Gigabit Ethernet Switch (GES) NXT-28

Part Number: AE103548-001

The Aeronix Gigabit Ethernet Switch (GES) NXT-28 is a fully manageable, MIL-Qualified 28-Port Ethernet Switch/Router equipped with four 10G BASE-T ports and twenty-four 1G BASE-T ports. It is designed for use in highly rugged commercial, industrial, and military applications that require ultra-high data transfer rates in a self-contained ruggedized package resistant to environmental effects. The GES-NXT-28 is certified to both military airborne and ground-based platforms making it ready to use for any environment. The unit has very low radiated emissions, surpassing all vehicle EMI/EMC requirements, particularly important to avoid for interference of radio communications such as SINGCARS. The rugged design requires no forced air or conductive cooling, operating in a broad range of harsh environments including uninhabited aircraft bays.

The NXT-28 supports vehicle-location-based, customer-specific configurations stored in non-volatile memory and loaded at startup to fulfill application specific requirements. All configurations are authenticated at startup, and if tampered with, the unit is placed in a fail-safe mode.

KEY FEATURES

Ethernet Ports

- 28 Copper Ports Total
  - 24 x 10/100/1000 ports
  - 4 x 100/1000/2500m/5000/10000 ports

QoS

- Muti-Layer Classifier, Strict Queues, Fair Queues, ToS/DSCP supported
- Broadcasting and Storm Control
- Loop Guard and Ethernet Ring Protection Switching (802.1Q) 50ms ring recovery
- Spanning Tree (8021.d), RSTP (802.1w), MSTP (802.15) for VLAN-aware fast loop recovery
- PTPv2.0 (IEEE-1588 and 802.1as)
  - Can support up to 3 time-domains
  - Grandmaster (GM) capable via external GPS
  - Phase lock to GM in less than 20 seconds
  - Jitter from GM less than 100 nanoseconds
- Time-Sensitive Networking (TSN)
  - Low latency, Highest QoS, Assured bandwidth
  - 802.1AS,802.1Qbv, 802.1CB, 802.1Qci, 802.1Qcc*, 802.1Qbu, 802.3br, 802.1Qch, 802.1CM/D2.2, 802.1Qav
- GCIA 2.0 ready

Configurations

- 8 possible based on strapping pins
  - configurations can be stored for any strapping
- Human-readable

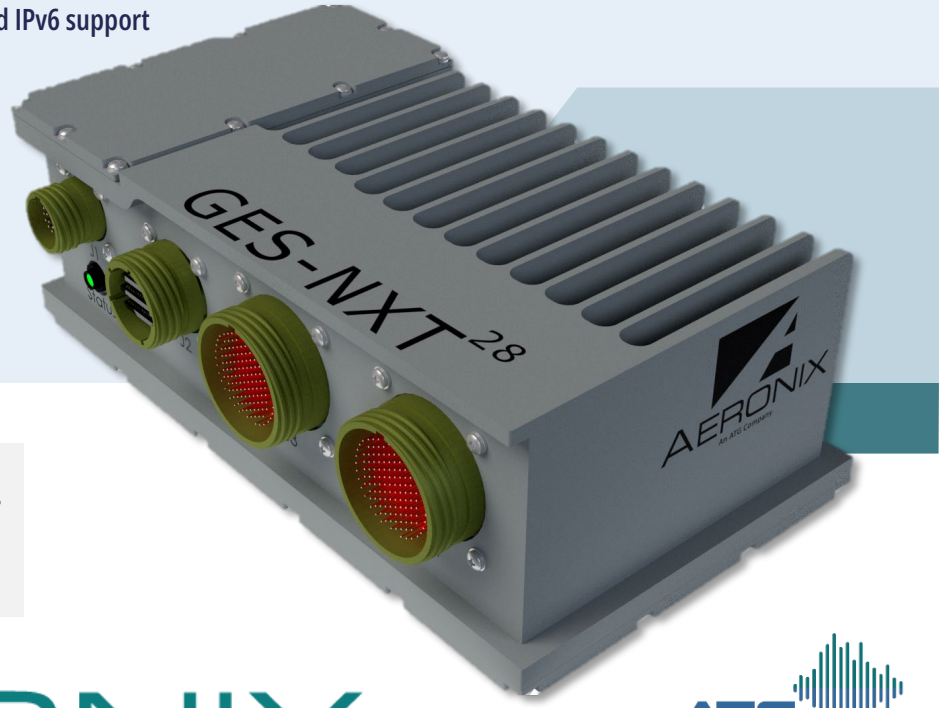
Management Interfaces

- In-band HMI: SSHv2 CLI, Telnet CLI, HTTP/S Web
- In-band MMI: SNMPv1/v2/v3, HTTP/S JSON-RPC
- In-band MMI Aeronix GEN2 (AE101264-00X) backwards compatible API
- Out-of-band HMI: RS232 CLI

Any interface can be individually disabled via startup-config.

Networking

- Auto-negotiation with automatic downshifting, Auto MDIX
- IGMP v2/v3 Snooping, MLD v1/v2 Snooping, GARP (802.1ak)
- VLANs (802.1Q) up to 4K groups, Trunking, and Native VLAN movement supported
- VLAN Q-in-Q double-tagging (bridging) & PVLANs supported
- L3 Static Routing in Hardware, RIP v2, OSPF v2/v3
- Link Aggregation (802.3AD)
- IPv4 and IPv6 support



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GES-NXT-28

The NXT-28 can also be remotely managed using a software-friendly, secure JSON-RPC or SNMPv3 protocol, and hosts a wide variety of Ethernet capabilities like PTP and TSN, making it suitable for nearly any modern Ethernet need. While it has extensive capabilities, the NXT-28 factory configuration is set for "basic Layer-2 switch" mode making it ready to use out of the box with no need for management.

Security and Access Control

- Authentication required on all management interfaces, Encryption on SSH, JSON-RPC and Web
- User accounts and permission levels, Minimum password complexity, timeouts
- Hardware-enforced Secure Boot (HRoT)
- AAA, 802.1X, RADIUS, TACACS+
- Firewall, ACLs
- Port MAC Security, Sticky MACs
- ARP Inspection, IP Source Guard, DHCP Snooping
- BPDU Guard, Root Guard
- Syslog and audit trail to both UDP and TCP servers
- Traffic data never stored in non-volatile memory
- Fail-safe to port switching blocked
- Backup Image and recovery
- NTPS

Enhanced Features

- Boot Time < 90s
- Tri-Color Power/status LED
  - Red (Error), Yellow (Booting), Green (Operational)
  - Can be turned off in startup-config
- Rescue account via time-sensitive, cryptographic exchange
- Enhanced Built-In Test (Startup, Periodic, Initiated)
  - PHY veriphy including Time-Domain Reflectometry
  - MAC Bouncing (spoofing) detection
- Port Mirroring, Flow Mirroring, Jumbo frames
- Store and Forward (default), Cut-through
- Monitoring alarms through SNMP or JSON-RPC

Anti-Tamper

- Secure Boot, Secure Update, Secure Config
  - Hardware ASIC-enforced using asymmetric ECDSA P384
- Hardware signal Zeroize
  - Flushes RAM and Resets to factory default condition

Standards Compliance & Compatibility

- G.8032 v1/v2 Ring Protection
- IEEE 802.3 Ethernet
- IEEE 802.1AB MAC Discovery
- IEEE 802.1D MAC learning, aging, static
- IEEE 8021.Q VLAN, PVLAN, Port Isolation, Trunking, Native VLAN, GVRP, GARP, MRP, MVRP
- IEEE 801.2ad Native or Translated VLAN
- IEEE 802.1p QoS
- IEEE 802.1s MSTP
- IEEE 802.1w RSTP
- IEEE 802.1ad Link Aggregation
- IEEE 802.1X Port Based Network Access Control
- IEEE 1588 v2 PTP
- IEEE 802.1AS Improved PTP timing
- IEEE 802.1AB-2005 Link layer discovery
- SNMP MIBs: VLAN, RMON, Traps, Bridge, IP Forwarding, IP, Multicast Group, RADIUS, Ethernet, SMI v2, MAU, Entity, Link OAM, SNMP Framework, User-based, View-based, SMON, MSTP, LLDP, LACP, PAE, Private MIBs

Aeronix has full software control of the NXT-28, so if custom features are needed (from MQTT to OMS to changing an LED blink pattern), let us offer a custom solution.

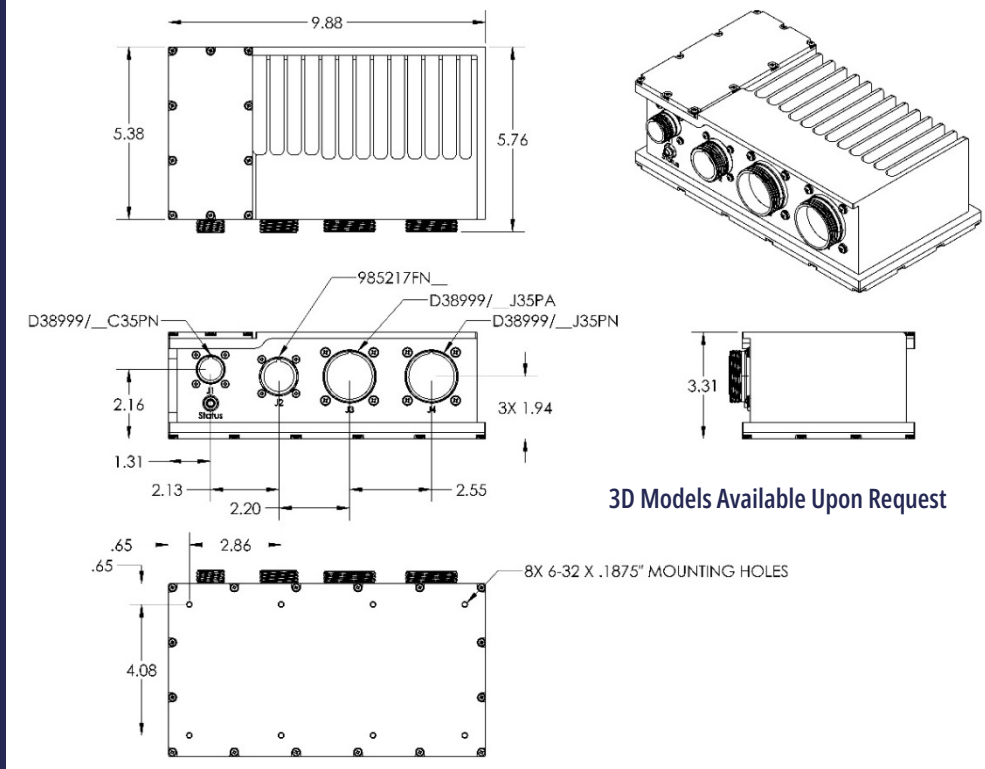
Part Number: AE103548-001

GES-NXT-28 Characteristics

Characteristic	Detail
Ports	28 Total: 24 x 10/100/1000Mbps IEEE 802.3ab compatible; 4 x 100/1000/2500/5000/10000 Copper Ports
Dimensions	WITH external mounting hardware - 9.88"W x 6.58"L x 3.31"H WITHOUT - 9.88"W x 5.76"L x 3.31"H
Weight	6 lbs (2.72 kg)
Processor	VSC7549TSN
Connectors	2x D38999/20WJ35 (1Gpbs), 1x Meritec 985217FNSHWB (10Gpbs), and 1x D38999/20WC35 (Power)
Cooling Air	No moving parts, no forced air or conduction cooling required
Coating	CARC-compliant option available, scratch resistant, powder-coat
MTBF	Airborne Fixed Wing Uninhabited Fighter Environment (calculated @ 100% duty cycle); 63,298 hours @ 55C, 44,943 hours @ 70C
Mounting Hardware	4 x 10-32 captive screws (Vibration Tolerance)

Part Number: AE103548-001	GES-NXT-28 Qualifications		
Test	**Detail**	**Specification**	**Comment/Tailoring**
Power Qualifications - MIL-STD-704F and MIL-STD-1275E			
Load Measurements	Operational	MIL-STD-704F Chg1, MIL-HDBK-704-8 LDC-101	'Operational' = Normal Conditions; ask for load measurement info
Startup	Operational	MIL-STD-704F Chg1, MIL-HDBK-704-8 LDC-102, Tests A, B, C; MIL-STD-1275E, 5.3.1.1 Figure 8	Steady state limits, 22 Vdc to 29 Vdc Startup at 18 Vdc to 100V dc (50ms) to 20 Vdc to 33 Vdc steady state, within 500ms
Voltage Distortion	Operational	MIL-STD-704F Chg1 Fig 15, MIL-HDBK-704-8 LDC-103 Tests A thru K	Voltage distortion spectrum
Total Ripple	Operational	MIL-STD-704F Chg1 Fig 15, MIL-HDBK-704-8 LDC-104, Table LDC104-II	
Peak-to-Peak Ripple	Operational	MIL-STD-1275E, 5.3.1.2, (MIL-STD-461 CS101)	Peak-to-peak ripple, 30Hz to 150 kHz extended to 250 kHz
Spikes and Surges	Operational	MIL-STD-704F Chg1 Fig 13, MIL-HDBK-704-8 LDC-105 Tests AA thru RR, MIL-STD-1275E, 5.3.3.2.1, MIL-STD-1275E, 5.3.3.2.1 Table 1	Normal voltage transients, 18Vdc to 29Vdc Spikes: +/- 250V, 50 ea, 2 Joules, Surges: 30 Vdc to 100 Vdc, 50ms, 5 pulses
Power Interrupt	Transfer Interrupt	MIL-STD-704F Chg1, MIL-HDBK-704-8 LDC-201	Power interrupt, 50ms, 22Vdc to 29Vdc
Steady State Limits	Abnormal	MIL-STD-704F Chg1, MIL-HDBK-704-8 LDC-301	Tests A and B, Steady State limits, 20.0 Vdc and 31.5Vdc, 30 minutes
	Emergency	MIL-STD-704F Chg1, MIL-HDBK-704-8 LDC-401	Steady state limits, 18 Vdc to 29 Vdc
Abnormal Transients	Abnormal	MIL-STD-704F Chg1 Fig 14, MIL-HDBK-704-8 LDC-302, Tests AAA thru NNN	Abnormal voltage transients, abnormal condition, 7 to 50V
Starting Voltage	Operational	MIL-STD-704F Chg1, MIL-HDBK-704-8 LDC-501, Table LDC501-IV, MIL-STD-1275E, 5.3.2 Figure 6	Starting voltage transients, 12 Vdc to 29 Vdc, Initial voltage, 12 Vdc for 1 second, Cranking, 16 Vdc for 30 seconds, then steady state
Auto-Recovery	Operational	MIL-STD-704F Chg1, MIL-HDBK-704-8 LDC-601	Tests A thru D, Power failure, from 100ms to 7 seconds
Power Failure	Operational	MIL-STD-704F Chg1, MIL-HDBK-704-8 LDC-602, MIL-STD-1275E, 5.3.4	Phase reversal protection/prevention Reverse polarity protection, 5 mins
Environmental Qualifications - MIL-STD-810G			
Low Pressure (Altitude)	Storage	MIL-STD-810G Method 500.4 Procedure I	Procedure I: -57°C @ 50,000 feet
	Operational	MIL-STD-810G Method 500.4 Procedure II	Procedure II: -54°C @ 40,000 feet
	Explosive Decomp	MIL-STD-810G Method 500.4 Procedure IV	Procedure IV: 8,000 feet to 40,000 feet in not more than 0.1Sec
High Temperature	Storage	MIL-STD-810G Method 501.5 Procedure I	Procedure I: +95°C
	Operational	MIL-STD-810G Method 501.5 Procedure II	Procedure II: Cyclic = +55°C Constant = +71°C for 30 Minutes
Low Temperature	Storage	MIL-STD-810G Method 502.5 Procedure I	Procedure I: -57°C
	Operational	MIL-STD-810G Method 502.5 Procedure II	Procedure II: Cyclic = -40°C Sea level Constant = -65°C for 120 Minutes
Temperature	Shock	MIL-STD-810G Method 503.5 Procedure I-B	Procedure I-B: from Constant = -54°C to +71°C at 125°C/Minute
Comb Temp Alt/Humidity	Operational	MIL-STD-810G Method 520.3 Procedure III	Procedure III: -40°C to +71°C Sea level to 60,000ft
Rain	Drip	MIL-STD-810G Method 506.5 Procedure III	7 gal/ft2/hr. 40 mph for 30 minutes
Humidity	Exposure	MIL-STD-810F Method 507.5 Procedure II	Operating and non-operating effects, 95% ± 4% Humidity +30°C to 60°C, 10 Cycles
Fungus	Non-Operational	MIL-STD-810G Method 508.6	7-day growth
Salt Fog	Exposure	MIL-STD-810G Method 509.5	Operating and non-operating exposure to salt-sea atmosphere – Four 24hr wet/dry cycles
Sand and Dust	Blowing	MIL-STD-810G Method 510.5 Procedure I & II	<150um dust, 150um to 850um sand
Explosive Atmosphere	Operational	MIL-STD-810G Method 511.5 Procedure I	At site and 40,000ft altitudes
Acceleration Load Factors (Structural)	Limit Loads	MIL-STD-810F Method 513.6 Procedure I	Performance at ±10.0g applied individually along all 3 axes
	Ultimate Loads	MIL-STD-810F Method 513.6 Procedure II	Withstand without structural failure ±15.0g applied individually along all 3 axes
	Crash Landing	MIL-STD-810F Method 513.6 Procedure III	Remain captive, 40G forward, 20G aft and down, 18G left/right, 10G up
Vibration	Performance	MIL-STD-810G Method 514.6 Procedure I	Cat 12, Annex D, 514.6D-I; 30 mins, 0.02 G2/Hz to 0.04 G2/Hz, 15-2000 Hz, Overall, 4.4Grms
	Endurance	MIL-STD-810G Method 514.6 Procedure I	Cat 12, Annex D, 514.6D-I; 60 mins, 0.04 G2/Hz to 0.06 G2/Hz, 15-2000 Hz, Overall, 9.2Grms
	Gunfire	MIL-STD-810G Method 519.6, Procedure III	7.5 min sweeps, 5 to 15 g, 66 to 856 Hz
	UH-60 Main	MIL-STD-810G Method 514.6, Procedure I	Cat 14, Annex A & D, Table 514.6D-III; 4 hours, 0.001g2/Hz to 0.01g2/Hz, 3 to 500 Hz
Shock	Functional	MIL-STD-810G Method 516.6 Procedure I	20g, 11ms nominal, 3 blows ea direction, ea axis (18 total), terminal peak sawtooth (TPS)
	Crash Hazard	MIL-STD-810G Method 516.6, Procedure V	40g, 11ms nominal, 2 blows ea direction, ea axis (12 total) TPS
	Bench Handling	MIL-STD-810G Method 516.6, Procedure VI	4" drop, 1 drop per edge per face (24 total)
Acoustical Noise	Operational	MIL-STD-810G Method 515.6 Procedure I	30 mins, 140dB overall, 50 to 10000 Hz
EMI/EMC Qualifications – MIL-STD-461G			
Conducted Emissions	Operational	MIL-STD-461G CE101 Par 5.4, CE101-4 Curve #2	Power Leads, 30 Hz to 10 kHz
		MIL-STD-461G CE102 Par 5.5, CE102-1 Basic Curve	Power Leads, 10 kHz to 10MHz
Conducted Susceptibility	Operational	MIL-STD-461G CS101 Par 5.7, CS101-1 Curve #2	Power leads, 30Hz to 150 kHz
		MIL-STD-461G CS114 Par 5.12, CS114-1 Curve #5	Bulk cable injection, 10 kHz to 200MHz
		MIL-STD-461G CS115 Par 5.13, CS115-1	Bulk cable injection, impulse excitation, 30Hz for one minute
		MIL-STD-461G CS116 Par 5.14, CS116-1 and CS116-2	Damped sinusoidal transients, cables, & power leads, 10kHz to 100MHz, 5 mins
Radiated Emissions	Operational	MIL-STD-461G RE101 Par 5.17, RE101-1 and RE101-2	Magnetic field, 30Hz to 100kHz
		MIL-STD-461G RE102 Par 5.18, RE102-3	Fixed wing external and Fixed wing internal < 25m; Electric field, 10kHz to 18GHz
Radiated Susceptibility	Operational	MIL-STD-461G RS101 Par 5.20 RS101-2	Army; Magnetic field, 30 Hz to 100 kHz
		MIL-STD-461G RS103 Par 5.21, Table XI	Aircraft Internal Army; Electric field, 2 MHz to 18 GHz

GES-NXT-28



3D Models Available Upon Request

ORDERING INFORMATION

PART NAME	PART NUMBER	DESCRIPTION
GES-NXT-28	AE103548-001	Military Rugged Ethernet Switch/Router, Airborne and Ground Qualified, 24x 10/100/1000 BASE-T and 4x 100/1000/10000 10GBASE-T ports. Note: GES-NXT-28 HW ICD is document# AE303588-001.
GES-NXT-28 w/ Combined Mounting Plate	AE103671-001	Military Rugged Ethernet Switch/Router, Airborne and Ground Qualified, 24x 10/100/1000 BASE-T and 4x 100/1000/10000 10GBASE-T ports w/External Mounting Plate.
Accessories		
External Mounting Plate for GES-NXT-28	AE103478-001	External Mounting Plate with captive screws for GES-NXT-28 (AE103548-001).
J1 Lab Power Breakout Box	AE103557-001	Power breakout box with red/black banana plugs to J1 connector.
J2 Lab Ethernet Breakout Cable	Meritec 948545	4x 10Gbps Mil-Circular to RJ45 breakout cable. ER17/PG/NKEY/CAD TO (4) RJ45 BRAID, HALAR,15FT LONG
J3 Lab Ethernet Breakout Cable	AE103558-001	12x 1Gbps Mil-Circular to RJ45 breakout cable.
J4 Lab Ethernet Breakout Cable	AE103558-002	12x 1Gbps Mil-Circular to RJ45 breakout cable.

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