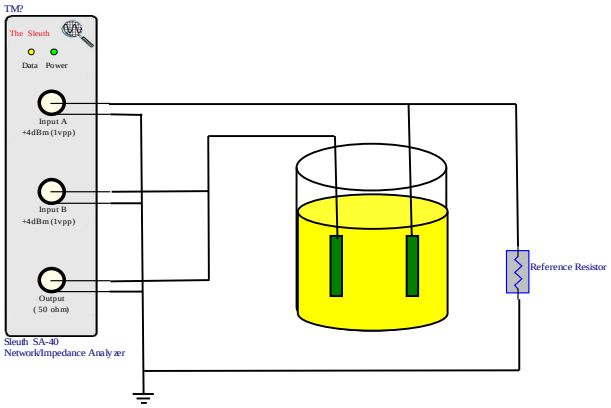
Core
Technology Group

Electro-Chemical Analysis Brief.

Core Technology Group offers the **SA-Series, Frequency Response/Impedance Analyzers**. The SA Series is a precision instrument that allows low cost analysis capability at a very low price.

The following is an example setup for measuring the impedance between 2 electrodes submerged in a solution:



In this and many cases, the data would be reported as impedance magnitude and phase in a variety of display options. Additionally, many applications involve developing electrical analogies based on the interpretation of the data from the electro-chemical system measured. A typical experiment proceeds as follows:

1. Measure system impedance response
2. Match existing electrical circuit model or develop a new one
3. Determine electrical component values of each element of the equivalent circuit model

The Core Technology Group SA-40 Frequency Response/Impedance Analyzer includes the following features relative to electro-chemical measurements:

- frequency range of 0.1 Hz to 40 MHz
- can be used for 2-electrode measurements
- can provide bode diagrams, standard and impedance magnitude /Phase vs. frequency
- data is available in text format for importing to external data analysis programs
- DLLs for custom apps like LabView

For reference, complete specifications are included at the end of this document.

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Appendix 1. SA-40 Frequency Response/Impedance Analyzer Specifications

System

Weight..... 2lbs.
Dimensions..... 5.5”H x 1.5”W x 9.5”L
Computer Interface ..... USB Serial Cable

Power Source

External ..... + 12VDC
Power Consumption.....12 Watts

Source Characteristics

Frequency Characteristics

Range..... 0.1 Hz to 40 MHz
Resolution..... 0.02 Hz

Frequency Reference
Accuracy..... 100 ppm
Aging..... < ± 5 ppm/year

Output Characteristics

Power Range (into 50 Ohm termination)..... –36 dbm to +4 dbm
..... (10mV$_{pp}$ to 1V$_{pp}$)
Flatness
0.1Hz to 10MHz ..... ± 0.5 db
10MHz to 40MHz ..... ± 1.5 db
Resolution..... 0.2 db step
Output Impedance ..... 50 Ohms
Current Limit (output shorted)..... 40 mA
Residual DC offset ..... < 10mV dc
Harmonics.....< -32 dbc
Connector ..... BNC

Receiver

Dynamic Range ..... 96 db
Input Signal Level Maximum
x1 probe ..... +4dbm ($1V_{pp}$)
x10 probe .....+24dbm($10 V_{pp}$)

Input coupling

AC input coupling

Input Impedance

x1 probe ..... 1 Megohm
x10 probe ..... 10 Megohm
Capacitance at BNC input ..... 22 pf

Magnitude Characteristics

Ratio Accuracy (typically for B/A) [3]
Input signal level = -10 dbm at channels A and B, Averages = 20
..... ± 0.05db

Dynamic Ratio Accuracy (typically for B/A) [3]

Input Signal Level at channels A and B	Dynamic Ratio Accuracy 10Hz ≤ frequency ≤ 10Mhz
0 dbm ≥ Signal Level ≥ -10 dbm [1]	± 0.3 db
-10 dbm ≥ Signal Level ≥ -60 dbm [1]	± 0.05 db
-60 dbm ≥ Signal Level ≥ -80 dbm [1,2]	± 0.2 db
-80 dbm ≥ Signal Level ≥ -100 dbm [1,2]	± 1 db

Phase Characteristics

Ratio Accuracy (typically for B/A) [3]
Input signal level = -10 dbm at channels A and B, Averages = 20
..... ± 0.6 °

Dynamic Ratio Accuracy (typically for B/A) [3]

Input Signal Level at channels A and B	Dynamic Ratio Accuracy 10Hz ≤ frequency ≤ 10Mhz
0 dbm ≥ Signal Level ≥ -10 dbm [1]	± 1 °
-10 dbm ≥ Signal Level ≥ -60 dbm [1]	± 0.6 °
-60 dbm ≥ Signal Level ≥ -80 dbm [1,2]	± 2 °
-80 dbm ≥ Signal Level ≥ -100 dbm [1,2]	± 10 °

1. Magnitude and phase measurements based on 20 averages.
2. Internal instrument gain = x10.
3. Ratio measurements cancel deviations in source.

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