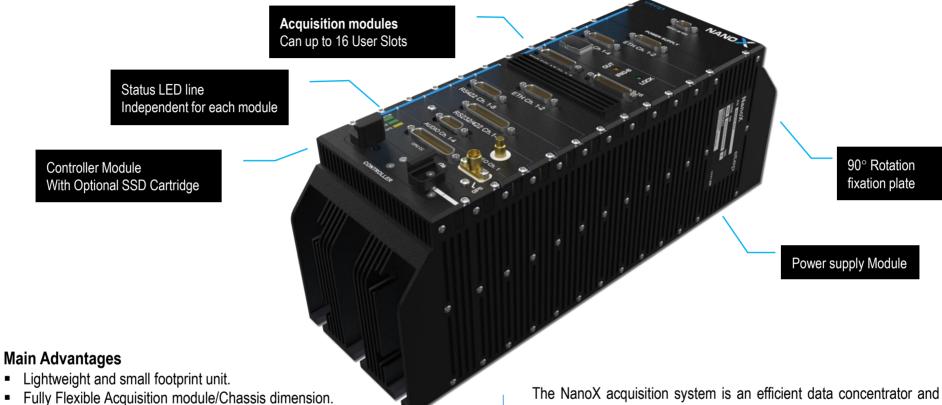




# **Overview**





High speed recording system (1Gbps) with adapted controller.

- High recording capacity (Can up to 2TB) with adapted controller.
- Real time Data Streaming in DTMUX / IRIG 106 Chapter 10 / IENA formats
- Patented Xchange® Module Technology.
- Record and Replay function available.
- Transmitter (TX) module available (5 to 20Watts)
- Master/slave(s) Ethernet or Wi-fi Architecture available.
- Can be configured from one acquisition module to sixteen (16).
- Integrate Battery module for standalone/backup application.
- Integrate module status led for easy Diagnostic.
- Easy fixation on each side with 90° rotation support integrate.
- IRIG 106 Chapter 10 compliant (Recording option)

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 64GB to 2TB) 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.

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Network capacity (For Master/Satellite(s) system).

Status LED (Green/Yellow or red)

GPS/ IRIG Status LED

Communication/Maintenance connector Ethernet/RS-232/ IRIG B ... SMA Connector for GPS Antenna **Extraction Module** screws Module Frame fixation screws CPU-N-NX presented here

Power presence Status LED (Blue)

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

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

#### Four main controller configurations:

[CPU-N-NX] Network capacity (For Master/Satellite(s) system).

[CPU-NR-NX] Network & Recording capacity.

[CPU-NT-NX] Network & PCM IRIG 106, chapter 4 telemetry.

[CPU-NTE-NX] Network & Ethernet IRIG 106-chapter 10 telemetry.

#### Premium configuration:

[CPU-NRT-NX] Network / Recording / IRIG 106-chapter 4 telemetry.
[CPU-NRTE-NX] Network / Recording / IRIG 106-chapter 10 telemetry.

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Status LED (Green/Yellow or red)



#### **CPU-NT-NX** Module Overview

Network & IRIG 106 chapter 4 capacity

Communication/Maintenance Ethernet/RS-232/ IRIG B ...

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

#### **Number of channels**

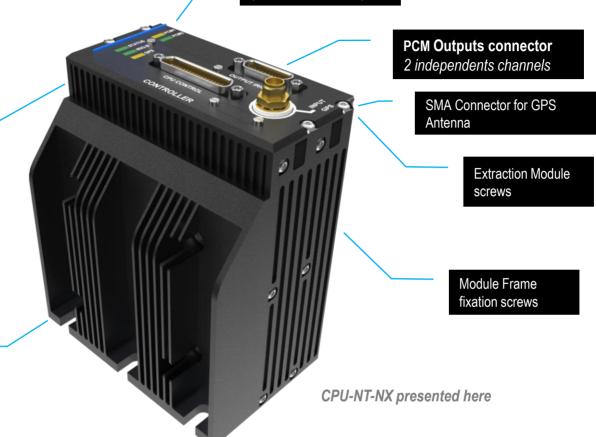
Two completely independent Compliant with IRIG 106 chapter- 4 (PCM Class I & Class II) Specifications

#### Bit Rate

Up to 20Mbps better than 0.1% of specified rate.

#### Words/major Frame

Compliant with IRIG 106 chapter- 4 (PCM Class I & Class II) Specifications



#### Frames/minor Frame

As per IRIG 106 chapter- 4 (PCM Class I & Class II)

#### **Sub Frame Synchronization**

By an incrementing Sub Frame identification (ID) word located anywhere within the minor frame. Provision to support URS & FCC

# Sub-Frame size for each stream As per IRIG 106 chapter- 4 (PCM Class I & Class II)

#### Pre-Modulation Filter

Bessel Filter selectable by software for the PCM n°2 1.25 MHz; 2.5 MHz; 5MHz; 10 MHz; 20 MHz; Bypass

#### **Output codes**

2 PCM can be generated totally independent. Should support multiple programmable PCM data codes like NRZ-L, RNRZ-L, Bi-Phase-L/M

#### **Output levels**

For the PCM1 TTL or RS422
For the PCM2 TTL and Analog output with prefilter

#### Time reference

From start of short or long frame with a resolution of better than one millisecond.







- 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 (option)

#### 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 2TB

Available with CPU-NR-NX or CPU-NRT-NX only.

#### **Ethernet Data Streaming**

- DTMUX Format (By default)
- IRIG 106 Chapter 10 (Option)
- IENA (Option)

#### 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 (PTP v2)
- By Wi-Fi 802.11g [OPTION]







#### **Optional Memory cartridge**

The unit can be also equipped with removable Solid-State Disk (SSD), available from 64GB to 2TB 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).

#### P/N SSDXX-DE-QE-DP-NX

\*See below for part number composition



# Available with CPU-NR-NX /

Rugged Connector For easy plug on computer (SATA/USB 3.0 Cable supplied)

#### Capacity

**XX** Capacity in Gigabytes (GB) 64 / 128 / 256 / 512 / 1024 / 2048

Sequential R/W (MB/sec, max.) 90/90 (720Mbps)

Max. Power consumption 2.8 W (5Vx560mA)

Extra DRAM Buffer Supported

ATA Security Supported

#### Vibration

20G @7~2000Hz

#### Shock

1500G @0.5ms

#### **Operation Temperature**

-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

- DE or none: 256bits AES Encryptions
- QE or none: Quick Erase

CPU-NRT-NX / CPU-NRTE-NX

• **DP** or none: Physical Auto-Destruction

#### **MTBF**

3 million hours



# **Power Supply module**



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

Removable fixation plate with  $90^{\circ}$  rotation axis. To fix unit in each position



#### **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 ~100ms.
- 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.



**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.



## **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)



\*Depth is increased of 24 mm with cooler heatsink with M5 fixation

(recommended for configuration use excitation voltage, video or more than 6 user module)

#### **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.

#### 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)

#### 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 g² of 5 to 2000 Hz, Overall RMS acceleration 2.97g 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) CS101 / CS114 / CS115 / CS116 CE102 / RE102 / RS103

#### 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

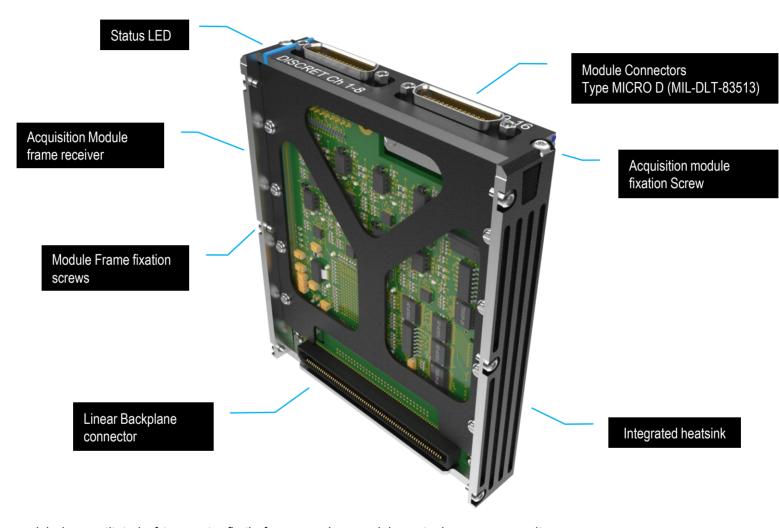
#### **Humidity in storage**

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





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®** 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.

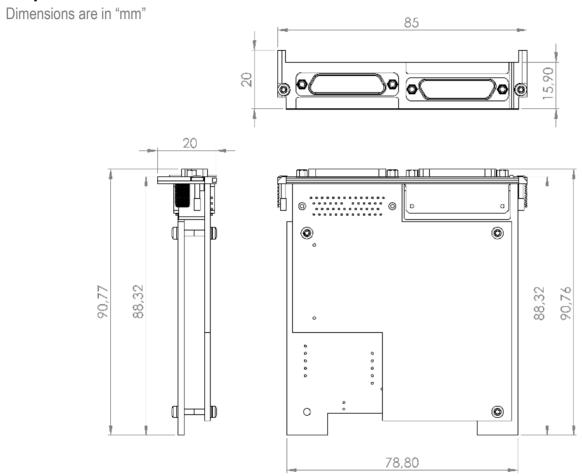
A big advantage also is the maintenance cost; with this kind of system if something goes wrong you can identify and replace quickly the problematic part of system.

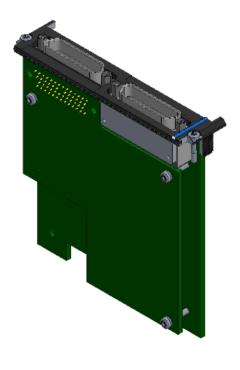
In fact, NanoX system is assembly of different part who work together, and the assembly will make you think to a famous construction toy of your childhood.





## **Acquisition/Replay cards Dimensions**

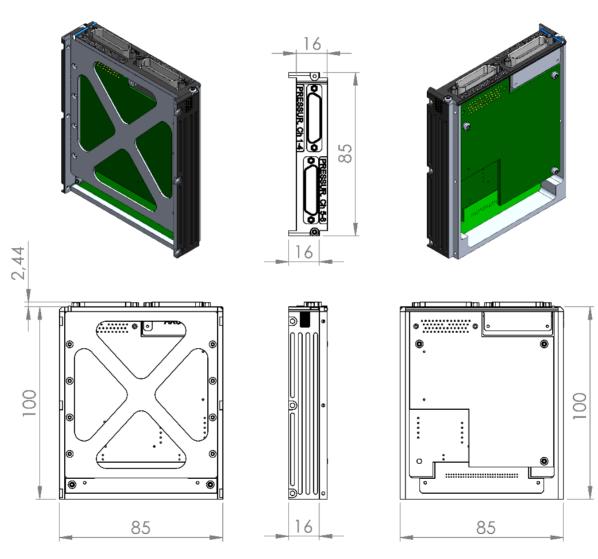






# Acquisition/Replay module with frame receiver

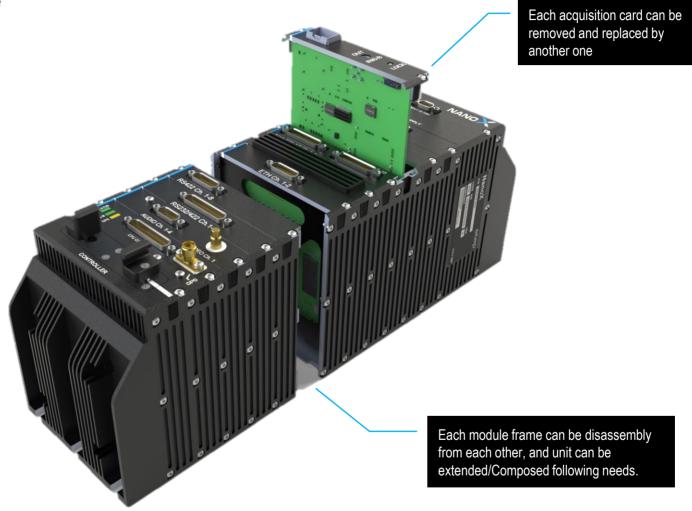
Dimensions are in "mm"



# **Flexibility**



Focus on eXtreme Flexibility



# **Analog/Sensors Modules**



	Reference						Option	Device				
	DESIGNATION	INPUTS		Max Sample Rate (kHz)		Max Dynamic (± Volts) *		Bridge Completion		RECORD & REPLAY	NanoX	
Advanced Analog (All in one)      Analog signals (differential or single-ended)     Thermocouples (type K, J, T, E, N)     RTD (PT50, PT100, PT1000)     Full bridge strain gauges     Piezo IEPE /ICP accelerometers	VOLTA	8			31		4	10	FB			NX
Analog Single/Differential Ended	VOLT	4	8	16	31	250	4	10			RP	NX
Accelerometer (ICP Sensors)	ICP	4	8	12	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 (Piezoresistive)	BRIDGE	4	8	12	31	250	4	10	FB	QB	RP	NX
Charge amplifier (Piezo)	PIEZO	4	8		31	250					RP	NX
Pressure Scanner	SCAN	2									RP	NX
Synchro Resolver	SYNC	2	4		31						RP	NX
Frequency Period/Pulse	PULSE	8	16		31						RP	NX
LVDT/RVDT Converter	LVRV	4	8									NX
Power Monitor	POWER	3			31							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

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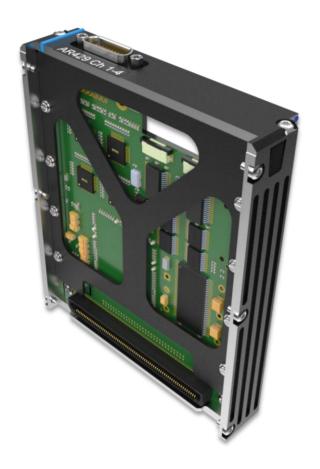
Example of a Part number: GAUGE-8-250-4-FB-NX

Modules can be tailored following your special needs,

Hybrid modules are available for high integration application

# **Digital/Bus Modules**





	Reference				Option	Device
	DESIGNATION	INPUTS			RECORD & REPLAY	NanoX
PCM acquisition	PCM	4			RP	NX
IRIG-106 PCM Decoder/Merger	MERG	2				NX
MIL-STD-1553 B, Redundant	1553	1R 2R 4R		4R	RP	NX
AFDX ARINC 664	AFDX	1R			RP	NX
Stanag 3910	3910	1R			RP	NX
ARINC 429	AR429	4	8	16	RP	NX
RS 232 / 422 / 485	RS	4	8	16	RP	NX
Ethernet 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
Video SD & Audio	VSD	1 4			RP	NX
Video HD & Audio	VHD	1 2			RP	NX

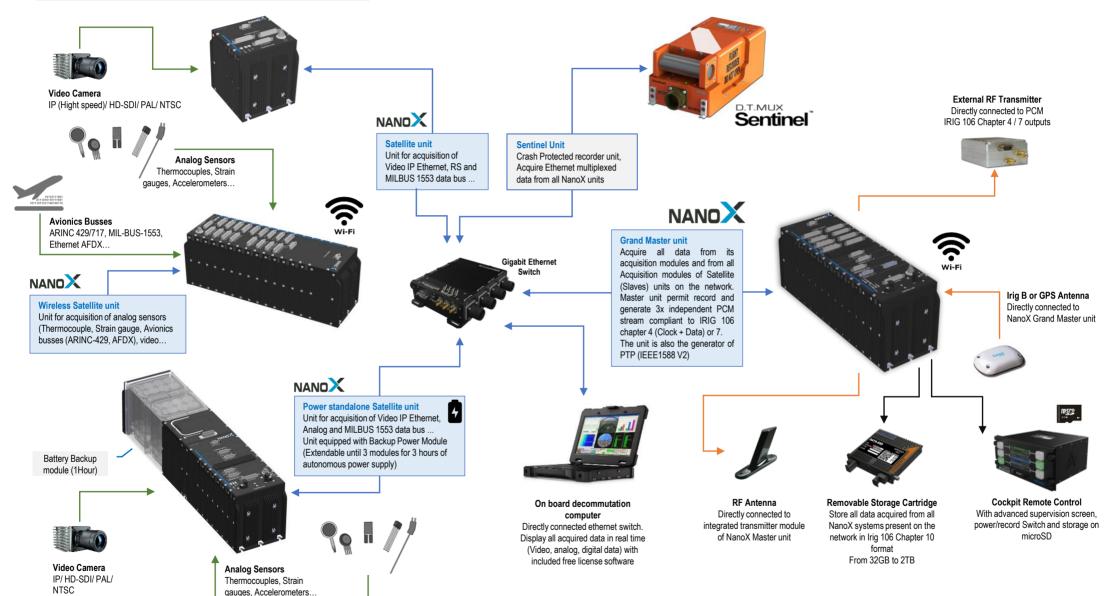
Example of a Part number: 1553-1R-RP-NX

RP Record & Replay function available following Green indication

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

# **Network Architecture**





# **RF Transmitter Module**

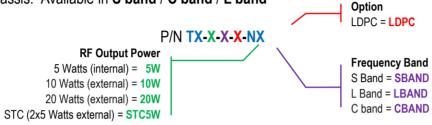


### **Optional Digital RF Transmitter Module**

On Board transmitter module for NanoX system.

This module can be combined to CPU-NRT-NX or CPU-NT-NX controller modules to integrate transmitter functionality

directly into the same chassis. Available in S band / C band / L band



(v) RF Specifications	
Carrier frequency range:	2150 to 2400 MHz S band or 1400 to 1600 MHz L band or C band 4400 to 4900 MHz
	or 5091 to 5150 MHz (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).
	2 x 5 W for STC option
VSWR	1.5:
Load mismatch	no degradation (RF = open or short)
Spurious outputs	In accordance IRIG106-96 (-60 dBc typical)
Harmonics	In accordance IRIG106-96.
Carrier frequency tuning step	125 kHz (for rate below 1Mbits/s) 250 kHz (for rate 1Mbits/s to 20Mbits/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)
Spectral occupancy	IRIG 106-17 Chapter 2 spectral mask for tier 0 and tier 1.
Data rate	1000 kbps to 20Mbps (100kbps option available) automatic adaptation of deviation according to Tier 0 and Tier I IRIG mask.
STC option	with two antennas with SMA connectors according to IRIG 106-15 Appendix S
LDPC option	1024, 4096 blocks code rate 1/2, 2/3 and 4/5 according to IRIG 106-15 Appendix R.
Monitoring and Settings	
Through GUI or IRIG 106-17 Chapter 2 Appendix 2C	Temperature Alarms, Frequency, Modulation etc
More Requirement	
Power input	28 V DC typical 24 V min to 32 V max (18 V min to 36 V max option available)
Current:	3A under 28 V @ 20 W RF.
Reverse polarity protection	✓ Included
Thermal protection	✓ Included

<sup>\*</sup>Also available in standalone format

# **Backup Power Module**

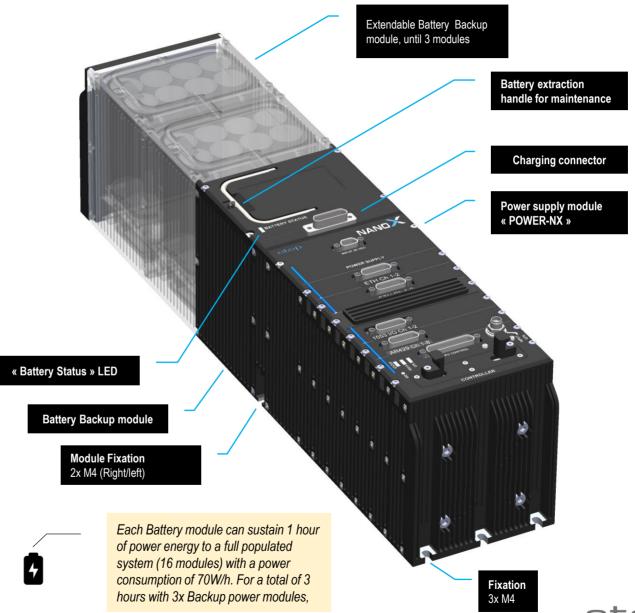




#### PN# BAT70W/H-NX

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.

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

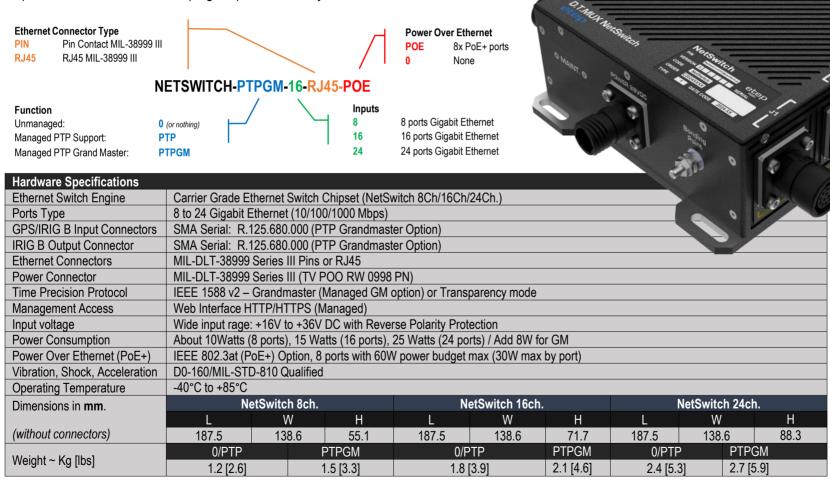


## **Network Switch**



#### 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.











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