



Application Note

Deriving I & Q Outputs with the SF800/1000

Applicable Products

SF1000
SF100E
SF800
SF800E

Description

The I & Q signal components are the in-phase and quadrature outputs of a frequency. The quadrature output is 90 degrees delayed from the in-phase frequency output. These signal may be used for testing I & Q based systems or as the LO source for RF equipment.

While the Signal Forge 800/1000 does not produce the I & Q outputs directly, an external splitter may be used to derive the in-phase and quadrature components from the signal generator's AC-coupled output. This application note describes how to design an external I & Q splitter.

Operation

The implementation shown below creates the required split of the carrier into an I & Q set of outputs.

Above 50 MHz

RC or RC/RL networks are used to create phase shifted outputs for frequencies above 50 MHz. For tight control over a narrow frequency band, use RC/RL which can be tuned as a resonant circuit.

Below 25 MHz

Below 25 MHz, the signal may be divided using digital flip flops as dividers.

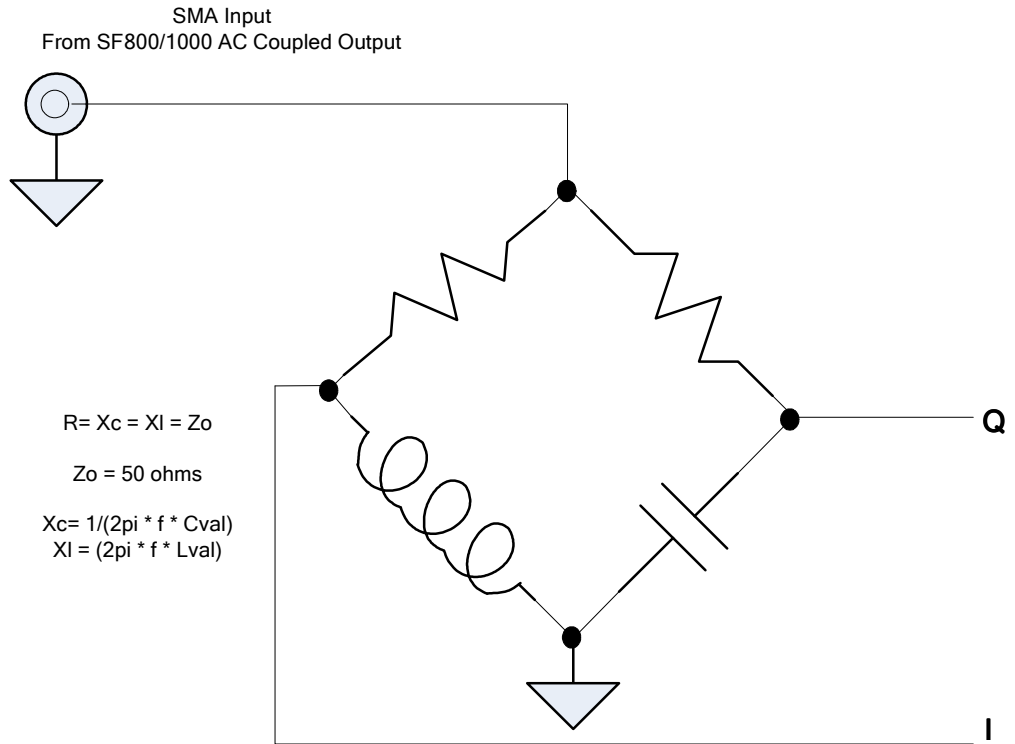
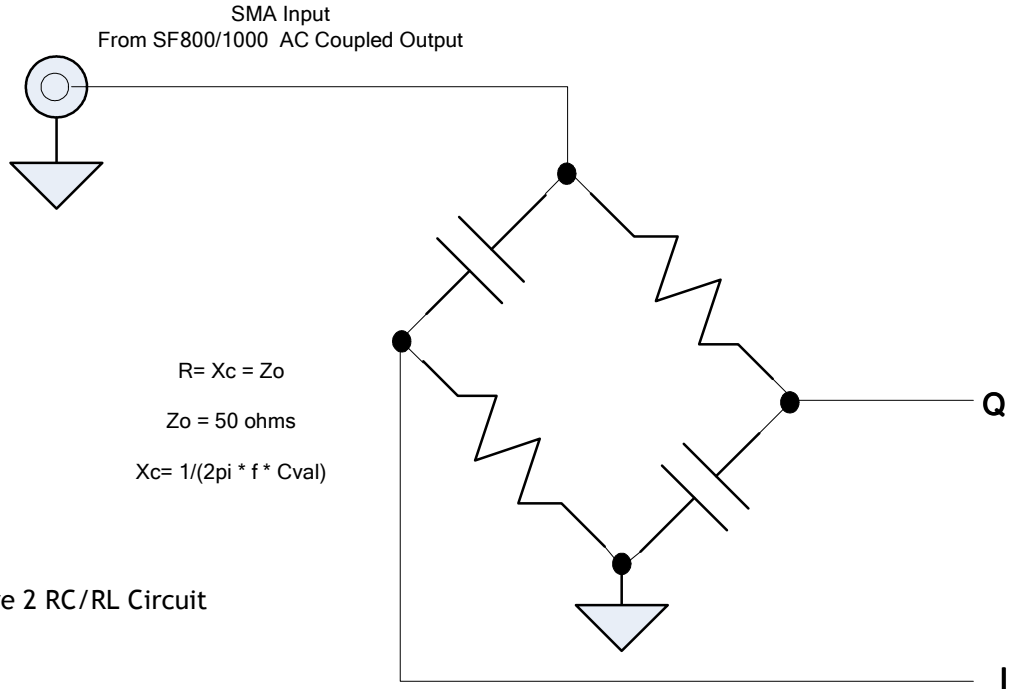
Since cabling and connectors are used to interconnect this I & Q phase shift network it will be necessary to empirically 'tweak' the component(s) that make the resonant delay circuit (L or C) in order to achieve the proper phase delay.

Design 'tweaking' for proper operation:

- Signal must be balanced for proper phase shift
- An oscilloscope can be used for the phase shift adjustment
- If needed, the 50 Ohm outputs of the I & Q splitter can be re-amplified

The block diagram below shows the two possible implementations along with the equations to derive the starting values:

Figure 1 RC Circuit



Implementation Notes

Additional notes to consider when implementing this type of phase shift network:

- Due to containing resonant circuits it is narrow band by nature - OK for most uses
- Lowest cost I& Q implementation
- Can be used as an LO source for I& Q type modulator/demodulators
- While the SF800/1000 provides a digital output up to 100 MHz it is not recommended that you create the I & Q components from the digital output since the RC or RC/RL components would require very large inductors.