



# CFIP Lumina Series Full Outdoor Unit

## Installation Manual

Product code: IODGET01

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To get up to date information about accessories and their availability, please contact sales representative.

**Note:** FODU/ODU does not contain serviceable parts. Warranty will not be applicable in the event FODU/ODU has been hermetically unsealed.

**Note:** SAF Tehnika JSC is not responsible for any radio or TV interference caused by unauthorized modifications to this equipment. Such modifications could void the user's authority to operate the equipment.

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## 1 Introduction

This manual describes how to install SAF CFIP series microwave radio link consisting of Full Outdoor Units (FODUs).

### 1.1 Revision history

Revision	Date	Comments
1.0	September, 2009	Document created
1.2	January, 2010	Document created

### 1.2 List of Abbreviations

128QAM – 128-Quadrature Amplitude Modulation  
 16APSK – 16-Amplitude and Phase Shift Keying  
 256QAM – 256-Quadrature Amplitude Modulation  
 32APSK – 32-Amplitude and Phase Shift Keying  
 64QAM – 64-Quadrature Amplitude Modulation  
 8PSK – 8-Phase Shift Keying  
 AC – Alternating Current  
 ACM – Adaptive Coding and Modulation  
 AGC – Automatic Gain Control  
 ASCII – American Standard Code for Information Interchange

BNC connector - Bayonet Neill-Concelman coaxial connector  
DC – Direct Current  
FO – Fiber Optics  
FODU – Full Outdoor Unit  
FTP – File Transfer Protocol  
GUI – Graphical User Interface  
IEEE - Institute of Electrical and Electronics Engineers  
QPSK - Quadrature Phase-Shift Keying  
RSL – Received Signal Level  
RSSI – Received Signal Strength Indicator  
Rx - Receive  
SNMP - Simple Network Management Protocol  
TCP/IP – Internet Protocol Suite (Transmission Control Protocol / Internet Protocol)  
Tx - Transmission

### 1.3 Safety Precautions

- Installation and service must be done by personnel having appropriate technical training and experience necessary to be aware of hazards during installation and/or service. The installation and/or service must be done under measures to minimize any danger to the involved person or any other person.
- Use the necessary safety devices when working on or around the mast. Be aware of the risk of falling objects. Consider the safety catch when hoisting the antenna and radio.
- Do not use any components (screws, nuts, etc.) other than those delivered together with the SAF Tehnika JSC microwave radio equipment or recommended by SAF Tehnika JSC.

#### 1.3.1 Electrical Safety

- The equipment meets the requirements for class I EN 60950 (protection against electric shock).
- All external circuits are TNV-1 (as defined in EN 60950).
- All equipment must be grounded before the power cable is connected.
- For electrical safety the DC power supply shall have reinforced insulation to the mains supply.

#### 1.3.2 Microwave Radiation

- The transmitter should be switched off before disassembling the equipment to avoid microwave radiation.

No dangerous levels of microwave radiation exist outside the antenna while in operation when the antenna is connected to the radio, yet any part of the body shall not be exposed to the radiation in front of the open radio waveguide output closer than 20 cm while radio transmitter is turned on.

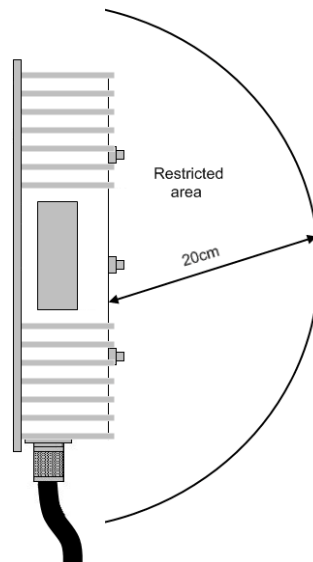


Figure 1.

## 2 Getting Started

### 2.1 Unpacking and Inventory

There are two types of packages, - the box for transportation and the commercial package. CFIP Lumina are packed in commercial packages whereas commercial boxes are packed in transportation boxes.

Transportation package for two CFIP Lumina contains two trading packages for CFIP Lumina.

#### 2.1.1 Contents of Transportation Package for CFIP Lumina link

- CFIP Lumina Full Outdoor Unit, 2 pcs.;
- CFIP Lumina mounting wrench, 2 pcs.;
- Documentation and software CD (optional);
- Twin BNC connector for RS-232 console port for FODUs, 1 pcs. (upon order);
- CFIP Lumina hermetical connector for power cable, 2 pcs.;
- Factory test report, 1 pcs. (in progress)

#### 2.1.2 Package Weight and Dimensions

The following table lists all the included packages and their weight and dimensions.

Package type	Weight of empty package [g]	Dimensions [mm]
Commercial package for CFIP Lumina	486	532x365x75
Transporting package for CFIP Lumina	700	562x385x283

## 2.2 Required Installation Tools

### 2.2.1 CFIP Lumina Installation Tools

- FODU mounting wrench (included);
- Power supply unit and power cable (not included);

- Necessary tools for assembling the optical or Ethernet cables, power cables and connectors (not included)

### 2.2.2 Antenna Installation Tools

- Voltmeter/multimeter with corresponding BNC adapter (not included);
- Mounting bracket and necessary wrenches, nuts, screws and clamps;
- Binoculars and compass for clear sight installation (not included).

## 2.3 Labels

### 2.3.1 CFIP Lumina Label

The label can be found on the front side of the unit.

The label contains the following information (see samples in the picture below):

- Model name ("CFIP-18-Lumina"). The FODU model name example is:
  - CFIP-13-Lumina for 13GHz FODU,
  - CFIP-23-Lumina for 23GHz FODU, etc, where:
    - xx - frequency band of the FODU.
- Product Number (I18GHT03L): product number contains information in which band side (L, H) the FODU operates. Letters A, B, C or D indicate specific subband.
- Unit Serial Number (3203601 00005); the serial number uniquely identifies the unit.

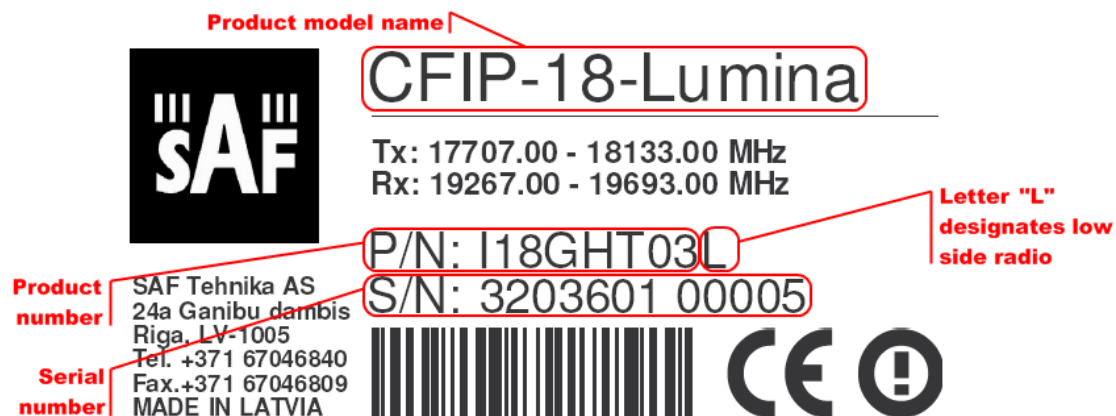


Figure 2. Label of the CFIP Lumina High band side, operating in 18 GHz band

## 3 Installing CFIP Lumina Full Outdoor Unit (FODU) radiolink

The installation of CFIP Lumina link involves the following steps:

### 1. Initial equipment set up at the customer's premises

- Unpack all equipment;
- Prepare necessary cables;
- Provide power to CFIP Lumina using appropriate power supply – 48V, any polarity, at least 35W of load power;
- Interconnect CFIP Lumina's with use of test suite (coaxial cable, attenuator, waveguide-to-coaxial adaptors).

Although testing suite is highly recommended, if it is not available, establish the link by turning CFIP Lumina's of one hop against ceiling (with flanges facing upward) and set minimum Tx power available.

### 2. Connecting to Web interface management or serial terminal through Ethernet bridge port or serial management port in order to configure the equipment.

## Notes:

- The default IP address of Eth port is 192.168.205.10 or 192.168.205.11 (depends on Low or High band side model) and mask is 255.255.255.0.
- Use serial cable with twin BNC connector to connect ASCII console to interface termination device, using 'Hyper Terminal' or similar application with the following settings: - Bits per second: 19200; - Data bits: 8; - Parity: None; - Stop bits: 1; - Flow control: None; use Ethernet patch cable to connect Web GUI or Telnet terminal to Ethernet management port;

[!] Default username for Web, Telnet and FTP access is *admin* and password is *changeme*.

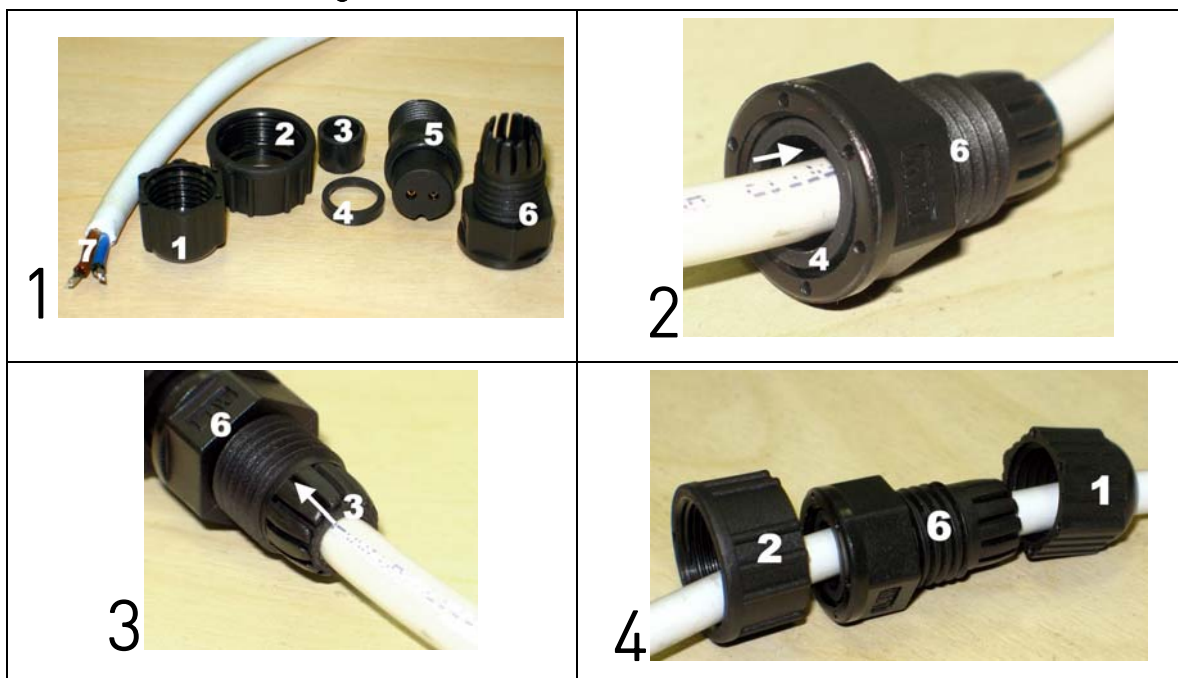
- 3. Configuration of equipment:** perform basic configuration for each CFIP Lumina;
- Radio frequency, bandwidth and transmitter power: by default the transmitter power is switched off.
  - Modulation: choose appropriate modulation with better sensitivity (e.g. "256QAM StrongFEC") or higher capacity (e.g. "256QAM WeakFEC") and with (e.g. "256QAM WeakFEC ACM") or without adaptive coding and modulation turned on.
  - IP settings:
    - IP address, netmask and gateway of the 10/100Base-T port;
    - Remote host address.
  - SNMP settings (optional):
    - Specify SNMP trap manager IP address;
    - Specify SNMP read and write community names;
    - Specify SNMP NMS hosts.

Complete steps 2 and 3 for each CFIP Lumina.

4. CFIP Lumina and Antenna mechanical installation; this is discussed in chapter 5.

## 4 Basic configuration with Web/command prompt

### 4.1 Assembling CFIP Lumina DC Connector





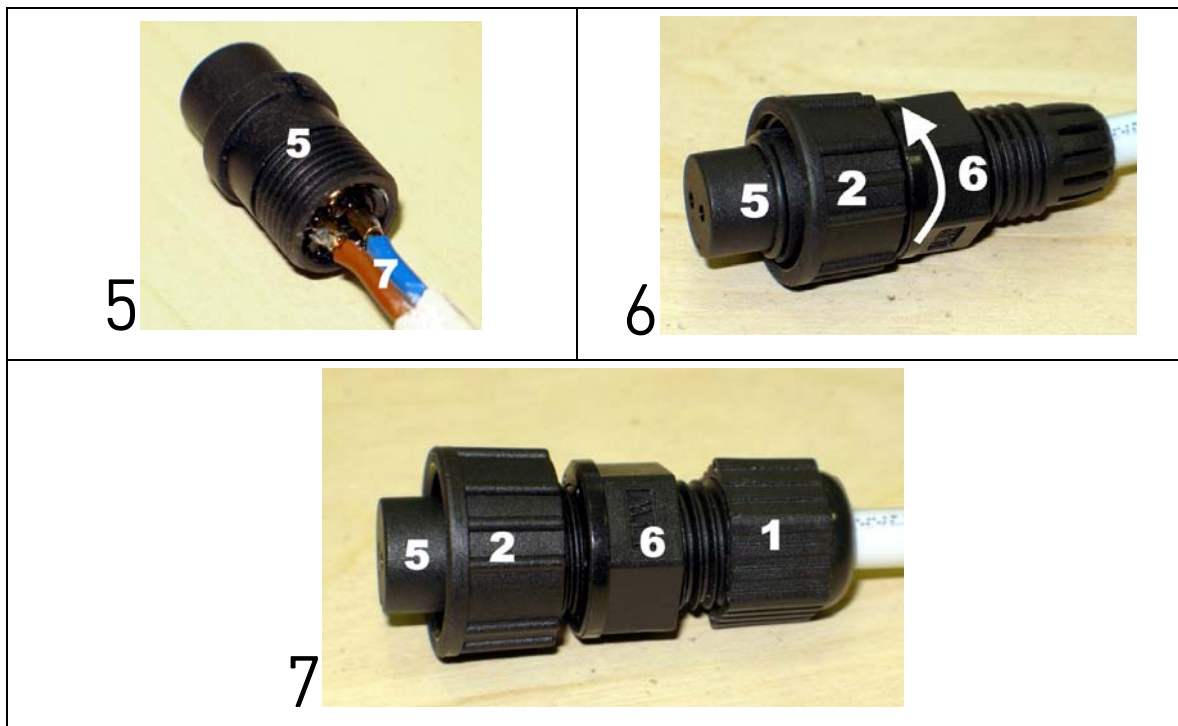


Figure 2.1. Assembling DC power weatherproof connector

1. You will need: (1-6) DC connector components and (7) ready 2-wire DC power cable.
2. Wider sealing rubber ring should be fitted inside from the front end of (6).
3. Narrower sealing rubber ring should be fitted inside from the rear end of (6).
4. Parts of the DC connector should be put on the cable in the sequence as shown
5. DC power cable should be soldered in any layout – any polarity can be used.
6. Afterwards, part (6) should be tightened on to part (5).
7. Assembled DC power connector after tightening the last part (1)

## 4.2 Initial configuration with Web GUI

### [!] Before you start

- Your connected laptop should be in the same subnet with manageable CFIP, so you can “see” them; that is why, the laptop Ethernet port settings should be set as follows: (in ‘Microsoft Windows’ go to *Control panel* → *Network Connections* → *Local Area Connection* → *Properties* → *Internet Protocol (TCP/IP)* → *Properties*):
  - IP address 192.168.205.1;
  - netmask 255.255.255.0;
  - everything else is blank.
- CFIP Lumina requires power source with the minimum of 35W to connect the laptop to the CFIP Lumina. Dedicated power supply can be purchased from SAF Tehnika JSC as optional accessory. Any power source polarity can be used.
- To know IP address, side value should be read from the label. See Chapter 2.3 for details.
  - If Low Side -> IP: 192.168.205.10
  - If High Side -> IP: 192.168.205.11

Connect to CFIP Lumina by entering IP address in the browser address line - by default 192.168.205.10 for the low side and 192.168.205.11 for the high side.

When asked to log in, the default user name is *admin* and password is *changeme*.

It is recommended to use the following or later versions of web-browsers:

- IE v. 6.0 (SVG plugin must be installed)
- Mozilla Firefox v. 2.0.0.11



- Safari v. 3.0
- Opera v. 9.50

If everything was connected correctly, you will see a screen similar to this (with no alarm indications):

**SAF** Name: SAF  
 IP: 213.226.134.245  
 SN: 321750100001  
 Uptime: 06:38:06

CFIP Lumina FODU - V1.42b 2009.11.03

Logout

Main status	Local	Remote
<b>Radio status</b>		
Radio data status	Ok	Ok
Radio side	Low	High
Tx mute	Off	Off
Tx power	12 dBm	12 dBm
ATPC	0	0
Rx level	-53 dBm	-56 dBm
Duplex shift	1008000 KHz	1008000 KHz
Tx frequency	24773000 KHz	25781000 KHz
Rx frequency	25781000 KHz	24773000 KHz
<b>Modem configuration</b>		
Configuration file	embedded->56_X_NWB_EGEv1c.bin	embedded->56_X_NWB_EGEv1c.bin
Bandwidth	56000 KHz	56000 KHz
Modulation	256QAM Weak FEC	256QAM Weak FEC
Ethernet capacity	366.900 Mbps	366.900 Mbps
<b>Modem status</b>		
Modem data status	Ok	Ok
Modem status	ACQUIRE_LOCKED	ACQUIRE_LOCKED
Last acquire error	ACQUIRE_SUCCESS	ACQUIRE_SUCCESS
Radial MSE	-32.5 dB	-30.9 dB
LDPC decoder stress	1.1e-05	7.3e-05
Bandwidth (calculated)	56000 KHz	56000 KHz
ACM engine	Off	Off
Current modulation Rx / Tx	256QAM / 256QAM	256QAM / 256QAM
Current Ethernet capacity Rx / Tx	366.900 / 366.900 Mbps	366.900 / 366.900 Mbps
<b>Diagnostics</b>		
Diagnostics data status	Ok	Ok
System temperature	+57.0 °C / +134.6 °F	+54.5 °C / +130.1 °F
Modem temperature	+63.0 °C / +145.4 °F	+60.0 °C / +140.0 °F
Input voltage	46.97 V	46.87 V
Input current	0.650 A	0.657 A
Consume power	26.96 W	27.07 W
Tx polarization		

Figure 4. Web Interface - main window

Otherwise please refer to "The CFIP Series Full Outdoor Unit Technical Description and Configuration Guide" or contact SAF Tehnika JSC support team [techsupport@saftehnika.com](mailto:techsupport@saftehnika.com)

### STEP 1

To start basic configuration process, you must proceed with the configuration wizard.

- Go to 'Configuration → Configuration wizard';
- Enter system name (CFIP Lumina identification name), change password for 'admin' account and specify password for 'guest' account. By default, the password for 'admin' account is 'changeme' and there is no password specified for 'guest' account;
- Press 'Next step >>'.

### STEP 2

- Enter IP address, IP mask, default gateway and remote link side IP address, if necessary; if 192.168.205.\* subnet is not reserved for other purposes, it is recommended that CFIP devices stay in the same subnet to avoid confusions regarding IP addressing;
- Press 'Next step >>'.

### STEP 3

- Enter preferable bandwidth, modulation type;
- Press 'Next step >>'.

**STEP 4**

- Enter preferable Tx power and Tx frequency;
- Press 'Next step >>'.

**STEP 5**

- Check the settings;
- Press 'Execute configuration' to confirm your choice.

**STEP 6**

- Repeat STEP 1-5 for the second CFIP Lumina;
- Go to 'Status' screen to check link operation.

### 4.3 Initial configuration with command prompt

Command prompt is available using serial connection (Twin BNC) or Ethernet management port – using Telnet or command prompt in Web interface – for further details see the "CFIP Series Full Outdoor Unit Technical Description and Configuration Guide".

Default user name for Web and Telnet access is *admin* and password is *changeme*.

Configuration steps using command prompt are the following:

- Check the system settings with command '**status**'
- Configuration required parameters:
  - Tx power with the command '**radio txpower** [<power dBm>]';
  - Tx frequency with the command '**radio freq** [<freq KHz>]';
  - Channel bandwidth and modulation type with the command '**modem set** <bandwidth> <modulation min> <modulation max> {StrongFEC|WeakFEC}';

**[!]** Before you set above mentioned parameters, you must know what frequency and bandwidth you may use and at what power you may transmit.

- Name of the CFIP Lumina with the command '**system name** <name>'. Default name is 'SAF';
- IP address with the command '**net ip addr** <addr>', if it is necessary;
- IP mask with the command '**net ip mask** <mask>', if it is necessary;
- IP default gateway with the command '**net ip gw** <gw>', if it is necessary.
- Save settings with the command '**cfg write**'; restarting with the command '**system reset**';
- Check the settings made, modem and radio status with the commands '**status**', '**modem status**' and '**radio status**' respectively.

## 5 CFIP Lumina Full Outdoor Unit and Antenna Installation

### 5.1 Polarization Considerations

The position of the CFIP Lumina determines the polarization of the radio signal. The waveguide flange can be used as the indicator, see picture in the next chapter.

When attaching CFIP Lumina to the antenna, the antenna waveguide transition polarization must match with the CFIP Lumina polarization.

**[!]** Polarizations must meet as perfect as possible at both ends of the link, otherwise you will be experiencing low RSL value.

## 5.2 Attaching CFIP Full Outdoor Unit to Antenna

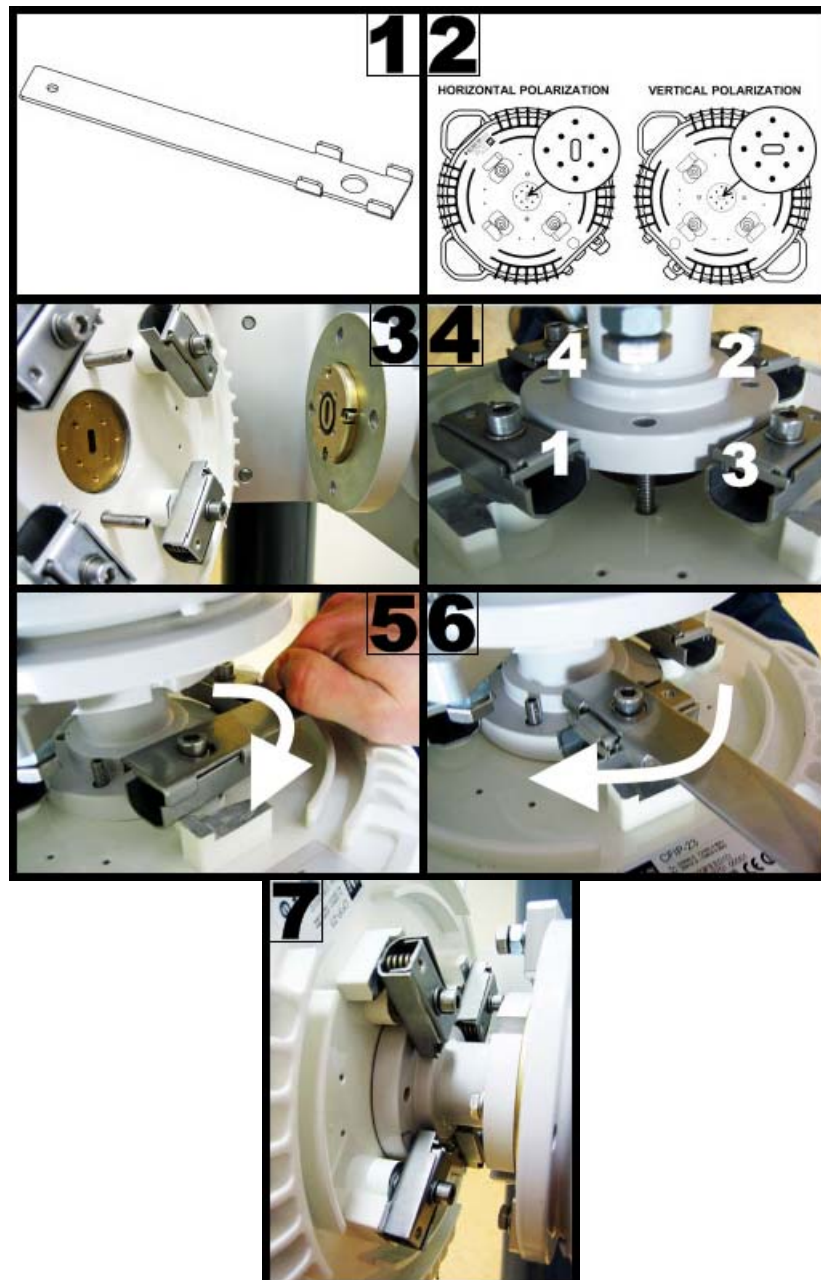


Figure 5. Attaching CFIP Full Outdoor Unit to Antenna

Fig. 5(1). You need only one tool to attach CFIP Lumina to the antenna.

Fig. 5(2). Check antenna polarization and match it with CFIP Lumina polarization.

Note, that antenna feed sticker must be removed before use.

Fig. 5(3). Note, that lockings should be positioned in way it is shown on picture.

Fig. 5(4). Use two guidance pins or 4 side lockings to choose preferable way of attachment. Lockings should be tightened diagonally in sequence as shown.

Fig. 5(5, 6). Attaching tool allows tightening lockings in two different ways. Twist the tool clockwise.

Fig. 5(7). Tightened lockings should look as shown on picture.

(!) Mounting locks may differ from the ones shown in the image.

### 5.3 Grounding the Full Outdoor Unit

Attach the site ground to the CFIP Lumina using the grounding screw provided on the CFIP Lumina housing, the location of the grounding screw is depicted in the picture below.



Figure 6.

### 5.4 Antenna Alignment

#### 5.4.1 Calculating Expected Received Signal Level (RSL)

The expected RSL (receive signal level) can be calculated using "path calculator" provided by SAF Tehnika JSC.

#### 5.4.2 Alignment Procedure

The antenna alignment procedure can be made easier by placing one person at each antenna location during alignment process. However, alignment should be performed on one antenna at a time, each person alternatively turns antenna until the RSL is optimized.

The following steps are required to properly align the antennas:

1. Start at one end of the link, connect a voltmeter to the RSSI port on the CFIP Lumina. Ensure the voltmeter is set to DC voltage and set on a range 0 – 2 volts.
2. Loosen the antenna hardware that is used for securing the antenna movement in the azimuth directions.
3. Roughly aim the antenna directing the main lobe to the far-end antenna.
4. Slowly sweep the antenna while observing the readings on the voltmeter. The higher is the voltage, the higher is the RSL.
5. Secure the azimuth adjustment hardware once main lobe is found and the highest signal level is achieved.
6. Loosen the antenna hardware that is used for securing the antenna movement in the elevation direction. Slowly sweep the antenna while observing the voltmeter. Once the signal is peaked, the elevation adjustment hardware can be secured.
7. Perform steps 1 through 6 on the opposite end of the link until the signal level is

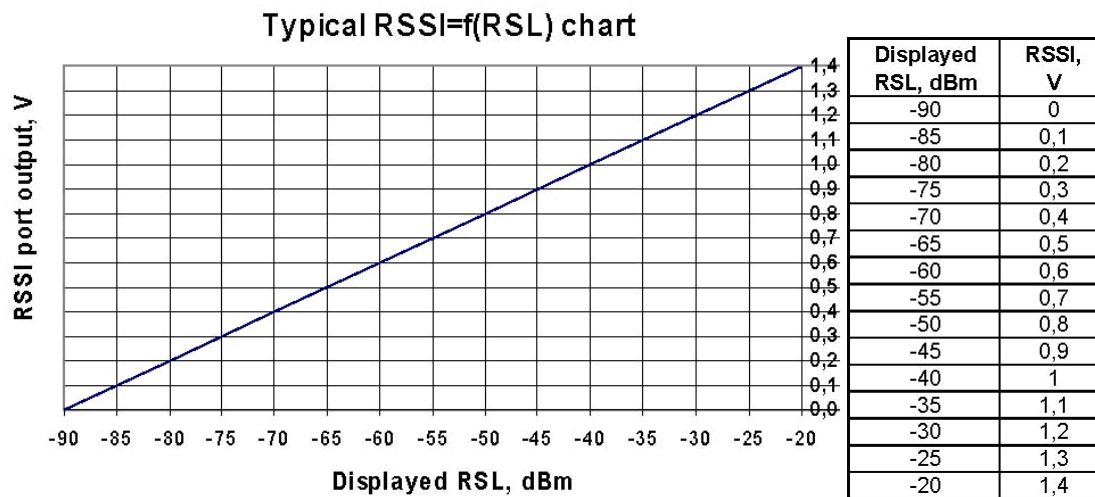


peaked for both azimuth and elevation.

After the AGC voltages have been peaked on both ends of the link, observe the RSL indicated in Web management window. Ensure that the RSL is within +/- 5dB of calculated RSL.

### 5.4.3 RSSI Readings

To aid in the antenna alignment process, the following chart and table shows typical relationship of the RSL (Rx level) vs. RSSI port output voltage (RSSI – Received Signal Strength Indicator). The evaluated Rx level has the error +/-2 dBm.



## 6 References

All the documents comprised in this chapter can be ordered from SAF Tehnika JSC or its sales representatives.

### • Technical Descriptions

Available technical descriptions:

*The CFIP Lumina Series Full Outdoor Unit Technical Description and Configuration Guide* - a generic technical description of the CFIP series products, it comprises the installation and commissioning issues and accessories, functional description, technical data.