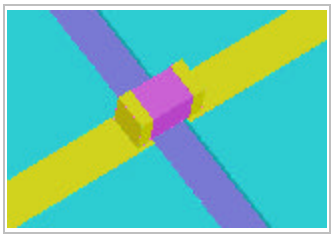
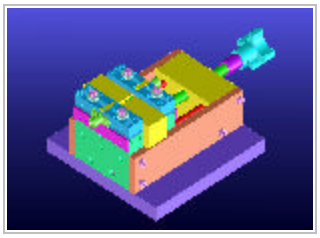
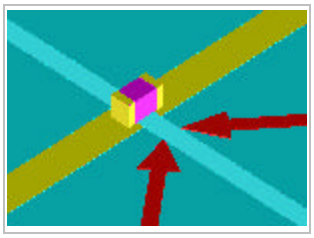
Product Note: B6140121

Introduction to Surface Mount Device Measurement

Introduction

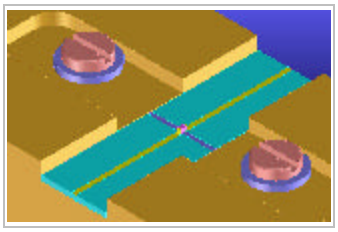
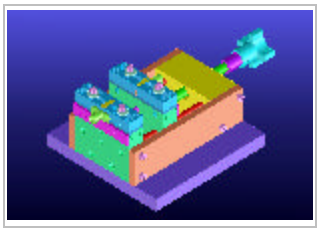
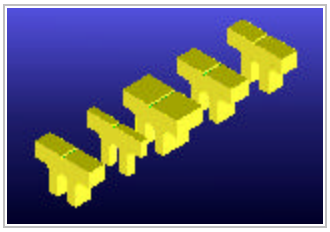
To measure SMD (Surface Mount Devices) components accurately, it is necessary to remove any outside influences which might change or mask the true characteristics of the device. For characterization, the DUTs are placed on a microstrip circuit and TRL de-embedding is used to shift the reference planes to precise locations. This eliminates the influences of the cables and test fixture environment. The SMD can be a capacitor, inductor, resistor, filter, etc.

ICM test fixtures are designed to allow the DUTs to be tested over a wide frequency range and appropriate TRL standards are included in the Measurement Solution Kits. Many DUT sizes can be tested in any desired configuration. For custom requirements, please contact the factory.

			
The SMD device is placed onto a microstrip	Calibration Standards are inserted into the Mainframe for calibration	Reference planes after calibration (red arrows)	The Midsection is inserted into the Mainframe for device measurements

Components of the Measurement Solution Kit

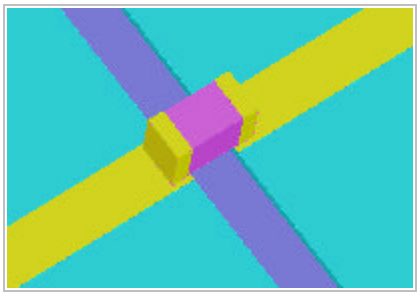
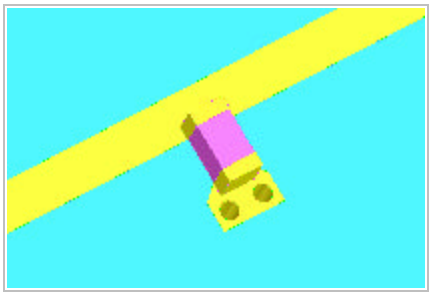
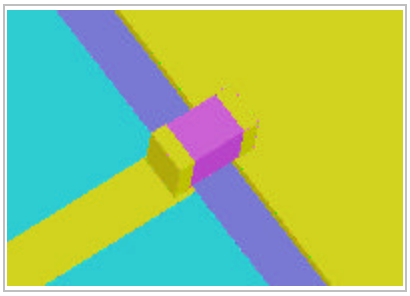
The Measurement Solution Kit provides all the items needed to measure SMD devices. Each kit contains a number of Midsections for specific DUT sizes. Additional sizes can be tested by selecting the appropriate Midsections. A TRL Calibration Kit is included to de-embed the Test Fixture. The Mainframe makes it very convenient to measure many different devices quickly.

			
Capacitor is placed onto microstrip line	Midsection Adapter with pusher	Universal Mainframe	TRL Calibration Kit

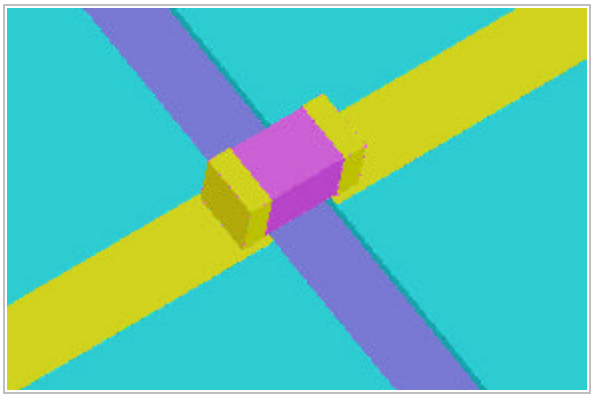
Measurement Configurations Available

Measurement Configurations Available

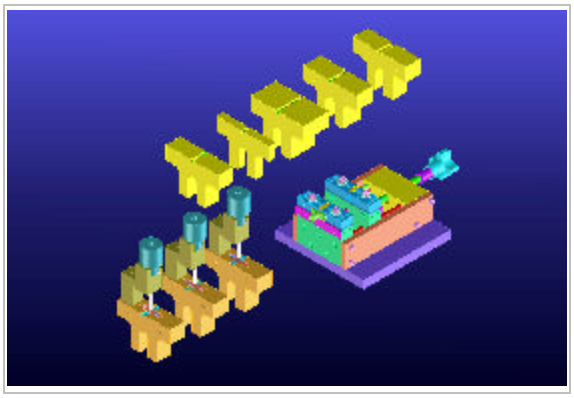
The SMD components can be measured in three different configurations. In the Series-Thru configuration, the device is inserted between two 50 ohm lines in series. In the Shunt-Thru configuration, the device is placed between a 50 ohm line and ground. In the Shunt-to-Ground configuration, the DUT is positioned at the end of a 50 ohm line and ground.

		
Series-Thru Configuration The DUT is in Series with a 50 ohm line	**Shunt-Thru Configuration** The DUT is placed between a 50 ohm line and Ground	**Shunt-to-Ground Configuration** The DUT is placed at the end of a 50 ohm line to Ground

Complete Measurement Solution



Capacitor in Series-Thru configuration



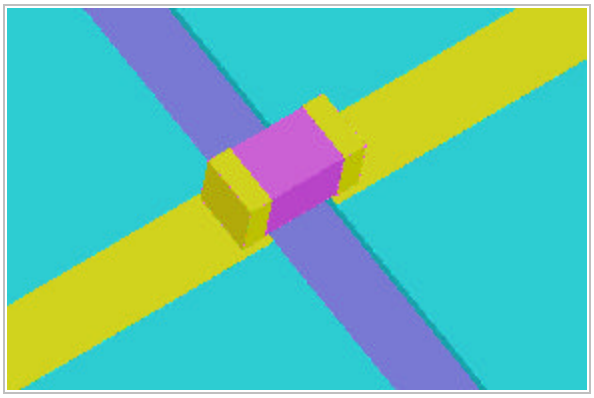
Complete Measurement Solution Kit

SERIES-THRU Configuration Measurement Solution Kits

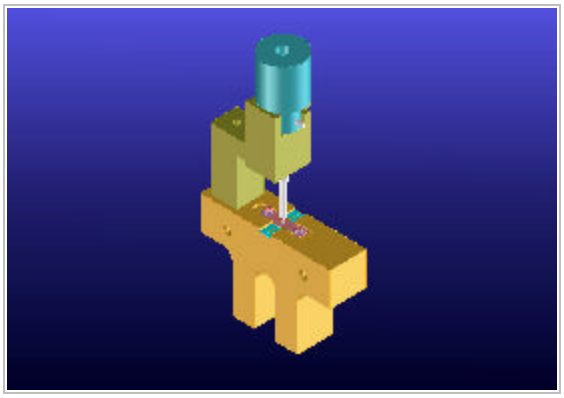
ICM P/N	Substrate	Frequency	Mainframe	TRL Cal Kit	DUT sizes*
A3139797	15 mil Alumina	DC - 10 GHz	10 GHz Mainframe included	15 mil Calibration Kit included	Midsections included for 01005, 0201, 0402
A3139982	15 mil Alumina	DC - 26.5 GHz	26.5 GHz Mainframe included	15 mil Calibration Kit included	Midsections included for 01005, 0201, 0402
A3139983	25 mil Alumina	DC - 10 GHz	10 GHz Mainframe included	25 mil Calibration Kit included	Midsections included for 0201, 0402, 0603
A3139984	25 mil Alumina	DC - 26.5 GHz	26.5 GHz Mainframe included	25 mil Calibration Kit included	Midsections included for 0201, 0402, 0603

* Additional DUT sizes can be added by selecting the appropriate midsection

Series-THRU Midsections



Capacitor in Series-Thru configuration



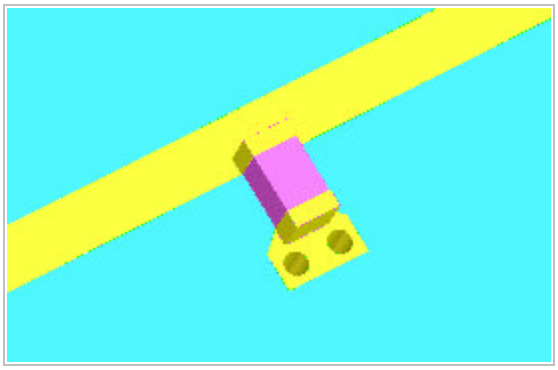
Midsection Assembly for SERIES-THRU Measurements

SERIES-THRU for Measurement of Capacitors in series with a 50 Ohm THRU line

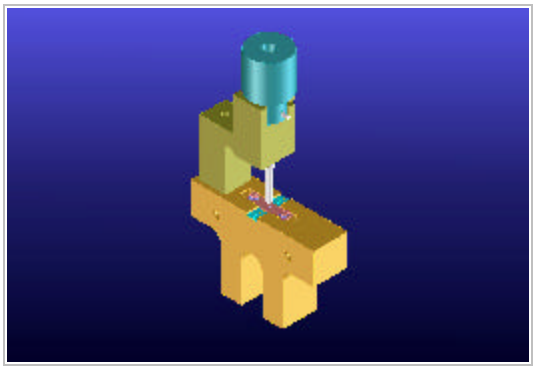
Midsection Assy. P/N	Configuration	Gap Width G (mils)	Chip Capacitor Style	Trace Width	Calibration Kit
A0139798	Series Thru	8	01005	15 mil	A0139796 or A0139988
A0139799	Series Thru	12	0201	15 mil	A0139796 or A0139988
A0139900	Series Thru	25	0402	15 mil	A0139796 or A0139988
A0139961	Series Thru	12	0201	25 mil	A01397989 or A0139990
A0139962	Series Thru	25	0402	25 mil	A01397989 or A0139990
A0139963	Series Thru	25	0603	25 mil	A01397989 or A0139990
A0139964	Series Thru	30	0805	25 mil	A01397989 or A0139990
A0139965	Series Thru	75	1206	25 mil	A01397989 or A0139990

Reference: Hewlett-Packard Product Note 8510-17, *Measuring Chip Capacitors with the HP 8510C Network Analyzers and Inter-Continental Microwave Test Fixtures* and Agilent Product Note 5989-0547EN.pdf, (available in our Application Notes section)

Shunt-THRU Midsections



Capacitor or Inductor in SHUNT-THRU Configuration



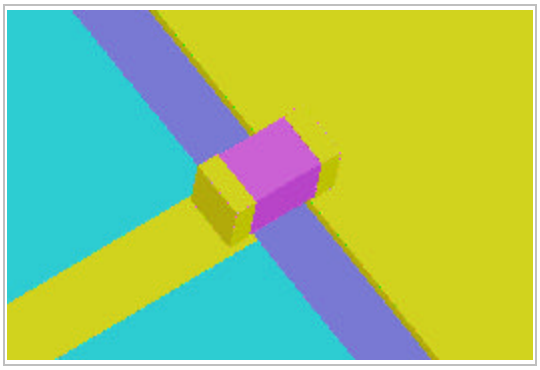
Midsection Assembly for SHUNT-THRU Measurements

SHUNT-THRU for Measurement of Capacitors in series with a 50 Ohm THRU line

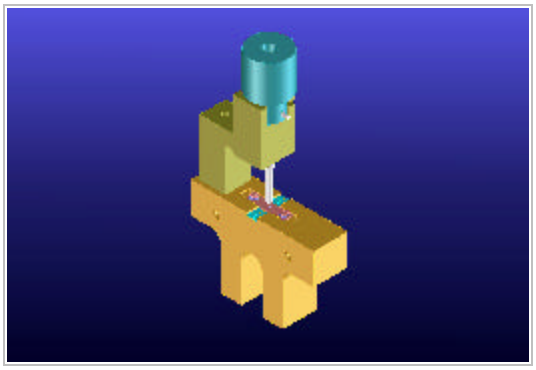
Midsection Assy. P/N	Configuration	Gap Width G (mils)	Chip Capacitor Style	Trace Width	Calibration Kit
A0139966	Shunt Thru	8	01005	15 mil	A0139796 or A0139988
A0139967	Shunt Thru	12	0201	15 mil	A0139796 or A0139988
A0139968	Shunt Thru	25	0402	15 mil	A0139796 or A0139988
A0139969	Shunt Thru	12	0201	25 mil	A01397989 or A0139990
A0139970	Shunt Thru	25	0402	25 mil	A01397989 or A0139990
A0139971	Shunt Thru	25	0603	25 mil	A01397989 or A0139990
A0139972	Shunt Thru	30	0805	25 mil	A01397989 or A0139990
A0139973	Shunt Thru	75	1206	25 mil	A01397989 or A0139990

Reference: Hewlett-Packard Product Note 8510-17, *Measuring Chip Capacitors with the HP 8510C Network Analyzers and Inter-Continental Microwave Test Fixtures* and Agilent Product Note 5989-0547EN.pdf, (available in our Application Notes section)

Shunt-to-Ground Midsections



Capacitor or Inductor in SHUNT-to-GROUND Configuration



Midsection Assembly for SHUNT-to-GROUND Measurements

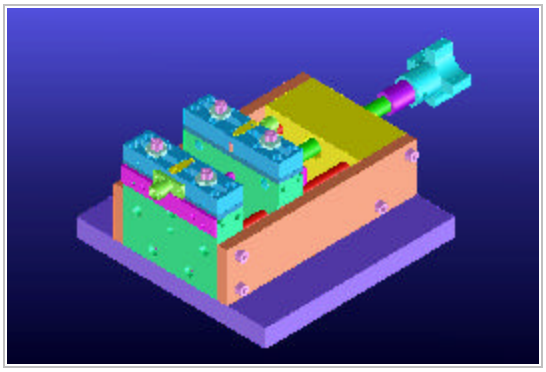
SHUNT-to-GROUND for Measurement of Capacitors from a 50 Ohm line to ground

Midsection Assy. P/N	Configuration	Gap Width G (mils)	Chip Capacitor Style	Trace Width	Calibration Kit
A0139974	Shunt-to-Ground	8	01005	15 mil	A0139796 or A0139988
A0139975	Shunt-to-Ground	12	0201	15 mil	A0139796 or A0139988
A0139976	Shunt-to-Ground	25	0402	15 mil	A0139796 or A0139988
A0139977	Shunt-to-Ground	12	0201	25 mil	A01397989 or A0139990
A0139978	Shunt-to-Ground	25	0402	25 mil	A01397989 or A0139990
A0139979	Shunt-to-Ground	25	0603	25 mil	A01397989 or A0139990
A0139980	Shunt-to-Ground	30	0805	25 mil	A01397989 or A0139990
A0139981	Shunt-to-Ground	75	1206	25 mil	A01397989 or A0139990

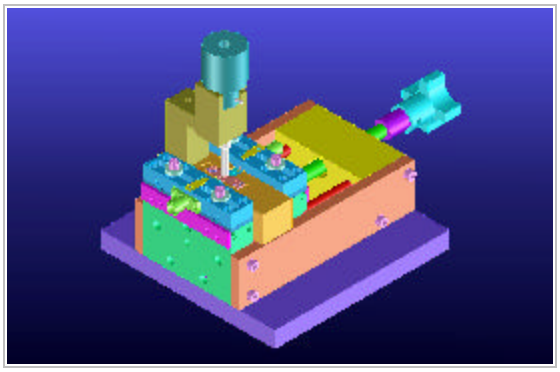
Reference: Hewlett-Packard Product Note 8510-17, *Measuring Chip Capacitors with the HP 8510C Network Analyzers and Inter-Continental Microwave Test Fixtures* and Agilent Product Note 5989-0547EN.pdf, (available in our Application Notes section)

Accessories for the Universal Mainframe

Universal Mainframes Available



Universal Test Fixture Mainframe



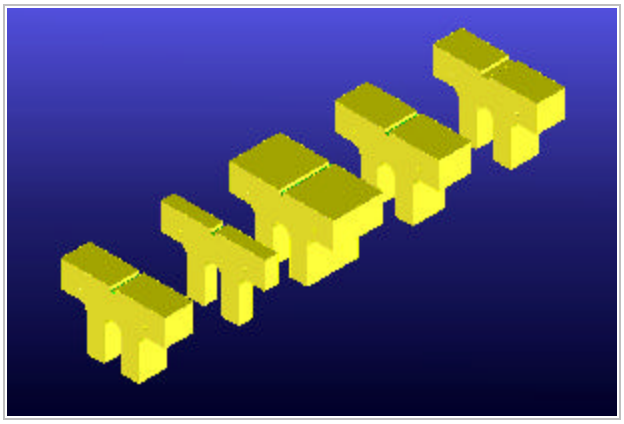
Universal Mainframe shown with Midsection inserted

ICM P/N	Substrate	Frequency	Number of RFs	TRL Cal Kit	DUT sizes*
A0138569	for 15 mil or 25 mil	DC - 10 GHz	2	any Cal Kit listed	any midsection listed
A0139985	for 15 mil or 25 mil	DC - 26.5 GHz	2	any Cal Kit listed	any midsection listed

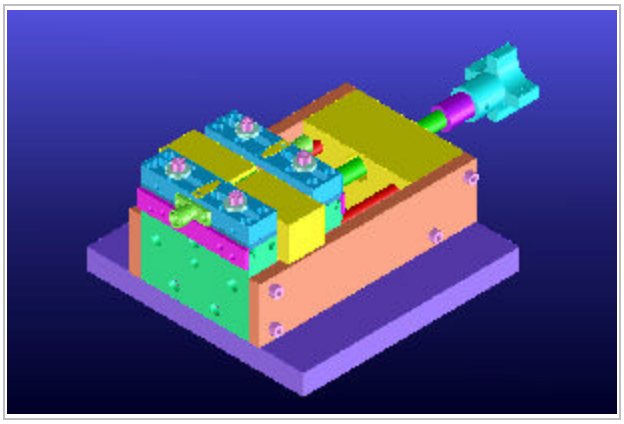
* The above Mainframes are compatible with any Midsection and any TRL Calibration Kit listed below.

Accessories for TRL Calibration Kits

TRL Calibration Kits Available



TRL Calibration Standards



Universal Mainframe shown with THRU Standard inserted

ICM P/N*	Substrate	Frequency	Calibration Type	Number of standards included	Compatible Midsections
A0139796	15 mil	DC - 10 GHz	TRL	5	any midsection with 15 mil substrate
A0139988	15 mil	DC - 26.5 GHz	TRL	5	any midsection with 15 mil substrate
A0139989	25 mil	DC - 10 GHz	TRL	5	any midsection with 25 mil substrate
A0139990	25 mil	DC - 26.5 GHz	TRL	5	any midsection with 25 mil substrate

* All Calibration Standards are compatible with any Universal Mainframe above

Application Notes

Available Application Notes

Application Note	ICM Part Number	Agilent Part Number
Impedance Characteristic Evaluation of SMD by Using the ENA with Inter-Continental Microwave (ICM) Test Fixture		Application Note: 1463-5 or 5989-0547EN
Notes on Capacitor and Inductor Testing in Series-Thru, Shunt-Thru and Shunt-to-ground Configurations	B6137223	
User Manual for Test Fixture A0134552A	B6140033	