# Equipment Required

* Impedance Analyzer: Keysight E4990A, CA2739
* Test Fixture: Custom Fixture, PCB Item Number 63324-01
* Effective Coupling Measurement Software: E4990A keff Measurement.exe
* Effective Coupling Measurement Worksheet: CR042
* Workstation with software installed, access to TCS and R:\ drive

# Procedure

## Startup

* **Turn on the Impedance Analyzer.** Let it warm up for a period of at least 30 minutes before beginning measurements.
* **Connect the Test Fixture to the Impedance Analyzer.** Connect the four leads coming off the test fixture to the front of the Impedance Analyzer. The leads are labeled Lp, Lc, Hp, Hc and correspond to the inputs.
* **Start up the computer and log in.**
* **Open a new copy of the worksheet from TCS.** Fill out the header information on the worksheet.
* **Load the Effective Coupling Measurement Software.** Select the communications address for the impedance analyzer from the dropdown menu. The current VISA Resource Name is “GPIB1::19::INSTR”. Enter the sweep start and stop frequencies into the software. The required sweep range will be provided on the router. Typical ranges are 100kHz-300kHz for test samples and 50kHz-100kHz for 58639-01.

## Measurement

* **Load a specimen into the test fixture.** The specimen must be centered, balanced and not touching anything but the two pogo-pin contacts.
* **Click the software button to run the test.** The test will automatically execute a Capacitance/Dissipation test at 1kHz, followed by an Impedance sweep over the frequency range entered. When it is complete, the data will be updated at the bottom of the software window.
* **Click the software button to export the data to the excel worksheet.** The export function will send data to the highlighted cell in Excel. Make sure the cursor is in the right place: “Sample 1, Start F”. This should only need to be checked once, as the cursor will move down one cell each time it is used.
* **Repeat the test process for the remaining specimens in the sample.**

## Shutdown

* **Save the data in the excel worksheet.** Save the data in the location “R:\Crystals\Test Data\[part number]”. Name the file using the job number then the form number. This may be done by typing manually or scanning the barcode on the router. An example of this is “R:\Crystals\Test Data\58639-01\NCR0000046-0000 CR042.xlsx”
* **Determine whether the sample passes or fails.** Evaluate the data according to the requirements of the part. Acceptable ranges for parameters will be given on the router. The Upper Specification Limit (USL) and Lower Specification Limit (LSL) may be entered directly into the worksheet and capability information will be calculated automatically. If it is determined the sample fails, notify the Supervisor, Engineer, or Lead Technician.
* Print the worksheet. (Optional)
* **Close the worksheet file.**
* Close the measurement software. (Optional)
* Log out of the computer. (Optional)
* Turn off the Impedance Analyzer (Optional)
* **Check to make sure a specimen was not left in the fixture.**

## Alternate Equipment

In the event the E4990A is unavailable, this measurement may be conducted using an alternative set of hardware and software:

* Impedance Analyzer: HP 4194A (CD039)
* Test Fixture: HP 16034E
* Effective Coupling Measurement Software: keff Measurement.exe

The startup process is different in the following ways:

* The VISA Resource Name is “GPIB0::17:INSTR”.
* The fixture connects directly to the front of the instrument.
* The specimen is oriented vertically in the fixture.
* The fixture tension requires adjustment to suspend the specimen.