OP4510 Simulator

RT-LAB / RCP / HIL System

OPAL·RT TECHNOLOGIES

The OP4510 is a compact entry-level simulator that combines OPAL-RT's core strengths: RT-LAB high-performance Rapid Control Prototyping and Hardware-In-the-Loop systems

OPAL-RT introduces the newest version of the OP4510, compact and affordable real-time power grid digital simulator. The OP4510 (V2) marks a significant evolution of the OP4500 and the first OP4510, bringing a new level of connectivity, expandability, and versatility to the platform.

The OP4510 is the natural evolution of the widely acclaimed OP4500, featuring:

Power
- Faster processor up to 3.5 GHZ
- FPGA Kintex7 able to process up to 410 K Cells

Versatility
- Possibility to adapt the I/O configuration to the targeted application

Connectivity
- Active/passive PCIe, CANbus, GPS time synchronization (IEEE 1588)
- Optional optical and SFP modules.
- Optional RS422, fiber optic or synchronization modules.
- Interconnectable with other OPAL-RT simulators or expansion units.

PRODUCT HIGHLIGHTS

- High-Performance Real-time High-Speed Connectivity
- Open and Optimized for Power Electronics
- Low Cost Entry-Level
- Compact, Portable and Large Number of Robust I/O Channels

APPLICATIONS

- Rapid Control Prototyping (RCP) and Hardware-in-the-Loop (HIL) Simulation for R&D and Teaching
- Bench Top and Portable Test and Measurement System
- FPGA Development System
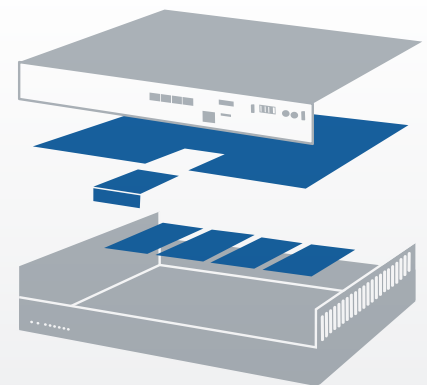
The OP4510 accepts any combination of four different I/O modules such as analog input, analog output, digital input and digital output.

GENERAL SPECIFICATIONS

Power supply	Universal input and active power factor correction 350W
FPGA	Kintex-7 FPGA, 325T, 326,000 logic cells, 840 DSP slice (Multiplier- adder)
Computer	Intel Xeon E3 v5 CPU (4 core, 8MB cache, 2.1 or 3.5GHz), 16G B RAM, 256 GB SSD
Fast optical interface	4 sockets for optional Small Form-factor Pluggable (SFP&SFP+) 1 to 5 Gbits/s optical cable pairs (Rx/Tx)
Software compatibility (CPU)	RT-LAB multi-processors platform, LINUX, Simulink, RTW, SimPowerSystems, SimScape, ARTEMIS, RT-EVENT, HYPERSIM and several third-party software compatible with Simulink
FPGA	XILINX System Generator for Simulink, RT-LAB XSG, eHS FPGA electrical circuit solvers, library of floating point functions, resolvers and Finite-Element based motor models and converters
Performance	Minimum time step of 7 microseconds for model subsystems executed on the INTEL CPU and 250 nanoseconds for models executed on the FPGA chips, 10 nanosecond timer resolution
Dimensions & weight	43.2 (W) x 27.4(D) x 8.9cm (H) (17" x 10.8" x 3.5") 5Kg (11lbs) approx, for laboratory use

AVAILABLE I/O SYSTEMS*

TYPE B MODULES

Digital output channels	32 channels, push-pull, 65 nanosecond typical propagation delay, 5V to 30V adjustable by an external voltage supplied by users, 50 mA max, short-circuit protected, Galvanic isolation
Digital input channels	32 channels, 4V to 50V, 3.5mA min, 110 nanosecond typical propagation delay, galvanic isolation with fast Opto-couplers
Analog input converter	16 channels, 16 bits, 2.5 microsecond conversion time for all channels simultaneously, +- 20V true differential input, 400 kOhms input impedance, conversion time directly controlled by the FPGA chip
Analog output converter	16 channels, 16 bits, 1.0 microsecond update time for all channels simultaneously, ± 16V, 15 mA (35 mA with optional fast driver), short-circuit protected, update time directly controlled by the FPGA chip

ON-BOARD CHANNELS

RS422 Fiber optic Synchronization	Various options available: RS422 to transmit differential encoder inputs and outputs or fiber optic for digital I/Os or for low-speed communication protocols or GPS synchronization

* Standard configuration includes 32 Dout, 32 Din, 16 Ain, 16 Aout.

ARCHITECTURE*
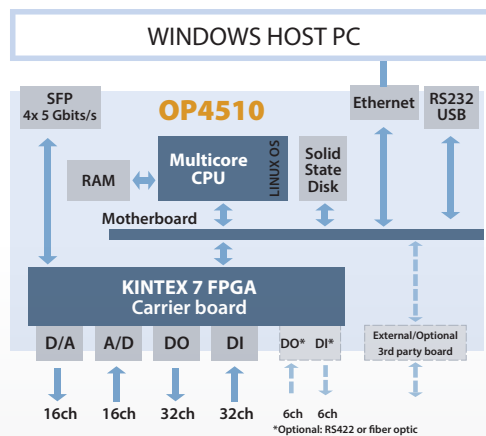
The OP4510 integrates OPAL-RT RT-LAB and eFPGAsim real-time platform with the highest performance processors from Intel and FPGA chips as well as with industry standard Simulink and LabVIEW software. This multi-rate FPGA-based architecture enables user to reach time steps below 7 µs for subsystems running on INTEL CPU and less than 250 nanoseconds on the FPGA chip to accurately simulate power converter for HIL applications. An advanced PWM converter controller can then be implemented to control real hardware for Rapid Control Prototyping (RCP) applications with timing resolution better than 20 nanoseconds. The OP4510 can also be delivered as a stand alone power electronic controller test system with pre-defined power electronic models.

I/O AND CONNECTORS

A Small Form Factor (SFP) 5Gbits/s optical interface modules connectors
B JTAG connector
C Synchronization connectors and status LEDs
D Target computer status LEDs
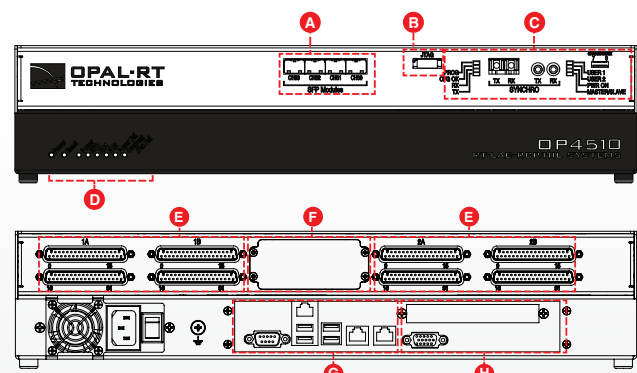
E DB37 connectors for digital and analog inputs and outputs
F Optional RS422 (differential inputs/outputs), fiber optic and synchronization connectors
G Standard ATX computer connectors (left to right): mouse and keyboard, USB ports, monitor, external SATA connector, network ports
H PCIe options available, depending on optional connector selection (F): Active/passive PCIe, CANbus, GPS time synchronization (IEEE 1588) SFP or RJ45.

About OPAL-RT TECHNOLOGIES

OPAL-RT is the world leader in the development of PC/FPGA Based Real-Time Digital Simulator, Hardware-In-the-Loop (HIL) testing equipment and Rapid Control Prototyping (RCP) systems to design, test and optimize control and protection systems used in power grids, power electronics, motor drives, automotive industry, trains, aircrafts and various industries, as well as R&D centers and universities.

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