

InfiNet Wireless R5000 *Quick Installation Guide*



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.



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 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.
 - Two shielded Screw Lock connectors for service cable (One shielded top Screw Lock connector for service cable in case of using IDU-5000-RJ or IDU-5000-CPE)
 - Ethernet cable for connecting IDU to LAN equipment (use a straight for connection to a hub/switch or a cross-over cable for connecting directly to a computer)
 - IDU's AC power cord with a power plug
 - Console cable for having easy direct connection to ODU and performing initial configuration, link diagnostic, performance monitoring
 - ODU mounting kit assembling. Pole, Low diameter pole or Wall mounting kits are available.
 - IDU mounting kit assembling (optional, depending on the model)
- In case of using Distribution box (optional, depending on the model):
- Distribution box. Distribution box is required to transfer the signal from STP/FTP Service cable going from ODU into UTP RJ-45 keyed patch cord going to IDU.
 - Distribution box patch cord with two preinstalled KEYED RJ-45 connectors for connecting Distribution box to IDU.
- In case of using IDU with external antenna:
- Antenna
 - Antenna installation kit assembling
 - RF low loss cable for connecting antenna to ODU
 - Required grounding system.
 - Audio Monitor for easy antenna alignment procedure (optiona

Tools to be available at the installation site.

- Screwdrivers set
- Pliers
- Spanners set
- Soldering iron 40 W (for Screw Lock connectors)
- RJ-45 Crimp Tool (for RJ-45 connectors)
- Connectors sealing set.
- Optional: GPS receiver or area map with compass and alidade
- Optional: Big zoom binocular

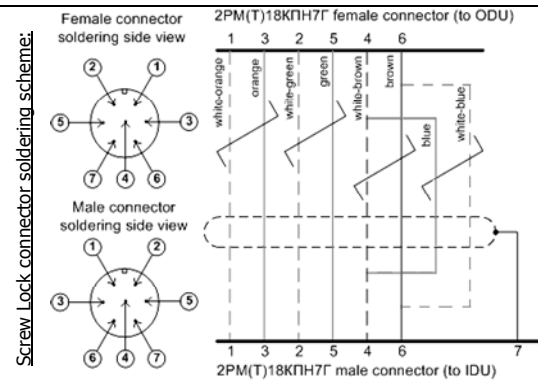
Cables preparation

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 is used to connect IDU and ODU. The total cable length between LAN equipment (behind IDU) and ODU should not be longer than 100 meters. Service cable should be STP/FTP Category 5E cable.
3. Install a connector for ODU on the Service cable and seal it (see Connector installation and Sealing instructions below).
4. If it is possible to lay the Service cable with a connector on the IDU side, install and seal connector for IDU on the Service cable.

Connector installation.

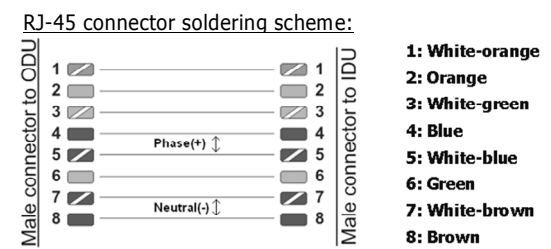
To install Screw Lock connector:

1. Peel the Service cable removing a small piece of its external jacket to free the internal wires.
2. Disassemble the connector detaching its bottom part by turning it clockwise.
3. Insert the cable into the bottom part of the connector.
4. Solder the top side of the connector with the free internal wires of the Service cable according to the Screw Lock soldering scheme.
5. Assemble the connector.



To install RJ-45 connector (without grounding) for ODU:

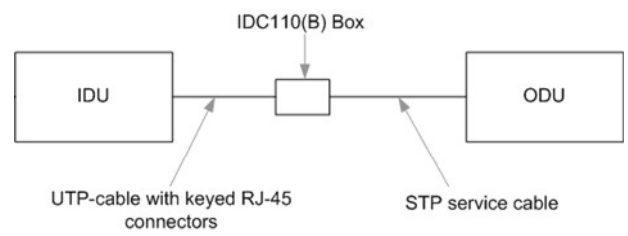
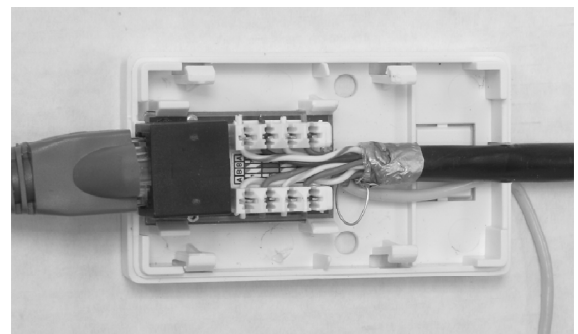
1. Peel the STP Service cable removing a small piece of its external jacket to free the internal wires.
2. Put connector parts on the Service cable.
3. Attach RJ-45 connector to the Service cable according to the "RJ-45" soldering scheme and crimp the connector.
4. Assemble the connector.



Distribution box connection.

To connect STP/FTP Service cable to Distribution box:

1. Peel the Service cable removing a piece of its external jacket to free the internal wires
2. Open Distribution box cover.
3. Assemble the Service cable freed wires into Distribution box contacts according to scheme "B" (See scheme "B" inside Distribution box). To assemble the Service cable wires force them in the Distribution box contacts.
4. Connect STP/FTP Service cable grounding wire to Distribution box grounding wire.
5. Close Distribution box cover.
6. Connect Distribution box UTP Service cable in the Distribution box RJ-45 connector.



WARNING Connect UTP-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.

Section 2. Antenna, ODU, IDU installation.

Installation guidelines.

1. 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. (In case of using ODU with external antenna).
2. Connect RF cable to the antenna. Twist the connector tightly. Seal the connector. (In case of using ODU with external antenna).
3. 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.

In case of using ODU with integrated antenna:

install ODU 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.

It is extremely important to install ODU connectors down!

4. 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 (in case of using ODU with external antenna).

5. Connect the STP/FTP Service (ODU-to-IDU) cable to the ODU. Seal the ODU connector.
6. 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.
7. If Service cable connector for IDU hasn't been installed, install it. Seal the connector.
Optional: In case of necessity of switching from STP/FTP Service cable with Screw Lock connector to UTP Service cable with RJ-45 connector use Distribution box (see Distribution box connection instructions above). Provide Distribution box grounding.
8. Install IDU. Provide IDU grounding.
9. Connect Service cable to IDU previously having touched IDU connector case with Service cable connector case for removing static electricity on the IDU.



Connect UTP-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.

10. Connect Ethernet cable to IDU.
11. Connect power cord to IDU. Provide power supply.
12. Connect to the unit using Telnet protocol.
13. Configure basic configuration parameters (see Basic configuration instructions below).

Basic configuration.

1. Connect to the ODU via ODU console port using console cable or via IDU LAN Ethernet port using wired LAN (start Telnet protocol).
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 the 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 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: radio frequency ('freq' parameter) in MHz, bit-rate ('bitr' parameter) in kBits/sec, system identifier ('SID' parameter). '<IF-NAME>' – is RF interface name of the device. You can find it on the label on the ODU. 'SID' – is a system identifier of the unit (all units that are supposed to see each other on the same radio link must have the same identifier). For example: *rfconfig rf4.0 freq 5260 bitr 24000 sid 01010101*. To learn your device's radio module capabilities type the command: *rfconfig <IF-NAME> capabilities*.



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 a 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.

Recommendations for antenna alignment: align antennas using optical equipment (binoculars, spyglass) accompanied by mobile phone actions coordination, use GPS receiver and area map, use Audio Monitor or build-in InfiNet Wireless Device 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 "RMA Test" utility if you have RMA firmware (R5000 WANFlex 4.XX) installed on your device or use "MINT Monitor" utility if you have MINT firmware (R5000 WANFlex 1.XX). See complete description of these utilities in OS WANFlex Manual for your firmware version. To know your firmware version type "**sys ver**" in the device command line.

To perform simple antenna alignment:

Using RMA firmware:

1. Connect to the ODU and perform basic configuration as it is shown in Basic configuration instructions.
2. Start "RMA Test" utility using "**rma** <IF-NAME> **test destination_device_MAC packet_lenth**" command. 'destination_device_MAC' – is a MAC address of a device on the opposite end of the radio link, 'packet_lenth' – testing packet length. (For example: **rma rf4.0 test 00:00:0e:12:13:ac 2048**)
3. When "RMA Test" starts you will see several columns of numbers. Pay attention to the "Replies" column. There are a number of sent and a number of received packets in "received(sent)" format. "In" and "Out" columns shows ingoing/outgoing signal level. Look at the "Lost In" and "Lost Out" columns. There must be 0% of lost packets.
4. Rotate (and/or) tilt the antenna to achieve the better link quality. See "RMA Test" screen again. Wait about 5 seconds for "RMA Test" results to appear for new antenna alignment position.
5. Do previous step until the best radio link quality is achieved (0% loses, high signal level). Fix the antenna.

Using MINT firmware:

1. Connect to the ODU and perform basic configuration as it is shown in Basic configuration instructions.
2. Start MINT. Type: "**mint** <IF-NAME> **-minbitrate 6000**", replace "<IF-NAME>" with your radio interface name. Press Enter. Then type: "**mint start**".
3. Start "MINT Monitor" utility using "**mint** <IF-NAME> **monitor destination_device_MAC**" command. 'destination_device_MAC' – is a MAC address of a device on the opposite end of the radio link. (For example: **mint rf4.0 monitor 00:00:0e:12:13:ac**)
4. When "MINT Monitor" starts you will see two stripes (stripes duet) that are continually repeating. The first stripe in duet and the number to the left of it show received signal level. The second stripe and the number to the left of it show transmitted signal level.
5. Rotate (and/or) tilt the antenna to achieve the better signal level. See "MINT Monitor" screen again. Wait about 5 seconds for "MINT Monitor" results to appear for new antenna alignment position.
6. Do previous step until the highest radio signal level is achieved. 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-shortened. In this case additional lightning arrester should be used between the antenna and ODU. Suggested grounding diagram is shown on the picture below.

ODU, IDU and Distribution box should be grounded using their grounding clamps. In case of using IDU-5000-CPE, IDU is grounded via a power source having grounding.

Antenna pole, tower, ODU and lightning arrester 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.

All units with metal connectors are staffed with a silicon gel which is used for a reliable outdoor connectors sealing. With gel usage no additional sealing is required. Even if connection was disassembled afterwards no additional gel is required. Please see the photos below to learn who gel is put onto the connector.