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# Ixia Novus QSFP28 100GE 8-Port

8-Port QSFP28 100 Gigabit Ethernet Load Module · L2-3

## Serial Number 719365

## Line Card Validation Report

Tested to ZC-TP-860-1417-10 rev A · issued 2026-11-12

**OVERALL RESULT: PASS**

| Prepared for | Order reference |
|---|---|
| Stock inventory<br>Zombie Components LLC | Invoice No: **n/a**<br>Order No: **STOCK**<br>Customer PO: **n/a**<br>Document: **ZC-TR-STOCK-719365**<br>Test procedure: **ZC-TP-860-1417-10 rev A**<br>Service: **Test to stock**<br><br>Chassis: Ixia XGS12<br>Chassis S/N: XGS12-J0701117<br>IxOS version: **9.24.3100.10** (chassis IxServer; version-matched client)<br>Report date: 2026-11-12 |

This report certifies the health-validation testing performed on the Ixia Novus QSFP28 100GE 8-Port, an 8-port QSFP28 100 Gigabit Ethernet load module identified herein. The module was exercised with live 64-byte traffic at full line rate across all 8 ports (a 3 h 17 min 100GBASE-CR4, QSFP28 passive copper direct-attach cable soak), each from a reset counter baseline, while identity, link state, line speed, every L1/L2 error and fault counter, and module temperatures were sampled continuously and assessed against the acceptance criteria. The complete per-port measurements and time-series charts follow.

**Acceptance criteria.** Each criterion is benchmarked to IEEE 802.3 or RFC 1242/2544 and set tighter. test procedure ZC-TP-860-1417-10 rev A, ten criteria, applied where the OEM gives no pass or fail limit, set out in full on the next page; each section states the criteria it verifies. **10 of 10 met.**

**Methodology.** All monitoring was performed read-only against a version-matched IxOS 9.24.3100.10 client; every error counter was verified zero at the start of each window and the module's traffic ran undisturbed. Verdicts reflect sustained behaviour, not single samples. **Limitations.** The IxOS Tcl API exposes one temperature per port on this family (central); it does not expose fan speed, supply voltages or optical digital diagnostics. The chassis is a native IxOS (Linux) XGS12: the IxServer session log is taken from the chassis web console and read on the chassis clock.

# Test Report Release Note

Issues of ZC-TR-STOCK-719365 from the report register. Issue 1 is the first release of this test record; each later issue re-issues the same test record without retesting, with the change stated. This copy is issue 1.

| Issue | Date | Procedure | Change |
|---|---|---|---|
| 1 | 2026-11-12 | ZC-TP-860-1417-10 rev A | First release |

# Acceptance Criteria

**Each criterion is benchmarked to IEEE 802.3 or RFC 1242/2544 and set tighter.** Where the OEM gives no pass or fail limit for a load module, Zombie Components applies the acceptance criteria of its test procedure ZC-TP-860-1417-10 rev A to the module. The rule behind every limit: a module passed here must behave as a transparent instrument, adding no measurable error, loss or rate deviation to the production data its user collects. Where the industry sets no number (boot record, event log), nothing is tolerated. Each measurement section of this report opens with the criteria it verifies, the value measured and the result, and the Acceptance Criteria Summary before the sign-off lists all ten.

| ID | Criterion and limit | Benchmark and basis |
|---|---|---|
| **AC-1** | Identity: enumerated model, port count and serial agree with the order, the unit label and the boot record | **Order, unit label, IxServer boot record.** The report certifies one physical unit. Identity must agree across all three sources, so the document stays valid after the card leaves the chassis. |
| **AC-2** | Boot: zero FAIL records in the as-tested IxServer boot record; card reaches Board Ready | **IxServer power-on sequence; no industry limit.** Zero FAIL records tolerated. A module that fails its own start-up checks is not accepted, however it performs afterward. |
| **AC-3** | Test conditions: IxOS client version-matched to the chassis; counters zeroed at window start; sampling interval 10 s or less; capture window at least the module soak time, the longest AC-8 window among the PHYs the module supports and never less than 2 h, applied equally to every medium | **Metrology practice: controlled, documented conditions.** A version-mismatched client returns empty or invalid data, and counters are zeroed so only this window is judged. The window is calculated, not chosen: it is the time at line rate needed to demonstrate AC-8 on the most demanding PHY the module supports, and never less than 2 h: the bit count proves the error ratio, but a short window does not bring the module to thermal equilibrium for AC-9. One soak time applies to the module, so copper and fiber are each run for that same time. |
| **AC-4** | Link: up on every port in every sample; zero link-down transitions | **IEEE 802.3 link status.** Industry practice only requires that the link comes up. We require zero drops for the whole window, because one flap in service resets sessions and corrupts the measurement in progress. |
| **AC-5** | Line rate: negotiated speed equals the nominal port speed in every sample | **IEEE 802.3 PHY line rate.** Nominal speed in every sample, with no downshift or renegotiation at any point. |
| **AC-6** | Throughput: every port within ±100 ppm of the theoretical line-rate frame rate for the frame size under test, measured over the whole window (IEEE 802.3 clock tolerance); the measurement uncertainty is stated | **IEEE 802.3 ±100 ppm clock tolerance; RFC 2544 §26.1.** Tested at the minimum 64-byte frame, the highest frame rate and hardest case, on all ports at once. The measured rate must sit inside the tolerance of a compliant link. |
| **AC-7** | Frame delivery: zero frame loss on every port (RFC 2544 throughput definition). Tx and Rx totals agree within 10 frames, the frames in flight at the read instant | **RFC 1242 §3.17 / RFC 2544 §26.1: throughput is the highest rate with zero loss.** Zero loss at full line rate on every port simultaneously. The only allowance is frames in flight when the counters are read. |
| **AC-8** | Errors: zero increase on every frame-integrity, data-path, line-coding, fault, drop and flow-control counter. The demonstrated bit-error-ratio bound per port (95% confidence, zero errors) is at least 5× tighter than the IEEE 802.3 objective for the PHY. On copper, FCS errors are attributed to cabling and excluded | **IEEE 802.3 BER objective: $10^{-12}$ (1000BASE-X, 10G/40G/100G), $10^{-10}$ (1000BASE-T).** Zero errors, over enough bits to prove BER ≤ objective/5 at 95% confidence (3/N bits). A test instrument must be well inside the limit its users test against; 5:1 exceeds the 4:1 minimum test-uncertainty ratio of metrology practice (ANSI/NCSL Z540.3). A module we pass contributes at most one fifth of the objective, which can only matter for a device already within 20% of its limit. |
| **AC-9** | Thermal: no over-temperature alarm or shutdown during the window; every exposed sensor below 80 °C. Temperature change over the window is an indication only, not a pass or fail limit | **Ixia Platform Reference Guide: a card shuts itself down above its temperature threshold.** A shutdown interrupts a user's test, so that is what is judged; 80 °C is taken as the start of a runaway toward it. Temperature change depends on the room and the chassis as much as the card, so it is an indication only. |
| **AC-10** | Stability: zero card hardware events logged by IxServer during the capture window | **IxServer event log; no industry limit.** Any reset, re-initialisation or hardware event during a run would corrupt a customer's test in service, so none is tolerated during the window. |

**Standard and overrides.** These criteria are the Zombie Components standard and are applied to every module we test. Because the modules are used equipment, sold with warranty terms that vary by unit, the President of Zombie Components

may accept a specific unit against a relaxed limit when its application and warranty justify it. Any such override is stated in the report: the criterion, the standard limit, the limit applied, the reason, who authorized it and when. An overridden criterion is shown as OVERRIDE, never as PASS. **No override was applied to this unit.**

Demonstrated error bound for this unit: 100GE: zero errors over at least 1.18e+15 bits per port gives BER ≤ 2.5e-15 at 95% confidence, 394× tighter than the IEEE 802.3 cl.82/86 objective of 1e-12 (the criterion requires 5×).

# Module Specifications & Intended Use

| Acceptance criteria | Measured | Result: PASS |
|---|---|---|
| **AC-1** Identity: enumerated model, port count and serial agree with the order, the unit label and the boot record | NOVUS100GE8Q28+FAN, 8 active of 8 enumerated ports, SN 719365 (label); EEPROM 719365; boot record SN 719365 | **PASS** |

The NOVUS100GE8Q28+FAN is a 100 Gigabit Ethernet load module that occupies one chassis slot and carries eight native QSFP28 ports. With the matching speed option installed, each 100GE port can be reconfigured as 1x40GE, 4x25GE or 4x10GE (and 2x50GE with the 50GE option), giving up to 8 ports of 40GE or 32 ports of 25GE or 10GE per module. It provides Layer 2-3 support under IxExplorer, IxNetwork and the Tcl API. (Ixia Platform Reference Guide, Release 8.20 EA (Dec 2016), Chapter 32 IXIA Novus QSFP28 Load Modules, printed pp.541-542; Keysight data sheet 3120-1109.EN, Novus QSFP28 High-Density 100/50/40/25/10GE Load Module Family (published March 27, 2026), pp.2-4)

The module is installed in an XGS12 or XGS2 chassis; port speed is selected per Resource Group in the card Operation Mode tab (1x100GE, 4x25GE, 2x50GE, 1x40GE, 4x10GE). The transmit engine generates wire-speed packets with timestamps, sequence numbers, data integrity signature and packet group signatures. The receive engine performs wire-speed packet filtering and capturing and measures real-time latency and inter-arrival time for each packet group, with data integrity, sequence and advanced sequence checking. (Ixia Platform Reference Guide, Release 8.20 EA (Dec 2016), Chapter 32 IXIA Novus QSFP28 Load Modules, Specifications table, printed pp.547-548; IxExplorer User Guide, Release 9.24 (doc version 202207211825), Chapter 17 Card Properties, Novus Operation Mode, printed p.981)

## Stated performance specifications

| Parameter | Specification |
|---|---|
| **Model / part number** | NOVUS100GE8Q28+FAN, 944-1140 (the v8.20 guide also lists 944-1144 as 100GbE only; 944-4004-T is the TAA version; 944-1165 is the 4-port enablement NOVUS100GE4Q28+FAN) |
| **Type** | 100 Gigabit Ethernet full-featured load module, L2-3 support |
| **Slots / ports** | 1 slot; 8x100GE native QSFP28 ports; 8x40GE and 32x10GE with the 40/10GE speed option; 32x25GE with the 25GE speed option; 16x50GE with the 50GE speed option |
| **Physical interface** | Native QSFP28 |
| **IEEE interface standards** | IEEE 802.3 100GBASE-R, 802.3bj, 802.3bm, P802.3by (v8.20 guide); the data sheet adds 802.3ba and 802.3ae; 25G/50G Consortium specification v1.6 (v1.5 in the v8.20 guide) |
| **Speed options and fan-out** | 25GE: 905-1007 factory installed, 905-1008 field upgrade (up to 4x25GE per port). 40GE and 10GE: 905-1025 factory installed, 905-1026 field upgrade (1x40GE or 4x10GE per port). 50GE: 905-1011 / 905-1012 (2x50GE per port). Ports default to 100GE. IxExplorer port speed modes per Resource Group: 1x100GE, 4x25GE, 2x50GE, 1x40GE, 4x10GE Normal Mode. |
| **Transceiver support** | QSFP28 100GBASE-SR4 (also 4x25GBASE-SR), 100GBASE-LR4, 100GE PSM4, 100GE CWDM4; QSFP+ 40GBASE-PLR4; Active Optical Cable |
| **Passive copper DAC support** | 100GBASE-CR4 passive copper DAC up to 5 m (requires RS-FEC enabled); 25GBASE-CR passive DAC point-to-point and QSFP28-to-4xSFP28 fan-out up to 5 m (requires Clause 74 BASE-R FEC; data sheet: or RS-FEC Clause 91); 40GE over passive copper DAC. Ixia cable 942-0088: QSFP28 passive copper DAC, point-to-point, 3 m. |
| **Max ports per chassis** | XGS12 (12 modules): 96 ports 100GE, 96 ports 40GE, 384 ports 25GE, 384 ports 10GE. XGS2 (2 modules): 16 ports 100GE, 64 ports 25GE, 64 ports 10GE. The data sheet prints 32 ports of 40GE for XGS2; 2 modules x 8 ports = 16, so that printed value is reported as is and flagged. |
| **Max streams per port** | v8.20 guide: 100GbE 32, 25GbE 16. Current data sheet: normal mode 100GE 64, 40GE 64, 25GE 16, 10GE 16; high stream mode 100GE 128, 40GE 128, 25GE 64, 10GE 64. |
| **Frame size** | Maximum 14,000 bytes (9,216 bytes in Data Center Ethernet). Minimum 60 bytes at full line rate, 49 bytes at less than full line rate (the v8.20 guide transmit row prints '6 bytes at full line rate'). |
| **Latency measurement resolution** | 2.5 nanoseconds |
| **Transmit line clock adjustment** | -100 ppm to +100 ppm across all ports on the load module |
| **Trackable receive flows per port** | 100GE and 40GE: 32K limited statistics mode, 4K full statistics mode. 25GE and 10GE: 8K limited, 2K full. |
| **Hardware capture buffer** | Two hardware capture buffers per card, assignable to a port or Resource Group. v8.20 guide: two 512MB buffers. Current data sheet: 2 GB per port for 1x100GE and 1x40GE, 1 GB per Resource Group for 4x25GE and 4x10GE (a second, unlabeled column of the same table states 1 MB). Extended capture on all 8 ports is supported only in XGS12-SD/SDL/HSL chassis; slots 1, 2, 11 and 12 then become inactive. |

| Parameter | Specification |
|---|---|
| **FEC, auto-negotiation, link training** | 100GE: RS-FEC Clause 91, auto-negotiation Clause 73 for copper DAC, link training; RS-FEC corrected and uncorrected codeword counts. 25GE: FC-FEC Clause 74 and RS-FEC Clause 108, AN Clause 73, link training. 40GE: AN Clause 73 and link training for passive copper DAC. Auto-negotiation is not available at 10GE. The v8.20 guide states that at that release the 4x25GE option did not support FEC or auto-negotiation. |
| **CPU and memory** | Multicore processor with 2GB of CPU memory per port |
| **Dimensions / weight** | 17.3 in (L) x 1.3 in (W) x 12.0 in (H), 440 x 33 x 305 mm; module only 11.8 lb (5.35 kg); shipping 18.6 lb (8.44 kg) |
| **Operating temperature / humidity** | Operating 41 F to 95 F (5 C to 35 C); storage 41 F to 122 F (5 C to 50 C); humidity 0% to 85% non-condensing |

Specification rows are from the local Ixia Platform Reference Guide Release 8.20 EA (December 2016), the IxExplorer User Guide Release 9.24 and the Keysight data sheet of the family, each row cited with the printed page. Definition ZC-FD-novus100ge8q28 rev 1, approved 2026-11-12.

# Module Family: Novus QSFP28 100GE

The Novus QSFP28 family is the 8-port native QSFP28 100GE load module of the XGS chassis line. One hardware part carries the speed options as licences on the card: 25GE, and 40GE with 10GE. IxOS names the card by the options it finds.

| Model | Part number | Description |
|---|---|---|
| **NOVUS100GE8Q28+FAN** (this unit) | 944-1140 | 8-port QSFP28 100GE load module, 1 slot, 100GE native; 25GE by option |
| NOVUS100GE8Q28+FAN +10G+25G+40G | 944-1140 | Same 944-1140 hardware with the 25GE and 40/10GE fan-out speed options installed. The IxOS card-type string itself is not printed in any source read; the options and their part numbers are. |

Platform Reference Guide v8.20 EA ch.32 and Keysight data sheet 3120-1109.EN, as cited per member.

# Device Under Test

| Acceptance criteria | Measured | Result: PASS |
|---|---|---|
| **AC-3** Test conditions: IxOS client version-matched to the chassis; counters zeroed at window start; sampling interval 10 s or less; capture window at least the module soak time, the longest AC-8 window among the PHYs the module supports and never less than 2 h, applied equally to every medium | interval 5.6 s, window 3 h 17 min of 2 h 00 min module soak time, counters zeroed yes; IxServer 9.24.3100.10, matched client (full card identity returned) | **PASS** |
| **AC-9** Thermal: no over-temperature alarm or shutdown during the window; every exposed sensor below 80 °C. Temperature change over the window is an indication only, not a pass or fail limit | max 48 °C, no over-temperature alarm; change over the window +0.0 °C (indication only) | **PASS** |

| Slot | Serial | Assembly | Rev | HW | FPGA | Ports |
|---|---|---|---|---|---|---|
| 1 | 719365 | 850-1410-06-01 | C | 1 | 1074397818 | 8 |

Serial number read from the unit's physical identification label and cross-referenced against the card's boot-record identity in the IxServer chassis log. Capture: 100GBASE-CR4, QSFP28 passive copper direct-attach cable 2026-11-12 03:37:34 to 06:54:38 local (3 h 17 min), 2,125 samples, longest gap 6 s, all 8 ports. All error counters verified zero at the start of each window.

## Thermal profile (limit 80 °C, AC-9)

| Sensor | 100GE min / max / mean |
|---|---|
| Central (card) | 45 / 48 / 46.7 °C |

## Installed transceivers

| Port | Vendor / Part | Serial | Port | Vendor / Part | Serial |
|---|---|---|---|---|---|
| 1 | Mellanox MCP1600-C001 | MT1538VS07429 | 5 | Molex Inc. 1002971101 | 507120092 |

| Port | Vendor / Part | Serial | Port | Vendor / Part | Serial |
|---|---|---|---|---|---|
| 2 | Mellanox MCP1600-C001 | MT1538VS07429 | 6 | Molex Inc. 1002971101 | 507120092 |
| 3 | Molex Inc. 1002971301 | 526820371 | 7 | Molex Inc. 1002971301 | 606220658 |
| 4 | Molex Inc. 1002971301 | 526820371 | 8 | Molex Inc. 1002971301 | 606220658 |

8 of 8 ports identified in the as-tested boot record. Identity only; optic digital diagnostics were not collected.

# Port Bring-Up & Aggregate Conformance Checklist

| Acceptance criteria | Measured | Result: PASS |
|---|---|---|
| **AC-4** Link: up on every port in every sample; zero link-down transitions | 17,000 of 17,000 port-samples up, 0 link-down transitions | **PASS** |
| **AC-5** Line rate: negotiated speed equals the nominal port speed in every sample | 100,000 Mbps in 17,000 of 17,000 port-samples | **PASS** |
| **AC-6** Throughput: every port within ±100 ppm of the theoretical line-rate frame rate for the frame size under test, measured over the whole window (IEEE 802.3 clock tolerance); the measurement uncertainty is stated | -13 to -10 ppm vs 148,809,524 fps (least-squares over all samples, 95% uncertainty ±1.9 ppm) | **PASS** |

Each test was evaluated across all 8 ports for every sample of each monitoring window (100ge 2,125); a test passes only if the criterion held continuously on every port.

| # | Aggregate Port Test | Pass Criterion | 100GE |
|---|---|---|---|
| 1 | Link establishment | Link up on all 8 ports, every sample | **PASS** |
| 2 | Line rate | Line speed = nominal port speed, every sample | **PASS** |
| 3 | Link stability (no flaps) | Zero link-down transitions over window | **PASS** |
| 4 | Frame integrity | FCS / alignment / undersize / oversize / fragments / dribble / symbol = 0 | **PASS** |
| 5 | Data-path verification | Sequence errors = 0 and data-integrity errors = 0 | **PASS** |
| 6 | Frame delivery | Dropped frames = 0, ingress and egress | **PASS** |
| 7 | Line coding | Code / disparity / invalid-EOF / error-character counters = 0 | **PASS** |
| 8 | Fault signaling | Local / remote fault, link-fault state, PCS counters = 0 | **PASS** |
| 9 | Flow control | Zero pause frames received | **PASS** |
| 10 | Line-rate throughput | Every port within ±100 ppm of the line-rate frame rate, least-squares over the window (AC-6) | **PASS** |
| 11 | Counter coherence | framesSent monotonic on every port (no resets) | **PASS** |
| 12 | Thermal | All sensors < 80 °C for the entire window | **PASS** |

Measured per-port frame rate: 148,802,580–148,808,875 fps against the 148,809,524 fps ceiling for 64-byte frames.

# IxServer Event Log: Card 1 Summary (S/N 719365)

| Acceptance criteria | Measured | Result: PASS |
|---|---|---|
| **AC-2** Boot: zero FAIL records in the as-tested IxServer boot record; card reaches Board Ready | 0 FAIL records; 0 BIST/memory-test records; Board Ready logged | **PASS** |
| **AC-10** Stability: zero card hardware events logged by IxServer during the capture window | 0 card hardware events | **PASS** |

Summary of the IxServer chassis log in the IxServer Task-window schema (**Date/Time** · **Card** · **Port** · **Result** · **Event**, per the Ixia IxServer User Guide), retrieved read-only and scoped to Card 1 (serial 719365) plus chassis-level records.

**Log summary by category.** Every record for card 1 from the as-tested boot record onward (18,720 records) and the chassis-level records of the same session (18,742), grouped by what the chassis was doing; counts, time span and the values that matter for each group.

| Category | Records | Span (workstation time) | Result | Summary |
|---|---|---|---|---|
| **Identity and assembly** | 5 | 02:51:26 to 02:52:34 | ok | Native Board, Serial Number 719365, BOM Assembly Number 860-1417-10 Rev E, PCBA Date Code J93936928, Assembly Number 850-1410-06-01 Revision C<br>LM type NOVUS100GE8Q28+FAN. Maximum current draw: 0.00 Amps at 3.3V, 0.00 Amps at 5V, 41.02 Amps at 12V. (492 Watts)<br>Port Card MFG Date Code J94239130 Assembly Number 850-1417-09-01 Revision A<br>LM Serial Number 719365 MFG Date Code J93936928 Assembly Number 850-1410-06-01 Revision C |
| **Firmware and FPGA** | 69 | 02:51:29 to 02:52:32 | ok | 1 distinct FPGA version line: FPGA versions: TX 1.865 (0x400a_0361) RX 1.865 (0x400a_0361)<br>8 main images booted, 8 firmware starts |
| **Processor boot** | 2 | 02:52:17 to 02:52:34 | ok | 1 local processor booted (port group leads 1); Board Ready logged |
| **Optics (transceivers)** | 16 | 03:14:44 to 03:18:30 | ok | Mellanox MCP1600-C001: 2 ports (1, 2)<br>Molex Inc. 1002971301: 4 ports (3, 4, 7, 8)<br>Molex Inc. 1002971101: 2 ports (5, 6) |
| **Port configuration and traffic control** | 78 | 02:52:08 to 03:30:31 | ok | 8 port configuration writes, 16 PFC control writes, 54 other control records (activation, transmit, ownership) |
| **Client sessions** | 17096 | 02:52:34 to 06:54:38 | ok | 261 client connections (chassis-level records) from 127.0.0.1, 192.168.2.13; 13 disconnects; 17096 card reads and keep-alives |
| **Faults and warnings** | 4 | 03:17:56 to 03:18:01 | Warning | 03:17:56 port 6 Warning specCompliance registers: 0x00000000<br>03:17:56 port 6 Warning Cable is missing compliance specifications and is not supported. Unpredictable results might be achieved.<br>03:18:01 port 5 Warning specCompliance registers: 0x00000000<br>03:18:01 port 5 Warning Cable is missing compliance specifications and is not supported. Unpredictable results might be achieved. |
| **Other card records** | 1450 | 02:51:19 to 03:37:32 | ok | 1450 boot and bring-up detail records (register values, link training, 50 link state changes before the capture window); none FAIL-tagged or Warning-tagged |
| **Chassis context** | 18742 | 02:51:22 to 06:56:01 | ok | ------- Server Session Begin -------<br>IxOS 9.24.3100.10 Patch1<br>OS Name: Linux, Build Number: 0, Service Pack: 3.10.0-1160.42.2.el7.x86_64<br>Processor Type: 64bit, Number Of Processor Cores: 32<br>Backplane ID: 1306<br>Top Panel Assembly Part Number 840-0123-04 Revision D<br>Top Panel Assembly Serial Number<br>Top Panel Sub-Assembly Part Number 860-1342-01 Revision D<br>Processor Card Assembly Part Number 942-0102-02 Revision N<br>Processor Card Assembly Serial Number 721630<br>Processor Card Sub-Assembly Part Number 860-1331-10 Revision K<br>Power Module Assembly Part Number 942-0032-08 Revision B<br>Power Module Assembly Serial Number 721826<br>Power Module Sub-Assembly Part Number 870-0103-01 Revision C |

**Event timeline (aggregate).**

| Date / Time | Card | Port | Result | Event | Observations (aggregate) |
|---|---|---|---|---|---|
| 11-12-2026 00:27:33 | - | - | ok | IxServer start: chassis boot | IxServer 9.24.3100.10, chassis Ixia XGS12 S/N XGS12-J0701117. Chassis-side timestamps are mapped to workstation time by the clock offset measured between the workstation and the chassis. |
| 11-12-2026 02:51:19 | 1 | - | ok | Hot insertion: complete boot record of the unit as tested | Native Board, Serial Number 719365, BOM Assembly Number 860-1417-10 Rev E, PCBA Date Code J93936928, Assembly Number 850-1410-06-01 Revision C; LM type NOVUS100GE8Q28+FAN. Maximum current draw: 0.00 Amps at 3.3V, 0.00 Amps at 5V, 41.02 Amps at 12V. (492 Watts). 0 BIST / memory-test records, Board Ready logged. Complete, error-free enumeration: **zero FAIL records** in the boot sequence. |
| 11-12-2026 02:51:19 | 1 | 1-8 | ok | Transceiver enumeration | 8 of 8 transceivers identified with vendor, part and serial. |

| Date / Time | Card | Port | Result | Event | Observations (aggregate) |
|---|---|---|---|---|---|
| 11-12-2026 03:35:54 | - | - | ok | Client sessions | 15 client connections: IxExplorer (traffic control) and read-only Tcl connections (discovery, port info, statistics logging), all from the test workstation. |
| 11-12-2026 06:50:34 | 1 | 1-8 | ok | Statistics baselines | 20 statistics-clear events; counters zeroed at the start of each capture window without stopping traffic. |
| 03:37–06:54 | 1 | 1-8 | ok | 100GBASE-CR4, QSFP28 passive copper direct-attach cable soak (3 h 17 min) | 0 card hardware events during the capture window (read-only statistics queries excluded). The card ran undisturbed at line rate. |
| 11-12-2026 06:57:06 | - | - | ok | Session log accounting | Chassis log downloaded from the chassis web console. Scope: the as-tested insertion of card 1 through the end of the retrieved log, 66,540 event lines, all represented above. 0 FAIL-tagged records for card 1 in scope. |

# Statistics Log: Full Field Aggregate (all 8 ports)

| Acceptance criteria | Measured | Result: PASS |
|---|---|---|
| **AC-7** Frame delivery: zero frame loss on every port (RFC 2544 throughput definition). Tx and Rx totals agree within 10 frames, the frames in flight at the read instant | max \|Tx–Rx\| 1 frames per port | **PASS** |
| **AC-8** Errors: zero increase on every frame-integrity, data-path, line-coding, fault, drop and flow-control counter. The demonstrated bit-error-ratio bound per port (95% confidence, zero errors) is at least 5× tighter than the IEEE 802.3 objective for the PHY. On copper, FCS errors are attributed to cabling and excluded | 0 errors / 31 counters; BER ≤ 2.5e-15 (target 2e-13, IEEE 802.3 cl.82/86) | **PASS** |

Every one of the 48 logged fields with its measured value per medium, including every error counter that stayed at zero. Counters show the per-port increase over the window, state fields the value held across all samples, temperatures the range across ports.

| Field | 100GE (8 ports) |
|---|---|
| **Port & link state (3 fields)** | |
| link | 1 (all ports, all 2,125 samples) |
| lineSpeed | 100000 (all ports, all 2,125 samples) |
| linkFaultState | 0 (all ports, all 2,125 samples) |
| **Traffic: transmit (4 fields)** | |
| framesSent | +1,759,476,521,178–1,759,550,955,346 per port · total 14,076,109,856,553 |
| scheduledFramesSent | +1,759,476,521,178–1,759,550,955,346 per port · total 14,076,109,856,553 |
| bytesSent | +112,606,497,355,440–112,611,261,142,128 per port · total 900,871,030,819,504 |
| bitsSent | +900,851,978,843,520–900,890,089,137,024 per port · total 7,206,968,246,556,032 |
| **Traffic: receive (3 fields)** | |
| framesReceived | +1,759,476,521,178–1,759,550,955,345 per port · total 14,076,109,856,552 |
| bytesReceived | +112,606,497,355,408–112,611,261,142,112 per port · total 900,871,030,819,408 |
| bitsReceived | +900,851,978,843,264–900,890,089,136,896 per port · total 7,206,968,246,555,264 |
| **Frame integrity (8 fields)** | |
| fcsErrors | 0 (all ports, all 2,125 samples) |
| alignmentErrors | 0 (all ports, all 2,125 samples) |
| oversize | 0 (all ports, all 2,125 samples) |
| undersize | 0 (all ports, all 2,125 samples) |
| fragments | 0 (all ports, all 2,125 samples) |
| dribbleErrors | 0 (all ports, all 2,125 samples) |
| symbolErrors | 0 (all ports, all 2,125 samples) |
| symbolErrorFrames | 0 (all ports, all 2,125 samples) |
| **Data-path verification (2 fields)** | |
| sequenceErrors | 0 (all ports, all 2,125 samples) |
| dataIntegrityErrors | 0 (all ports, all 2,125 samples) |
| **Media access (1 field)** | |
| collisions | 0 (all ports, all 2,125 samples) |
| **Frame delivery (drops) (2 fields)** | |
| droppedFrames | 0 (all ports, all 2,125 samples) |
| egressDroppedFrames | 0 (all ports, all 2,125 samples) |
| **Line coding (5 fields)** | |
| codeError | 0 (all ports, all 2,125 samples) |
| codingErrorFramesReceived | 0 (all ports, all 2,125 samples) |

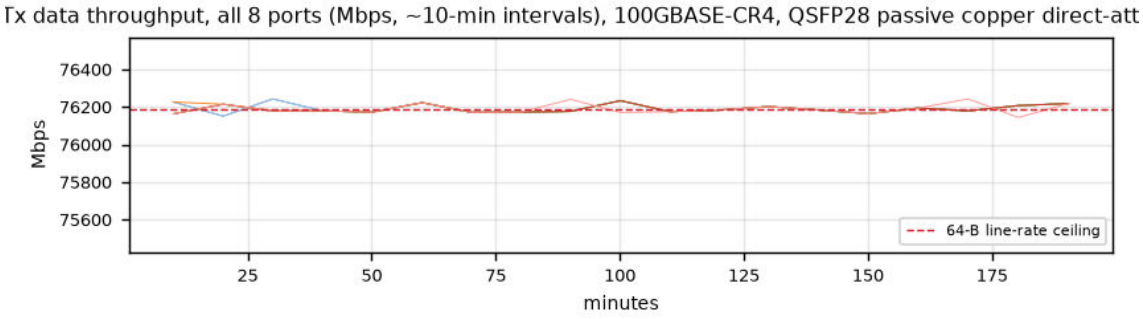
| Field | 100GE (8 ports) |
|---|---|
| eErrorCharacterFramesReceived | 0 (all ports, all 2,125 samples) |
| invalidEOFCount | 0 (all ports, all 2,125 samples) |
| disparityErrors | 0 (all ports, all 2,125 samples) |
| **Flow control & VLAN (2 fields)** | |
| flowControlFrames | 0 (all ports, all 2,125 samples) |
| vlanTaggedFramesRx | 0 (all ports, all 2,125 samples) |
| **Capture comparators (2 fields)** | |
| captureTrigger | +1,759,476,521,178–1,759,550,955,347 per port · total 14,076,109,856,554 |
| captureFilter | +1,759,476,521,178–1,759,550,955,347 per port · total 14,076,109,856,554 |
| **Timing (1 field)** | |
| transmitDuration | raw duration register, advancing every sample |
| **Fault signaling (sampled at every speed) (7 fields)** | |
| localFaults | 0 (all ports, all 2,125 samples) |
| remoteFaults | 0 (all ports, all 2,125 samples) |
| pcsSyncErrorsReceived | 0 (all ports, all 2,125 samples) |
| pcsIllegalCodesReceived | 0 (all ports, all 2,125 samples) |
| pcsLocalFaultsReceived | 0 (all ports, all 2,125 samples) |
| pcsRemoteFaultsReceived | 0 (all ports, all 2,125 samples) |
| pcsIllegalIdleReceived | 0 (all ports, all 2,125 samples) |
| **FEC (not used at this line rate; sampled regardless) (4 fields)** | |
| fecCorrectedBitsCount | 0 (all ports, all 2,125 samples) |
| fecUncorrectableSubrowCount | 0 (all ports, all 2,125 samples) |
| rsFecCorrectedCodewordCount | 0 (all ports, all 2,125 samples) |
| rsfecUncorrectedCodewordCount | 0 (all ports, all 2,125 samples) |
| **Thermal sensors (3 fields)** | |
| centralTemperature | 45–48 °C across ports |
| portTemperature | reads 0 on every sample (sensor not exposed) |
| trafficFpga1Temperature | reads 0 on every sample (sensor not exposed) |
| **Other (1 field)** | |
| tRead | min 1794483454.496 / max 1794495278.886 |

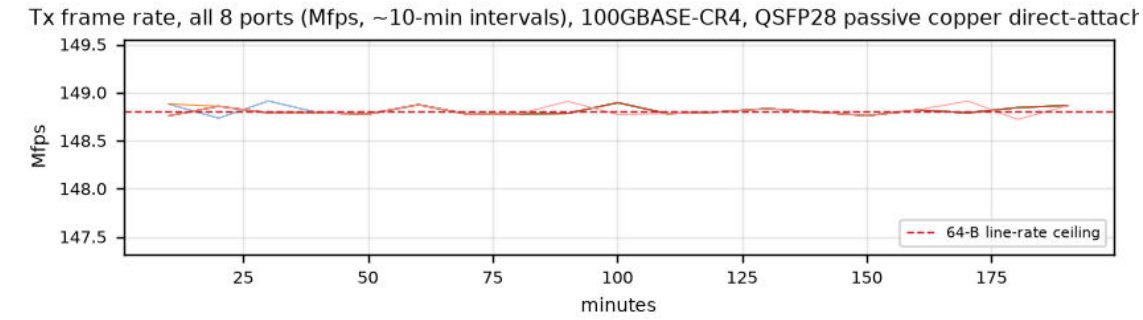
Zeros are measured values, sampled for the full window on every port.

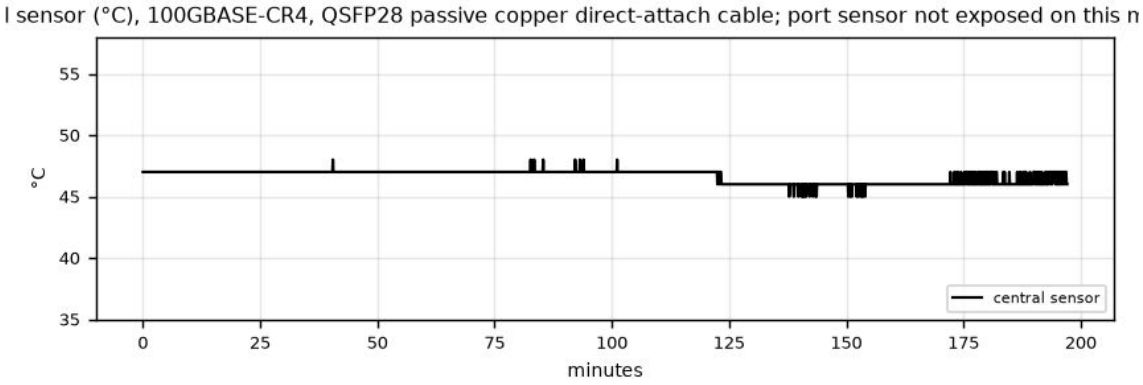
## Statistics Log: Time-Series Graphs (100GBASE-CR4, QSFP28 passive copper direct-attach cable)

| Acceptance criteria | Measured | Result: PASS |
|---|---|---|
| **AC-6** Throughput: every port within ±100 ppm of the theoretical line-rate frame rate for the frame size under test, measured over the whole window (IEEE 802.3 clock tolerance); the measurement uncertainty is stated | -13 to -10 ppm vs 148,809,524 fps (least-squares over all samples, 95% uncertainty ±1.9 ppm) | **PASS** |
| **AC-9** Thermal: no over-temperature alarm or shutdown during the window; every exposed sensor below 80 °C. Temperature change over the window is an indication only, not a pass or fail limit | max 48 °C, no over-temperature alarm; change over the window +0.0 °C (indication only) | **PASS** |

Data throughput holds at ≈76,190 Mbps per port and the frame rate at the 148,809,524 fps ceiling for 64-byte frames (dashed line). Rates are exact counter deltas over ~10-minute intervals; 1-second timestamp resolution gives up to ±0.3% per interval, the scatter about the ceiling. Window totals are exact.



# Per-Module Detail

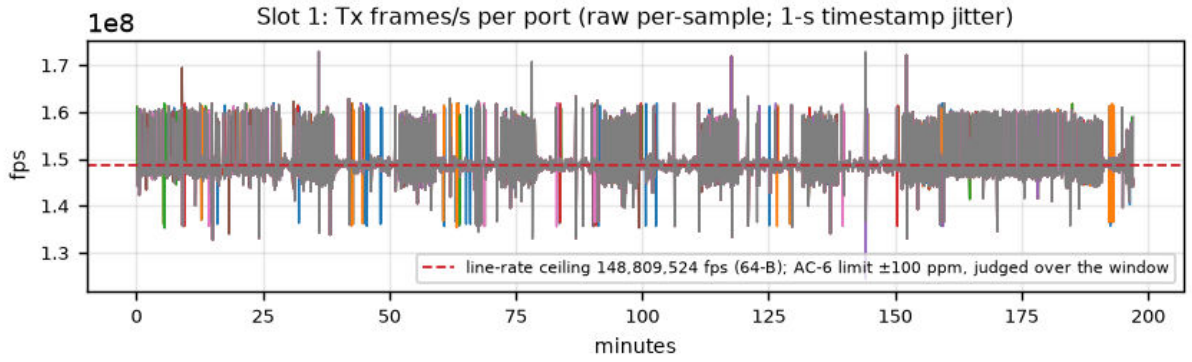
## Slot 1: NOVUS100GE8Q28+FAN · S/N 719365 · 100GE

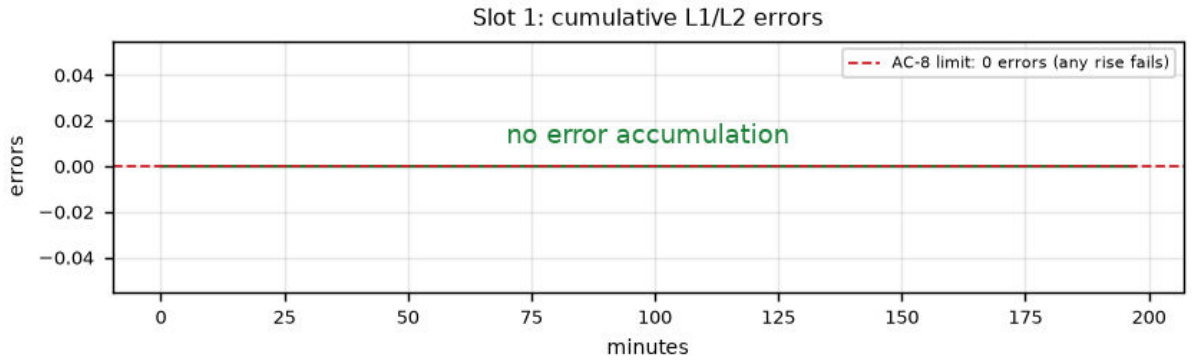
**PASS**

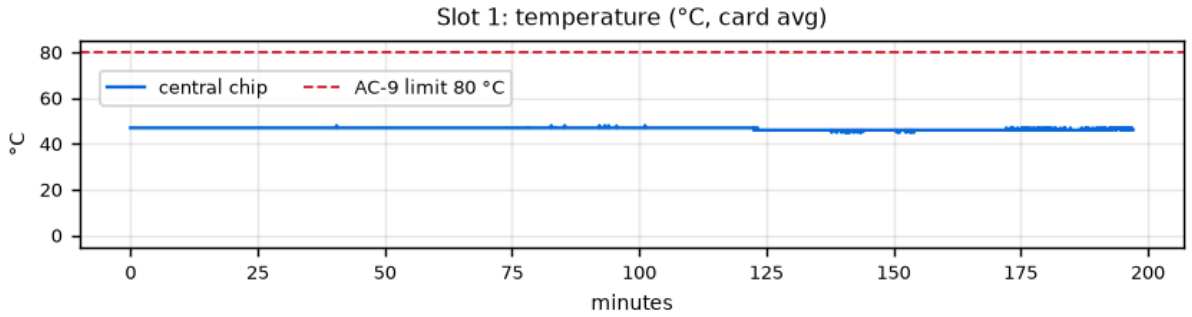
| Per-port acceptance criteria | Measured | Result: PASS |
|---|---|---|
| **AC-4** Link: up on every port in every sample; zero link-down transitions | 8 of 8 ports up in 100% of samples with 0 transitions | PASS |
| **AC-5** Line rate: negotiated speed equals the nominal port speed in every sample | 8 of 8 ports at 100,000 Mbps | PASS |
| **AC-7** Frame delivery: zero frame loss on every port (RFC 2544 throughput definition). Tx and Rx totals agree within 10 frames, the frames in flight at the read instant | max \|Tx–Rx\| 1 frames on any port | PASS |
| **AC-8** Errors: zero increase on every frame-integrity, data-path, line-coding, fault, drop and flow-control counter. | 0 counted errors, all ports | PASS |
| **AC-9** Thermal: no over-temperature alarm or shutdown during the window; every exposed sensor below 80 °C | max 48 °C | PASS |

| Port | Link | Speed | Tx frames | Rx frames | Loss | Avg fps | Throughput | Errors | Result |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 100% | 100000 | 1,759,550,955,345 | 1,759,550,955,345 | +0 | 148,808,875 | 76.2 Gbps | 0 | PASS |
| 2 | 100% | 100000 | 1,759,550,955,345 | 1,759,550,955,345 | +0 | 148,808,875 | 76.2 Gbps | 0 | PASS |
| 3 | 100% | 100000 | 1,759,550,955,346 | 1,759,550,955,345 | +1 | 148,808,875 | 76.2 Gbps | 0 | PASS |
| 4 | 100% | 100000 | 1,759,476,521,178 | 1,759,476,521,178 | +0 | 148,802,580 | 76.2 Gbps | 0 | PASS |
| 5 | 100% | 100000 | 1,759,476,521,179 | 1,759,476,521,178 | +1 | 148,802,580 | 76.2 Gbps | 0 | PASS |
| 6 | 100% | 100000 | 1,759,476,521,178 | 1,759,476,521,179 | -1 | 148,802,580 | 76.2 Gbps | 0 | PASS |
| 7 | 100% | 100000 | 1,759,476,521,179 | 1,759,476,521,179 | +0 | 148,802,580 | 76.2 Gbps | 0 | PASS |
| 8 | 100% | 100000 | 1,759,550,905,803 | 1,759,550,905,803 | +0 | 148,808,870 | 76.2 Gbps | 0 | PASS |

**Thermal:** central chip avg 47°C (max 48°C) · port chip not exposed · drift +0°C over run: stable, within normal range.




Slot 1: temperature (°C, card avg)
central chip
AC-9 limit 80 °C
°C
minutes
0
20
40
60
80
0
25
50
75
100
125
150
175
200




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# Acceptance Criteria Summary

All ten acceptance criteria of ZC-TP-860-1417-10 rev A with the value measured on this unit and the result. The overall result is PASS only if every criterion is met: **10 of 10 met.**

| Acceptance criteria (ZC-TP-860-1417-10 rev A) | Measured | Result: PASS |
|---|---|---|
| **AC-1** Identity: enumerated model, port count and serial agree with the order, the unit label and the boot record | NOVUS100GE8Q28+FAN, 8 active of 8 enumerated ports, SN 719365 (label); EEPROM 719365; boot record SN 719365 | **PASS** |
| **AC-2** Boot: zero FAIL records in the as-tested IxServer boot record; card reaches Board Ready | 0 FAIL records; 0 BIST/memory-test records; Board Ready logged | **PASS** |
| **AC-3** Test conditions: IxOS client version-matched to the chassis; counters zeroed at window start; sampling interval 10 s or less; capture window at least the module soak time, the longest AC-8 window among the PHYs the module supports and never less than 2 h, applied equally to every medium | interval 5.6 s, window 3 h 17 min of 2 h 00 min module soak time, counters zeroed yes; IxServer 9.24.3100.10, matched client (full card identity returned) | **PASS** |
| **AC-4** Link: up on every port in every sample; zero link-down transitions | 17,000 of 17,000 port-samples up, 0 link-down transitions | **PASS** |
| **AC-5** Line rate: negotiated speed equals the nominal port speed in every sample | 100,000 Mbps in 17,000 of 17,000 port-samples | **PASS** |
| **AC-6** Throughput: every port within ±100 ppm of the theoretical line-rate frame rate for the frame size under test, measured over the whole window (IEEE 802.3 clock tolerance); the measurement uncertainty is stated | -13 to -10 ppm vs 148,809,524 fps (least-squares over all samples, 95% uncertainty ±1.9 ppm) | **PASS** |
| **AC-7** Frame delivery: zero frame loss on every port (RFC 2544 throughput definition). Tx and Rx totals agree within 10 frames, the frames in flight at the read instant | max \|Tx−Rx\| 1 frames per port | **PASS** |
| **AC-8** Errors: zero increase on every frame-integrity, data-path, line-coding, fault, drop and flow-control counter. The demonstrated bit-error-ratio bound per port (95% confidence, zero errors) is at least 5× tighter than the IEEE 802.3 objective for the PHY. On copper, FCS errors are attributed to cabling and excluded | 0 errors / 31 counters; BER ≤ 2.5e-15 (target 2e-13, IEEE 802.3 cl.82/86) | **PASS** |
| **AC-9** Thermal: no over-temperature alarm or shutdown during the window; every exposed sensor below 80 °C. Temperature change over the window is an indication only, not a pass or fail limit | max 48 °C, no over-temperature alarm; change over the window +0.0 °C (indication only) | **PASS** |
| **AC-10** Stability: zero card hardware events logged by IxServer during the capture window | 0 card hardware events | **PASS** |

Demonstrated error bound for this unit: 100GE: zero errors over at least 1.18e+15 bits per port gives BER ≤ 2.5e-15 at 95% confidence, 394× tighter than the IEEE 802.3 cl.82/86 objective of 1e-12 (the criterion requires 5×).




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# Validation Sign-Off

Zombie Components LLC certifies that the health-validation testing described in this report was performed on the line-card module and chassis identified below, and that the recorded results are accurate and complete to the best of the tester's knowledge.

| | |
|---|---|
| **Document** | ZC-TR-STOCK-719365 · issue 1, 2026-11-12 |
| **Tested to** | ZC-TP-860-1417-10 rev A · assembly 860-1417-10 |
| **Customer** | Stock inventory, Zombie Components LLC |
| **Order / Invoice** | STOCK / n/a |
| **Service** | Test to stock |
| **Chassis** | Ixia XGS12 · S/N XGS12-J0701117 |
| **IxOS version** | IxOS 9.24.3100.10 (chassis IxServer; testing client version-matched) |
| **Module tested** | Ixia Novus QSFP28 100GE 8-Port · S/N 719365 · 100GBASE-CR4, QSFP28 passive copper direct-attach cable |
| **100GE window** | 2026-11-12 03:37:34 to 06:54:38 local (3 h 17 min), 2,125 samples |
| **Overall result** | **PASS** |

**Tested by:** Allen E. Hall

**Title:** President

**Signature:** 

**Date:** November 12, 2026