WipAir Smart IDU

Installation and Operation Instructions

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Notices

Radio Frequency Statement

WipAir has been tested and found to comply with part 15 of the FCC rules and EN 301 489-1 rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a residential environment notwithstanding use in commercial, business and industrial environments. Operation is subject to the following two conditions:

(1) This device may not cause harmful interference, and

(2) This device must accept any interference received, including interference that may cause undesired operation.

IMPORTANT! It is the responsibility of the installer to ensure that when using the outdoor antenna kits in the United States (or where FCC rules apply), only those antennas certified with the product are used. The use of any antenna other than those certified with the product is expressly forbidden in accordance to FCC rules CFR47 part 15.204.

IMPORTANT! Outdoor units and antennas should be installed ONLY by experienced installation professionals who are familiar with local building and safety codes and, wherever applicable, are licensed by the appropriate government regulatory authorities. Failure to do so may void the product warranty and may expose the end user or the service provider to legal and financial liabilities. WaveIP and its resellers or distributors of this equipment are not liable for injury, damage or violation of regulations associated with the installation of outdoor units or antennas.

R&TTE Declaration on Conformity

CE Hereby, WaveIP Ltd, declares that WipAir is in compliance with the essential requirements and other relevant provisions of Directive 1999/5/EC. The declaration of conformity may be consulted through WaveIP Ltd., Teradion Industrial Park, Misgav 20179, Israel.

Compliance with European Union WEEE Directives

In January 2003, the European Union adopted an important environmental directive -- the Directive on Waste Electrical and Electronic Equipment (WEEE). It represents an important milestone in providing a safer environment for future generations.

The WEEE label and instructions for disposal are as follows:

Instructions for Disposal of Waste Equipment by Users in the European Union

This symbol on the product or its packaging indicates that this product must not be disposed of with other waste. Instead, it is your responsibility to dispose of your waste equipment by handing it over to a designated collection point for the recycling of waste electrical and electronic equipment. The separate collection and recycling of your waste equipment at the time of disposal will help conserve natural resources and ensure that it is recycled in a manner that protects human health and the environment. For more information about where you can drop off your waste equipment for recycling, please contact WaveIP.

Warranty

WaveIP warrants that this product shall be free from defects in workmanship and materials for a period of one year from the date of original purchase. If the product should fail to operate correctly in normal use during the warranty period, WaveIP will replace or repair it free of charge. No liability can be accepted for damage due to misuse or circumstances outside WaveIP's control. WaveIP will not be responsible for any loss, damage or injury arising directly or indirectly from the use of this product. WaveIP's total liability under the terms of this warranty shall in all circumstances be limited to the replacement value of this product.

If any difficulty is experienced in the installation or use of this product that you are unable to resolve, please contact WaveIP.

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1. Introduction

Thank you for purchasing WipAir Smart Indoor Unit (S-IDU).

WipAir S-IDU enables transmitting TDM (E1/T1) and Ethernet streams over WipAir Point-to-Point wireless backhauls with ultra-low latency, low jitter connectivity, 1+1 backup redundancy and minimal power consumption.

S-IDU models:

- Ethernet only – Gigabit PoE and 2 Gigabit Ethernet interfaces.
- Ethernet + TDM - Gigabit PoE, 2 Gigabit Ethernet interfaces and 1-16 TDM ports.
- HUB – 3 Gigabit Ethernet interfaces.
- S-IDU license upgrades:
    - 1TDM -> 2TDM -> 4TDM -> 8TDM -> 16TDM.
    - 1+1 Hot standby (Ethernet)
    - 1+1 Hot standby (TDM)
    - 1+1 HUB mode (for S-IDU HUB model)

WipAir PTP and S-IDU Highlights:

- WipAir's highest capacity, extremely low latency and interference rejection technologies are optimized for TDM over IP traffic.
- WipAir's efficient protocol ensures high capacity in longest-range links and highest availability.
- Error-free solution via Hitless ACM (Adaptive Coding & Modulation).
- Minimal Jitter via fastest ARQ (Automatic Retransmit reQuest).
- Built in QoS with 8 priority queues.
- 1+1 hot standby with automatic detection of less than 50ms.
- Built in GigE PoE for WipAir radios.
- Fully integrated with WipAir NMS, SNMP and web-based management.
- Green solution with lowest power consumption in the market.

Traffic Prioritization:

TDM traffic must be prioritized over Ethernet traffic. For this purpose, WipAir system includes built in Quality of Service (QoS) based on 802.1p & 802.1q with 8 priority queues.

Configure WipAir MU system mode to PTP+TDM to enable Point-to-Point mode optimized for TDM over IP traffic with built in QoS. This system mode was specifically designed to handle TDM & Ethernet traffic over the same link, where TDM traffic will be marked with high priority.

The TDM prioritization is done automatically. WipAir assigns highest priority (7) to the TDM packets in order to make sure the TDM traffic is prioritized over any other type of traffic.

2. Installation

2.1 Packing list

When you first open the package, verify that the unit is complete with the following components:

1. WipAir S-IDU.
2. Indoor AC-DC power supply.

Figure 2-1: General System View

2.2 Additional part list – required for installation

- Grounding cable.
- Outdoor-to-Indoor shielded CAT5e cable (up to 100 meters).
- Indoor CAT5e cable.
- Indoor TDM cables.

2.3 S-IDU ports scheme

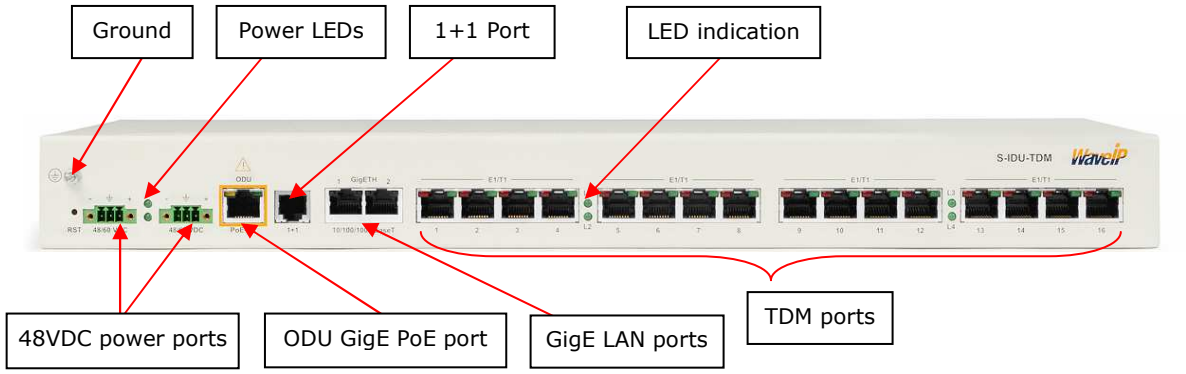

Figure 2-2: S-IDU front panel

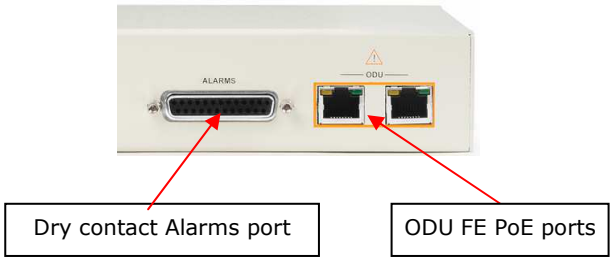

Figure 2-3: S-IDU back panel

S-IDU port	Description	Notes
48VDC power ports	Dual power supply input for power redundancy. • Left: -48VDC • Center: GND • Right: +48VDC	
Power LEDs	The power LEDs indicate S-IDU 48VDC power ports are connected to power: • Upper LED – left power port • Lower LED – right power port	
Ground	Grounding screw.	
ODU GigE PoE port*	10/100/1000Base-T Gigabit PoE, connected to WipAir outdoor Unit. The ODU port LEDs indicate: • Green LED – port synchronized on 100M. • Yellow LED – port synchronized on 1000M. • Blinking LED indicates activity (traffic).	This port connects to WipAir ODU only. Do not connect this port to any other network device.
1+1 port	1+1 Hot standby port for TDM redundancy mode.	
GigE LAN ports	10/100/1000Base-T Gigabit LAN ports. The port LEDs indicate: • Orange LED (left) – port synchronized on 100M. • Yellow LED (right) – port synchronized on 1000M. • Blinking LED indicates activity (traffic).	

TDM ports	E1/T1 ports. The TDM port LEDs indicate: **Red LED:** • Off – local TDM link is synchronized. • On – local LOS detected. • Blink – External loopback mode enabled. **Green LED:** • Off – Remote TDM link is synchronized. • On – Remote LOS detected. • Blink – Internal loopback mode enabled.	LOS - Loss of Signal (indicates problem in the connection between the port to the operator TDM device)
LED indication	**L1:** • Off – wireless link offline (MU---SU link is down). • On – wireless link online (MU---SU link is up). • Blink - wireless link online, configuration error. **L2:** • Off – ODU to S-IDU link is down. • On – ODU to S-IDU link is up. • Blink – S-IDU test mode enabled.	
ODU FE PoE port* [Back panel]	10/100Base-T PoE, connected to WipAir outdoor Unit. The ODU port LEDs indicate activity: • Off – port not connected. • On – port connected, no activity (traffic). • Blink - indicates activity (traffic).	This port connects to WipAir ODU only. Do not connect this port to any other network device.
Dry contact alarms port [Back panel]	4 Outputs + 4 Inputs dry contact alarms.	

2.4 Typical installation scheme

S-IDU device is assembled as follows:

1. Plug the outdoor unit (WipAir) cable to the RJ-45 Jack marked *'ODU PoE'* using a straight CAT5e Gauge 24-shielded outdoor rated cable (the cable should be UV resistant, flame retardant, UL listed and contain at least 4 twisted pairs).

Note: The *'ODU-PoE'* port is connected to WipAir radio only. Do not attach standard CAT5e cable from the PC (or other network device) to *"ODU-PoE"* jack. It may damage the PC's Ethernet interface.

The radio is connected and powered only via the 'ODU-PoE' port. Do not connect the radio to any other port.

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2. Plug standard CAT5e cable from the PC (or network switch/router) to the RJ-45 Jack marked *"GigETH – 10/100/1000 BaseT".*
3. Plug the TDM lines to the RJ-45 jacks marked *'E1/T1'*.
4. Plug the green 48VDC power jack to S-IDU *'48/60 VDC'* power port.
5. Connect a ground cable between S-IDU and an appropriate grounding point.
6. Plug the AC Input to the power (100-240VAC).

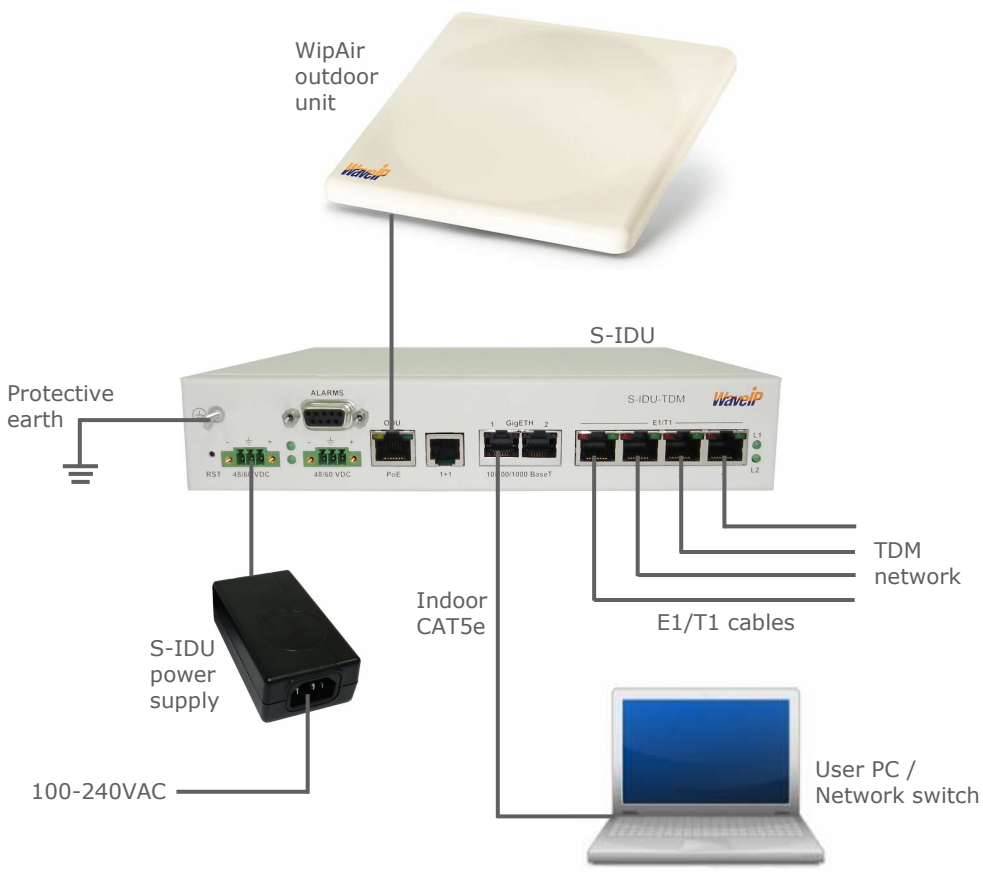


Figure 2-4: Typical installation

2.5 Cable schemes

2.5.1 Outdoor to indoor CAT5e cable

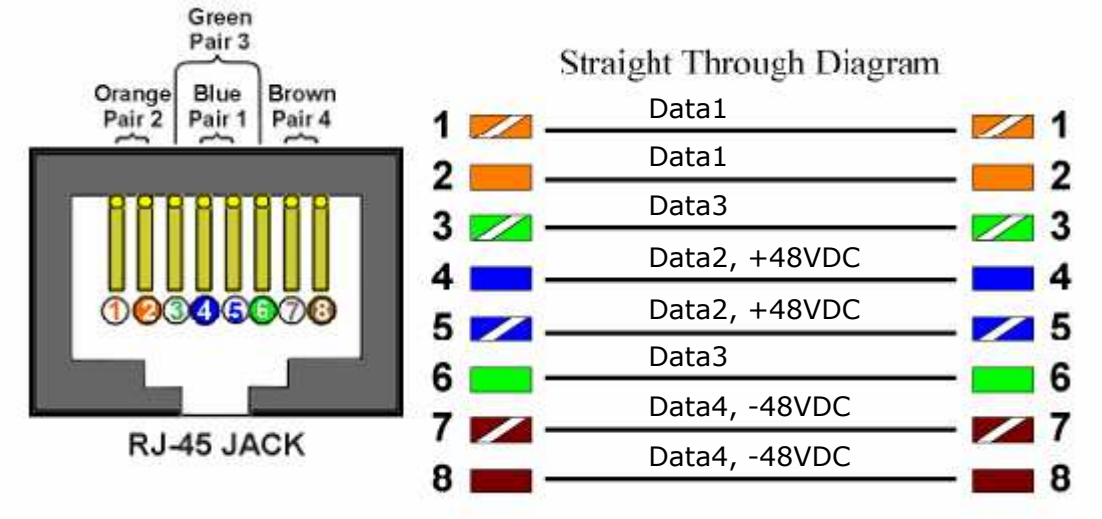


Figure 2-5: CAT5e cables scheme

Note: In order to comply with 100 meter CAT5e cable

- Pins 1,2 must be a twisted pair wire.
- Pins 3,6 must be a twisted pair wire.
- Pins 4,5 must be a twisted pair wire.
- Pins 7,8 must be a twisted pair wire.

2.5.2 TDM trunk cable

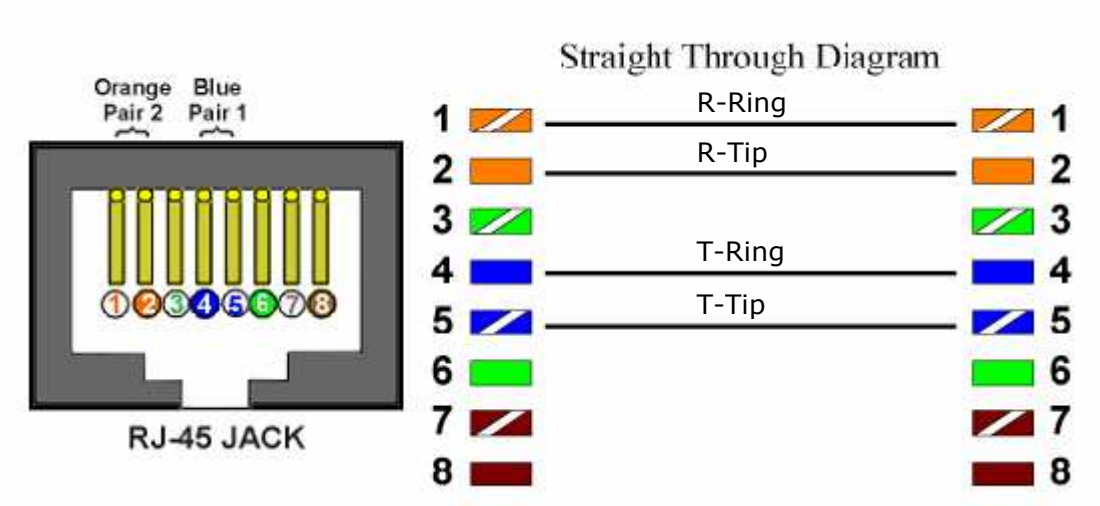
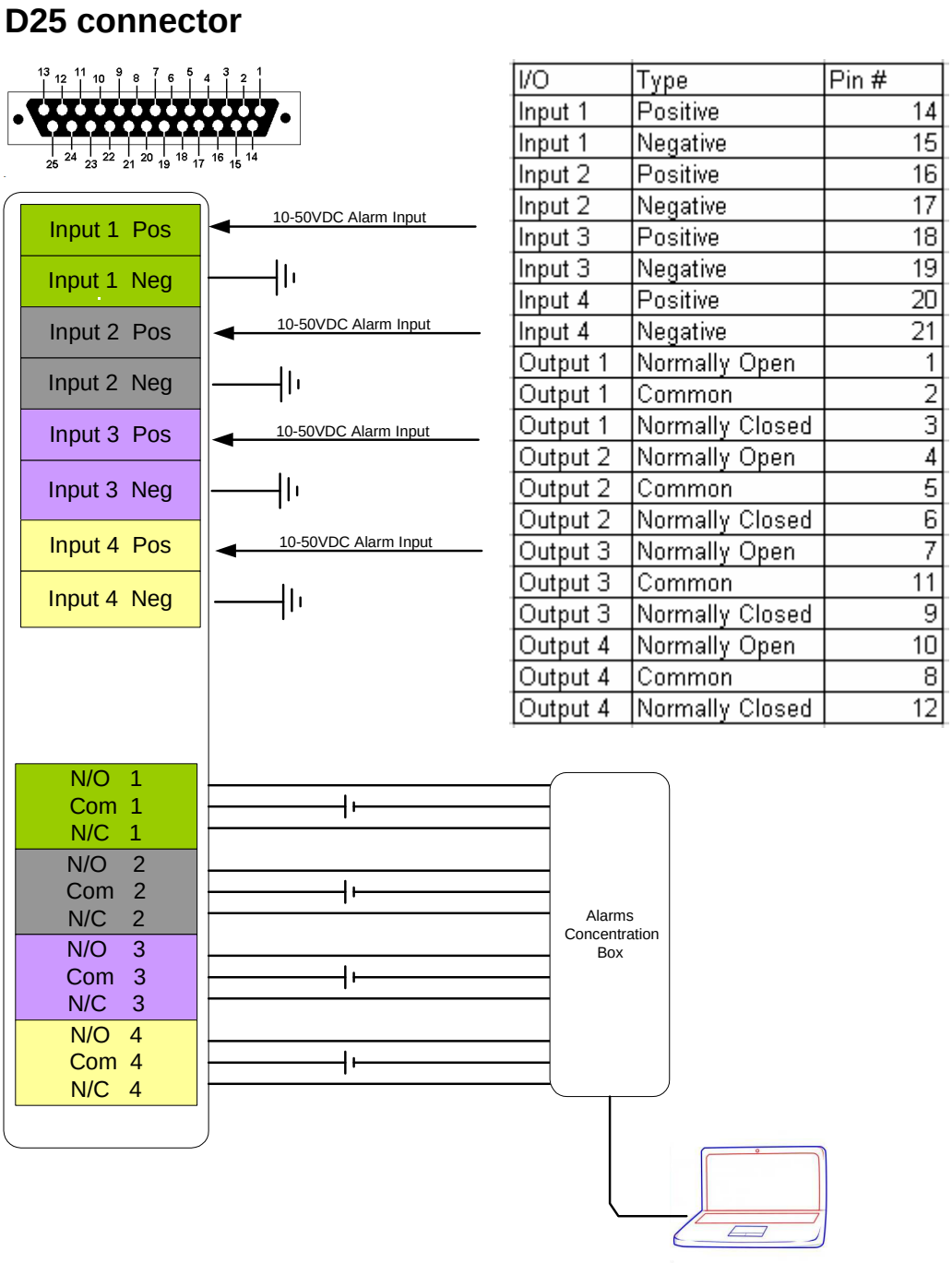


Figure 2-6: TDM cable scheme

- Pins 1,2 must be a twisted pair wire.
- Pins 4,5 must be a twisted pair wire.

2.5.3 House keeping alarms (dry-contacts)



I/O	Type	Pin #
Input 1	Positive	14
Input 1	Negative	15
Input 2	Positive	16
Input 2	Negative	17
Input 3	Positive	18
Input 3	Negative	19
Input 4	Positive	20
Input 4	Negative	21
Output 1	Normally Open	1
Output 1	Common	2
Output 1	Normally Closed	3
Output 2	Normally Open	4
Output 2	Common	5
Output 2	Normally Closed	6
Output 3	Normally Open	7
Output 3	Common	11
Output 3	Normally Closed	9
Output 4	Normally Open	10
Output 4	Common	8
Output 4	Normally Closed	12

Figure 2-7: Alarms connection scheme

- Current at the output relays should not exceed 1Amp. Please use an external current limit resistor to limit current.
- Input alarm voltage range 10 to 50 VDC.
- Remote and local alarms are presented in the Radio WEB interface.

Note: S-IDU is provided by default without dry contact alarms port. In case this port is needed, please make sure to order S-IDU with alarms port from factory.

2.6 Grounding

S-IDU unit is connected to WipAir outdoor unit, therefore proper grounding is required to protect against lightning.

It is the operator's responsibility to install and ground S-IDU in accordance with local codes and regulations, such as ANSI/NFPA No.70-1984

S-IDU earth lug should be connected to the protective earth at all times by a wire with a diameter of 10 AWG or wider.

Units intend to be installed in a Rack should be mounted only in earthed racks and cabinets.

Ground connection should be connected first and disconnected last.

Do not connect telecommunication or any other cables to ungrounded equipment.

Note: Only experience, trained professionals who are familiar with local building and safety codes and wherever applicable, are licensed by the appropriate regulations should install grounding. Failure to do so may expose the operator to legal and financial liabilities. WaveIP and its resellers or distributors are not liable for injury, damage or violation of regulations associated with the installation of indoor or outdoor units

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3. Configuration

S-IDU parameters are configured by default via SIDU's built in WEB interface.

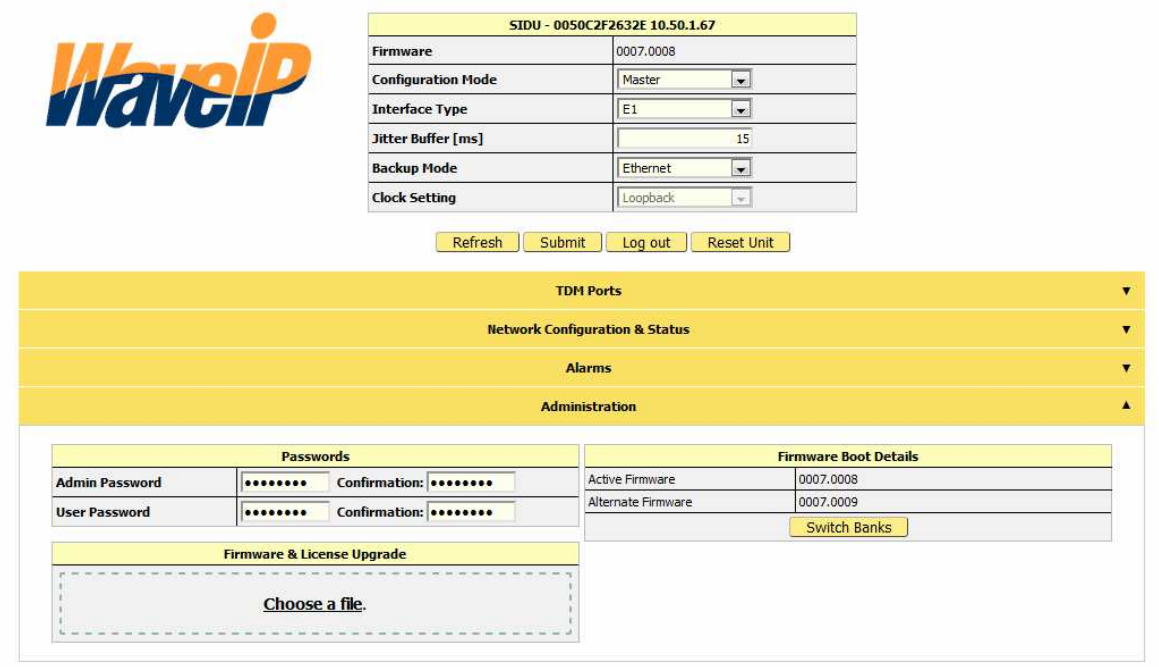

Figure 3-1: S-IDU WEB interface

3.1 Login

Activate your browser – The WEB interface is based on HTML5 and support the following browsers:

- Firefox version 7 and above.
- Chrome version 12 and above.
- IE version 8 (requires chrome frame plug-in that is downloaded automatically).
- Any other browser that implement HTML5 and web sockets version 13 and above.

Browse for the unit's IP – the WEB login screen will appear. The default IP is 10.50.1.1.

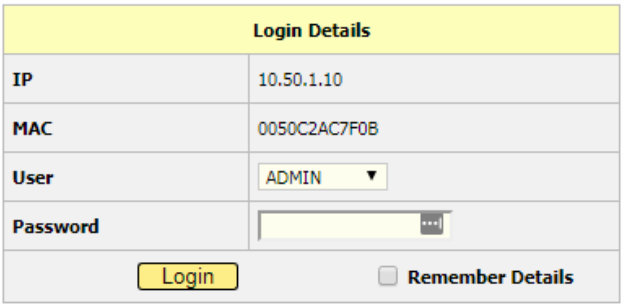

Figure 3-2: Login screen

Parameter	Description
IP	Display unit's IP address.
MAC	Display unit's MAC address.
User	Select operator privilege: • Admin – allows unit's monitoring and configuration. • User – allows monitoring only.
Password	Enter password.
Login	Press to login to the unit's WEB.

3.2 Main information

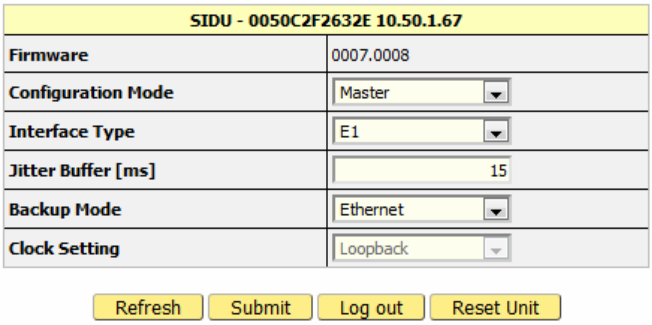

Figure 3-3: Main information table

Parameter	Description	Notes
Firmware	Indicates active firmware version.	
Configuration mode	Select S-IDU configuration mode: • Master – TDM clock is received via master's TDM lines. • Slave – TDM clock is recovered by the Slave S-IDU. • From ODU – to configure TDM via the ODU (MU/SU). This is legacy mode.	On TDM link, one S-IDU is the master and the second S-IDU is the slave. Default mode – master/slave.
Interface Type	Select S-IDU TDM interface mode – E1 or T1.	
Jitter Buffer	Configure the jitter buffer in msec.	Typical configuration = 8-15 msec
Backup mode	Configure 1+1 mode: • None – 1+1 mode disabled. • Ethernet – 1+1 HSB mode for backup of the air link only. • TDM – 1+1 HSB mode for backup of both air link and S-IDU. • HUB – For S-IDU HUB unit (used in 1+1 TDM backup mode)	Backup mode configuration must be identical for both WipAir MU and S-IDU.
Clock setting	Presented automatically based on the configuration mode: • Loopback – when S-IDU is configured as Master • Adaptive – when S-IDU is configured as Slave	When S-IDU is configured from ODU, the clock setting will be presented based on the ODU's configuration
Refresh	Refresh unit's parameters.	
Submit	Submit the configuration to the unit.	
Log out	Log out from the WEB interface.	
Reset unit	Send reset command to the unit.	

3.3 TDM Ports

TDM ports section configures and displays status for each TDM port.

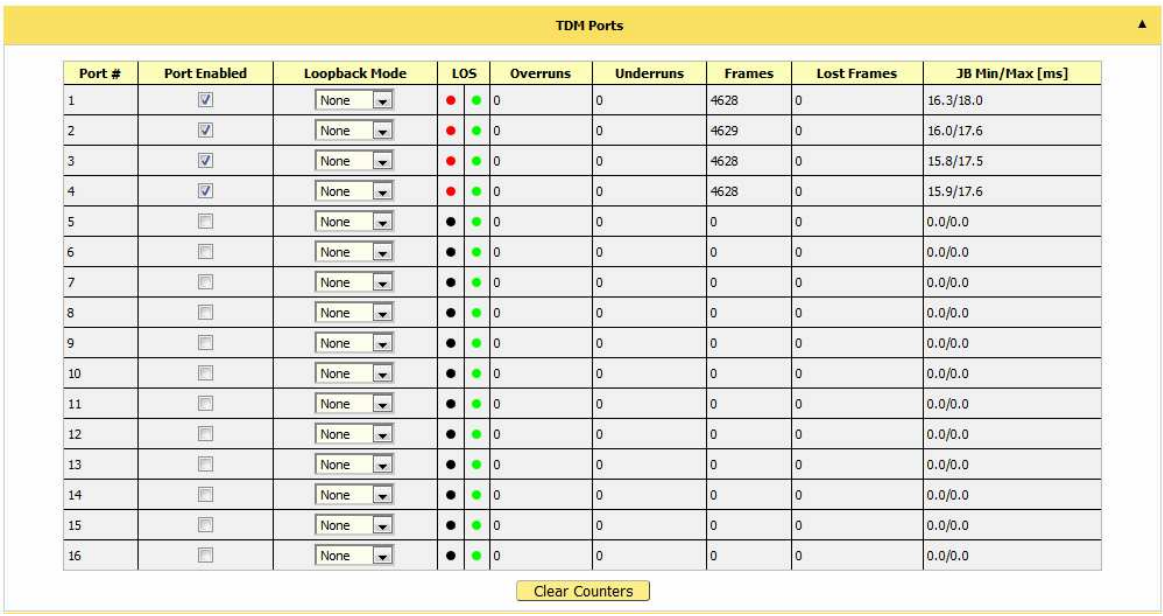

Figure 3-4: TDM ports

Parameter	Description	Notes
Port #	Indicates S-IDU port number.	
Port Enabled	Enable/disable S-IDU port.	
Loopback Mode	Configure port loop mode (for testing purpose): • None – loop mode disabled (normal operation) • External – enable external loop. • Internal – enable internal loop.	Default – none. Note: loop mode is automatically 'none' after unit reset.
LOS [port status]	Display S-IDU port status (for each port): • Black (left) – local TDM link is synchronized. • Red (left) – local LOS detected. • Black (right) – Remote TDM link is synchronized. • Green (right) – Remote LOS detected. • X – port not licensed.	LOS - Loss of Signal (indicates problem in the connection between the port to the operator TDM device)
S-IDU ports status		
Overruns	Number of port Overruns (must be 0 in normal operation).	In case value is not 0, try to increase jitter buffer size.
Underruns	Number of port Underruns (must be 0 in normal operation).	In case value is not 0, try to increase jitter buffer size.
Frames	Total number of received frames.	
Lost Frames	TDM over IP lost frames (must be 0 in normal operation).	In case value is not 0, verify the air link is stable with no PER.
JB Min/Max	Display Minimum and Maximum Jitter buffer recorded (msec) in the last 2 seconds.	
Clear Counters	Clear the counters.	

3.4 Network Configuration & Status

This section configures and displays S-IDU's network parameters.

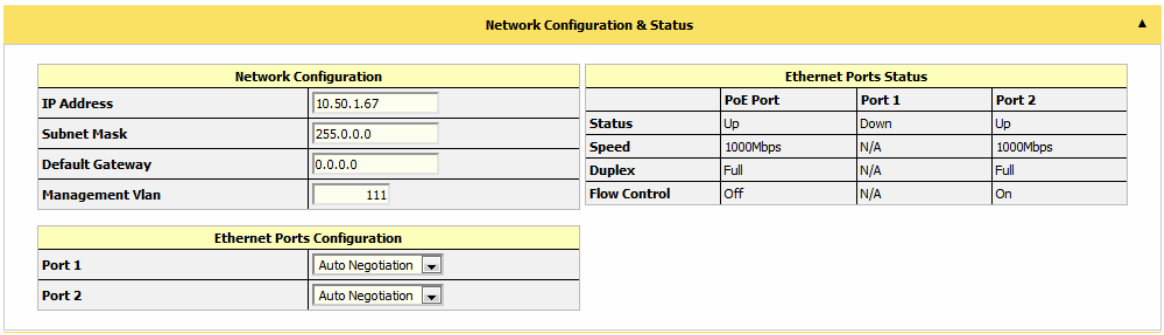

Figure 3-5: Network Configuration

Parameter	Description
IP Address	Configure S-IDU management IP Address.
Subnet Mask	Configure S-IDU subnet mask.
Default Gateway	Configure S-IDU default gateway.
Management VLAN	Configure management VLAN ID (0-4095). Default value = 0 (no VLAN)
Ethernet Port Configuration	Set the speed and duplex of S-IDU GigETH ports. S-IDU GigETH port and the other end Ethernet port (Router, PC, etc.) must be set to the same configuration (both sides AUTO, 100 Full/Half or 10 Full/Half). Fail to do so may cause Ethernet packet loss.
Ethernet Port Status	Displays Ethernet status for each port (POE / GigETH 1 / GigETH 2) - active port, speed, duplex and flow control.

3.5 Alarms

This section configures and displays S-IDU's Dry contact alarms functionality.

Note: S-IDU is provided by default without dry contact alarms port. In case this port is needed, please make sure to order S-IDU with alarms port from factory.

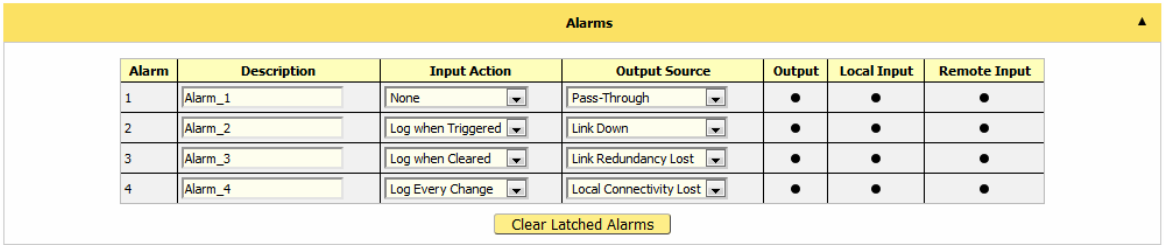

Figure 3-6: Dry Contact Alarms

Parameter	Description
Description	Configure name for each alarm.
Input Action	Configure alarm input action: • None – do not log alarm input. • Log when triggered. • Log when cleared. • Log every change.
Alarm Output	Configure alarm output function: • Pass-Through – output the remote S-IDU input alarm. • Link down – no communication to the other side. Self-cleared. • Link Redundancy lost – in 1+1 mode, link switch has occurred. Cleared manually. • Local connectivity lost – local connectivity problem (LAN) between S-IDU and radio. Self-cleared. • Always On. • Off.
Output	Display local output status: • Black – local output is in "low" state • Red – local output is in "high" state
Local Input	Display local input status: • Black – local input is in "low" state • Red – local input is in "high" state
Remote Input	Display remote input status (Remote S-IDU inputs): • Black – Remote input is in "low" state • Red – Remote input is in "high" state
Clear Latched Alarms	Clear output alarms that do not clear automatically.

3.6 Administration

Administration section is used to load new passwords, firmware or license to S-IDU.

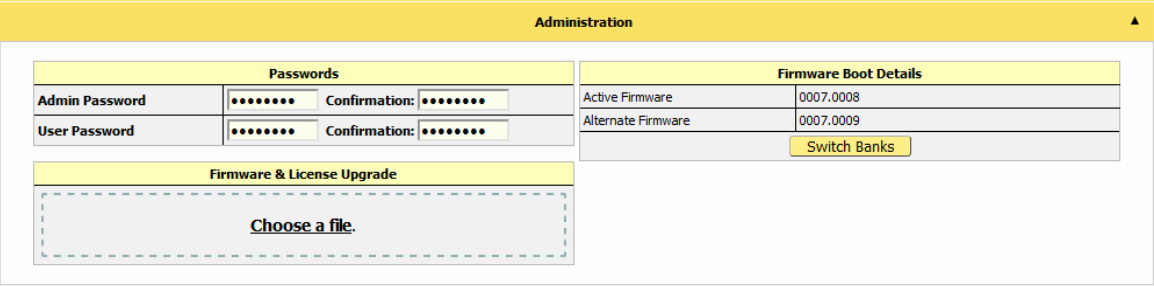

Figure 3-7: Administration

Passwords

- Set the "Administrator" password for **Admin** login.
- Set the "User" password for **User** login.
- Default passwords are blank.

Firmware update

S-IDU includes 2 firmware banks - Active and Alternate.

On firmware upgrade, the new firmware file is loaded to the alternate bank. After successful upgrade, the operator switch between the banks (the alternate bank becomes active and the active bank is now the alternate bank).

- Browse for the firmware file (*.brn). The firmware details will automatically appear.
- Press 'Submit' to load the firmware into the alternate bank.
- After successful upgrade, the firmware details will be displayed in the alternate bank.
- Press 'Switch banks' to switch between the active and alternate banks. The unit will automatically reboot.

License upgrade

- Browse for the license file (*.brn). The MAC addresses that are included in the file will automatically appear in a list.
- Press 'Submit'. The unit will automatically reboot after license upgrade.

3.7 Configuration from ODU – legacy mode

S-IDU TDM parameters can be configured via WipAir radios – the MU and SU.

Note: this option can be used only for TDM delivery (E1/T1), and does not support 1+1 backup modes.

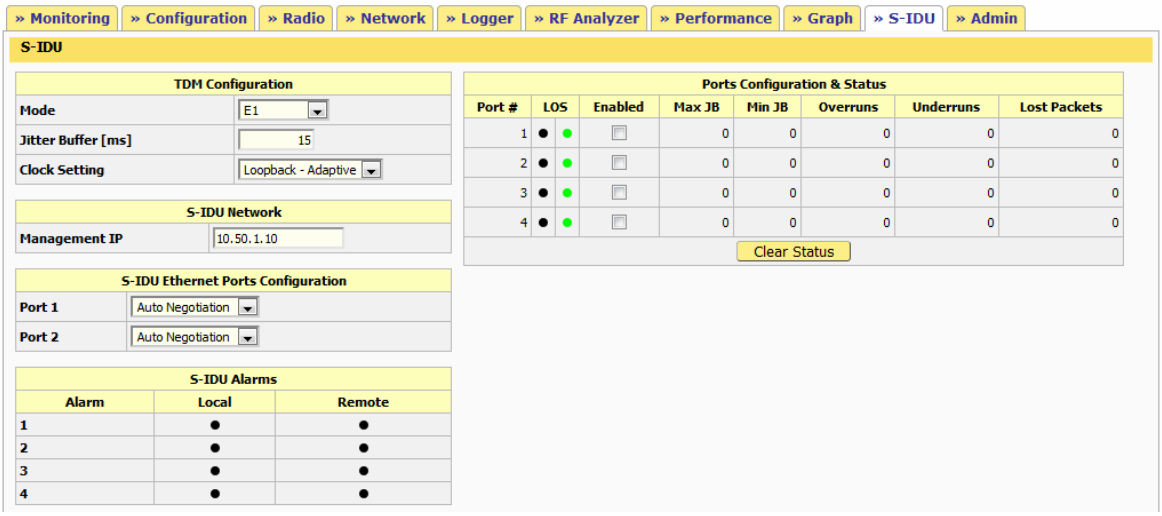

Figure 3-8: S-IDU configuration from ODU

Parameter	Description	Notes
Mode	Select S-IDU TDM interface mode – E1 or T1.	
Jitter Buffer	Configure the jitter buffer in msec.	Relevant for MU only. Typical value = 8-15msec
Clock setting	Set S-IDU clock configuration: • Loopback-Adaptive (default) • Adaptive-Loopback • Internal-Adaptive • Adaptive-Internal	Relevant for MU only. Default configuration = Loopback-Adaptive
Management IP	Configure the S-IDU management IP: • In the MU - assign management IP to the S-IDU connected to the MU. • In the SU - assign management IP to the S-IDU connected to the SU.	
Ethernet Port Configuration	Set the speed and duplex of S-IDU GigETH ports. S-IDU GigETH port and the other end Ethernet port (Router, PC, etc.) must be set to the same configuration (both sides AUTO, 100 Full/Half or 10 Full/Half). Fail to do so may cause Ethernet packet loss.	
SIDU Alarms	Display dry contact input alarm status: • Local S-IDU input - Black for "low" state, Red for "high" state • Remote S-IDU input - Black for "low" state, Red for "high" state	
S-IDU ports configuration & Status		
Port #	Indicates S-IDU port number.	
LOS [port status]	Display S-IDU port status (for each port): • Black (left) – local TDM link is synchronized. • Red (left) – local LOS detected. • Black (right) – Remote TDM link is synchronized. • Green (right) – Remote LOS detected. • X – port not licensed.	LOS - Loss of Signal (indicates problem in the connection between the port to the operator TDM device)
Enabled	Enable/disable S-IDU port.	

S-IDU ports status		
Max JB	Maximum Jitter buffer recorded (usec) in the last 2 seconds.	
Min JB	Minimum Jitter buffer recorded (usec) in the last 2 seconds.	
Overruns	Number of port Overruns (must be 0 in normal operation).	In case value is not 0, try to increase jitter buffer size.
Underruns	Number of port Underruns (must be 0 in normal operation).	In case value is not 0, try to increase jitter buffer size.
Lost packets	TDM over IP lost packets (must be 0 in normal operation).	In case value is not 0, verify the air link is stable with no PER.
Clear status	Clear the counters.	

3.7.1 S-IDU clock settings from ODU

TDM traffic is a clocked traffic, where the information (bits) is transmitted at a constant rate. S-IDU converts the TDM traffic into Ethernet packets and sends it via WipAir Point-to-Point link.

The Ethernet traffic is bursty (not constant rate and has variable size), so the main challenge of S-IDU subsystem is to provide constant rate traffic on both ends, or in other words, producing and transferring the clock.

There are four clock modes combinations (configured at WipAir MU):

S-IDU clock setting		TDM network (user equipment)	
MU S-IDU	SU S-IDU	MU side	SU side
Loopback	Adaptive	Internal	Adaptive
Adaptive	Loopback	Adaptive	Internal
Internal	Adaptive	Adaptive	Adaptive
Adaptive	Internal	Adaptive	Adaptive

- Loopback-Adaptive - MU S-IDU clock is received via the TDM lines (Loopback) and SU S-IDU recovers it (Adaptive).
- Adaptive-Loopback - SU S-IDU clock is received via the TDM lines (Loopback) and MU S-IDU recovers it (Adaptive).
- Internal-Adaptive - The MU S-IDU uses internal clock (Internal) and SU S-IDU recovers it (Adaptive).
- Adaptive-Internal - The SU S-IDU uses internal clock (Internal) and MU S-IDU recovers it (Adaptive).

4. Special modes

4.1 Backup mode (1+1) - Ethernet

Ethernet 1+1 mode includes 2x S-IDUs and 2x WipAir links. This mode is used to backup the air interface while passing Ethernet traffic with or without TDM traffic.

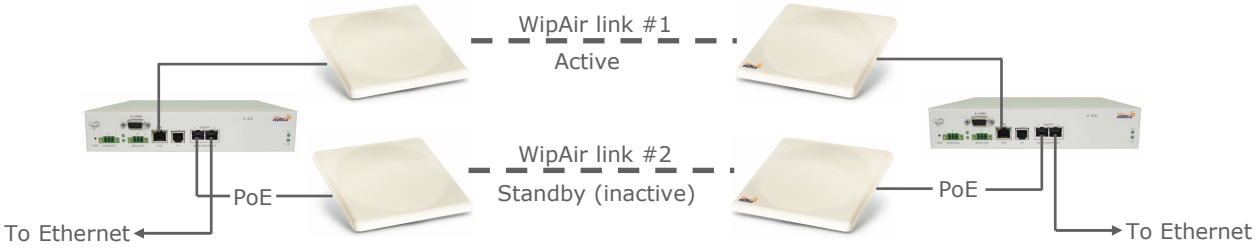

Figure 4-1: 1+1 configuration - Ethernet

WipAir links in 1+1 configuration operate in hot standby mode:

- One link is active.
- Second link is inactive (standby).

As such, both links may be configured to operate on same RF channel, saving valuable RF spectrum.

When failure is detected in the active link, the backup link automatically becomes online (automatic detection of less than 50ms).

S-IDU 1+1 mode is assembled as follows:

1. Plug WipAir outdoor unit (link #1) cable to the RJ-45 Jack marked *'ODU PoE'* using a straight CAT5e Gauge 24-shielded outdoor rated cable (the cable should be UV resistant, flame retardant, UL listed and contain at least 4 twisted pairs).
2. Plug standard indoor CAT5e between S-IDU *'GigETH #1'* to WipAir PoE device (provided with WipAir ODU) *'LAN-IN'* port.
3. Plug WipAir outdoor unit (link #2) cable to WipAir PoE device *'PWR LAN-OUT'* using a straight CAT5e Gauge 24-shielded outdoor rated cable (the cable should be UV resistant, flame retardant, UL listed and contain at least 4 twisted pairs).
4. Plug standard CAT5e cable from the PC (or network switch/router) to the RJ-45 Jack marked *"GigETH #2".*
5. Plug the green 48VDC power jack to S-IDU *'48/60 VDC'* power port.
6. Connect a ground cable between S-IDU and an appropriate grounding point.
7. Plug the AC Input to the power (100-240VAC).

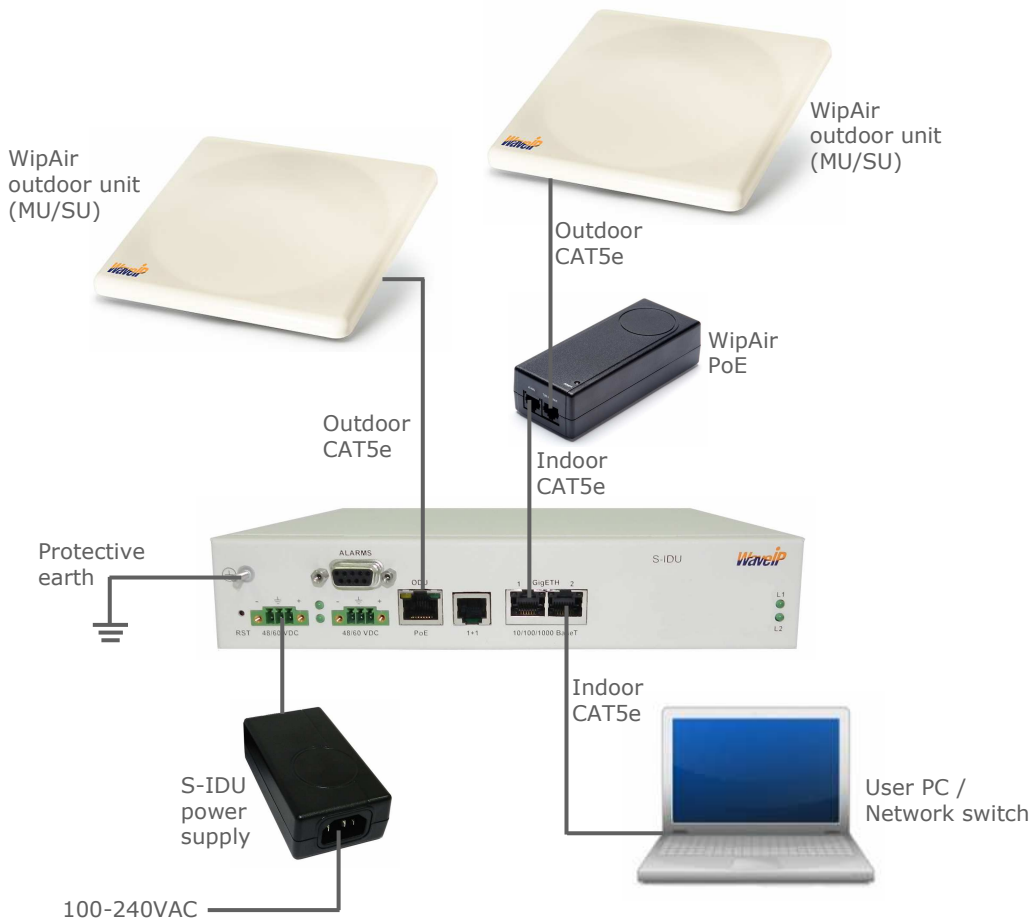

Figure 4-2: 1+1 connection scheme (Ethernet only)

Configuration notes:

1) WipAir radio – in MU radio tab, select backup mode "Ethernet". Make sure both MUs are configured, for both active and standby links.
2) Select S-IDUs configuration "master/slave" (not "from ODU") – one S-IDU is configured as master (usually the S-IDU on MUs side), and the second S-IDU is slave.

4.2 Backup mode (1+1) - TDM

TDM 1+1 mode includes 4x S-IDUs, 2x E1 splitters and 2x WipAir links.

This mode is used to backup the air interface while passing TDM traffic only.

In case traffic includes both TDM and Ethernet (typical), additional 2x HUB S-IDUs are required.

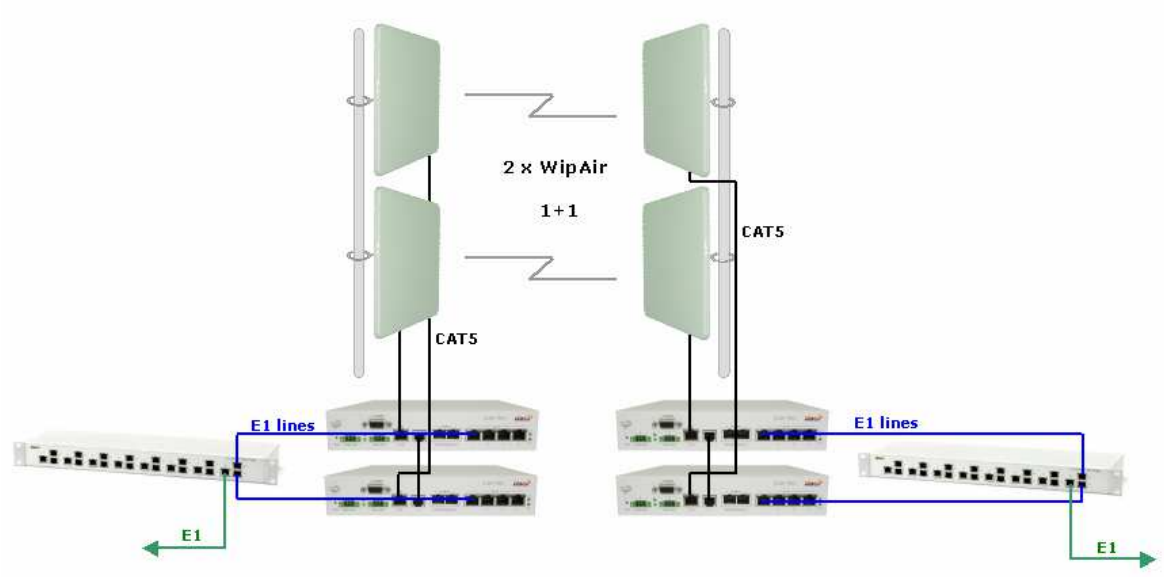

Figure 4-3: TDM 1+1 connection scheme

WipAir links in 1+1 configuration operate in hot standby mode:

- One link is active.
- Second link is inactive (standby).

As such, both links may be configured to operate on same RF channel, saving valuable RF spectrum.

When failure is detected in the active link, the backup link automatically becomes online (automatic detection of less than 50ms).

S-IDU 1+1 TDM mode is assembled as follows:

1. Configure 2x S-IDUs on main site (TDM clock origin) – master + TDM backup mode.
2. Configure 2x S-IDUs on remote site (TDM clock recovery) – slave + TDM backup mode.
3. Connect one link without backup mode TDM enabled (at MU radio tab).
4. Connect the 2nd link without backup mode TDM enabled (at MU radio tab).
5. Make sure that only one SU side SIDU is connected to LAN's switch to prevent loop at this stage.
6. Connect E1/T1 to each SIDU via TDM splitter (1 splitter at MUs side, and 1 at SUs side).
7. Connect the RJ-11 cable between MU side SIDUs.

8. Connect the Ethernet (via 2x HUB S-IDU):
   - MU side:
     - Connect *GigETH2* of TDM S-IDU #1 to *GigETH1* of HUB S-IDU.
     - Connect *GigETH2* of TDM S-IDU #2 to *GigETH2* of HUB S-IDU.
     - Connect *Orange GigETH* port of HUB S-IDU to network.
   - SU side:
     - Connect *GigETH2* of TDM S-IDU #1 to *GigETH1* of HUB S-IDU.
     - Connect *GigETH2* of TDM S-IDU #2 to *GigETH2* of HUB S-IDU.
     - Connect *Orange GigETH* port of HUB S-IDU to network.

9. The link is now in 1+1 TDM mode.

4.3 Test mode

Test mode is used to test 2x S-IDUs without WipAir wireless link.

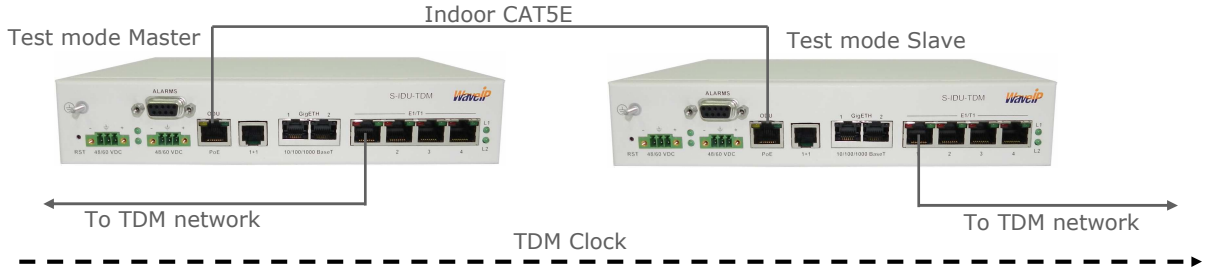

Figure 4-4: Test mode

Test mode configuration includes:

- S-IDU master.
- S-IDU slave.

4.4 Loopback mode

Loop mode is used to apply automatic loop on S-IDUs port for test purpose.

External loop mode:
External loop mode tests the local TDM port in the following configuration:

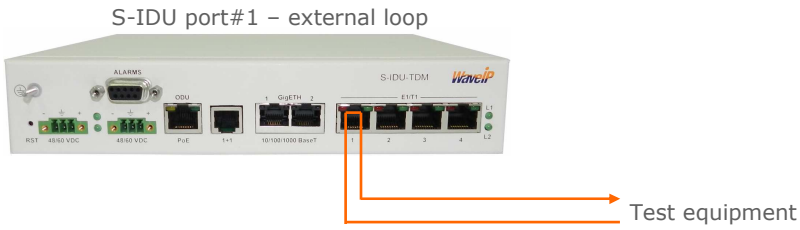

Figure 4-5: External loop scheme

In external loop mode, data coming from the user equipment is looped back to it.

Internal loop mode:
Internal loop mode tests the local and remote S-IDUs and the connection via the wireless link in the following configuration:

Figure 4-6: Internal loop scheme

In internal loop mode, data coming from the user equipment pass the wireless link, and looped back by the remote S-IDU.

Note: Loop mode (internal or external) is automatically turned off after reset.

5. S-IDU Specifications

Specifications	
Number of E1/T1 ports	Up to 16, 120 ohm
Framing	Unframed (transparent) E1 2048Kbps symmetrical data rate T1 1544Kbps symmetrical data rate
Standards	ITU-T G.703, G.826
Latency	Configurable 5-30ms
Jumbo Frames	2048 Bytes (Ethernet)
Physical Interface	1x 10/100/1000 Base-T (POE) 2x 10/100/1000 Base-T (LAN)
Connector Type	RJ-45
Power Consumption	<10Watt
Operating Temperature	-5c to 50c
Operating Humidity	95% non condensing