FM Section

The oscillator center is approximately the resonance of the inductor L_2 from Pin 2 to Pin 3 and the effective capacitance C_3 from Pin 3 to ground. For overall oscillator stability, it is best to keep X_L in the range of 300 Ω to 1.0 kΩ.

The modulator transfer characteristic at 4.5 MHz is shown in Figure 15. Transfer curves at other frequencies have a very similar shape, but differ in deviation per input volt, as shown in Figures 13 and 17.

Most applications will not require DC connection to the audio input, Pin 14. However, some improvements can be achieved by the addition of biasing circuitry. The unaided device will establish its own Pin 14 bias at 4 θ, or about 3.0 V. This bias is a little too high for optimum modulation linearity. Figure 14 shows better than 2 to 1 improvement in distortion between the unaided device and pulling Pin 14 down to 2.6 V to 2.7 V. This can be accomplished by a simple divider, if the supply voltage is relatively constant.

The impedance of the divider has a bearing on the frequency versus temperature stability of the FM system. A divider of 180 kΩ and 30 kΩ (for V_{CC} = 12 V) will give good temperature stabilization results. However, as Figure 18 shows, a divider is not a good method if the supply voltage varies. The designer must make the decisions here, based on considerations of economy, distortion and temperature requirements and power supply capability. If the distortion requirements are not stringent, then no bias components are needed. If, in this case, the temperature compensation needs to be improved in the high ambient area, the tuning capacitor from Pin 3 to ground can be selected from N75 or N150 temperature compensation types.

Another reason for DC input to Pin 14 is the possibility of automatic frequency control. Where high accuracy of inter–carrier frequency is required, it may be desirable to feed back the DC output of an AFC or phase detector for nominal carrier frequency control. Only limited control range could be used without adversely affecting the distortion performance, but very little frequency compensation will be needed.

One added convenience in the FM section is the separate Pin "oscillator B+" which permits disabling of the sound system during alignment of the AM section. Usually it can be hard wired to the V_{CC} source without decoupling.

Standard practice in television is to provide pre–emphasis of higher audio frequencies at the transmitter and a matching de–emphasis in the TV receiver audio amplifier. The purpose of this is to counteract the fact that less energy is usually present in the higher frequencies, and also that fewer modulation sidebands are within the deviation window. Both factors degrade signal to noise ration. Pre–emphasis of 75 µs is standard practice. For cases where it has not been provided, a suitable pre–emphasis network is covered in Figure 20.

It would seem natural to take the FM system output from Pin 2, the emitter follower output, but this output is high in harmonic content. Taking the output from Pin 3 sacrifices somewhat in source impedance but results in a clean output fundamental, with all harmonics more than 40 dB down. This choice removes the need for additional filtering components.

The source impedance of Pin 3 is approximately 2.0 kΩ, and the open circuit amplitude is about 900 mV pp for the test circuit shown in Figure 11.

The application circuit of Figure 1 shows the recommended approach to coupling the FM output from Pin 3 to the AM modulator input, Pin 1. The input impedance at Pin 1 is very high, so the intercarrier level is determined by the source impedance of Pin 3 driving through C4 into the video bias circuit impedance of R4 and R5, about 2.2 k. This provides an intercarrier level of 500 mV pp, which is correct for the 1.0 V peak video level chosen in this design. Resistor R6 and the input capacitance of Pin 1 provide some decoupling of stray pickup of RF oscillator or AM output which may be coupled to the sound circuitry.

Figure 11. FM Test Circuit

f_o (MHz)	C3 (pF)	L2 (µH)
10.7	12	10
4.5	120	10
1.76	200	40

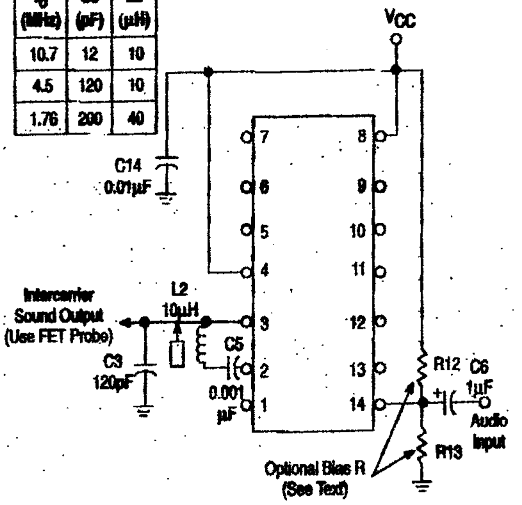

Figure 12. Modulator Sensitivity