

MOVE FORWARD LEAVE NOTHING BEHIND

Allowing utilities to move forward in modernizing substations without the worry of future integration or legacy applications.





Your world is changing and so are we.

At RFL, we know your needs change much faster than your infrastructure. Our comprehensive line of solutions meets you wherever you are to help you bridge the gap from yesterday to tomorrow.

We aren't just engineering products. We are continuously innovating to give legacy equipment the advantage of today's technologies. Our highly adaptable solutions offer more features for more flexibility and a custom fit for your specific needs.

When we deliver, we also deliver our reputation. So when you open that box, you're opening a custom-engineered solution, factory-tested and ready for deployment.

And as long as you own that equipment, you own the attention of RFL. We see you as our partner and we want to ensure that our solution is working for you – now and over the long haul. RFL – delivering solutions that work. Period.

Description:

The eXmux® 4500 Multi-Service Access & Transport (MSAT) platform is designed and engineered to address the challenges of network migration and infrastructure upgrades for power utilities. The solution provides utilities with the confidence to move forward and leave nothing behind. Whether it's reliability and security, IT/OT convergence, or "drag and drop" configuration, the eXmux 4500 delivers a solution to an industry-wide dilemma, and addresses the various technology, knowledge and IT/OT convergence gaps.

The RFL eXmux 4500 provides a one-box solution that converges two important traffic types onto one infrastructure, providing the benefit of connecting traditional voice, video, serial data over Ethernet/IP networks.

The RFL eXmux® 4500 comes with an advanced Graphical User Interface (GUI) Network Management Software for Operations, Administration, Maintenance and Provisioning (OAM&P). The intuitive and user friendly VNMS is designed to allow the user to effortlessly manage their RFL eXmux® 4500 network, making configuration, port mapping, network monitoring and diagnostics simple and easy. The VNMS communicates using the latest SNMPv3 for authentication and encryption.

Key Advantages:

RELIABILITY without compromise

- Dependable communications that offer network resiliency and data survivability
- Modernization without degrading the performance of older, trusted equipment
- Security that ensures data availability, integrity and confidentiality

EASY-TO-USE straightforward management platform

- Fast network provisioning - from staging to deployment-in minimal time
- System-wide configuration, status and monitoring for increased efficiency
- Management system that reduces user error and Speeds up troubleshooting

ELIMINATE MIGRATION GAPS and leave nothing behind

- Reduce network complexity and bridge knowledge gaps
- Assure technological cooperation for IT/OT convergence
- A guided management software enabling a seamless migration both during and after the migration

FUTURE-PROOF your infrastructure

- Extensible platform that eliminates the vicious cycle of "vintage vs. modern"
- Single integrated network solution to deliver power safely, reliably and securely
- A migration solution at your own pace without the worry of future integration

Key Features:

- **10-Gig Carrier Ethernet** Access and Transport Communications Platform
- **Redundant controller** & network multiple points of failure protection
- **G.8032 Ethernet ring** protection with sub 50ms switch-over time
- **"Hitless Switching"** functionality with zero-data-loss to protect mission-critical TDM data
- **Low latency** with < 3ms circuit propagation delay for real-time mission-critical applications
- **TDM legacy interfaces** including DACS functionality
- **Encryption** - Data and Management
- **"Secure Lockdown"** (Patented) - two-factor authentication for increased security
- **"Zero Data Outage Upgrade"** - when upgrading controller system software.

eXmux® VNMS

The RFL eXmux® Visual Network Management Software has been designed by to allow the end user to easily set-up and configure their network along with maintaining and troubleshooting their system. The software communicates using the latest SNMPv3 for authentication and encryption. The software features a graphical interface with user-friendly drop-down screens and intuitive navigation to conduct commissioning in hours instead of days. The VNMS allows management up to 1000 nodes and multiple networks. eXmux VNMS software allow the following major functions:

- Show the user a graphical picture of the network from any node in the network.
- Allow the user communication with any RFL eXmux unit in the network.
- Allow the user access to any interface unit located on any RFL eXmux in the network.
- Allow the user access to any configuration information on any node in the network.
- Allow the user to change interface unit parameters in real time.
- Allow the user to setup Ethernet services
- Allow the user to setup TDM services
- Allow the user to setup traffic engineering
- All the user to mange users' access
- Allow the user to perform network maintenance and troubleshooting.

Network Group View

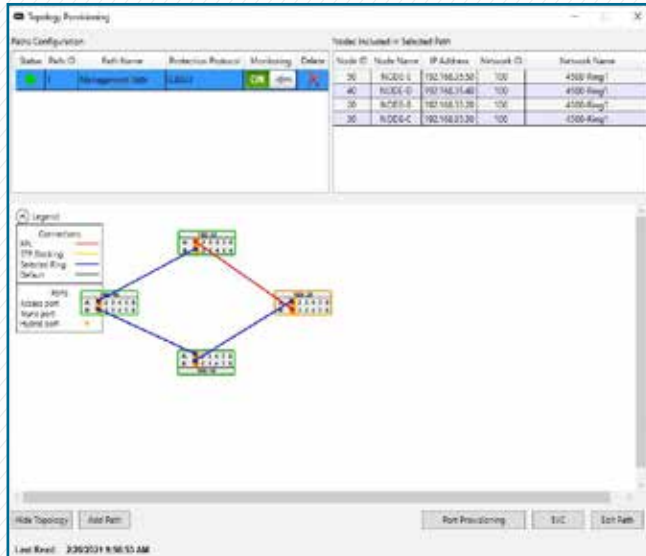
Network Group View **Graphical View** **Table View**

100 : 4000 Ring 1

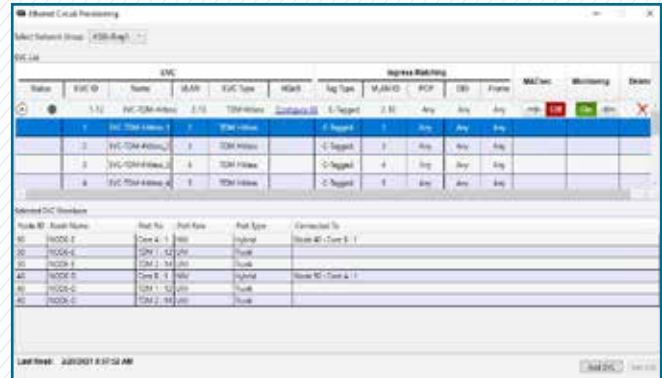
Node ID	Node Name	Type	Source	Description
02/28/2021 09:09:23 AM	20	NODE-8	Normal	Node Minor Alarm
02/28/2021 09:09:22 AM	20	NODE-8	Minor	IG Inventory Mismatch

Node View

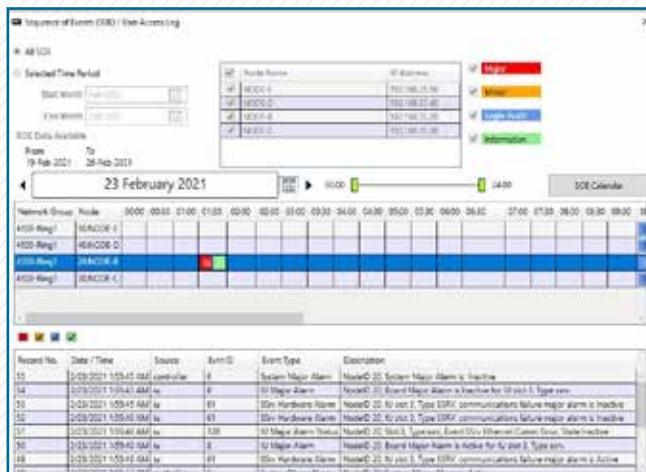
Network Topology



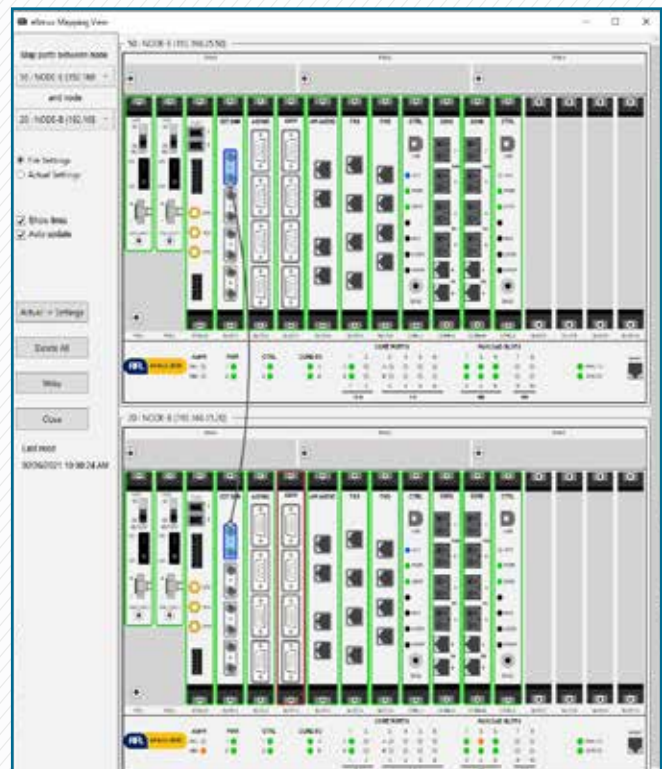
EVC View



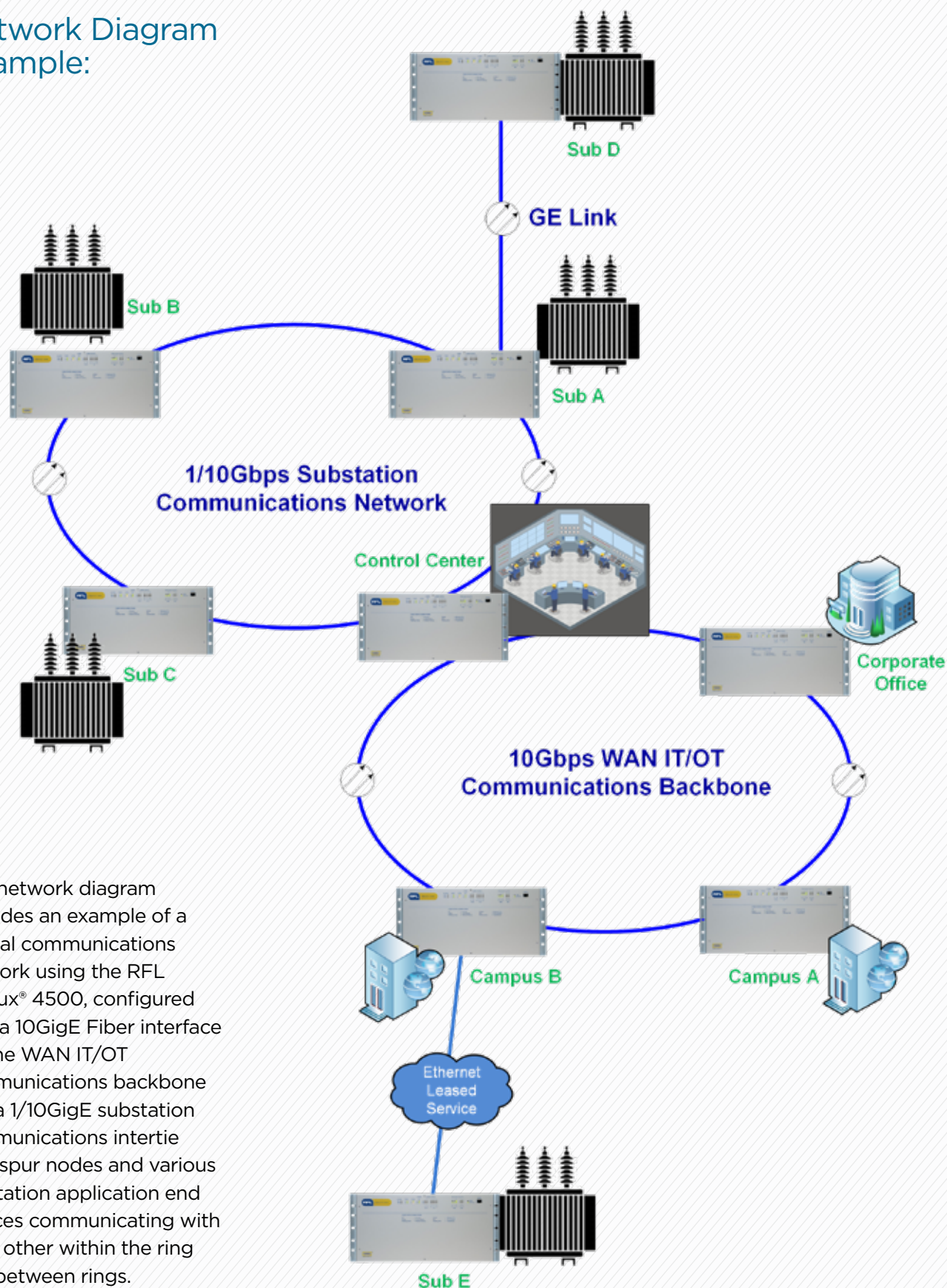
SOE Calendar view



TMD Mapping View



Network Diagram Example:



This network diagram provides an example of a typical communications network using the RFL eXmux® 4500, configured with a 10GigE Fiber interface for the WAN IT/OT communications backbone and a 1/10GigE substation communications intertie with spur nodes and various substation application end devices communicating with each other within the ring and between rings.

Key Technical Specifications

Main Cards:

Controller (Redundant Option)

- Processor
- Switch Fabric
- Pseudo-Wire Engine

Power Supply (Redundant Option)

- 38-150Vdc/88-130Vac
- 200-300Vdc/200-275Vac *
- 19-32Vdc *

Core I/O-A [Ethernet Ports]

- [2] 10GigE SFP Ports
- [2] GigE SFP Ports
- [2] GigE RJ-45 Port

Core I/O-B [Ethernet Ports]

- [2] 10GigE SFP Ports
- [2] GigE SFP Ports
- [2] GigE RJ-45 Port

System I/O

- [2] T1/E1 Ports
- GPS Input
- IRIG-B input/output
- 1PPS Input
- IEEE 1588v2 PTP
- Alarms Contacts [Minor & Major]
- Contact Status Inputs [2 Inputs]

SFP Options:

- RJ-45 10/100/1000 Base TX
- 1000 Base-FX [550m (0.34mi), 10km (6.2mi), 30km (18.4mi), 60km (37.3mi), 80km (49.7mi), 120km (74.5mi)]
- 10000 Base-FX [400m (0.25mi), 10km (6.2mi), 40k(24.9mi), 80km (49.7mi), 120km (74.5mi)]

Interoperability:

- Interoperate with eXmux 3501
- TDM circuit interoperability with IMUX 2000 DSO via T1/E1 interface

Interface Units (IU) Payloads:

- 2 Port Sync. Interface
- 4 Port Async. RS-232/485 Interface
- 4 Port Serial Server RS-232/485 Interface
- 4 Port C37.94MM Sync. Interface
- 4 Port C37.94SM Sync. Interface
- 4 Port G.703 Co-directional Sync. Interface
- 4 Port 4-Wire E&M Audio Interface
- 4 Port 2-Wire E&M Audio Interface
- 4 Port 2-Wire FXO Interface
- 4 Port 2-Wire FXS Interface
- 4 Port T1/E1 Interface*
- 4/8 Function Teleprotection Interface*
- 8 Input/Output Contact Status Interface*
- 6 Port RJ-45 10/100 BaseTx interface*
- 1 Port GigE SFP*

Mechanical:

- 19" Rack Mount (5RU)
H: 8.75" (222mm) W: 19" (483mm) D: 11" (279mm)
- 19" Rack Mount (3RU)
H: 5.25" (144mm) W: 19" (483mm) D: 11" (279mm)

Environmental:

- Convection cooling (No Fans)
- Operating temperature: -30C to +65C (-22F to +149F)
- ANSI/IEC SWC, ESD, RFI compliant
- IEEE1613, IEC61850-3 compliant

User Interface:

- USB Port on Active Controller for Management IP address setup
- MGMT Port on front unit for Visual NMS GUI
- Management of multiple eXmux networks up to 1000 nodes

Security:

- Management - SNMP v3
- Payload Data - MACsec AES 128/256-bit encryption
- Management -Two-Factor Authentication - "Secure Lockdown*" (Patented)

Carrier Ethernet (CE) 2.0 Ready:

- E-Line, E-LAN, E-Tree*

Warranty:

- 36 months

* Future Release

Interface Units (IU)

2 Port Synchronous Interface

- Protocol supported: RS-422/RS-530, V.35, X.21
Signal Interconnection: DCE / DTE Control line: RTS and CTS
- Connector: DB-25 Female
- Data Rates: 56Kbps, Nx64Kbps (N=1 to 31)
Loopback: Local and Remote

4 Port Asynchronous Interface

- Protocol supported: RS-232, V.24, RS-485
RS-485 operating mode: 2 or 4 Wire
Control line: RTS and DTR
- Connector: DB-9 Female
- Data Rates: 600bps to 38.4Kbps
- Loopback: Local and Remote

4 Port Serial Server Interface

- Protocol supported: Raw socket mode, SSH, Telnet, DNP3-Serial to DNP3-IP
- Application: Point-to-point, PC Client, Multipoint-to-multipoint
- Operating Mode: RS-232 or RS-485 4-Wire
- Connector: DB-9 Female
- Data Rates: 300bps to 115Kbps
- Loopback: Local and Remote

4 Port C37.94 Synchronous Relaying Interface

- Connector: ST
- Fiber type: Multimode, Singlemode
- Data Rates: Nx64Kbps (N=1 to 12)

Interface Units (IU) Payloads:

SYS I/O Port 1 & 2 T1/E1:

- Framer type: Electrical T1 or E1
- Framer mode: Pass-thru or DSO grooming
- T1 framer: Conforms to ANSI T1.102-1993, AT&T 62411 & 43801
- E1 framer: Conforms to ITU G.703, G.823 & G.704
- Connector: RJ-45 with RJ-48C adapter cable
- Loopback: Local and Remote

4 Port T1/E1 Interface*:

- Framer type: Electrical T1 or E1
- Framer mode: Pass-thru or DSO grooming
- T1 Mode: Conforms to ANSI T1.102-1993, AT&T 62411 & 43801
- E1 Mode: Conforms to ITU G.703, G.823 & G.704
- Connector: RJ-48C
- Loopback: Local and Remote
- Conforms to ANSI C37.94
- Loopback: Local and Remote

2 Port G.703 Co-directional Synchronous Interface

- Signal Interconnection: DCE / DTE
- Connector: DB-15 Female
- Data Rate: 64Kbps Loopback: Local and Remote

4 Port 4-Wire & 4 Port 2-Wire E&M Audio Interface

- Coding: PCM
- Signaling: Type I, II, III & V
- Connector: RJ-45
- Conforms to AT&T Publication 43801
- Loopback: Local and Remote

4 Port 2-Wire FXO Interface

- Coding: PCM
- Signaling: Loop start
- Connector: RJ-11
- Conforms to AT&T Publication 43801

4 Port 2-Wire FXS Interface

- Coding: PCM
- Signaling: Loop start
- REN per Port: 4
- Connector: RJ-11
- Conforms to AT&T Publication 43801

Digital Teleprotection System*

2 Port eXmux TPS Interface Unit:

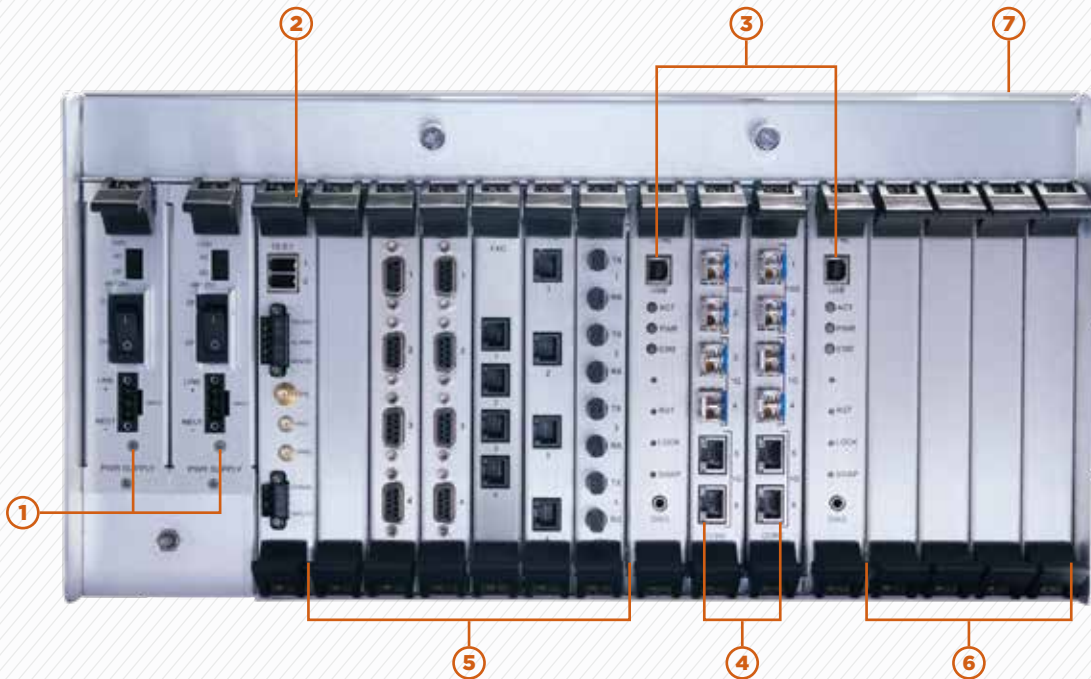
- Signal Interconnection: RS-485
- Interface Connector: DB-9 Female
- Slot(s) occupied: 1
- Data Rate: Two independent 64Kbps channel
- Records: 1500 SOE records
- SOE synchronization: NTP/SNTP/IEEE 1588
- Loopback: Local and Remote
- Compatibility: IMUX 2000 MTS

eXmux TPS I/O Box:

- Interface Connector: DB-9 Male
- Inputs: 4 Optically isolated (voltages: 24V, 48V, 125V or 250V), 2 auxiliary controlling inputs
- Outputs: 4 Solid state or Relay
- Terminal Block: Compression or Screw type
- Status: Inputs, Outputs, Power, and alarms
- Alarms: Minor and Major alarm and form C contacts rip Function Disable Switch

* Future Release

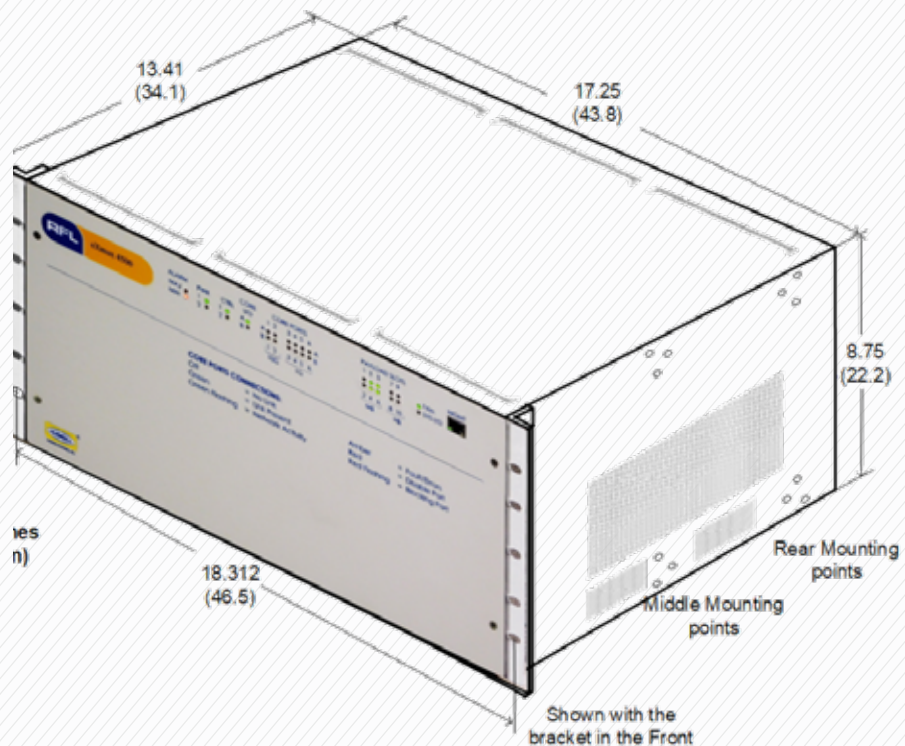
eXmux 4500 Chassis:



Module Overview:

- | | |
|---|------------------------------------|
| 1. Power Supply (Main and Redundant) | 5. Payload Cards (Mixed Bandwidth) |
| 2. System I/O | 6. Payload cards (High Bandwidth) |
| 3. Controller (CTRL-1 & CTRL-2) | 7. Optional Fan Slots |
| 4. Ethernet ports (Core I/O-A & Core I/O-B) | |

Mounting Information:



eXmux 4500 MSAT Ordering Information:

RFL Smart Number Description	CM	P1	P2	CT	FU	CA-1	CA-2	CA-3	CA-4	CB-1	CB-2	CB-3	CB-4	MB-1	MB-2	MB-3	MB-4	MB-5	MB-6	HB-7	HB-8	HB-9	HB-10
(fill in blanks):	EX4500																						
CHASSIS																							
5RU Chassis(Chassis + SYS-I/O +	5																						
3RU Chassis (Chassis + SYS-I/O +	3																						
POWER SUPPLY - 1																							
24 VDC *		1																					
38-150VDC / 88-130VAC		2																					
200-300VDC *		3																					
220VAC *		4																					
POWER SUPPLY - 2 OPTION																							
None (blank plate)		0																					
24 VDC *		1																					
38-150VDC / 88-130VAC		2																					
200-300VDC *		3																					
220VAC *		4																					
CONTROLLER																							
Single Controller				A																			
Dual Controller				B																			
FAN MODULE OPTION																							
None					0																		
Fan Modules					1																		
CORE I/O-A ETHERNET PORTS (W/ Two[2] RJ45 10/100/1000 Base TX)																							
No SFP						-	-	O	O														
One[1] SFP - RJ-45 10/100/1000 Base TX						-	-	G	G														
One[1] SFP - 1000Base-SX 850nm 550m/1800ft MM LC Connector						-	-	H	H														
One[1] SFP - 1000Base-LX 1310nm 10km/6.2mi SM LC Connector						-	-	J	J														
One[1] SFP - 1000Base-LX 1310nm 30km/18.6mi SM LC Connector						-	-	K	K														
One[1] SFP - 1000Base-FX 1550nm 60km/37.3mi SM LC Connector						-	-	L	L														
One[1] SFP - 1000Base-ZX 1550nm 80km/49.7mi SM LC Connector						-	-	M	M														
One[1] SFP - 1000Base-ZX 1550nm 120km/74.5mi SM LC Connector						-	-	N	N														
No SFP						O	O	-	-														
One[1] SFP - 1000Base-SX 850nm 400m/1300ft MM LC Connector						A	A	-	-														
One[1] SFP - 1000Base-LX 1310nm 10km/6.2mi SM LC Connector						B	B	-	-														
One[1] SFP - 1000Base-FX 1550nm 40km/24.9mi SM LC Connector						C	C	-	-														
One[1] SFP - 1000Base-ZX 1550nm 80km/49.7mi SM LC Connector						D	D	-	-														
One[1] SFP - 1000Base-ZX 1550nm 120km/74.5mi SM LC Connector **						E	E	-	-														
CORE I/O-B ETHERNET PORTS (W/ Two[2] RJ45 10/100/1000 Base TX)																							
None								Z	Z	Z	Z												
No SFP								-	-	O	O												
One[1] SFP - RJ-45 10/100/1000 Base TX								-	-	G	G												
One[1] SFP - 1000Base-SX 850nm 550m/1800ft MM LC Connector								-	-	H	H												
One[1] SFP - 1000Base-LX 1310nm 10km/6.2mi SM LC Connector								-	-	J	J												
One[1] SFP - 1000Base-LX 1310nm 30km/18.6mi SM LC Connector								-	-	K	K												
One[1] SFP - 1000Base-FX 1550nm 60km/37.3mi SM LC Connector								-	-	L	L												
One[1] SFP - 1000Base-ZX 1550nm 80km/49.7mi SM LC Connector								-	-	M	M												
One[1] SFP - 1000Base-ZX 1550nm 120km/74.5mi SM LC Connector								-	-	N	N												
No SFP								O	O	-	-												
One[1] SFP - 1000Base-SX 850nm 400m/1300ft MM LC Connector								A	A	-	-												
One[1] SFP - 1000Base-LX 1310nm 10km/6.2mi SM LC Connector								B	B	-	-												
One[1] SFP - 1000Base-FX 1550nm 40km/24.9mi SM LC Connector								C	C	-	-												
One[1] SFP - 1000Base-ZX 1550nm 80km/49.7mi SM LC Connector								D	D	-	-												
One[1] SFP - 1000Base-ZX 1550nm 120km/74.5mi SM LC Connector **								E	E	-	-												
INTERFACE UNIT (IU) OPTIONS																							
2-Port Multi-Protocol Sync IU (RS-422/530, X.35, X.21)						MB								A	A	A	A	A	A	-	-	-	-
4-Port Async. RS-232/RS-485 IU						MB								B	B	B	B	B	B	-	-	-	-
4-Port C37.94 MM Sync. IU						MB								C	C	C	C	C	C	-	-	-	-
4-Port C37.94 SM Sync. IU						MB								D	D	D	D	D	D	-	-	-	-
4-Port 4-Wire Audio E&M IU						MB								E	E	E	E	E	E	-	-	-	-
4-Port 2-Wire Audio E&M IU						MB								F	F	F	F	F	F	-	-	-	-
4-Port 2-Wire FXO IU						MB								G	G	G	G	G	G	-	-	-	-
4-Port 2-Wire FXS IU						MB								H	H	H	H	H	H	-	-	-	-
4-Port RS-232/485 Serial Server IU						MB/HB								J	J	J	J	J	J	-	-	-	-
4-Port TI/EI IU*						MB/HB								K	K	K	K	K	K	-	-	-	-
2-Port G.703 Co-Directional Sync. IU *						MB								L	L	L	L	L	L	-	-	-	-
2-Port TPS IU with One[1] SS I/O Box *						MB								M	M	M	M	M	M	-	-	-	-
2-Port TPS IU with One[1] RLY I/O Box *						MB								N	N	N	N	N	N	-	-	-	-
2-Port TPS IU with Two[2] SS I/O Box *						MB								P	P	P	P	P	P	-	-	-	-
2-Port TPS IU two Two[2] RLY I/O Box *						MB								Q	Q	Q	Q	Q	Q	-	-	-	-
2-Port TPS IU with One[1] SS I/O Box and One[1] RLY I/O Box *						MB								R	R	R	R	R	R	-	-	-	-
2-Port 16-Point Contact Status IU *						MB								S	S	S	S	S	S	-	-	-	-
6-Port RJ-45 10/100 Base TX Ethernet IU *						MB/HB								T	T	T	T	T	T	-	-	-	-
1-Port 1G SFP Ethernet IU *						MB/HB								W	W	W	W	W	W	-	-	-	-
None						MB/HB								Z	Z	Z	Z	Z	Z	-	-	-	-

* = Future Release
 ** = Commercial Grade
 CM = Chassis
 P1 = Power Supply 1

P2 = Power Supply 2
 CT = Controller Module
 FU = Fan Unit Option
 CA-X = Core I/O Module A Port

CB-X = Core I/O Module B Port X (Where X = 3 - 6)
 MB-Y = Mix Bandwidth IU (Where Y=1 - 6)
 HB-Y = High Bandwidth IU (Where Y= 7 - 10)

Notes:

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Printed in U.S.A. BR_10_314_E