PRODUCT DESCRIPTION

Aviat Networks WTM 3100
ALL OUTDOOR PACKET MICROWAVE RADIO SYSTEM

RELEASE 1.0

260-668220-001

September 2012

WTM 3100 Product Description Copyright and Terms of Use

August 2012

This documentation incorporates features and functions provided with WTM 3100.

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Document Revision:

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Corporate Headquarters California, USA	International Headquarters Singapore
Aviat Networks, Inc. 5200 Great American Parkway Santa Clara, California 95054 U. S. A. Phone: + 1 408 567 7000 Fax: + 1 408 567 7001 Toll Free for Sales Inquiries: + 1 888-478-9669	Aviat Networks (S) Pte. Ltd. 17, Changi Business Park Central 1 Honeywell Building, #04-01 Singapore 486073 Phone: +65 6496 0900 Fax: + 65 6496 0999 Sales Inquiries: +1-321-674-4252

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Phone: +1 210 561 7400 Toll-free in US: +1 800 227 8332 Fax: +1 408 944 1683	Hamilton: +44 (0) 16 98 717 230 Paris: + 33 (0) 1 77 31 00 33 Fax: +44 1698 717 204	Phone: +63 45 599 5192 Fax: +63 45 599 5196
TAC.AM@aviatnet.com	TAC.EMEA@aviatnet.com	TAC.APAC@aviatnet.com

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 Czech Republic	Aviat Networks tímto prohlašuje, že tento WTM 3100 je ve shodě se základními požadavky a dalšími příslušnými ustanoveními směrnice 1999/5/ES.
 Denmark	Undertegnede , Aviat Networks erklærer herved, at følgende udstyr WTM 3100 overholder de væsentlige krav og øvrige relevante krav i direktiv 1999/5/EF.
 Germany Austria Switzerland Belgium  Luxembourg Netherlands Liechtenstein	Hiermit erklärt , Aviat Networks dass sich das Gerät WTM 3100 in Übereinstimmung mit den grundlegenden Anforderungen und den übrigen einschlägigen Bestimmungen der Richtlinie 1999/5/EG befindet.
 Estonia	Käesolevaga kinnitab , Aviat Networks seadme WTM 3100 vastavust direktiivi 1999/5/EÜ põhinõuetele ja nimetatud direktiivist tulenevatele teistele asjakohastele sätetele.
 United Kingdom Ireland Malta	Hereby, Aviat Networks declares that WTM 3100 is in compliance with the essential requirements and other relevant provisions of Directive 1999/5/EC.
 Spain	Por medio de la presente Aviat Networks declara que el WTM 3100 cumple con los requisitos esenciales y cualesquiera otras disposiciones aplicables o exigibles de la Directiva 1999/5/CE.
 Greece Cyprus	ΜΕ ΤΗΝ ΠΑΡΟΥΣΑ, Aviat Networks ΔΗΛΩΝΕΙ ΟΤΙ WTM 3100 ΣΥΜΜΟΡΦΩΝΕΤΑΙ ΠΡΟΣ ΤΙΣ ΟΥΣΙΩΔΕΙΣ ΑΠΑΙΤΗΣΕΙΣ ΚΑΙ ΤΙΣ ΛΟΙΠΕΣ ΣΧΕΤΙΚΕΣ ΔΙΑΤΑΞΕΙΣ ΤΗΣ ΟΔΗΓΙΑΣ 1999/5/ΕΚ.
 France Luxembourg Switzerland Belgium	Par la présente, Aviat Networks déclare que l'appareil WTM 3100 est conforme aux exigences essentielles et aux autres dispositions pertinentes de la directive 1999/5/CE.
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 Portugal	Aviat Networks declara que este WTM 3100 está conforme com os requisitos essenciais e outras disposições da Directiva 1999/5/CE.
 Slovenia	Aviat Networks izjavlja, da je ta WTM 3100 v skladu z bistvenimi zahtevami in ostalimi relevantnimi določili direktive 1999/5/ES.
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 Finland	Aviat Networks vakuuttaa täten että WTM 3100 tyyppinen laite on direktiivin 1999/5/EY oleellisten vaatimusten ja sitä koskevien direktiivin muiden ehtojen mukainen.
 Sweden	Härmed intygar Aviat Networks att denna WTM 3100 står I överensstämmelse med de väsentliga egenskapskrav och övriga relevanta bestämmelser som framgår av direktiv 1999/5/EG.
 Iceland	Hér með lýsir Aviat Networks yfir því að WTM 3100 er í samræmi við grunnkröfur og aðrar kröfur, sem gerðar eru í tilskipun 1999/5/EC.
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 România	Noi, Aviat Networks, declarăm pe propria noastră răspundere că produsul WTM 3100 este în conformitate cu cerinţele esenţiale şi celelalte prevederi aplicabile ale Hotărârii Guvernului nr.88/2003 (R&TTE) sau ale Directivei 1999/5/EC (R&TTE)

INTENDED USE

The WTM 3100 radio is classified under the R&TTE Directive 99/5/EC as a class 2.8 radio (microwave fixed link) product.

Band (GHz)	Austria	Belgium	Bulgaria	Cyprus	Czech Republic	Denmark	Estonia	Finland	France	Germany	Greece	Hungary	Iceland	Ireland	Italy	Latvia	Lithuania	Luxembourg	Malta	Netherlands	Norway	Poland	Portugal	Romania	Slovak Republic	Slovenia	Spain	Sweden	Switzerland	United Kingdom
07	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X	X	X
13	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
15	X	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
18	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
23	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
38	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X

Table 1-1; Country Availability Matrix

Aviat Networks intends to market this product where a ‘X’ is shown.

It should be noted that a license to operate this equipment is likely to be necessary, and the appropriate regulatory administration should be contacted.

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RF EXPOSURE GUIDELINES FOR WTM 3100

The following MPE (maximum permissible exposure) calculations have been produced in accordance with the guidelines of EN 50383/EN 50385. These calculations represent the maximum conducted output power and the maximum antenna gain, by frequency range. These calculations are based on the exposure requirements for the general public.

Frequency Range	Minimum Compliance distance (meters)	TX conducted power	Antenna Gain
7.125 – 7.9 GHz + 7.725 – 8.5 GHz	6.03 m	+25.5 dBm	41.1 dBi
12.75 – 13.25 GHz	8.42 m	+24.0 dBm	45.5 dBi
14.4 – 15.35 GHz	9.45 m	+24.0 dBm	46.5 dBi
17.7 – 19.7 GHz	7.0 m	+19.5 dBm	48.4 dBi
21.2 - 23.632 GHz	8.32 m	+19.5 dBm	49.9 dBi
37.0 – 39.46 GHz	4.12 m	+17.5 dBm	45.8 dBi

Table 2: WTM 3100 Maximum Permissible Exposure Values

WEEE DIRECTIVE

In accordance with the WEEE Directive (2002/96/EC), WTM 3100 is marked with the following symbol:

This symbol indicates that this equipment should be collected separately for the purposes of recovery and/or recycling.

For information about collection and recycling of Aviat Networks equipment please contact your local Aviat Networks sales office. If you purchased your product via a distributor please contact the distributor for information regarding collection and recovery/recycling.

More information on the WEEE Directive is available at our website:

http://www.aviatnetworks.com/products/compliance/weee/

(WEEE is the acronym for Waste Electrical and Electronic Equipment)

ROHS DIRECTIVE

The RoHS (Restriction of Hazardous Substances) Directive (2002/95/EC) was implemented on 1 July, 2006. WTM 3100 meets the requirements of this directive.

CONTENTS

1. INTRODUCTION

This document provides technical information about the WTM 3100. Use this document as a reference for information about the WTM 3100, and with the *WTM 3100 User Manual* for installation, commissioning and maintenance.

This document provides the following information:

- System description with reference to hardware and software implementation
- Physical composition and configurations
- ETSI compliant technical specifications
- Documentation and supporting tools
- Maintenance

Aviat Networks is ISO90001:2008 and TL9000 Certified. Full certification means all departments and business units within Aviat Networks have been strictly assessed for compliance to both standards. It testifies that Aviat Networks is a certified supplier of products, services and solutions to the highest ISO and Telecommunication standards available.

This document and its content apply to the following products and SW versions of the WTM 3100 product line.

Product Line	Model Number	Comment
WTM 3100	W3100-07 W3100-13 W3100-15 W3100-18 W3100-23 W3100-38	WTM 3100, 07 GHz, Terminal WTM 3100, 13 GHz, Terminal WTM 3100, 15 GHz, Terminal WTM 3100, 18 GHz, Terminal WTM 3100, 23 GHz, Terminal WTM 3100, 38 GHz, Terminal

Table 1-1; WTM 3100 Product models

Title	Part Number	Comment
1.0.1 SW version	W3100-SWP-1-0	WTM 3100 Software package, version 1.0.1

Table 1-2: WTM 3100 releases

2. SYSTEM DESCRIPTION

The Aviat Networks WTM 3100 is an all outdoor packet-microwave radio operating in licensed frequency bands from 7 to 38 GHz with channel sizes from 7 to 56 MHz. Suitable for connecting locations up to ~50km apart, the WTM 3100 will deliver up to 360 Mbit/s of Ethernet capacity on a single port. It is designed to meet Carrier Ethernet transport requirements and provides operators with an economic solution for basic microwave networking applications.

Figure 2-1; WTM 3100 housing, top

Simple Design, Simple Deployment

Deployment of the WTM 3100 is straightforward and time-efficient. The combined benefits of an integrated antenna mount, easy access connectors (ports) and a user friendly browser-based configuration tool (ePortal) means the WTM 3100 can be deployed rapidly for new sites in your network, especially sites with severe space restrictions.

Ethernet Interoperability and Operation

The WTM 3100 can be deployed in a variety of Ethernet or Carrier Ethernet applications to connect packet switches, routers or specialized IP enabled platforms such as 4G mobile RAN. It operates as a transparent Ethernet bridge and can be deployed in chain, ring, star or mesh topologies.

The WTM 3100 also provides operators with a clear demarcation between the Ethernet transport (microwave) and the switching layer of the network, enabling rapid fault isolation and optimizing the mean time to repair (MTTR).

Networks and Applications

The WTM 3100 complements Aviat Network's all-indoor and split-mount microwave networking portfolio.

It provides an optimized solution for operators that face the challenge of extending their networks to increasingly small all-outdoor sites in order to serve the growing demand for IP-based applications and services. Deployment scenarios for the WTM 3100 include:

- Mobile RAN networks: Backhaul for access sites with 3/4G base-stations
- Rural and urban xDSL networks: High capacity connections to micro exchanges
- Fixed line access networks: Broadband connections for enterprise customers
- Electric SmartGrid networks: Sub-station interconnect
- Public safety and security networks: Backhaul for land mobile radio (e.g. Tetra or P.25)
- Oil and gas networks: High capacity connections to field and pipeline infrastructure

Lowering the Total Cost of Ownership

Aviat Networks has a long established track record of delivering high quality products empowering operators to optimize their capital and operational costs. The WTM 3100 builds on this heritage, providing operators with an exceptionally good value entry level packet-microwave networking solution.

Key Features

- All outdoor zero footprint packet-microwave solution for space restricted sites
- Antenna integration options: Direct Mount (Slip Fit) – up to 1.8 m and Remote Mount using flex/fixed waveguide
- Single-port Carrier Ethernet transport, delivering up to 360 Mbit/s throughput per link (symmetrical) with QoS and synchronous Ethernet support
- Operates in licensed frequencies from 7 GHz to 38 GHz and with ETSI channels ranging from 7 MHz to 56 MHz
- Full range of adaptive modulation steps from 4 QAM to 256 QAM for optimal link design and antenna sizing
- Link configurations: Point to point only, Non protected (1+0, NP) and Protected hot standby (1+1 HSB)
- High quality environmentally hardened (IP65) outdoor enclosure with ePortal local/remote access for configuration and maintenance support
- Full integration with ProVision EMS for terminal, link and network level management
- Power options include PoE injectors (110/220 AC, -48 VDC and -24 VDC) for single cable deployment and direct -48 VDC power for dual cable deployment
- Topologies supported: chain, star, ring and mesh

2.1. EQUIPMENT ARCHITECTURE

2.1.1. GENERAL SYSTEM BLOCK DIAGRAM

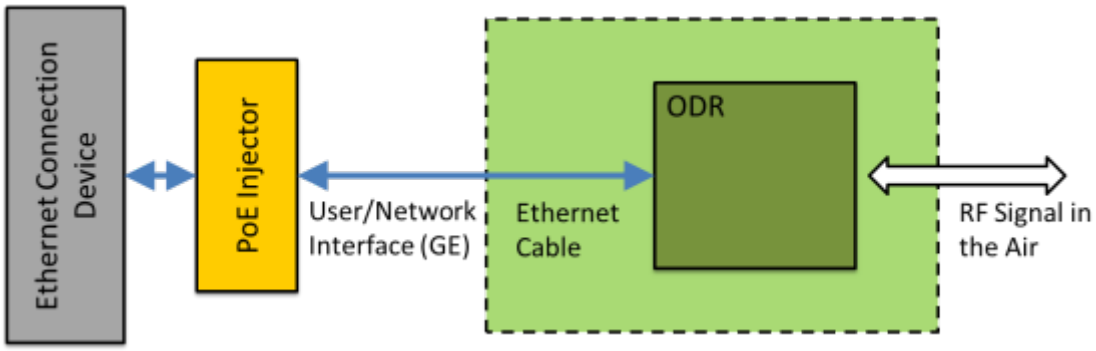


Figure 2-2; WTM 3100 System Configuration, powered over PoE injector

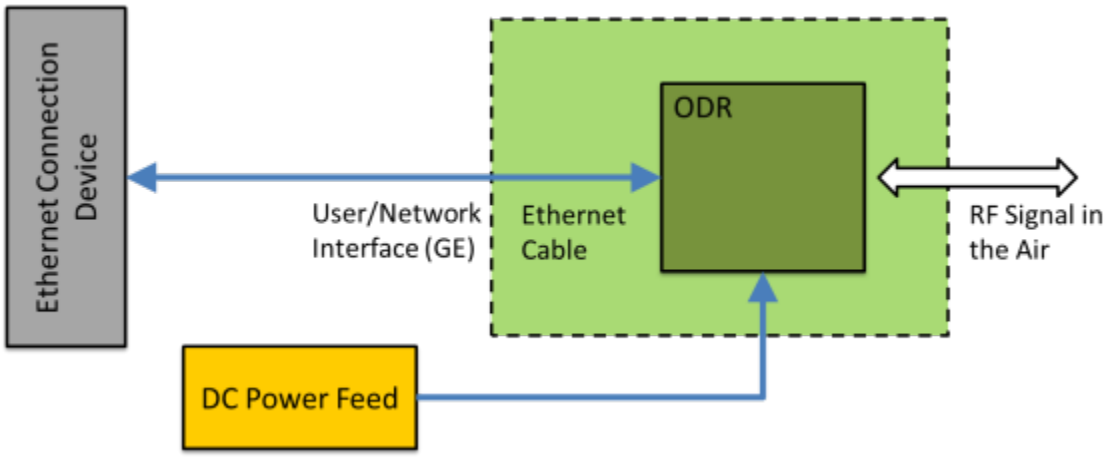


Figure 2-3; WTM 3100 System Configuration, powered over -48 VDC power feed

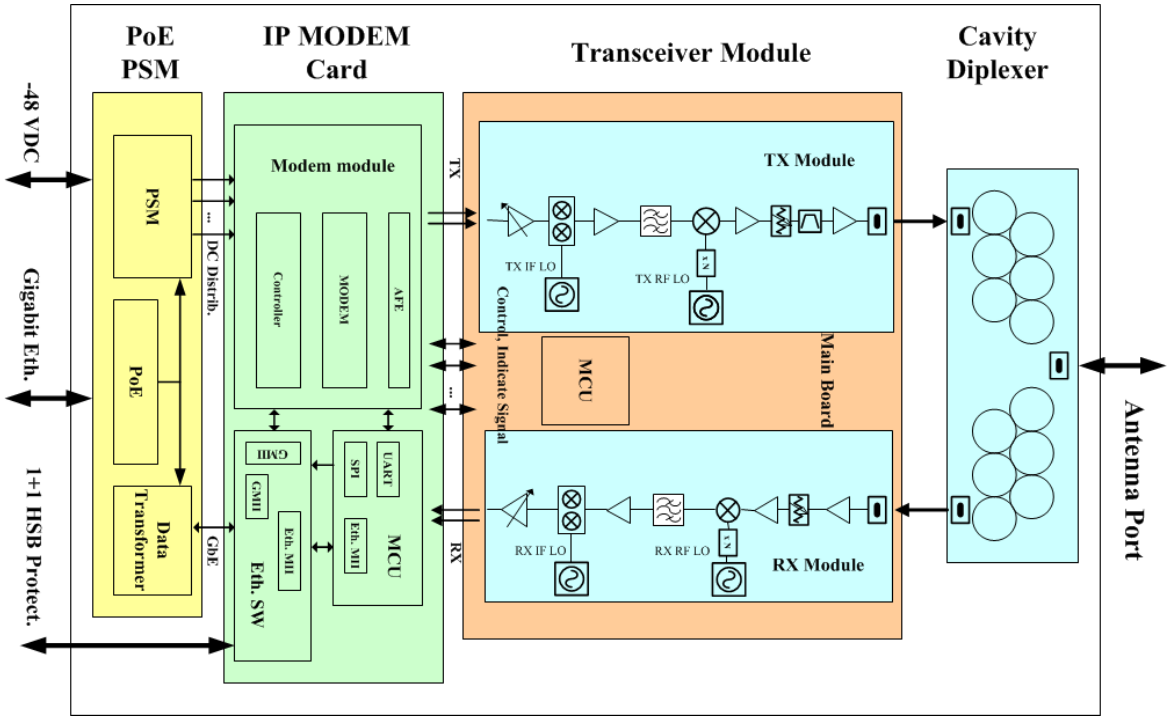


Figure 2-4: WTM 3100 Block Diagram

The WTM 3100 ODR consists of the following blocks: DC module, modem card, transceiver module and diplexer. Each module serves specific functions. DC module supplies DC voltage and current for all other modules. The modem transforms Ethernet packets to baseband signals which are modulated in the range from 4 QAM to 256 QAM. The transceiver works with different frequency bands. It combines baseband signal and local oscillation signal with carrier frequencies from 7 GHz to 38 GHz. The diplexer separately connects the transmitted and received signals between transceiver and antenna.

2.1.2. MODEM CHARACTERISTICS

The modem supports LDPC (Low Density Parity Check) coding and ACM function.

Various modulation schemes (4 QAM, 16 QAM, 64 QAM, 128 QAM, 256 QAM) and selectable bandwidth options (7 MHz, 14 MHz, 28 MHz, 56 MHz) provide choices of different throughput options for multiple types of network configurations.

2.1.3. POWERING OPTIONS

Two options are available for powering the unit. The first one is powering with a PoE injector. The PoE injector injects the DC power into the Ethernet cable. The second option uses the Direct -48 VDC power interface to power the ODR.

PoE injector

The WTM 3100 operates with an external PoE injector, which injects the DC power into an Ethernet cable and delivers it to the ODR. If this option used, the WTM 3100 is powered by an external PoE injector. The DC power is injected into the Ethernet cable and delivered to the ODR. The PoE injector provides both data and power over a single cable. The ODR therefore does not require a separate DC power cable.

PoE injector provides both data connection and power supply over a single cable. The ODR does not require separate cabling.

Following PoE injector options are supported:

- 110~220 VAC POE; fully supported, works with up to 100 meters Ethernet cable
- -48 VDC POE; fully supported, works with up to 100 meters Ethernet cable
- 24 VDC (18~36 VDC) POE; limited support, works with up to 80 meters Ethernet cable dou to high bit error rate.

The PoE injector enables DC power to be injected safely per IEE802.3at standard including PSE (power source equipment) and PD (powered device) components. PoE injector(PSE) has detection circuitry to poll if the remote ODR (PD) had well connected at initial powering stage and then decide to deliver DC power or not. After powering ODR, PoE injector (PSE) starts to monitor if over-current situation occurs and then starts protection process.

Direct -48 VDC Power Feed

N-type female interface on the ODR is used to connect -48 VDC power source and to power the ODR.

The input DC voltage range is from -37 VDC to -57 VDC. The DC voltage is supplied to use the coaxial cable with N-type connector. The benefit of deploying this powering option is that the user doesn't need to acquire an extra PoE injector. This results in reduced deployment cost.

Note: Powering the ODR over the DC connector does not provide current protection, so external current protection is needed at the power supply side.

Warning: When the Direct - 48 VDC power interface is used, do not short any of the Ethernet connection to an external ground. Otherwise it may cause damage to the ODR.

For more details about technical specification refer to chapter 5.1.

2.1.4. ETHERNET CABLE

A ruggedized outdoor Ethernet cable is used to connect Ethernet connection devices (ECD) with the WTM 3100. Cable types can be Mdi (Straight) or MdiX (Crossover) Category 5e. The cable with

RJ45 connector is connected at ODR side to the 10/100/1000 Base-TX port and at IDU side to the POE injector or to ECD directly when ODR is powered over Direct -48 VDC power feed.

Cable type:

- S/FTP Cat5e RJ45 cable, Belden 7921A or equivalent
- Operation temperature: - 40 ~ +75 °C

Also, higher category outdoor cables (Cat6) can be used.

For more details about technical specification refer to chapter 5.2.

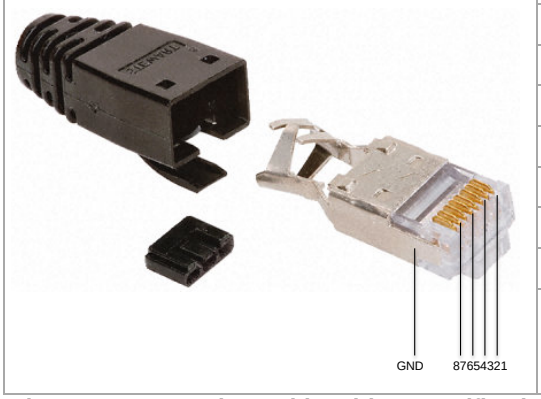
2.1.5. PROTECTION CABLE

The 1+1 HSB protection connection between two paired units is enabled with a specially wired Ethernet cable.

The cable type is:

- S/FTP Cat5e RJ45 cable, Belden 7921A or equivalent
- Operation temperature: - 40 ~ +75 °C

Cable wiring for 1+1 HSB Protection cable is as follows:



Pin	RJ45 Shielded Connector A	RJ45 Shielded Connector B
1	white/orange stripe	white/green stripe
2	orange solid	green solid
3	white/green stripe	white/orange stripe
4	blue solid	white/brown stripe
5	white/blue stripe	brown solid
6	green solid	orange solid
7	white/brown stripe	blue solid
8	brown solid	white/blue stripe
9	GND	GND

Figure 2-5: Protection Cable Wiring Specification

2.2. SYSTEM CONFIGURATIONS

2.2.1. 1+0 NON PROTECTED LINK CONFIGURATION WITH POE

An example of WTM 3100 1+0 NPL deployment with POE injector is shown below. A simple, one cable connection of ODR and PoE injector is used to deploy data link between two remote locations.

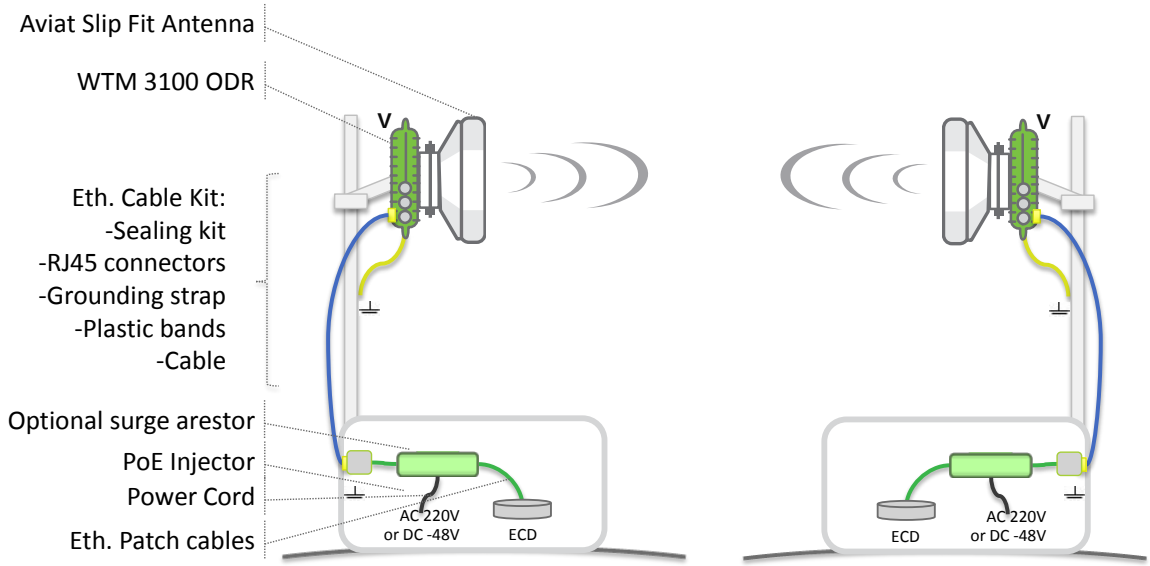


Figure 2-6: 1+0 Non Protected Configuration with PoE injector powering

2.2.2. 1+0 NON PROTECTED LINK CONFIGURATION WITH DIRECT -48 VDC POWER

An example of WTM 3100 1+0 NPL deployment with direct -48 VDC powering is shown below. Dual cable deployment is used, a simple connection of ODR and ECD and connection between -48 VDC.

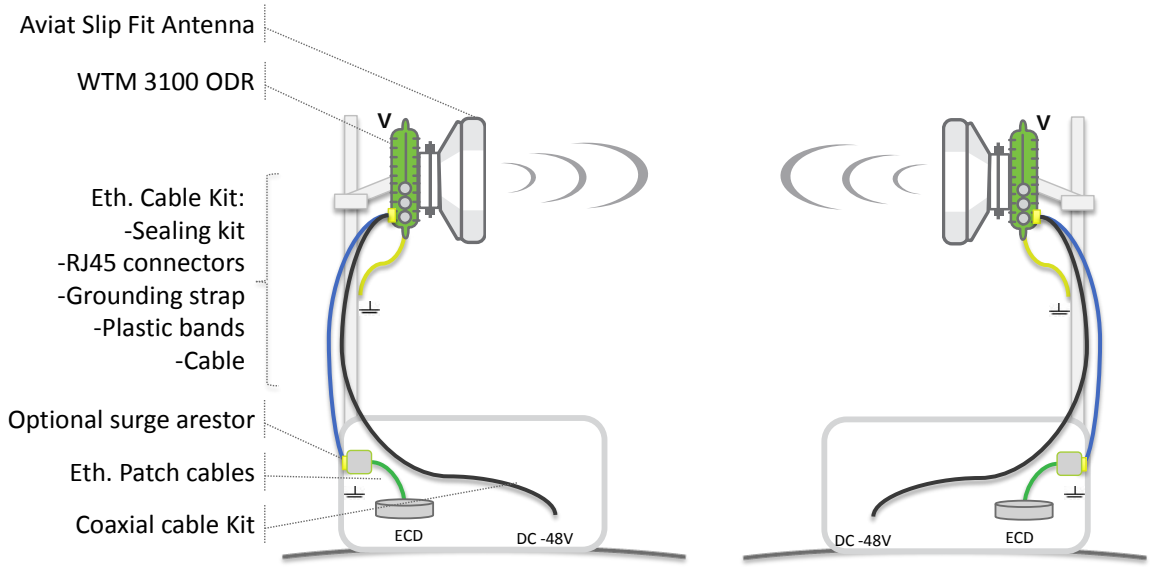


Figure 2-7: 1+0 Non Protected Configuration with direct -48 VDC powering

2.2.3. 1+1 HSB PROTECTED LINK CONFIGURATION WITH POE

WTM 3100 ODR can be deployed as 1+1 hot standby (1+1 HSB) protected link with powering over POE injector.

At this configuration, the upper left and lower left ODRs are paired as well as upper right and lower right ODRs, refer to Figure 2-8.

In a normal situation, one ODR (active unit) is responsible for transmitting data. Meanwhile, the other paired unit, named as standby unit, constantly monitors the performance of the active unit and replaces the role of transmitting data if an alarm occurs on the active unit.

ODR will turn off the Tx transmission when in stand-by mode. The protection cable will send a control signal to switch the operation mode between the protected ODR after the Microcontroller Unit (MCU) receives a severe alarm message (i.e. PA alarm, Synthesizer unlock alarm or Air frame loss alarm).

No special protocols need to be enabled on the relevant Ethernet ports of the ECD. As soon as a protection switch happens, the indoor ECD will update its forwarding table to pass on frames on the alternate port. Interworking with RTPC is also possible.

For carrier Ethernet networks, the G.8031 ELPS protocol can be enabled on the ECD. Only the unidirectional switching mode, that doesn't require the APS channel, can be enabled because the protection transport entity is not always available.

There are different MAC addresses for each ODR at 1+1 HSB configuration.

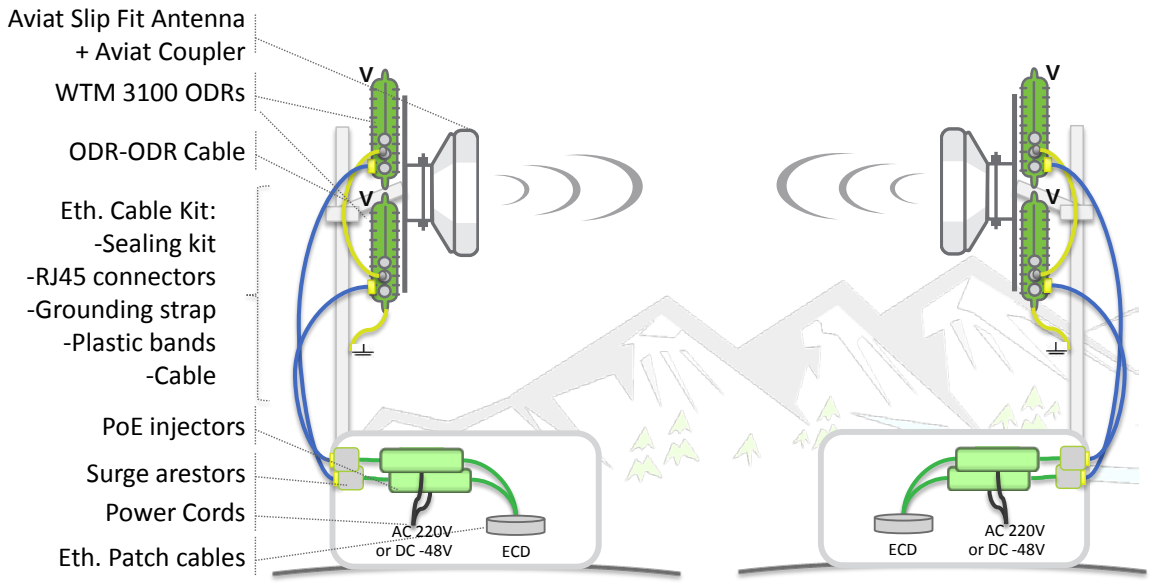


Figure 2-8: 1+1 HSB Protected Link Configuration with POE injector powering

2.2.4. 1+1 HSB PROTECTED LINK CONFIGURATION WITH DIRECT -48 VDC POWER

WTM 3100 ODR can be deployed as 1+1 hot standby (1+1 HSB) protected link, directly powered over -48 VDC.

This configuration requires 4 cables at each side of the link. For more details about the operation refer to previous section, 2.2.3.

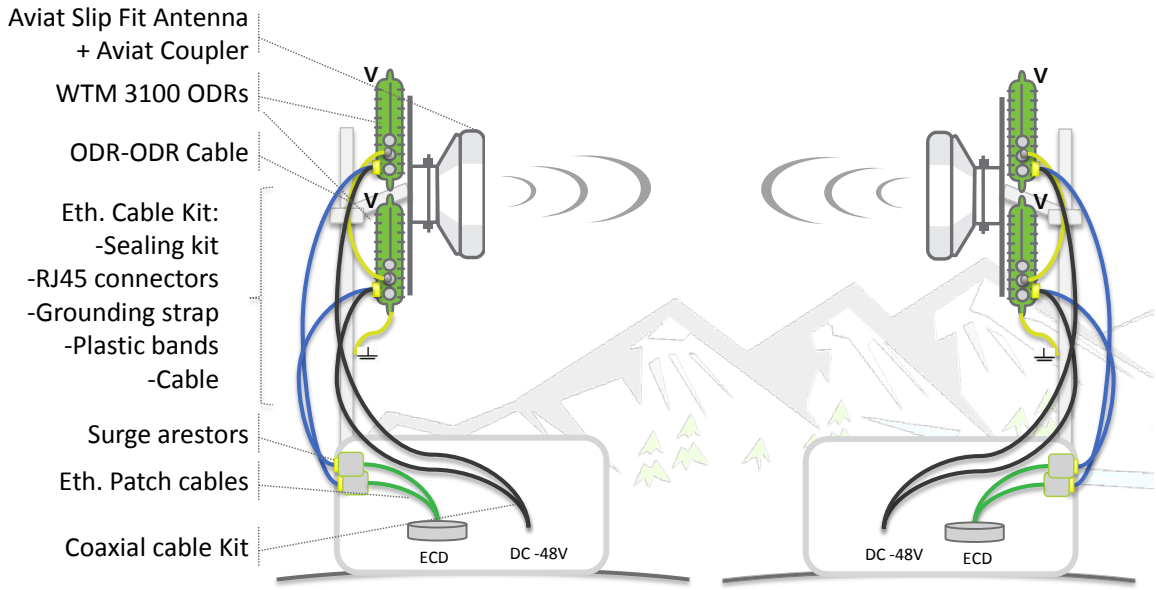


Figure 2-9: 1+1 HSB Protected Link Configuration with direct DC powering

2.3. RADIO TRANSMISSION; FREQUENCY, BANDWIDTH & TRANSMIT POWER

2.3.1. FREQUENCY AGILITY

WTM 3100 offers several frequency options from 7 to 38 GHz regulated by ETSI. A user can manually configure transmitting frequency and automatically configure the received frequency. Detailed Frequency band, range, and T-R spacing are listed in the WTM 3100 Tuning Guide.

The operating RF channel (transmitter and receiver frequency) is selected in ePortal. The step size is 250 kHz at all freq. bands.

Tx and Rx frequencies are linked by the T-R spacing value. Any change of Tx (Rx) frequency automatically involves the change of Rx (Tx) frequency according to the ODR T-R spacing, which is uniquely defined by the hardware product code of the unit. The end user can select the channel frequency (in MHz), of the Tx. The independent setting of Tx and Rx frequencies is not possible.

2.3.2. BANDWIDTH AGILITY

The radio channel bandwidth (Channel Spacing) can be set using the Radio Interface window of the ePortal at the following values: 7 MHz, 14 MHz, 28 MHz, 56 MHz (ETSI setting).

The performances of the system at each Channel Spacing are detailed in Section 4.6.

2.3.3. TRANSMIT POWER CONTROL; STATIC (RTPC) AND AUTOMATIC (ATPC)

Transmit power can be manually set in steps of 0.5 dB. A user configures the transmit power using either ePortal or ProVision. User can configure the remote unit through air channel to configure a suitable received power level. Furthermore, WTM 3100 also provides automatic transmit power control (ATPC). With the enabled ATPC function, the WTM 3100 automatically configures the transmitted power of each ODR to a specific level which is determined by the given margin value. Thus, each ODR always operates within an adequate received power level.

2.3.4. MODULATION AND ADAPTIVE MODULATION

WTM 3100 uses multiple modulations and channel capacity options. Lower modulations are able to withstand more difficult path conditions. User can manually configure the modulation by ePortal or ProVision at either local or remote site. WTM 3100 also provides the Adaptive Coding and Modulation (ACM) feature, which automatically changes the modulation according to the received signal quality.

ACM enables the changes of coding rate and modulation in real time according to the link conditions. This feature results in a significantly increased payload capacity and increased link availability. When the link SNR is sufficient, operation of all applications at full capacity is enabled. In case the link SNR drops significantly, the link capacity is reduced.

When this function is in use and the modulation switched to low modulation scheme, the QoS function drops lower priority throughput but still keeps higher priority throughput without change.

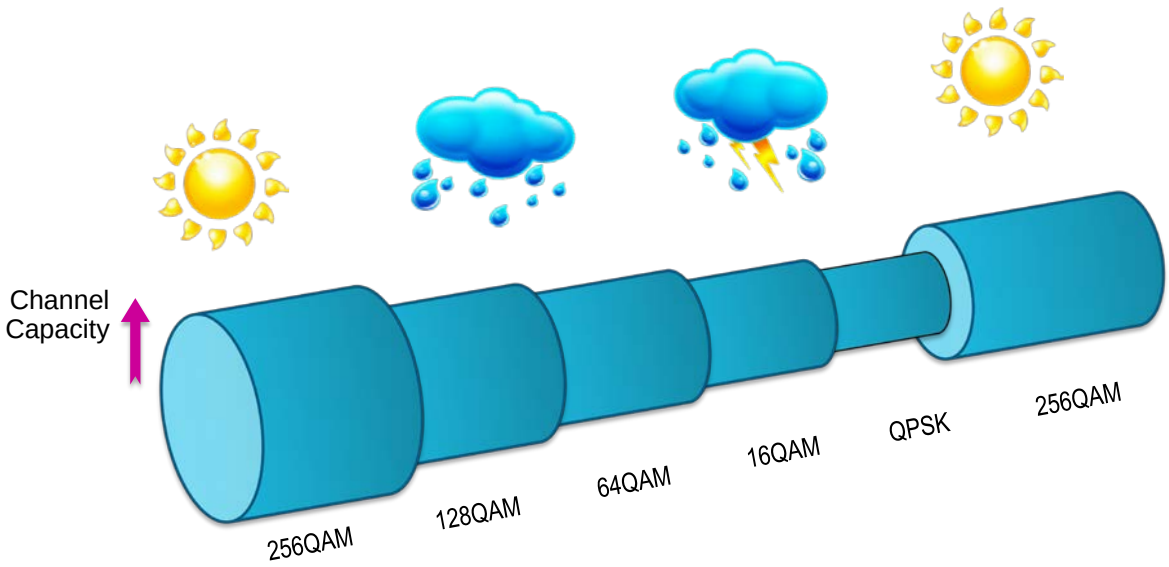


Figure 2-10; Supported Modulations

2.4. ETHERNET AND PAYLOAD FEATURES

2.4.1. ETHERNET SERVICES

As an IP-based radio which transmits data in packet form, WTM 3100 provides several Ethernet features: QoS, Sync-E, IEEE PTP 1588 (Limited support) and SNTP. The capacity of each bandwidth and modulation matrix is listed in section 4.6. WTM 3100 can transmit the data with air link speed up to 360 Mbit/s and 274 Mbit/s at L1 Ethernet throughput and 64 bytes packets.

2.4.2. QUALITY OF SERVICE

WTM 3100 provides four types of QoS mechanisms:

- 4x Strict Priority (SP)
- SP + 3x Weighted Round Robin (WRR)
- 2x SP + 2x WRR
- 4x WRR

When operating in the adaptive modulation mode, the QoS mechanism minimizes traffic loss and delays for the error-free high priority transmission traffic. Different mechanisms allow the user a more flexible configuration.

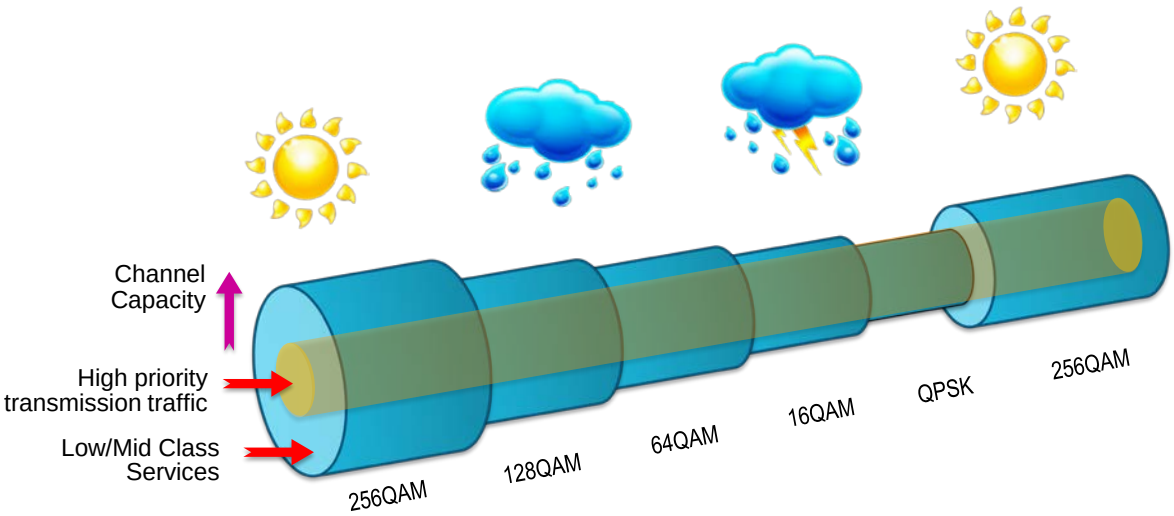


Figure 2-11: Adaptive Modulation as QoS Ensuring Mechanism

WTM 3100 provides a queue controller to enable advanced non-blocking, priority-based, output queue architecture with Resource Reservation. As a result, the embedded Ethernet switch supports definable frame latencies with guaranteed frame delivery for high priority frames. It helps avoiding the head-of-line blocking problems or non-blocked flow disturbances in any congested environment and for all frame priorities.

Four QoS policies are supported: “4SP”, “1SP+3DWRR”, “2SP+2DWRR” and “4DWRR to set the scheduling. To activate a different policy, user has to enable different queues to implement the QoS policy. Additionally, for some policies with DWRR, user can set the queue weight as follows.

- 4SP
  For this policy, in QoS ePortal pages user should use queues 0, 1, 2 and 3 in QoS.
- 1SP+3DWRR
  For this policy, in QoS ePortal pages user should use queue 0, 1, 2 and 7 and set weight for DWRR at queue 0, 1 and 2.
- 2SP+2DWRR
  For this policy, in QoS ePortal pages, user should use queue 0, 1, 6 and 7 and set weight for DWRR at queue 0 and 1.
- 4DWRR
  For this policy, in QoS ePortal pages, user should use queues 0, 1, 2 and 3 and set weight for DWRR at queue 0, 1, 2 and 3.

2.4.3. MANAGEMENT TRAFIC PRIORITIZATION

A dedicated VLAN with highest priority can be assigned to the Management traffic. The Management VLAN is used to separate the management and payload traffic data via dedicated VLAN Identifier (VID). Only the ingress packets that have the same VID as Management traffic VLAN can access the ePortal. Management traffic VLAN can also set the priority mapping to the 802.1Q. The management traffic and payload traffic can be configured as different priority. The higher priority assures management packets wouldn't be dropped in case of heavy traffic and congestion.

2.5. EQUIPMENT CONTROL AND MANAGEMENT

2.5.1. MANAGEMENT INTERFACES

There are two software programs available to configure and monitor the WTM 3100 performance:

- ePortal
- ProVision NMS

Moreover, users can measure the received power level by measuring the RSSI Auto Gain Controller (AGC) output.

2.5.2. SYSTEM MANAGEMENT BY EPORTAL

The ePortal enables easy access to the ODR using any web browser. Preferred browsers are Microsoft IE and Mozilla Firefox. Users don't need to install any 3rd party application software in order to access the ePortal.

The ePortal is the browser based configuration tool for WTM 3100. It offers complete control over all functions of the ODR. The ePortal shows the following general information:

- Account page - allows the user to modify the user name and password
- Log Message page - records event and failure logs
- Setting pages - used for modifying the system configuration
- Status pages – allows the user to monitor the current performance of radio and Ethernet interfaces

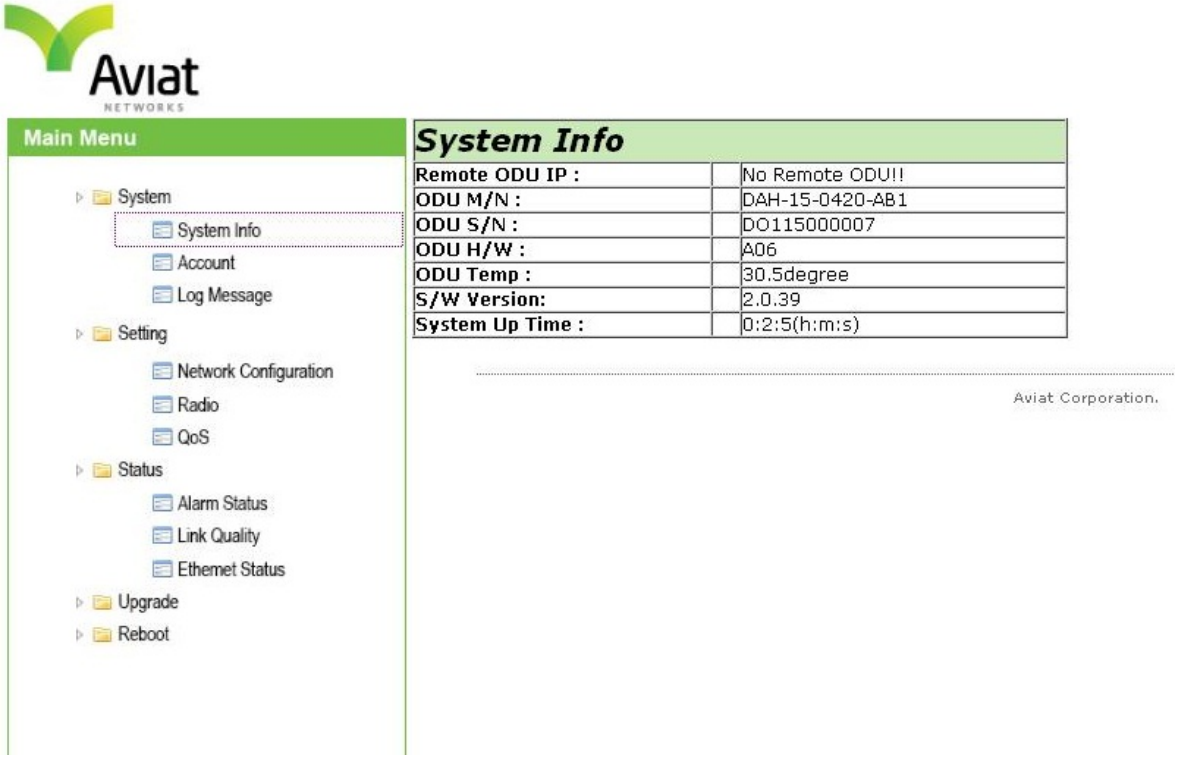


Figure 2-12: ePortal

2.5.3. SYSTEM MANAGEMENT BY PROVISION NMS

ProVision is an alternative for monitoring and configuring the WTM 3100 ODR. It operates with an SNMP-based interface. Every item that is visible in ePortal can be also found and configured in ProVision. Furthermore, WTM 3100 also provides information about traps that are received by the ProVision SNMP trap server.

2.5.4. ALARMS AND MONITORING

Alarms are displayed in two ways – as alarms indicators in the ePortal or as SNMP traps sent to ProVision or the MIB browser. User can check the alarm status in ePortal. The alarm status is displayed by the lights on the “Alarm Status” page in the ePortal. ProVision or MIB browser can be used to catch the traps sent by the SNMP protocol. Detailed alarm descriptions are listed in the table below.

Alarm	Description	SNMP Trap value
Modem	Modem alarm indicates the demodulator status. It turns green after the modem gets locked.	0: Normal 1: Alarm
RXLO1	RXLO1 alarm indicates a failure on the IF and RF synthesizer of receiver. It turns green if the oscillator is locked. Any malfunction of the synthesizer makes it unlocked and the alarm turns red.	0: Normal 1: Alarm

TXLO1	TXLO1 alarm indicates a failure of transmitter IF and RF synthesizer. It turns green if the oscillator is locked. Any failure on synthesizer makes it become unlocked and the alarm turns red.	0: Normal 1: Alarm
TXPowerAlarm	TXPowerAlarm is an indicator of power amplifier performance in the XCVR. It turns green when the amplifier is turned on and operating normally. If the applied voltage is abnormal or the connection between XCVR and MCU is lost, the alarm turns red.	0: Normal 1: Alarm
Airlossalarm	Airlossalarm indicates the loss of modem lock. The status is green if the modem is locked. This alarm can also join the modem alarm, it turns green up if a strong co-channel interference occurs.	0: Normal 1: Alarm
SyncE_Lock	SyncE_Lock alarm indicates the active status of Synchronous Ethernet. If the Sync-E function is successfully enabled, it turns green. When not enabled, the enable Sync-E function it is turned red.	0: Normal 1: Alarm
Link_Alarm	Link_Alarm is an indicator of Ethernet cable connection. If the RJ45 connector is properly linked to an active device, ECD or PC, the indicator turns green.	0: Normal 1: Alarm

Table 2-1: Alarm Description List

2.6. SYNCHRONOUS ETHERNET (SYNC-E) FEATURES

Unlike time-division multiplexing (TDM) networks, the Ethernet transmission does not include clock synchronization information. Synchronous Ethernet and Precision Time Protocol (IEEE 1588) are two clock synchronizing mechanisms for Ethernet. Carrier Ethernet services require synchronized clocks to fit into traditional TDM & synchronous optical networking systems.

WTM 3100 supports operation within a Synchronous Ethernet Network by allowing the clock propagation from one terminal of the link to the other (Clock Transparency). The clock information is transported on the radio link. It locks the symbol rate of the modulating signal (Tx) of the RF carrier to the clock-in from the network. On the receiver side, the clock-out to the network is locked to the symbol rate demodulated by the receiver.

The Clock Transparency can be configured by the operator. There are two working modes, according to user interface configuration either as GE or FE.

Holdover condition is entered every time the radio link is not operational or demodulator is unable to lock to the incoming radio signal.

When Sync-E is enabled, the clock specifications are compliant with QL-EEC1 and are summarized in Table 2-3.

2.6.1. ODR CLOCK TRANSPARENCY WITH POE INJECTOR OPERATING AS GE

The feature allows the GE clock to be propagated from one terminal of the link (Clock-In) to the other (Clock-Out) as shown in Figure 2-13.

The PoE GE interfaces of the two ODR have to be configured as:

- Slave at the side from where the clock is received
- Master at the side to where the clock is distributed.

The symbol rate of the RF carrier is locked to the in-GE clock in both Master and Slave sides, while the clock recovered from the symbol rate of the received RF signal drives the out-GE clock on the Master side in normal operating conditions.

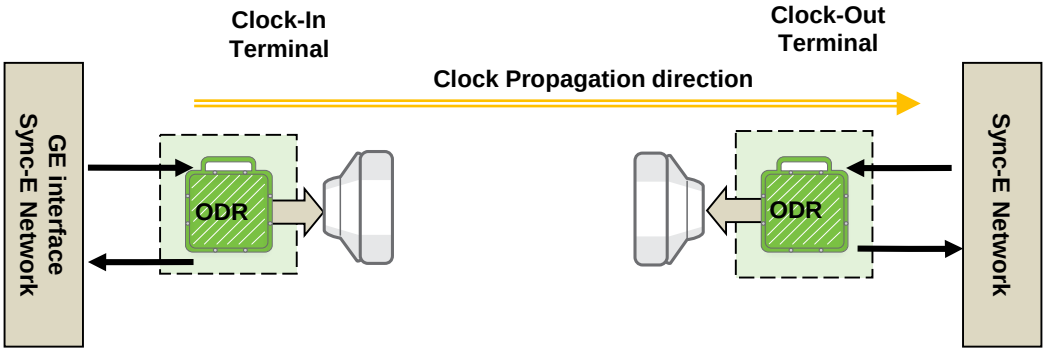


Figure 2-13; Clock Transparency on the ODR (GE)

- Slave: Equipment configured as Slave recovers the clock from the incoming Ethernet physical signal and uses that clock both to clock the outgoing Ethernet signal and the transmitted radio bit stream.
- Master: Equipment configured as Master recovers the clock from the incoming radio bit stream and uses that clock for the outgoing Ethernet.

The HW configurations to be set in different cases are summarized in Table 2-2.

PoE Interface	Clock transparency	PHY Device Configuration
GE	Disabled	GE Master/Slave auto mode
	Enabled Ck In	GE Master/Slave manual mode and forced to Slave
	Enabled Ck Out	GE Master/Slave manual mode and forced to Master
FE	All	FE

Table 2-2; Timing Configurations on the ODR

2.6.2. ODR CLOCK TRANSPARENCY WITH POE INJECTOR OPERATING AS FE

If the PoE injector interface is configured as FE, the clocks of the In and Out signals are independent. Therefore in such case both ODRs must:

- Lock the Tx symbol rate on the RF signal to the In-FE signal
- Lock the Out-FE signal to the recovered symbol rate of the RF signal.

The clock is propagated bi-directionally in both directions even if under normal conditions only one clock propagation direction is useful (see Figure 2-14).

The HW configurations are shown in Table 2.4.

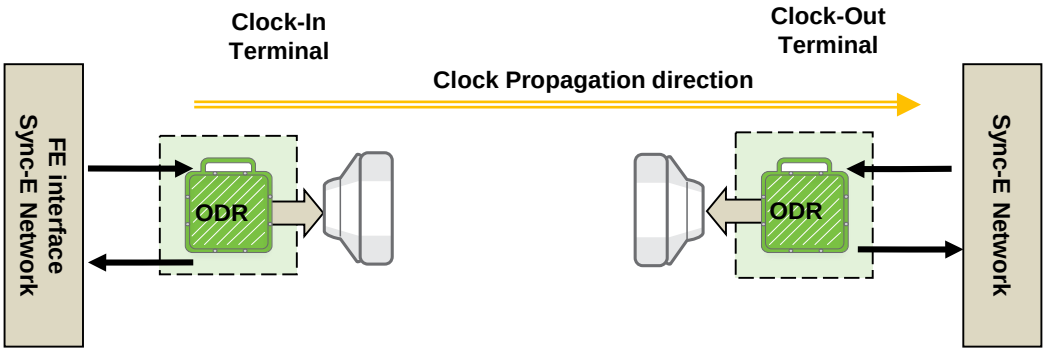


Figure 2-14; Clock Transparency on the ODR (FE)

2.6.3. CLOCK SPECIFICATIONS

When Sync-E operation is disabled the clocks associated with the GE or FE PoE injector interface comply with standard requirements of IEEE 802.3.

When Sync-E is enabled, the clock specifications are compliant with QL-EEC1 and are summarized in Table 2-2.

Frequency accuracy vs. PRC (Primary reference Clock)	± 4.6 ppm (over 365 days period)
Pull-in range (input freq. change tolerance)	± 4.6 ppm
Frequency drift due to aging during holdover	0.05 ppm/day
Frequency drift due to temperature during holdover	2.5 ppm
Wander generated @ output in 1000 s (15 min)	150 ns

Table 2-3; Clock Specifications with Sync-E enabled

LIMITATION according to ITU-T G.8262 section, both free-run and holdover is not compliant since current system TCXO is not STIII type.

With current software version wander transfer can work only with wander input less than 6Hz with new software version this limitation will be removed. Next software version will support higher than 6 Hz.

2.6.4. SYNC-E ALARMS AND MONITORING

When Sync-E is enabled, the Clock recovered from the received symbol rate on the radio link is monitored. It is used to synchronize the GE/FE Clock out of the PoE injector or ECD interface only when the radio link is operating correctly (no demodulator alarm).

When a demodulator alarm is On, the ODR enters the Holdover state and the generated frequency at its output is frozen to the actual current value, being locked to the associated (Temperature

Compensate X\'tal (crystal) Oscillator) TCXO, until the demodulator alarm goes off and the normal operation restart.

2.6.5. SSM MANAGEMENT

SSM messages possibly transmitted on the Network Interface are transparently transported by the system.

WTM 3100 supports default clock quality and is set at 11 according to SEC, Option 1.

EEC-Option 1; applies to synchronous Ethernet equipment that is designed to interwork with networks optimized for the 2048-kbit/s hierarchy.

EEC-Option 2; applies to synchronous Ethernet equipment that is designed to interwork with networks optimized for the 1544-kbit/s hierarchy.

SEC; ITU-T Rec. G.813, “Timing Requirements of SDH Equipment Slave Clocks

2.7. IEEE 1588 - LIMITED SUPPORT

This protocol is designed to provide precision clock synchronization for network measurement.

WTM 3100 ODR acts as an End-to-End Transparent Clock (TC). This feature monitors the Ethernet packet Arrival and Departure Time to calculate the residence time. After that the protocol inserts this residence time into the field Correction of PTP packet.

IEEE 1588 specification requires nano second level precision, but the accuracy of WTM 3100 ODR clock is only micro second level.

3. PHYSICAL COMPOSITION AND CONFIGURATIONS

This section describes the WTM 3100 solution elements and WTM 3100 interfaces accessible by the User.

3.1. SOLUTION ELEMENTS

In Figure 3-1, all WTM 3100 solution elements are shown. Each box represents a single element or piece of equipment that represents a part of an overall solution. Refer to WTM 3100 Product Ordering Guide for details how to order the equipment that is part of the solution.

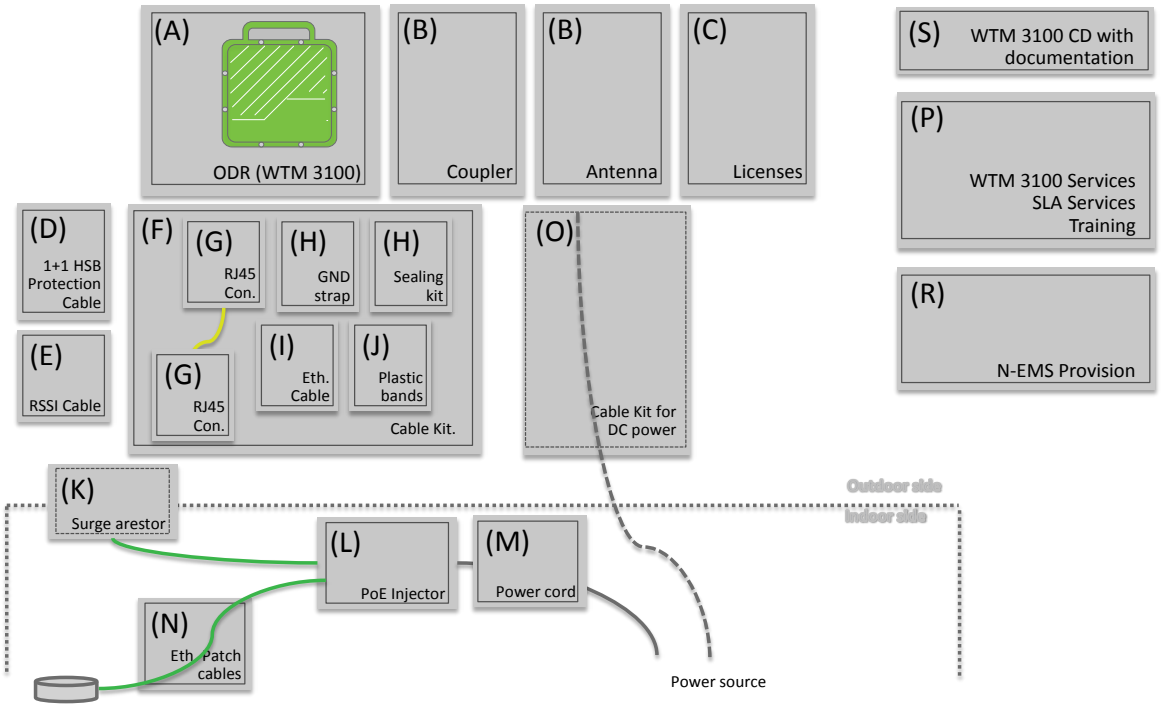


Figure 3-1; WTM 3100 solution elements

In Table 3-1, all WTM 3200 solution elements are listed with the description and usage recommendation.

#	Description	Usage
A	WTM 3100 ODR units	Mandatory part
B	Eclipse Antennas attached via Slip-Fit or remotely mounted and Aviat Networks Coupler	Antenna Mandatory part Coupler Optional part, depends on the configuration
C	Licenses	Optional, needed in case additional capacity or licensed feature is required.

#	Description	Usage
D	1+1 HSB Protection Cable	Optional needed in case of protected 1+1 HSB configuration
E	RSSI measurement cable	Optional needed by installer
F	ODR to IDU Cable kit: Ethernet cable, crimped with shielded RJ45 connector, GND strap, Sealing kit Plastic Bands.	Use either cable kit, that have predefined length or each part, separately
K	Surge arrestor	Optional
L	PoE injector	AC or DC variant
M	Power cord for AC PoE injector	AC with plug or DC variant, simple two wire cable
N	Ethernet patch cable	Recommended
O	Auxiliary -48 VDC powering	Optional
P	WTM 3100 Services	Recommended.
R	N-EMS, ProVision	Recommended
S	WTM 3100 CD with documentation	Optional

Table 3-1; WTM 3100 solution Elements

Refer to the *WTM 3100 Tuning Guide* for details about all available WTM 3100 ODRs. And to the *WTM 3100 Purchase Ordering Guide* for more details how to configure the WTM 3100 solution elements.

3.2. ODR EXTERNAL INTERFACES

There are five external interfaces on the WTM 3100 ODR housing where user connects dedicated cable. They are shown and explained in the Table 3-2 and Figure 3-2following figure and table.

#	Item/Label	Type	Description
1	Direct -48 VDC power feed	N-type, Female	-48 VDC power feed interface; this is an optional powering input port which can be used when the PoE powering option is not available.
2	1+1 HSB Protection	RJ45, Special wiring	RJ45 connector for 1+1 HSB protection (only customized crossover cable can be used)
3	RSSI Monitor	BNC Female -50 Ohm	RSSI monitoring port is used for the ODR installation.
4	Surge Ground	Grounding lug (M5)	Surge Ground pin to be ground ODR, being installed in the field.
5	Payload and Management Interface	PoE RJ45, 10/100/1000 BaseT	PoE + Ethernet data port is the major connection between the ODR and ECD.
6	Aviat Networks Slip-Fit Antenna interface		Slip-Fit antenna interface and mounting arrangement.
7	Waterproof membrane vent		To equalize air pressure

Table 3-2: WTM 3100 External Interfaces

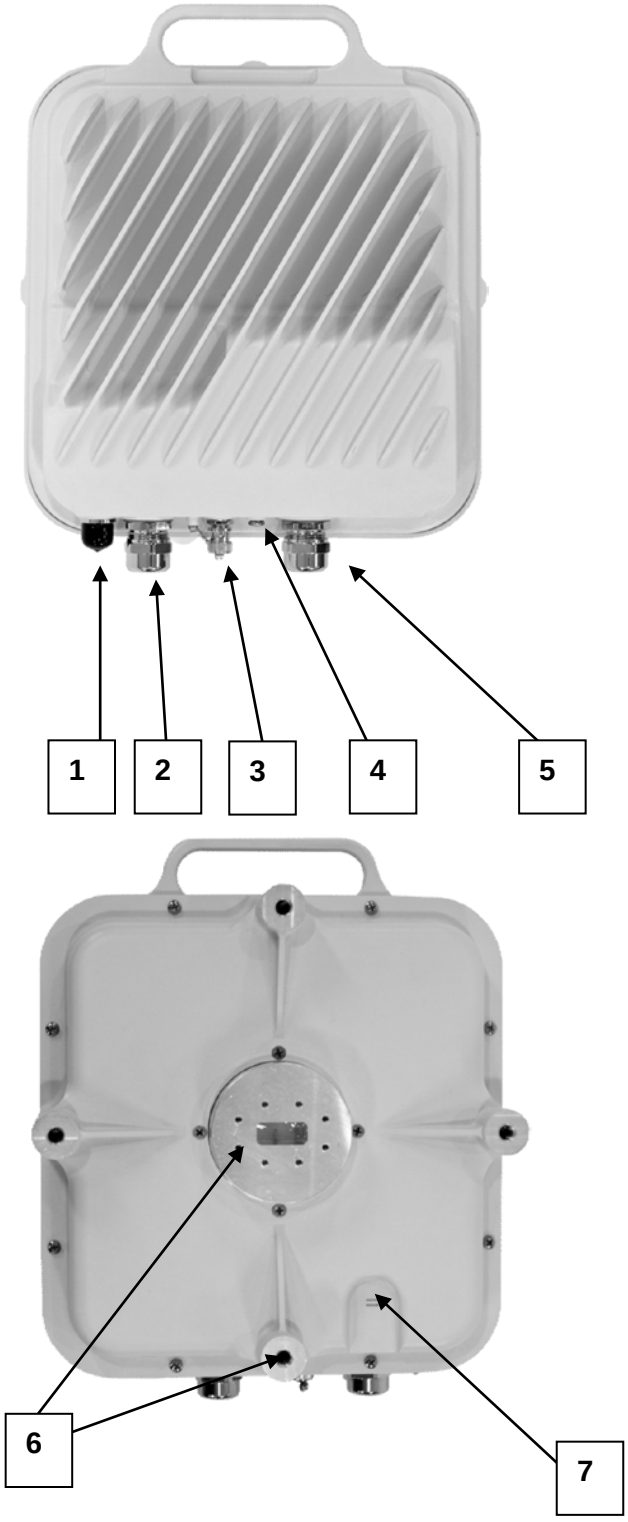


Figure 3-2; ODR housing with external interfaces

Direct -48 VDC power feed Interface

The N-type connector's center pin is -48V and outer jack is ground. On the ODR side N-type female connector is used.

Supported Input voltages range from -37 to -57 VDC

Maximum current at 48W and at min voltage 37 V is 1.2 A.

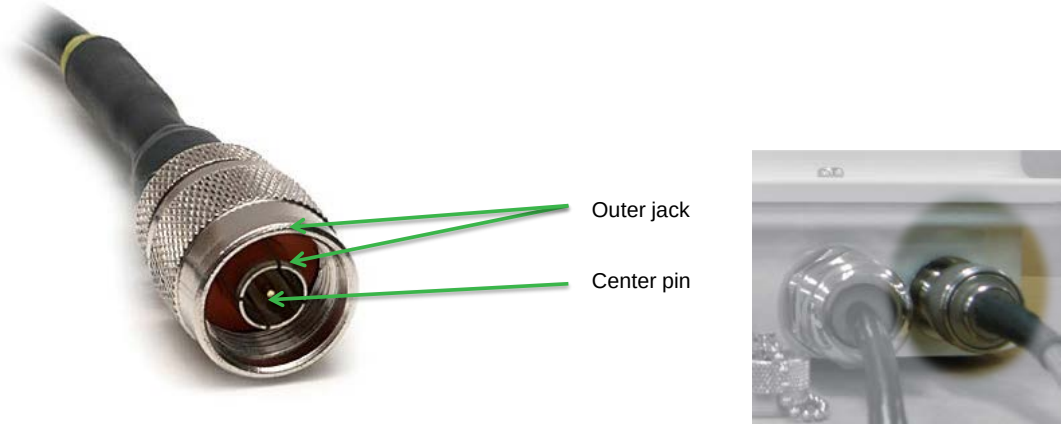


Figure 3-3; N-type cable interface for powering

1+1 HSB Protection Interface

Protection interface is used to connect two WTM 3100 ODR, to enable 1+1 HSB protection configuration mode.

Refer to section 2.1.5, for more details about 1+1 HSB Protection cable.

A special brass nickel plated connector is used for higher durability and for all weather conditions.

Each connector is waterproof and sealed according to IP 65 rating.

Warning: When assembled according to the instructions, the connector is waterproof. If the connector is not tightened correctly, leakage may occur.

Figure 3-4; RJ45 connector for 1+1 HSB protection interface

Note: The sealing plug must be fitted if no cable is connected to the protection interface.

RSSI Interface

The Received Signal Strength Indicator (RSSI) interface allows the installer of the ODR to obtain information about the received RF signal level. A standard (portable) voltmeter can be used as measuring instrument. The main technical characteristics for RSSI are shown in Table 3-3. Parameter values are valid over the temperature/humidity range of the ODR climatogram and over the whole frequency range.

Parameter	Value
Connector type	Female BNC, 50 Ω, waterproof
Waterproof level	IP 65
Output voltage range	0.5 V ÷2.25 V
Output impedance	> 10kΩ
Nominal sensitivity	0.25V / 10 dB
Slope	positive
Reference points	+0.5 V @ PRX = -20 dBm +2.25V @ PRX = -90 dBm
Accuracy in the ePortal	± 2 dB @ -40 to -70 dBm AND @0°C to +35°C ± 4 dB @ -25 to -85 dBm AND @-33°C to +55°C

Table 3-3; RSSI Interface Characteristics

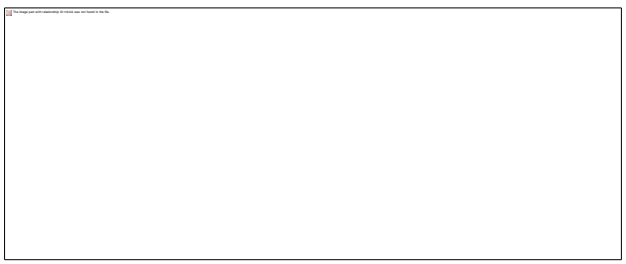


Figure 3-5; RSSI interface

Ground lug Interface

Grounding of the WTM 3100 is carried over the ground interface equipped with 5 mm mounting bolt. See the figure below for a view of the chisel-point lockwasher mounted on the attaching bolt.

Figure 3-6; Ground bolt

The ring connector, crimped onto a ground wire, is part of the cable Kit or can be ordered as separate accessory. Refer to the *WTM 3100 POG* for more details.

Payload and Management Interface

The ODR Payload interface carries payload traffic, management signals and power supply. On the ODR side, it has a waterproof RJ45 connector. Table 3-4 shows connector pin out.

PIN	Signal	Description
1	ETH_A-	ETH_A, ETH_B, ETH_C and ETH_D are the four bidirectional Data signals according to 1000 BaseT standard. Power feed according to different Alternatives of 802.3at All 4 pairs A, B, C, D are used bi-directionally to transmit the GE signal from/to the User equipment
2	ETH_A+	
3	ETH_B-	
4	ETH_C-	
5	ETH_C+	
6	ETH_B+	
7	ETH_D-	
8	**ETH_D+**	

Table 3-4; ODR Signal Interface (RJ45 waterproof connector)

The characteristics of this interface are reported also in Table 4-3 and Table 5-1.

The user data traffic is composed of an Ethernet Frames stream according to IEEE 802.3. The main electrical specification of the signal is shown in Table 4-3.

The physical interface is a RJ45 connector. The pin assignment is reported in Table 3-4.

A special brass nickel plated connector is used for higher durability and for all weather conditions.

Each connector is waterproof and sealed according to IP 65 rating.

Figure 3-7; RJ45 connector for payload interface

Aviat Networks Slip-Fit Antenna Interface

WTM 3100 ODR is form & fit compatible with standard Aviat Networks Slip-Fit antennas and mounting arrangements. For more details about antenna refer to section 5.3.

Waterproof membrane vent

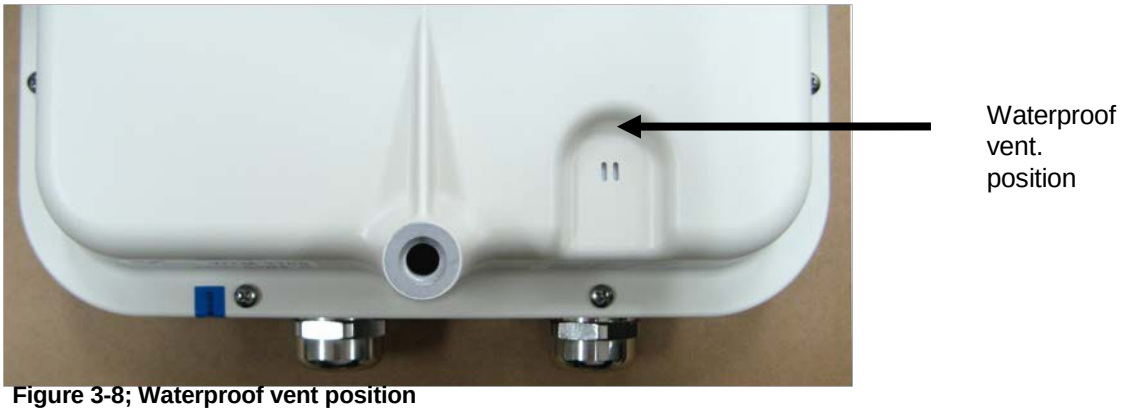


Figure 3-8; Waterproof vent position

3.3. MECHANICAL CHARACTERISTICS

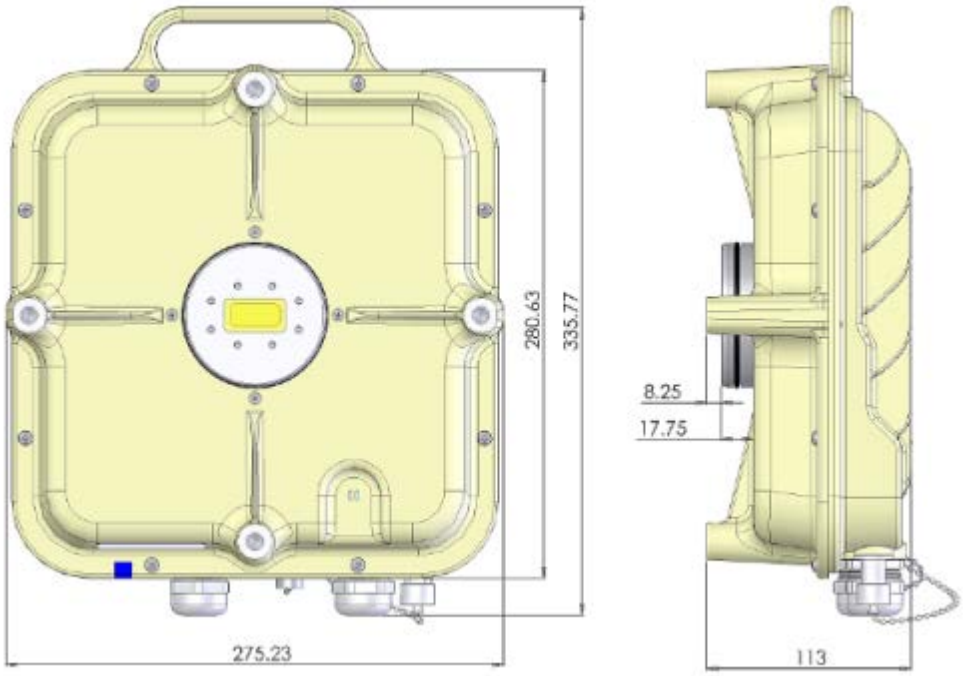


Figure 3-9: WTM 3100 Mechanical Characteristics and dimensions

Refer to Section, Electrical and Mechanical and Table 4-5, for more details.

3.4. PRODUCT LABELING AND IDENTIFICATION

WTM 3100 ODR is equipped with the following labels:

1. Product compliance label
2. Product identification label
3. Product licenses label

Label position is shown on below Figure 3-10.

Figure 3-10; WTM 3100 labels and identification

Product compliance label

Compliance label shows the following information:

1. WTM 3100 model name
2. Aviat logotype
3. CE declaration mark and alert sign
4. RoHS Compliance logotype
5. WEEE logotype

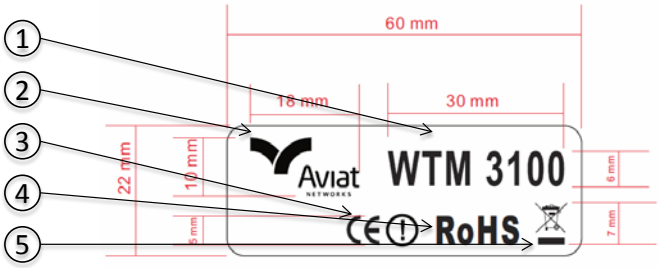


Figure 3-11: WTM 3100 Compliance Label

Product Identification label

Identification label shows the following information:

1. Supported T-R spacing
2. Low and High Tx and Rx Frequency
3. Part number
4. Serial Number
5. Product revision number
6. Short description

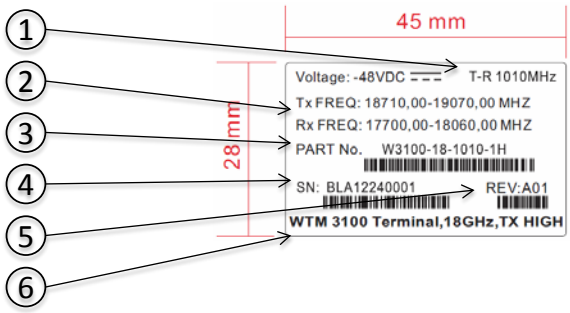


Figure 3-12: WTM 3100 Compliance Label

Product licenses label

Licenses label shows the list of the supported licenses that are loaded to the unit during manufacturing and have the following information.

1. Part number of the ODR, this is the same as on product identification label
2. List of licenses Part numbers.

Figure 3-13: WTM 3100 Compliance Label

4. TECHNICAL SPECIFICATIONS - ODR - ETSI

This section describes the main technical characteristics of the WTM 3100 series with reference to the products referred to in Table 1-1.

The characteristics in tables refers to points A-A' and C-C' as shown in the below block diagram defined by ETSI specifications.

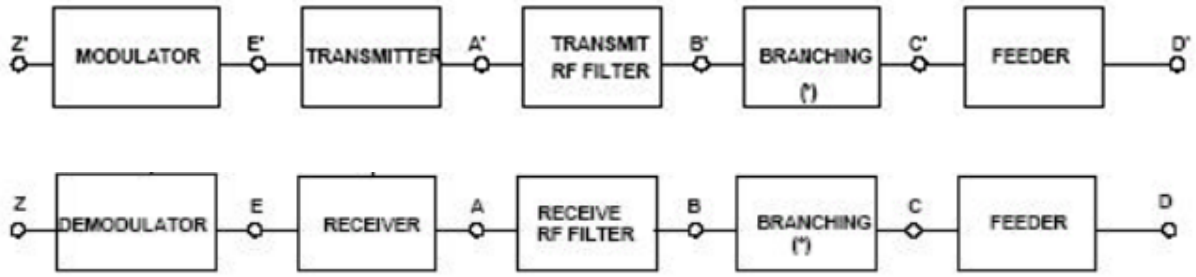


Figure 4-1; ETSI EN 302 217 System block diagram

Figure Notes:

Note 1: (*) no filter included.

Note 2: For the purpose of defining the measurements points, the branching network doesn't include a hybrid.

Note 3: The points shown above are reference points only; points C and C', D and D' in general coincide.

Note 4: Points B and C, B' and C' may coincide when simple diplexer is used.

4.1. GENERAL

Frequency band options	Licensed	7, 13, 15, 18, 23, 38 GHz
Modulation options	Fixed	4, 16, 32, 64, 128, 256 QAM
	Adaptive	4, 16, 32, 64, 128, 256 QAM
Error Correction		LDPC (Low Density Parity Check)
ETSI radio channel size	Software configurable	7, 14, 28, 56 MHz
Capacity range	Airlink capacity	10 - 360 Mbit/s
	Ethernet/IP throughput L2/64 byte	7 - 274 Mbit/s
Configurations	All Outdoor	1+0, 1+1 HSB

Table 4-1; General System specifications

Symbol Rate and Gross Bit Rate	See Table 4-19
Modem Radio Frame	from 5000 to 42000 symbols
Coding and Mapping	LDPC coding on at least 2 bits per symbol and up to 8 bits per symbol.

Service Channel	10 bytes per radio Frame (synch, AM control, ATPC, etc.)
Radio Scrambler /Descrambler	Yes

Table 4-2; Modem specifications

Standard	IEEE 802.3:2008
Symbol rate	125 MHz
Frequency tolerance	+/-100 ppm
Coding	4B/5B MLT3@100Base-T 8B/10B PAM@1000 GE Base-T

Table 4-3; Ethernet Interface specifications

Electrical and Mechanical

Max / Typical Power consumption at ODR (All Bands)	45 W / 40 W
Max / Typical Power consumption at ODR 1+0 Configuration (ODR + PoE injector)	59 W / 55 W*
Power Consumption Terminal 1+1 HSB (ODRs + PoE injectors)	118 W / 110 W*

*Measurements based on PowerDsine 9501 PoE injector

Table 4-4; Power Consumption specifications

Housing	Rectangular shape container with handle.
Paint	RAL1015
Dimensions	336 x 275 x 113 mm
Weight	5.5 kg
Antenna	Compatible with Aviat Networks Slip Fit Design system

Table 4-5; Mechanical Characteristics

Environmental

Temperature range	Operating	-33°C to 55°C
Humidity	Operating	0 to 100%
Altitude	Operating	Up to 3000 meters
Degree of Protection		IP65

Table 4-6; Environmental Conditions

Fault and Configuration Management

Protocol			SNMP v1, v2c (RFC1441-1452)
Interface, electrical			Ethernet 10/100/1000 Base-T
Interface, physical			RJ45
Performance monitoring	Simple		Tx/Rx frame count, frame CRC errors count
Element management	Browser-based	EM Network	Aviat Networks ProVision®
		EM Local	ePortal
Management channel			Dedicated VLAN with highest priority

Table 4-7; Management Interface options

Emission Designator

Bandwidth	7 MHz	14 MHz	28 MHz	56 MHz
Emission Designator	7M00D7W	14M0D7W	28M0D7W	56M0D7W

Table 4-8; Emission Designator

Standards Compliance

EMC	EN 301 489-1, EN 301 489-4, EN 55022 (Class A)
Operation	EN 300 019-2-4 test T 4.1 (IEC Class 4M5 for vibrations)
	EN 300 019-2-4 test T4.1 (IEC Class 4M3 for shocks)
Safety	EN 60950-1, IEC 60950-1, EN 60950-22, IEC 60950-22
RF performance	EN 302 217-2-2
Lightning protection	Surge 5 kV - 10/700 microsec ITU-T k.45 for Ethernet Cable
Maximum Permissible Exposure	EN 50385
RoHS	2002/95/EC
WEEE compliance	2002/96/EC

Table 4-9; Electromagnetic compatibility and safety standards

Interfaces

Traffic and management		RJ45 (10/100/1000 BaseT)
1+1 HSB Protection		RJ45 (Special wiring)
Direct DC power		-37 VDC to -57 VDC
RSSI		Female BNC, 50 ohm
Antenna port interface	7-38 GHz	Standard EIA rectangular waveguide
Antenna mounting	7-38 GHz, standard	Aviat Networks Slip-Fit direct mount for antenna diameters 0.3 to 1.8 m
	7-38 GHz, optional	Remote mount via flex/elliptical waveguide
Polarization, field selectable		Vertical or horizontal polarization, by manually rotation the ODR
Grounding lug		M5

Table 4-10; Interfaces

4.2. TRANSMITER

In the following tables the most important RF Parameters are reported, compliant with the ETSI reference standards shown in Table 4-12.

Transmitter source	Synthesized
Frequency stability	± 5 ppm

Manual transmitter power control range

4 QAM	0-25.5 dBm
16 QAM	0-23.5 dBm
32 QAM	0-23 dBm
64 QAM	0-22.5 dBm
128 QAM	0-21.5 dBm
256 QAM	0-19.5 dBm

Automatic transmitter power control resolution

Range 4 QAM	0-20 dBm
Range 16 QAM	0-18 dBm
Range 32 QAM	0-17.5 dBm
Range 64 QAM	0-17 dBm
Range 128 QAM	0-16 dBm
Range 256 QAM	0-14 dBm
Resolution/speed	1 dB steps / 50 dB/s

Transmitter mute	< -50 dBm
Channel selection	By software control within tuning range of ODR
Synthesizer resolution	0.25 MHz

Table 4-11; Transmitter Specifications

Standard References

	7 GHz	13 GHz	15 GHz	18 GHz	23 GHz	38 GHz
Frequency Range [GHz]	7.125 - 7.9	12.75-13.25	14.4 - 15.35	17.7 - 19.7	21.2 - 23.6	37.0 - 40.0
T-R Spacings supported, [MHz]	150, 154, 161, 175, 196, 245	266	315, 420, 490, 644, 728	340 1010 1560	1008, 1200, 1232	1260
Channeling [ITU-R]	F.385-9, Annex 1,3,4,5	F.497-7	F. 636-3	F.595-9 Annex 2,3,4, 5,6,7	F.637-3, Annex 1,3,4,5	F.749-2
Channeling [CEPT]	ECC Rec. (02)06 Annex 1,3	ERC Rec. 12-02E Annex A,B	ERC Rec. 12-07E	ERC Rec. 12-03E	ERC Rec. 13-02E Annex A	ERC Rec. 12-01 E Annex A
ETSI reference standard	302 217	302 217	302 217	302 217	302 217	302 217
Synthesizer Step size	250 kHz	250 kHz	250 kHz	250 kHz	250 kHz	250 kHz

Maximum tuning range	84 MHz	130 MHz	240 MHz	440 MHz	660 MHz	588 MHz

Table 4-12; ETSI Standard References

RF Antenna interface

	7 GHz	13 GHz	15 GHz	18 GHz	23 GHz	38 GHz
Flange Type	UDR84	UBR140	UBR140	UBR220	UBR220	UBR320
Mating Flange Type	PDR84 or CDR84	PBR140 or CBR140	PBR140 or CBR141	PBR220	PBR220	PBR320
Waveguide Type	R84 (WR112)	R140 (WR62)	R140 (WR62)	R220 (WR42)	R220 (WR42)	R320 (WR28)

Table 4-13; RF Antenna interface specifications

Transmitter Output Power [dBm]

Modulation	7 GHz	13 GHz	15 GHz	18 GHz	23 GHz	38 GHz
4 QAM	25.5	24	24	19.5	19.5	17.5
16 QAM	23.5	22	22	17.5	17.5	15.5
32 QAM	23	21.5	21.5	17	17	15
64 QAM	22.5	21	21	16.5	16.5	14.5
128 QAM	21.5	20	20	15.5	15.5	13.5
256 QAM	19.5	18	18	13.5	13.5	11.5

Table 4-14; Transmitter Output Power

Typical Output Power values in dBm (P_{TxMax}) at antenna port are shown in Table 4-14. Values are valid over the whole temperature/humidity range of ODR climatogram and over the whole frequency range of the unit.

For Guaranteed values (over time and operational range) subtract 2 dB from Power Output, add 2dB to Threshold values.

4.3. RECEIVER

Receiver source		Synthesized
LO Frequency Stability		± 5 ppm
Rx Max Input Level	No damage	0 dBm
	Error free operation	-20 dBm
Residual (Background) Bit Error Rate		Better than 10^{-12}
RSSI Accuracy (measured at BNC port)	-40 to -70 dBm@0°C to +35°C	± 2 dB
	-25 to -85 dBm@-33°C to +55°C	± 4 dB

Table 4-15; Receiver Specifications

Rx Sensitivity

	7 GHz	13 GHz	15 GHz	18 GHz	23 GHz	38 GHz
7 MHz Channel						
4 QAM	-92.5	-92.5	-92	-92	-91.5	-90
16 QAM	-86	-86	-85.5	-85.5	-85	-83.5
32 QAM	-82	-82	-81.5	-81.5	-81	-79.5
64 QAM	-78.5	-78.5	-78	-78	-77.5	-76
128 QAM	-74.5	-74.5	-74	-74	-73.5	-72
256 QAM	-71.5	-71.5	-71	-71	-70.5	-69
14 MHz Channel						
4 QAM	-89.5	-89.5	-89	-89	-88.5	-87
16 QAM	-83	-83	-82.5	-82.5	-82	-80.5
32 QAM	-79	-79	-78.5	-78.5	-78	-76.5
64 QAM	-75.5	-75.5	-75	-75	-74.5	-73
128 QAM	-71.5	-71.5	-71	-71	-70.5	-69
256 QAM	-68.5	-68.5	-68	-68	-67.5	-66
28 MHz Channel						
4 QAM	-86.5	-86.5	-86	-86	-85.5	-84
16 QAM	-80	-80	-79.5	-79.5	-79	-77.5
32 QAM	-76	-76	-75.5	-75.5	-75	-73.5
64 QAM	-72.5	-72.5	-72	-72	-71.5	-70
128 QAM	-68.5	-68.5	-68	-68	-67.5	-66
256 QAM	-65.5	-65.5	-65	-65	-64.5	-63
56 MHz Channel						
4 QAM	-83.5	-83.5	-83	-83	-82.5	-81
16 QAM	-77	-77	-76.5	-76.5	-76	-74.5
32 QAM	-73	-73	-72.5	-72.5	-72	-70.5
64 QAM	-69.5	-69.5	-69	-69	-68.5	-67
128 QAM	-65.5	-65.5	-65	-65	-64.5	-63
256 QAM	-62.5	-62.5	-62	-62	-61.5	-60

Table 4-16; Rx Sensitivity [dBm] @ BER=10-6

Note: Typical values are shown. For Guaranteed values (over time and operational range), reduce the sensitivity by 2 dB, e.g. -85 dBm typical = -83 dBm guaranteed.
Receiver Threshold, BER = 10-6, in dBm*

4.4. PROTECTION LOSSES

Coupler option

	Frequency band	Main channel	Protection channel
Coupler option	7 to 18 GHz / 21 to 32 GHz / 38 GHz	3.6 dB / 3.8 dB / 4 dB	3.6 dB / 3.8 dB / 4 dB

	7 to 18 GHz / 21 to 32 GHz / 38 GHz	1.6 dB / 1.8 dB / 2 dB	6.6 dB / 6.8 dB / 7 dB

Table 4-17: Additional Protection Losses with Available Couplers

4.5. CARRIER ETHERNET & IP SPECIFICATIONS

Ethernet Standards Compliance	Ethernet	IEEE 802.3
	Networking Protocols	IPv4 (as per RFC791) and IPv6 (pass through)
User ports	RJ45	10/100/1000 Base-T
Burst and Frame Handling (Typical)	Ethernet Port Buffer Size	128 kB
	Max frame size	9.6 kB
MAC address register		4096 entries
QoS	Transmission Queues	With WRR and SP queuing
	Scheduling	Hybrid WRR+SP
	Classification	IEEE 802.1p QoS/CoS bits
Synchronization	Sync-E Standards	ITU-T 8261, G.8262 (HW), G.8264 (SW), G.8264 SSM
	Holdover clock	'±2 ppm TCXO
	Ingress clock reference	Selectable, external only
	Sync-E. States	Operational nonoperational state. Free Run or Locked.
Monitoring	Status	Tx/Rx frame count, CRC errors count

Table 4-18; Ethernet / IP specifications

4.5.1. DISPERSIVE FADE MARGIN (DFM)

Channel Bandwidth	Modulation	Symbol rate [Mbaud]	Gross bit rate [Mbit/s]	DFM [dB]
7 MHz	4 QAM	6.05	10.00	66.00
7 MHz	16 QAM	6.05	20.00	66.00
7 MHz	32 QAM	6.05	25.00	66.00
7 MHz	64 QAM	6.05	30.00	65.00
7 MHz	128 QAM	6.05	36.00	64.00
7 MHz	256QAM	6.05	41.00	61.00
14 MHz	4 QAM	12.10	20.00	63.00
14 MHz	16 QAM	12.10	40.00	62.00
14 MHz	32 QAM	12.10	51.00	61.00
14 MHz	64 QAM	12.10	64.00	60.00
14 MHz	128 QAM	12.10	75.00	55.00
14 MHz	256 QAM	12.10	86.00	53.00
28 MHz	4 QAM	24.60	40.00	62.00
28 MHz	16 QAM	24.60	80.00	57.00
28 MHz	32 QAM	24.60	101.00	53.00
28 MHz	64 QAM	24.60	127.00	50.00
28 MHz	128 QAM	24.60	152.00	47.00
28 MHz	256 QAM	24.60	176.00	40.00
56 MHz	4 QAM	49.21	81.00	62.00
56 MHz	16 QAM	49.21	163.00	48.00
56 MHz	32 QAM	49.21	204.00	44.00
56 MHz	64 QAM	49.21	260.00	42.00
56 MHz	128 QAM	49.21	308.00	38.00
56 MHz	256 QAM	49.21	357.00	35.00

4.6. PAYLOAD CHARACTERISTICS

This table shows Air Link Capacity, L1 and L2 throughput values for different frame sizes, as a function of the Channel Spacing and Modulation Index, for two lengths (64 and 1518) of the MAC frame. The MAC Rate (throughput) is the transmission rate (Mbit/s) considering only the MAC frame bytes transmitted in a second.

Note: the relationship between MAC Rate and Utilization depends on the length of the frames.

The values have been calculated or measured according to RFC 2544.

	Modulation	Air link Capacity Ethernet [Mbit/s]	Ethernet L1 Throughput [Mbit/s]		Ethernet L2 Throughput [Mbit/s]	
			1518 byte	64 byte	1518 byte	64 byte
7 MHz Channel						
	4 QAM	10	10	10	9	7
	16 QAM	20	20	20	19	15
	32 QAM	25	25	25	24	19
	64 QAM	30	30	30	29	22
	128 QAM	36	36	36	35	27
	256 QAM	41	41	41	40	31
14 MHz Channel						
	4 QAM	20	20	20	19	15
	16 QAM	40	40	40	39	30
	32 QAM	51	51	51	50	38
	64 QAM	64	64	64	63	48
	128 QAM	75	75	75	74	57
	256 QAM	86	86	86	84	65
28 MHz Channel						
	4 QAM	41	41	41	40	31
	16 QAM	84	84	84	82	64
	32 QAM	105	105	105	103	80
	64 QAM	129	129	129	127	98
	128 QAM	153	153	153	151	116
	256 QAM	177	177	177	173	134
56 MHz Channel						
	4 QAM	84	84	84	82	64
	16 QAM	168	168	168	165	127
	32 QAM	210	210	210	207	160
	64 QAM	264	264	264	258	199
	128 QAM	310	310	310	305	236
	256 QAM	360	360	360	355	274

Table 4-19; ETSI Payload Gross Bit Rate on the Radio Channel

4.6.1. LATENCY

Latency is Transmission Delay of Ethernet frames.

The transit time in a complete WTM 3100 link is reported in the below table as a function of the different Channel Spacing (CS) and Modulation Index (MI).

Values are measured with fixed modulation and at the 1+0 configuration.

The measurement is done using traffic with 1518 byte frames and with a link load less than 80 % according to the maximum MAC rate supported by the CS and MI.

Latencies are calculated or measured according to RFC 2544.

Channel Size (CS)	Latency per Link [msec] – Fixed Modulation					
	[4 QAM]	[16 QAM]	[32 QAM]	[64 QAM]	[128 QAM]	[256 QAM]
Minimum Value [msec]						
7 MHz	1195	634	523	565	541	533
14 MHz	914	489	401	447	435	437
28 MHz	460	248	205	233	226	222
56 MHz	238	133	112	122	120	117
Average Value [msec]						
7 MHz	1206	643	531	575	551	544
14 MHz	920	493	406	451	439	441
28 MHz	463	250	207	235	228	224
56 MHz	240	134	113	124	121	118
Maximum Value [msec]						
7 MHz	1224	654	540	584	560	552
14 MHz	932	500	411	457	445	447
28 MHz	469	254	210	237	231	227
56 MHz	243	137	115	126	123	120

Table 4-20; Latency per Link (ms), Fixed Modulation (Minimal, Average and Maximum values)

4.7. SUPPORTED CHANNEL SPACINGS AND MODULATIONS

Modulation	ETSI setting, Channel spacing [MHz]			
	7	14	28	56
4 QAM	✓	✓	✓	✓
16 QAM	✓	✓	✓	✓
32 QAM	✓	✓	✓	✓
64 QAM	✓	✓	✓	✓
128 QAM	✓	✓	✓	✓
256 QAM	NA	✓	✓	✓

Table 4-21; Supported Ch. Spacing's and Modulations

4.8. SYSTEM GAIN

[dB]	7 GHz	13 GHz	15 GHz	18 GHz	23 GHz	38 GHz
7 MHz Channel						
4 QAM	118	116.5	116	111.5	111	107.5
16 QAM	109.5	108	107.5	103	102.5	99
32 QAM	105	103.5	103	98.5	98	94.5
64 QAM	101	99.5	99	94.5	94	90.5
128 QAM	96	94.5	94	89.5	89	85.5
256 QAM	91	89.5	89	84.5	84	80.5
14 MHz Channel						
4 QAM	115	113.5	113	108.5	108	104.5
16 QAM	106.5	105	104.5	100	99.5	96
32 QAM	102	100.5	100	95.5	95	91.5
64 QAM	98	96.5	96	91.5	91	87.5
128 QAM	93	91.5	91	86.5	86	82.5
256 QAM	88	86.5	86	81.5	81	77.5
28 MHz Channel						
4 QAM	112	110.5	110	105.5	105	101.5
16 QAM	103.5	102	101.5	97	96.5	93
32 QAM	99	97.5	97	92.5	92	88.5
64 QAM	95	93.5	93	88.5	88	84.5
128 QAM	90	88.5	88	83.5	83	79.5
256 QAM	85	83.5	83	78.5	78	74.5
56 MHz Channel						
4 QAM	109	107.5	107	102.5	102	98.5
16 QAM	100.5	99	98.5	94	93.5	90
32 QAM	96	94.5	94	89.5	89	85.5
64 QAM	92	90.5	90	85.5	85	81.5
128 QAM	87	85.5	85	80.5	80	76.5
256 QAM	82	80.5	80	75.5	75	71.5

Table 4-22; System Gain @ BER=10-6 (equiv. FER=5x10-4) (ETSI)

Note: Typical values are shown. System Gain, BER = 10-6, in dB

4.9. CHANNEL INTERFERENCE THRESHOLDS

Co-channel interference (RSL degradation of 1 dB)

	Modulation	Spectral eff.	7 GHz	13 GHz	15 GHz	18 GHz	23 GHz	38 GHz
C/I (dB) for BER≤10^{-6}								
7 MHz Channel								
	4 QAM	2	8.6	12.84	12.66	10	12.7	12
	16 QAM	4L	16.3	19.34	21.66	25.5	25.2	19
	32 QAM	4H	21.8	20.67	24.84	28	25.9	24.5
	64 QAM	5B	22.8	23.33	26.66	26.5	29.4	26
	128 QAM	5B	26.8	27.16	30	29.5	31.8	29
14 MHz Channel								
	4 QAM	2	10.3	9	11.17	10.5	15.6	15
	16 QAM	4L	20.7	16.66	27.33	20	22.1	21
	32 QAM	4H	22.8	19.5	24.83	21.2	23.9	24.5
	64 QAM	5B	22.8	23.5	30.83	21	29.1	26.5
	128 QAM	5B	27.3	26.17	31.5	24.9	30.2	29
	256 QAM	6B	30.6	30.5	34	28.1	33.7	33
28 MHz Channel								
	4 QAM	2	16.3	10.16	12.33	7.9	16.7	13
	16 QAM	4L	22.3	19.33	14.63	15.8	23.1	23
	32 QAM	4H	22.8	20.83	23.17	18.7	25.3	25
	64 QAM	5A/5B	22.8	22.83	24.34	23.8	29	26
	128 QAM	5A/5B	26.8	26.17	28.84	23	32.2	29
	256 QAM	6A/6B	30.1	29	32.83	28.4	33.7	32
56 MHz Channel								
	4 QAM	2	11.3	9	12.5	8.3	17.4	14
	16 QAM	4L	23.3	16.83	21.5	15.4	23.2	23
	32 QAM	4H	21.3	20	24.17	19	26.3	26
	64 QAM	5A/5B	21.2	23.66	26	21.3	28.4	29
	128 QAM	5A/5B	25.8	27	27.66	24.6	32.1	32
	256 QAM	6A/6B	30.6	28	30.5	32.5	33.7	35

Table 4-23; C/I (dB) for BER≤10-6 - Co-channel interference (1 dB degradation)

Note: Typical measured values are shown.

Co-channel interference (RSL degradation of 3 dB)

	Modulation	Spectral eff.	7 GHz	13 GHz	15 GHz	18 GHz	23 GHz	38 GHz
C/I (dB) for BER≤10^{-6}								
7 MHz Channel								
	4 QAM	2	7.5	11.5	11.33	11.7	11.6	10
	16 QAM	4L	14.3	19	20.5	17.8	18.7	16
	32 QAM	4H	17.8	20	21.83	22.6	22.5	20
	64 QAM	5B	20.8	22.83	24.83	24.3	24.1	24
	128 QAM	5B	24.8	26.66	27.34	25.4	27.6	26
14 MHz Channel								
	4 QAM	2	8.1	8.67	10.33	9.2	9.9	12
	16 QAM	4L	17.3	15.5	18.83	16.9	17	19
	32 QAM	4H	21.8	17.33	22.5	18.7	20.5	21.5
	64 QAM	5B	203	22.5	25.5	20.8	23.8	23.5
	128 QAM	5B	25.3	25.84	28.17	24.1	26.7	27
	256 QAM	6B	28.6	29.5	32	27.6	29.9	30
28 MHz Channel								
	4 QAM	2	13.3	8.16	10.84	7.4	10.7	11
	16 QAM	4L	17.3	17.17	21	14.7	16.8	19
	32 QAM	4H	19.3	18.5	20.67	18.3	21.1	21
	64 QAM	5A/5B	20.3	21.83	22.83	22.5	23.7	24
	128 QAM	5A/5B	24.8	25.67	26.5	22	26.4	27
	256 QAM	6A/6B	28.6	28.17	30.5	27.6	29.8	30
56 MHz Channel								
	4 QAM	2	7.8	7.67	9	7.5	10.7	11
	16 QAM	4L	17.3	14.83	17.5	14.8	17.3	19
	32 QAM	4H	18.8	18.83	20.66	17.9	21	22
	64 QAM	5A/5B	19.8	22	23.17	20.5	23.7	25
	128 QAM	5A/5B	24.8	26	25.34	23.8	27	28
	256 QAM	6A/6B	28.6	26.5	27.67	27.5	29.1	31

Table 4-24; C/I (dB) for BER≤10-6 - Co-channel interference (3 dB degradation)

Note: Typical measured values are shown.

First Adjacent Channel interference (RSL degradation of 1 dB)

Modulation		Spectral eff.	7 GHz	13 GHz	15 GHz	18 GHz	23 GHz	38 GHz
C/I (dB) for BER≤10^{-6}								
7 MHz Channel								
	4 QAM	2	-18	-19.83	-19.4	-19.1	-15.4	-15.5
	16 QAM	4L	-15.7	-16.83	-15.25	-17.4	-13.4	-13.5
	32 QAM	4H	-15.7	-16.17	-16.5	-17.6	-11.9	-12
	64 QAM	5B	-14.8	-15.83	-15.75	-17.2	-10.4	-12
	128 QAM	5B	-11.3	-13.34	-12.41	-17.1	-10.2	-11.5
14 MHz Channel								
	4 QAM	2	-18.17	-19.34	-20.41	-17.4	-15.3	-10.5
	16 QAM	4L	-13.54	-17.83	-18.17	-23.2	-12.5	-11.5
	32 QAM	4H	-16.5	-17	-17.25	-15.5	-11.9	-11
	64 QAM	5B	-15.7	-15.33	-15.75	-14.6	-9.6	-10
	128 QAM	5B	-18.5	-15	-12.42	-14.7	-9.1	-10
	256 QAM	6B	-10.83	-11.17	-10.6	-12.6	-5.3	-11
28 MHz Channel								
	4 QAM	2	-20.33	-19.5	-21.7	-17.7	-15.6	-12.5
	16 QAM	4L	-17.83	-17	-19	-17.1	-12.6	-10.5
	32 QAM	4H	-17.17	-17.33	-18.75	-17.4	-11.9	-10.5
	64 QAM	5A/5B	-15.83	-15.16	-15.5	-16.5	-10.3	-10
	128 QAM	5A/5B	-12.66	-13.16	-16.6	-16.7	-9.6	-10
	256 QAM	6A/6B	-8	-9.83	-10.5	-13.5	-5.9	-6
56 MHz Channel								
	4 QAM	2	-22.67	-23.34	-26.5	-28.1	-17.1	-16
	16 QAM	4L	-12.64	-20	-18.1	-25.9	-15.6	-14
	32 QAM	4H	-12.34	-18.66	-15.8	-24.2	-14.8	-14
	64 QAM	5A/5B	-12.83	-15.34	-14.75	-23.6	-13.2	-12.5
	128 QAM	5A/5B	-12.16	-12.34	-13.3	-17.2	-9.3	-11
	256 QAM	6A/6B	-7	-11.5	-11.5	-11.9	-7.7	-5.5

Table 4-25; C/I (dB) for BER≤10-6 – (1 dB degradation)

Note: Typical measured values are shown.

First Adjacent Channel interference (RSL degradation of 3 dB)

	Modulation	Spectral eff.	7 GHz	13 GHz	15 GHz	18 GHz	23 GHz	38 GHz
C/I (dB) for BER≤10^{-6}								
7 MHz Channel								
	4 QAM	2	-17.71	-20	-19.92	-19.4	-17.8	-15
	16 QAM	4L	-14.17	-17.17	-16.67	-17.8	-14.9	-14
	32 QAM	4H	-15.7	-16.33	-16.34	-17.7	-14.4	-13
	64 QAM	5B	-15	-16.16	-14.91	-17.2	-12.9	-12.5
	128 QAM	5B	-14.67	-14.17	-13.58	-17.1	-12.3	-12.5
14 MHz Channel								
	4 QAM	2	-18.5	-19.66	-19.75	-17.3	-17.6	-13.5
	16 QAM	4L	-17.17	-17.5	-17.4	-16.2	-15.1	-11.5
	32 QAM	4H	-18	-17.33	-17.92	-15.6	-14.3	-11.5
	64 QAM	5B	-16.16	-16	-15.83	-14.7	-11.6	-10.5
	128 QAM	5B	-18	-15.83	-13.42	-14.6	-11.6	-10
	256 QAM	6B	-11	-11	-10.75	-13.9	-9.6	-11.5
28 MHz Channel								
	4 QAM	2	-20.5	-20	-21.9	-17.5	-18.4	-14
	16 QAM	4L	-18	-17	-19.3	-17.4	-15.7	-11
	32 QAM	4H	-18.5	-17.67	-19.83	-16.8	-15.1	-11.5
	64 QAM	5A/5B	-15.83	-15.5	-18.34	-16.6	-13.1	-11
	128 QAM	5A/5B	-13.67	-14	-16.9	-16.8	-12.6	-10.5
	256 QAM	6A/6B	-10	-9.84	-10.34	-12	-12.1	-9
56 MHz Channel								
	4 QAM	2	-25	-24.83	-26.42	-29.4	-20.4	-18
	16 QAM	4L	-17.53	-22.17	-21.3	-27.2	-18.1	-15
	32 QAM	4H	-17.54	-19.33	-19.41	-24.2	-16.8	-15
	64 QAM	5A/5B	-15.67	-15.33	-16.67	-21	-17.4	-14
	128 QAM	5A/5B	-12.16	-13.17	-14	-17.3	-15.3	-13
	256 QAM	6A/6B	-10.57	-11.67	-11.8	-12.2	-14.4	-9.5

Table 4-26; C/I (dB) for BER≤10-6 (3 dB degradation)

Note: Typical measured values are shown.

4.10. SUPORTED RADIO CHANNEL CONFIGURATIONS

Refer to the *WTM 3100 Tuning Guide* for the available frequency ranges (Tx Min Frequency ÷ Tx Max Frequency) per PN. Tx Frequency can be configured at the selected Nominal Capacity/Channel Spacing.

5. TECHNICAL SPECIFICATIONS - ACCESSORIES

5.1. POE INJECTORS

A High Power Single Port PoE injector is used as a standard accessory. Two PoE injector types are available with 220 VAC and -48 VDC powering option.

General

- Fully Compliant Detection, Disconnect and Voltage Control according to IEEE802.3af, 12.5K resistor detection.
- Diagnostic LEDs
- Broken Wire Detection
- Gigabit Compatible
- Single source 2 or 4 - pairs Power Supply through the PoE injector–ODR Cable
- Detection and Power turn-on as per IEEE 802.3at ; Signature resistance 25 kΩ

Standards Compliance

- cUL/UL
- CE
- SAA
- C-Tick
- FCC Part 15 Class B
- EN55022 Class B

Figure 5-1; POE compliance logotypes

Environmental

Operation temp. range	0 to +40°C
Non-operation temp. range	-25 to +65°C
Humidity Operation	5 to 90 %

Electrical and Mechanical specifications

Dimensions	166 x 44 x 80 mm (L x H x W)
Weight	0.4 kg

Input connector	AC POE	IEC320 inlet 3 pin
	DC POE	Anytek OQ0355510000G
Input Voltage range	AC POE	100 to 240 VAC, 47-63 Hz
	DC POE	36 to 72 VDC
Input current range	AC POE	2A (RMS) maximum for 90 VAC 1.2A (RMS) maximum for 240 VAC
	DC POE	4.0A, 32 VDC at maximum load 2.0A, 72 VDC at maximum load
Maximum output power		60 W
Efficiency (typical)	AC POE	75 % @ maximum load, and 120 VAC 60 Hz
	DC POE	85 % @ maximum load, and 48 VDC

Isolation Test

- Primary to Secondary: 4242 VDC for 1 minute 10 mA
- Primary to Field Ground: 2121 VDC for 1 minute
- Output to Field Ground: 2121 VDC

Immunity

- ESD: EN61000-4-2. Level 3
- RS: EN61000-4-3. Level 2
- EFT: EN61000-4-4. Level 2
- Surge: EN61000-4-5. Level 3

5.2. ETHERNET CABLE (FROM ODR TO POE INJECTOR -ECD)

Type of cable	Standard Ethernet twisted multipair cable, S-FTP 24 AWG Cat. 5E
Environmental	Temperature range from –33° C to +55° C UV resistant, for outdoor application.
PoE injector–ODR Connectors	RJ45 shielded
Max. length	100 m, according to the standard. This is total length from ODR to ECD.
DC loop resistance of the cable per pair	< 25 Ω
Transmission standards	1000 Base T with PoE injector
Gross bit rate on the cable	125 MHz
Max Cable attenuation on a pair	22 dB/100 m @ 100 MHz
Power Signals on the cable	DC/DC voltage according to PoE injector
Lightening protection	6 kV 10/700 μs. CCITT K17, ITU-T K45 1kV 8/20μs. CE, EN6100-4-5

Table 5-1; PoE injector–ODR Cabling and Connection

5.3. ANTENNA

The standard Aviat Networks antenna (Eclipse product family) is equipped with pole/tower mounting hardware. It enables the WTM 3100 ODR to be attached directly to the antenna using a Slip-Fit connector.

When installing antennas that exceed 1.8 m in diameter (six feet) or dual pole antennas, the ODR(s) must be remotely mounted and connected to the antenna with waveguides(s). Most antennas are Class 3 ETSI is approved with the exception of those made by Xian. These are class 2 and are generally unsuitable for Europe and the USA.

Applicable mounting options are:

- WTM 3100 ODR can be mounted directly to an Aviat Networks Slip-Fit antenna
- Dual WTM 3100 ODRs are mounted to a slip-fit coupler which is attached to the antenna
- Remotely mounted WTM 3100 ODR is connected via flexible waveguide cable to the antenna
- WTM 3100 ODRs are mounted remotely and connected via flexible waveguides to the dual polarization antenna
- The WTM 3100 ODRs are mounted directly to equal loss couplers and these are connected via waveguides to a dual polarization antenna

Typical antenna gains obtainable at mid band are reported in the Table 5-2. In case of use of a NON INTEGRATED antenna, the connections between the ODR and the external antenna must be compliant with Table 5-3.

FREQUENCY	Antenna 20 cm Gain [dBi]	Antenna 30 cm Gain [dBi]	Antenna 60 cm Gain [dBi]	Antenna 80 cm Gain [dBi]	Antenna 120cm Gain [dBi]
7 GHz	21,3	25,0	30,0	33,5	37,0
13 GHz	25,7	30,0	35,6	37,9	41,8
15 GHz	26,9	30,5	36,5	39,0	42,5
18 GHz	28,9	32,5	38,5	41,0	44,5
23 GHz	30,8	34,0	40,0	42,5	46,0
38 GHz	NA	40,1	45,2	NA	NA

Table 5-2: Antenna Gain

FREQUENCY	OUTPUT FLANGE at radio unit	OUTPUT FLANGE at flexible wave guide	WAVE GUIDE
7 GHz	UDR84	PDR84	WR112
13 GHz	UBR120	PBR120	WR75
15 GHz	UBR140	PBR140	WR62
18 GHz	UBR220	PBR220	WR42
23 GHz	UBR220	PBR220	WR42
38 GHz	UBR320	PBR320	WR28

Table 5-3: External Antenna Connection

ODR Mounting

Antennas for direct mounting to the ODR are available in diameters from 0.3 m (1 ft) to 1.8 m (6 ft), depending on the frequency band. These antennas are high performance, low profile shielded types.

Antennas are supplied without the normal rectangular waveguide feed. Instead, there is a simple circular feed-point that connects the ODR directly to the WTM 3100 or to the coupler unit for 1+1 HSB configurations.

V or H polarization selection is done by rotating the ODR.

Antenna mounting collar is designed for use with industry-standard 115 mm OD (4.5 inch) pipe-mounts.

6. DOCUMENTATION AND SUPPORTING TOOLS

6.1. CUSTOMER DOCUMENTATION

Customer Documentation for the WTM 3100 product line is subdivided into the following documents:

Product Description (PD) (260-668220-001)

Document contains WTM 3200 overview, applications, composition, performance, features, interfaces, functions and maintenance.

It contains the most important technical data, at certain paragraphs and when more details are available in another document, reference is provided.

Technical Specifications ETSI (260-668223-001)

This is available in two forms. The short form datasheet contains main product features and main technical specification. The long form technical specification document contains all main technical details about WTM 3100, primarily in table format.

WTM 3100 Tuning Guide (260-668224-001)

This is an MS Excel document and contains all available and supported WTM 3100 ODRs. All listed WTM 3100 ODRs are released in production.

It also contains information about supported frequency ranges, T-R spacing's and simplified figure that shows covered frequency band supported by each ODR.

User Manual (260-668219-001)

Document contains instructions about mounting, connecting and commissioning the WTM 3100 product. Provides information on how to install, operate, monitor and maintain the WTM 3100 product using the ePortal operating terminal and ProVision element management system

In addition to Graphical User Interface (GUI) window descriptions and task instructions, the User Manual describes remedial actions for alarms.

Release Notes (260-668222-001)

Information about WTM 3100 Software release, supported functionalities and known limitations.

WTM 3100 Product Ordering Guide (260-668225-001)

A guide to assist sales staff and approved resellers when quoting the WTM 3100.

Aviat Networks Best Practices Guide (280-200019-001)

This manual describes standard practices and procedures common to all Aviat Networks radio systems, including:

- Recommended safety standards
- Minimum standards to ensure reliable network operation
- Acceptable standards dictated by the Aviat Networks Warranty policy

It also provides a wealth of information on planning and installation practices, systems operation, testing, troubleshooting and technical background.

ProVision NMS documentation (300-662025-001000)

To Integrate WTM 3100 into network OSS, refer to the Aviat Networks ProVision documentation.

6.2. RELATED WHITE PAPERS

Calculated MTBF values

AVIAT NETWORKS WTM 3100 RELIABILITY REPORT: MTBF calculations for WTM 3100 ODR, according to Telcordia SR-332/Bellcore TR-332 model.

Pathloss files

Pathloss Version 4 files are available for all supported modulations and channel spacings.

This includes a TECHNICAL NOTE about WTM 3100 Path Loss Files.

7. MAINTENANCE

Key information regarding the maintenance activities is covered in this section. For more details, refer to the *WTM 3100 User Manual.*

Maintenance Policy

The WTM 3100 system has been designed to operate with a minimum level of maintenance. This section describes recommended maintenance procedures.

Maintenance Tools and Spare Parts

The Maintenance policy in this paragraph is based on maintenance tools and spare parts availability.

The main tool for maintenance is the ePortal which allows displaying alarms; system status, measurements and performances of the system.

If ProVision NMS is implemented and connected, it's possible to carry out activities remotely similar to those performed with ePortal.

Tools required for the system installation and maintenance activities, are described in detail in the WTM 3100 User Manual.

Spare Parts Policy

The spare part policy is defined as follows:

- Replacement of the complete ODR
- Replacement of the PoE injector

In case of ODR failure, after replacement it is necessary to reconfigure the system with the previous station parameters using the ePortal.

It is important that the spare part units have exactly the same part number as replaceable units.

Spare Parts Quantity

The total amount of spare parts depends from Customer Requirements and is influenced by the network size, MTBF and MTT-R values.

Parts Replacement in Case of Faults

Aviat Networks procedures and operations to be followed in case some faulty part needs to be replaced.

8. GLOSSARY

Abbreviations	Description
ACM	Adaptive Code Modulation Block
AGC	Automatic Gain Control
AMC	Adaptive Modulation Control
AMINTL	Min Transmitted Power when ATPC enabled
ANSI	American National Standards Institute
ARO	After receipt of order
ART	Air Recovery Timing
ASTM	American Society for Testing and Materials
ATPC	Automatic Transmit Power Control
AUX	Auxiliary/Alarm I/O Card
BER	Bit Error Rate
CCDP	Co-Channel Dual Polarization
CCM	Continuity Check Messages
CFR	Code of Federal Regulations
CMINTL	Min Calibrated Transmission Level
CoS	Class of Service
CW	Continuous Waveform
D/A, A/D	Digital-to-Analog, Analog-to-Digital
DAC	Data access card
DC	Direct current
DMAXTL	Dynamically Adjusted Max Transmitted Power
DSCP	Differentiated Services Code Point
DWRR	Deficit weighted round-robin
E/NMS	Element/Network Management System
ECD	Ethernet Connected Device (e.g. Mobile Base-station)
ECN	Engineering Change Notice
EEPROM	Electrically Erasable Programmable Read-Only Memory
EIPR	European Intellectual Property Review
EMC	Electromagnetic compatibility
ePortal	User device management portal
ES	Errored Seconds
ETSI	European Telecommunications Standards Institute
EXP	Experimental bits
FD	Folded Dipole Antenna
FE	Fast Ethernet
FEC	Forward Error Correction
FIFO	First In, First Out
FMEA	Failure Mode and Effects Analysis

FPGA	Field-Programmable Gate Array
GE	Gigabit Ethernet
GHz	Gigahertz
HPT	High Power Threshold
HSB	Hot Stand By
HSBY	Hot Standby
HTML	Hyper Text Markup Language
HTS	Harmonized Tariff Schedule of the United States
HTTP	Hypertext Transfer Protocol
IDU	Indoor Unit
IDUGE	Gigabit Ethernet enabled indoor unit
INU	Intelligent node unit (Eclipse)
ITMN	Installation and Test Manual
LBM	Loopback Message
LCT	Local Craft Terminal
LED	Light-emitting diode
LLC1	Logical link control
LPT	Low Power Threshold
LPRC	Low Density Parity Check
MAXTL	Max Transmitted Power
MCU	Microcontroller
MHSB	Monitored Hot Standby
MI	Modulation Index
MIB	Management Information Base
MINTL	Min Transmission Level
MPE	Maximum Permissible Exposure
MPLS	Multi-protocol labeling system
MSE	Mean Squared Error
MTBF	Mean Time Between Failures
MTTR	Mean Time to Recovery
NEBS	Network equipment-building system
N-EMS	Network or Element management system
NMS	Network management system
NTP	Network Time Protocol
ODR	Outdoor Radio
ODU	Outdoor unit
OS	Operation system
OTA	Over the air
OUTTL	Transmitted Power when in manual or predefined PTx operation
PCBA	Printed Circuit Board Assembly

PCP	Priority Code Point
PDH	Plesiochronous Digital Hierarchy
PHY	Physical layer
PM	Performance Monitoring
PoE	Power over Ethernet
PoE injector	Power over Ethernet injector
ProVision	Aviat Networks ProVision E/NMS
PSE	Power Sourcing Equipment
PTC	Positive Temperature Coefficient Thermistor
QAM	Quadrature amplitude modulation
QoS	Quality of Service
4 QAM	Quadrature Phase Shift Keying
RAC	Radio access card
RAM	Random Access Memory
REACH	Registration, Evaluation, Authorization and Restriction of Chemical substances
RF	Radio Frequency
RoHS	Restriction of Hazardous Substances Directive
RS-CC	Recursive Systematic Convolutional Codes
RSSI	Received signal strength indication
RTPC	Remote Transmit Power Control
RU	Rack unit
RX	Receive
Rx/Tx	Receive/Transmit
SES	Severely Errored Seconds
SFP	Small Form-Factor Pluggable Transceiver
SGMII	Serial Gigabit Media Independent Interface
SNMP	Simple Network Management Protocol
SSH	Secure Shell
TCP	Transmission Control Protocol
TDM	Time division multiplex
TX	Transmit
TCXO	Temperature Compensate X\'tal (crystal) Oscillator
UAS	Unavailable Seconds Counter
UDP	User Datagram Protocol
ULA	Unidirectional Link Avoidance
VLAN	Virtual LAN
VLAN ID	Virtual LAN Identification
WEEE	Waste Electrical and Electronic Equipment Directive
WRR	Weighted Round Robin
XPIC	Cross Polarization Interference Cancellation

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