



The RuggedSwitch™ RS900 is a 9-port industrially hardened, fully managed, Ethernet switch specifically designed to operate reliably in electrically harsh and climatically demanding environments.

The RS900 provides a high level of immunity to electromagnetic interference and heavy electrical surges typical of environments found on plant floors or in curb side traffic control cabinets. An operating temperature range of -40 to +85°C (-40 to +185°F) coupled with hazardous location certification (Class 1 Division 2) allows the RS900 to be placed in almost any location.

The RS900 is packaged in a compact, galvanized steel enclosure that allows either DIN or panel mounting for efficient use of cabinet space. The RS900 provides an integrated power supply with a wide range of voltages (88-300VDC or 85-264VAC) for worldwide operability or dual-redundant, reversible polarity, 24VDC and 48VDC power supply inputs for high availability applications requiring dual or backup power inputs.

The RS900's superior ruggedized design coupled with the RuggedSwitch™ Operating System (ROS) provides improved system reliability and advanced networking features making it ideally suited for creating Ethernet networks for mission-critical, real-time, control applications.

The versatility and wide selection of fiber optics allows the RS900 to be used in a variety of applications. The RS900 provides up to three 100Mbps fiber optical Ethernet ports for creating a fiber optical backbone with high noise immunity and long haul connectivity.

All RuggedCom products are backed by a five year warranty and unsurpassed technical support.

## KEY FEATURES AND BENEFITS

### 9-ETHERNET PORTS

- Up to 9 Ports: 10/100BaseTX or 100BaseFX (Fiber Optical) combinations (Optional: 1-10/100BaseTX Port or 1-100BaseFX)
- Multimode and Singlemode optical transceivers
- Industry standard fiber optical connectors: LC, SC, ST, MTRJ
- Long haul optics allow distances up to 90km

### UNIVERSAL POWER SUPPLY OPTIONS

- Input voltages of 24VDC, 48VDC, and (88-300VDC or 85-264VAC) for worldwide operability
- Dual-redundant, reversible polarity DC power supply inputs (24 or 48VDC only)
- Terminal blocks for reliable maintenance free connections
- CSA/UL 60950 safety approved to +85°C

### DESIGNED FOR HARSH ENVIRONMENTS

- Exceeds IEC 61000-6-2 EMC Requirements for Industrial Environments
- Exceeds NEMA TS-2 Standard for Traffic Control Equipment
- Hazardous Location Certification: Class 1 Division 2
- Operates over a temperature range of -40 to +85°C without the use of fans for improved reliability
- 20 AWG galvanized steel enclosure and DIN or panel mounting options provide secure mechanical reliability

### HIGH PERFORMANCE ETHERNET SWITCHING

- Full compliance with IEEE 802.3 and IEEE 802.3u Ethernet standards for universal interoperability
- Non-blocking, store and forward switching for high network throughput
- Full duplex operation and flow control (IEEE 802.3x) results in no collisions and deterministic network response

### SIMPLE PLUG AND PLAY OPERATION

- Auto-negotiation on 10/100TX ports simplifies setup
- Auto-MDI/MDIX on all 10/100TX ports eliminates need for crossover cables
- LED indicators for link, activity and speed aid in field troubleshooting

### ROS ADVANCED MANAGEMENT

- Enhanced Rapid Spanning Tree (802.1w) for fault tolerance with fast recovery times (<5ms)
- Quality of Service (802.1p) for real-time traffic
- Port rate limiting: 128kbps, 256, 512, 4, 8Mbps
- VLAN (802.1q) for traffic segregation with double tagging
- IGMP Snooping for multicast filtering
- Port configuration, status, statistics, mirroring, security
- Loss of link management for link pulse control on fiber ports
- Web-based, Telnet, CLI management interfaces
- SNMP v2 and RMON
- Rich set of diagnostics with logging and alarms

## **RAPID SPANNING TREE PROTOCOL (IEEE 802.1w)**

RSTP allows the creation of fault-tolerant ring and mesh Ethernet networks that incorporate redundant links that are 'pruned' to prevent loops. The ROS optimized version of RSTP yields worst-case failovers of 5ms times the 'bridge diameter' and allows rings of up to 80 switches. For example, a ring of ten switches will have failover times under 50ms. ROS implements both STP and RSTP to ensure interoperability with commercial switches unlike other proprietary 'ring' based solutions.

## **QUALITY OF SERVICE (IEEE 802.1p)**

Some networking applications such as real-time control or VoIP (voice over IP) require predictable arrival times for Ethernet frames. Switches can introduce latency in times of heavy network traffic due to the internal queues that buffer frames and then transmit on a first come first serve basis. ROS supports 'Class of Service' in accordance with IEEE 802.1p that allows time critical traffic to jump ahead to the front of the queue thus minimizing latency and reducing jitter to allow such demanding applications to operate correctly. ROS allows priority classification by port, tags, MAC address, and IP type of service (TOS). A configurable "weighted fair queuing" algorithm controls how frames are emptied from the queues.

## **VLAN (IEEE 802.1q)**

Virtual local area networks (VLAN) allow the segregation of a physical network into separate logical networks with independent broadcast domains. A measure of security is provided since hosts can only access other hosts on the same VLAN and traffic storms are isolated. ROS supports 802.1q tagged Ethernet frames and VLAN trunks. Port based classification allows legacy devices to be assigned to the correct VLAN.

## **IGMP SNOOPING**

ROS uses IGMP snooping (Internet Group Management Protocol v1&v2) to intelligently forward or filter multicast traffic streams (e.g. MPEG video) to or from hosts on the network. This reduces the load on network trunks and prevents packets from being received on hosts that are not involved. ROS has a very powerful implementation of IGMP snooping that:

- Can be enabled on a per VLAN basis.
- Detects and filters all multicast streams regardless of whether subscribers exist
- Supports "router-less" operation by supporting an "active" mode
- Restores traffic streams immediately after an RSTP topology change

## **PORT MIRRORING**

ROS can be configured to duplicate all traffic on one port to a designated mirror port. When combined with a network analyzer, this can be a powerful troubleshooting tool.

## **PORT CONFIGURATION AND STATUS**

ROS allows individual ports to be 'hard' configured for speed, duplex, auto-negotiation, flow control and more. This allows proper connection with devices that do not negotiate or have unusual settings. Detailed status of ports with alarm and SNMP trap on link problems aid greatly in system troubleshooting.

## **PORT STATISTICS AND RMON (REMOTE MONITORING)**

ROS provides continuously updating statistics per port that provide both ingress and egress packet and byte counters as well as detailed error figures. Also provided is full support for the RMON statistics, history, alarms, and event groups. RMON allows for very sophisticated data collection, analysis and detection of traffic patterns.

## **LOSS OF LINK MANAGEMENT**

Some intelligent electronic devices (IEDs) have dual fiber optic ports with automatic failover to a backup port should the primary fail. ROS ensures this mechanism works reliably under all failure modes by appropriately disabling link signals when required. ROS also flushes learned MAC addresses to ensure the failover occurs quickly.

## **PORT SECURITY**

ROS provides the ability to filter or accept traffic from specific hosts to prevent unknown users or devices from gaining access to the network. Unauthorized access results in the port being shutdown for a period of time along with SNMP trap and alarm generation.

## **BROADCAST STORM FILTERING**

Broadcast storms wreak havoc on a network and can cause attached devices to malfunction. This could be disastrous on a network with mission critical equipment. ROS limits this by filtering broadcast frames with a user-defined threshold.

## **PORT RATE LIMITING**

ROS supports configurable rate limiting per port to limit unicast and multicast traffic. This can be essential to managing precious network bandwidth for service providers. It also provides edge security for denial of service (DOS) attacks.

### SNMP (SIMPLE NETWORK MANAGEMENT PROTOCOL)

SNMP provides a standardized method for network management stations the ability to interrogate devices from different vendors. ROS supports numerous standard MIBs (Management Information Base) allowing for easy integration with any network management system (NMS). A feature of SNMP supported by ROS is the ability to generate "traps" upon system events. A NMS can record traps from multiple devices providing a powerful network troubleshooting tool. RuggedVue™ is RuggedCom's NMS that provides graphical visualization of the network and is fully integrated with all RuggedCom products.

### HTML WEB BROWSER AND TELNET USER INTERFACES

ROS provides a simple, intuitive user interface for configuration and monitoring via a standard graphical web browser or via Telnet. All system parameters include detailed on-line help to make setup a breeze. ROS, presents a common look and feel and standardized configuration process allowing easy migration to other RuggedCom managed products.

### EVENT LOGGING AND ALARMS

ROS records all significant events to a non-volatile system log allowing forensic troubleshooting. Events include link failure and recovery, unauthorized access, broadcast storm detection, and self-test diagnostics among others. Alarms provide a snapshot of recent events that have yet to be acknowledged by the network administrator. An extreme hardware relay is de-energized during the presence of critical alarms allowing an external controller to react if desired.

### SNTP (SIMPLE NETWORK TIME PROTOCOL)

SNTP automatically synchronizes the internal clock of all ROS devices on the network. This allows for correlation of time stamped events for troubleshooting.

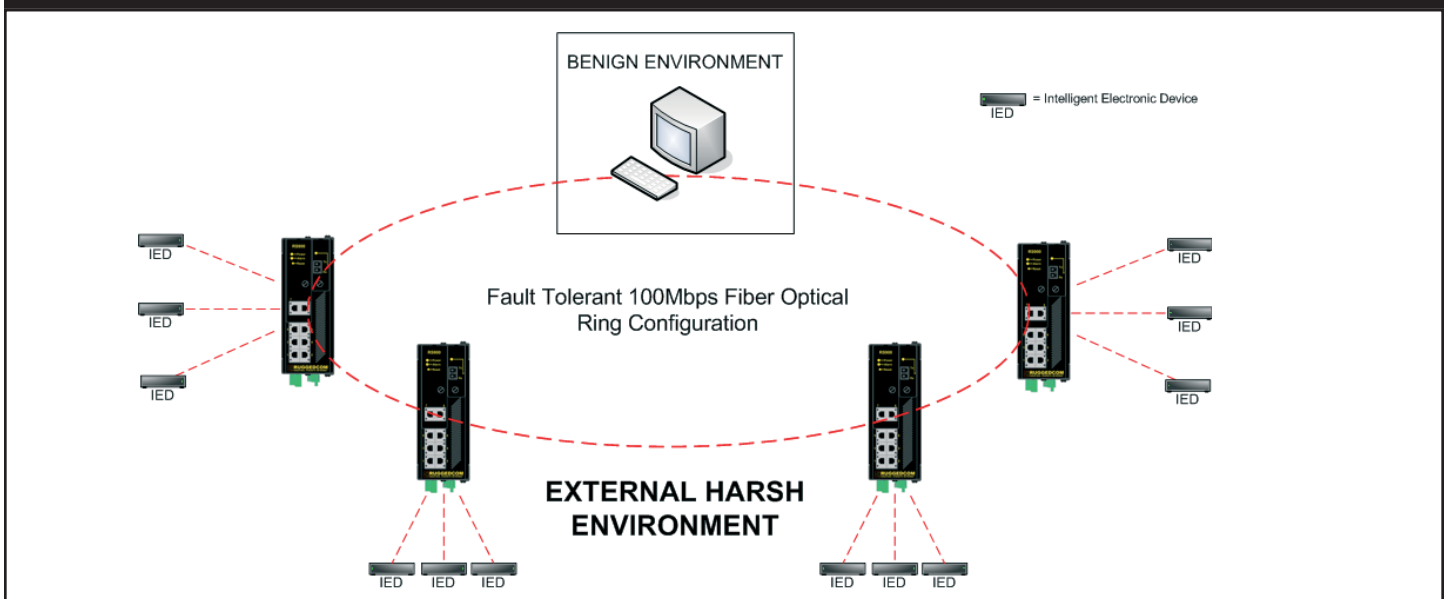
### CONFIGURATION VIA ASCII TEXT FILE

All configuration parameters are stored in an ASCII formatted text file that can easily be transferred via TFTP or Xmodem. The configuration file can be saved for backup purposes and easily manipulated by a text editor. The text same file can be downloaded to the switch at a later date in order to re-configure or restore a previous configuration.

### COMMAND LINE INTERFACE (CLI)

A command line interface can be used in conjunction with remote shell to automate data retrieval, configuration updates, and firmware upgrades. A powerful SQL-like capability allows expert users the ability to selectively retrieve or manipulate any parameters the device has to offer.

### Typical Application: Fault Tolerant Loop Architecture with Fast Recovery Times



NEMA TS-2 Requirements				
Test	Description	Levels	Performance Criteria*	
TS-2 1998, Section 2, para 2.2.7.3	Temperature: Low Temperature/Low Voltage	89.0 VAC @ -34°C	EUT Continued to function properly during and following all temperature and humidity testing	
TS-2 1998, Section 2, para 2.2.7.4	Temperature: Low Temperature/High Voltage	135.0VAC @ -34°C		
TS-2 1998, Section 2, para 2.2.7.5	Temperature: High Temperature/High Voltage	135.0VAC @ + 75°C		
TS-2 1998, Section 2, para 2.2.7.6	Temperature: High Temperature/Low Voltage	89.0VAC @ + 75°C		
TS-2 1998, Section 2 para. 2.2.8.4	Vibration Endurance Test	0.5g @ 30Hz for 1hr on all three planes	EUT functioned properly following test procedure. No physical damage.	
TS-2 1998, Section 2, para 2.1.10	Mechanical Shock	+/-10g half sine wave for 11msec on all three planes	EUT functioned properly following test procedure. No physical damage.	
TS-2 1992, Section 2, para. 2.1.6.1	Electrical Transients: High Repetition Noise (AC Terminals)	One +/-300VDC pulse every other cycle once every 3 seconds across 360 ° of line cycle (2500W peak)	EUT functioned properly during and following test procedure. No damage	
TS-2 1998, Section 2 para. 2.1.6.2	Electrical Transients: Low-Repetition High Energy (AC Terminals)	One +/-600VDC pulse every second, randomly distributed across 360 ° of line cycle. Ten pulses total.	EUT functioned properly during and following test procedure. No damage	
TS-2 1998, Section 2, para 2.1.7	Electrical Transients: I/O Terminals	One +/-300VDC pulse every second, minimum 5 pulses per port	EUT functioned properly during and following test procedure. No damage	
TS-2 1992, Section 2, para. 2.1.8	Electrical Transients: Nondestruct Transient Immunity (AC Terminals)	One +/-1000VDC pulse every two seconds, 3 per each polarity.	EUT functioned properly following test procedure. No damage	

IEC 61000-6-2 EMC Generic Standard: Immunity for Industrial Environments					
Test	Description	Levels	RuggedCom Test Level	Performance Criteria*	
IEC 61000-4-2	ESD	Enclosure Contact	+/- 4kV	+/- 8kV	B
		Enclosure Air	+/- 8kV	+/- 15kV	B
IEC 61000-4-3	Radiated RFI	Enclosure ports	10 V/m, 80 to 1000Mhz	20V/m	A
IEC 61000-4-4	Burst (Fast Transient)	Signal ports	+/- 1kV @ 5kHz	+/- 4kV @ 2.5kHz	B
		D.C Power ports	+/- 2kV @ 5kHz	+/- 4kV	B
		A.C. Power ports	+/- 2kV @ 5kHz	+/- 4kV	B
IEC 61000-4-5	Surge	Signal ports	+/- 1kV line-to-earth	+/- 2kV line-to-earth, +/- 2kV line-to-line	B
		D.C Power ports	+/- 0.5kV line-to-earth/line	+/- 4kV line-to-earth, +/- 2kV line-to-line	B
		A.C. Power ports	+/- 2kV line-to-earth, +/- 1kV line-to-line	+/- 4kV line-to-earth, +/- 2kV line-to-line	B
IEC 61000-4-6	Induced (Conducted) RFI	Signal ports	10V @ 0, 5-80 MHz	10V @ 0, 5-80 MHz	A
		D.C Power ports	10V @ 0, 5-80 MHz	10V @ 0, 5-80 MHz	A
		A.C. Power ports	10V @ 0, 5-80 MHz	10V @ 0, 5-80 MHz	A
		Earth ground ports	10V @ 0, 5-80 MHz	10V @ 0, 5-80 MHz	A
IEC 61000-4-8	Magnetic Field	Enclosure ports	30 A/m @ 50, 60 Hz	40 A/m continuous, 1000 A/m for 1s	A
IEC 61000-4-11	Voltage Dips	A.C. Power ports	30% reduction for 0.5 period	30% for 1 period	B
			>95% reduction for 250 periods	100% for 5 periods, 100% for 50 periods	C
IEC 60255-5	Dielectric Strength	Signal ports	2kVac (Fail-Safe Relay output)	2kVac (Fail-Safe Relay output)	N/A
		D.C. Power ports	2kVac	2kVac	N/A
		A.C. Power ports	2kVac	2kVac	N/A
IEC 60255-5	H.V. Impulse	Signal ports	5kV (Fail-Safe Relay output)	5kV (Fail-Safe Relay output)	N/A
		D.C. Power ports	5kV	5kV	N/A
		A.C. Power ports	5kV	5kV	N/A

Environmental Type Tests				
Test	Description	Test Levels	Severity Levels	
IEC 60068-2-1	Cold Temperature	Test Ad	-40°C, 16 Hours	N/A
IEC 60068-2-2	Dry Heat	Test Bd	+85°C, 16 Hours	N/A
IEC 60068-2-30	Humidity (Damp Heat, Cyclic)	Test Db	95% (non-condensing), 55°C , 6 cycles	N/A
IEC 60255-21-1	Vibration	Tests Fc	2g @ (10 - 150) Hz	Class 2 <sup>1</sup>
IEC 60255-21-2	Shock	Tests Ea	30g @ 11mS	Class 2

Notes:  
 1. Class 2 refers to "Measuring relays and protection equipment for which a very high security margin is required or where the vibration levels are very high, ( e.g. shipboard application and for severe transportation conditions")

## POWER SUPPLY

- Power Consumption: 10W MAX
- 24VDC: 18-36 VDC, 0.4A
- 48VDC: 36-59 VDC, 0.2A
- HI Voltage AC/DC: 88-300VDC, 85-264VAC, 0.1A

## CRITICAL ALARM RELAY

- Form-C failsafe contact relay: 1A@30VDC

## PHYSICAL

- Height: 7.4"
- Width: 2.6"
- Depth: 5.0"
- Weight: 2.7lbs
- Ingress Protection: IP40 (1mm objects)
- Enclosure: 20 AWG galvanized steel enclosure
- Mounting: DIN rail or panel mounted

## SWITCH PROPERTIES

- Switching method: Store & Forward
- Switching latency: 8 us (100Mbps)
- Switching bandwidth: 1.8Gbps
- MAC address table size: 16kbytes
- Priority Queues: 4
- Frame buffer memory: 1 Mbit
- VLANs: 64
- IGMP multicast groups: 256
- Port rate limiting: 128kbps, 256, 512, 4, 8Mbps
- No head of line blocking

## APPROVALS

- ISO: Manufactured in an ISO9001 facility
- cCSAus: CSA C22.2 No. 60950, UL 60950
- CE : EN 60950
- Emissions: FCC Part 15, Class A
- Hazardous Location Certification: Class 1 Division 2
- Complies with 21 CFR Chapter 1, Subchapter J.
- NEMA TS-2

## WARRANTY

- 5 Years-Applicable to design or manufacturing related product defects.

## NETWORK MANAGEMENT

- ROSVue HTTP graphical web-based
- SNMP v1, v2c
- Telnet, VT100
- Command Line Interface (CLI)

## IEEE COMPLIANCE

- 802.3-10BaseT
- 802.3u-100BaseTX, 100BaseFX
- 802.3x-Flow Control
- 802.3d-MAC Bridges
- 802.1d-Spanning Tree Protocol
- 802.1p-Class of Service
- 802.1q-VLAN Tagging
- 802.1w-Rapid Spanning Tree Protocol

## IETF RFC COMPLIANCE

- RFC791-IP
- RFC792-ICMP
- RFC793-TCP
- RFC783-TFTP
- RFC826-ARP
- RFC768-UDP
- RFC894-IP over Ethernet
- RFC854-Telnet
- RFC1519-CIDR
- RFC1541-DHCP (client)
- RFC1112-IGMP v1
- RFC2236-IGMP v2
- RFC2030-SNTP
- RFC2068-HTTP

## IETF SNMP MIBS

- RFC1493-BRIDGE-MIB
- RFC1907-SNMPv2-MIB
- RFC2012-TCP-MIB
- RFC2013-UDP-MIB
- RFC2578-SNMPv2-SMI
- RFC2579-SNMPv2-TC
- RFC2819-RMON-MIB
- RFC2863-IF-MIB
- draft-ietf-bridge-rstpmib-03-BRIDGE-MIB
- draft-ietf-bridge-bridgemib-smiv2-03-RSTP-MIB
- IANAifType-MIB

Fiber Optical Specifications				
Parameter	Fiber Port Type			
	Multimode	Singlemode		
Mode	MTRJ / ST / SC	LC / SC		
Connectors	2	20	50	90
Typical Dist. (km)	1310	1310		
Optical Wavelength (nm)	50 or 62.5/125	8 or 9/125		
Cable SizeCore/Cladding (um)	-15.7	-15.5	-2.5	2.5
Tx Power (dBm)	-33.5	-32	-37	-39
Rx Sensitivity (dBm)	17	16.5	34.5	41.5
Typical Budget (dB)	Longer segment lengths dependent on fiber specifications. Consult factory for further details.			

**ORDER CODES**

**RS900** - \_ - \_ - \_  
**PS M P7P8P9**

**PS: POWER SUPPLY**

- 24 = 24 VDC
- 48 = 48 VDC
- HI = 87-264VAC OR 88-300VDC

**M: MOUNTING OPTION**

- D = DIN RAIL
- P = PANEL MOUNT
- N = NONE

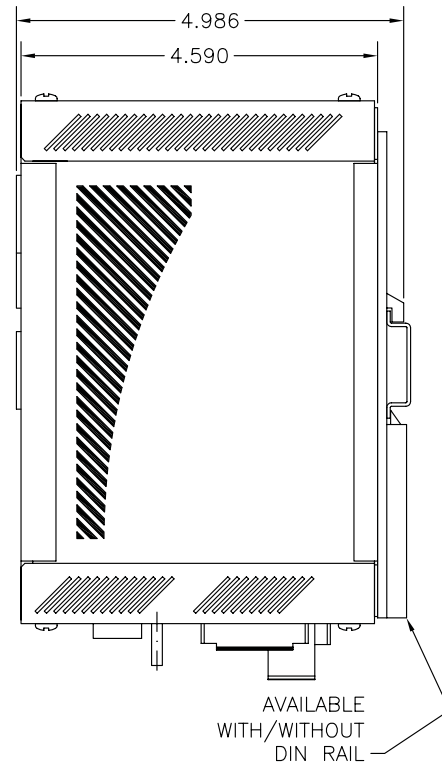
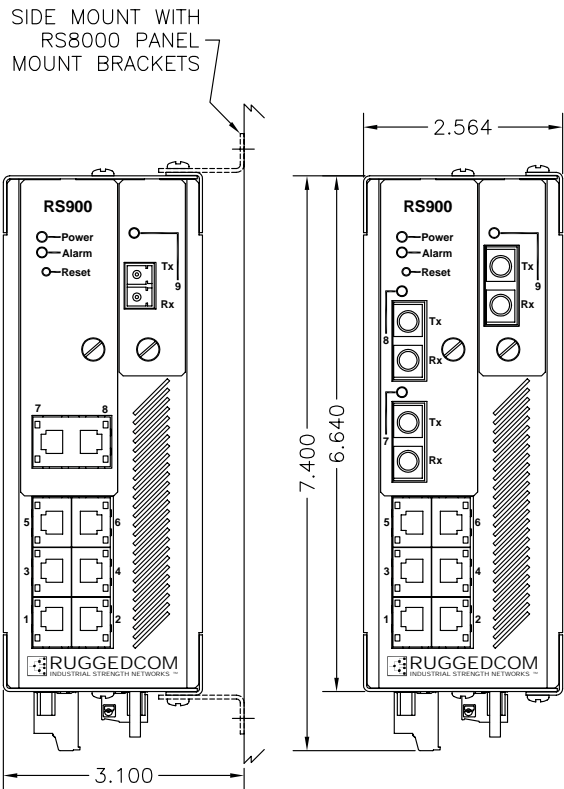
**P7,P8,P9: PORT 7-9 OPTIONS**

- 00 = No port
- TX = 10/100TX (if selected, port 7&8 must both be TX)
- MJ = Multimode MTRJ
- MC = Multimode SC
- MT = Multimode ST
- T2 = Singlemode ST, Standard 20km
- L2 = Singlemode LC, Standard 20km
- L5 = Singlemode LC, Intermediate Reach 50km
- L9 = Singlemode LC, Long Reach 90km
- C2 = Singlemode SC, Standard 20km
- C5 = Singlemode SC, Intermediate Reach 50km
- C9 = Singlemode SC, Long Reach 90km

**VALID ORDER CODE EXAMPLES**

- RS900-24-D-000000
- RS900-24-D-TXTX00
- RS900-48-P-TTXMT
- RS900-HI-D-C20000
- RS900-HI-D-L2L200
- RS900-HI-N-C5C5C9

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