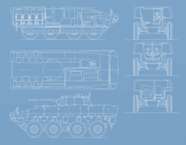
Overview

The RELY-MIL-SWITCH-ROUTER is a COTS general purpose 20+5 port managed Gigabit Ethernet L2/L3 Switch that is packaged in a reliable, lightweight and compact MIL-STD-810G certified enclosure, with capability for up to four 10Gb Ethernet ports. A military compliant dual redundant power supply is fitted in full equipped versions to cover all applications and accept American & European standard AC/DC voltages for immediate worldwide operation.

Latest generation conduction-cooled electronics have been custom designed to fit enclosure mechanics and withstand harsh environments. The SWITCH-ROUTER is fitted with a complete set of active auxiliary electronics and supervisory systems that are indispensable for next generation programs and provide increased payload safety, greater system control and easy integration.

Main Features

- Managed 20x port GbE L2/L3 Switch
- Up-to 6x 1/10GbE SR/LR/BX Fiber Optic Links
- General purpose service Ethernet port
- Latest generation ARM-Cortex-A53,-R5,GPU and FPGA hardware
- High-availability Seamless Redundancy (HSR)
- Parallel Redundancy Protocol (PRP)
- Precision Time Protocol (PTP)
- Multilayer management, security & monitoring
- Auxiliary RS232 console port
- Edge computing capabilities for user defined applications
- General purpose, PPS and IRIGb Input and Output available on auxiliary connector
- Sealed military enclosure cold plate cooled
- Dual redundant MIL-STD-704 AC/DC power supply
- System operation front panel LED indicators
- Optimized heat dissipation chassis design
- Real Time High/Low temperature monitoring
- Remote reset, battleshort & standby system control
- Dual oversized in-line EMI/EMC power Input filters
- Advanced security mechanisms and services
- Tested and certified by independent official laboratories per MIL-STD-810G & MIL-STD-461G



Functional Overview

Ports Configuration
- 4x 1G/10G Base-SX/SR/LR fiber optic HSR/PRP port (other media options optional)
- 20x 10/100/1000Base-T copper ports
- Up-to 2x 10GBase-BX BiDir Fiber Optic Link

Xilinx Zynq UltraScale + EG
EG devices feature a quad-core ARM® Cortex-A53 platform running up to 1.5GHz. Combined with dual-core Cortex-R5 real-time processors, a Mali-400 MP2 graphics processing unit, and 16nm FinFET+ IEC 62439-3. EG devices have the specialized processing elements needed to excel in next generation Aerospace and Defense applications.

RAM Memory
- 16Gb DDR4 – 64-bit attached to processor subsystem

HSR / PRP Technology
- Reconfigurable Switch Architecture: flexible combination of low-latency HSR/PRP, L2 and L3 blocks

Redundancy
- IEC 62439-3 Clause 4 PRP "Parallel Redundancy Protocol"
- IEC 62439-3 Clause 5 HSR "High availability Seamless Redundancy"
- Optional IEC 62439-2 Media Redundancy Protocol (MRP)
- Optional Device Level Ring (DLR) Redundancy
- Optional IEEE 802.1w for (MRSTP (Rapid Spanning Tree Protocol)

Layer 3 Functionalities (not applies to HSR/PRP ports)
- IPv4/IPv6
- Multicast IP Routing
- IGMP Snooping
- DSCP TOS
- Dynamic Routing: BGPv4, BGPv6, OSPFv2, RIPv2
- Static routing

Security
- IEEE 802.1X access control, port & MAC based authentication
- MAC port binding & authentication for login security
- TACACS+, and RADIUS authentication
- Secure Shell (SSH) Protocol v2.
- Internal Gyroscope and Accelerometer for security purposes
- TPM IC for identity authentication
- AES 256/HMAC/RSA 2048 encryption/authentication & signature for firmware and bitstream
- Firewall, VPN

Telecontrol
- Protocol SNMP V1/V2/V3

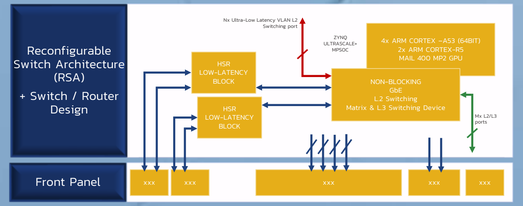
Deterministic Ethernet
- IEEE 1588 AS profile -TSN- supported (station & switches)

Gateway
- Optional CAN 2.0 integrated ports
- Optional RS-232/422/485 buses with Modbus / Profibus / Serial console

Layer 2 General Functionalities
- IEEE 802.3-2000
- Automatic MAC address learning and aging
- Static MAC Table
- Port-Based Virtual LANs (VLANs)
- IEEE 802.1Q for VLAN tagging
- IEEE 802.1Q for VLAN based Ethernet priorities
- Ethertype based switching
- IEEE 802.1p for Class of Service (CoS)
- IEEE 802.lab for Link Layer Discovery Protocol (LLDP)
- Priority Modes: PCP (802.1p), Ethertype (Up to 16)
- Broadcast protection configurable via register
- Layer 2 multicast filtering
- Jumbo frame support
- IEEE 1588 StateLess TC (Transparent Clock)

Synchronization
- IEEE 1588v2 PTP "Precision Time Protocol" profiles with E2E mode and P2P mode of operation
- IEEE 1588v2 PTP "Precision Time Protocol" over HSR & PRP
- Optional Ordinary Clock & Boundary Clock mode of operation
- S(NTP) & Client

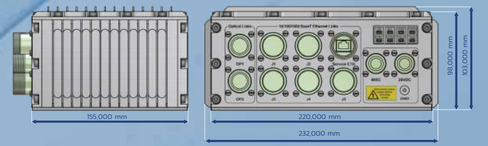
Management and Monitoring
- HTTPS WEB interface with secure firmware/bitstream update
- Graphic representation of Network status (HSR DANs & VDANs)
- Statistics independent per port
- SNMP RFC 1157/RFC
- DHCP (Client and Server)
- ANSI C Low Level library
- System Syslog
- MIB support
- Console port



MIL-STD Testing & System Dimensions

MIL-STD-461G	CE101, CE102, CS101, CS114, CS116, RE101, RE102, RS101, RS102
MIL-STD-810G	Method: 501.4, 502.4, 507.4, 508.5, 509.9, 513.5, 514.5, 516.5
MIL-DTL-38999, MIL-STD-704F, MIL-STD-1474D, MIL-STD-110F, MIL-STD-1275D, IP66	

Dimensions (mm)	220 (W) I 155 (D) I 98 (H)
Weight (Kg)	1.9KG (metalwork) I 3.4Kg (with PSU & Payload)
DC Power Input / Consumption	+28VDC, +48VDC, +270VDC / 50W
AC Power Input / Consumption	115VAC 40-800Hz, 220VAC 40-800Hz / 50W
I/O ports	Ethernet (5x4), fiber (2x2), RS232 (1), RJ45 (1)
Power & Control	Miscellaneous (13 pin), Power (5 pin)



RELY-MIL-SWITCH-ROUTER is mounted as standard via six M4 bottom cover threads that provide secure attachment to the application vehicle base plate. Other mounting options are available upon request. These include side or rear panel fixings, protruding bottom cover legs, front NAS-622 hooks and self-clinching pilot pins, or other.

The enclosure has a self dissipation capacity up to 50W and is not dependent upon cold plate mounting. Cold plate installation is recommended to significantly improve thermal performance and decrease payload Delta-T by approximately 12-15°C. This will double the MTBF of the enclosed electronics.

HIGH-AVAILABILITY MILITARY SWITCH-ROUTER

POWERFUL, OPEN AND FLEXIBLE COTS L2/L3 MANAGED SWITCH WITH UP TO 26x ETHERNET PORTS AND EDGE-COMPUTING CAPABILITIES

High-availability for mission-critical applications	Full IEEE1588 (PTP) support	SW and HW microservices supported
HSR and PRP for zero-delay recovery time in case of network failure	Nano-second range time accuracy even over redundant networking paths	Cutting edge multi-core CPU with FPGA to support user applications

Security-by-design	MIL-STD	Multiple media type
Multi-layered security to protect the system against heterogeneous threats	1st class military enclosure MIL-STD-461G MIL-STD-810G	Copper and fiber based connections Support Up to 4x 10Gb Ethernet

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SWITCH-ROUTER Versions & Features

The RELY-MIL-SWITCH-ROUTER is precision engineered to satisfy the most demanding military programs.
An 'STANDARD' version incorporates all the features that are common in the military rugged Switch market.
A 'PLUS' improved version fits a wide set of extras that make it ideal for new generation critical systems.

When reliability and performance matter, version 'PLUS' includes a Dual Redundant PSU, Temperature Supervisory Unit, Cold Start-up Heaters, Double Capacitor Bank for extended hold up time, Front Panel LED Indicators, Remote Operation capability & Power Fail Monitor. This version is delivered within an extended fins enclosure that provides 30% greater self-dissipation capability.

Oversized in-line EMI/EMC filters

Low and High frequency filters are fitted for full MIL-STD-461G compliance. These filters have been selected-on-test (matched) in official labs for performance.

PSU Input protection

The SWITCH-ROUTER dual PSU are reverse polarity protected, also fitting an inrush current and over voltage limiter.

DC/DC converters

Installed DC/DC converters provide over current and short circuit protection, input/output galvanic isolation, thermal protection and military temperature range.

Extended hold-up

An oversized set of hold- up capacitors are fitted to maintain SWITCH-ROUTER circuitry DC voltages in the event of momentary power loss of the PSU input voltage.

Time delay fuses

Six military PCB fuses are fitted across the dual PSU modules in order to provide protection to the front-end stage, DC/DC converters and TSU power electronics.

Power fail monitor

A power supervisory device continuously monitor the primary AC or DC SWITCH-ROUTER PSU input power voltage and notifies the payload when power failure is imminent.

DC supervisor

The PSU DC output voltage is monitored via a micropower chip to ensure voltage level is within a specified tolerance. The monitor chip illuminates the panel ON green LED when payload voltage is in range.

PSU Faraday cavity

The internal SWITCH-ROUTER layout incorporates an independent metallic partition for housing the PSU modules and in-line filters. This greatly reduces PSU heat and avoids electrical noise on payload electronics.

Dual Input diode

A dual diode with common cathode is installed on the rear of the front panel when the STD SWITCH-ROUTER is ordered for redundant operation with two external batteries.

SWITCH-ROUTER PSU specifications

PSU operating temperature: -40º to +90ºC
PSU storage temperature: -50º to +120ºC
PSU DC/DC converter average efficiency: 89%
PSU front-end module average efficiency: 99%
DC/DC converter in-to-out galvanic isolation: 3000 Vrms
DC/DC converter baseplate-to-out galvanic isolation: 500 Vrms
DC PSU over-voltage transient suppression: 2.5x nominal 12.5 ms
AC PSU over-voltage output surge suppression: 1KV during 50 µs
PSU DC DC power output ripple and noise: less than 30 mV RMS

Temperature Supervisor

A Temperature Supervisory Unit (TSU) is fitted in the RELY-MIL-SWITCH-ROUTER 'PLUS' version. This device protects SWITCH-ROUTER electronics against extreme climatic conditions, switching the power supplies OFF (standby) when the internal temperature is under or over the established limits. Users may set HI & LO temperature trip-points to regulate and optimize the system safety operational temperature range.

Heating elements are also fitted for mitigating against cold startups. An 'early warning' signal advises the digital electronics prior to shutdown-to-standby, allowing critical data to be orderly stored and saved. The equipment power is restored once internal temperatures are within operational limits. All functions can be user enabled or disabled by soldered bridges.

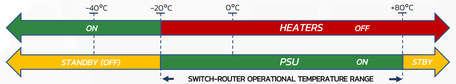
Remote switches

External switches can control system PSU & TSU operation. Lines can be wired to a cockpit or to a master system.

Thermal monitoring

The High and Low TSU temperature trip points are user-adjustable through two multi-turn trimming resistors located in the power supply PCB. Factory presets fitted with fixed resistors can be installed in production series.

BATTLE Remote	STANDBY Remote	SYSTEM POWER SUPPLY & TSU STATUS
Switch-OFF	Switch-OFF	NORMAL OPERATION: Both PSU and TSU operate normally.
Switch-OFF	Switch-ON	PSU in STAND-BY MODE. The PSU converters are forced to stand-by. No DC power is available to the digital payload. The TSU operates normally.
Switch-ON	Switch-OFF	BATTLE MODE (TSU DISABLED). The PSU is operating normally. The TSU is not allowed to shut-down the system power regardless of temperature.
Switch-ON	Switch-ON	PSU in STAND-BY MODE. The PSU converters are forced to stand-by. No DC power is available to the digital payload. The TSU is disabled.



Thermal heaters

Resistive heating elements powered by the TSU are bolted to the enclosure frame in order raise internal temperatures during cold startups.

Battle short switch

Ability to disable the TSU during an emergency or battle situations via the remote 'Battle short' switch. This bypasses and overrides all critical TSU functionalities despite the risk of payload temperature over-stress.

Front panel LEDs

TSU status and operations can be visualized in real time via three chassis front panel LEDs: TSPW (TSU power on), TSHI (system over temperature) and TSLO (system under temperature).

TSU power supply

TSU circuitry is powered by an independent +5VTSU @ 2 Watt PSU.
This module is permanently connected to the SWITCH-ROUTER primary power input & remains operational during Standby.

Delayed Shut-down

An AC/DC FAIL* signal advises the SWITCH-ROUTER CPU when power failure is imminent prior to power shut-down. Ethernet communications and critical data in memory, etc may be orderly stopped or saved.

Reset push button

A remote push button allows to RESET the SWITCH-ROUTER digital payload without switching off the mains breaker. TSU remote operations can be manually activated by an operator or via a master computer.

TSU power supply specifications

Provides +5VTSU DC output voltage, up to 2 Watts.
Autorange input 80-265 VAC 20-1000 Hz. 7 mA typical.
28VDC 32mA, 48VDC 18mA, 270VDC 4mA typical (±40%).
Output current short circuit protection in +5V_TSU 400mA.

TSU heater elements

DC 12 VDC @ 3,3 Amps. DC 270 VDC @ 0,15 Amps.
DC 28 VDC @ 1.5 Amps. AC 115 VAC @ 0,3 Amps.
DC 48 VDC @ 0,8 Amps. AC 220 VAC @ 0,18 Amps.

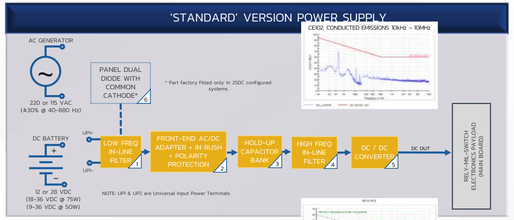
Military PSU Input Options

The RELY-MIL-SWITCH-ROUTER power supply unit is extremely versatile in order to cover the full range of system applications regardless of the available end platform primary (main) and secondary power voltage.

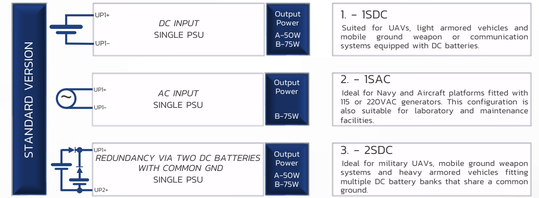
The three integrated high-performance PSU blocks incorporate a range of features that are only available in latest generation advanced military systems.

When the reliability is mission critical and faults are not tolerated, the 'PLUS' dual redundant PSU version ensures low stress load sharing for the twin DC/DC converters and mitigates the risk of an output power failure.

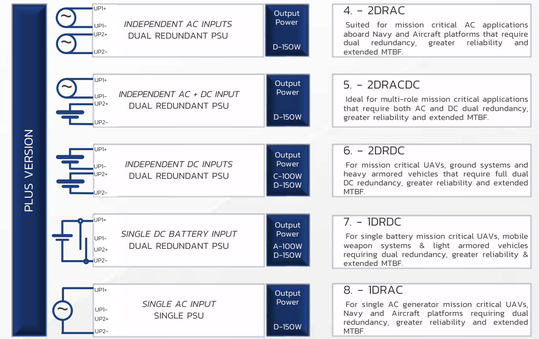
A wide variety of single or redundant AC/DC power input combinations are supported as standard to guarantee flawless operation in worst case scenarios.



STANDARD VERSION



PLUS VERSION



CODE	SWITCH-ROUTER PSU PART NUMBER CONFIGURATION
1	The device is powered by one external AC or DC source
2	The device is powered by two external AC or DC sources
S	A single PSU is fitted in the SWITCH-ROUTER (STANDARD Version
DR	Two (dual redundant) PSUs are fitted in the SWITCH-ROUTER (PLUS Version)
115VAC	The input voltage is 115VAC @ 40-880Hz
220VAC	The input voltage is 220VAC @ 40-880Hz
12VDC	The input voltage is 12VDC (9-36VDC @ 50W)
28VDC	The input voltage is 28VDC (9-36VDC @ 50W or 18-36VDC @ 75W)
48VDC	The input voltage is 48VDC (36-75VDC @ 75W)
270VDC	The input voltage is 270VDC (180-375VDC @ 75W)
A-50W	The device fits a single 9-36VDC PSU with 50W output
B-75W	The device fits a single AC or 18-36VDC PSU with 75W output
C-100W	The device fits two redundant 9-36VDC PSUs with 50W+50W output each
D-150W	The device fits two redundant AC or 18-36VDC PSUs with 75W + 75W output each

PSU PART NUMBER EXAMPLES

- 1 S 12VDC A-50W
- 1 S 115VAC B-75W
- 1 DR 12VDC C-100W
- 1 DR 28VDC D-150W
- 2 DR 12VDC 12VDC C-100W
- 2 DR 28VDC 220VAC D-150W
- 2 DR 115VAC 220VAC D-150W
- 2 DR 270VDC 48VDC D-150W
- 2 DR 115VAC 12VDC C-100W
- 2 DR 115VAC 28VDC D-150W

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