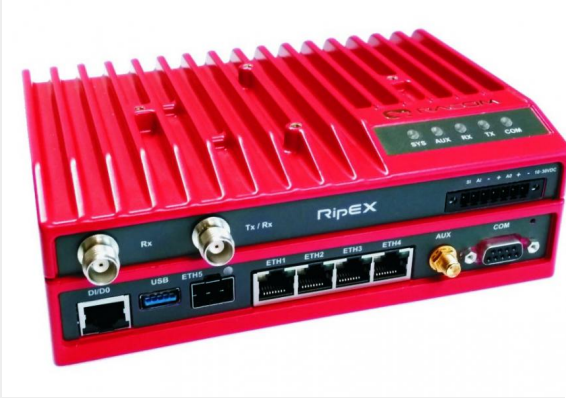
RipEX Radio Modems

RipEX Radio Modems

RipEX2

- [x] 1.1 Mbps / 200 kHz / 256QAM
- [x] 4× ETH, 1× SFP, 1× COM, 1× USB,
- [x] RipEX compatible
- [x] All RipEX features plus:
  - [x] 6.25 - 200 kHz channel size
  - [x] ACM, Adaptive FEC
  - [x] RADIUS
  - [x] HW tamper proof
  - [x] Expansion ready - mPCIe
  - [x] Full-duplex ready



RipEX is a radio modem platform renowned for overall data throughput in any real-time environment. RipEX radio modems are native IP devices, Software Defined with Linux OS that have been designed with attention to detail, performance and quality. All relevant state-of-the-art concepts have been carefully implemented.

RipEX, 1st generation, is a best-in-class compact radio modem proven within the market since 2011 and use in thousands of installations.

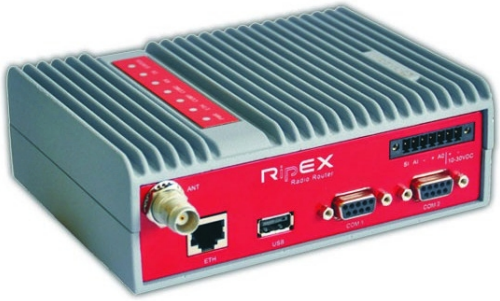
RipEX2, 2nd generation, was introduced in 2018. This more powerful standard radio modem provides significant improvements, especially in terms of data speed, security and number of interfaces.

RipEX-HS, a fully redundant 19’ hot-standby master station with two radios and two power supplies and available for both, RipEX and RipEX2, is the final member of the RipEX family.

All RipEX devices provide a 24/7 reliable service for mission-critical applications like SCADA & Telemetry for Electric and Water Utilities, Oil & Gas distribution and many other applications.

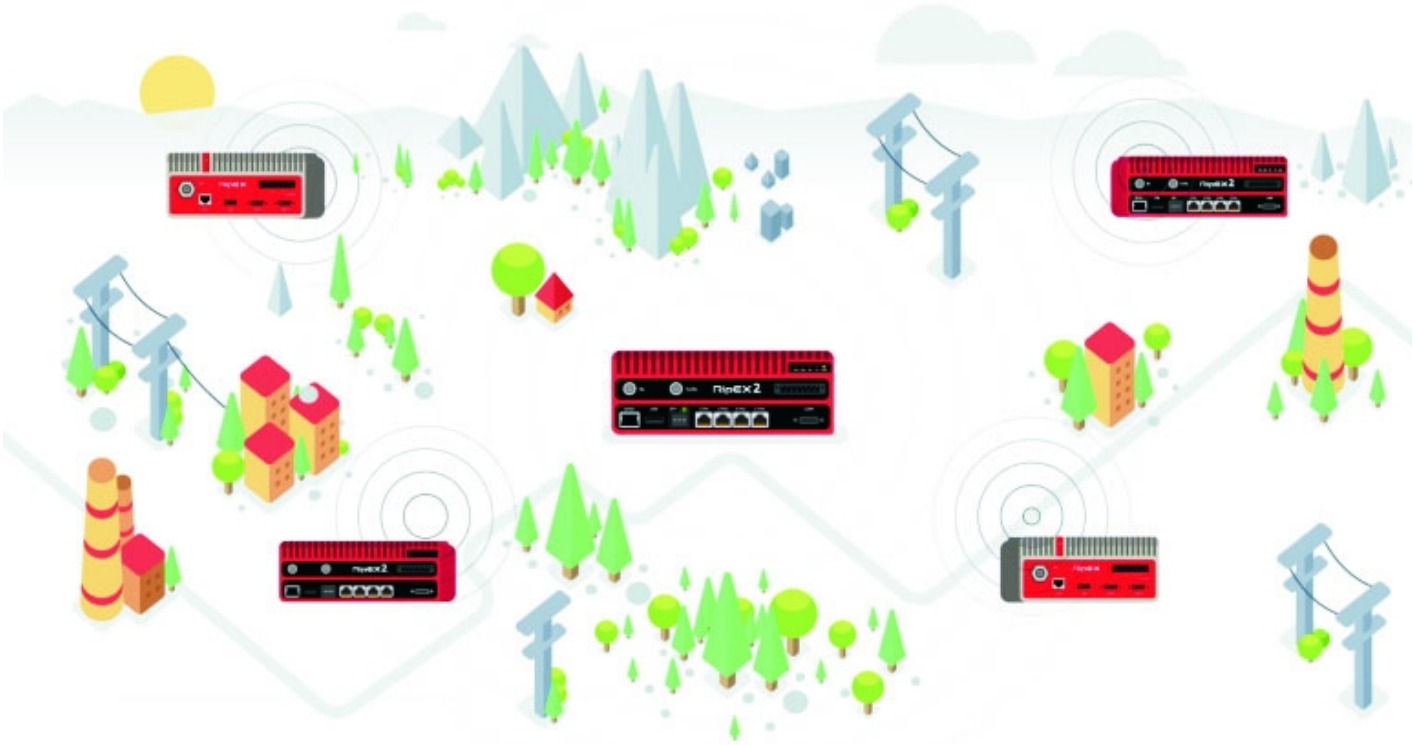
RipEX

- [x] 166 kbps / 50 kHz / 16DEQAM
- [x] 1× ETH, 2× COM, 1× USB
- [x] Solar ready
- [x] 0.1 – 10 watts
- [x] - 40 to +70 °C
- [x] WiFi management
- [x] Customized protocols
- [x] Backup routes
- [x] Fast remote access
- [x] IPsec



General overview

	RipEX	RipEX2
Max. Gross data rate	166 kbps	1.1 Mbps
Gross data rate / 25 kHz	83 kbps	167 kbps
Interfaces	1x ETH, 2x COM, 1x USB	4x ETH, 1x SFP, 1x COM, 1x USB
IPsec	Yes	Yes
RADIUS	No	Yes
Modulations	CPFSK - 16DEQAM	CPFSK - 256QAM
Channel size	6.25 - 50 kHz	6.25 - 200 kHz
Stream mode	Yes	No



Native IP Device

Native IPBridge mode – uses a Transparent protocol on the Radio channel, i.e. packets received on any interface are broadcast to the respective interfaces on all units in the network. Packets received on COM are broadcast to all COM's at all remote sites, allowing you to connect more RTU's to each remote unit.

Router mode – RipEX works as a standard IP Router with all interfaces (Radio and 1-5 Ethernets) and 1-2 COM ports without any compromise. Each of the five Ethernet ports on RipEX2 can be configured either as a switch or a router. There is an option of two protocols on the Radio channel: Flexible – unlimited anti-collision meshing without base stations or Base driven where all packet transmissions are managed by the local base station.

- ☑ Switch – switched or routed Ethernet ports (RipEX2)
- ☑ Terminal server - Serial-Ethernet converters, 5 independent sessions
- ☑ TCP proxy - converts TCP to UDP, eliminates transfer of TCP overhead
- ☑ ARP proxy - any IP address simulating (for RTU's without routing capabilities within the same subnet)
- ☑ Subnets - unlimited number of virtual Ethernet interfaces (IP aliases)
- ☑ VLAN - unlimited number of VLANs assigned to Subnets
- ☑ NAPT - many IP addresses behind RipEX can be mapped to one RipEX IP
- ☑ GRE - non encrypted end-to-end tunnel
- ☑ QoS - prioritization of packets from different interfaces and/or applications on Radio channel

Data speed & Throughput

- [x] Possible Network throughput is achieved by
  - [x] Min. Rx/Tx switching and synchronization times
  - [x] Optimum Radio protocol for the application
  - [x] Optimization
    - [x] payload data and headers compression
    - [x] packet flow optimization on Radio channel
  - [x] Different data speeds for individual links
- [x] Auto-speed - receiver is automatically adjusted to the data
- [x] rate of the incoming frame
- [x] ACM and Adaptive FEC (RipEX2)
- [x] Stream mode - transmitting starts immediately on the Radio channel, without waiting for the end c the received frame on COM => zero latency

Channel size	Gross data rate		Possible Network throughput	
	RipEX	RipEX2	RipEX	RipEX2
6.25 kHz	21 kbps	42 kbps	> 25 kbps	> 50 kbps
12.5 kHz	42 kbps	83 kbps	> 50 kbps	> 100 kbps
25 kHz	83 kbps	167 kbps	> 100 kbps	> 200 kbps
50 kHz	167 kbps	333 kbps	> 200 kbps	> 400 kbps
100 kHz	-	555 kbps		> 700 kbps
150 kHz	-	925 kbps		> 1.1 Mbps
200 kHz	-	1.1 Mbps		> 1.4 Mbps

Security & Integrity

- [x] Licensed radio bands
- [x] FEC, interleaving, proprietary data compression
- [x] CRC32 data integrity control on Radio channel
- [x] Proprietary protocol on Radio channel
- [x] Backup routes
- [x] Digitally signed FW (RipEX2)
- [x] Management - https, ssh,
- [x] Role-based access control
- [x] AES256 encryption
- [x] IPsec - encrypted end-to-end tunnel
- [x] Firewall - Layer 2 – MAC, Layer 3 – IP, Layer 4 – TCP/UDP

Radio protocols

- [x] Transparent / Bridge
  - [x] Repeater(s) supported
  - [x] No collision avoidance capability
- [ ]

- [x] Flexible / Router
  - [x] Unlimited Tree topology
  - [x] Multi-polling and report-by-exception concurrently
  - [x] Nomadic mode - automatic routing
- [x] Base driven / Router
  - [x] Star topology, repeaters supported
  - [x] Optimized for TCP/IP (IEC104)
  - [x] Fair distribution of channel capacity among all remotes

Long range

- [x] One radio hop over 50 km
- [x] Line of sight not required
- [x] Carrier output power 0.1 - 10W
- [x] Exceptional data sensitivity
- [x] Any unit can work simultaneously as a repeater
- [x] Unlimited number of repeaters on the way
- [x] Any IP network can interconnect RipEX units

Reliability

- [x] Units tested in a climatic chamber and in real traffic
- [x] Heavy-duty industrial components
- [x] Industrial rugged die-cast aluminium case
- [x] IP40 or IP51
- [x] -40 to +70 °C
- [x] 3 year warranty

Easy to configure and maintain

- [x] Web interface or CLI via SSH
- [x] All configuration parameters within one page
- [x] Wizards - fast and simple setup
- [x] Non-intrusive management via USB using either ETH/USB adapter or WiFi/USB adapter with DHCP
- [x] Fast remote access - only the effective data are transferred over the air, html page downloaded from the local unit
- [x] External flash disc - automatic configuration, SW keys and FW upgrade

Diagnostics & Network Management

- [x] Statistic logs for interfaces and communication links
- [x] Historical and on-line values displayed in graphs
- [x] 20 periods (e.g. days) of history

- ☑ Watched values (RSS, Ucc, Temp, PWR, etc.) also from neighbouring units
- ☑ SNMP v3 including Traps and Informs
- ☑ HW Alarm input, HW Alarm output
- ☑ Monitoring – on-line analysis of communication over any of the interfaces

Scalability

- ☑ SW feature keys
  - ☑ Advance features only when and where needed
  - ☑ Router, Speed, COM2, 10W, Backup routes, Master
  - ☑ Free Master-key trial - for 30 days in every RipEX
- ☑ HW models
  - ☑ The same HW for Base, Repeater or Remote stations
  - ☑ Internal GPS module - NTP synchronization (RipEX)
  - ☑ mPCIe slot for expansion boards (RipEX2) GPS, 4G, 2x RS232, DI/DO…

SCADA protocols

- ☑ Modbus, IEC101, DNP3, PR2000, Comli, DF1, Profibus, Async Link, C24, Cactus, RP570, Slip, Siemens 3964(R), IEC104, DNP3/TCP, Modbus TCP and others
- ☑ SCADA serial protocol addresses are mapped to RipEX addresses
- ☑ TCP(UDP) protocols can be handled transparently or using Terminal server or TCP proxy
- ☑ Embedded Modbus RTU / Modbus TCP converter
- ☑ Each packet is transferred as an acknowledged unicast

Backup routes

- ☑ Tested alternative paths between two RipEX units
- ☑ Automatic switch-over to backup gateway, if primary route fails due to packet loss or weak RSS
- ☑ Backup gateway can be behind Radio or Eth interfaces
- ☑ Unlimited number of Alternative paths
- ☑ Alternative path priority assignment

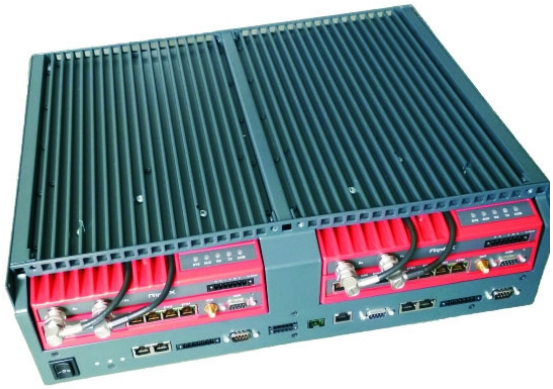
Energy savings

- ☑ Solar ready
- ☑ Sleep mode - wake up triggered by Sleep digital input or by internal RTC (RipEX2)
- ☑ Save mode - wake up by a received packet from Radio channel or by Sleep digital input

RipEX-HS

- ☑ Fully redundant hot-standby master station
- ☑ Fully monitored
- ☑ Automatic switchover capability on detection of failure
- ☑ Auto toggle mode periodically switches units regardless of failure

- ☑ Two booted-up standard RipEX units inside
- ☑ Switch-over time < 2 s
- ☑ Two independent power supplies
- ☑ One or two antenna connectors
- ☑ Hot swappabble
- ☑ 19″ rack 3U



Technical parameters

Radio parameters	**RipEX**	**RipEX2**
Frequency bands	135–154; 154–174; 215-240; 300–320; 320–340; 340–360; 368–400; 400–432; 432–470; 470-512; 928–960 MHz	400-470
Channel spacing	6.25 / 12.5 / 25 / 50 kHz	6.25 / 12.5 / 25 / 50 / 100 / 150 / 200 kHz
Frequency stability	+/- 1.0 ppm	
Modulation	QAM (Linear): 16DEQAM, D8PSK, π/4DQPSK, DPSK FSK (Exponential): 4CPFSK, 2CPFSK	QAM (Linear): 256QAM, 64QAM, 16DEQAM, D8PSK, π/4DQPSK, DPSK FSK (Exponential): 4CPFSK, 2CPFSK
FEC (Forward Error Correction)	On/Off, 3/4	On/Off, 2/3, 3/4, 5/6
Gross data rate	up to 167 kbps	up to 1.1 Mbps
RF Output power	0.1 to 10 W programmable	
Duty cycle	Continuous	
Rx to Tx Time	< 1.5 ms	
Sensitivity	- 99 dBm / 16DEQAM / 25 kHz -115 dBm / 2CPFSK / 25 kHz	- 93 dBm / 256QAM / 25 kHz -115 dBm / 2CPFSK / 25 kHz
Electrical		
Primary power	10 to 30 VDC, negative GND	
Rx	5 W/13.8 V; 4.8 W/24 V; (Radio part < 2 W)	8 W
Tx (dependent on RF power and modulation)	13 – 40 W	13 – 55 W

Sleep mode	0.1 W	0.01 W
Save mode	2 W	5 W
Interfaces		
Ethernet	1x 10/100 Base-T Auto MDI/MDIX / RJ45	4x 10/100 Base-T Auto MDI/MDIX / RJ45
SFP	No	1×10/100/1000 Base-T/1000Base-SX/1000Base-LX
COM 1	RS232 / DB9F 300 – 115 200 bps	RS232/RS485 / DB9F 300 bps – 1 Mbps
COM 2	RS232/RS485 SW configurable / DB9F 300 – 115 200 bps	mPCIe expansion board 2x RS232
USB	USB 1.1 / Host A	USB 3.0 / Host A
Antenna	1x TNC female / 50 ohms (Rx/Tx) or 2x TNC (Rx+Tx) - different HW model	2x TNC female / 50 ohms SW configurable: 1x Rx/Tx or 1x Rx + 1x Tx
Inputs/Outputs	1x HW alarm input, 1x HW alarm output, 1x Sleep input	2x HW alarm input, 1x HW alarm output, 1x Sleep input
Indication LEDs		
LED panel	Power, ETH, COM1, COM2, Rx, Tx, Status	SYS, AUX, RX, TX, COM
ETH	No	4x RJ45 - 2x LED, 1x SFP - 1x LED
Environmental		
IP Code (Ingress Protection)	IP40, IP51	
MTBF (Mean Time Between Failure)	> 900.000 hours (> 100 years)	
Operating temperature	- 40 to +70 °C (- 40 to +158 °F)	
Operating humidity	5 to 95% non-condensing	
Mechanical		
Casing	Rugged die-cast aluminium	
Dimensions	50 H x 150 W x 118 D mm (1.97 x 5.9 x 4.65 in)	60 H x 185 W x 125 D x mm (2.34 x 7.2 x 4.9 in)

Weight	1.1 kg (2.4 lbs)	1.55 kg (3.4 lbs)
Mounting	DIN rail, L-bracket, Flat-bracket, 19″ Rack shelf	
SW		
Operating modes	Bridge / Router	Bridge / Router (+Switch)
User protocols on COM	Modbus, IEC101, DNP3, PR2000, Comli, DF1, Profibus, Async Link, C24, Cactus, RP570, Slip, Siemens 3964(R)…	
User protocols on Ethernet	Modbus TCP, IEC104, DNP3 TCP, Comli TCP…	
Serial to IP convertors	Modbus RTU / Modbus TCP, DNP3 / DNP3 TCP, Terminal server	
Radio protocols	Transparent, Flexible, Base driven	
Multi master applications	Yes	
Report by exception	Yes	
Collision Avoidance Capability	Yes	
Remote to Remote communication	Yes	
Repeaters	Store-and-forward; Every unit; Unlimited number	
Optimization	Payload data and Ethernet / IP / TCP / UDP header compression, Packet flow on Radio channel optimization	
NTP (Network Time Protocol)	Client, Server (synchronized from internal GPS)	
Security		
Management	HTTP, HTTPS (own certificate), SSH	
Access accounts	2 levels (Guest, Admin)	4 levels (Guest, Tech, SecTech, Admin) x 3 users
Encryption	AES256	
IPsec	Yes	
RADIUS	No	Yes
Firewall	Layer 2 - MAC, Layer 3 - IP, Layer 4 - TCP/UDP	
HW tamper proof	No	Yes
Diagnostics and Management		
Radio link testing	Yes (ping with RSS, Data Quality, Homogenity)	
Watched values	Device – Ucc, Temp, PWR, VSWR, HW Alarm Input Radio channel – RSScom, DQcom, TXLost [%]	

	User interfaces – ETH [Rx/Tx], COM1 [Rx/Tx], COM2 [Rx/Tx]	
Statistics	For Rx/Tx Packets on User interfaces (ETH, COM1, COM2) User data and Radio protocol (Repeates, Lost, ACK etc.) on Radio channel	
Graphs	For Watched values and Statistics	
History (Statistics, Neighbours, Graphs)	20 periods (configurable, e.g. days)	
SNMP	SNMPv1, SNMPv2c, SNMPv3, SNMP Traps for Watched values	
Approvals	CE (RED), FCC, ATEX, RoHS	Pending

RipEX – Radio Modems