

DF Antenna Simulator 400038-92 for 225-400 MHz DF receivers



Fig.1 DF UHF antenna simulator

The 400038-92 radio direction finding antenna simulator was designed primarily for testing DF receivers. It operates between 200 and 400 MHz.

The simulator has a 16-position switch allowing the user to select desired phase shift of the commutated signal in 22.5° increments between 0 and 337.5° or 337.5° to 0° depending on the position of the switch placed on the rear panel of the simulator .

The source of 225-400 MHz RF signal is a Signal Generator.

The newer version of the simulator the 400038-92SG model has a RF signal source built in.

Both simulators are fully compatible with all direction finding receivers made by Servo Corporation of America.

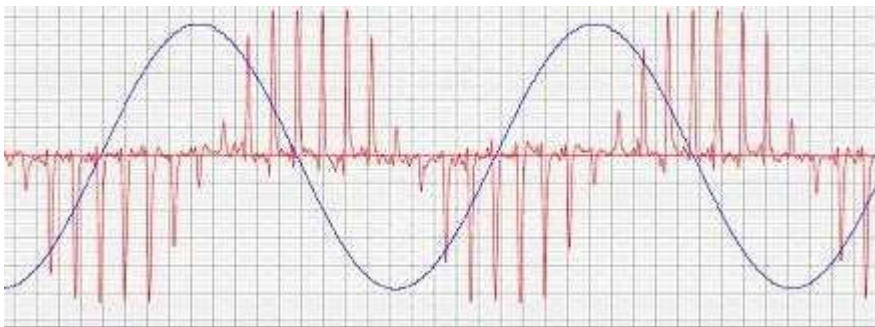


Fig.2 DF spikes generated by the DF antenna simulator for 90° bearing observed at the DF receiver demodulated output.

Antenna Simulator Insertion Loss.

For DF receiver sensitivity measurement and proper Squelch setting it is important to know the Insertion Loss of the Antenna Simulator.

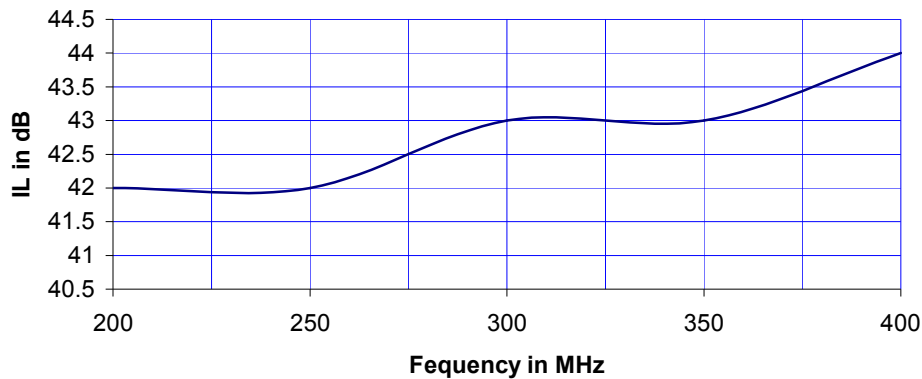
Measuring the Insertion Loss of the Simulator:

- Set the Signal Generator to 300 MHz, +10 dBm and connect it to the Spectrum Analyzer.
- Measure the power of the RF signal coming out of the Generator using the Spectrum Analyzer in dBm.
- Disconnect the Generator from the Analyzer and connect it to the Antenna Simulator.
- Connect the Spectrum Analyzer to the Antenna Simulator receiver input.
- Connect the antenna commutation cable from the DF receiver to the Antenna Simulator.
- Connect the Antenna Simulator to ~ 110 or 230V and press 1 on the ON/OFF switch located on the rear panel of the Antenna Simulator.
- Measure the power of the RF signal coming out of the Antenna Simulator in dBm.
- The Insertion Loss of the Antenna Simulator is the difference between the power of the RF signal going in to the Simulator and the power of the signal coming out of the Simulator.

Note: the Antenna Simulator should be connected to the Spectrum Analyzer only via RC network providing shunt 2k resistance to ground on a Simulator side and series capacitance 100 pF on the Spectrum Analyzer side.

The resistor is needed to complete the DC path for the Antenna Simulator that is normally used to measure the antenna current and the capacitor is needed to block the DC voltage (+/-18V) from the Spectrum Analyzer.

Antenna Simulator Insertion Loss



In order to test the Squelch setting at 300 MHz (typically set to -65 dBm for Servo DF receivers) the Signal Generator should be set to:

-65 dBm

and varied slightly around that value to see when it actually breaks Squelch.

Testing DF receivers with DF antenna simulator.

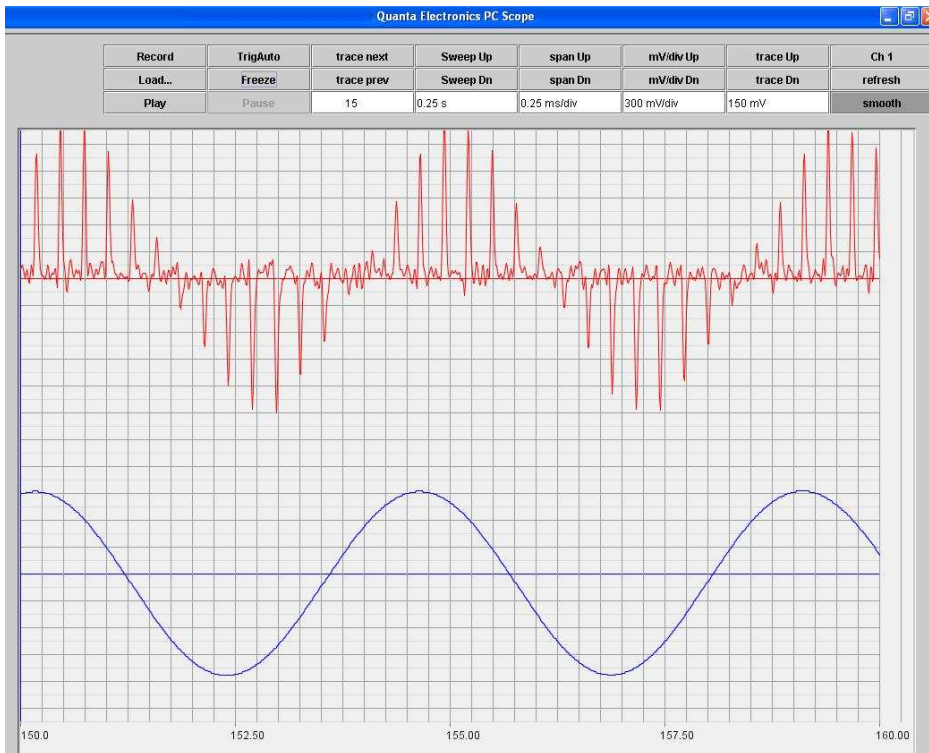
Test Setup.

- Connect the Antenna Commutation cable from the DF receiver to the Antenna Simulator.
- Connect the DF receiver antenna input to the Antenna Simulator using 50 Ω coax cable.
- Connect the RF Signal Generator to the Antenna Simulator and set it to -15 dBm.
- Connect the Antenna Simulator to ~ 110 or 230V and press 1 on the ON/OFF switch located on the rear panel of the Antenna Simulator.
- Set the desired direction of the antenna rotation using the toggle switch placed on the rear panel of the Antenna Simulator.

If desired rotation is 0 to 337.5° set the Antenna Rotation switch placed on the front panel to position 1 and reset the DF receiver to 0° or if desired rotation is 337.5° to 0° change the position of the toggle switch on the back of the Antenna Simulator then set the Antenna Rotation switch placed on the front panel to position 16 and reset the DF receiver to 0°.

The receiver calibration is described in DF2120 and DF2140 manuals.

It worth to note here that the calibration of the DF receiver to 0° in position 1 or 16 is not absolutely necessary. The only important thing during the test is that the change between the positions 1 thru 16 is always 22.5°.



Red trace: DF spikes
Blue trace: reference

Fig3. Demodulated DF signal generated by 400038-92 Antenna Simulator at 300 MHz

Test Results

Rotary Switch Position	Antenna Simulator P/N 400038-92 bearing	Theoretical bearing
1	0	0
2	22.2	22.5
3	44.9	45.0
4	67.3	67.5
5	90.0	90.0
6	112.5	112.5
7	134.7	135.0
8	157.4	157.5
9	180.0	180.0
10	202.3	202.5
11	225.0	225.0
12	247.5	247.5
13	269.8	270.0
14	292.5	292.5
15	315.1	315.0
16	337.5	337.5