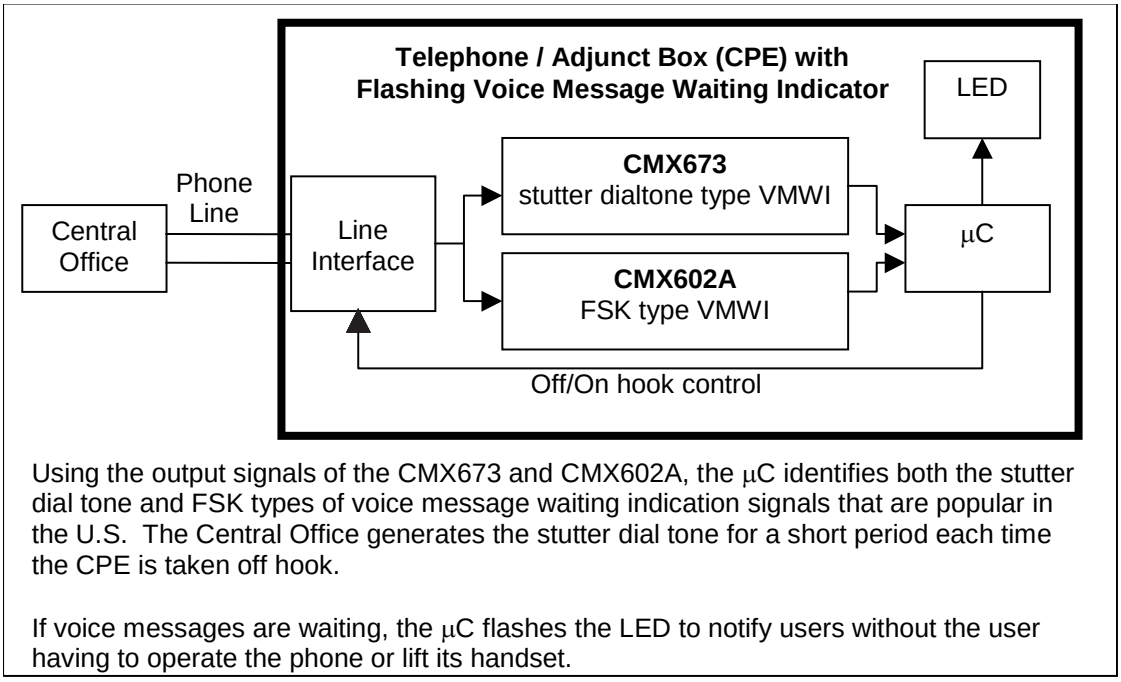
APPLICATION NOTE

CMX673 Suggested Applications

The CMX673 is a signal detector that operates on energy in the frequency band of about 300 to 650Hz. It's primary use is in the detection of status tones encountered in a telephone system. These tones include dial tone, circuits busy, ring tone, station busy, and others. Identification of specific status tones is derived by examining the specific on/off cadence of the CMX673's tone detector output. Featuring both high accuracy and rapid response time makes the CMX673 well suited for the rapid/short cadences used for services such as voice message waiting indication (VMWI).

This application note shows some typical applications (Figures 1, 2, 3, and 4), a simple scheme for connecting the CMX673 to a balanced telephone line (Figure 5), and some common call progress tone cadences and frequencies (Tables 1 and 2) and an illustrative cadence timing diagram (Figure 6).



Using the output signals of the CMX673 and CMX602A, the µC identifies both the stutter dial tone and FSK types of voice message waiting indication signals that are popular in the U.S. The Central Office generates the stutter dial tone for a short period each time the CPE is taken off hook.

If voice messages are waiting, the µC flashes the LED to notify users without the user having to operate the phone or lift its handset.

Figure 1: Low Cost Dual Type U.S. Voice Message Waiting Indication

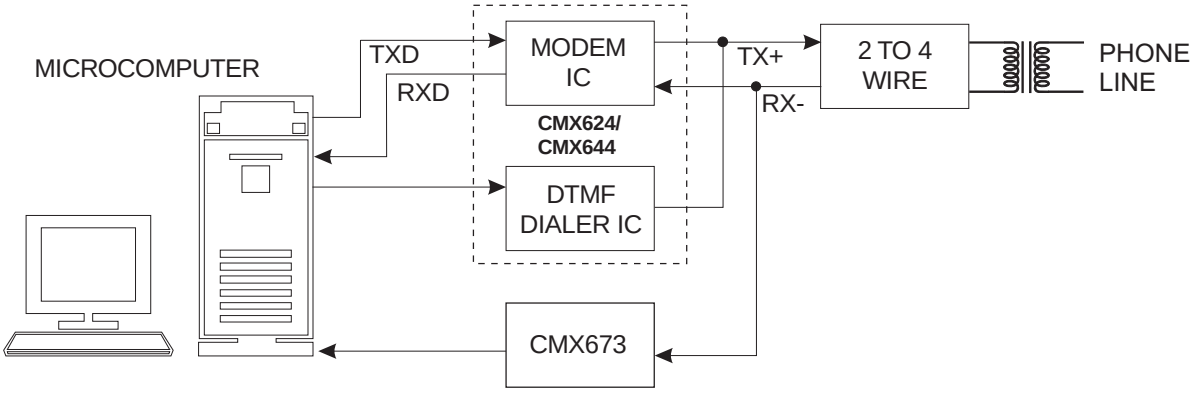


Figure 2: Detecting Dial Tone and Secondary Dial Tones in an Automatic Dialing Data Modem

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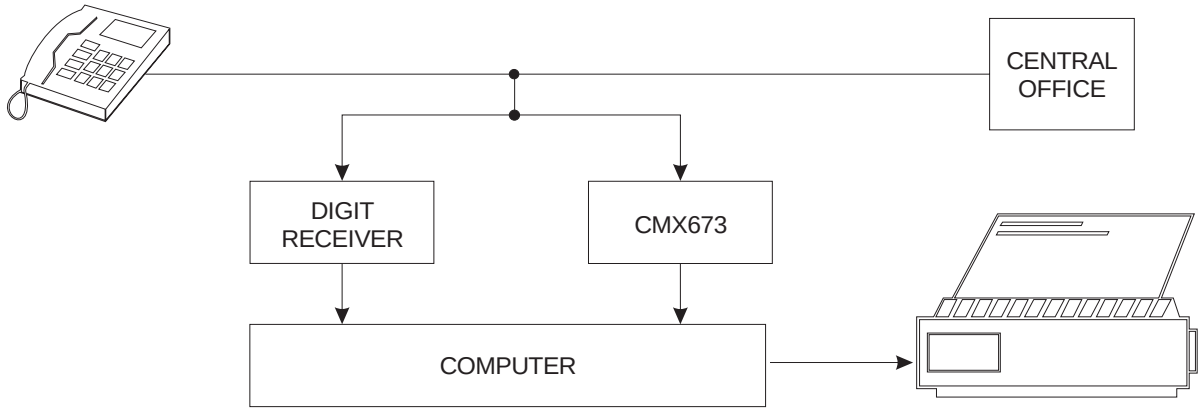


Figure 3: Call Detail and Completion Monitor in a Billing System

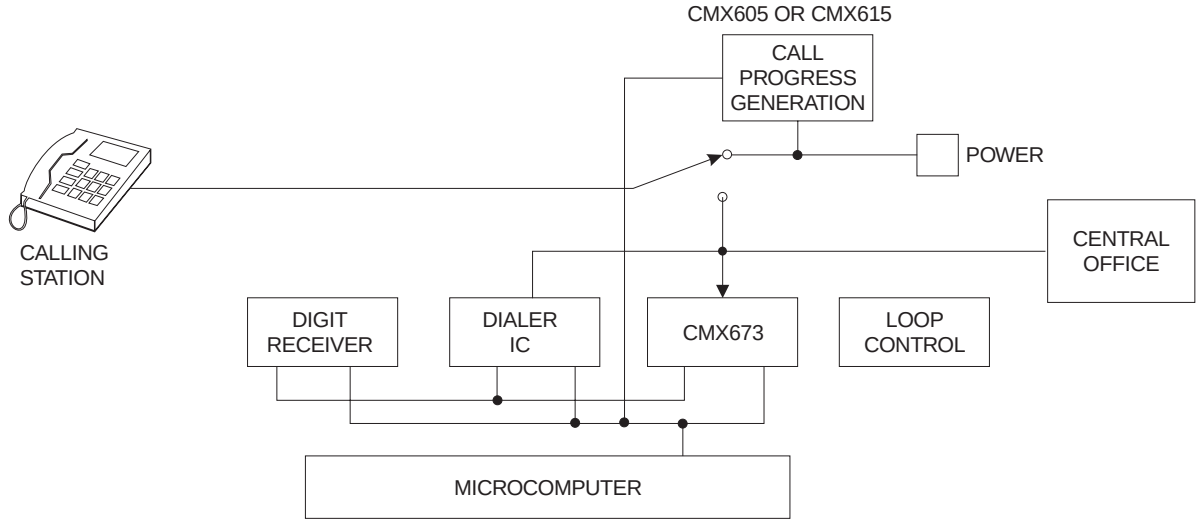


Figure 4: Call Routing in a Speed Dialing System

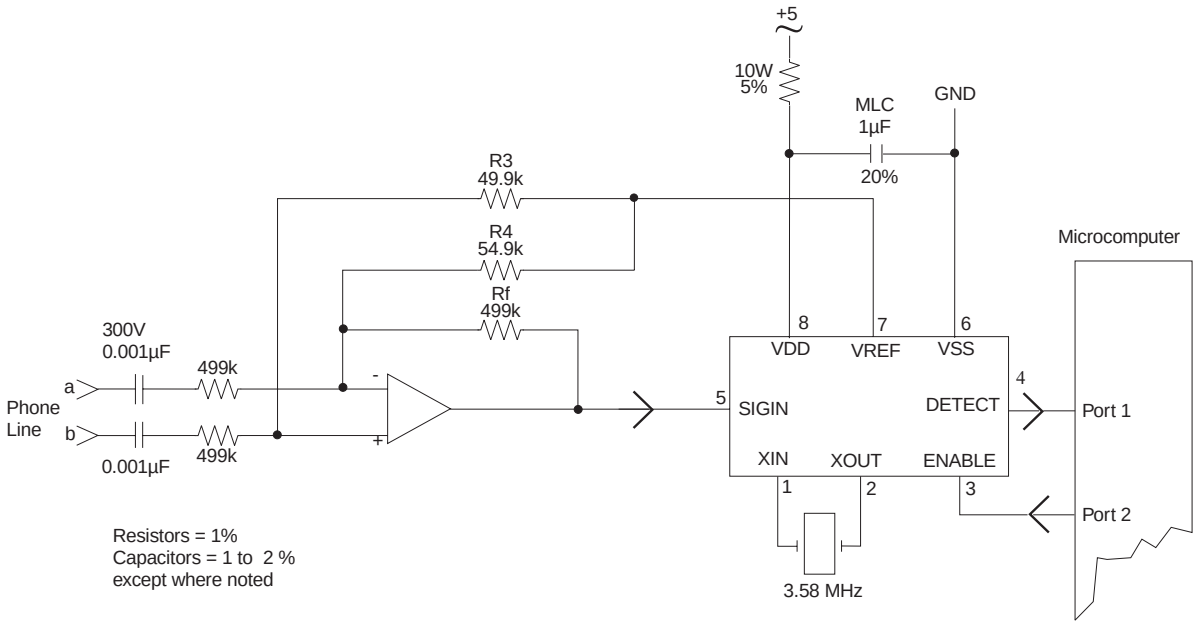
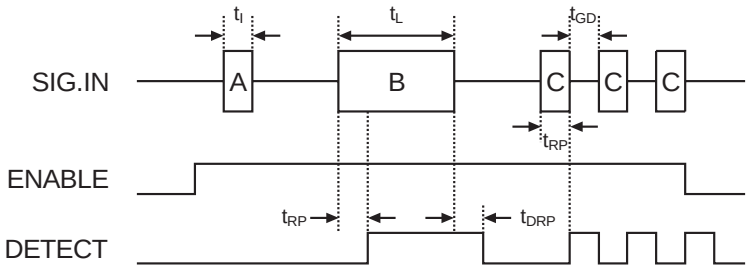


Figure 5: Monitoring Signals from a Balanced Phone Line



KEY

A = Signal within call progress detection range, but not of sufficient duration to be detected

B = Continuous call progress tone. i.e. Dial Tone

C = 3 bursts of 0.1seconds followed by a continuous tone (not shown) in the call progress band. i.e. Recall Dial 1

t_I = Burst length ignored

t_L = Burst length detected

t_{GD} = Call progress tone gap length detected

t_{RP} = Call progress response time

t_{DRP} = Call progress tone de-response time

Figure 6: An Example of Tone Detection (via Tone Cadence) using the CMX673

The minimum level required by the CMX673 is -38dBm. In general, to optimize transient response and to limit spurious DETECTs, it is best to use the least sensitive configuration possible. The gain of the buffer stage shown in Figure 4 is equal to the ratio of Rf to Rin and may be varied to obtain the sensitivity required for a given application. Balanced network input impedance provides rejection of common mode signals. If component values are changed to obtain different gain, then the parallel combination of Rf and R4 must be kept equal to R3 to maintain proper balance. Closely matching 1% resistor and capacitor values should also be used.

STUTTER DIAL TONE	
Cadence	10 bursts (each 0.1 sec on / 0.1 sec off) then steady on.
Frequencies	350 + 440 Hz
DIAL TONE	
Cadence	On, Steady
Frequencies	400, 425, 350 + 440, 600 x 120, 33 Hz
AUDIBLE RING	
Cadence	2 sec. on, 4 sec. Off or 1/3 sec. on, 1/3 sec. off, 1/3 sec. on, 2 sec off …
Frequencies	400, 425, 440 + 480, 420 x 40, 450 ,400 x 25 Hz
LINE BUSY	
Cadence	0.5 sec. On, 0.5 sec. Off, …,
Frequencies	400, 425, 480 + 620, 600 x 120, 450 Hz
RECORDER (Busy Circuits)	
Cadence	0.25 sec. On, 0.25 sec. Off, or 0.5 sec. On, 1 sec off, …
Frequencies	400, 425, 480 + 620, 600 x 120, 450 Hz

Table 1: Some Common Call Progress Tone Cadences and Frequencies

TONES	350	440	480	620	Power per frequency at exchange(b) where tone is applied[c]	Cadence
Dial Tone	X	X			-13dBmO	Continuous Tone
Dial tone – Modern PABX only	X	X			-16dBmO	Continuous Tone
Recall Dial Tone	X	X			-13dBmO	3 burst of 0.1 seconds followed by a continuous tone [e]
Recall Dial Tone – Modern PABX only [g]	X	X			-16dBmO	3 burst of 0.1 seconds followed by a continuous tone [e]
Busy Tone			X	X	-24dBmO	Burst 0.5 seconds / silence 0.5 seconds
Busy Tone – Modern PABX only			X	X	-21dBmO	Burst 0.5 seconds / silence 0.5 seconds
Reorder Tone			X	X	-24dBmO	Burst 0.25 seconds / silence 0.25 seconds
Reorder Tone – Modern PABX only			X	X	-21dBmO	Burst 0.25 seconds / silence 0.25 seconds
Audible Ringing Tone		X	X		-19dBmO	Burst 2 seconds / silence 4 seconds
Audible Ringing Tone – Modern PABX only		X	X		-16dBmO	Burst 1 seconds / silence 3 seconds
Call Waiting Tone		X			-13dBmO	Burst of 0.3 seconds every 10 seconds
Call Waiting Tone – Modern PABX only [g]		X			-16dBmO	Station Call Waiting : Burst of 0.3 seconds
					-16dBmO	Outside Call Waiting: 2 bursts of 0.1 seconds [e]
					-16dBmO	Urgent Call Waiting: 3 bursts of 0.1 seconds [e]
Busy Verification		X			-13dBmO	A 2.0 second burst followed by o.5 second bursts every 10 seconds
Busy Verification – Modern PABX only [g]		X			-14dBmO	Bursts of 1.5 to 2.0 seconds followed by… [f]
Executive Override – Modern PABX only [g]		X			-14dBmO	Burst of 3.0 seconds
Confirmation Tone	X	X			-13dBmO	Burst of 0.1 seconds / silence 0.1 second / burst 0.3 seconds
Confirmation Tone – Modern PABX only [g]	X	X			-16dBmO	3 bursts 0.1 seconds [e]

(a) Frequency Limits are ±0.5% of the niominal frequency.
(b) PABX tone levels are measured at the PABX interfaces (typically at customer premises). Power levels are 2dB lower for private line interfaces.
(c) Power level tone tolerances are +1.5dB
(d) Tolerance level for PABX dial tone is +0.75dB.
(e) Bursts are separated by 0.1 seconds
(f) Burst of 1.5 to 2.0 seconds before attendant intervenes, followed by repeated bursts of 0.5 to 0.8 seconds, 8 to 20 seconds apart
(g) Tones applied at PABX station or private line interfaces and not at the exchange interfaces.

Table 2: Call Progress Tone Cadence and Frequencies - Taken from the CCITT Blue Book (Fascicle ii.2 - Suppl. No. 3)

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