

# EXTERMINATOR II<sup>®</sup>

87-108 MHz High Power VHF Broadcast Antenna

# Manual

## **IMPORTANT NOTE**

**Upon receiving your order inspect the packaging material and unit for apparent damage. Any damage should be reported immediately so we can make a claim with the shipping company. Take photos, if you can, they can be used as a proof.**

**Although we tune antennas for our customers, it is strongly recommended that you verify tuning once antenna is installed. Objects around the antenna can affect the tuning.**

**This is a narrowband antenna so changing frequency requires retuning with a suitable instrument (antenna analyzer or SWR meter).**

**Antenna is shipped in a collapsed state! Extend both sections of the telescopic main antenna pole until the black marker ring shows, than tighten the clamp.**

**The SWR on the antenna can only be tuned in a free transmission zone, if you are broadcasting close to another antenna with powered transmitter this will have undesirable results and you will not be able to find the perfect tune, remember to turn off any transmitters or find a suitable location that is not close to an antenna used for broadcasting.**

## **DANGER!**

**WARNING BE AWARE THAT ERECTING ANY ANTENNA CLOSE TO OR NEARBY ELECTRICAL POWER LINES CAN LEAD TO SERIOUS INJURY AND POSSIBLE DEATH! BE VERY CARFEFUL!**

**DO NOT TRANSMIT UNLESS YOU CAN CONFIRM THE ANTENNA IS MATCHED TO YOUR FREQUENCY!**

**TABLE OF CONTENTS**

**INTRODUCING THE EXTERMINATORII®..... 4**

    WHAT’S NEW IN VERSION II..... 4

    ADVANTAGES ..... 4

    TECHNICAL SPECIFICATIONS..... 4

    HOW MUCH ERP WILL MY TRANSMITTER HAVE WITH THIS ANTENNA?..... 5

    THANK YOU FOR PURCHASING EXTERMINATOR II® ANTENNA..... 5

**BEFORE YOU START - INSTALLATION ADVICE..... 6**

**ANTENNA CONSTRUCTION – PARTS & TUNNING INFORMATION..... 7**

**TUNING INFORMATION..... 9**

**APPENDIX A – WARRANTY AND LEGAL INFO..... 11**

    IMPORTANT NOTICE!..... 11

    WARRANTY AND SERVICING! ..... 11

    LEGAL INFO ..... 11

    LIMITATION OF LIABILITY ..... 11

**ALSO AVAILABLE FROM WWW.PCS-ELECTRONICS.COM..... 12**

**REVISIONS AND ERRATA ..... 13**

**INDEX..... 13**

## Introducing the EXTERMINATORII®

### *87-108 MHz High Power VHF Broadcast Antenna*

**The ExterminatorII is a powerful omni-directional FM Broadcast Antenna based on the successful Sirio shortwave antenna with several important modifications and improvements. ExterminatorII® gives the same range as 2 vertical dipoles and when mounted on the top of a tower it gives close to perfect omni-directional pattern. Produced to exacting standards using state of the art electrical and mechanical designs resulting in superior performance and long service life.**

The high build quality and DC short protection will provide peace of mind to stations who want to stay on air. ExterminatorII® withstands the toughest environments. ExterminatorII® ships fully tuned and assembled and can be installed on your tower or mast in a matter of minutes.

ExterminatorII® delivers a massive 5.15 dBi gain across the entire FM II Band. All RF hotspots are teflon/PTFE components with specifications that exceed required ratings. Once tuned to your frequency the ExterminatorII® will never go "out of tune" and will not be affected by rain unlike some other versions.

Remember to write your desired frequency during checkout at the time of ordering (under comments); we will tune your antenna for you. You can always re-tune your antenna alone with antenna analyzer or SWR meter. Note that although antenna is tuned at the factory it is often necessary to make a small adjustment depending on how installation is performed. Some parts may also move slightly during shipping. Antenna ships in fully assembled form but the two telescopic sections are collapsed for easy transport. You will only have to release two screws and extend the two telescopic sections all the way to the two black marker circles, than fix the screws again.

#### **What's new in version II**

- Significantly improved connector assembly, better than any other design out there at time of release.
- Improved gamma match, better than any other design out there at time of release.

#### **Advantages**

- Near perfect circular coverage when mounted on top of a tower/pole
- Matches or outperforms 2 dipoles
- Usually easier and also cheaper to mount than 2 dipoles

#### **Technical specifications**

- Frequency range: 87.5 - 108 MHz
- Max power rating: 950-1000W (N), 3KW (7/16) - 4kW (EIA)
- Impedance: 50 Ohm unbalanced
- Gain: 5.15 dBi (Upgrades 1KW TX into 2KW ERP TX)
- Radiation (H-plane): 360° omni directional
- Polarization: Vertical
- Connector: "N" - 7/16" DIN – EIA
- 6MHz Bandwidth at S.W.R. 2:1:
- S.W.R. at res. freq.: ≤ 1.5:1
- Feed system: Gamma match v2
- Tuning: Arrives pretuned (retuning by length adjustment and gamma match adjustment)
- Tuning: Pre-Tuned / Whip Adjusting

**Mechanical Data:**

- Materials: Aluminum, Teflon, Copper, Nylon
- Wind load/resistance: 305N at 250 Km/h / 230 Km/h
- Wind surface: 0.28 m<sup>2</sup>
- Height (approx.): 3,5m max
- Weight (approx.): 5,5Kg
- Mounting mast: 40mm

**How much ERP will my transmitter have with this antenna?**

1KW transmitter: Your ERP will be increased by 3dB (2x), 1KW transmitter will give 2KW ERP.

**Thank you for purchasing Exterminator II® antenna.**

We hope you will enjoy it as much as we do and remember to tell your friends about it. Please feel free to leave your comments at our website or post your experience in our forum. From all of us we wish you happy broadcasting!

Your PCS Electronics team

**DANGER**  
**DO NOT ERECT CLOSE**  
**OR NEAR HIGH**  
**VOLTAGE POWER LINES**  
**THEY CAN KILL YOU!**

## **BEFORE YOU START - INSTALLATION ADVICE**

**WARNING - BE AWARE THAT ERECTING ANY ANTENNA CLOSE TO OR NEARBY ELECTRICAL POWER LINES CAN LEAD TO SERIOUS INJURY AND POSSIBLE DEATH! BE VERY CAREFUL!**

**NO SWR/POWER METER OR ANTENNA ANALYZER? GET ONE OFF OUR WEBSITE!**

**DO NOT TRANSMIT UNLESS YOU CAN CONFIRM THAT THE ANTENNA IS MATCHED TO YOUR TRANSMIT FREQUENCY!**

1. Always make sure the installation area is free and clear of power lines.
2. If possible it is recommended to check the antenna's tune prior to erecting on your tower/mast; this can be achieved by ensuring the antenna is raised at least 2 meters above the ground free and clear of other mechanical objects.
3. Always reduce or extend telescopic sections in equal amounts to find the perfect tune, the gamma match should remain in its original position however if you move to a frequency that is 5 MHz higher or lower than the factory tuned measurement then you need to follow the gamma match tuning instructions.
4. The SWR on the antenna can only be tuned in a free transmission zone, if you are broadcasting close to the antenna this will have undesirable results and you will not be able to find the perfect tune, remember to turn off any transmitters or find a suitable location that is not close to an antenna used for broadcasting.
5. After you have erected the antenna on your tower/mast and connected to your transmitter/amplifier begin to operate at low power—check the SWR anything below 1.5:1 is acceptable, above 1.5:1 the antenna needs to be fine tuned.
6. Once you are satisfied that the antenna is matched to your frequency begin to increase RF power slowly until you have reached your pre-determined output, during these power cycles continue to monitor the SWR.

## ANTENNA CONSTRUCTION – PARTS & TUNNING INFORMATION

### ANTENNA CONSTRUCTION—PARTS & TUNING INFORMATION

If it becomes necessary to re-tune the antenna you must read and understand the antenna's characteristics and components this will also assist us in the event you require telephone/e-mail support.

**The Antenna is made up of the following parts:**

1. **Center / Main Section** - the center/main section of the antenna forms the heart and soul of the Antenna it also facilitates an effective method to mount the antenna to your tower/mast/pole with two clamps.
2. **At the lower part of the main section** you will note the aluminum **"HUB"** (see figure 1) the length of aluminum tubing below the hub is used to mount the Antenna to your mast/tower/pole; the hub must remain free and clear of any other object.
3. **Bolted to the hub** are 4 x 1/2" aluminum tubes that rise to form the **isotropic ring**, this section is always pre-assembled at our factory however it is wise to check the nuts and bolts are tightness. (Do not over tighten)
4. **The hub** incorporates the eyelet for the **"gamma match" system** (see figure 2). Due to various applications gamma matching systems may vary.
5. **The gamma match** is pre-tuned to provide maximum performance for your desired frequency, in the event you need to re-tune the antenna the gamma rod may require a slight adjustment, **IMPORTANT** if you do have to alter the position of the gamma rod do this in millimeters, a small movement in either direction will yield big results.
6. **Nylon hub** is locked into place by a set screw; remember to unlock the set screw if you need to relocate the hubs position. This nylon hub is keyed to accept the 4 nylon stabilizers, insert each stabilizer at an angle then push into the keyed/slotted position on the nylon hub.
7. **Each telescopic section should be extended to the indicated marker ring**, (section #1 is the main element that holds the hub) section #2 and #3 are secured by clamps, do not over tighten the stainless steel clamps as it may strip the gear.

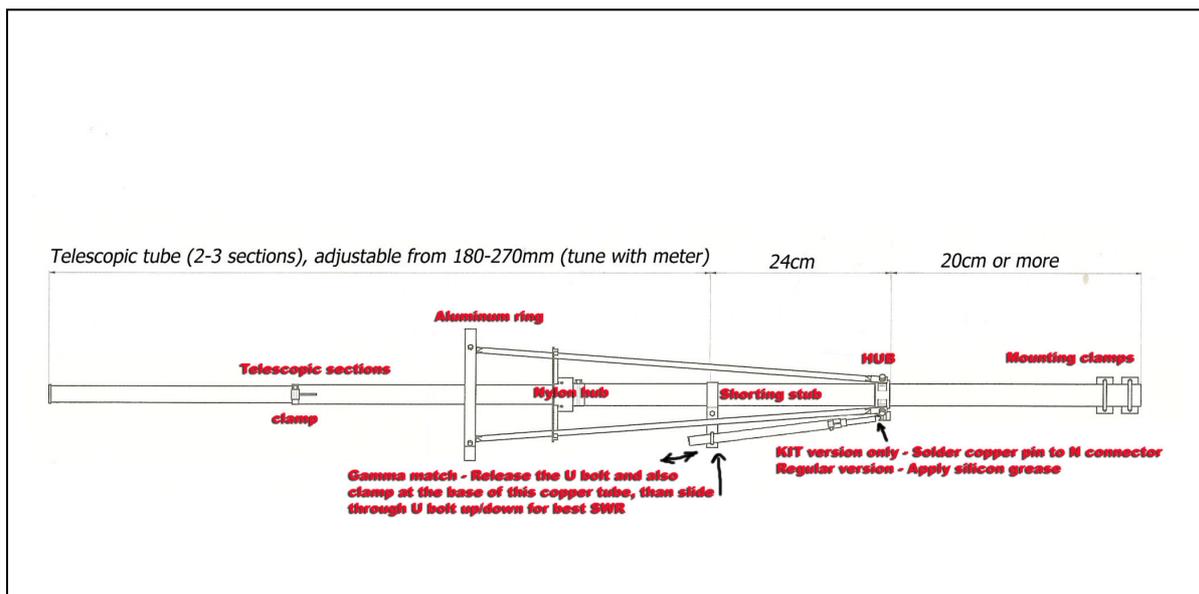


Fig. 1: The antenna construction. Note N connector ships already soldered, you only need to solder it if you purchase KIT.

## Assembly & Tuning

1. **There are several procedures** to obtain a perfect tune—always keep in mind; lower frequencies require a longer antenna, higher frequencies require a shorter antenna.
2. **Your Antenna will arrive factory tuned** in some cases you may need to re-tune the antenna to a new frequency; the secret to tuning the antenna is a little patience.
3. **The initial assembly**, the antenna arrives in several parts and consists of the central section/main element “section #1”; the second part consists of 2 telescopic aluminum tubes that fit snugly into each other.
4. **Extend the sections** to their marked position now lock up these sections with the hose clamp/screws provided, this should complete the initial assembly.
5. **Tuning the Antenna consists of two inherent elements** the central element (telescopic sections) and the gamma match. Antenna arrives pre-tuned by default.
6. **USING AN ANTENNA TUNER—WE RECOMMEND YOU TO PURCHASE THE RIGEXPERT AA-170...** Begin by unscrewing the clamp that secures section 2 just enough to allow you to move the tube, if you are going up the FM band then reduce this section a few cm - now conduct a SWR sweep, continue making adjustments to sections 2 and 3 until you obtain the best reading at your new frequency. If you are unable to produce a reading of 1:5:1 or below you may need to fine tune the gamma matching system. (See paragraph 8)
7. **TUNING THE ANTENNA WITH YOUR SWR METER... While tuning your antenna always remember to set low power!** No antenna tuner? Not to worry identical results can be achieved by following the same principals in paragraph 6, except with an SWR meter it may take a little more time.
8. **GAMMA MATCH TUNING.....** If you cannot obtain 1.5:1 or below on your new frequency by following the above you may need to alter the position of the gamma match rod. (see figure 1). First loosen the nuts on the U bolt that secures the gamma rod to the upper bracket (the shorting strap to the main section), next loosen the hose clamp that secures the Teflon/gamma rod in its gamma tube, IMPORTANT the gamma matching system is highly sensitive you should move the gamma rod up and down in millimeters (SMALL ADJUSTMENTS EQUAL VAST DIFFERENCES) each time you move the gamma rod check your SWR, if it goes higher then go in the opposite direction, continue to make small changes until you discover the best SWR. By taking your time and following these directions you should find tuning/retuning the antenna is in fact very simple, of course if you run into trouble we are always here to assist you.

## Tuning information

The antenna is an advanced design that delivers excellent characteristics across the entire FM band. **ExterminatorII®** delivers performance that rivals a 2-bay multi stacked phased array. To achieve maximum results the antenna should be mounted as high as possible, clear from all other obstructions. We have included a pack of U-Bolt brackets to provide for easy mounting. If you are mounting the antenna on a mast/tower with other equipment the antenna must be set at least 3 meter or one wave length from any other antenna.

For tuning use a meter designed for the intended frequency band. Preferably use antenna analyzer such as RigExpert AA-170. If you have to use SWR meter, do not attempt to measure SWR at high power levels; resulting high SWR could damage the transmitter and is also exposing you to unnecessarily high EM field. Do not touch any parts of the antenna when reading SWR. Also move as far away from the antenna as possible during measurements. If you are tuning the antenna on the ground you must ensure the antenna is at least 2 meters above ground level to minimize impact of ground on the readout.

Primary tuning is done by setting the length of the main element equal to .82 wave of your operating frequency. This is measured from the lower edge of the aluminum hub to the tip of the main element; the main element is made up of three (3) tubular sections. The first element is the “main” section that secures the antenna components, the second and third elements are adjustable and can be extended / retracted.

The correct length of the main section (elements 1, 2 & 3 combined) is calculated in inches by using the formula of 9212 divided by your frequency in MHz Example: 104.1MHz would be  $9212 / 107.1 = 88.4$  inches. Remember measure from the lower part of the main aluminum hub, do not include the length below the hub with connector, this is for mounting purposes only and is not actual accurate antenna’s tuning which can only be done with a SWR analyzer or meter.

<b>Frequency:</b>	<b>Extend To:</b>
88MHz =	2,66m (104.6 inches)
90MHz =	2,61m (102.3 inches)
92MHz =	2,55m (100.1 inches)
94MHz =	2,49m (98.0 inches)
96MHz =	2,44m (95.9 inches)
98MHz =	2,39m (94.0 inches)
100MHz =	2,34m (92.1 inches)
102MHz =	2,29m (90.3 inches)
104MHz =	2,25m (88.5 inches)
106MHz =	2,21m (86.9 inches)
108MHz =	2,16m (85.2 inches)

The next adjustment is measured by the length of gamma rod set into the lower portion of the captive tube (air-capacitor). Further adjustment is determined by the location of the gamma rod and the bracket. Moving the bracket up and down will change inductance; this sets the balance between the inductive and capacitive components that make it possible to produce the correct resonance and a flat 1:0 SWR. When both the inductive reactance and the capacitive reactance are equal at your frequency they will cancel each other out and present 50 Ohm resistive load to your transmitter.

We have set the “shorting strap” (the part where the gamma rod is secured to the main element) to its optimum position, under most conditions you should not need to re-position this part.

The length of the gamma rod determines the “fine tune” once you have extended the main element to match your frequency the next step is to release the u bolt and the hose clamp to allow adjustment of the gamma rod.

**IMPORTANT:** The gamma rod is very “SENSITIVE” to change, do not move the GAMMA ROD more than 1-2mm during the fine tuning phase. When tuning the gamma constantly check your SWR meter. Continue to make fine adjustments to the GAMMA ROD until you achieve the best SWR reading. In the event you cannot achieve better than 1.5:1 the next step is to revisit the main element length, extend the main element 1 cm, check SWR if it increases then go the other way until you find the best position. In any event an SWR reading of 1.5:1 or less is acceptable.

Once tuning is complete, lock all nuts, bolts and clamps, make sure to seal the exposed metal parts of gamma assembly with a coating of included silicon grease (do not use the type for bathrooms/kitchens), especially the part around the connector. When screwed together the grease is compressed and forms a weather proof seal. Do not use electrical tape it cannot keep moisture out!

We are always available to assist you by e-mail send your enquiries to [radio@pcs-electronics.com](mailto:radio@pcs-electronics.com)



Fig. 2: The telescopic sections before extension

## **Appendix A – Warranty and legal info**

### **Important notice!**

**Please remember to turn off the transmitter/amplifier when not in use!** This goes especially for high powered transmitters. Remember that anything you broadcast through the transmitter can be heard by anyone tuning in to that frequency. Although it is unlikely certain weather conditions may allow the signal to go further than your immediate listening area so please don't broadcast anything you don't mind anyone else hearing.

### **Warranty and servicing!**

Within one (1) year of receiving your order, if any product proves to be defective; please contact us via e-mail or our feedback form. Please **DO NOT** ship the product back to us without contacting us first and receiving return instructions. After we receive the defective merchandise, we will test it if need be, and we will ship back to you a non-defective replacement product. Please note that this doesn't cover final RF transistor as it can be damaged by using defective or poorly matched antenna. An exception is as well any mishandling or abuse by the customer. If the product is defective, you will receive a replacement. If you choose to return the defective item, rather than replace it, we will charge a 20% restocking fee and your original shipping and handling charges will not be refunded. The return of the product is at your expense. We believe that this is a fair policy because lower overhead results in lower prices for all of our customers.

### **Legal info**

It may be illegal to operate this device in your county. Please consult local authorities before using our products! PCS Elektronik d.o.o. is not responsible for any damage to your PC arising from use of this product and will not be held responsible for any violation of local laws pertaining to the use of this product. It is entirely your responsibility that you make sure you operate in accordance with local laws and/or regulations.

### **Limitation of liability**

To the law, in no event shall PCS Elektronik d.o.o. or its suppliers be liable for any special, incidental, indirect, or consequential damages whatsoever (including, without limitation, damages for loss of business profits, business interruption, loss of business information, or any other pecuniary loss) arising out of the use of or inability to use the PRODUCT, even if PCS Elektronik d.o.o. has been advised of the possibility of such damages. In any case, PCS Elektronik d.o.o.'s entire liability under any provision of this agreement shall be limited to the greater of the amount actually paid by you for the PRODUCT or U.S. \$5.00; because some states and jurisdictions do not allow the exclusion or limitation of liability, the above limitation may not apply to you.

## Also available from [www.pcs-electronics.com](http://www.pcs-electronics.com)

We also carry a big range of:

- FM transmitters in assembled and KIT form
- TV transmitters in assembled and KIT form, VHF and UHF
- AM transmitters with extremely clear modulation (PWM design)
- Various accessories for professional and hobby FM radio stations
- A large assortment of hard to obtain RF components (RF transistors; MRF, 2SC, coils, silver plated wire, coaxial cable, capacitors, quartz crystals and many others)
- PC based FM transmitters (PCI MAX pc based FM transmitter turns your PC into a radio station)
- A large number of beginners guides to get you started
- A large selection of free schematics is as well available at our website.

If you can't get much range with your homebrew antenna, have a look at these: <http://www.pcs-electronics.com>

# Choose your own frequency



89.7      89.9      90.1      *MyMusic*      90.5      90.7

## Turn your PC into a Radio Station !

Simply plug a card into your PC and you're ready to broadcast! Lets you control output power and frequency with a simple click of the mouse! Broadcast Mp3s across your yard, gallery, or use it as a small scale community radio.

**with PC-MAX ULTRA**  
the latest from the makers of  
the world's 1<sup>st</sup> commercially  
available FM broadcasting  
PC transmitter!



This is not all we offer! We also currently stock amplifiers, high-quality links, transmitters, frequency meters, antennas, filters, power supplies, coaxial cable and even some HAM equipment. Sign up for a newsletter to receive special deals and discounts. **check prices and place your order online.**

## Revisions and errata

V3.0 (August, 2017): Updated version

Please report any errors you see in this manual, you will be helping us and many other users out there. Thank you!

## Index

### *C*

**construction** ..... 7

### *G*

gamma match ..... 8

gamma rod ..... 10

### *I*

installation ..... 6

### *P*

power lines ..... 5, 6

### *S*

silicon grease ..... 10

specifications ..... 4

### *T*

**tuning** ..... 8, 9