

Solwise Ltd

**Backbone R1,
Outdoor Backbone
Endpoint**



ZYGMA7

Affordable Infrastructure

ZyGMA7 from Solwise

**Backbone R1, Outdoor Backbone Endpoint R1 with one Radio
(54/108Mbps 5G 802.11a), High-gain, Long Distance, UK Band B and Band C legal**

Product Overview

The TDMA backbone solution ensures that audio and video packets are transmitted smoothly.

The ZyGMA7 Backbone Repeater series has three product items, the R1, R2, and Backbone Panel Antenna. The R1 has one 5GHz radio channel used to initiate or terminate the internet bandwidth through the Backbone. The R2 has dual 5GHz Radio Channels and is typically used as a relay in the backbone. The R2 can also be used in point-to-point configuration to link two sites (with up to 40km distance) and with link-aggregation to increase the effective channel throughput.

The R1 and R2 Backbone products are legal for use in the 5GHz Band B unlicensed band (5470-5720MHz) and in the Band C licensed frequency range (5725-5850MHz). Key features include DFS, TPC and also notching in the range 5795 to 5815MHz. The Backbone Repeater series is a robust and versatile design for the harshest outdoor environment. Innovative features to enhance the network throughput include, TDM coordination, Distributed TDMA, and Super A wireless to increase the link to 108 Mbps. They also include Wireless Isolation (Client Isolation) to isolate clients from each other, and SNMP management feature. Other environmental and mechanical designs include the wide-temperature

Key Features

- Operating Mode: Base Station , CPE, P2P, P2MP
- High Reliability & Long Distance Connectivity (up to 40km)
- Super A: Fast Frames, Burst, Compression
- Intel® TDMA Technology
- Wireless Isolation (Client Isolation)
- RF Output Power: 24dbm
- Built-in Antenna(23 dbi, 5.4~5.85GHz Frequency Range).
- Industrial Design for -30 ~ 70 °C Operating Temperature
- IP 67 Enclosure (Level 7 Waterproof)
- Level 17 Beaufort Scale
- Vented to exclude moisture
- CLI(Command Line Interface) Support
- SNMP Management
- group firmware upgrade
- signal indication for easy installation method

tolerance, pole-mounting and wall-mounting mechanism, and an angle adjustment bracket for long-distance directional fine-tuning.

The network designer can use the R1 and R2 and ZyGMA7's range of outdoor AP/CPE products to provide a complete delivery solution including Wireless Backhaul and last-mile connectivity.

The Backbone Panel is a directional antenna operating at 5GHz range with 23dBi high-gain. When the it is installed with the Backbone Repeater R2 as the antenna for the second channel. A V-cut board is included in the shipping package to isolate signals from the built-in antenna of the Repeater R2. Running two radios with link aggregation can increase the throughput up to 207% (Use of Link Aggregation in CSMA mode at a LOS distance of 10KM).

The BACKBONE series uses high quality components for operating in a ruggedized environment and can operate at a wide temperature range from -30°C ~ 70°C.

Z9000R1

Feature Descriptions

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- High Reliability
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- Built-in Antenna(23 dbi, 5.4~5.85GHz Frequency Range)
- Industrial Design for -30 ~ 70 °C Operating Temperature
- IP 67 Enclosure (Level 7 Waterproof)
- Level 17 Beaufort Scale
- Provide a vent to exclude moisture
- CLI(Command Line Interface) Support#
- SNMP Management
- Support multiple data Encryption algorithms, including WEP , TKIP , AES
- Proprietary SW management tool to provide group firmware upgrade• Built in buzzer for signal indication to provide easy installation alignment

UK 5GHz Channel Usage

For UK operation 5GHz Bands B & C are selectable.

According to Ofcom IR2006 and IR2007 regulations the following channels are permitted.

Notes	40MHz	20MHz	10MHz	5MHz
Band B 5470~5725MHz 140 CH120~131 excluded for Meteorology Radar	100,108,116,	100,104,108, 112, 116,136, 140	99,101,103,105,107, 109,111,113,115,117, 119,133, 135,137, 139,141	99,100,101,102,103,104, 105,106,107,108,109,110, 111, 112,113,114,115,116, 117, 118,119,133,135,136, 137, 138,139,140,141
Band C 5725~5850MHz 5795-5815MHz excluded for RTTT devices	151,167	147,151,155,167	146,148,150,152,154, 156, 158,164,166,168	146,147,148,149,150,151, 152,153,154,155,156,157, 158,162,163,164,165,166, 167,168,169

Application Notes

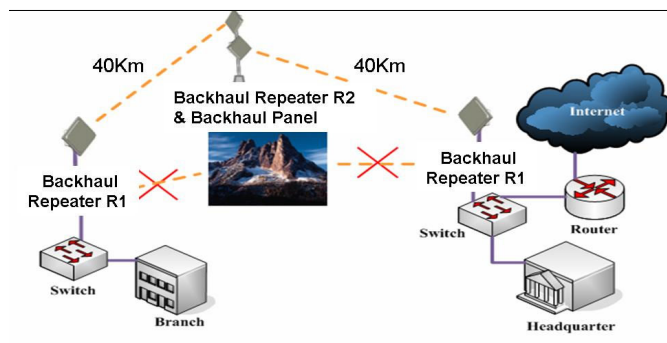
The R1/R2 product series can be configured as P2P mode, P2MP mode, Relay mode, Base Station mode, and CPE mode.

P2P mode and P2MP mode

- The most common configuration is the P2P mode or P2MP mode. In P2P mode users may use 2 units of R1 installed remotely and then aligned so their built in antenna are targeted at the opposite R1 unit. There are several setup parameters which can be tuned in this configuration e.g. the TDMA/CSMA mode selection. The network administrator may adjust the wireless parameters according to the setup environment. Please note that the R1 units need to be installed with line-of-sight with no obstacles in the path.
- To increase the bandwidth capacity, the network designer may use a pair of R2s. Each R2 is installed with an additional 23dBi Backbone Panel directional antennas. You can then run the Link Aggregation feature to run two links simultaneously. The R2s can then generate 80% to 100% additional bandwidth compared to the R1 (single radio) configuration.

For Relay Mode

- The Backbone Repeater R2 relay function can be used to 'bend' the link around an obstacle or to extend the range between two remote Backbone Repeater R1 points. The Backbone Repeater R2 can use the second radio to bridge again to another location for extended range. Under this condition, the Z9500-5G23 Backbone Panel should be installed along with the Backbone Repeater R2 relay unit.

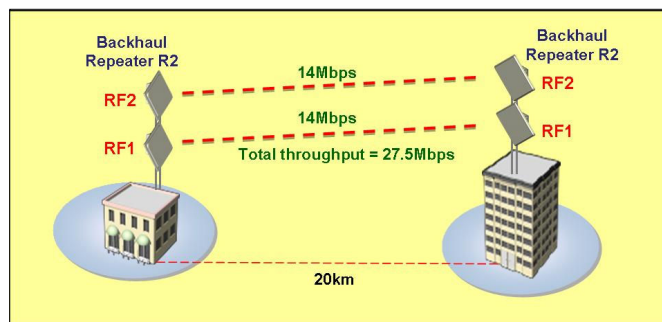


Multihop Relaying

- In the above diagram, there is one R2 used in relay mode between the 2 R1s, making the transmission distance can be doubled compared to just using 2 R1 units (actual distance will depend upon output power settings and bandwidth but an estimated maximum distance at maximum throughput would be about 5-8Km. With reduced throughput then the maximum theoretical range is about 40Km). If we put two consecutive R2s between 2 R1s, then the maximal distance is increased again. You are not advised to use more than 2 R2 relay units since throughput will start to fall - a maximum limit of 2 R2s as relays in the transmission path is recommended.

For Link Aggregation

- For extreme bandwidth-hungry applications then you can use the Link Aggregation technology supported in the R2 units. You also need a Backbone Panel 23dBi high gain directional antennas connected to the second radio of Backbone Repeater R2 and then R2 units at both sites. Aggregating the traffic over two links will greatly enhance data rate and maximize the resources utilization. It is important that the same supplementary antenna is used with the R2 units as the built-in antenna of the Backbone Repeater R2. This way you get equal performance and transmission range for the two radios



TDM Coordination & Distributed TDMA

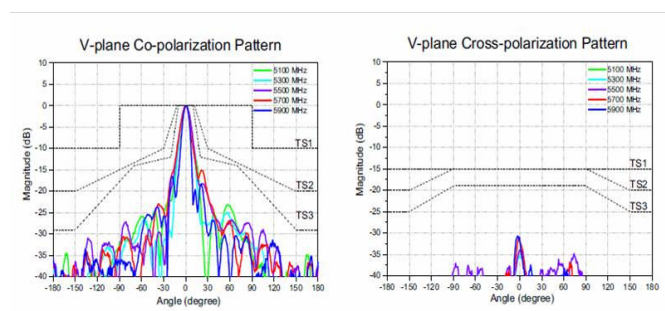
- TDM Coordination is a feature to allot transmission time-slot to each client. It ensures all the clients getting access in a fair manner, and avoids the bandwidth from being hogged by clients with heavy traffic.
- Another feature is the Distributed TDMA that is used to overcome the network throughput issues in long distance links. The traditional CSMA mechanism in ethernet can not work well when the distance gets longer. In a wireless environment, when the distance exceeds 20km, then the ACK-time in CSMA increases so the throughput will decrease dramatically. When the distance is longer than 40km, the throughput of CSMA is less than 10% of that of Distributed TDMA technology.
- The Distributed TDMA algorithm from Intel improves the network throughput issue in long distance environment. The Distributed TDMA mechanism will allot the clients in synchronous mode automatically so that the traffic will not be interfered by the longer ACK-time, and the throughput will not degrade as the distance gets longer.

Installation Tips: V-Cut Board and Spacing

- To reduce signal interference, the V-type isolation board on the Backbone Panel external antenna should be located between Backbone Repeater R2 device and the Backbone Panel external antenna.
- To minimize the influence of obstacles, signal interference or reflections, install all the external antenna at least 30 cm away from the Backbone Repeater R2



V-Plane of the Antenna



Related Products

PartNo	Stock Code	Description
Z9024L-BGN-v2	ZY-FIGHTERN2	Fighter N2 , 802.11 b/g/n 150Mbps High-gain Outdoor Wireless AP/CPE, with 1T1R Built-in 10dbi Panel Antenna, External SMA Antenna Connector, 1LAN + 1WAN, Passive PoE, -30°C ~ 55°C
Z9024-BGN	ZY-FEATURAN2	Featura N2 , 802.11 b/g/n 150Mbps High-gain Outdoor Wireless AP/CPE, with 1T1R Built-in 8dbi Antenna and External Antenna Connector, 1LAN, Passive PoE, -20°C ~ 70°C (High-end Model)
Z9050L-AN	ZY-FIGHTERN5	Fighter N5 , 802.11 a/n 150Mbps High-power Outdoor Wireless AP/CPE, with 1T1R Built-in 14dBi Panel Antenna, External SMA Antenna Connector, Dual 10/100Mbps RJ45 interfaces(LAN Port & WAN Port), -30°C ~ 60°C. UK Band B and Band C legal.
Z9050-AN	ZY-FEATURAN5	Featura N5 , 802.11 a/n 300Mbps High-gain Outdoor Wireless AP/CPE, with 2T2R Built-in 14~16dBi dual-polarity Antenna and Dual External Antenna Connectors, Dual 10/100Mbps RJ45 interfaces, PoE out to secondary device for applications such as IP Surveillance, -20°C ~ 70°C (High-end Model). UK Band B and Band C legal.
Z9000R1	ZY-BACKR1	Backbone R1 , Outdoor Backbone Repeater R1 with one Radio(54Mbps 5G 802.11a), High-gain, Long Distance, -30 ~ 70 °C. UK Band B and Band C legal.
Z9000R2	ZY-BACKR2	Backbone R2 , Outdoor Backbone Repeater R2 with Dual Radio(54Mbps 5G 802.11a), High-gain, Long Distance, -30 ~ 70 °C. UK Band B and Band C legal.
Z9500-5G23	ZY-BACK23PN	Backbone Panel , Outdoor Backbone Panel Directional Antenna, 5.4~5.85GHz, 23dbi, 10° Coverage Angle, N-type Female Connector, with 1m Male-to-male Coaxial Cable, -40 ~ 80 °C, Pole Mount & Wall Mount - used with the R2 relay unit.

Specifications

Specifications	
System Memory	16MB Flash 64MB DDR2 *2
Power	Power over Ethernet (Output 20Watts ,48V /0.4A) Powered by Pin 4/5/7/8
Operating Frequency	FCC: 5.725~5.850 GHz CE: 5.470~5.720 GHz, 5.725~5.850 GHz (for Band C use 5.795~5.815 GHz is excluded) (Programmable for regulations of different countries)
RF Modulation	802.11a: OFDM (BPSK, QPSK, 16QAM, 64QAM)
RF output power	24dBm (Max. of Avg.) at Radio for FCC (Band 4) 30 dB EIRP for ETSI 301 893 (Band3) for Band B use, 36dBm EIRP for UK Band C (Controllable for regulations of different countries)
Sensitivity	≤ -90dBm @6Mbps ≤ -73dBm @54Mbps
Channel Spacing	40/20/10/5 MHz
Features	
Operation Mode	Base Station , CPE, PtP, P2MP
Security	WEP 64/128bits, WPA-PSK/WPA2-PSK, WPA/WPA-2
Radio Bandwidth Control	5MHz/10MHz/20MHz/40MHz
Super A	Fast Frames, Burst, Compression
TDM Coordination Technology	Traffic management to coordinate the traffics between clients, and to ensure all the clients get access; to avoid the bandwidth being hogged by clients with heavy traffic
Intel® Distributed TDMA	For long distance transmission(longer than 20km), the synchronous Distributed TDMA transmission algorithm is much better than the normal asynchronous CSMA technology, hence keeping the throughput much higher. Distributed TDMA automatically allocates time-slots to clients to optimize the network throughput.
Distance in Meters	Auto ACK-Time adjustment
Wireless Isolation (Client Isolation)	YES
Management Statistics	Wireless and Ethernet
Link Test	Self-Wireless Connection test
Configuration & Management	Web-based Management (Secure SSL) Command Line Interface (SSH or RS-232 (9600)) Windows-based Utility, SNMPv2
FW Upgrade	Web/Windows management tool
Antenna	
Gain	23dBi
Frequency Range	5400~5850 MHz
HPBW (horizontal)	10°
HPBW (vertical)	10°
Dimensions	320 x 320 x 18mm
Physical & Interface	
Ethernet	10/100 Base T x 1 Auto-sense, Negotiation
RS-232	YES (in RJ45 form factor)
USB	N/A
Buzzer	Signal Indication
Reset Pin	Reset system to factory default
Enclosure & Environment	
External Antenna Connector	N-Type (R2 unit only)
Enclosure	IP-67 (Die-Casting) Level 7 Waterproof Level 17 Beaufort Scale Vent design Antenna Flexibility
Mounting	Pole Mount (ADC-12 Aluminum alloy)

Temperature	-30 ~ 70 °C (Operating)
PCBA Dimensions	160 x 135 mm
Weight	2.4 Kg
Humidity	10~95% (Operating)
Regulation Compliance	
FCC	Radio Requirement: FCC Part 15, Subpart C
	EMI Requirement: FCC Part 15, Subpart B, Class B
CE	Radio Requirement: EN 301 893 V1.4.1 (2007-02)
	SAR Requirement: EN 50385:2002
	EMC Requirement: EN 301 489-1 V1.8.1 (2008-04), EN 301 489-17 V2.1.1 (2009-05)
	Safety Requirement: EN 60950-1:2001+A11:2004

The product specifications are subject to change without prior notice.

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