

# NPort® S9650I Series

## 8/16-port rugged device server with managed Ethernet switch



- > 8/16-port RS-232/422/485 serial interface
- > Supports up to four managed Ethernet switch ports (fiber available with some optional network modules)
- > DNP3 and Modbus protocols supported
- > IEC 61850-3, IEEE 1613 compliant (for power substations)
- > Ethernet redundancy with Turbo Ring/Chain and RSTP/STP supported
- > Real COM/TTY drivers for Windows and Linux
- > IEEE 1588v2 and IRIG-B time synchronization functions
- > Supports IEC 61850 MMS protocol
- > Security features based on IEC-62443/NERC CIP
- > -40 to 85°C wide operating temperature



### Introduction

The NPort S9650I 8/16-port RS-232/422/485 device servers, which come with a built-in full-function managed Ethernet switch, are designed specifically for the harsh environmental conditions found in electrical substations. With both fiber and wire Ethernet ports

supported, the combination of device server plus Ethernet switch gives users the ability to easily install, manage, and maintain the NPort S9650I itself, as well as attached serial devices.

### Electromagnetic Compatibility for Harsh Substation Environments

The NPort S9000 Series supports a high level of surge protection to prevent damage from the types of power surges and EMI one finds in electrical substations and industrial automation applications. Combined with a -40 to 85°C operating temperature range and galvanized steel housing, the NPort S9000 is suitable for a wide range

of industrial environments. Another plus is the NPort S9000's dual power supplies, which provide both redundancy, as well as a wide range of voltage inputs. The HV models accept a power input of 88 to 300 VDC and 85 to 264 VAC.

### Power SCADA with IEC 61850 MMS for Easy Maintenance

The current trend in power SCADA applications is to control and monitor both IT devices (switches, routers, etc.) and IEDs (sensors, actuators, etc.) with the MMS protocol. Contrast this with the more traditional management approach of using SNMP for IT devices and MMS for IEDs. In fact, SIs may even need to manage a variety of

legacy devices that use proprietary communications protocols. The NPort S9000 device servers are the world's first device servers to integrate MMS into an IT-type device designed specifically for power SCADA applications. The NPort S9000 even supports using MMS to monitor serial legacy devices.

### Supports Modbus/DNP3 Protocol Gateway

The NPort S9000 Series provides maximum flexibility for integrating industrial Modbus/DNP3 networks of all types and sizes. The NPort S9000 is designed to integrate Modbus TCP, ASCII, and RTU devices in almost any master/slave combination, including simultaneous serial

and Ethernet masters. The NPort S9000 device servers also support protocol conversion between DNP3 serial and DNP3 IP. All models are ruggedly constructed and are DIN-rail mountable.

### Cybersecurity Features Based on IEC-62443/NERC CIP

The NPort S9650I Series has security features based on IEEE 62443/NERC CIP to provide a high level of cybersecurity. Protecting mission-critical networks from cyberattacks is a high priority for industrial

automation applications, which can suffer large losses due to extended network downtime.

## : Supports IEEE 1588v2 and IRIG-B Time Synchronization Functions

The NPort S9650I Series, which has a modular design that supports IEEE 1588 and IRIG-B time synchronization, is able to interconnect and synchronize multiple types of intelligent electronic devices (IEDs) that

use different communication protocols. The time source is provided via IEEE 1588 v2 and converted to IRIG-B for distribution to the IEDs via the serial ports or via a dedicated IRIG-B BNC connector.

## : Ring Redundancy at the Device Level

Device-level communication networks for industrial automation are very critical since they are used to control and monitor device processes. The reliability of these communications depends on ring redundancy at the device level, which is designed to provide fast network fault detection and reconfiguration to support the most demanding control applications. The NPort S9000 Series integrates

a full-function NPort device server with an industrial switch to carry serial and Ethernet devices at the same time. In addition, the NPort S9000 can also achieve ring redundancy with standard STP/RSTP and Moxa's proprietary Turbo Ring or Turbo Chain 2 redundancy protocols. This all-in-one design can be used to optimize and simplify your device network and enhance reliability.

## : General Specifications

### Port Summary

**Serial Ports:** 8/16 RS-232/422/485 ports

**Ethernet Switch Ports:** 2 built-in RJ45 Ethernet ports. Add 2 additional Ethernet ports with optional expansion modules:

- Option 1: Expansion module with 2 RJ45 Ethernet ports
- Option 2: Expansion module with 2 fiber Ethernet ports
- Option 3: Expansion module with BNC connectors for IRIG-B time sync

**Magnetic Isolation Protection:** 1.5 kV built in

**Console Ports:** 1 (10-pin RJ45 connector)

### Physical Characteristics

**Housing:** Metal

**Weight:** 5.15 kg (11.35 lb)

**Dimensions:** 457 x 32 x 330 mm (18.00 x 1.25 x 12.99 in)

### Environmental Limits

**Operating Temperature:** -40 to 85°C (-40 to 185°F)

**Storage Temperature:** -40 to 85°C (-40 to 185°F)

**Ambient Relative Humidity:** 5 to 95% (non-condensing)

### Power Requirements

**Input Voltage:** 110/220 VAC/VDC (88 to 300 VDC, 85 to 264 VAC)

**Input Current:** 0.27 A @ 110 VDC, 0.415 A @ 110 VAC

### Standards and Certifications

**Safety:** UL 61010

**EMC:** EN 61000-6-2/61000-6-4

**EMI:** CISPR 22, FCC Part 15B Class A

**EMS:**

IEC 61000-4-2 ESD: Contact: 6 kV; Air: 8 kV

IEC 61000-4-3 RS: 80 MHz to 1 GHz: 10 V/m

IEC 61000-4-4 EFT: Power: 4 kV; Signal: 4 kV

IEC 61000-4-5 Surge: Power: 4 kV; Signal: 4 kV

IEC 61000-4-6 CS: 150 kHz to 80 MHz: 10 V/m; Signal: 10 V/m

IEC 61000-4-8 PFMP

IEC 61000-4-11 DIPs

### Warranty

**Warranty Period:** 5 years

**Details:** See [www.moxa.com/warranty](http://www.moxa.com/warranty)

## : Device Server Specifications

### Serial Interface

**Number of Ports:** 8 or 16

**Serial Standards:** RS-232/422/485

**Connector:** DB9 male, DB9 female, multi-mode fiber (ST)

**Serial Line Protection:** 2 kV isolation protection

**RS-485 Data Direction Control:** ADDC® (Automatic Data Direction Control)

**Terminator for RS-485:** 120 Ω

**Console Port:** Dedicated RS-232 console port (10-pin RJ45)

### Serial Communication Parameters

**Data Bits:** 5, 6, 7, 8

**Stop Bits:** 1, 1.5, 2

**Parity:** None, Even, Odd, Space, Mark

**Flow Control:** RTS/CTS and XON/XOFF

**Baudrate:** 50 bps to 921.6 Kbps

### Serial Signals

**RS-232:** TxD, RxD, RTS, CTS, DTR, DSR, DCD, GND

**RS-422:** Tx+, Tx-, Rx+, Rx-, GND

**RS-485-4w:** Tx+, Tx-, Rx+, Rx-, GND

**RS-485-2w:** Data+, Data-, GND

### Software

**Configuration Options:** Command Line Interface (CLI) through Serial/Telnet/SSH, Web Console (HTTP/HTTPS), Windows Utility

**Windows Real COM Drivers:** Windows 95/98/ME/NT/2000, Windows XP/2003/Vista/2008/7/8/8.1/10 (x86/x64), Windows 2008 R2/2012/2012 R2 (x64), Windows Embedded CE 5.0/6.0, Windows XP Embedded

**Fixed TTY Drivers:** SCO Unix, SCO OpenServer, UnixWare 7, QNX 4.25, QNX 6, Solaris 10, FreeBSD, AIX 5.x, HP-UX 11i, Mac OS X

**Linux Real TTY Drivers:** Linux 2.4.x, 2.6.x, 3.x, 4.x

**Android API:** Android 3.1.x and later

**Operation Modes:** Real COM, TCP Server, TCP Client, UDP, RFC2217, Modbus, DNP3, DNP3 Raw Socket

**Management:** SNMP MIB-II, IEC 61850 MMS

### Reliability

**Alert Tools:** Built-in buzzer and RTC (real-time clock)

**Automatic Reboot Trigger:** Built-in WDT (watchdog timer)

**MTBF** (mean time between failures)

**Time:**

NPort S9650I-16B-2HV-T: 161,039 hrs

NPort S9650I-16-2HV-T: 165,308 hrs

NPort S9650I-16F-2HV-T: 264,628 hrs

NPort S9650I-16F-2HV-E-T: 262,639 hrs

**Standard:** Telcordia (Bellcore) Standard TR/SR

## Ethernet Switch Specifications

### Ethernet Interface

#### Standards:

- IEEE 802.3 for 10BaseT
- IEEE 802.3u for 100BaseT(X) and 100BaseFX
- IEEE 802.3x for Flow Control
- IEEE 802.1D for Spanning Tree Protocol
- IEEE 802.1w for Rapid STP
- IEEE 802.1Q for VLAN Tagging
- IEEE 802.1p for Class of Service
- IEEE 802.1x for Authentication
- IEEE 802.3ad for Port Trunk with LACP

**Network Protocols:** ICMP, IPv4, TCP, UDP, ARP, Telnet, DNS, HTTP, SMTP, SNMP, IGMPv1/v2, GVRP, SNMPv1/v2c/v3, DHCP Server/Client, DHCP Option 82, BootP, TFTP, SNMP, SMTP, RARP, GMRP, LACP, RMON

**MIB:** MIB-II, Ethernet-Like MIB, P-BRIDGE MIB, Q-BRIDGE MIB, Bridge MIB, RSTP MIB, RMON MIB Group 1, 2, 3, 9

**Flow Control:** IEEE 802.3x flow control, back pressure flow control interface

### Switch Properties

**Priority Queues:** 4

**Max. Number of Available VLANs:** 64

**VLAN ID Range:** VID 1 to 4094

**IGMP Groups:** 256

#### Cybersecurity:

- Ready for NERC CIP compliance system development
- Supports IEC 62443
- Supports port access control list: MAC, 802.1x authentication
- Supports RADIUS, TACACS+
- Supports Syslog for system/event

### Optical Fiber Interface

		100BaseFX		
		OM1	Multi-Mode	Single-Mode
Fiber Cable Type			50/125 $\mu$ m 800 MHz*km	G.652
Typical Distance		4 km	5 km	40 km
Wave-length	Typical (nm)	1300		
	TX Range (nm)	1260 to 1360		1280 to 1340
	RX Range (nm)	1100 to 1600		1100 to 1600
Optical Power	TX Range (dBm)	-10 to -20		0 to -5
	RX Range (dBm)	-3 to -32		-3 to -34
	Link Budget (dB)	12		29
	Dispersion Penalty (dB)	3		1

**Note:** When connecting a single-mode fiber transceiver, we recommend using an attenuator to prevent damage caused by excessive optical power.

**Note:** Compute the "typical distance" of a specific fiber transceiver as follows: Link budget (dB) > dispersion penalty (dB) + total link loss (dB).

### Switch Interface

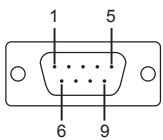
**RJ45 Ports:** 10/100BaseT(X) auto negotiation speed, F/H duplex mode, and auto MDI/MDI-X connection

**Alarm Contact:** 1 relay output with current carrying capacity of 1 A @ 24 VDC

### Pin Assignment

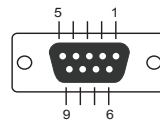
Serial Port (DB9 male connector)

DB9 male connector



Pin	RS-232	RS-422/485-4w	RS-485-2w
1	DCD	TxD-(A)	-
2	RxD	TxD+(B)	-
3	TxD	RxD+(B)	Data+(B)
4	DTR	RxD-(A)	Data-(A)
5	GND	GND	GND
6	DSR	-	-
7	RTS	-	-
8	CTS	-	-

DB9 female connector



Pin	RS-232	RS-422/485-4w	RS-485-2w
1	DCD	TxD-	-
2	TxD	RxD+	Data+
3	RxD	TxD+	-
4	DSR+/IRIG-B	DSR+/IRIG-B	DSR+/IRIG-B
5	GND	GND	GND
6	DTR	-	-
7	CTS	RxD-	DATA-
8	RTS	-	-

## Ordering Information

### Available Models

**NPort S9650I-8-2HV-E-T:** 8-port RS-232/422/485 rugged device server, 2 10/100M Ethernet ports with IEEE 1588v2 support, 88-300 VDC or 85-264 VAC, -40 to 85°C operating temperature, with 2-port Ethernet RJ45 module

**NPort S9650I-8-2HV-MSC-T:** 8-port RS-232/422/485 rugged device server, 2 10/100M Ethernet ports with IEEE 1588v2 support, 88-300 VDC or 85-264 VAC, -40 to 85°C operating temperature, with 2-port Ethernet multimode SC connector fiber module

**NPort S9650I-8-2HV-SSC-T:** 8-port RS-232/422/485 rugged device server, 2 10/100M Ethernet ports with IEEE 1588v2 support, 88-300 VDC or 85-264 VAC, -40 to 85°C operating temperature, with 2-port Ethernet singlemode SC connector fiber module

**NPort S9650I-8B-2HV-IRIG-T:** 8-port RS-232/422/485 rugged device server with IRIG-B signal output on the serial ports, 2 10/100M Ethernet ports with IEEE 1588v2 support, 88-300 VDC or 85-264 VAC, -40 to 85°C operating temperature, with IRIG-B BNC module

**NPort S9650I-8F-2HV-E-T:** 8-port RS-232/422/485 rugged device server with multimode ST connectors on the serial ports, 2 10/100M Ethernet ports with IEEE 1588v2 support, 88-300 VDC or 85-264 VAC, -40 to 85°C operating temperature, with 2-port Ethernet RJ45 module

**NPort S9650I-8F-2HV-MSC-T:** 8-port RS-232/422/485 rugged device server with multimode ST connectors on the serial ports, 2 10/100M Ethernet ports with IEEE 1588v2 support, 88-300 VDC or 85-264 VAC, -40 to 85°C operating temperature, with 2-port Ethernet multimode SC connector fiber module

**NPort S9650I-8F-2HV-SSC-T:** 8-port RS-232/422/485 rugged device server with multimode ST connectors on the serial ports, 2 10/100M Ethernet ports with IEEE 1588v2 support, 88-300 VDC or 85-264 VAC, -40 to 85°C operating temperature, with 2-port Ethernet singlemode SC connector fiber module

**NPort S9650I-16-2HV-E-T:** 16-port RS-232/422/485 rugged device server, 2 10/100M Ethernet ports with IEEE 1588v2 support, 88-300 VDC or 85-264 VAC, -40 to 85°C operating temperature, with 2-port Ethernet RJ45 module

**NPort S9650I-16-2HV-MSC-T:** 16-port RS-232/422/485 rugged device server, 2 10/100M Ethernet ports with IEEE 1588v2 support, 88-300 VDC or 85-264 VAC, -40 to 85°C operating temperature, with 2-port Ethernet multimode SC connector fiber module

**NPort S9650I-16-2HV-SSC-T:** 16-port RS-232/422/485 rugged device server, 2 10/100M Ethernet ports with IEEE 1588v2 support, 88-300 VDC or 85-264 VAC, -40 to 85°C operating temperature, with 2-port Ethernet singlemode SC connector fiber module

**NPort S9650I-16B-2HV-IRIG-T:** 16-port RS-232/422/485 rugged device server with IRIG-B signal output on the serial ports, 2 10/100M Ethernet ports with IEEE 1588v2 support, 88-300 VDC or 85-264 VAC, -40 to 85°C operating temperature, with IRIG-B BNC module

**NPort S9650I-16F-2HV-E-T:** 16-port RS-232/422/485 rugged device server with multimode ST connectors on the serial ports, 2 10/100M Ethernet ports with IEEE 1588v2 support, 88-300 VDC or 85-264 VAC, -40 to 85°C operating temperature, with 2-port Ethernet RJ45 module

**NPort S9650I-16F-2HV-MSC-T:** 16-port RS-232/422/485 rugged device server with multimode ST connectors on the serial ports, 2 10/100M Ethernet ports with IEEE 1588v2 support, 88-300 VDC or 85-264 VAC, -40 to 85°C operating temperature, with 2-port Ethernet multimode SC connector fiber module

**NPort S9650I-16F-2HV-SSC-T:** 16-port RS-232/422/485 rugged device server with multimode ST connectors on the serial ports, 2 10/100M Ethernet ports with IEEE 1588v2 support, 88-300 VDC or 85-264 VAC, -40 to 85°C operating temperature, with 2-port Ethernet singlemode SC connector fiber module

### Package Checklist

- 1 NPort S9650I device server
- Quick installation guide (printed)
- Warranty card