



**SG-237 SMARTUNER™  
INSTALLATION MANUAL**



## SG-237 Smartuner™ Manual

### SG-237 Specifications

HF Frequency Range:	1.8-60 MHz
Power Input Range:	3-100 W (PEP) 40 W CW Max (40% duty cycle)
Input Impedance Range:	45-55 Ohms
VSWR (Typical):	Less than 1.4:1
DC Input Requirement:	+13.8 VDC (nominal)
Average Input Current:	300 mA
Initial Tune Time:	Less than 2 sec. (typical)
Retune from Memory:	Less than 10 msec. (typical)
Memory Bins:	170
Tuning Combinations:	½ Million
Antenna Length (>3.3 MHz):	8 feet (2.5 M) minimum
Antenna Length (<3.3 MHz):	28 (8.5 M) feet minimum
Installation:	Any Position
Operating Temperature:	-35 to +70 C (-31 to +158 F)
Case:	Weatherproof ABS plastic with aluminum base
Cable:	9 foot shielded 4-conductor/RG-58 coax (PL-259 connector)
Dimensions:	9”L x 7”W x 1.5”H (23L x 18W x 4H cm) 2 Lbs. (1 Kg)

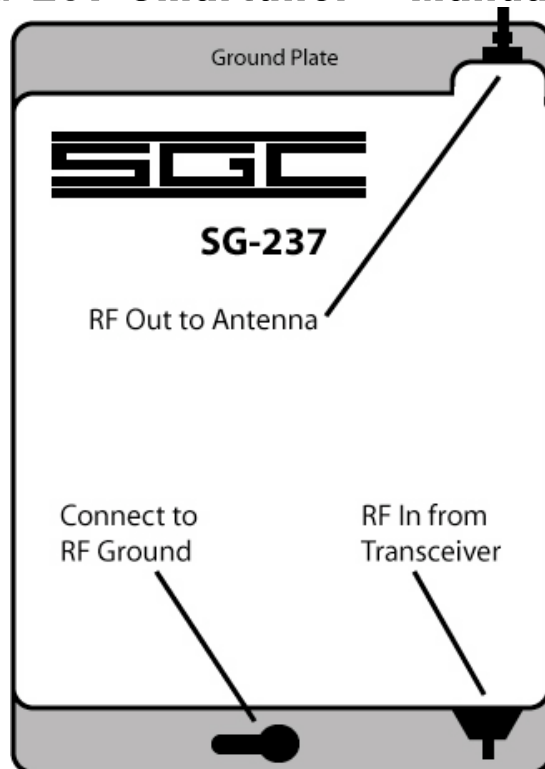
### 1.0 The Coupler Basics

Congratulations on purchasing the most versatile and reliable HF coupler available on the market today. Your SGC Smartuner™ is designed to give you dependable operation and the flexibility to operate on any HF frequency without any extra ‘tuning’ effort on your part. Unlike a traditional ‘tuner’ – there are no knobs or buttons to fiddle with. You simply install the unit, and operate – the Smartuner does the rest! Once the unit is installed, it will automatically sense your RF frequency and tune your antenna down to minimum SWR to maximize the efficiency of your signal and squeeze the most out of every watt. A Smartuner doesn’t require any special interface or balun and will work with any transceiver and any antenna within its specifications range. Installation is simple too! Read on to get on the air quickly and easily.

There are three connections on the SG-237 case: (1) The coaxial RF cable and power cables (bundled together) that will connect to your transceiver and power supply. (2) The antenna output connection. (3) The RF ground connection. All that is necessary to begin using your coupler is to supply power, hook up to antenna, ground, and transceiver – and transmit. The SG-237 does the rest.

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## SG-237 Smartuner™ Manual



The SG-237 is supplied in a waterproof case, on a mounting plate with pre-drilled holes. It is ideal for any mobile or base-station installation. RF and DC power is supplied to the unit through the same bundled cable (9 feet supplied). The cable includes the RG-58 coax for the RF connection to the transceiver, two wires for DC and ground, and two wires for optional accessories. (See Section 5 for more details on the Smartlock™).

Wiring for the SG-237 is as follows:

- RF Coax: To transceiver
- Red Wire: DC Power
- Black Wire: DC Ground
- White Wire w/ Black Stripe: LED Indicator (Smartlock)
- White Wire w/ Red Stripe: Tune Lock/Reset (Smartlock)

### 2.0 Coupler Placement

SGC always recommends placing the antenna coupler as close as possible to the base of the antenna – regardless of whether it is an SGC coupler or another brand. All SGC couplers can be operated with a coaxial cable output connection; but this is not our recommendation. Antenna “tuners” which use coaxial cable connection are actually line trimmers and have a limited adjustment range (25 to 800 ohms). This impedance limitation prevents high voltages and current which may cause flashing or burning of the coaxial cable – not the coupler. Trimmers are less expensive than actual antenna couplers and much more common. However, because of the impedance range limitations, they cannot tune whip or end fed wire antennas. On the other

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## **SG-237 Smartuner™ Manual**

hand, SGC antenna couplers are not limited in their impedance ranges and will tune all types of antennas, including end fed wires and whips. For the most efficient operation possible, install your SGC coupler as close to the feedpoint of your antenna as physical limitations allow. See section 4.0 for examples of ideal configurations. More information, including details of several real installations and technical notes can be found on our website.

### **3.0 Outdoor Installation**

The SG-237 antenna coupler's waterproof case is designed to withstand the environmental conditions encountered aboard ship when mounted on weather decks. The internal construction is designed to withstand the shock and vibration of marine service. Corrosion resistant hardware and passive alloys are employed throughout. We do not recommend opening the case unless it is necessary. For 99% of installations, the factory settings for jumpers will be correct.

The coupler must be installed in an area not directly exposed. Excessive weather or exposure to heat and sunlight can shorten the life of the unit. Although the SG-237 built very solidly, it is good installation practice to provide additional protection from the elements. SGC makes the following recommendations:

#### **3.1 Marine Mounting**

The Smartuner should be located inside the house or under the aft lazaret on a sailboat. On powerboats, the coupler may be mounted outside, but an additional protective housing is recommended. The preferred installation if vertical is with the RF stud pointing upward. The antenna connects to the bolt on the top. The SG-237 may be mounted in any position, including inverted without any degradation of performance.

#### **3.2 Desert and High Temperature Installations**

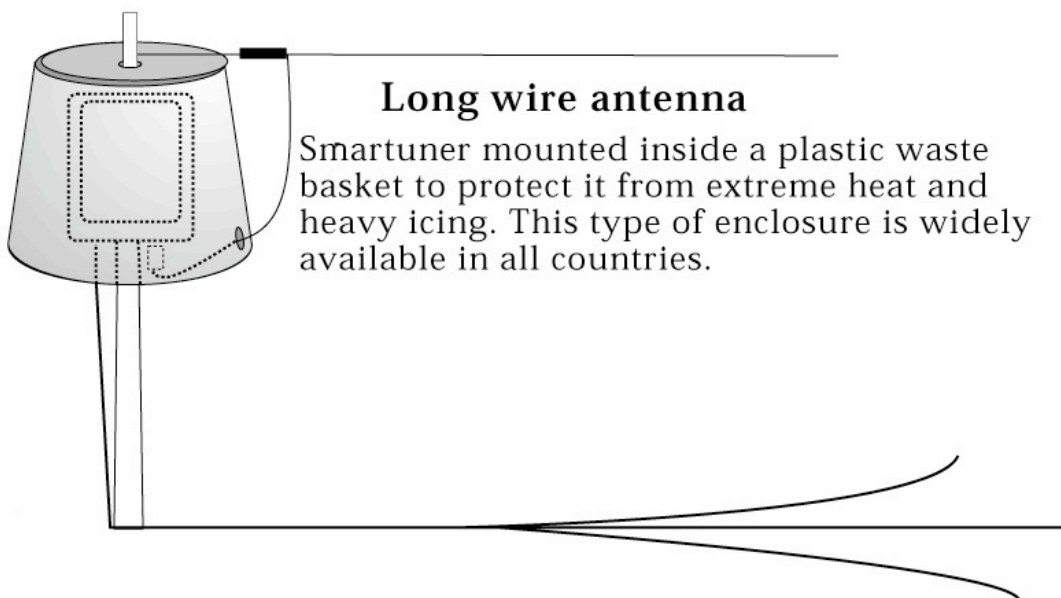
The Smartuner may be used in very hot climates on a continuous basis if installed in a manner that protects it from direct sunlight.

#### **3.3 Additional Weather Protection Installations**

To protect the unit from direct exposure to sunlight, and to prevent heavy build-up of ice, we recommend installing the Smartuner under additional protective housing. If you are mounting it on a tower or in an extremely hot or cold climate, a plastic wastebasket (such as those made by Rubbermaid™) makes an excellent weather cover and costs only a few dollars.



## SG-237 Smartuner™ Manual



### Long wire antenna

Smartuner mounted inside a plastic waste basket to protect it from extreme heat and heavy icing. This type of enclosure is widely available in all countries.

#### 4.0 Five Golden Rules of HF Installation

These rules apply to all types of stations, including base, mobile, airborne and marine. They are very important for planning and installing your HF system, if you want to achieve good communications.

1. Install transceiver as close to operation site and power supply system as possible (whether an external power supply or battery system).
2. The antenna must be installed in an open space and as far as possible from your operating point. Example: On a sailboat, use the backstay as the antenna, since it is the farthest point away from the rest of the vessel.
3. The antenna coupler should be installed at the base/feedpoint of the antenna.
4. Always create your own ground with radial wire or copper straps. They will guarantee a solid and proper ground system.
5. All cables – power supply, control or coaxial – must always be as short as possible and/or necessary. An excess cable should be shortened to the proper length – never coiled.

Following these rules will minimize marginal installations and problem sources such as RF feedback in the radio, power supply or cables and “hot” or RF burning microphones. If all five of the above points are followed during the design and installation of your HF system, the operator can expect top performance. Further information regarding applications, installation and operation can be downloaded from our website at [www.sgcworld.com](http://www.sgcworld.com). These publications include:

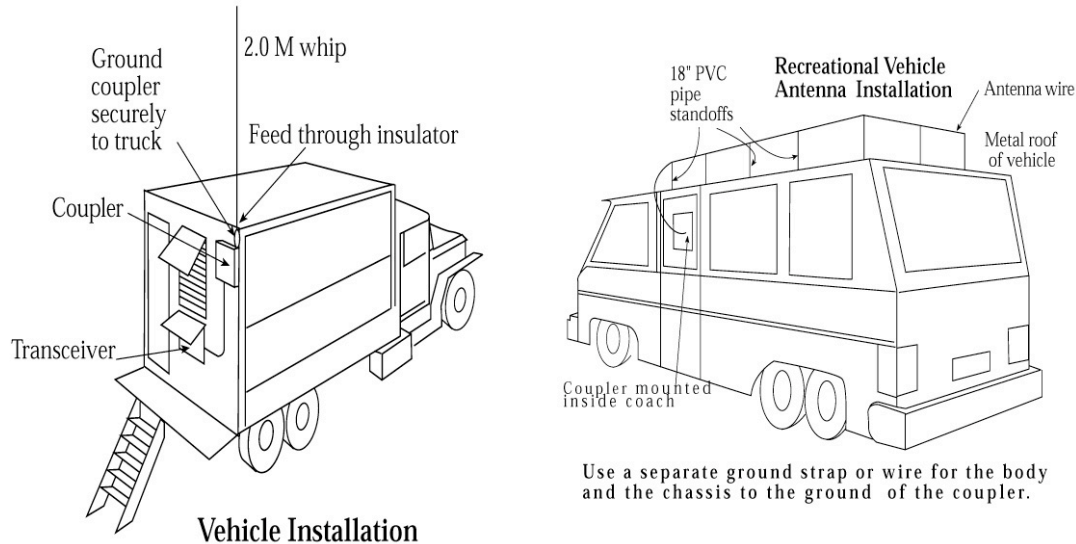
- HF User’s Guide
- Go Mobile at 500 Watts
- Stealth Antennas
- Smartuner Antenna Coupler Manuals

## SG-237 Smartuner™ Manual

This manual is produced as a guideline for the SG-237 antenna coupler. Performance and results may vary and SGC does not warrant any installation or any result. This manual is subject to change without notice.

### Selected Antenna Configurations

Automobiles: RVs or trailers provide an excellent base to install effective low cost antennas, and end feed or loop antennas can be used.

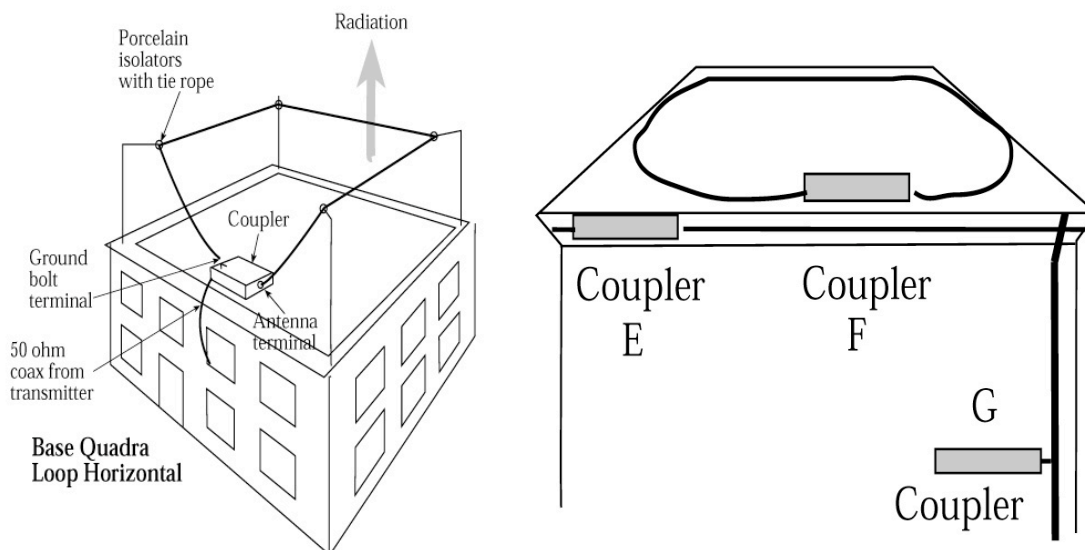


**Buildings:** The horizontal quad loop is a groundless antenna for high angle radiation and is ideal for HF communications up to 500 miles in the frequency range of 2 to 10 MHz. This configuration provides optimum near-right angle reflection to the ionosphere for short-range communications.

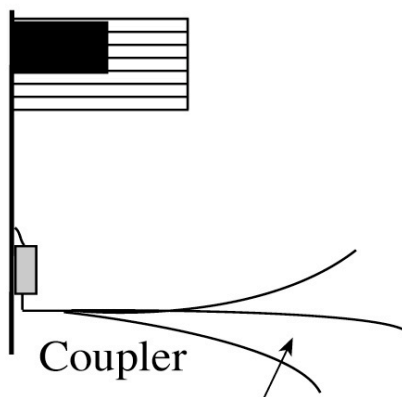
**Roofs/Walls:** E. Under a roof overhang, all kinds of wire antennas may be installed. F. All types of antennas may be hidden along the roof of a building, as long as it uses non-metallic roofing materials. Loop antennas are good for this type of installation. G. A downspout, rain gutter antenna works well if the piping and gutter are aluminum.

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## SG-237 Smartuner™ Manual



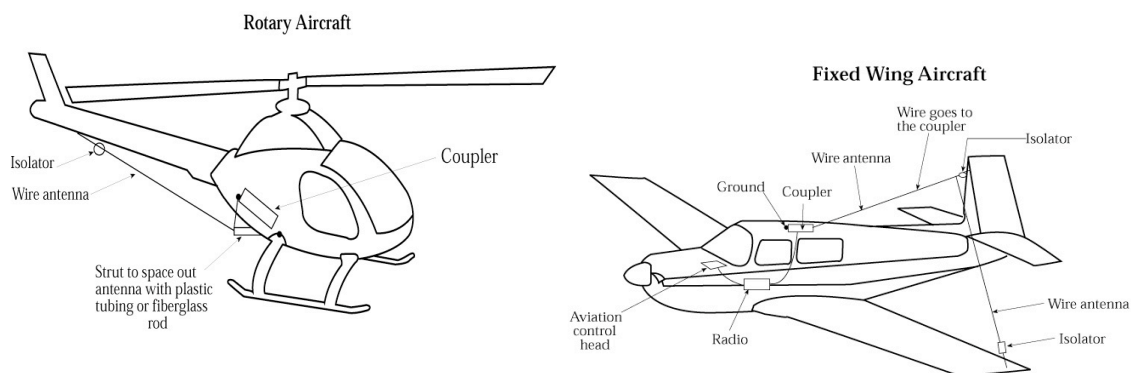
**Flagpole:** If a flagpole is made of PVC pipe, it is easy to tape a large gauge wire to the inside of the pipe and use a good counterpoise. Typical flagpoles are 25 to 35 feet in height, which offers excellent performance on all bands. Note the ground radials that are necessary with any long wire or vertical antenna.



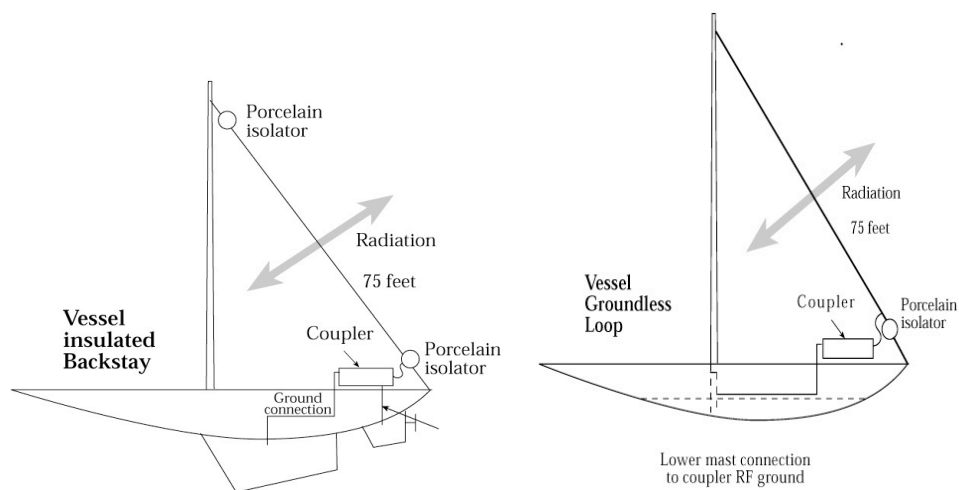
**Helicopters/Planes:** The Smartuner will also match well the more common wire antenna from fuselage to vertical stabilizer (and continuing to a wing tip, if desired) and a long wire antenna under the tail and rotor of the helicopters. When installed in an aircraft, the Smartuner will operate well with a shunt-fed antenna. This is generally a 13-foot piece of metal that mounts on the fuselage and is grounded to the aircraft at one end.

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## SG-237 Smartuner™ Manual



**Insulated Backstay:** The coupler must be placed as close as possible to the base of the backstay antenna. Connect the RF ground terminal to all the metal parts or structure of the boat.



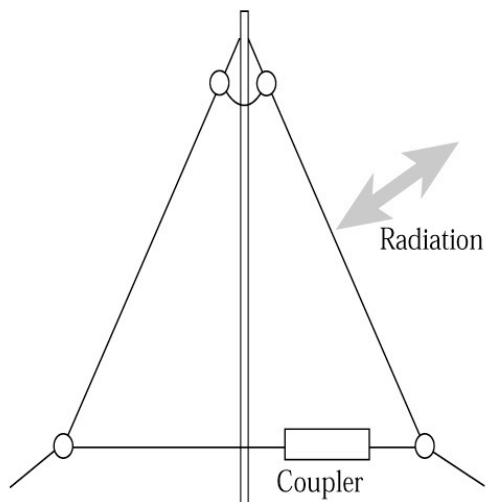
**Triangular Loop Antenna:** This antenna for sailboats is designed to operate in a groundless environment and still provide high performance. This type of installation will require only one insulation point on the bottom backstay and an electrical connection on top of the mast and the stay. The grounded side of the coupler should be connected to the bottom of the mast. (See above)

**Delta Loop Antennas:** These are ideally suited to long range communications due to their low angle. This configuration is best for communications ranging from 500 to 5000 miles in the HF frequency range of 4 to 22 MHz. Noise rejection is excellent. Because the antenna system is not connected to a ground, noise rejection is enhanced.



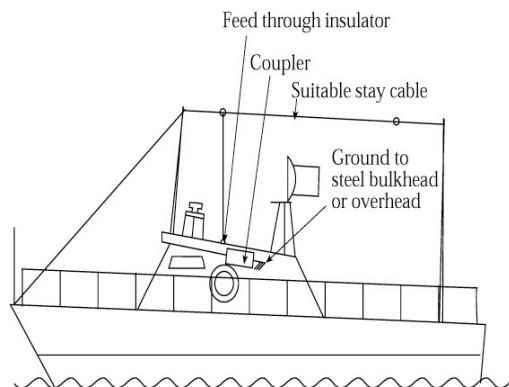
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## SG-237 Smartuner™ Manual



**Base Delta Loop**

**Long Wire Antenna:** These perform well on fishing vessels and are very efficient because antenna lengths of 50 feet or more can be installed without any difficulties. If vessel is not of a metal structure 3 radial wires as long as possible can be connected to the coupler and spread on the lower bottom part of the vessel.

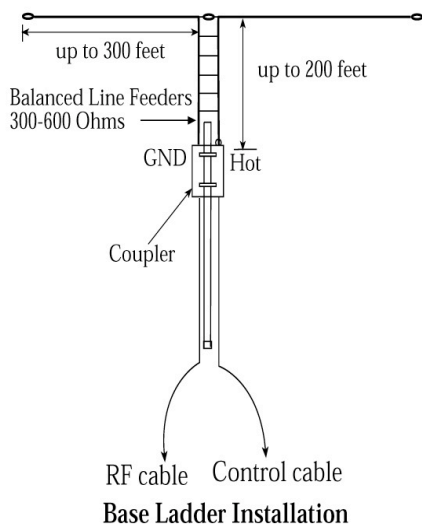


**Motor Vessel Installation**

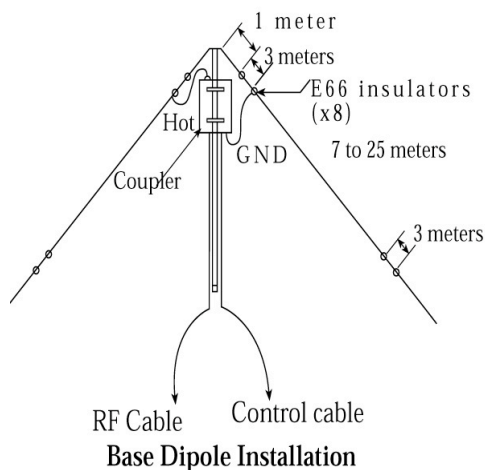
**Ladder feed Antenna:** These may be used if necessary, however, installation of the coupler directly at the antenna is preferred for higher efficiency.

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## SG-237 Smartuner™ Manual



“V” Antennas: Both “V” and inverted “V” antennas are convenient for limited space installation and increase of directivity.



### 5.0 Optional Smartlock

The Smartlock allows the operator to have additional controls over the SG-237. It is not required for normal operation.

#### 5.1 Tune, Tune Lock/Reset

The ‘Tuned’ (Green LED): This LED lights when the coupler has successfully tuned.

Normal/Tune Lock: The toggle switch allows the user to prevent coupler re-tuning by switching to the Tune Lock position. When in the Tune Lock position, the red LED blinks to notify the user that the coupler is locked on the current setting.

# SGC

## SG-237 Smartuner™ Manual

Reset:

Pushing the red reset button allows the coupler to be reset, if the toggle switch is in the normal position. This is preferred over turning the input power off and on.

### 5.2 Smartlock Notes

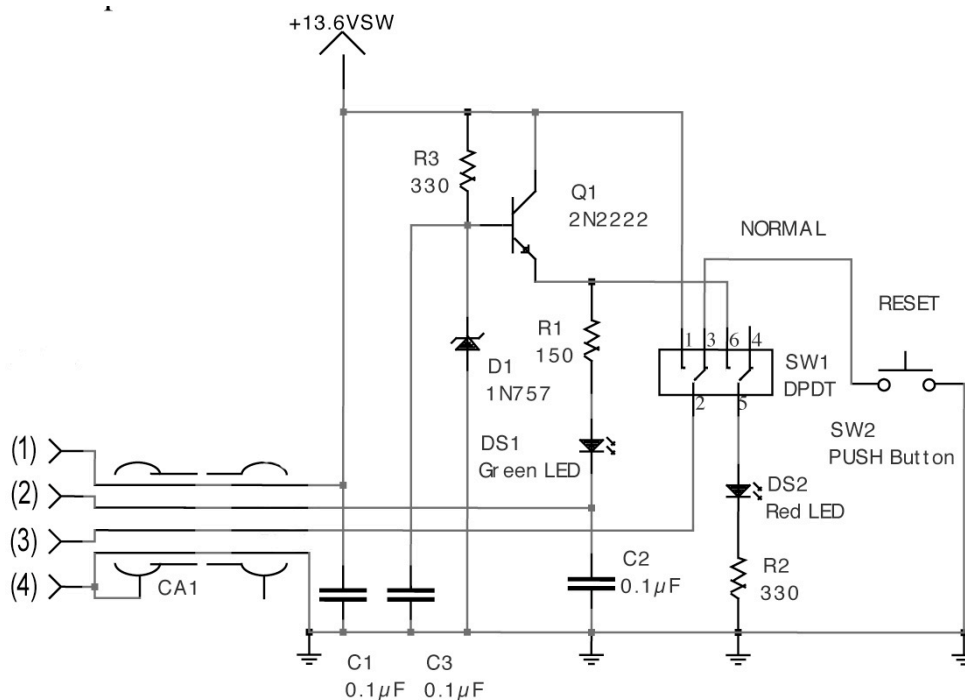
The Tune Lock function is in most cases unneeded. Inadvertent retuning is a rare occurrence. Re-tuning may occur when the environment or antenna system has changed (as in with mobile operation being used while in motion). In this case, re-tuning is within normal operation of the coupler.

### 5.3 Smartlock Connections

Refer to the diagram below for the pathways of the different Smartlock connections. To hook the unit up to your SG-230 or SG-237, connect as follows:

- (1) Red wire/13.6 VDC – Red wire in coupler cable
- (2) Green wire/Tuned Indicator – White/Black wire in coupler cable
- (3) White wire/Reset Line – White/Red wire in coupler cable
- (4) Black wire/DC Ground – Black wire in coupler cable

Please note: the wire colors may change. If your wire colors do not match what is listed here, refer to our website for more current information, or contact SGC for assistance.





## SG-237 Smartuner™ Manual

### 6.0 Troubleshooting

SGC has a knowledgeable staff that can assist you with several common issues you may encounter with your coupler, however, we suggest you follow these steps before contacting us.

1. Check all of your connections and cables. The most common fault with an SGC coupler is insufficient RF grounding. Many users underestimate the importance of this, and as a result, compromise their station's performance. Several guides to good grounding can be found under the 'Technical' section of our website.
2. Download our 'Coupler Troubleshooting Guide' from our website and follow the instructions. It is best to use an in-line meter to determine how your coupler is functioning.
3. Use the troubleshooting methods outlined below.
4. If you contact SGC for assistance, the best way to do so is through our Online Help Request, which you can fill out and submit on our website, or print and fax. In either case, it is best to have the information on this form readily available before calling an SGC representative, as it will insure timely handling of your problem.

### 6.1 Do-It-Yourself Light Bulb Dummy Load Procedure

Any time that a transmitter is used, it must be outputting into a load. A load is anything that the output power can be pumped into. If the transmitter is operated without any sort of load connected, the final amplifier stage should never test a transmitter on the air for the first time, if you are unsure about how to operate it, and if you are unsure whether it is working properly. You could create a harmful interference to other stations.

To test transmitters without actually without actually operating into an antenna, dummy loads were created. A dummy load is a load that will dissipate the energy from the transmitter instead of emanating it into the ionosphere. Nearly all commercial dummy loads are large oil-filled cans. These dummy loads change the transmitted energy into heat, which is absorbed by the oil. Because different transmitters output different amounts of power, different sizes of dummy loads must be used. Dummy loads for typical amateur power (<500 watts) are relatively inexpensive and readily available.

Unfortunately, when you use a can-type dummy load, you can't see "what's happening" with your transmitter. In this case, you can use a light-bulb dummy load to test your transmitter. Here, the light bulb is directly connected to the output of the transmitter and it dissipates the RF energy as light. The light bulb dummy load is more useful than the oil-can type because you can guess how much power is being output, you can see the voice modulation the SSB (the light will flicker with your voice peaks), and you can tune the transmitter for maximum output (if the transmitter is an older model that requires tuning).



## SG-237 Smartuner™ Manual

Before building or using the light-bulb dummy load, remember that these models typically don't dissipate the transmitter's output as well as an oilcan dummy load. The result is that weak RF will 'leak' out; we have heard a few stories of amateurs who were heard around town while operating their transmitters into a light-bulb dummy load. If you use this system, make sure that you test the equipment on a clear, harmless frequency. (NEVER test with the transmitter set on an emergency frequency.)

SGC recommends that you build the light-bulb dummy load with the following parts:

- AC socket to cable with a PL-259 connector (for transceiver)
- AC socket to cable with alligator clips (for coupler)
- Light bulb to AC adapter
- 75 to 125 Watt light bulb, 120 to 220 VAC
- 100 Watt transceiver
- SGC Coupler

### RADIO TEST PROCEDURE

1. Connect the transceiver light bulb to the radio RF in/out jack.
2. Turn the radio and set the CW mode.
3. Key the PTT switch on the microphone and look at the light bulb. If the light bulb load is connected and the radio is transmitting, the light should turn on.
4. Set the radio to SSB mode.
5. Key the PTT switch on the microphone and talk into the microphone. Notice that the light turns on when you talk.

### COUPLER TEST PROCEDURE

1. Connect the coupler to the radio.
2. Connect coupler light bulb load to Smartuner coupler antenna output.
3. Turn on radio and Smartuner.
4. Set the radio to the CW mode.
5. Key the PTT switch on the microphone and look at the light bulb. The light should turn on if the coupler has completed its' tuning cycle and if the radio is transmitting.
6. For further testing, follow steps 4 & 5 of the radio test procedure. Note: The light bulb might not turn on immediately if the coupler has not yet been tuned for the frequency of the transmitter. The output power (light-bulb brightness) is greatest when the coupler is properly tuned.

This test will ensure that the radio and coupler are working properly. If your unit fails this test, contact SGC for further assistance.



## SG-237 Smartuner™ Manual

### 6.2 B.I.T.E.\* LED Descriptions

\*Built-In Test Equipment: Utilizing these LEDs to troubleshoot your Smartuner requires opening the coupler case and observing the LEDs located on the PCB. Please note that doing so will break the factory seal and may compromise the weatherproofing of your unit. If your unit is still under warranty, it is recommended that you call SGC before opening the cover.

#### TND

This LED will light when the tuner has found an acceptable match. It will remain lit until conditions have changed which will cause the tuner to find a different match. (i.e. A new transmit frequency has been detected or tuner has been reset.)

#### L 'Z'

This LED shows the stats of the antenna impedance. When lit, the impedance is 50 ohms or less. When off, the impedance is greater than 50 ohms.

#### 2:1

This LED will light when the VSWR is greater than 2:1. It will extinguish when VSWR is less than 2:1.

#### PHZ

This LED indicates the presence of lack of RF power from the radio. When transmitting, the LED will light to indicate RF is being detected. In receive, the LED should be extinguished.

#### OTHER

All LEDs will blink on and off at a rate of 2Hz to indicate the tuner was not able to find a valid match.

Note that these status LEDs are usually used to aid a technician in diagnosing the status of the system and should not be thought of as laboratory instruments.

As the Smartuner tunes, the BITE status will be continually updated from the CPU. If your coupler's BITE LEDs are not responding as outlined above, contact SGC for further assistance.

Additional technical information on coupler design and theory, with schematics, is available for download from our website free of charge.

Visit [www.sgcworld.com](http://www.sgcworld.com) for more information on our full line of HF antenna couplers and accessories.