

## X, Y, R and $\theta$

This measurement is designed to use the internal oscillator and an external signal source to explore some of the display types. You will need a synthesized function generator capable of providing a 100 mVrms sine wave at 1.000 kHz (the DS335 from SRS will suffice), BNC cables and a terminator appropriate for the generator function output.

Specifically, you will display the lock-in outputs when measuring a signal close to, but not equal to, the internal reference frequency. This setup ensures changing outputs which are more illustrative than steady outputs. The displays will be configured to show X, Y, R and  $\theta$ .

1. Disconnect all cables from the lock-in. Turn the power on while holding down the [Setup] key. Wait until the power-on tests are completed.
2. Turn on the function generator, set the frequency to 1.0000 kHz (exactly) and the amplitude to 500 mVrms.

Connect the function output (sine wave) from the synthesized function generator to the A input using a BNC cable and appropriate terminator.

3. Press [Freq]

Use the knob to change the frequency to 999.8 Hz.

When the power is turned on with the [Setup] key pressed, the lock-in returns to its standard settings. See the Standard Settings list in the Operation section for a complete listing of the settings.

The Channel 1 display shows X and Channel 2 shows Y.

The input impedance of the lock-in is 10 M $\Omega$ . The generator may require a terminator. Many generators have either a 50 $\Omega$  or 600 $\Omega$  output impedance. Use the appropriate feedthrough or T termination if necessary. In general, not using a terminator means that the function output amplitude will not agree with the generator setting.

The lock-in defaults to the internal oscillator reference set at 1.000 kHz. The reference mode is indicated by the INTERNAL led. In this mode, the internal oscillator sets the detection frequency.

The internal oscillator is crystal synthesized so that the actual reference frequency should be very close to the actual generator frequency. The X and Y displays should read values which change very slowly. The lock-in and the generator are not phase locked but they are at the same frequency with some slowly changing phase.

Show the internal oscillator frequency on the Reference display.

By setting the lock-in reference 0.2 Hz away from the signal frequency, the X and Y outputs are 0.2 Hz sine waves (frequency difference between reference and signal). The X and Y output displays