InfiNet Wireless R5000 *Quick Installation Guide*

WARNING The document is intended to be used by qualified RF engineers/technicians and IT professionals. Qualified personnel should have skills and experience in the following areas: outdoor/indoor radio equipment installation, outdoor wireless networks, TCP/IP networking protocols, safety procedures and instructions for installing antenna equipment, professional manage of electrical equipment and accessories, safety procedures and instructions for working on towers and heights.

WARNING The warranty is not spread for the devices which stopped working properly due to improper usage, careless treatment, incorrect deployment or exploitation. The warranty voids in the following cases: the device was opened and/or repaired by the owner on his own, improper exploitation conditions (including improper grounding), electrical damaging of the print circuit board due to electric disruption caused by improper grounding, mechanical defects of the case.

Section 1. Installation preparations

Components and accessories required for the installation

- Indoor Unit (IDU)

- Outdoor Unit (ODU)

- Service cable for IDU-to-ODU connection. Service cable should be STP (or FTP) Category 5E cable. The total cable length between LAN equipment (behind IDU) and ODU should not be longer than 100 meters.

- One shielded and one standard RJ-45 connectors for service cable

- Ethernet cable for connecting IDU to LAN equipment (use a straight Ethernet cable for connecting to a hub/switch or a cross-over cable for connecting directly to a PC)

- IDU's AC power cord with a power plug

- Console cable for easy direct connection to ODU (optional)

- ODU mounting kit assembling (Pole, Low-diameter Pole or Wall mounting kit).

- IDU mounting kit assembling (optional)

In case of using ODU with external antenna:

- Antenna

- Antenna installation kit assembling

- RF low loss cable for connecting antenna to ODU

- Required grounding system.

- InfiNet Wireless "RapidView-1" visual diagnostic device for easy antenna alignment procedure (optional)

Tools required for the installation

- Screwdrivers set

- Pliers

- Spanners set

- RJ-45 Crimp Tool (for RJ-45 connectors)

- Connectors sealing set.

- Optional: GPS receiver

- Optional: Big zoom binocular

Cables preparation

1. In case of installing ODU with external antenna: prepare RF cable of the required length. RF low loss cable of 1 meter length is recommended. Install and seal the connectors on the RF cable.

2. Determine the Service cable length that you need to connect IDU to ODU. The total length of cables between LAN equipment and ODU should not be longer than 100 meters.
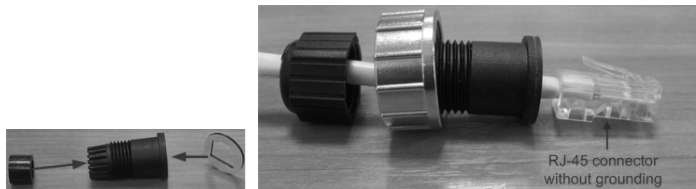
   For example, total length of the Ethernet cable connecting your switch to IDU and Service cable connecting IDU to ODU should not be more than 100 meters. So if you are using 60 meters Service cable then Ethernet cable length should not be more than 40 meters.

   Service cable should be STP/FTP Category 5E cable.

3. Install a RJ-45 connector without grounding (used to connect to ODU) on the Service cable and seal it (see RJ-45 Connector installation and Sealing instructions below).

4. If it is possible to lay the Service cable with a RJ-45 connector on the IDU side, install and seal shielded RJ-45 connector for IDU on the Service cable.
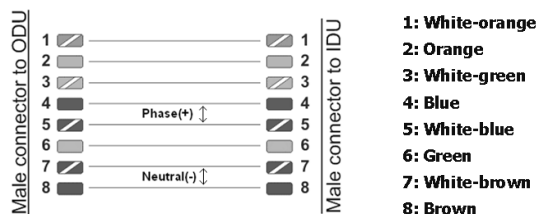

RJ-45 connector installation

To install RJ-45 connector without grounding on the Service cable on the ODU side (shielded RJ-45 connector is installed on the for IDU side of the Service cable):

1. Peel the STP Service cable removing a small piece of its external jacket to free the internal wires.

2. Assemble RJ-45 connector parts together and put them on the Service cable according to the picture.

3. Attach RJ-45 connector to the Service cable according to the "RJ-45" soldering scheme and crimp the connector.

⚠ WARNING	Please tightly crimp the RJ-45 connector. Not crimped or badly crimped connector damages the unit when assembled into it which is not considered as a warranty case.

4. Assemble the connector to the unit.

⚠ WARNING	Connect STP-cable with KEYED RJ-45 connectors ONLY to "ODU" port on the IDU. Do NOT try to connect it to "LAN" port, it will damage Keyed RJ-45 connector or IDU's port.

Picture. RJ-45 connector assembling (steps 2 and 3)

RJ-45 connector soldering scheme:

1: White-orange
2: Orange
3: White-green
4: Blue
5: White-blue
6: Green
7: White-brown
8: Brown

Section 2. Antenna, ODU and IDU installation

Installation guidelines

1. In case of using ODU with external antenna:

- Install the antenna in the appropriate location (see antenna alignment instructions below). Antenna's position must be lower than the highest antenna pole point at least by 2 antenna heights. Point the antenna to the required direction. Provide antenna grounding.

- Connect RF cable to the antenna. Twist the connector tightly. Seal the connector.

- Install ODU having its connectors pointing down and tighten it. Appropriate place for ODU installation is as close as possible to the antenna but reachable for you to connect ODU via its console port. Provide ODU grounding.

- Connect RF cable to the ODU previously having touched RF cable connector case with ODU connector case for removing static electricity on the ODU. Seal the connector.

2. In case of using ODU with integrated antenna:

- Install the ODU in the appropriate location (see antenna alignment instructions below). ODU's position must be lower than the highest antenna pole point at least by 2 ODU's heights. Point the ODU with integrated antenna according to the direction required for the link. Do not tighten it too hard unless the

integrated antenna alignment is not complete. Install ODU connectors down. Provide ODU grounding.

WARNING   It is extremely important to install ODU connectors down!

3. Connect the STP/FTP Service (ODU-to-IDU) cable to the ODU. Seal the ODU connector.

4. Lay the STP/FTP Service cable "from top to bottom" – from ODU to IDU. Provide cable whipping before entering the building. Whipping radius should be at least 10 times STP/FTP cable diameter.

5. If shielded RJ-45 Service cable connector for IDU hasn't been installed, install it. Seal the connector.

6. Install IDU. Provide IDU grounding.

7. Connect STP Service cable to "ODU" port on the IDU's, previously having touched IDU connector case with Service cable connector case for removing static electricity on the IDU.

8. Connect LAN Ethernet UTP cable to "LAN" port on the IDU.

WARNING   Connect LAN UTP-cable with KEYED RJ-45 connectors ONLY to "LAN" port on the IDU. Do NOT try to connect it to "ODU" port: it will damage Keyed RJ-45 connector or LAN equipment.

9. Connect power cord to IDU. Provide power supply.

10. Connect to the unit using Telnet protocol.

11. Configure basic configuration parameters (see Basic configuration instructions below).

Basic configuration

1. Connect to the ODU via ODU's console port using console cable or via IDU's LAN Ethernet port using wired LAN (use Telnet).

2. Configure your computer parameters.

   If you are using console port start any terminal emulation software (e.g. Hyper Terminal), set console interface properties to 38400 baud rate, 8 bit, 1 stop bit, parity off, flow control disabled, enable emulation mode ANSI or VT100, keyboard VT100.

   If you are using Telnet protocol from via wired LAN run Telnet with 10.10.10.1 IP-address that is configured for the Ethernet interface of the device by default.

3. You will see the WANFleX OS login prompt. Enter login and password. Every new device has no initial login and password settings, so you can use any non-zero length login and password to enter the device. After default authorization there will be standard prompt string.

4. Perform basic radio interface configuration using "rfconfig <IF-NAME>" command. Basic parameters are: radio frequency ('freq' parameter) in MHz and bit-rate ('bitr' parameter) in kBits/sec. '<IF-NAME>' – is RF interface name of the device. You can find it on the label on the ODU. For example: *rfconfig rf5.0 freq 5260 bitr 130000*. To learn your device's radio module capabilities type the command: *rfconfig <IF-NAME> cap*.

☞   Choose the frequency attentively. The frequency should be the one your radio link is working on.

Antenna alignment

Install antennas as high as possible over specific level. Proximity of other antennas should be avoided (at least 2 meters). Consider reflecting surfaces (building with reflective windows, water surfaces or wet grounds). When installing antenna over water surface, one should tune height bracket within 1-3 meter range variation, because it can yield signal level variation from minimum to maximum.

To obtain the best performance results, it is necessary to perform a precise analysis of a LOS conditions, signal propagation path zone and possible obstructions that may cover a part of the 1st Fresnel zone. Possible obstructions on the signal propagation path are neighboring buildings, trees, bridges, power lines.

Antenna polarization must be taken into consideration while installation. In most cases Omni-directional and sector antennas have vertical polarization. Directional antennas can be installed either with vertical or horizontal polarization. Please check a corresponding labeling on the antenna and address to the antenna technical documentation. R5000-Xm 2x2 series devices should use Dual-polarization antennas.

Recommendations for antenna alignment: align antennas using optical equipment (binoculars, spyglass) accompanied by mobile phone actions coordination, use GPS receiver and area map, use InfiNet Wireless RapidView-1 device or build-in InfiNet Wireless ODU features. These features allow evaluating current channel/signal quality and perform precise antenna alignment. To achieve the best link quality on the radio link use "Ltest" software utility. See complete description of these commands and utilities in OS WANFleX Manual (wanflex.pdf) and Technical User manual (tum.pdf).

To perform simple antenna alignment:

1. Connect to the ODU and perform basic configuration as it is shown in Basic configuration instructions.

2. Start "Ltest" utility using "**ltest** *<IF-NAME> destination_device_MAC*" command. 'destination_*device_MAC*' – is a MAC address of a device on the opposite end of the radio link (for example: ***ltest rf5.0 00:00:0e:12:13:ac***).

3. When "Ltest" starts you will see a growing table with two parts: local (device) and remote (device). In four columns of each side of the link you will see current/maximum received signal levels, current/maximum number of retries (%), current/maximum number of undelivered packets (%) and current/maximum number of undelivered ACKs (%).

4. Rotate (and/or) tilt the antenna to achieve the best signal levels, zero retries and errors.

5. Fix the antenna.

Grounding

Antenna should be placed on the mast on the level that is at least 1 meter lower than a mast's top. In this case it is of big probability that the lightning strikes the mast and not the antenna. The mast is to be grounded on the grounding contour according to your local standards.

A special attention should be paid if antenna used is not DC-shorted. In this case additional lightning arrestor should be used between the antenna and ODU. Suggested grounding diagram is shown on the picture below.

ODU and IDU should be grounded using their grounding clamps. In case of using IDU-5000-CPE, IDU is grounded via power cord grounding.

Antenna pole, tower, ODU and lightning arrestor should be connected to the first common grounding contour. Cable thickness should be no less than 10AWG using corrosion-steady connectors. It is highly recommended to entrust grounding contour development to the skilled personnel. IDU should be grounded to the same contour as customer LAN, having the second common grounding contour.

Connector hermetic sealing

A big number of problems with link signal quality in case of outdoor installations result from RF cable and connectors corrosion. In order to avoid these problems it is necessary to isolate all the connections that are situated outdoors. It is recommended to use either thermal shrinkage with gel stuff or special waterproof tape.

Once the antenna alignment is not complete it is not recommended to perform sealing. This prevents you to remove the sealing when there is a need to reallocate the antenna or the cable. Sealing with thermal shrinkage usage is performed with a special fan. **Obey all precaution measures while using the fan as it is written in its manual!** The isolation using the waterproof tape is performed by its winding with intersection around the connection.

Please keep in mind the following recommendations: clean all the surfaces to be isolated and keep them free from the dust and water. Sealing material must cover the whole connector and the cable with a gap of at least 2-3 cm from the connection place, sealing material must cover the surfaces as tight as possible.

To protect the sealing material from the sun rays, it is recommended to cover it with vinyl isolation tape.