

Noble Radio RXLP-1 Broadband Active Receiving Loop



**And RXLPTR1 Loop Control Interface with T/R Switch, Power
Supply and Bias Tee**

User Manual

**Noble Radio
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Overview

The Noble Radio RXLP-1 is a broadband receiving loop capable of operation from 300 Khz to 30 MHz using a broadband LNA (Low Noise Amplifier) and has a performance that is comparable to full sized dipoles over its range. The 39 inch diameter loop can provide a lower noise floor than a conventional dipole or vertical plus allows local noise sources to be minimized or eliminated by rotating the antenna. This null in the antenna pattern also allows interfering stations to be reduced or practically eliminated by rotation of the antenna. The antenna is powered and controlled by the RXLPTR1 control box that provides DC power up the coax signal cable, the ability to switch between the transmit antenna and the loop for receiving and a high and low gain setting for the LNA. The LNA has an average gain of 23 dB with an OIP3 = +22 dBm. The RXLPTR1 also includes a T/R switch so that the loop may be safely used with a transmitter. A power level of up to 125W can be used with the switch. The switch uses the PTT line from the transmitter and also contains an RF sensing circuit. The RF sense circuit can be used without the PTT line but is also active when the PTT is used. This provides a backup in case of a PTT line failure or the PTT is not connected when the transmitter is active thereby protecting the LNA from damage. A front panel LED indicates when the loop is connected to the receiver / transceiver and another LED indicates when the transmitter and PTT/RF sense circuit is active. A High and Low Gain switch is also on the front panel. The low gain position is generally used for operation at frequencies above 3 MHz while the high gain is used at the lower end of the spectrum. Either gain can be used at any frequency simply by using the switch.

The Mast section of the antenna is built from 1 inch OD fiberglass tube sections that connect together by inserting $\frac{3}{4}$ inch fiberglass tubing sections between them and bolting these together with stainless steel hardware. This makes for a very sturdy and resilient mast that is 69 inches long but breaks down to 23 inches for storage or portable operation. The loop itself is made from a 10 ft length of LMR-400 coax with PL-259 connectors on each end that screw into the SO-239 connectors on the sides of the LNA enclosure. These connectors provide a very sturdy and reliable connection to the loop. A mounting bracket is also supplied that allows the loop mast to be attached to up to a 2.0 inch OD pipe or fiberglass tube which is compatible with common TV type rotor installations. To obtain the best performance from the antenna it is recommended that it be used with a rotor. This will allow peaking (or nulling) signals and reducing or eliminating noise sources.

Assembly Instructions

The loop support mast is comprised of three 1 inch OD, 23 inch long fiberglass tube sections. These are connected together by inserting two $\frac{3}{4}$ inch OD fiberglass tubes into the sections and bolting them together. The process is simple and quick and typical assembly time of the antenna is 5 minutes or less. There is a mounting plate supplied with the loop to allow the loop mast to connect with up to a 1.5 inch diameter mounting mast which is a common size for most low cost TV antenna rotors.

Assemble the RXLP-1 using the following steps and illustrations:

1> Locate the following parts for the first assembly step:

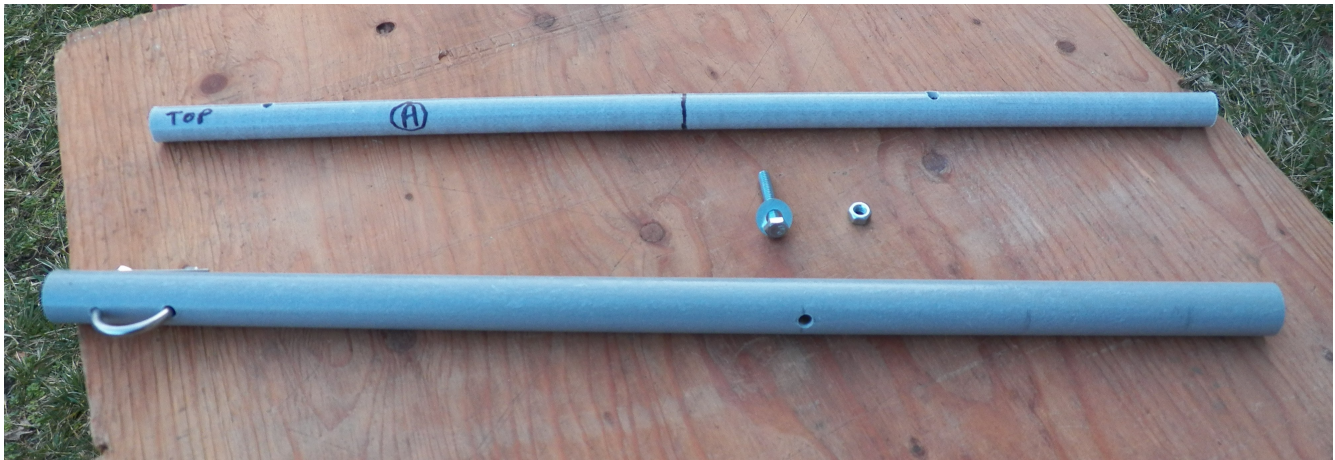
Top section 1 inch OD fiberglass tube with the U bolt at one end.

$\frac{3}{4}$ inch OD fiberglass tube labeled "A"

1.5 inch long by $\frac{1}{4}$ inch SS bolt

SS Washer

$\frac{1}{4}$ inch SS nut



Insert the $\frac{3}{4}$ inch tube inside the mast tube with the end marked "TOP" going into the tube until the center mark is reached and then rotate the tube until the holes in both tubes align. Insert the bolt (do not place the washer on the bolt at this time) through both tubes with the head on the side that the U bolt is on. Once it is protruding from the rear of the tube install the washer then the nut and tighten snugly with a $\frac{7}{16}$ inch wrench or nut driver.



Assembled top section

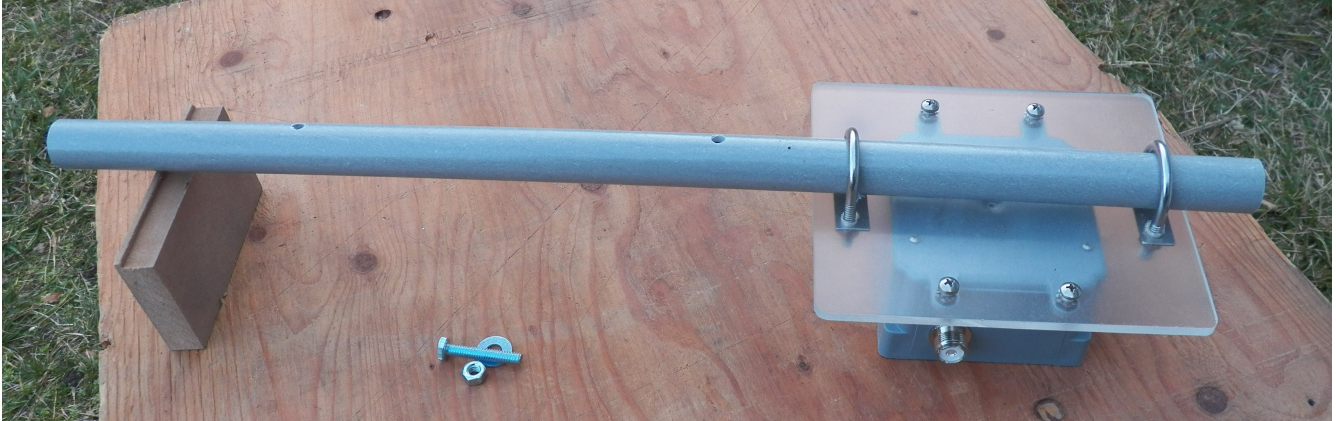
2> Locate the following parts for the next assembly step:

Middle section 1 inch OD fiberglass tube which has 2 holes and the LNA enclosure assembly attached

1.5 inch long by $\frac{1}{4}$ inch SS bolt

SS Washer

$\frac{1}{4}$ inch SS nut



Check that the top of the LNA plate is 15 inches from the top of the mast section. Adjust with the U bolts if necessary.

Slide the $\frac{3}{4}$ inch tube protruding from the top section into the middle tube at the end furthest from the LNA enclosure. Rotate the top section until the mounting hole aligns with the top hole in the middle section. The closed part of the U bolt on the top section should be on the same side as the LNA enclosure. Place the bolt through the hole and then secure with the washer and nut as was done for the first section. Tighten with a $\frac{7}{16}$ inch wrench or nut driver.



Top and Middle Sections Assembled

3> Locate the following parts for the first assembly step:

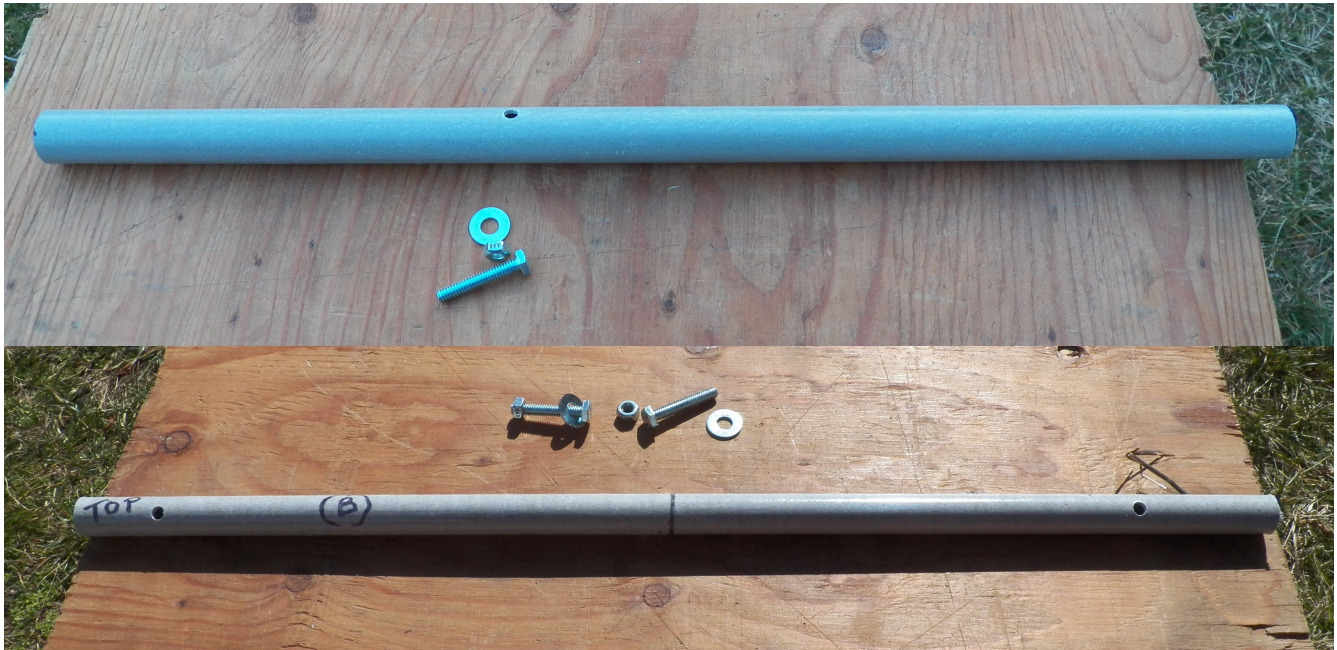
Bottom section 1 inch OD fiberglass tube.

$\frac{3}{4}$ inch OD fiberglass tube labeled "B"

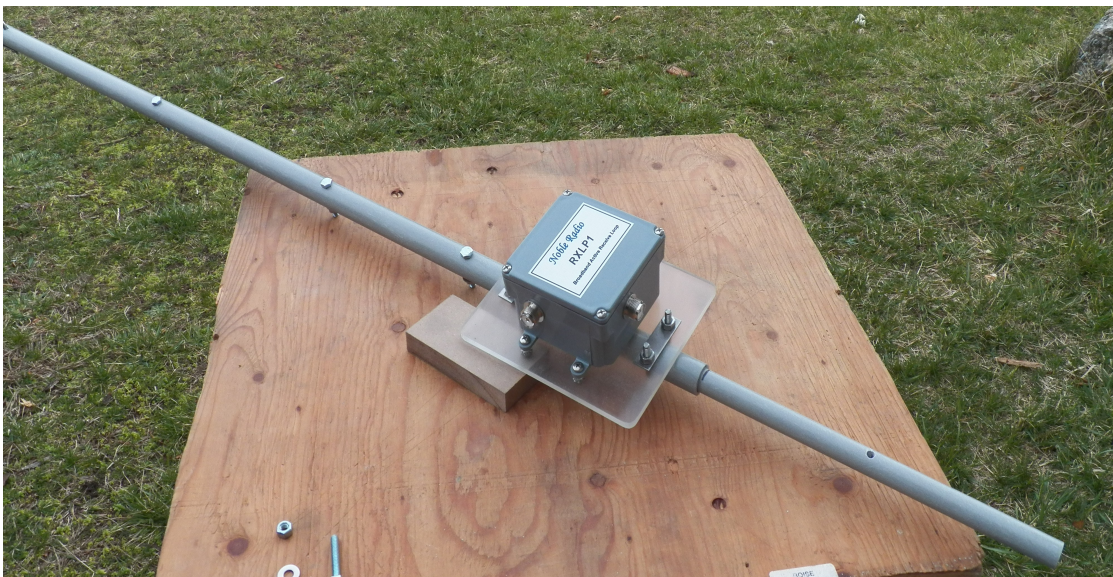
1.5 inch long by $\frac{1}{4}$ inch SS bolt

SS Washer

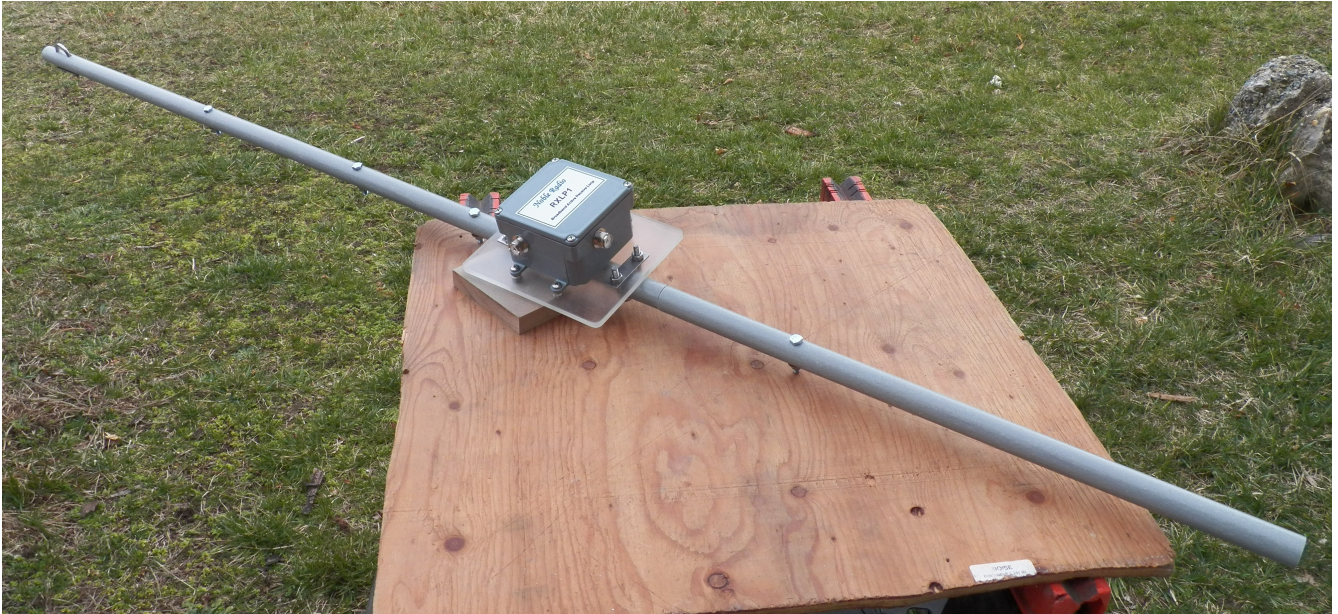
$\frac{1}{4}$ inch SS nut



Insert the $\frac{3}{4}$ inch OD "B" section into the bottom end of the middle section up to the center line marked on the "B" tube and then rotate the tube until the holes are aligned. Place a 1.5 inch bolt through the hole and attach with a washer and nut as was done in the previous steps. Tighten securely.



Place the last (bottom) 1 inch OD mast section over the protruding $\frac{3}{4}$ inch tube and rotate until the holes are aligned. Secure with a bolt, washer and nut as in the previous steps. The loop mast is now assembled.



Assembled loop mast

4> Remove the 2 nuts and plate from the rear of the top U bolt and push the bolt into the mast tube until the threaded portion is flush with the mast tube. Unroll the LMR-400 cable into a relatively circular shape. Take one end of the cable and feed the PL-259 connector through the U bolt.



Keep feeding the cable through the U bolt and create a circle that will meet with the 2

PL-259 connectors on the LNA enclosure. Screw the connectors onto the enclosure and then go around the loop to bend the cable to create a symmetrical circle with the mast at the centerline of the circle. Once the coax is in position push the U bolt through the mast and attach the plate and nuts. Tighten the nuts just enough to hold the coax in position at the top. Do not tighten enough to crush the coax. The loop is now ready to be mounted to a tripod, rotor or even hung from a tree branch, etc. Use the U bolt at the top for hanging the loop. For a more permanent installation or for use with a rotor attach the mounting plate to the bottom of the mast. The best way to mount the loop to another mast (either fixed or in a rotor) is to attach the mounting bracket to the fixed or rotor mast first and then slide the loop mast into the rear section of the bracket and tighten the nuts with a ½ inch open end wrench. Do not overtighten the nuts which can damage the mast tubing.



The picture below shows a typical installation of the loop connected to a mast in a rotor.



Installation of the Control Box / RXLPTR1 T/R Switch and Bias Tee

The remaining step to complete the installation is to connect the coax from the RXLPTR1 console to the coax OUTPUT connector on the LNA enclosure. Care must be taken with this line to make sure the power on the RXLPTR1 is off while connecting the cable since there is a DC voltage that is on the cable and the center conductor should never be shorted to ground (coax shield).

Connecting the RXLPTR1

The RXLPTR1 Control Box for the RXLP-1 Loop has three antenna connections on the rear panel.



The BNC connector to the left must be connected to the Loop via coax. It is very important to be sure that this port is not connected to anything else but the RX Loop. There is a DC voltage on this line as well as the RF signal from the loop. Connecting this line to the input of a receiver or transceiver can do damage to both the receiver and the RXLPTR1. **DO NOT CONNECT THE BNC LOOP CONNECTOR ON THE BACK OF THE RXLPTR1 CONTROL BOX TO ANYTHING EXCEPT THE RXLP-1 LOOP LNA BOX AT THE ANTENNA.**

Almost any type of decent quality 50 or 75 ohm coax may be used for this. Examples are RG-6, RG-58, RG-8, RG-8X, etc. The end at the RXLPTR1 needs to be a BNC (or another type connector can be used with a BNC adapter, eg PL-259 to BNC) and the

LNA end needs to be a PL-259 type. The power on the RXLPTR1 should be off when making this connection to prevent the DC in the cable from becoming shorted during the installation.

The SO-239 connector in the center of the back panel labeled TX ANT should be connected to the antenna that will be used for transmitting. The last SO-259 on the right side labeled TO XCVR should be connected to the receiver or the transceiver. If the antenna is to be used with just a receiver then the TX ANT can be used as a second or comparison antenna with no power being fed to it from a transmitter or it can be left open with no antenna connected and the receiver will just use the loop.

The RXLPTR1 contains a T/R switch for disconnecting the RX Loop from the radio when transmitting. There is an RF sense circuit in the RXLPTR1 which will automatically switch the RX Loop out of the circuit when it senses RF at the TO XCVR port. It can be used with power levels from QRP to 125 Watts. At least 3 Watts should be used for RF Sensing to insure a reliable switch. If less than 3 W is run then the PTT connection should be used. If an amplifier is to be used with the transmitter the TX ANT connection should go to the input of the amplifier with the TX antenna being connected to the amplifiers output. The drive to the amplifier would then need to be limited to no more than 125 Watts.

In addition to the RF sense circuit there is a hardwired PTT IN connection that can be used to switch the RX loop out of the system when transmitting. This connection needs to pull down to ground when in TX mode. The RF sense circuit will still be active but the PTT connection will override the RF Sense. That is, if RF is not present but the PTT is active then the RX Loop will remain disconnected from the circuit. There is a second connector on the back of the RXLPTR1 labeled PTT OUT which is simply a pass through connection so that a Y adapter does not need to be used to connect the PTT to other pieces of equipment such as an amplifier.

When SSB operation is used it is recommended that the PTT connection be used since the RF sense circuit will not switch until there is RF present. So if a PTT switch is not used the circuit will not actually switch the antennas until someone speaks into the mic to create an RF output even though the PTT switch on the mic (or foot switch) is depressed. Using the PTT connection will cause the antenna to switch any time the PTT on the mic is depressed regardless of whether there is RF present at the TX output.

Note that the RF sense circuit is connected all the time whether the PTT connection is used or not. This provides a backup of protection for the RX Loop LNA if the PTT connection is broken or not plugged in when the transmitter is active.

There is a slight delay between the removal of the PTT signal or when RF is removed when using the sense circuit and the connection of the RX Loop to the receiver. During this interval the receiver will be connected to the TX antenna. This delay is adjustable by a trimpot on the circuit board in the RXLPTR1. The factory setting should be fine for most types of operation but if not it can be changed. See the section at the end of this document for instructions on how to do this. Note that for modes like CW and digital the

RF sense option alone will be fine for the T/R switching. So if those are the only modes being used for transmit a PTT connection is not really necessary.

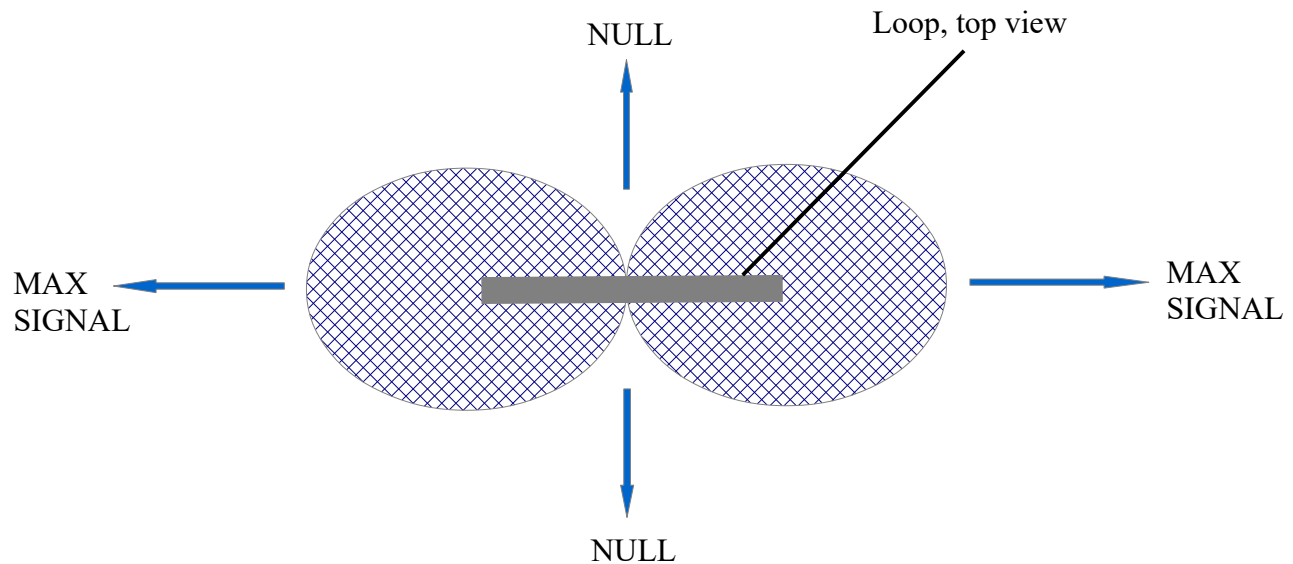
Once the antenna connections are made the plug on the supplied 12VDC wall mount power supply should be plugged into the connector labeled +12V DC on the back of the RXLPTR1. Check for the front panel power switch to be in the off position and plug the power supply into an available wall outlet.

Turn on the receiver or transceiver and the system should be operating with the receiver connected to the transmit antenna. This can be checked by removing the antenna connection from the TX ANT connector at the rear of the RXLPTR1 and the receiver should go quiet. Set the switches on the front panel to RX ANT = TX ANT and GAIN = LOW. Next switch the power on the RXLPTR1 on and the red "Power" LED should light. The receiver should still be receiving off the TX antenna at this point. Switching the RX ANT switch to LOOP should now connect the RX Loop to the receiver and there will probably be some difference in background noise and signal levels from what was heard on the TX antenna. When using the loop for frequencies of 3 MHz and higher the GAIN should be kept on LOW for the lowest noise floor and best SNR. There are certain instances where the higher gain will improve things and can be used. In general the noise floor will rise somewhere between 1 to 2 S-units on the higher gain at these frequencies. At the lower frequencies like 160M and the AM BCB or lower the higher gain will need to be used most of the time. Signals can be peaked or nulled by rotation of the loop. Local noise sources can also be minimized or even eliminated by rotating the loop. For this reason is it highly recommended that the loop be used with a rotor. A small, low cost TV type unit is more than enough to handle it. This adds great flexibility to what can be done with this antenna. The RX ANT switch can be used to easily switch back and forth between the loop and the TX antenna for comparison.

Once these receive functions have been verified as operating the last test is to verify that the loop is switched out of the signal path when transmitting (if a transmitter is to be used). Switch the transmitter to CW and set the power level to a low value (around 10W or so) and key the transmitter. You should hear a relay click in the RXLPTR1 unit and the transmitter power should be going out the TX ANT. Unkey the TX and after roughly a 500 mS (½ second) delay the relay should switch back and you should be receiving on the RX Loop again. Do the same thing bringing the power up to the level that will be used for normal transmit operation (max of 125W) and things should work the same way. At this point the RX loop is installed and working properly and can be used on the air.

The loop will work best if it is mounted at least 4 to 5 feet above the ground and should always be used in a vertical plane. It should also be located as far as possible from local noise sources.

The following illustration indicates the direction of the receiving field of the loop.



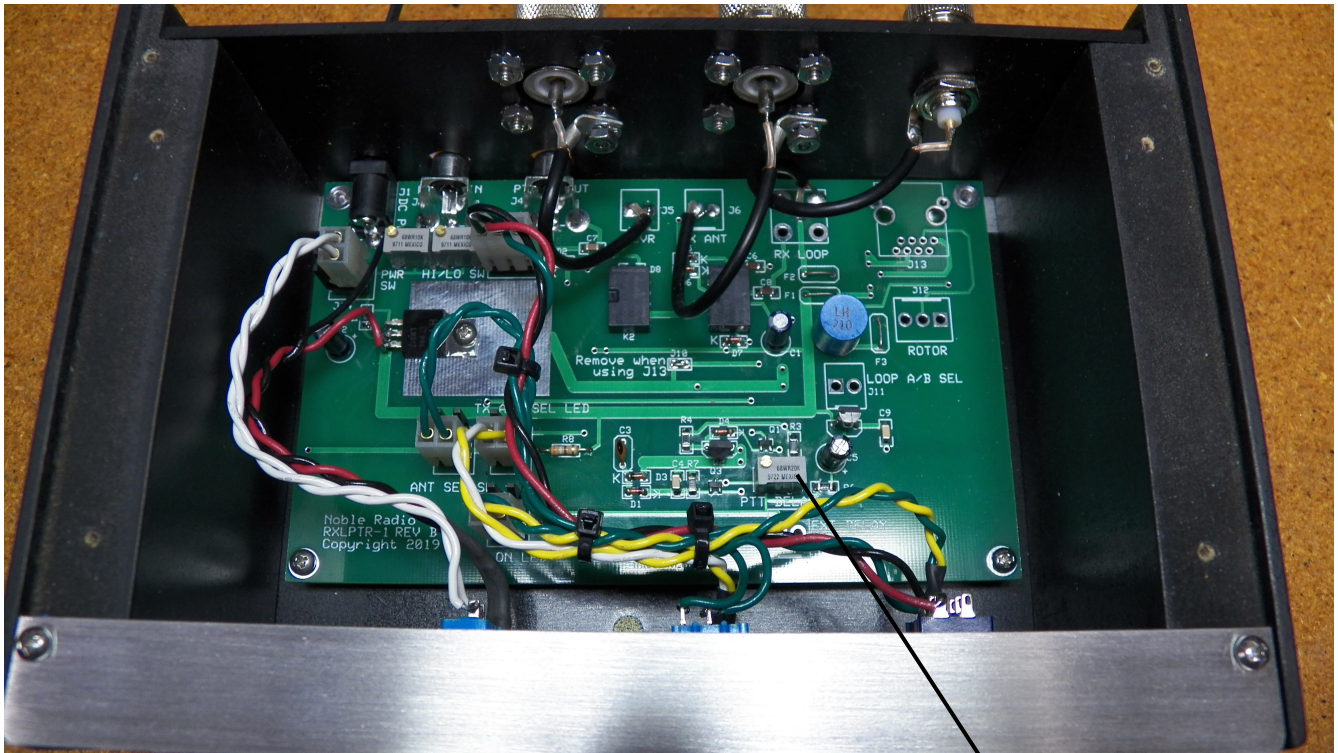
The figure 8 radiation pattern of the loop

Signals and interfering noise sources can be minimized or nulled by turning the antenna to place the source in the null spot in the field.

Changing the T/R Switch Turn Around Delay

To access the trimpot that controls the delay of the T/R switch the top cover of the RXLPTR1 needs to be removed. To do this remove the two screws holding the rear top metal bar and lift that off (pay attention to the left and right side so it goes back in the same direction). Next remove the 4 screws holding the top cover on and gently lift that off to expose the circuit board in the unit.

Locate the adjustment pot from the photo and using a small flat blade screwdriver or adjustment tool make about $\frac{1}{2}$ turn at a time and using the CW mode transmit and then release the TX and check the new delay time. Adjust in this manner until the desired delay is achieved. Do not adjust any other pots in the unit. Everything else is preset at the factory for optimum performance of the antenna.



T/R Switch Delay Adjust

Once the pot is set the cover and rear bar can be replaced. The cover should go back first and aligned so that the side with the small dot on it is facing down and the dot is to the front of the unit. Set that in place and install the 4 screws to hold it. Do not use a power driver to replace and tighten the screws. Use a hand driver and only make the screws snug. The side panels are MDF material and excessive tightening can strip the material. Next replace the rear bar in the same orientation it was removed (check that the holes in the side panels line up to the center of the holes in the bar. If they appear too far off flip the bar from left to right). Snug the two screws for the rear bar down with a hand driver and the operation is complete.

Specifications

Frequency Coverage: 300 KHz to 30 MHz

LNA Gain: +10 dB @ 200 KHz
+17 dB @ 300 KHz
+24 dB @ 500 KHz
+30 dB @ 1.8 MHz
+30 dB @ 3.5 MHz
+25 dB @ 14.25 MHz
+20 dB @ 21.3 MHz
+17 dB @ 29.0 MHz

LNA OIP3: +22 dBm

DC Power: 12V DC @ 100 mA max (2.5mm barrel plug with center positive)
Maximum DC input should not exceed 15 VDC Regulated

T/R Switching: Hardwired PTT and RF Sensing with adjustable turn around delay
(RF sensing needs 100 mW minimum)

Maximum Transmit Power into RFLPTR1: 125 Watts

Loop Diameter: 39 inches (10 ft circumference)

Loop Material: LMR-400 Coax

Mast Material: Fiberglass

Overall Mast Height: 69 inches

Weight (Loop): Approximately 5 lbs

Weight (RXLPTR1): 1 lb 11 oz

Weight (DC Power Supply): 9 oz

Size of RXLPTR1: 7.875in x 6 in x 3 in (LWH)

Noble Radio
PO Box 509
Ridge, NY 11961

LIMITED WARRANTY

Warranty Terms:

Subject to the Limitations of Warranty and the Warranty Procedures described below, NOBLE RADIO hereby warrants this product to be free of defects in materials and workmanship in normal use for a period of (12) months (the “Warranty Period”) from the date of the original purchase.

Limitations of Warranty:

- A. NOBLE RADIO is not liable for any express warranties except the Limited Warranty described above.
- B. The Limited Warranty extends only to the original purchaser.
- C. The Limited Warranty shall be limited to the repair or replacement of any materials found to be defective, any servicing or adjustment of the product which NOBLE RADIO believes is necessary, or replacement of the product should such repair, servicing or adjustment be deemed by NOBLE RADIO to be ineffective. The repair or replacement of defective materials and the servicing, adjustment or replacement of the product, under the terms of this warranty, shall be performed free of charge by NOBLE RADIO.
- D. Any tampering with, misuse or unauthorized modifications of or damage (for any reason) to this product shall relieve NOBLE RADIO from any further obligations under this Limited Warranty.
- E. The Limited Warranty applies only to the product as it existed at the time of original purchase by the original purchaser and shall not preclude NOBLE RADIO from later making any changes in design, adding to or otherwise improving subsequent versions of the product or impose upon NOBLE RADIO any obligation to modify or alter this product to conform to such changes, additions or improvements.
- F. NOBLE RADIO assumes no responsibility for any consequential damages caused by or arising out of any such defect in materials or workmanship.

G. TO THE FULLEST EXTENT PERMITTED BY LAW, NOBLE RADIO SHALL NOT BE RESPONSIBLE FOR ANY IMPLIED WARRANTY WITH RESPECT TO THIS PRODUCT.

H. If NOBLE RADIO elects to send the original purchaser a replacement product rather than repair the product that was returned to NOBLE RADIO, then the Limited Warranty shall apply to the replacement product only for the remainder of the original product's Warranty Period.

I. The above warranties shall not extend to any products or parts thereof which have been subjected to any misuse or neglect, damaged by accident, rendered defective by reason of improper installation, damaged from severe weather including floods or hurricanes, or abnormal environmental conditions such as prolonged exposure to corrosives or power surges, or by the performance of repairs or alterations performed by persons other than NOBLE RADIO.

J. Warranty statutes vary from state to state so some of the above limitations may not apply to you.

Warranty Procedures:

A. To obtain the benefits provided by this Limited Warranty, the original purchaser must comply with the following procedures:

1. NOBLE RADIO must be contacted by email (info@nobleradio.com) or regular mail, at the address at the top of this warranty description, to describe fully the defect for which warranty assistance is sought.
2. If suggestions from NOBLE RADIO cannot affect a repair then NOBLE RADIO will issue an RMA number and address to return the product for repair.
3. The purchaser is responsible for all shipping and insurance costs. NOBLE RADIO assumes no liability for products shipped by the purchaser without insurance and are lost or damaged by the carrier.
4. NOBLE RADIO will return the repaired product (or replacement product) free of charge to the purchaser. The decision as to whether to repair or replace the product will be made at the sole discretion of NOBLE RADIO.