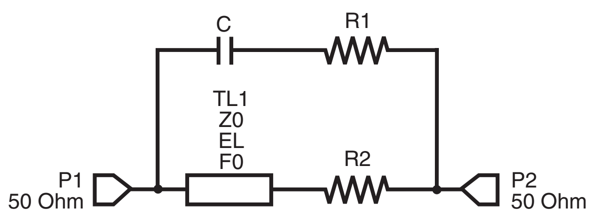
Transmission Line Model 439RAT, 470 RAT

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 an air gap, as illustrated in Figure 1. The gap width for each size component is given in Table 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 plane is also illustrated in Figure 1.

Table 1. Test Gap

Size	Gap Width (inch / mm)
439	0.060 / 1,524
470	0.120 / 3,048

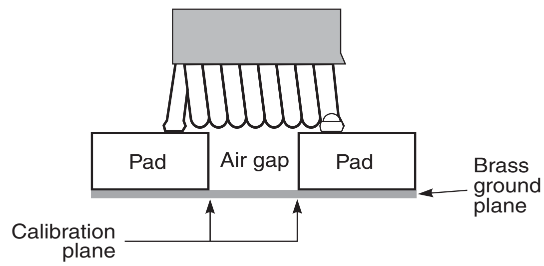


Figure 1. Test Setup

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-cps.com/models.aspx**.

Disclaimer

Coilcraft makes every attempt to provide accurate measurement data and software, representative of our components, in a usable format. Coilcraft, however, disclaims all warrants relating to the use of its data and software, whether expressed or implied, including without limitation any implied warranties of merchantability or fitness for a particular purpose. Coilcraft cannot and will not be liable for any special, incidental, consequential, indirect or similar damages occurring with the use of the data and/or software.

Specifications subject to change without notice. Document 343C-1 Revised 05/21/03

1102 Silver Lake Road
Cary IL 60013
Phone 800-981-0363
Fax 847-639-1508
E-mail cp@coilcraft.com
Web www.coilcraft-cps.com

Transmission Line Model for Coilcraft CPS 439RAT, 470RAT

Part number	Frequency limit of Model (MHz)		R1 (Ω)	R2 (Ω)	C (pF)	TL1		
	Lower	Upper				Z0 (Ω)	EL (degrees)	F0 (MHz)
439RAT2N5	50	14000	11.13	0.0150	0.0904	94.13	33.44	3505
439RAT5N0	50	9000	11.55	0.0320	0.1114	116.7	34.19	2218
439RAT8N0	50	5500	6.809	0.0513	0.1508	144.2	39.01	1957
439RAT13N	50	4500	7.084	0.0807	0.2621	182.9	38.39	1572
439RAT19N	50	3500	5.363	0.1202	0.2456	213.8	39.56	1279
470RAT18N	50	4000	14.85	0.1508	0.1234	182.5	40.64	1184
470RAT22N	50	3500	16.69	0.1778	0.1329	203.6	44.14	1143
470RAT28N	50	2500	26.68	0.2304	0.1247	225.3	48.11	1082
470RAT36N	50	2500	22.30	0.2802	0.1390	254.5	50.75	1021
470RAT43N	50	2300	17.51	0.3509	0.1866	269.3	49.99	882

Specifications subject to change without notice. Document 343C-2 Revised 05/21/03

1102 Silver Lake Road
Cary IL 60013
Phone 800-981-0363
Fax 847-639-1508
E-mail cp@coilcraft.com
Web www.coilcraft-cps.com