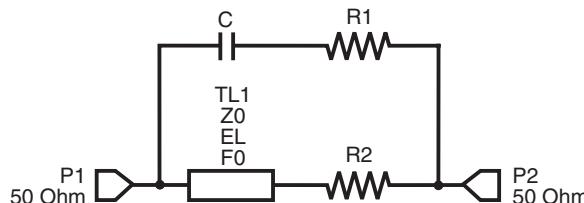


Transmission Line Models

1111SQ
Air Core Inductors

These transmission line models accurately simulate the frequency-dependent behavior of Coilcraft surface mount "Spring" air core inductors within the frequency limits shown in the accompanying table for each individual inductor. They are based on de-embedded measurements using a 2-port network analyzer.

The model schematic, shown below, combines an ideal transmission line model with lumped elements. Each model should be analyzed only as a whole at the input and output ports. Conclusions based on individual lumped element values may be erroneous. The individual element values R1, R2, C, Z0, EL, and F0 are listed in the table for each individual spring inductor.



Effects due to different circuit board traces, board materials, ground planes or interactions with other components are not included. They *will* have a significant effect when comparing the simulation to measurements of the individual inductors using other production verification instruments and fixtures.

Typically, the Self-Resonant Frequency (SRF) of the inductor model will be higher than a measurement of the component mounted on a circuit board. The parasitic reactive elements of a circuit board or fixture will effectively lower the circuit resonant frequency, especially for very small inductance values. Data sheet specifications are based on typical production measurements. These models are based on de-embedded 2-port measurements as described below, so the model results may be different from the data sheet specifications.

Lumped Element Modeling Method

The measurements were made over a brass ground plane with each component centered over a 0.060 in/1.524 mm air gap, as illustrated in Figure 1. The test pads were 30 mil (50 Ohm) wide traces of tinned gold over 25 mil thick alumina, and were not included in the gap. The TRL* calibration planes are also illustrated in Figure 1.

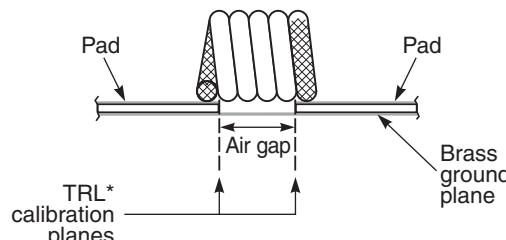


Figure 1. Test Setup

The lumped element values were determined by matching the simulation model to an average of the measurements. This method results in a model that represents as closely as possible the typical frequency-dependent behavior of the component within the specified frequency limits of the model. The lumped element models were used to generate our 2-port S-parameters and therefore give identical results with the same number of simulation frequency points. The S-parameters are available on our web site at <http://www.coilcraft.com/models.cfm>.

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Transmission Line Model for Coilcraft 1111SQ

Part number	Frequency limit of Model (MHz)		R1 (Ω)	R2 (Ω)	C (pF)	TL1		
	Lower	Upper				Z0 (Ω)	EL (degrees)	F0 (MHz)
1111SQ-27N	10	4000	12.0	0.313	0.0816	1678	1.81	312
1111SQ-30N	10	4000	10.2	0.345	0.0760	1830	1.81	312
1111SQ-33N	10	3200	33.0	0.380	0.0596	2020	1.81	312
1111SQ-36N	10	3300	106.8	0.345	0.0596	2200	1.81	312
1111SQ-39N	10	3300	656.6	0.295	0.0666	2380	1.81	312
1111SQ-43N	10	3000	311.6	0.390	0.0552	2630	1.81	312
1111SQ-47N	10	2800	460.6	0.345	0.0665	2860	1.81	312