



R-1500 series ruggedised multifunction routers

Auto-recovery and auto-configuration for multi-site projects

The Garderos R-1500 routers connect to cellular networks to provide IP connectivity in remote locations. The router software cannot "hang up" as it is supervised by a hardware watchdog. R-1500 routers can connect to one cellular network ("single-radio") or, if required, to two cellular networks simultaneously ("dual-radio"). The routers auto-configure themselves against a central server, which means low-effort manageability. Manageability in turn means that the configuration, firmware and cyber-security features of the routers can be regularly maintained.

Key Features

- Wireless interfaces ("single radio"):
 - LTE/HSPA/EDGE/GPRS (3G/4G) or
 - HSPA/EDGE/GPRS (3G) or
 - CDMA (450 MHz)
- Wireless interfaces ("dual radio"):
 - 3G and 3G/4G simultaneously
 - 3G and CDMA simultaneously
 - 3G/4G and CDMA simultaneously
- Router software cannot "hang up" (supervision by hardware watchdog)
- Thermally hardened
- Electrically hardened for substations (IEC 61850-3)
- Auto-configuration of router configuration and firmware against a central server
- Field-proven Cyber-Security
- IPsec VPN compatible with the major VPN gateway vendors
- Serial interface (RS232)
- Optional WiFi interface
- Optional digital inputs/outputs

Secure IP connectivity for:

- Intelligent transport systems (ITS)
- Electricity distribution networks



Figure: R-1500 router

Manageability

Manageability means that the routers can be deployed in large numbers, yet only require low management effort. **Survivability** means that each router uses on-board software and hardware features to maximize its own uptime.

Configuration / Scalability

- Low-effort setup via configuration server or local
 - Configuration per CLI
 - Configuration download via HTTP(S)
 - Configuration API can be integrated with any web server
- Router management
 - Thousands of routers can be administered from one web server
 - Routers auto-check regularly for available updates
- Bidirectional security
 - Configuration Server ↔ Router
 - Certificate based

Compatibility with NMS

- SNMP monitoring and traps

Syslog remote logging

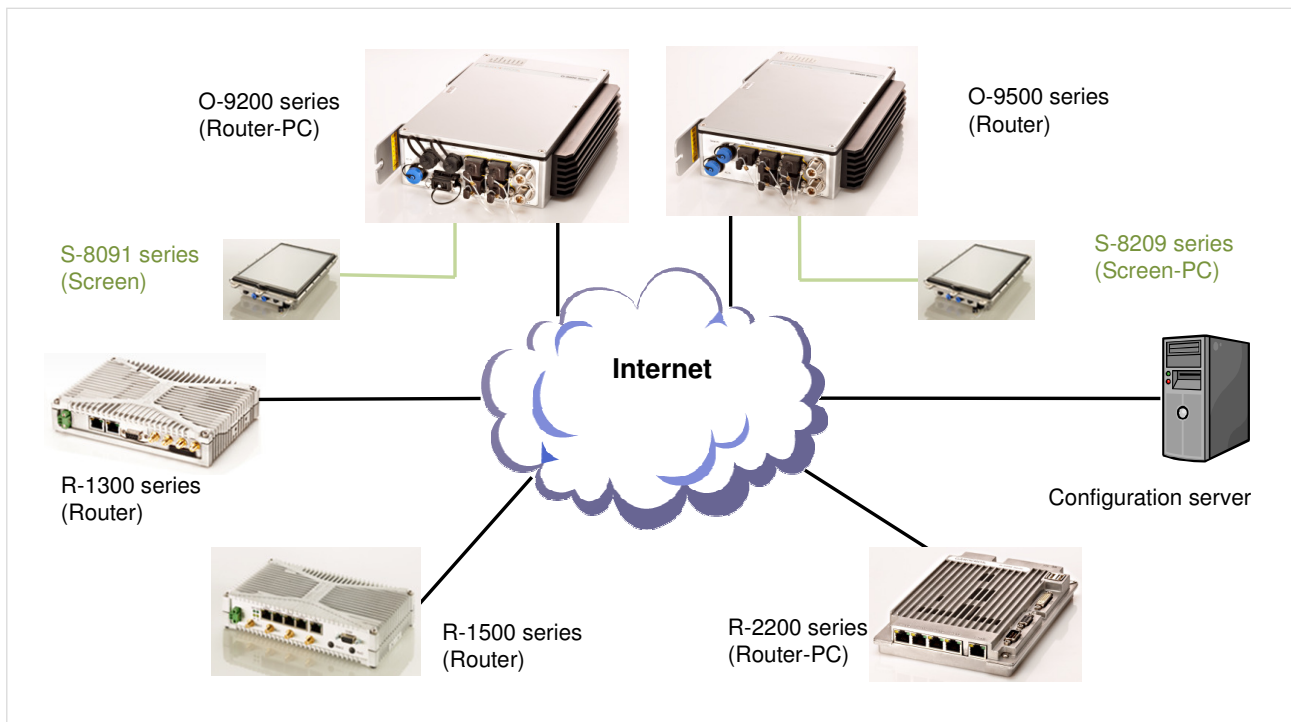
- Routers send status messages to central syslog server

Watchdog

- Hardware watchdog detects OS problems
- Configurable software watchdog
 - WAN monitoring and automatic re-connection
 - Reachability of configuration server
 - Network monitoring

Standard management tools

- Serial console
- Telnet, SSH
- Command Line Interface (CLI)
- Test routines for troubleshooting



Hardware features

Casing	Material Dimensions (WxHxD) Dimensions incl. connectors Weight Ingress protection IEC protection class	Diecast aluminium 206x44,5x115mm 200x44,5x121mm ~0.8kg IP40 3
Temperature range		Temperature range depends on router model. Please see page 6.
Interfaces on casing	Power connector Serial connector WWAN antenna connector Ethernet connector WLAN antenna connector SIM card slot GPIO (General Purpose I/O)	Phoenix 2 pin 1 D-Sub 9 (female) 4 SMA (female) 5 RJ-45 2 RP-SMA (female) 2 Mini-SIM (thermoresistant) 2xInput, 2xOutput, Binder M5 (male) 4 contacts
Power supply	Input voltage Power consumption	12-48 VDC ~6-9W
Serial interface	RS-232	1
WWAN interface	Technology/Bands CDMA EVDO, 1x CDMA RUIM, non-RUIM Active GPS Passive GPS Dual WWAN	2G/3G ¹⁾ , 2G/3G/4G ²⁾ , CDMA ³⁾ for CDMA for CDMA for 2G/3G/4G for 2G/3G
LAN interface	Ethernet Autosensing Auto-MDIX	1x10/100BT + 4 port 10/100BT managed switch
WLAN interface	Supported standards	1x802.11n a/b/g
Other features	Hardware watchdog Cryptographic hardware accelerator	Monitors "heartbeats" from router OS. Restarts router in case of software problems. md5, aes, des, 3des, sha1, sha512
I/O Ports	Digital Inputs Digital Outputs	Two opto-isolated dry contact digital inputs. Voltage input: 3.3-36 VDC Two open-collector digital outputs with pull-up resistor. Output voltage = Router input voltage. Max. current: 200mA
Certifications	Criteria for EMI immunity and radiation	IEC 61850-3
Regulations	RoHS,CE,FCC	

¹⁾ 2G/3G

WCDMA 850/900/1900/2100MHz
EDGE/GPRS/GSM 850/900/1800/1900MHz
HSPA+ peak download speed: 21.1 Mbps
HSPA+ peak upload speed: 5.76 Mbps
GPS passive antenna connector

²⁾ 2G/3G/4G

LTE 800/900/1800/2100/2600 MHz
WCDMA 900/2100MHz
EDGE/GPRS/GSM 900/1800/1900MHz
HSPA+ peak download speed: 21.1 Mbps
HSPA+ peak upload speed: 5.76 Mbps
LTE peak download speed: 100 Mbps
LTE peak upload speed: 50 Mbps
GPS 3V active antenna connector

³⁾ CDMA 450MHz

EV-DO Rev. A, B
1xRTT
Block A/C/D/L
R-UIM and non R-UIM

Routing features

Operating system

- Garderos Router Software (GRS) Rel. 2.12

WWAN Features

- PPP over WWAN *
- Dual WAN (Cellular, Ethernet) *
- Dual WWAN (WWAN, WWAN) *
- CDMA RUIIM and non-RUIIM *
- CDMA ESN and MEID authentication *

Router Features

- Ethernet configurable link speed
- Ethernet bridging and switching
- Ethernet switch port separation
- Ethernet switch VLANs up to 16
- Ethernet switch 802.1q VLAN tagging
- Ethernet switch 802.1q untagged VLAN
- VLAN support (802.1q and priority tagging)
- Ethernet WAN static IP, DHCP, PPPoE
- PPPoE client with PAP and CHAP
- PPPoE always on
- PPPoE relay
- PPPoE session termination before provider reconnect
- PPPoE client static IP
- Handling of dynamic IP addresses on WAN
- Layer 2 multicast/broadcast (on integrated switch)
- Static routes
- Dynamic routing protocols RIPv2, OSPFv2, BGPv4
- Filtering for dynamic routing protocols
- Firewall (stateful firewall)
- NAT (PAT and 1-to-1)
- Source-NAT (SNAT)
- Port forwarding
- Invalid-packet-filter
- DHCP server
- DHCP address pools per VLAN/interface
- DHCP secure ARP
- DHCP ARP ping before assigning lease
- Configurable MTU
- Path MTU discovery
- TCP MSS adjustment
- Diffserv (set DSCP bits based on IP-source/destination address and/or ports/protocols)
- QoS packet prioritization (bandwidth reservation based on IP-source/destination address and/or ports/protocols)
- Ethernet port security (block port after cable removal)
- Reverse path filter

VPN

- GRE
- IPsec with PSK and certificate authentication
- IPsec encryption algorithms AES, DES, 3DES, AES256
- IPsec phase 1 key length up to 8192 bit
- IPsec phase 2 key length up to 4096 bit
- IPsec throughput max. 50 Mb/s
- IPsec throughput (3des-sha512-modp4096) 10 Mb/s
- IPsec throughput (aes256-sha1-modp2048) 46 Mb/s
- IPsec VPN gateway

- Up to 5 IPsec tunnels (full WAN speed)
- NHRP dynamic tunnel management
- OpenVPN with PSK and certificate authentication
- Up to 5 OpenVPN tunnels (full WAN speed)
- OpenVPN Layer 2 and 3

Router management

- RS-232 console
- SSH server
- Telnet server
- Administrator authentication by TACACS+, RADIUS, password file and public key authentication
- Command line interface (CLI)
- Remote configuration file download (HTTP/HTTPS)
- OSCP (configuration file download)
- HTTP basic authentication for config-file download
- Certificate authentication for configuration file download
- Remote software updates
- Router bulk management
- SNMPv2 and SNMPv3 monitoring
- SNMPv2 and SNMPv3 traps
- Hardware and software watchdogs
- Syslog

WLAN *

- 802.11n a/b/g
- Multiple SSID
- Hidden SSID
- Configurable channel
- Configurable transmit power
- Intra cell traffic blocking
- WEP (64 and 128 bit), WPA and WPA2
- 802.1x
- EAP (802.11i, RADIUS authentication)
- Access point and client mode

Other functions

- DNS server and proxy
- DynDNS client
- NTP client, server
- NTP with MD5 authentication
- GPS localization *
- NMEA GPS interface *
- General purpose IOs
- External I/O handling by CLI
- External I/O handling by web interface
- External I/O scripting API
- External I/O event API
- Cron job
- Security hardening (switch off unsecure features)
- SMS sender (optional) *
- Serial-to-network proxy (ser2net)
- Serial modes: Console, Off and Script
- Scripting interface
- Open APIs for network integration

*) Prerequisite is a suitable interface. Please see also order information.

Ordering information

Garderos model number:	Ethernet (10/100 BT)	RS-232	WLAN (802.11n a/b/g)	IO-Module	HSPA+ (3G)	LTE, HSPA+ (3G/4G)	CDMA 450 MHz	Operating temperature range
R-1501 (5x LAN/WLAN)	5	1	1					-25°C to +70°C
R-1503 (5x LAN/IO)	5	1		1				-30°C to +70°C
R-1507 (5x LAN)	5	1						-30°C to +70°C
R-1521 (5x LAN/3G/WLAN)	5	1	1		1			-25°C to +70°C
R-1522 (5x LAN/4G/WLAN)	5	1	1			1		-25°C to +60°C
R-1523 (5x LAN/3G/IO)	5	1		1	1			-30°C to +70°C
R-1524 (5x LAN/ 4G/IO)	5	1		1		1		-30°C to +60°C
R-1527 (5x LAN/3G)	5	1			1			-30°C to +70°C
R-1528 (5x LAN/4G)	5	1				1		-30°C to +60°C
R-1541 (5x LAN/3G/CDMA/WLAN)	5	1	1		1		1	-25°C to +70°C
R-1542 (5x LAN/ 4G/CDMA/WLAN)	5	1	1			1	1	-25°C to +60°C
R-1543 (5x LAN/3G/CDMA/IO)	5	1		1	1		1	-30°C to +70°C
R-1544 (5x LAN/4G/CDMA/IO)	5	1		1		1	1	-30°C to +60°C
R-1547 (5x LAN/3G/CDMA)	5	1			1		1	-30°C to +70°C
R-1548 (5x LAN/4G/CDMA)	5	1				1	1	-30°C to +60°C
R-1551 (5x LAN/3G/4G/WLAN)	5	1	1		1	1		-25°C to +60°C
R-1552 (5x LAN/4G/4G/WLAN)	5	1	1			2		-25°C to +60°C
R-1553 (5x LAN/3G/4G/IO)	5	1		1	1	1		-30°C to +60°C
R-1554 (5x LAN/4G/4G/IO)	5	1		1		2		-30°C to +60°C
R-1555 (5x LAN/3G/3G/WLAN)	5	1	1		2			-25°C to +70°C
R-1556 (5x LAN/3G/3G/IO)	5	1		1	2			-30°C to +70°C
R-1557 (5x LAN/3G/4G)	5	1			1	1		-30°C to +60°C
R-1558 (5x LAN/4G/4G)	5	1				2		-30°C to +60°C
R-1559 (5x LAN/3G/3G)	5	1			2			-30°C to +70°C
R-1571 (5x LAN/CDMA/WLAN)	5	1	1				1	-25°C to +70°C
R-1573 (5x LAN/CDMA/IO)	5	1		1			1	-30°C to +70°C
R-1577 (5x LAN/CDMA)	5	1					1	-30°C to +70°C

Supported by:



on the basis of a decision
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