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- Lightweight and small footprint unit.
- Fully Flexible Acquisition module/Chassis dimension.
- High speed recording system (1Gbps) with adapted controller.
- High recording capacity (Can up to 512GB) with adapted controller.
- Patented Xchange® Module Technology.
- Record and Replay function available.
- Transmitter (TX) module available.
- Master/slave(s) Ethernet or Wi-fi Architecture available.
- Can be configured from one acquisition module to sixteen (16).
- CPU (Controller) module is also available with recording SSD cartridge.
- Integrate Battery module is also available to sustain until 3 hours of power.
- Each module integrate status led for easy Diagnostic.
- Easy fixation on each side with 90° rotation support integrate.
- IRIG 106 Chapter 10 compliant (Recording option)

The NanoX acquisition system is an efficient data concentrator and recorder, with an ultra-compact design, and an ease of changing acquisition modules. The NanoX provide modularity and permit to plug/stack until sixteen data acquisition modules by unit. A unit is constituted by a CPU/Controller module with a optional recording capacity (from 32GB to 512GB) and a smart power supply module. The NanoX is a data acquisition concentrator completed with high speed (1Gbps) recording and transmitting system combined in the same device, with this device you can make all in one modular and compact solution where other solutions require two or three separate units.







The NanoX Controllers are available in four different version following your need, this one can integrate only some basic functionalities or integrate transmission and recording functionalities to transform your data acquisition system to a real and powerful data recorder.

#### Three mains controllers configurations:

[CPU-N-NX]Network capacity (For Master/Satellite(s) system).[CPU-NR-NX]Network & Recording capacity.[CPU-NT-NX]Network & IRIG 106, chapter 4 capacity.

#### Premium configuration:

[CPU-NRT-NX] Network, Recording and IRIG 106 chapter 4 capacity.





### **CPU-N-NX** Module Dimensions

Dimensions are in "mm"





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### **CPU-NT-NX** Module Dimensions

Dimensions are in "mm"

















#### Features/Utility channels

- Audio input
- Irig B Time input
- GPS input (Time, Position...)
- Support IEEE 1588 Time v2
- Discrete; ON/OFF and ON/OFF record
- Tricolor status outputs LED
- CPU, IRIG B, GPS status LED

#### **RS 232 Communication**

- Port for configuration
- Port for maintenance

#### **Gigabit Ethernet**

- Configuration/Control/Status/Download (from SSD)
- Real time transmitting for Real time visualization
- Network link with NanoX Satellites units
- PTP v2 Grandmaster Clock

#### Wi-Fi 802.11g [OPTION]

- Configuration/Status/Download (from SSD)
- Network link with NanoX Satellites units
- Real time transmitting (To master Unit/ To decom software).

#### Discrete used to the NanoX functioning

- Discrete; ON/OFF and ON/OFF record
- Tricolor outputs LED
- Outputs: 2 cathodes and anode for operating green, orange, red.
- Intensity outputs for LED: 20 mA max.

#### Audio channel

- Input: 1 volt efficient.
- Sample frequency 31.25KHz
- Band pass: 0 to 14.7KHz
- Input impedance: 1 MΩ

#### Input Connector

- MICRO D (MIL-DTL-83513) for data Input/output
- SMA for GPS input

#### **Recoding Capacity**

From 32GB to 512GB Available with CPU-NR-NX or CPU-NRT-NX only.

#### Time stamping/Synchronization

- Internal Time/IRIG B Time
- Time accuracy 1 µsec
- GPS Time
- IEEE 1588 (PTP v2) –Precision Time Protocol
- Time Offset programmable

#### Irig B channel

- Input: Sinus 1000 Hz, modulation level 1/3- 3/3.
- Output IRIG B time generation (1pps TTL).
- Modulation: 8Volts P to P max.
- To 500mVolts P to P min.
- Input Impedance greater than 10 KΩ
- Loss of the Irig B, time continuous to progress on internal base time
- Second, minutes, Hours and days.

#### **GPS** Function

- SMA independent input.
- Second, minutes, Hours and days (UTC).
- GPS data GPRMC format (Latitude, Longitude, Ground speed)
- Satellite acquisition less than 50 Seconds (Clear Sky)
- Output IRIG B time generation from GPS (1pps TTL).
- NMEA output at a rate of 1Hz
- Compatible with GPS Patch Antenna

#### **Internal Sensors**

Temperature sensor / Pressure sensor / Humidity sensor

#### Master/Slave(s) link

- By Gigabit Ethernet (GbE) with IEEE 1588 Time (Precision Time Protocol)
- By Wi-Fi 802.11g [OPTION]









### **Optional Memory cartridge**

The unit can be also equipped with removable Solid-State Disk (SSD), available from 32GB to 512GB capacity. This Memory unit is rugged and full qualified for harsh environment. SSD cartridge can be easily removed from unit and connected to a Windows based computer with USB 3.0 cable (Supplied).

Available with **CPU-NR-NX** and **CPU-NRT-NX** 



Standard SATA connector For easy plug on computer (SATA/USB 3.0 Cable supplied)

Rugged design

Capacity 32GB to 512GB

Sequential R/W (MB/sec, max.) 90/90

Max. Power consumption 2.8 W (5Vx560mA)

Extra DRAM Buffer Supported

ATA Security Supported Vibration 20G @7~2000Hz

Shock 1500G @0.5ms

**Operation Temperature** Industrial Grade: -40°C~+85°C

Storage Temperature -55°C~+95°C

Environmental standard MIL STD 810F MIL STD 461E Replay

On any Windows desktop (Seven or higher) with USB 2.0 or 3.0 input

**Security** Password/ Encryption/Auto destruction can be available in option

#### MTBF

4 million hours (SLC) 3 million hours (MLC)





#### Module Connector Type MICRO D (MIL-DLT-83513)

Power presence Status LED

Removable fixation plate with 90° rotation axis. To fix unit in each position

Module Frame fixation screws

### [POWER-NX] module

The power supply module is constituted by two electrical circuits and is conform to MIL-STD-704F, one circuit DC-DC Converter card, and another one is Ultra capacitor circuit who protect NanoX installation from power interruption about 100 milliseconds. There is no battery and therefore no preventive maintenance for power down protection. These modules are also able to be powered by battery if aircraft power is not available.

- Can support 16 different user modules.
- Until 130 Watts of power distribution.
- Compliant MIL-STD-704F standard.
- Powerful Ultra-capacitor to prevent power cut.
- MICRO D (MIL-DTL-83513) connector.
- Can be Extended with Battery module

**MIL-STD-704F** qualified, this module assures over voltage protection and permit to protect and assure data safety during acquisition or recording in case of power failure. There is no battery and therefore no preventive maintenance, for power down protection. These modules are also able to be powered by battery if aircraft power is not available.

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**Temperature Management:** Power supply module is also the seat of a smart and powerful Temperature control processor who permit the protection of all unit in case of aggressive temperature environment, this one monitors the temperature of each module and operate heating or cooling process following the environment encountered.







### Power supply module Dimensions

Dimensions are in "mm"













# **Technical**



#### Size in "mm"

User-slot(s)	Depth*	width	Height		
1	93	85	100		
2	109	85	100		
3	125	85	100		
4	141	85	100		
5	157	85	100		
6	173	85	100		
7	189	85	100		
8	205	85	100		
9	221	85	100		
10	237	85	100		
11	253	85	100		
12	269	85	100		
13	285	85	100		
14	301	85	100		
15	317	85	100		
16	333	85	100		

\*Depth is increased of 18 mm with CPU module who include recording capacity on SSD.



\*Depth is increased of 16 mm with CPU module who include IRIG 106 Chapter 4 capacity.



\*Depth is increased of 16 mm with CPU module who include Wi-Fi Network capacity option.



\*Depth is increased of 80 mm with Power Supply who include one additional Battery power supply module (Until 3 modules possible 3x80mm)

#### Weight

About 1.8 Kg (2 user-slots) About 2.2 Kg (4 user-slots) About 2.6 Kg (8 user-slots) About 3.0 Kg (12 user-slots) About 3.4 Kg (16 user-slots)

#### Input Connectors

MICRO D (MIL-DLT-83513) & SMA (For GPS Antenna)

#### Mounting

90° Rotating support plate integrate.

#### Power supply

28Volts DC (16 to 36V) MIL STD704 E Consumption: 12 Watts nominal (Controller& Power supply modules) until 130 Watts following configuration. Ultra-capacitor "to preserve recorder of power cuts (power interruption ≈100ms)

#### Grounding

Electronics electrically isolated of the primary 28 Volts supply. GND electronics is also isolated of the NanoX external box.

#### Cooling

Passive convection

#### Position of use

All positions

MTBF> 30 000 hours MTTR< 1 minute (With spare module)

#### Transport

Delivered with a transport suitcase equipped to receive the NanoX and accessories.



### **Environmental**



**Vibration** MIL-STD-810G method 514.4 0.04 g<sup>2</sup> of 5 to 2000 Hz, 1 hour per axis (3 axis)

Linear Acceleration MIL STD 810F, 15g for one minute in six directions.

Shocks MIL-STD-810F method 516.5/516.3 100g, 11ms (6 axis) in functioning

**Operating Temperature** - 40°C to + 71°C. MIL-STD-810G method 502.5 procedure II MIL-STD-810G method 501.5 procedure II

Extreme of temperature (Short period) - 55° C to 85°C [Short period no destructive] Test MIL STD 810F Extreme temperature cannot guarantee data integrity

Humidity in use 5% to 95 % without condensation MIL STD 810F Electromagnetic compatibility (EMI) MIL STD 461 Rev. G (2015) CE101 Power leads 30Hz to 10KHz CE102 Power leads 10KHz to 10MHZ RE101 Magnetic field 30Hz to 100KHz RE102 Electric field 10KHz to 18GHz

#### Altitude and decompression Min: -1500 feet, max: 60,000 feet

With 12.000 feet/minute (420Kpa/minute), MIL STD 810G.

Altitude max. Storage No limit

Storage temperature - 55°C to + 90°C

Humidity in storage 5% to 95 % without condensation MIL-STD-810G method 507.4

**Aircraft Electrical Power Characteristics** MIL-STD-704 Rev. F (2004) Prevent power down < 60 milliseconds

# **User module**



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One user module is constituted of two parts, firstly frame receiver module part who compose unit chassis and secondly the acquisition card part. The acquisition card part can be removed easily from the chassis module receiver part. With **Xchange® Technology** you can fit your frame dimension and acquisition modules exactly like you want. It's not more necessary to uninstall unit from aircraft when you want to change or remove a module





Each Acquisition module can be extract and replaced easily

**Xchange**<sup>®</sup> **patented Technology**, has been study and developed hand to hand with end users, to give the maximum of flexibility and growth capacity to a system. NanoX system is fully flexible that mean each acquisition module can be replaced by another one. System can be combined with different controllers modules and acquisition modules who can be easily removed from their module frame receiver. Each module frame receiver are equipped with linear backplane connector who permit a connection with each other (until 16). That mean Main frame of your unit is totally flexible but you have also the flexibility to put/remove or change Acquisition module where you want.

A big advantage also is the maintenance cost; with this kind of system if something goes wrong you can identify and replace quickly the problematic part of system.

In fact, NanoX system is assembly of different part who work together, and the assembly will make you think to a famous construction toy of your childhood.



Linear Backplane connector





### Acquisition/Replay cards Dimensions

Dimensions are in "mm"







# User module

### Acquisition/Replay module with frame receiver

Dimensions are in "mm"



# Flexibility





# **Sensors Modules**



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	Reference								Option	Device		
	DESIGNATION	INPUTS		Max Sample Rate (KHZ)		Max Dynamic (± Volts) *		Bridge Completion		RECORD & REPLAY	NanoX	
Single/Differential Ended Voltage	VOLT	4	8	16	31	250	4	10			RP	NX
Accelerometer (ICP Sensors)	ICP	4	8		31	250	4	10			RP	NX
Thermocouple (J, K, W, T, E)	THERMO	4	8	16	31	250	4	10			RP	NX
Thermistor (PT100)	THERMI	4	8	16	31	250	4	10			RP	NX
Pressure	PRESS	4	8		31	250	4	10			RP	NX
Strain gauges	GAUGE	4	8	12	31	250	4	10	FB	QB	RP	NX
Bridge signal	BRIDGE	4	8	12	31	250	4	10	FB	QB	RP	NX
Charge amplifier (Piezo)	PIEZO	4	8		31	250					RP	NX
Temperature Scanner	SCAN	2									RP	NX
Synchro Resolver	SYNC	2	4		31						RP	NX
Frequency Period/Pulse	PULSE	8	16		31						RP	NX
Power Monitor	POWER	3			31							NX

Example of a Part number: GAUGE-8-250-4-FB-NX

#### \*Dynamic are programmable by software:

For example, ±10V, ±1V, ±100mV, ±10mV

**QB** (Quarter Bridge)

FB (Full/Half Bridge)

RP Record & Replay function available following Green indication

- *The Modules can be tailored following your special needs,*
- Phybrid modules are available for high integration application

# **Digital/Bus Modules**



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	Refe	rence	Option	Device		
	DESIGNATION	INPUTS			RECORD & REPLAY	NanoX
PCM acquisition	PCM	4			RP	NX
PCM Merger Modules	MERG	4	8			NX
MIL-STD-1553 B, Redundant	1553	1R	2R		RP	NX
AFDX ARINC 664	AFDX	1R			RP	NX
Stanag 3910	3910	1R			RP	NX
ARINC 429	AR429	4	8	16	RP	NX
RS 422/232	RS	4	8	16	RP	NX
Ethernet TCP/IP - UDP	ETH	2			RP	NX
CAN data bus	CAN	2	4	8	RP	NX
Serial FPDP Fiber optical	SFPDP	3			RP	NX
Digital to Analog converter	DIGIANA	4	8		RP	NX
Differential discrete	DISCR	8	16	24	RP	NX
Pulses/Counter/frequency/Period	PULSE	8	16		RP	NX
/ideo SD & Audio	VSD	1	4		RP	NX
/ideo HD & Audio	VHD	1	2		RP	NX

#### Example of a Part number: 1553-1R-RP-NX

RP Record & Replay function available following Green indication

- *The Modules can be tailored following your special needs,*
- *The second seco*

### **Network Architecture**





Unit can be extended to 16 user module (slots)



RF Specifications	
Carrier frequency range:	2150 to 2400 MHz S band or 1400 to 1600 MHz L band (must be specified when order).
RF output power:	From 5 W to 20 W (43 dBm ± 1 dB) all conditions (must be specified when order).
VSWR	1.5:
Load mismatch (RF = open or short)	no degradation
Spurious outputs	In accordance IRIG106-96 (-60 dBc typical)
Harmonic	In accordance IRIG106-96.
Carrier frequency tuning step	125 kHz (for rate 1Mbits/s to 20Mbits/s), 250 kHz (for rate below 1Mbits/s)
Carrier frequency stability	± 2.5 ppm over temperature range. ± 7.5 ppm all clauses including aging over 5 years.
Modulation	user selectable digital PCM/FM (Tier 0), SOQPSK-TG (Tier I) and analog video FM
Spectral occupancy	99% energy with theoretic bandwidth for FM modulated with PCM data.
Deviation linearity	2% max
Modulation distortion	2%
Analog FM Modulation Specific	ations
Modulation input impedance	50 or 75 ohms, AC or DC selectable
Analog input Bandwidth	DC to 15 MHz – 3dB or 30Hz to 15 MHz – 3 dB
Video	Composite video signal PAL with or without CCIR 405 emphasis, 1Vpp 75 ohms
Any signal	0.25,0.5,1,2,5 or 10V Vpp programmable
Deviation sensitivity	0.5, 1, 2 or 5 MHz / Vpp programmable
Igital PCM/FM and SOQPSK-T	G Modulation Specifications
Modulation	user selectable digital PCM/FM, SOQPSK-TG (Tier I) and analog video FM.
Data rate	100 Kbps to 20Mbps option available automatic adaptation of deviation
	according to Tier 0 and Tier I IRIG mask.
Signal interfaces	Serial data with separate synchronous clock, TTL 5V or RS422
Modulation input impedance	50 ohms with TTL inputs
Control interface	RS-232 serial control
🄏 Power Requirement	
Power input	28 V DC (18 V min to 36 V max)
Current:	3A under 28 V @ 20 W RF.
Reverse polarity protection	✓ Included
Thermal protection	✓ Included

## **Backup Power Module**





#### PN# BAT70W/H-NX

The battery backup power module can be connected just after the power supply module of any NanoX system. The first battery module comprises a power connector intended exclusively for charging the battery module or modules. A battery module includes a charge state LED for fast display of the battery charge. Each battery module is equipped with a handle allowing the extraction of the battery module for replacement. A NanoX system can be extended up to 3 battery modules (*Like illustration below*).

Backup Battery module take automatic relay on primary 28VDC in case of power down without any impact on system.



# **Network Switch**

### 8/16/24ch. Gigabit Ethernet PTP GrandMaster Switch

From 8 to 24 Ch. Gigabit Ethernet Rugged Airborne managed Switch with support of IEEE 1588v1&2 PTP or PTP Grandmaster (GPS & IRIG-B) in option for hardware time stamping for precise time synchronization.

#### D0-160/MIL-STD-810 Qualified.

Excellent for high-end airborne applications, the NetSwitch/GbE Managed Carrier Ethernet Switch is a highly reliable way to communicate with 10/100/1000 devices in an embedded system. Powered by the latest generation Carrier Ethernet Switch engine. Its embedded 416 MHz MIPS 32-bit CPU, 1Gb DDR2 external memory and DMA-based frame extraction and insertion support timing over packet, Ethernet OAM, and performance monitoring.

Hardware Specifications										
Ethernet Switch Engine	Carrier (	Carrier Grade Ethernet Switch Chipset (NetSwitch 8Ch/16Ch/24Ch.)								
	A power	A powerful embedded 416 MHz RISC 32-bit CPU, with DDR2 external memory and DMA-based frame								
Dant Tama		extraction and insertion supports timing over packet, Ethernet OAM, and performance monitoring.								
Port Type	8 to 24 0	8 to 24 Gigabit Ethernet (10/100/1000 Mbps)								
GPS/IRIG B Input Connectors	SMA Se	SMA Serial: R.125.680.000 (PTP Grandmaster Option)								
IRIG B Output Connector	SMA Se	SMA Serial: R.125.680.000 (PTP Grandmaster Option)								
Ethernet Connectors	MIL-DLT-38999 Series III ( TV POO RW 1135 PN)									
Power Connector	MIL-DLT-38999 Series III (TV POO RW 0998 PN)									
Time Precision Protocol	IEEE 1588 v2 – Grandmaster (option) or Transparency mode									
Management Access	Web Interface HTTP/HTTPS									
Input voltage	Wide input rage: +16V to +36V DC with Reverse Polarity Protection									
Power Consumption	About 8 ports 10Watts , 16 ports 15 Watts, 24 ports 25 Watts									
Vibration, Shock, Acceleration	D0-160/MIL-STD-810 Qualified									
Operating Temperature	-40°C to +85°C									
Dimensions in <b>mm</b> .	NetSwitch 8ch.			N	etSwitch 16ch	۱.	NetSwitch 24ch.			
(without connectors)	L	W	Н	L	W	H	L	W	Н	
	140	126	40*	140	126	75*	140	126	110*	

\* PTP Grandmaster option has an impact on the height of 15mm







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