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RTSASRFO-12X

12-Port Serial Attached SCSI (SAS)
Fanout Expander

Operating Manual



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Version 1.01a

TABLE OF CONTENTS

OVERVIEW	3
GENERAL FEATURES.....	4
SPECIFICATIONS.....	5
LED Color Pattern	5
CONFIGURATIONS	6
CABLE CONFIGUATIONS.....	7
SAS ROUTING	8
APPLICATIONS.....	9
Simple topology.....	9
Multiple initiators and targets	10
Path redundancy.....	11
EXPANDER COMMUNICATION	11

OVERVIEW

The RTSASRFO-12X is a 12-port, 3Gb/s Serial Attached SCSI (SAS) Fanout Expander in a 1U rackmount chassis. It is fully compliant with ANSI Serial Attached SCSI specification with improved performance, cabling, and power requirements. The RTSASRFO-12X supports Serial Attached SCSI Protocol (SSP), SAS management protocol (SMP), Serial ATA protocol, and Serial ATA tunneling protocol (STP). The RTSASRFO-12X expander supports both 1.5Gb/s and 3Gb/s data transfer per port.

Rancho's RTSASRFO-12X SAS expander complies with SAS standard and enhanced reliability compared to parallel SCSI. Rancho's SAS expander provides functionality for connecting targets and initiators with up to 12 phys integrated for SAS initiators, SAS targets, SAS expanders, or Serial ATA (SATA) target devices. The RTSASRFO-12X supports both wide and narrow port configurations.

GENERAL FEATURES

- 1.72 x 17 x 16 inches, fits 1U 19" rack mount
- Weight 12.5 lbs
- 12 full independent SAS and SATA ports
- Supports SSF, STP, SMP, and SATA standards
- Supports multiple data rates and auto negotiation (SAS only)
 - SAS – 3.0Gb/s
 - SATA – 1.5Gb/s
- Supports direct and table routing
- Provides 12 routing table entries per phy (up to 144 destination addresses)
- SATA/SAS HDD spin up sequencing
- Provides low latency connection router
- Provides configurable drive spin up sequencing on per phy basis
- Front and back Act/Fault LED light indicators
- Allows concurrent connections for SAS and SATA targets
- Allows Addressing of multiple SATA targets
- Allows multiple initiators to address a single target
- Decode SMP packets that are destined for the expander
- Performs CRC checking and generation on the request frames and response frames
- Provides UART interface for debug functions

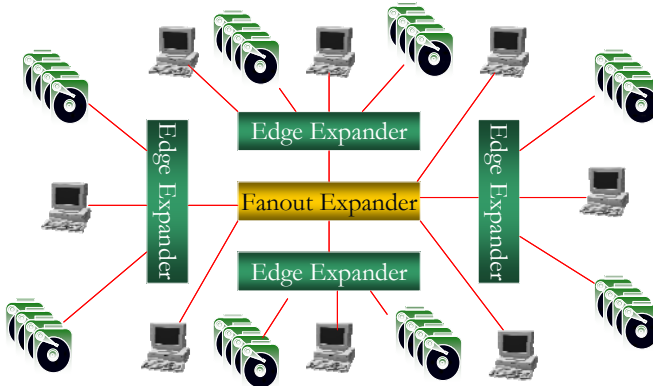


Figure 1: SAS topology offers high scalability

SPECIFICATIONS

Operating Voltages	100-240 VAC @ 50/60Hz
Power consumption	10 Watts
Data Connector	3 x SFF-8470 (4X connector) Serial Port – DB9 HSSDC2 – 1X Infiniband
Throughput	3.0Gb/s – SAS 1.5Gb/s – SATA
Operating temperature	0-50° C
Altitude	3000 meters
Relative humidity	5-95% (non condensing)



Figure 2: Front view

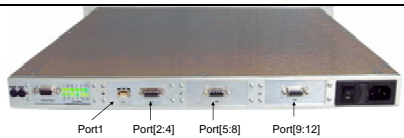


Figure 3: Back view



Figure 4: Data connector descriptions.
Green = Activity, Yellow = Fault

LED Color Pattern

Yellow = Fault

1. Medium blink rate when waiting for spin up
2. Fast blink rate when between OOB and first FIS
3. Solid yellow when device is not READY
4. Off when device is connected and ready

Green = Activity

CONFIGURATIONS

Host and Target configurations

- Host Connector: 1X Infiniband connector
- Target: 4X and 3X connector
- Debug: Serial Port (DB9)

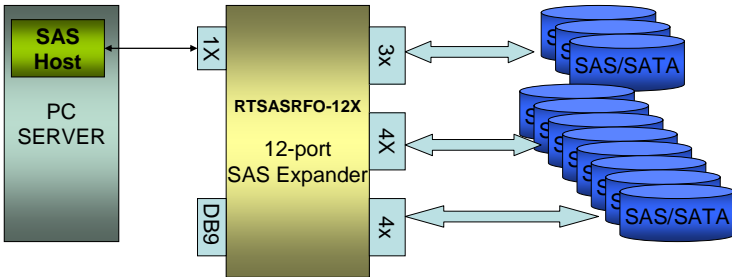


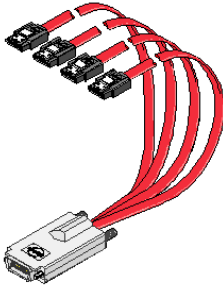
Figure 5: Basic SAS topology

The RTSASRFO-12X connects up to 12 SAS/SATA devices. Port [3:1] is available on the first 4X connector from the left near the LED indicator on the back side of the enclosure. Port [10:4] is available on the other two 4X connectors. Port0 is reserved for HBA interface. Refer to Figure 4 on the previous page for their physical locations.

CABLE CONFIGURATION

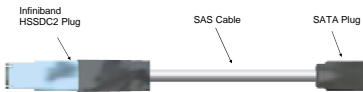
Cable requirements

- Host: 1x External Infiniband to 1x SATA
- Target: 4x External (SFF-8470) to 1x SAS/SATA (SFF-8482)



SFF-8470 Plug				SATA SIGNALS
Signal	Pin	Signal	Pin	
RX0+	S1	TX0+	S16	SATA 0
RX0-	S2	TX0-	S15	
RX1+	S3	TX1+	S14	SATA 1
RX1-	S4	TX1-	S13	
RX2+	S5	TX2+	S12	SATA 2
RX2-	S6	TX2-	S11	
RX3+	S7	TX3+	S10	SATA 3
RX3-	S8	TX3-	S9	
G1-G9:	Signal Ground			
Housing	Chassis Ground			

Figure 6: 4x external (SFF-8470) to 1x SAS/SATA



HSSDC2			SATA	
Signal	Pin	-----	Pin	Signal
G	1	-----	7	G
R+	2	-----	6	T+
R-	3	-----	5	T-
G	4	-----	4	G
T-	5	-----	3	R-
T+	6	-----	2	R+
G	7	-----	1	G

Figure 7: 1x Infiniband HSSDC2 to 1x SATA crossover cable

Cable sources for SAS expanders contact:

Technical Cable Concepts
 Casey Dugan caseyd@techcable.com
 Ph: 714-835-1081 Fx: 714-835-1595
 www.techcable.com

Part #	Description	
RTCSAS-200	Assy HSSDC2-SATA 100ohm	1M
294428-1000MM	Assy SAS4X-SAS4X	1 Meter
294428-2000MM	Assy SAS4X-SAS4X	2 Meter
294424-5000MM	Assy SAS4X-SAS4X	5Meter

SAS ROUTING

The RTSASRFO-12X supports direct routing and table routing. The individual routing method is configurable for each individual port.

DIRECT ROUTING

Direct routing is done on the SAS initiators, SAS/SATA targets that direct attached to one of the RTSASRFO-12X port. Rancho SAS expander does not use subtractive or table routing in this configuration.

TABLE ROUTING

The RTSASRFO-12X supports up to a total of 144 routing table entries. Table routing is used for cascading multiple SAS expanders. Refer to Figure 9 for typical application in this topology.

APPLICATIONS

SAS Edge Expanders are ideal for servers and hard drive enclosure to provide interface connection for multiple devices.

Typical applications

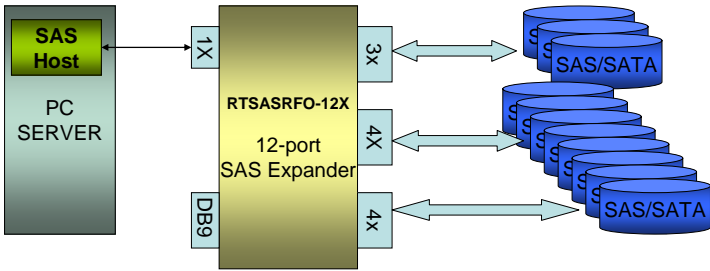


Figure 8: Server with multiple SAS/SATA target devices.

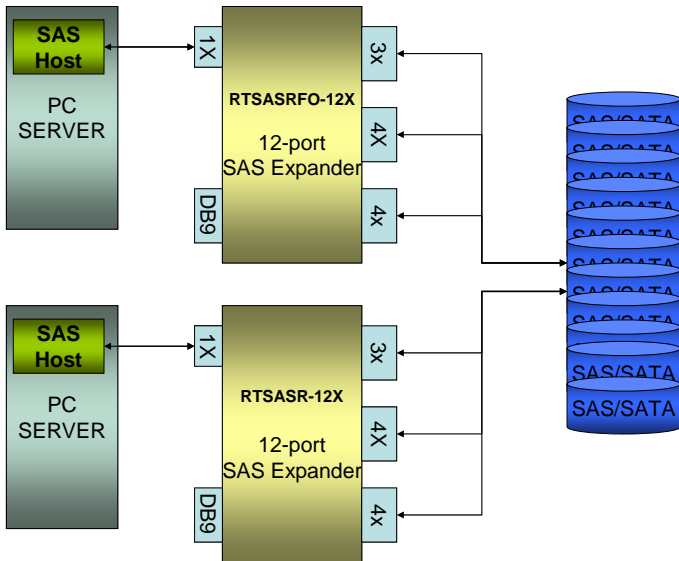


Figure 9: Multiple initiator and multiple target

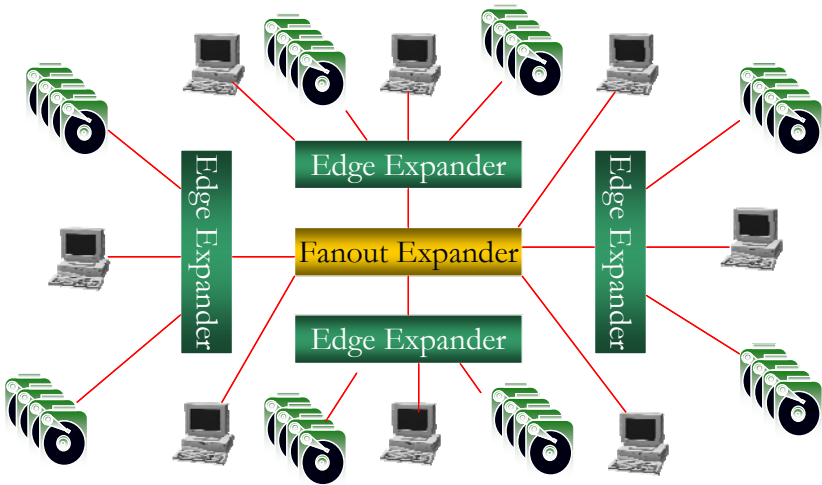


Figure 10: SAS Fanout Expander with Multiple Edge Expanders

This SAS topology supports up to 144 with SAS Edge Expanders.

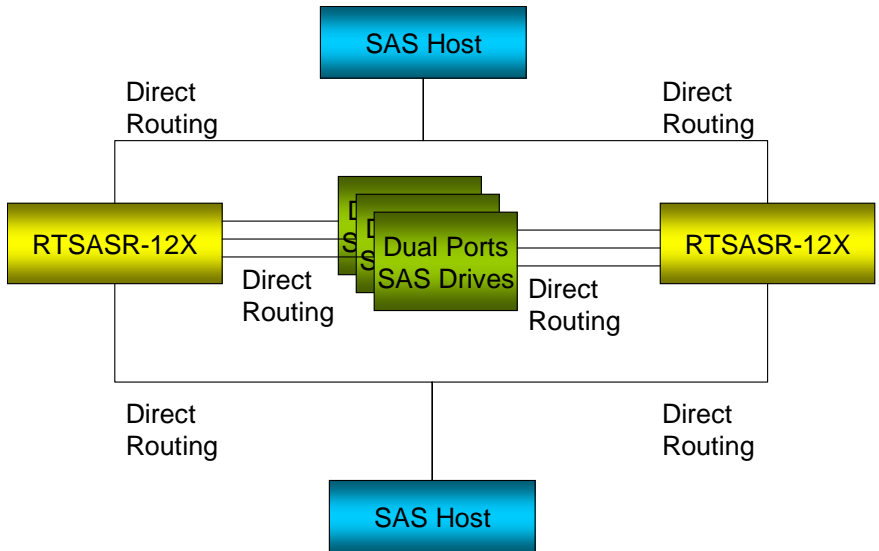


Figure 11: Path redundancy application

EXPANDER COMMUNICATION

Rancho RTSASRFO-12X supports Serial Protocol (SSP), Serial ATA Tunneled Protocol (STP), Serial Management Protocol (SMP), and Serial ATA Protocol (SATA). SSP provides SCSI mapping command that supports initiators, targets and enabling the expander to communicate with other SSP devices. STP maps SATA commands to support multiple initiators and targets, and enabled the RTSASRFO-12X to communicate with SATA devices.



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