

# Application Note



## Narrowband Analog Sweeps on 2030/2040 series Signal Generators



The DC coupled FM mode of the 2030/2040 series of Signal Generators allows high resolution, narrowband analog sweeps to be obtained

## Introduction

The sweep mode of operation of the 2030/2040 series of Signal Generators allows five different types of sweep with the sweep capability controlled by four parameters - start value, stop value, number of steps and time per step.

Five markers may be defined and a marker output is provided on a rear panel socket, together with a 0 - 10 V ramp signal for driving the X axis input of an oscilloscope or X-Y plotter.

A single key press starts the sweep and a horizontal bar graph on the display shows the progress of the sweep. The sweep can be stopped at any time and the Up/Down keys used to step forwards or backwards for search purposes. Transfer of the current sweep value into the signal generator or LF modes for more detailed analysis is also possible.

## LF Oscillator

The internal modulation oscillator is provided with a frequency range of 0.1 Hz to 500 kHz with 0.1 Hz resolution. In addition to the normal sine wave output an alternative triangular waveform may be selected, and it is this waveform that can be used to provide an analog sweep capability in the instrument. If the optional second modulation oscillator is fitted the capabilities can be further extended to allow analog sweeping of a modulated RF signal (e.g. a narrowband sweep with AM present).

## Modulation Characteristics

The internal modulation channel is AC coupled and, although its 1 dB bandwidth is below 10 Hz, for most slow sweep applications external connections will be needed to allow the modulation channel to be used in its DC coupled mode. An external coupling between the LF output socket and one of the external modulation input sockets will allow sweep rates down to 0.1 Hz (i.e. 10 seconds per sweep).

The sweep width is equal to twice the FM deviation set since the RF signal is being swept from the negative peak to the positive peak, with each peak separated from the carrier frequency by the FM deviation value. The maximum deviation that can be set on the 2030/2040 series Signal Generators is 1% of carrier frequency, giving a maximum sweep width of 2% of the carrier frequency selected.

## Method

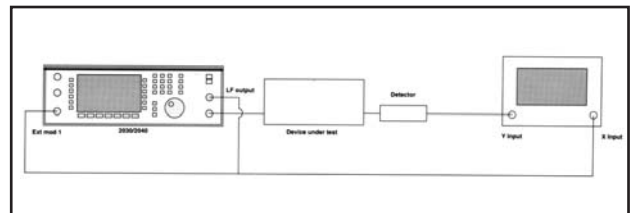
To obtain an analog sweep:

- If the sweep rate required is above 10 Hz simply use the internal FM mode and select the triangular modulation waveform at the required sweep frequency.
- If the sweep rate required is less than 10 Hz select the triangular waveform in the LF generator mode and set the output level to 1 V RMS at the required sweep frequency. Connect the LF output to the EXT MOD 1 modulation input socket and set the signal generator mode to external DC coupled FM with EXT MOD 1 as the modulation source.
- Connect the LF output socket to the X input of the display device to provide the X-axis signal.
- Set the carrier frequency to the sweep centre frequency required.
- Set the FM deviation to half the required sweep width.
- Set the RF output level to obtain the required output.

## Applications

Tests on narrowband filters are often best made with a continuous analog sweep technique (as described above) as this avoids any possibility of 'ringing' due to rapid changes of frequency which may be encountered in a digitally stepped sweep.

An analog sweep is also better for susceptibility or other EMC tests. Normally this would require a wideband analog sweep, which can be generated by combining the narrowband sweep described above with a normal digitally stepped sweep. The step time set in the digital mode must not be less than half the period of the triangular modulation signal. In this way the combined sweep will be certain to pass through all frequencies between the start and stop values selected in the digital sweep mode.



Use of LF output signal for analog sweeping

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