

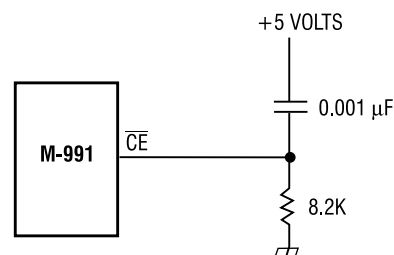
The M-991 is a 14-pin DIP IC that is capable of generating precise, low-distortion tones for use in dial telephone systems as status indicators. The tones described in the North American Precise Tone Plan and in various other international standards can be selected easily using latching binary inputs.

The M-991 can drive AC loads as low as 580 ohms (within 600 ohms  $\pm$  10%) directly at high levels compatible with the strongest tone generally specified (dial tone). Other levels can be selected by simple external circuits. Distortion is a minimum of 35 dB down. The power-on reset circuit application is shown to the right.

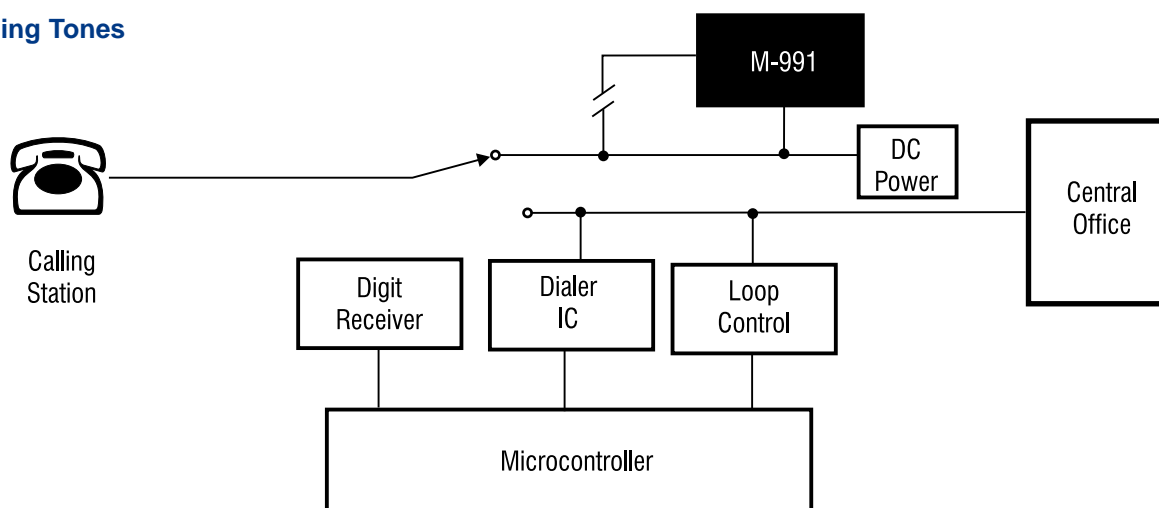
Some applications require that the data lines be hard wired for a specific task, for example, dedicated dial tone generation. Since the data lines are required to be set before  $\overline{CE}$  is activated (see Figure 3 in the M-991 data sheet), a power-on reset circuit should be included to ensure that this condition is met on power-up. The diagram below shows a simple scheme to provide approximately 5 ms time delay before enabling the chip immediately after power-up. Another potential area of concern is that of bus switching noise affecting tone out-

put. When used with a bus-oriented system, noise may propagate from the data inputs and appear as audible noise at the output. This is obviously worse at higher clock rates. To eliminate this, use an external data latch such as a 74HC77. It is also good practice to bypass pin 8 ( $V_{ref}$ ) to ground with a small ( $\sim 0.01 \mu\text{F}$ ) capacitor. When using a transformer to couple to a phone line, always use a DC blocking capacitor ( $\sim 1 \mu\text{F}$ ). You should then add a resistor (600  $\Omega$  - 1 k $\Omega$ ) from pin 14 (outdrive) to ground to bias the output stage.

### Power-On Reset Circuit



### Generating Tones





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Specification: AN-M991-R1  
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1/16/01