

Manual Configuration of Wideband Synthesizer VCO

Pete Hanish

Fast frequency steps can be critical for some applications. The fastest technique for stepping between frequencies involves manual configuration of VCO selection and capacitor bank. This document briefly describes how this manual configuration can be implemented.

Many synthesizers, such as the TRF372017 and the TRF3765 use banks of VCOs and capacitor arrays to achieve extremely wideband operation. The structure of the tuning elements, VCO and capacitor, are described in application note slwa069, section 2.1. To lock the PLL at a chosen frequency, the correct combination of VCO and capacitor bank must be selected.

This selection can take place through three different methods, each consuming a different amount of time. Automatic calibration enables an internal algorithm that selects the most appropriate VCO and capacitor settings, but this search algorithm requires up to 46 calibration clock cycles. The fastest method is manual programming of the VCO and capacitor setting, skipping the automated algorithm completely.

Manual configuration takes place when the customer sets CAL_BYPASS. The VCO_SEL and VCO_TRIM bits then select the VCO and capacitor. To use manual programming, the user must first identify and record the most appropriate VCO and capacitor for any specific frequency and store these values in a lookup table. The table would map from the desired frequency to VCO and capacitor setting information.

The easiest way to construct a table would be to program the device frequencies one at a time, use the internal calibration, read back the selected VCO and capacitor, and record the result. Use the table instead of in situ calibration during operation.

The VCO and capacitor settings will be different for each individual device. The setting will not, however, vary over temperature. Therefore, a table built at room temperature could be used in any conditions.

The steps involved in a system that uses manual calibration follow:

1. Determine set of customer frequencies: (freq1, freq2, ... freqn)

2. At factory test, select device<i>.
3. Program device<i> to freq<k>.
3. Calibrate using EN_CAL.
4. Read algorithm-selected VCO_TRIM<k> and VCO_SEL<k> from register 0.
5. Increment $k = k + 1$. Return to step 3.
6. Increment $i = i + 1$. Return to step 2.
7. Record table of (FREQ VCO_TRIM VCO_SEL) onto system EEPROM.
8. During operation, select freq<k>. Program device with CAL_BYPASS = 1, VCO_SEL (reg2) = VCO_SEL<k>, VCO_TRIM (reg7) = VCO_TRIM<k>.