ALPAO

Leading the light

Compact RTC - Rackable

Preliminary Technical Datasheet
Real-Time Computer

クロニクス株式会社
160-0023　東京都新宿区西新宿3-2-11新宿三井ビル二号館9F　TEL:03-5322-7191　FAX:03-5322-7790　Emai:sales@chronix.co.jp

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ALPAO Real-Time Computer

Table of Contents

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Product Overview

General Description

For the most demanding applications, ALPAO provides a state-of-the-art Compact Real Time Computer (Compact RTC), based on a Linux CPU running up to 5kHz with a typical latency of less than 80 µs.

The RTC pipeline is specially optimized for high-speed AO loops, targeting specific applications such as atmospheric turbulences compensation.

The following functionalities are provided in RTC:

- Low Size Weight and Power
- Available on two formats, Tabletop or Rackable (2U 19")
- Compatible with a large range of ALPAO products, all wavefront sensors and deformable mirrors up to 820 actuators (more on demand)
- User friendly interface with ACE (available on order)
- RTC SDK Library available for advanced system integration
- Typical command matrix update rate : 1Hz, online without opening the loop
- Accessibility to the data produced by the RTC in real time
- Advanced algorithms
  - Hadamard modes for fast and low-noise calibration
  - Modal calibration for optimized modal gain control
  - Anti-wind up controller for improved loop stability
  - Optimized centroid computation for enhanced robustness in scintillation or low-flux scenariis

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RTC technical specifications and interfaces

ALPAO RTC Technical Specifications

RTC Dimensions (mm)	88.9 x 436.8 x 298.8 (2U 19")
RTC Weight (kg)	10.0
RTC power consumption$_{max}$ (kW)	0.68

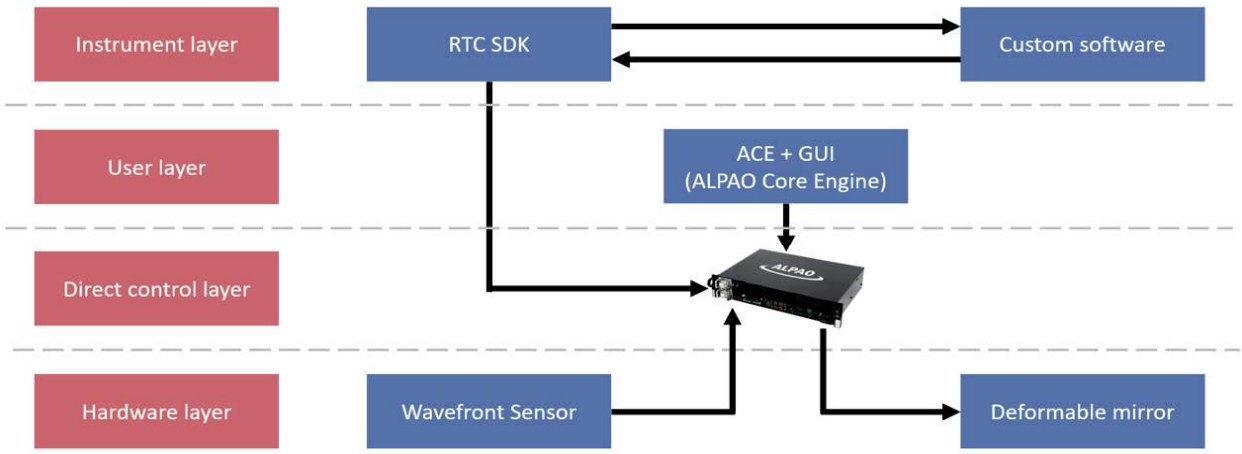
Functional temperature (°C)	0 °C to 35 °C, no direct sunlight.
Storage temperature (°C)	-40 °C to 70 °C
Maximum temperature gradient(°C)	TBD

Functional relative humidity (°C)	8% to 90% RH - Non-condensing atmosphere
Storage relative humidity (°C)	5% to 95% RH

Functional altitude (m)	TBD
Storage altitude (m)	TBD

Available interfaces

ALPAO strongly recommends using ALPAO ACE software (available on order) for a steep learning curve, and ALPAO RTC SDK (available on demand) for advanced users and industrial applications.



*The maximum frequency of the perturbation that can be attenuated by the system, is defined for each configuration on request.

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RTC Performances

ALPAO RTC Typical Performances

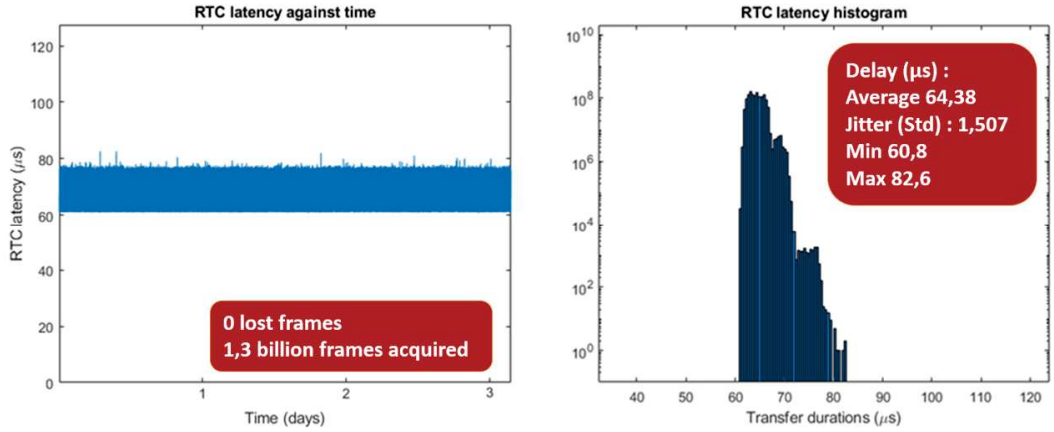
AO loop performances are capped by both RTC performances and WFS performances. Please refer to ALPAO Wavefront Sensors datasheets to evaluate the overall performances of the AO loop.

WFS sub-aperture ROI	8x8	10x10	15x15	16x16	19x19	23x23	31x31
Compatible DM (Fried geometry)	DM69	DM97	DM192	DM256	DM308	DM468	DM820

RTC Performance	Max Frame rate (Hz)	5000	5000	5000	5000	5000	5000	5000
	RTC delay (µs)	30	30	30	30	40	80	60

RTC Latency

Lost frame and jitter could have a large impact on the overall loop performances and stability. In the following example, there was zero lost frame over 3 days while working at 5 kHz using ALPAO SH-CMOS Fast 32x32 subapertures and a DM820. RTC latency was very stable as shown on the following histogram.



Telemetry server capability option

Data produced by the RTC can be accessed through its buffer. The buffer changes with system and setup. For example, a DM308, InGaAs Fast Wavefront Sensor system running at 3kHz, has a buffer of about 1 million frames.

Telemetry server option will allow you to record this data in real time.
This option needs to be confirmed by ALPAO, and may not be available for the most demanding systems.

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Bill of materials, power and cooling

RTC Package Items

Item	Product	Quantity
Real Time Computer	ALPAO Compact RTC - Rackable	1
Sliding rails	1U heigth sliding rails set	1
Power Supply	Cable C13- Country specific power plug	1
	RJ45	1
Packaging	Carton Box	1

Note : Laptop (MSERV), Keyboard, Mouse, Screen are not provided with ALPAO Compact RTC

Power Interface

System ID	Item	Power Supply Voltage	Max Power	Max Current	Frequency
Compact RTC	1U 600/680W Multi output PWS 80+ Gold	100 - 240 VAC	680 W	n/a	50-60 Hz

System cooling

System ID	Description
Fans	4x 4-PIN PWM 8cm Fans
Air Shroud	1 Air Shroud

[1]Included with the purchase of a DM and a WFS.

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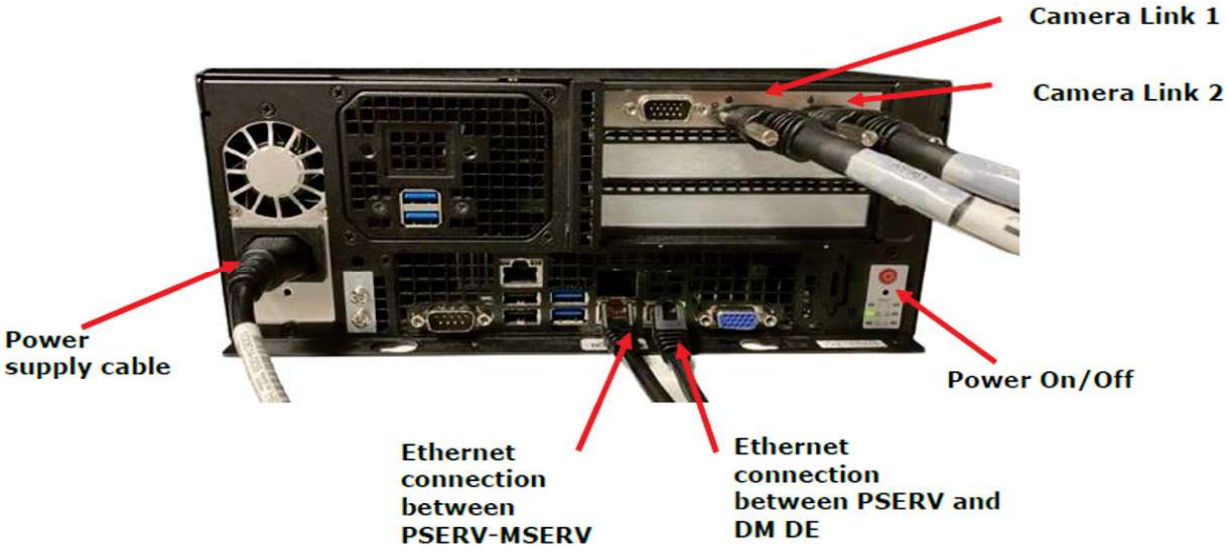
Cabling and certification

Cabling



Note : The image reprensents the Tabletop version, Rackable will be available soon.
For more details, please refer to Compact RTC Quick Start Guide

Certification

Certified Safety Models	
Compliant with UL or CSA: E403iF-S6X12 and E403iF-6.	
Regulatory Compliance	
FCC, ICES, CE, UKCA, VCCI, RCM, NRTL, CB	
Applied Directives, Standards	
EMC/EMI: 2014/30/EU (EMC Directive) Electromagnetic Compatibility Regulations 2016 FCC Part 15 Subpart B Class A ICES-003 VCCI-CISPR 32 AS/NZS CISPR 32 EN/BS 55032 EN/BS 55035 CISPR 32 CISPR 24/CISPR 35	EN/BS 61000-3-2 EN/BS 61000-3-3 EN/BS 61000-4-2 EN/BS 61000-4-3 EN/BS 61000-4-4 EN/BS 61000-4-5 EN/BS 61000-4-6 EN/BS 61000-4-8 EN/BS 61000-4-11
Product Safety: 2014/35/EU (LVD Directive) UL/CSA 62368-1 (USA and Canada) Electrical Equipment (Safety) Regulations 2016 IEC/EN/BS 62368-1	
Environment: 2011/65/EU (RoHS Directive) EC 1907/2006 (REACH) 2012/19/EU (WEEE Directive)	

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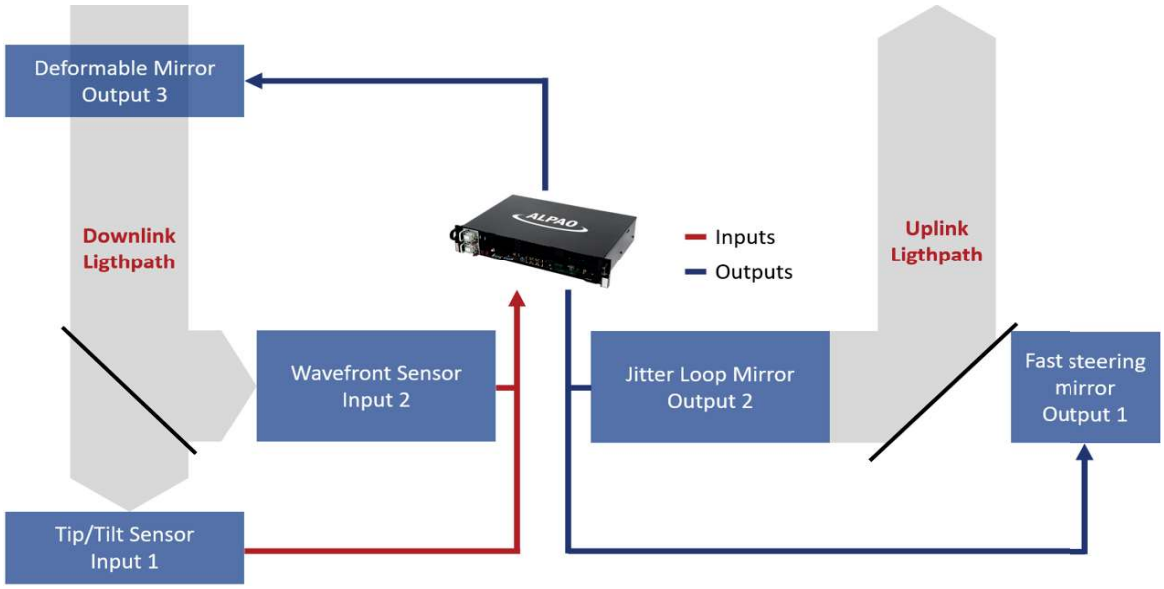
Architectures

Architectures available[1]

ALPAO RTC allows almost all varieties of architectures
- Single Input Single Output (SISO)
- Single Input Multiple Outputs (SIMO)
- Multiple Inputs Multiple Outputs (MIMO)

SISO example : Classic AO Loop

MIMO example : OGS[2] for Free Space Optical Communication



[1]Non-exhaustive list. For any request, please contact us in order to discuss the feasibility of your project.
[2]Optical Ground Station

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Safety and grounding

Safety Instructions

- This PDU (Power Distribution Unit) is intended for indoor use only.
- Do not install this PDU where excessive moisture or heat is present.
- Never install any wiring, equipment or PDU's during a lightning storm.
- Always connect this PDU into a three-wire, grounded power outlet.
- The power input cable should be connected to appropriate branch circuit/mains protection (fuse or circuit breaker. Connection to any other type of power outlet may result in a shock hazard.
- Use only the supplied brackets for mounting.
- Never work alone under hazardous conditions.
- Check that the power cord, plug and socket are in good condition.
- Disconnect the PDU from the power outlet before you install or connect equipment to reduce the risk of electric shock if you cannot verify grounding. Reconnect the PDU to the power outlet only after you have made all connections.
- Use a protective earth connector with equipment. This type of connector carries the leakage current from the load devices (computer equipment). Do not exceed a total leakage current of 3.5mA or a risk of electrical shock will result.
- Use the M3 threaded earth point n the back of the PDU to directly ground to the rack.
- ALWAYS make sure the qupment that has been connected to the PDU is OFF, before switching on the PDU, as the Inrush Current can blow the power fuse and activate the protection circuit.
- All the equipment plugged into this unit should have the correct fuses fitted for their current draw.

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Warranty and Installation

Warranty

The Equipment is guaranteed against latent defect for a period of 12 (twelve) months from the date of supply.

Any request for intervention under the guarantee must be communicated by the Client to ALPAO by email at suppport@alpao.fr as soon as possible after the defect is discovered. The guarantee claim must indicate the exact nature of the defect and be accompanied by one of the following supporting documents: purchase order, order confirmation, invoice or delivery note.

The Client expressly authorises ALPAO to examine the Equipment to verify the reality of the defect invoked and to investigate its origin.

If the claims are found to be founded, ALPAO will, at its discretion and at its own expense, replace, repair or reimburse the defective or faulty Equipment.

This guarantee is not enforceable in the following cases:

- Non-compliant use of the Equipment or non-respect of the user instructions by the Client
- Lack of maintenance or cleaning of the Equipment
- Modifications made to the Equipment, repairs or work carried out on the Equipment
- Unauthorized third-party intervention on the Equipment
- Normal wear and tear

Extensions of the Warranty are available as option at the time of purchase

Installation

Unless the Client has taken out an On-site Support Service for this purpose, it shall be solely responsible for Equipment installation and wiring at the place of use (wiring, software, batteries, etc.).

The Equipment is supplied for the exclusive use of the Client. The Equipment must only be entrusted to duly qualified personnel who have, where applicable, the required authorisations. The Equipment must be kept in good working condition, be duly cleaned, and be used by the Client in strict compliance with the instructions for use issued by ALPAO. The Equipment may not be used for any purpose other than that for which it is normally intended.

The Equipment are not designed, intended or authorized for use in life support, life sustaining, human implantable, nuclear facilities, flight control systems or any other applications in which the failure of the Equipment could results in personal injury, loss of life or catastrophic damage

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Support

Support

To contact support, please send an email to, or call :

support@alpao.fr
+33 476 890 965 (9am to 5pm FRANCE TIME)

Please, provide a detailed explanation of the problem as well as the serial number of your product. A ticket will be created and we will contact you within the shortest delay possible.

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Deformable Modal Mirrors

Large Aperture Deformable Mirrors

ALPAO Software Control

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