

## RF POWER AMPLIFIER

The power amplifier is intended to increase receiver sensitivity and compensate for various line losses (in the feeder, connectors and cable) as well as signal losses due to electromagnetic radiation, in order to attain maximum allowable signal emission. The bi-directional amplifier operates in half-duplex mode in the 2.4 - 2.5 GHz ISM frequency range.

The amplifier assembly consists of four main components:

1. Low-noise receive amplifier, transmit amplifier, and switching control unit assembled in a sealed enclosure.
2. Bandpass filter, which determines the usable frequency band of the amplifier and its sensitivity to interference outside of the selected RF band.
3. DC power injector. The DC power injector should be located near a transmitting device, such as a radio modem or a bridge. The power injector connects to the transmitting device and the amplifier assembly via 50 Ohm coaxial cable.
4. 110-220 VAC Power supply.

### Technical Characteristics

#### *Receive Amplifier*

Gain, dB	$25.0 \pm 3.0$
Noise figure, dB	$\leq 3.0$
Input saturation power, mW	$\cong 10$

#### *Transmit Amplifier*

Automatic gain & power control	
Input power, mW	0.5 – 100
Max Output power, mW	250.00
Switching power, mW	$0.5 \pm 0.3$
Switching time, mks	$\leq 0.5$

#### *Bandpass Filter*

Frequency band (with ripple 0.5 dB ), GHz	2.4 – 2.5
Attenuation in frequency band 2.4–2.5 GHz, (dB)	0.5
Out-of-Band Attenuation	
@ 2 GHz, (dB)	60
@ 3 GHz, (dB)	60

***DC Power Injector***

Frequency band (with ripple 0.5 dB ), GHz	2.4 – 2.5
Attenuation in frequency band 2.4–2.5 GHz, (dB)	0.6
RF connector type	N-female

***Power Supply***

DC out, V	12
Max output power, W	12
DC Connector type	BNC – male

*Operating temperature range -50°C — +50°C*

The filter determines the frequency characteristics of the amplifier. In standard configuration the amplifier is shipped with a 100 MHz filter, main frequency of 2445 MHz, main frequency attenuation of 0.5 dB, and an input shunt for quasi-direct currents. At the foregoing settings signal attenuation is > 60 dB in the 0 - 2.4 GHz and 2.5 - 18 GHz ranges.

The amplifier/filter set includes the following:

<u><i>Item</i></u>	<u><i>Quantity</i></u>
Amplifier / Filter	1
DC Power injector	1
Power supply	1
Amplifier / filter mounting plate	1
U-shaped mast mounting brackets	2
Grounding strap	1

## Installation Instructions

### **Important Notice:**

***Read the following installation instructions and all warnings carefully prior to installing the amplifier. Failure to follow installation instructions or tampering with the amplifier or the power supply will void the warranty.***

1. Install the amplifier mounting plate, with the amplifier and filter attached, on a mast near the external antenna, using two U-shaped brackets (included). The amplifier can also be installed horizontally on a mounting stand through predrilled holes in the mounting plate.
2. Connect the amplifier to the antenna and DC power injector, as marked, with 50 Ohm coaxial cable. **Important:** In order for the amplifier to operate properly, and to avoid damage to the amplifier and the power supply, the maximum input power to the amplifier must not exceed 100mW. User must check for proper attenuation.
3. Following installation, a weather sealant of 100% silicone over electrical tape must be applied to all external connectors to protect them from moisture (moisture can cause increased signal losses in the feeder, diminished transmission quality, and possible damage to the connectors and the amplifier).
4. **Grounding.** Ensure that the mounting mast is properly grounded. Connect the amplifier assembly's grounding strap to the mast with a bolt. Check the ground on the amplifier assembly with an  $\Omega$ -meter.

### **Warning:**

***Improper grounding can adversely affect amplifier performance and may lead to equipment damage or personal injury. Failure to properly ground the amplifier will void the warranty.***

***The amplifier is not designed to withstand a lightning strike. Amplifier warranty does not apply to damage caused by lightning.***

## Operation of the Amplifier

- On power up, the amplifier will be in a "receive" mode. The mode switches to "transmit" when the amplifier receives a signal from a radio modem or another transmitting device. A red light on the DC injector indicates that the amplifier is in a "transmit" mode. The red light blinks when the amplifier is connected to a radio bridge, and is half-lit when the amplifier is connected to a radio modem.
- A constant red light indicates that the amplifier is continuously in the "transmit" mode and is not communicating properly. This is an abnormal condition that can be caused by any of the following:
  - *High noise level in the feeder of the transmitting device.* With time, some radio modems and other transmitting devices develop elevated natural noise levels, even in the "receive" mode. This noise can cause the amplifier to switch from "receive" to "transmit" mode, causing interruptions in communications. This problem can be diagnosed by measuring the natural noise level of the transmitting device with an oscilloscope. If the problem is detected, the transmitting device should be replaced.
  - *External interference.* If the amplifier is not properly grounded, external interference can cause the amplifier to intermittently switch to "transmit" mode. This condition has been observed with certain brands of radio modems, due to the modems' poor shielding characteristics. Thus, if the transmitting device is not adequately shielded, several such devices operating in close proximity can interfere with the amplifier's operation.
- If the red light does not come on at all, the cable could be defective, or the cable length may exceed maximum allowable length.

### **Important FCC Notice:**

Operation of RF power amplifiers in the United States is subject to the Federal Communications Commission's regulations in accordance with 47 USC 302. Use of the amplifiers with Part 15 transmitters may be restricted by federal law. User is responsible for compliance with all applicable laws and regulations.

### **FCC Regulatory Notice**

This equipment complies with FCC Regulation 15.247, which specifies the license-free operation of direct sequence, spread-spectrum wireless communications devices. This device operates in the 2.4 to 2.4835 GHz frequency band reserved for industrial, scientific and medical applications.

Since this device generates radio frequency waves, it may interfere with other radio signals in the same area unless the proper installation and operations procedures are followed. It has been

proven in testing that this device complies within the limits of FCC Regulations that are designed to provide reasonable protection against such interference in a commercial environment.

**NOTE:** Installation and maintenance must be performed by authorized **Winncom Technologies** personnel, or those persons properly trained and authorized to do such procedures. **Winncom Technologies** is not responsible for any damages, incidental or otherwise, in connection with use of this manual by anyone not described above.

In order to comply with **FCC adopted RF Exposure Requirements**, the included antenna must be installed in a manner that will provide clearance from the antenna, to any personnel or member of the public, according to the following guide:

<b>WRO2400-70 - 7dBi Omni .....</b>	<b>20 cm</b>
<b>WRO2400-125 - 12.5 dBi Omni .....</b>	<b>20 cm</b>
<b>HGY15 – 13.5 dBi Yagi .....</b>	<b>21 cm</b>
<b>WRO2400-24 – 24 dBi Grid Dish .....</b>	<b>71 cm</b>

