

LDG RT-600
600 WATT REMOTE
AUTOMATIC TUNER



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Introduction

LDG pioneered the automatic, wide-range switched-L tuner in 1995. From its laboratories in St. Leonard, Maryland LDG continues to define the state of the art in this field with innovative automatic tuners and related products for every amateur need.

Congratulations on selecting the RT-600 600-watt remote automatic tuner. The RT-600 provides full- and semi-automatic antenna tuning across the entire HF spectrum plus 6 meters, at power levels up to 600 watts peak. It will tune dipoles, verticals, Yagis, or virtually any coax-fed antenna. It will match an amazing range of antennas and impedances, far greater than some other tuners you may have considered, including the built-in tuners on many radios.

The RT-600 is similar to previous LDG tuners, but is weatherproof and can be installed outdoors as near to the antenna as possible, reducing or eliminating coax SWR losses. The tuner is powered over the coax feedline, so no additional cables are required. The included RC-600 control unit provides DC power injection, as well as a convenient on/off switch, power indicator, and a TUNE button.

Quickstart Guide

1. Turn off power to your radio and amplifier.
2. Connect the antenna jack on your amplifier to the “**Radio**” jack on the RC-600.
3. Connect the “**Tuner**” jack of the RC-600 controller to the “**Radio**” jack on the RT-600 via a suitable coax feedline.
4. Connect the antenna to the “**Ant**” jack on the RT-600.
5. Connect a source of 12VDC, 1000mA to the **Power** jack on the RC-600, and turn on your transceiver and amplifier. The power jack is center-positive.
6. Bypass your amplifier; never tune with more than 100 watts.
7. Begin transmitting; the tuner will automatically begin a tuning cycle if there is an SWR mismatch.
8. When tuning is complete, un-bypass your amplifier; you are ready to transmit.

The RT-600 mounts remotely at the antenna, eliminating coax losses.

You should really read the whole manual, but this summary will get you started.

Specifications

Always operate within specified limits.

- 3 to 600 watts SSB and CW peak power, 250W PSK and digital modes and 6 meters.
- 2,000+ memories for instantaneous frequency and band changing.
- Power: 12VDC, 1000mA, carried on the coax feedline.
- 1.8 to 54.0 MHz coverage.
- Tunes 4 to 800 ohm loads (16 to 150 on 6M), 16 to 3200 ohms with external 4:1 Balun.
- For Dipoles, Verticals, Vees, Beams or any Coax Fed Antenna.
- External balun allows tuning of random length, long wire or ladder line fed antennas.
- Included RC-600 controller provides DC power injection, On/Off switch, and Tune button.
- Dimensions: RT-600: 9”L x 8.5”W x 3”H; RC-600: 4”L x 3”W x 2”H
- Weight: RT-600: 3 lb.; RC-600: 8oz.

An Important Word About Power Levels

Never exceed 600 watts peak on SSB/CW, or 250 watts on 100% duty cycle modes.

The RT-600 is rated at 650 watts peak power input at most. Many amateur amplifiers are capable of transmitting well over 650 watts. Power levels that significantly exceed specifications will definitely damage or destroy your RT-600. If your tuner fails under overload, it could also damage your transmitter or transceiver. Be sure to observe the specified power limitations.

Operating instructions in this manual direct you to “bypass” your amplifier for tuning. This means turning your amplifier off or placing it in standby mode, connecting your transceiver or transmitter directly to the tuner without amplification. Never tune at more than 100 watts.

IMPORTANT SAFETY WARNING

Never install antennas, supports or transmission lines over or near power lines. You can be seriously injured or killed if any part of the antenna, support or transmission line touches a power line. Always follow this antenna safety rule: the distance to the nearest power line should be at least twice the length of the longest antenna, support or transmission line dimension.

Getting to know your RT-600

You'll be using your RT-600 for a long time; take a few minutes to get to know it.

Your RT-600 is a quality, precision instrument that will give you many years of outstanding service; take a few minutes to get to know it.

The RT-600 has 2,000 memories.

The RT-600 tuner is designed to be used remotely, powered over the coax cable that carries both the RF energy and DC power. An internal "Bias Tee" circuit separates the RF from the DC power with virtually no loss. The included RC-600 controller injects DC power at the radio end of the coax, and provides Power and Tune control buttons, and a Status LED.

The RT-600 has 2,000 frequency memories. When tuning on or near a previously tuned frequency, the RT-600 uses "Memory Tune" to recall the previous tuning parameters in a fraction of a second. If no memorized settings are available, the tuner runs a full tuning cycle, storing the parameters for near-instant recall on subsequent tuning cycles on that frequency. In this manner, the RT-600 "learns" as you use it, adapting to your bands, frequencies and antennas. The RT-600's latching relays hold the tuned configuration indefinitely, even when DC power is completely removed. Tuning memories are stored indefinitely in non-volatile flash memory.

RC-600 Front Panel

The included RC-600 injects DC power onto the feedline and controls the remote tuner.

The included RC-600 controller inserts 12 volts DC onto the coax feedline, and provides controls and status information.



The RC-600 controller has two pushbuttons and one LED indicator light.

- **Power:** Turns DC power on and off.
- **Tune:** Initiates a tuning cycle
- **Status LED:** lights when the RT-600 is powered on.

Connections

The RT-600 has three connectors:

The RT-600 uses standard SO-239 connectors.

- **Antenna SO-239:** Output to the antenna. Connect the antenna to this SO-239 using the shortest practical coax cable.
- **Gnd (wingnut):** Connect to antenna system ground.
- **Radio SO-239:** Connect to the feedline which comes from the RC-600 controller.



The RC-600 controller has three connectors:



- **Tuner:** connects via coaxial cable to the Radio port on the RT-600.

- **Radio:** connects via coaxial cable to the Antenna port on your amplifier.
- **Power:** connects to a source of 12 volts DC, 1000 mA (center positive).

Installation

Overview

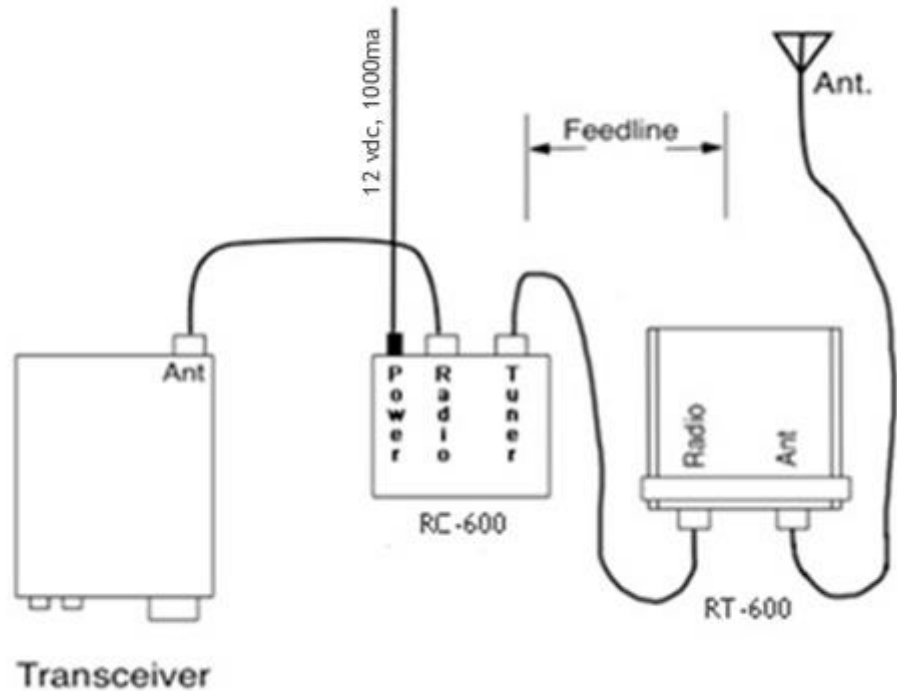
Your RT-600 is designed for outdoor use.

The RT-600 tuner is designed for outdoor use; it is weather resistant. However, LDG recommends using silicone coax sealing tape on the coax connections after installation to help keep rainwater out of the connections. The RT-600 is designed for use with coax-fed antennas; an external balun is required to use it with longwires or antennas fed by ladder line. To avoid damage always turn your radio and amplifier off before connecting or disconnecting anything.

Basic Installation

Install the RT-600 as close as possible to the antenna.

Place the RT-600 tuner as near the antenna feed point as possible. Place the included RC-600 controller in a convenient position near your amplifier. Connect a 50-ohm coax jumper from the amplifier's antenna jack to the RC-600's **Radio** jack. Connect a 50-ohm coax cable from the RT-600 tuner's **Antenna** jack to the antenna. Connect the RT-600's **Radio** jack to the RC-600's **Tuner** jack via a suitable coax cable. LDG recommends grounding the RT-600 tuner via the wingnut marked **Gnd**. Connect the RC-600 to a source of 12Volt DC power, 1000 mA.

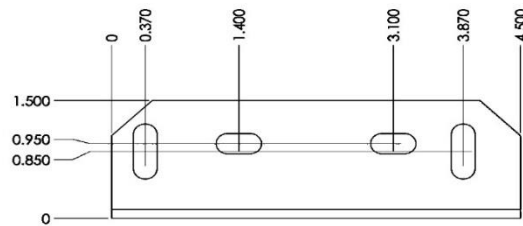
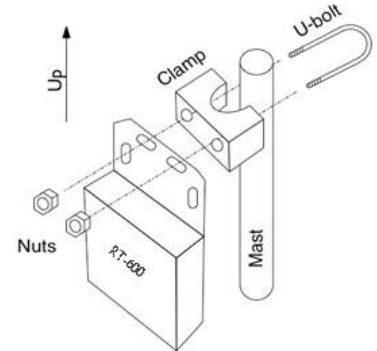


Secure the RT-600 to a Mast

The RT-600 is intended to be installed on a ground-mounted mast.

Your RT-600 is designed to be mounted on a mast or other similar support; a clamp and U-bolt are provided for this purpose. Remove the nuts and clamp from the U-bolt. Place the U-bolt around the mast, then slide the clamp over the threaded ends of the U-bolt, so that the flat edge of the clamp faces away from the mast. Insert the threaded ends of the U-bolt through the back of the mounting bracket at the top of the RT-600. Thread the nuts back onto the U-bolt, and snug them up. Tighten only as much as is required to keep the RT-600 from sliding down the mast; do not over-tighten. Install with the mounting bracket up and the connectors down to help prevent rainwater from leaking into the connectors.

Although the U-bolt is electroplated to resist corrosion, you may wish to apply a thin layer of grease to the threads to help prevent rust and aid in later removal. If you wish to use a larger U-bolt (to bolt the tuner to a larger mast, or other support), refer to the RT-600 mounting bracket dimensions below for sizing.



Tips for Outdoor Installation

Mount the RT-600 on a mast. Do not simply lay it on the ground.

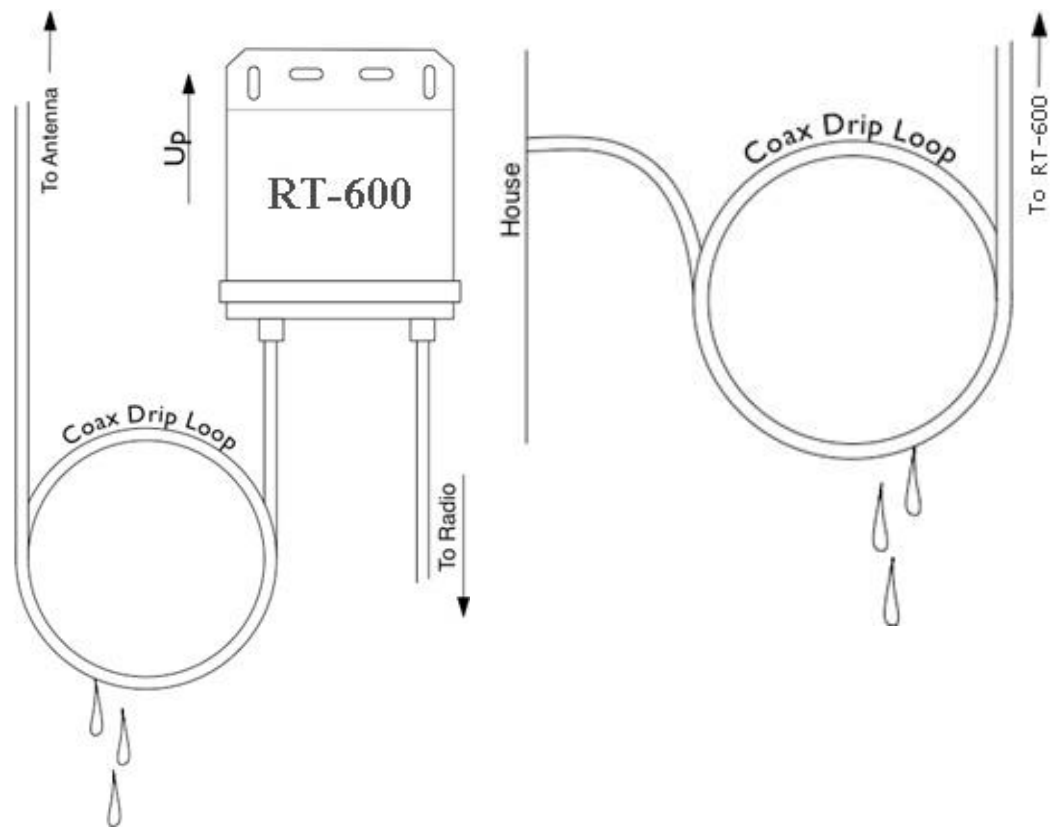
The RT-600 is weather resistant and suitable for permanent outdoor installation, but it may leak if immersed. The RT-600 should be mounted on a mast with the mounting bracket facing upward, and the SO-239 jacks facing down; do not simply lay it on the ground, as a puddle could form around it. If necessary, install a short ground mast near your antenna to mount the RT-600.



Drip loops prevent water from getting in to the tuner or your house.

To prevent rainwater from running down the coax and into the connectors, all connections should be wrapped with coax sealing tape such as Coax Seal™. Additionally, a drip loop should be provided by coiling the coax and zip-tying it into a loop below the connectors. The drip loop collects any water running along the coax, and directs it away from the tuner. Also provide a drip loop where the coax enters the house to prevent water from running along the coax and into the house. Be sure the drip loop hangs below the coax entry point into the house.

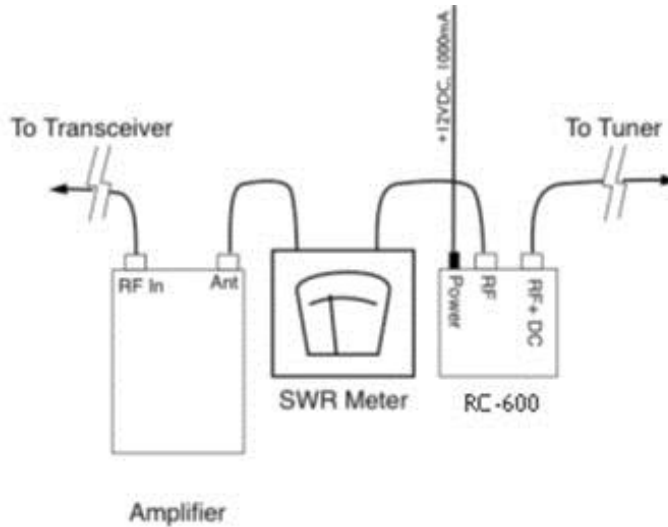
If you are using existing coax between the RT-600 and the RC-600, inspect it carefully for water damage. Best Amateur practice calls for cutting away one foot of coax for each year it has been outdoors. If the coax was sealed with waterproof tape or other material this may not be necessary.



SWR Meter

You may install an external SWR meter if desired.

The RC-600 has no SWR display. If your transceiver does not have a built-in SWR display, you may install an external SWR meter between the output of the amplifier and the input of the RC-600.



Bias Tee Information

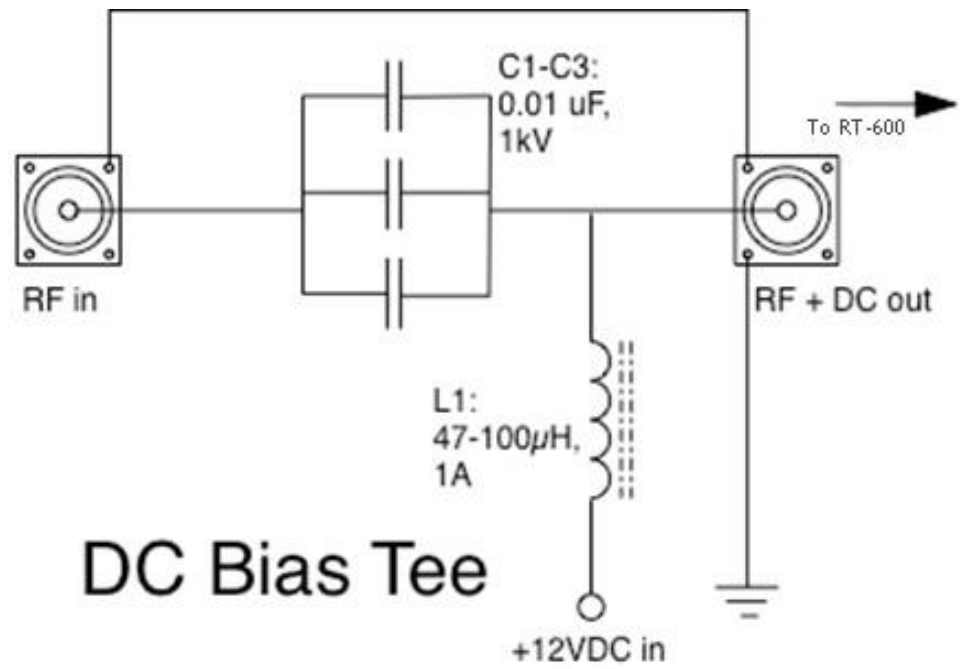
You can make your own Bias Tee circuit if you need to use the RT-600 without the RC-600.

A Bias Tee is a circuit that injects DC power onto the coax feedline, while isolating the DC power from both the transmitter and the antenna; two are required, one at each end of the coax. The LDG RT-600 contains an internal Bias Tee, and the RC-600 contains a Bias Tee designed specifically for use with the RT-600. The following information is provided for your reference if you ever need to use the RT-600 without the RC-600.

You can easily “homebrew” a Bias Tee from readily available components. Alternatively, ready-made Bias Tees are available from commercial suppliers, including the SGC 54-70 DC Coaxial Line Isolator, the Array Solutions Bias Tee Master, and many others. The Bias Tee must be rated for at least 1 Amp, and 1.8 to 54 MHz.

For more information on Bias Tee construction and theory, see the Wikipedia article “Bias Tee” at http://en.wikipedia.org/wiki/Bias_tee, ARRL’s QST article in the January 2013 issue, Vol. 97, Issue 1, p46, or the Array Solutions Bias Tee Master product review in the September 2009 issue of QST.

A sample schematic appears below:



Operation

Operation Overview

You will probably use fully automatic tuning most of the time.

Two types of tuning cycles are available; a Memory Tuning cycle and a Full Tuning cycle. A memory tuning cycle restores parameters saved after an earlier successful tune on the present frequency. Those settings are checked to see that an acceptable SWR match is found. If this fails, then a full tuning cycle automatically begins. A full tuning cycle “starts from scratch”, rapidly trying combinations of inductance and capacitance values, converging on the best possible match. When the tuning cycle ends successfully, the inductance and capacitance settings are saved in a memory associated with the present frequency so that they can be recalled in a future memory tuning cycle. In this manner the RT-600 “learns” as you use it, adapting itself to the bands, frequencies and antennas you use.

The RT-600 always powers up in fully automatic Memory Tuning mode. This means that whenever RF is present, if the SWR is too high a memory tuning cycle will automatically begin. You will probably use memory tuning most of the time; it takes advantage of any saved tuning settings, but defaults to a full tuning cycle if no stored data is available.

Never tune at high power.

NOTE: Before beginning a tuning cycle always bypass the amplifier. Tuning should always be performed with 100 watts or less of forward power. Typically tuning will occur when you make large frequency changes, or change bands.

Memory Tuning Cycle

Tuning is fully automatic.

To begin operation first bypass the amplifier. Tune the radio to the desired frequency, press the Power button on the RC-600 to power up the RT-600, bypass your amplifier and begin transmitting. If a high SWR condition is detected, the RT-600 Tuner will begin tuning. To watch the progress of the tuning cycle, observe your radio’s built-in SWR meter (or external SWR meter, if applicable). The SWR needle will oscillate as the tuner seeks a match, and will then settle to a low SWR value when tuning is complete. If operating on a previously memorized frequency, the tuning cycle will last only a fraction of a second while memory settings are restored and verified. Once tuning is complete, un-bypass the amplifier and operate normally.

Full Tuning Cycle

You can force a full tuning cycle.

In some circumstances you may want the RT-600 to perform a full tuning cycle instead of the usual memory cycle. To do this, first bypass the amplifier. Press the **Tune** button on the RC-600, begin transmitting a carrier, and while still keying the radio, release the **Tune** button. Continue transmitting the carrier until the SWR settles to a low value. When tuning is complete un-key, un-bypass the amplifier and begin normal operation.

Bypass

Whenever the RT-600 is turned off (Power button in the Off position, Status LED off), the tuner is bypassed; RF from the amplifier is passed directly to the antenna with no matching. When the tuner is powered up again, it restores the most recent tuned state it held when last powered down.

Relay Protection

The RT-600 software disables tuning if the input power exceeds 200W, or 150W if the SWR exceeds 3:1. This protects the relay contacts from arcing damage caused by switching under high power. Always bypass your amplifier during tuning; you may place your amplifier back in normal operating mode once tuning is complete.

Re-tuning Prohibition

In some rare cases, when an antenna is tuned far from its resonant frequency, the RT-600 may erroneously attempt to re-tune even though it has already found an acceptable match. In these cases the following procedure may be used to place the RT-600 into non-tuning mode:

1. Turn off power to the RT-600, wait for one full second.
2. Turn on power to the RT-600 wait for one full second. Do not transmit.
3. Repeat this cycle three times. In other words, turn power off and back on slowly three times in a row, but do not transmit during this time.

The RT-600 is now in active, non-tuning mode; it will hold the current tuning settings, but will not re-tune. This mode is useful for antennas tuned far from their resonant frequency, where the final SWR match found by the RT-600 is perhaps higher than usual. By placing the RT-600 in active, non-tuning mode, you can transmit without the RT-600 continuously attempting to re-tune this high SWR load. To return to normal mode, simply initiate a full tuning cycle: press the **Tune** button on the RC-600, begin transmitting, and while transmitting release the **Tune** button on the RC-600.

MARS/CAP Coverage

The RT-600 provides continuous tuning coverage over its specified range, not just in the amateur bands. This makes it useful for MARS or CAP, or any other legal HF operation.

The RT-600 automatically protects itself from tuning at high power.

The RT-600 1.8-54 MHz continuously, not just in the ham bands.

Be careful not to interfere with other stations when you tune.

A Word About Tuning Etiquette

Be sure to use a vacant frequency when tuning. With today's crowded ham bands this is often difficult. However, causing interference to other hams should be avoided whenever possible. The RT-600's very short tuning cycle minimizes the impact of tuning transmissions.

Care and Maintenance

The RT-600 tuner and RC-600 controller are essentially maintenance-free. You should always strictly observe the power limits specified in this manual. The outer cases may be cleaned as needed with a soft cloth slightly dampened with household cleaning solution. As with any modern electronic device, the RT-600 and RC-600 can be damaged by temperature extremes, water leakage, impact, or static discharge. LDG strongly recommends using a good quality, properly installed lightning arrester in the antenna lead.

Technical Support

Email if you have questions or need help.

Technical support is always available by e-mail (support@ledelectronics.com). We've placed answers to common questions in the FAQ section of our web page. LDG also keeps up-to-date product information on our web site, including product manuals if you need a replacement. When you consider buying another LDG product, our website has complete specifications and photographs you can use to help make your purchase decision. There are also links to all of the quality LDG dealers who are ready to help you make your purchase decision.

Two-Year Transferrable Warranty

Your two-year warranty is transferable.

Your LDG product is warranted against manufacturer defects in parts and labor for two full years from the date of purchase. This two-year warranty is transferable; when you sell or give away your LDG product include the original sales receipt, and the two-year warranty goes with the product to the new owner. There is no need to complete a warranty card or to register an LDG product; your receipt establishes eligibility for warranty service, so be sure to save it. Include a copy of your receipt whenever you send your product to LDG for warranty repair. Products sent to LDG without a receipt are considered requests for out-of-warranty repair. The warranty does not cover damage or abuse; a failure caused by the customer or by a natural calamity (e.g. lightning), as determined by LDG, is not covered under the two-year warranty. Damage can be caused by failure to observe the product's published limitations and specifications, or by not following good Amateur practice.

We'll be happy to fix your tuner even if it's out of warranty.

Pack it carefully, include your receipt for warranty service, and ship it to us; no RMA is required.

We love to hear from our customers.

Out of Warranty Service

LDG will repair your product even after the warranty has expired; a reasonable fee will apply. We will troubleshoot the problem, and based on your instructions either contact you with an estimate, or fix it and bill you for any repair charges. Check our web site for the latest information on obtaining out of warranty service.

Returning Your Product For Service

LDG does not require a return merchandise authorization, and there is no need to contact LDG before returning your product. Download the LDG Product Repair Form from our web site. On the Repair Form describe the problems you're experiencing. Our technician attempts to duplicate the problems you describe, so please be accurate and complete. LDG recommends using a shipper that provides a tracking number. Include your email address so our return shipper can alert you when your product is in-route. Repairs can take six to eight weeks, but are often faster; we appreciate your patience. Current information on returning products for service is found on the LDG website under the Support menu item, then under the Tech Support sub-menu.

Send your carefully packaged unit with the Repair Form and a copy of your receipt to:

LDG Electronics, Inc.
Attn: Repair Department
1445 Parran Rd
St. Leonard, MD 20685

Product Feedback

We encourage product feedback; tell us what you think of your LDG product. In a card, letter, or email (preferred) tell us how you used the product, how well it worked in your application, and any suggestions you have for enhancements or new products. Send along a photo or even a schematic or drawing to illustrate your narrative. We like to share your comments with our staff, our dealers, and even other customers on the LDG website:

<http://www.ldgelectronics.com/>