchronized. They accept CML inputs that drive the board's sync and trigger/gate signals. The Pentek Model 9192 Cobalt Synchronizer can drive multiple µSync connectors enabling large, multichannel synchronous configurations.

Memory Resources

The architecture of these models supports four or eight independent memory banks of DDR3 SDRAM. Each bank is 512 MB deep and is an integral part of the board's DMA and waveform playback capabilities. Waveform tables can be loaded into the memories with playback managed by the linked-list controllers.

In addition to the factory-installed functions, custom user-installed IP within the FPGA can take advantage of the memories for many other purposes.

PCI Express Interface

These models include an industry-standard interface fully compliant with PCI Express Gen. 1 and 2 bus specifications. Supporting PCIe links up to x8, the interface includes multiple DMA controllers for efficient transfers to and from the board. ►

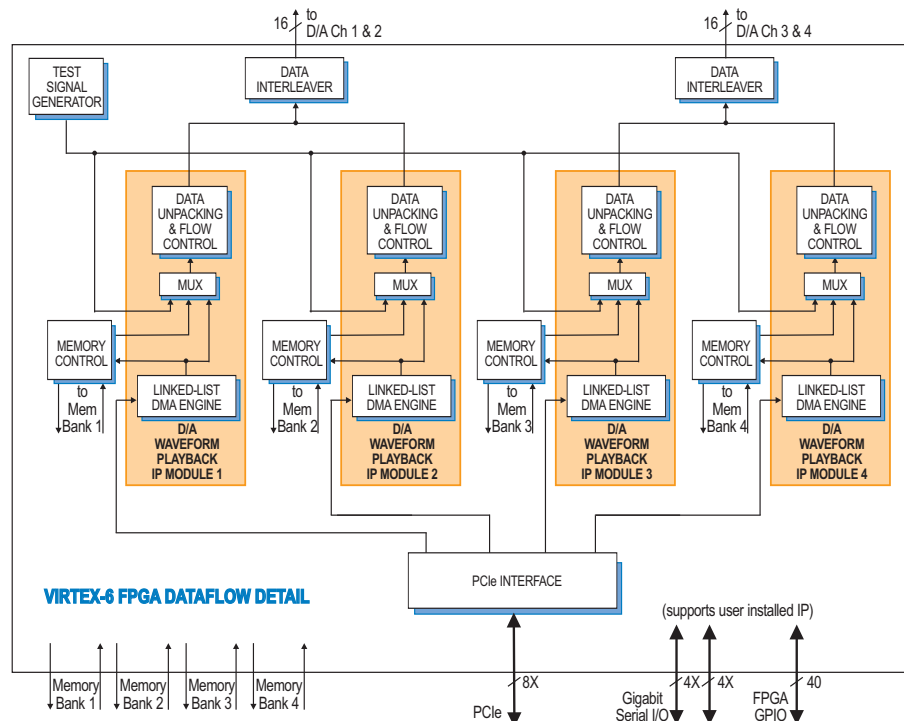
D/A Waveform Playback IP Module

The factory-installed functions in these models include one or two sophisticated D/A Waveform Playback IP modules. Four or eight linked list controllers support waveform generation to the four or eight D/As from tables stored in either on-board memory or off-board host memory.

Data for Channel 1 and Channel 2 are interleaved for delivery to a dual channel D/A device. For this reason, they must share a common trigger/gate, sample rate, interpolation factor, and other parameters. The same rules apply to Channel 3 and Channel 4, as well as to the other four channels of Model 58670.

Parameters including length of waveform, waveform repetition, etc. can be programmed for each channel.

Up to 64 or 128 individual link entries for each D/A channel can be chained together to create complex waveforms with a minimum of programming.



► **Specifications**

Model 57670: 4-Channel DUC, 4-channel D/A

Model 58670: 8-Channel DUC, 8-channel D/A

D/A Converters (4 or 8)

Type: TI DAC3484

Input Data Rate: 312.5 MHz max.

Output Bandwidth: 250 MHz max.

Output Sampling Rate: 1.25 GHz max. with interpolation

Interpolation: 2x, 4x, 8x or 16x

Resolution: 16 bits

Front Panel Analog Signal Outputs (4 or 8)

Output Type: Transformer-coupled, front panel female SSMC connectors

Full Scale Output: Programmable from -20 dBm (0.063 Vp-p) to +4 dBm (1.0 Vp-p) in 16 steps

Full Scale Output Programming: $1.0 \times (G+1) / 16$ Vp-p, where 4-bit integer $G = 0$ to 15

Clock Synthesizers (1 or 2)

Clock Source: Selectable from on-board programmable VCXO or front panel external clock

VCXO Frequency Ranges: 10 to 945 MHz, 970 to 1134 MHz and 1213 to 1417 MHz

Synchronization: VCXO can be phase-locked to an external 4 to 200 MHz system reference, typically 10 MHz

Clock Dividers: External clock or VCXO can be divided by 1, 2, 4, 8, or

16 for the D/A clock

External Clocks (1 or 2)

Type: Front panel female SSMC connector, sine wave, 0 to +10 dBm, AC-coupled, 50 ohms, accepts 10 to 500 MHz sample clock or 5 or 10 MHz system reference

External Trigger Inputs (1 or 2)

Type: Front panel female SSMC connector
Function: Programmable functions include: trigger, gate, sync and PPS

Timing Bus (1 or 2): 19-pin μ Sync bus

connector includes, clock, reset and gate/trigger inputs and outputs, CML

Field Programmable Gate Arrays (1 or 2)

Standard: Xilinx Virtex-6 XC6VLX130T-2

Optional: Xilinx Virtex-6 XC6VLX240T-2 or XC6VSX315T-2

Custom I/O

Option -104: Provides 20 LVDS pairs between the FPGA and the VPX P3 connector, Model 57670; P3 and P5, Model 58670

Option -105: Supports serial protocols by providing a 4X gigabit link between the FPGA and VPX P2, Model 57670; or one 4X link from each FPGA to P2 and an additional 4X link between the FPGAs, Model 58670

Memory Banks (1 or 2)

Four or eight 512 MB DDR3 SDRAM memory banks, 400 MHz DDR

PCI-Express Interface

PCI Express Bus: Gen. 1 or 2: x4 or x8

Environmental: Level L1 & L2 air-cooled; Level L3 ruggedized, conduction-cooled
Size: 3.937 in. x 6.717 in. (100 mm x 170.6 mm)

Ordering Information

| Model | Description |
|-------|---|
| 57670 | 4-Channel 1.25 GHz D/A with Virtex-6 FPGA - 6U VPX |
| 58670 | 8-Channel 1.25 GHz D/A with two Virtex-6 FPGAs - 6U VPX |

Options:

| | |
|-------|--|
| -002* | -2 FPGA speed grade |
| -062 | XC6VLX240T FPGA |
| -064 | XC6VSX315T FPGA |
| -104 | LVDS I/O between the FPGA and P3 connector, Model 57670; P3 and P5 connectors, Model 58670 |
| -105 | Gigabit link between the FPGA and P2 connector, Model 57670; gigabit links from each FPGA to P2 connector, Model 58670 |
| -155* | Two 512 MB DDR3 SDRAM Memory Banks (Banks 1 and 2) |
| -165* | Two 512 MB DDR3 SDRAM Memory Banks (Banks 3 and 4) |

* These options are always required

Contact Pentek for availability of rugged and conduction-cooled versions