
A Guideline to Measure Crystal and Color-Burst Frequencies

Description

The frequency of the crystal oscillator in CH7003 - CH7012 must be accurate to within ± 50 ppm from the specified frequency of 14.31818 MHz before the color-burst PLL in most TV to lock. The color-burst frequency generated by the TV encoder is derived from the pixel clock, which in turn is synthesized from this reference clock. If the TV shows a black and white screen or poor color representation, the cause is likely due to inaccurate color-burst frequency. This technical bulletin describes how to properly measure the crystal reference frequency and the color-burst frequency by using the BCO (Buffered Clock Output) pin.

Please also refer to AN-06 for guideline to crystal oscillator design.

Explanation

It is suggested that both the crystal and color-burst frequency measurements be taken from the BCO pin. Connecting a probe to the crystal leads, XI or XO, is not recommended because this will add an extra capacitive loading to the crystal, causing the oscillator to run slower than normal. The measurement can be taken by a frequency counter or an oscilloscope (with accurate frequency measuring capability) with its probe connected to the BCO pin.

To output the desired signals on the BCO pin, the BCO register must be programmed correctly.

For CH7003 - CH7008, the BCO register (register 17h) bits BCO[2:0] control the BCO output clock. When these bits are set to {0,0,0}, the crystal reference (14.31818 MHz) is output on the BCO pin. When set to {1,0,0}, the sign-bit of the digital color-burst signal is output instead. The long-term average frequency of the sign-bit equals 3.579545 MHz for NTSC or 4.433619 MHz for PAL.

For CH7009 - CH7012, the BCO register can be found at Address 22h of the control registers. Bit 4 (BCOEN) must be set to "1" in order to activate the BCO pin. Bits BCO[2:0] control the output clock on the BCO pin. The settings are the same as CH7003 - CH7008, where {0,0,0} will output the crystal frequency and {1,0,0}, for the color-burst frequency.

Measurement Procedures

A. Measurement Procedures for CH7003 - CH7008

1. Power up the encoder chip by programming PMR (register 0Eh) PD[2] = 0, and PD[1:0] = 00, 10, or 11.
2. Set BCO[2:0] (register 17h) = {0,0,0}.
3. Measure the output of BCO pin for crystal frequency.
4. Set M/S* bit of CM register (06h) to 0 (clock-slave mode).
5. Select any NTSC/PAL display mode.
6. Set BCO[2:0] (register 17h) = {1,0,0}.
7. Measure the output of BCO pin for color-burst frequency (NTSC or PAL).

B. Measurement Procedures for CH7009 - CH7012

1. Power up the encoder chip by programming PMR[0] (register 49h), FPD = 0.
2. Set BCO[4] (register 22h), BCOEN = 1 to enable BCO output.
3. Set BCO (register 22h), bits BCO[2:0] = {0,0,0}.
4. Measure the output of BCO pin for crystal frequency.
5. Set M/S* bit of CM register (1Ch) to 0 (clock-slave mode).
6. Select any NTSC/PAL display mode.
7. Set BCO[2:0] (register 22h) = {1,0,0}.
8. Measure the output of BCO pin for color-burst frequency (NTSC or PAL).