

# **SGC SMARTUNER™ TROUBLESHOOTING**

All SGC automatic antenna couplers operate in a similar manner, initiating tuning by sampling RF power. The Smartuner measures the RF frequency and loads the tuning sequence into memory. There are three operational sections, (1) Input RF sense, (2) Microprocessor and (3) Output tuning elements. Smartuner failures fall into three categories:

1. No response to RF
2. Continuous tuning
3. Intermittent or sporadic tuning

Any SG-230 Smartuner manufactured before the year 2000 (serial number 658XXXX) has 7 red internal status LEDs. Any SG-230 manufactured from year 2000 to date (5146XXXX), as well as the other SGC antenna couplers(except the SG-211) have 5 pale green LEDs. These are used to aid in troubleshooting failures.

Step one in coupler troubleshooting is to confirm the nature of the suspected failure. To do this, you need to isolate the coupler by disconnecting the antenna and RF ground/counterpoise. We recommend connecting a light bulb load for testing the coupler (see SGC manuals or website for constructing a light bulb load and conducting the light bulb test). For the SG-230, set the transmitter to 3.5Mhz, AM, CW or similar mode, 100 watts. NOTE: If your transmitter has SWR shutdown issues at 100 watts, reset the power to 10-15 watts. Repeat these steps at 7Mhz, 14Mhz, 21Mhz and 28Mhz.

For initial troubleshooting purposes, disregard the 'TND' 'PHASE' and 'LOW Z' LEDs. Take note of the 'FWD PWR' and reverse 'PWR (2:1)' LEDs. Both of these must light to initiate tuning. If one or both LEDs fail to light, turn off DC power and check the input RF sense circuit. This consists of transformers T1, T2, T3 and associated components. Check all diodes and replace any that have open or shorted resistance readings. Check the transformers for burned or broken wires. Re-apply DC and RF power and use a DC voltmeter to check for voltages on the sensing diodes. If no voltage increase is noted during TXMT, then check for shorted RF bypass capacitors. Continue troubleshooting and replacing defective components until both FWD and 2:1 VSWR LEDs light when RF power is applied.

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If both LEDs are lit and the coupler does not initiate tuning, then the failure is associated with the microprocessor. For older models SG-230 units:

1. Check the clock circuit and verify that a signal is present at output of IC14. If not, check diode array DN1 (TND908) and/or IC13 (LS7493).
2. You should also have a spare set of plug-in ICs for IC15, IC5, IC4, IC3, IC6, IC8, and IC7. These can be used to assist in isolating microprocessor related faults.
3. Generally, if FWD and VSWR LEDs do not light, RF sensing diodes and/or RF bypass capacitors are at fault. If FWD and VSWR LEDs do light and the coupler does not initiate a tune, then IC13, DNI or plug in ICs are at fault.

For newer SG-230's and other SGC antenna couplers:

1. If LEDs do not light, RF sense diodes and bypass capacitors are suspect. Also check Q1 (ZN2222) and CPU chip (68HC711).
2. If LEDs do light and coupler does not initiate tuning, check the CPU chip. On rare occasions, the mixer A1 may fail. Verify if you have clock signal on the output of U3 (74HC393) chip. Verify DC voltage at U11, Pin 1 during transmit. Check R1 and if no voltage is present, check all 4 sensing signal inputs to the CPU chip – FWD, REV, PHASE, IMPEDANCE. If you have an input signal, you should see the appropriate LED light. Also verify RF PWR signal is present.

For continuous tuning:

1. Carefully inspect all relay contacts for signs of pitting or arced contacts.
2. Check all tuning coils and capacitors for signs of overheating or arcing.
3. On older SG-230 units, remove IC9 and using a jumper, ground each output line to IC 10, 11, and 12 (Pins 7-12, Pin 2,3, 25-28 and pins 18-23). You should see an individual relay key each time you ground a pin. If any relays fail to key, we recommend you check each relay line for shorts or low resistance to ground. If any bad readings are found, replace the associated CN capacitor array and/or 2003 IC.
4. For newer SG-230's, and other SGC antenna couplers, do a similar ground jumper test on output pins 11-18 on U6, U7, U8 (UCN5841). Failure of the 5841 chip is rare, but can occur.

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Generally, continuous tuning issues are due to defective relays, defective coils or an occasional relay driver chip. Defective RF bypass capacitors can also contribute to irregular relay operation.

Intermittent or sporadic tuning issues can be difficult to isolate. You must pinpoint the nature of the malfunction when it does occur. It should fall under the “No response to RF” or “Continuous tuning”. Once the nature of the improper operation is determined, you should troubleshoot in the manner defined above.

Typically, if a coupler tunes a frequency, it should be capable of tuning all frequencies. This can be verified by doing the light bulb test. If the coupler passes the light bulb test and there are still have tuning issues in the installation, carefully check out each aspect: power supply, antenna, RF ground/counterpoise, wiring, etc. A poor or improper ground can result in sporadic coupler tuning. The same is true with an antenna that is not installed correctly. RF feedback issues can interfere with the power supply, transceiver and the coupler’s operation.

## **SG-211 Servicing**

The SG-211 does not have status LEDs to assist in troubleshooting. However, it does operate in a similar manner to other SGC antenna couplers, and it does have RF sensing and frequency measuring. The main difference is that the SG-211 uses latching relays. The manual gives a detailed circuit operation. As with other SGC couplers, if the SG-211 fails to initiate a tune, then the input RF sense circuit (XFMR/diodes) are suspect. If it continuously tunes, then the microprocessor or relays are suspect. RF sense failures should be repairable in the field. Microprocessor issues require that the unit to be returned to the factory.