Keywords: audio subcarrier, notch filter, group-delay equalization, RF video modulator, NTSC,

APPLICATION NOTE 3745

Low-Cost Quad Op Amp Drives RF Modulator

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Abstract: A video circuit combines an audio-subcarrier notch filter, group-delay equalization, and an amplitude-adjustment capability for driving an RF video modulator in NTSC applications.

The video circuit of **Figure 1** combines an audio-subcarrier notch filter and group-delay equalization as required by the ITU-470 standard. The circuit also includes amplitude-adjustment capability for driving an RF video modulator in NTSC applications. (PAL operation requires a minor adjustment of the filter and allpass values.)
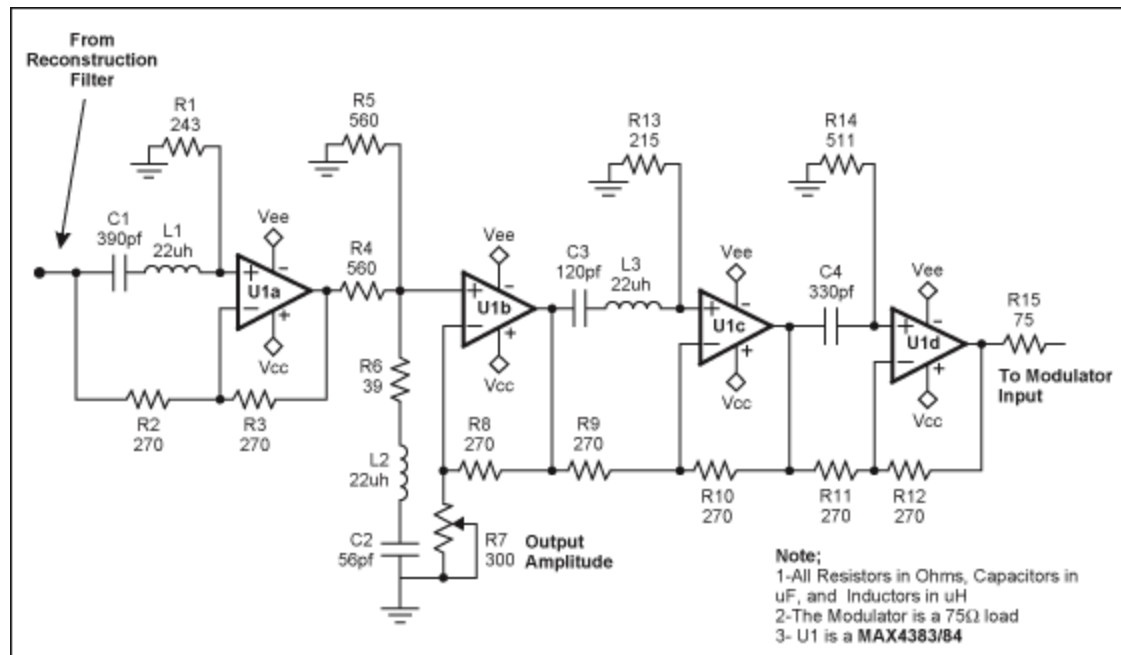

Figure 1. Bandstop filter and delay equalizer for NTSC applications.

For best performance, the input should be driven from a low-impedance source such as an op amp or active filter. Two second-order allpass stages (U1a, R1, C1, L1) and (U1c, R13, C3, L3) and a first-order allpass stage (U1d, C4, R14) form a fifth-order group-delay equalizer that compensates for group delay introduced by the notch filter (U1b, R6, C2, L2). See **Figure 2**. Potentiometer R7 adjusts the output amplitude as required by the modulator in use.
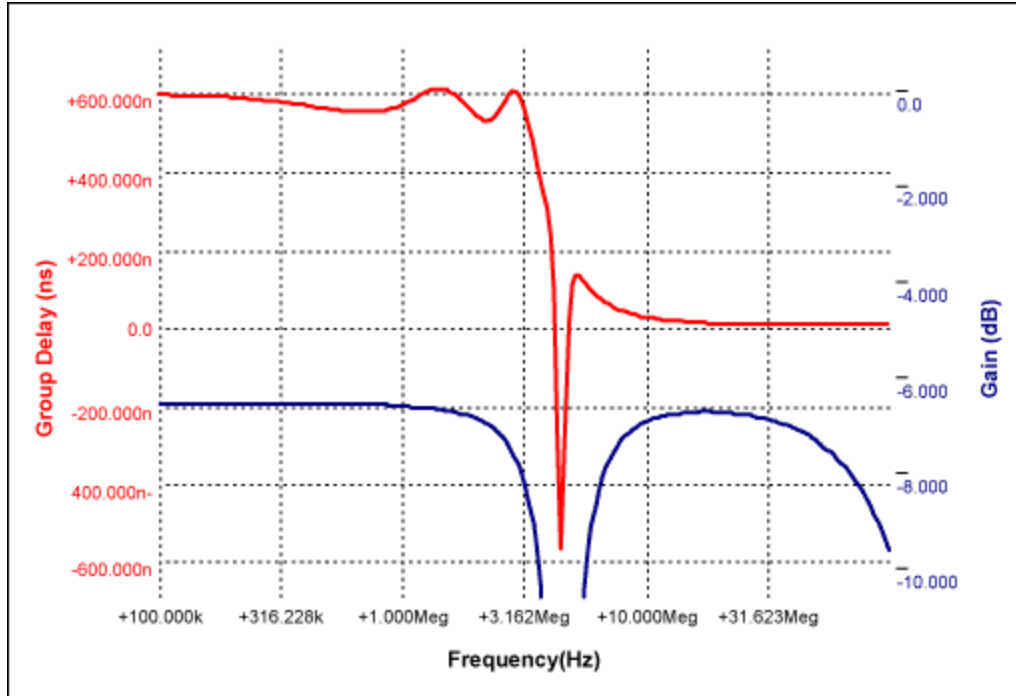
Figure 2. Gain and group-delay response for the notch filter and group-delay compensation of Figure 1.

The notch frequency is set by L2 and C2; the notch depth and bandwidth are set by R4, R5, and R6. The typical notch depth is greater than -16dB. Flatness above 2.5MHz is ±0.5dB.

A similar article appeared as a Design Brief in the July 21, 2005 issue of *Electronic Design*.

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