

1.--FEATURES-

The OCTEL3 SCWID (Spontaneous Call Waiting Identifier) part is designed to meet:
 The Bellcore "Customer Premises Equipment Alerting Signal (CAS)": TR-NWT-000030 & SR-TSV-002476 specifications.
 The British Telecom "Idle State Tone Alert Signal": SIN227 & SIN242 specifications.
 The European Telecommunication Standard: ETS300 778-1 & ETS300 778-2 specifications.

2.--OVERVIEW-

SCWID (Spontaneous Call Waiting Identifier), is a feature that allows a subscriber that is already engaged in a telephone call to receive caller ID information about an incoming call. European Telecommunication Standard specifies Dual-Tone Alerting Signal (DT-AS) for Off-line data transmission (on-hook) and On-line data transmission (off-hook).

British Telecom caller ID, uses a Idle State Tone Alert Signal in on-hook mode . Bellcore specifies a dual tone alert signal called CPE Alerting Signal (CAS) for use in off-hook data transmission.

Bellcore states that the CPE should be able to detect the CAS in the presence of near end speech.

The CAS detector should also be immune to imitation from near and far end speech.

Note, the term "**near end**" refers to the end of the telephone connection receiving the Caller ID service, "**far end**" refers to the other end of the connection ,the CO (Central Office).

There are two aspects of speech immunity: talkoff and talkdown.

Talkoff, is the condition where signals are falsely detected because of imitation by speech or music. An imitation can be caused from the far end or the near end.

Talkdown, is the condition where signals are missed because of interference from speech or music.

A CAS can be talked down only from the near end because the far end has already been muted by the CO (Central Office).

3.--DESCRIPTION-

The OCTEL3 SCWID part is a complete dual-tone receiver designed to detect the two frequencies 2750HZ and 2130HZ dedicated for this alerting function. An output interrupt is provided to the microprocessor when detecting the alert signal.

This device part provides all necessary filtering without any external component.

The OCTEL3's on chip filtering provides excellent Signal to Noise performance.

The dual tone alert signal is divided into high and a low bandpass switched capacitor filters:

-The high alert filter is 2750Hz bandpass design, with a notch placed at 2130HZ for low frequency rejection.

-The low alert filter is 2130Hz bandpass design, with a notch placed at 2750HZ for high frequency rejection.

The filter outputs, are smoothed and then limited by high gain comparators which have hysteresis to reduce sensitivity to unwanted low level signals, jitter and noise. The outputs of the comparators are squared signals.

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The two resulting rectangular waves are applied to digital circuitry where a counting algorithm measures and averages their periods. This averaging prevents dual-tone SCWID simulation by extraneous signals such as voice.

The averaging algorithm has been optimised to provide excellent immunity to "Talk-off", and tolerance to the presence of interfering frequencies (third tones) and noise.

When both digital circuitries simultaneously detect a valid tone (2130Hz and 2750Hz), the signal applied at the Guard-Time block goes high. Should the alert tone signal be lost, the input signal at the Guard-Time block will go low.

4. – GUARD TIME, overview

To prevent false detection due to talk-off effects and to detect real CAS signals even with drops, a guard time system is necessary. A Guard-Time system improves the detection performance and verifies that the duration of a valid signal is sufficient before alerting the microprocessor with an interrupt. It rejects detection of insufficient duration (Up Guard Time) and masking momentary detection dropout (Down Guard Time).

- There are nine bits for controlling the Guard Time block :
- _2 bits, CDE<4> and CDE<5>, for controlling the Early Guard Time
- _2 bits, CDE<0> and CDE<1>, for controlling the Up Guard Time
- _2 bits, CDE<2> and CDE<3>, for controlling the Down Guard Time
- _1 bit , CDE<6> for controlling the width filter.
- _1 bit , CDE<7> for controlling the drops count.
- _1 bit , CDE<8> for enabling the Wetting Pulse function.
- One bit is dedicated for enabling the SCWID part.

4.1 - Up Guard Time, description.

The Up Guard Time circuitry prevents false detection from speech or music (Talkoff).

The input signal (both 2130Hz and 2750Hz) must be continuously high for a duration depending of the 2 programmable bits CDE<0> and CDE<1>.

CDE<0>	CDE<1>	UGT value	0	0	
20ms	1	0	25ms	0	1
30ms	1	1	35ms		

If a drop occurs at any time before the selected value the detection system is cleared.

Nevertheless there is a possibility to improve such a system : Using an Early Guard Time circuitry.

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4.2 - Early Guard Time, description.

The Early Guard Time system, when enabled, help the Up Guard Time to detect CAS signal even if there are drops in it. But there are conditions before validating such a polluted signal :

The input signal (both 2130Hz and 2750Hz) must be continuously high for duration depending of the 2 programmable bits CDE<4> and CDE<5>.

CDE<4>	CDE<5>	EGT value	0	0
Disabled	1	0	8.5ms	0
10.3ms	1	1	13.7ms	1

After that, the input signal is filtered and a drop can occur without clearing the system if it is not too long , the maximum time value depends of the command filter bit CDE <6> :

CDE <6>	Filter Value			
(Maximum drop duration)	0	2ms	1	
4ms				

But if there are too many drops then the system is cleared.

The count of drops admitted depends of the command count bit CDE <7> :

CDE <7>.	Count Value			
(Maximum drop count)	0	4	1	3

The Early Guard Time with filter and count drops allow a good compromise to achieve talkoff and talkdown immunity.

4.3 -Down Guard Time, description.

The Down Guard Time circuitry prevents drops from speech or music (Talkdown).

The input signal (both 2130Hz and 2750Hz) must be continuously low for a duration depending of the 2 programmable bits CDE<2> and CDE<3>.

The Early Guard Time is used like for Up Guard Time, but the drop counter is not activated.

CDE<2>	CDE<3>	DGT value	0	0
15ms	1	0	17ms	0
18ms	1	1	19ms	1

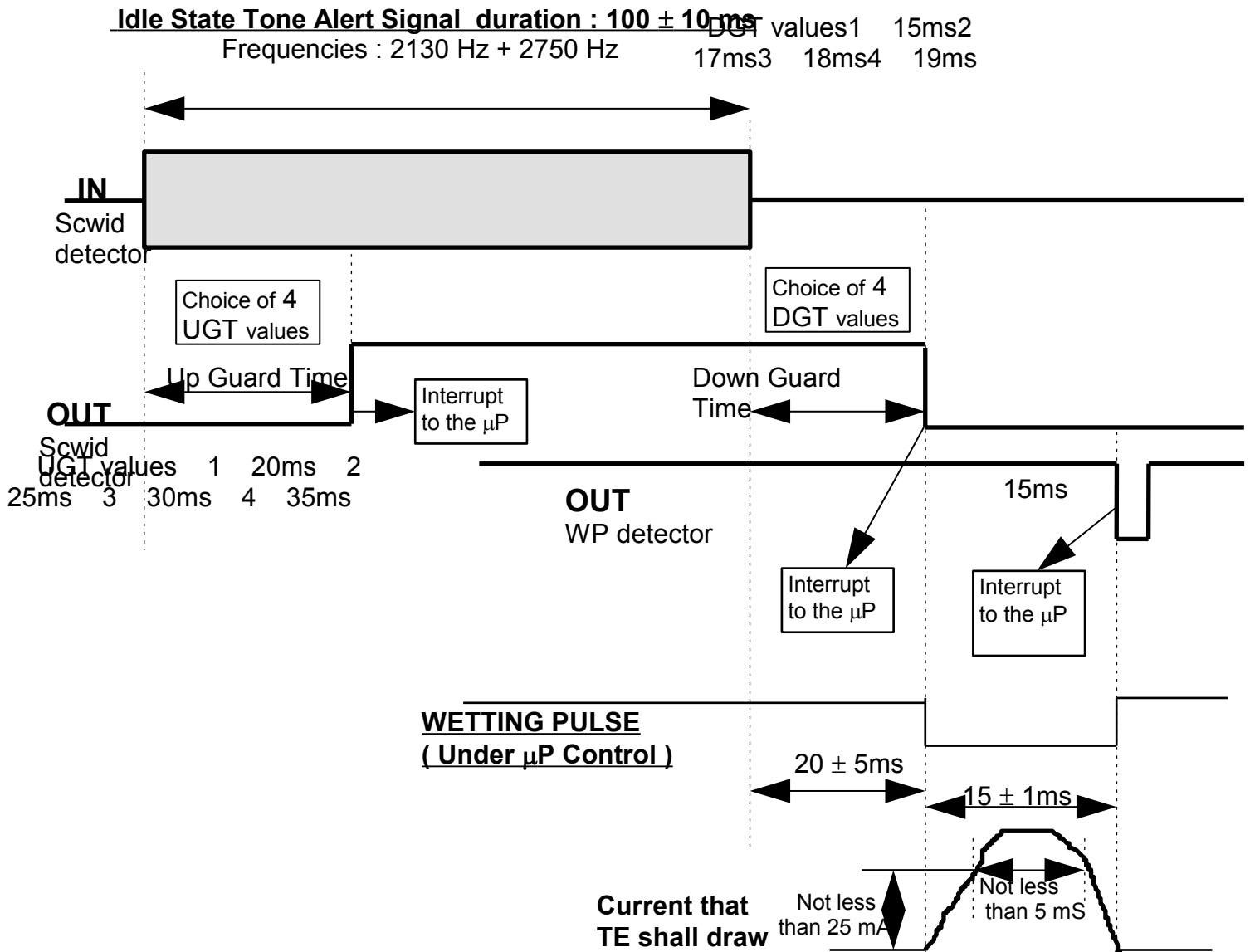
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U.K Mode - Wetting Pulse function.

British Telecom states that the TE is required to apply a DC wetting pulse and an AC load $20 \pm 5\text{ms}$ after the end of the alerting signal (the Idle State* Tone Alert Signal), the duration of the wetting pulse is $15 \pm 1\text{ms}$, the TE shall rise to a minimum of 25 mA and maintain that current for a total time of not less than 5 ms.

OCTEL3 provides a 15ms counter (which start at the end of the alerting signal delayed by the Down guard time value) to help the microprocessor to fulfil this requirement.

***Note** : The Idle State is an electrical condition into which the TE when connected to the network is placed such that it draws minimum current and does not activate the exchange.



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5. Main Electrical Characteristics. ALERT TONE Detection

	Characteristics	Sym	Min	Typ	Max	Units	Notes
1	Low tone frequency	fl		2130		HZ	
2	High tone frequency	fh		2750		HZ	
3	Frequency deviation accept		± 0.75%				range within which tones are accepted
4	Frequency deviation reject		± 3.5%				range within which tones are rejected
5	Accept signal level		-37.78		0.22	dBm	*
6	Reject signal level (threshold)		-43.78		- 37.78	dBm	*
7	Positive and Negative twist accept		7			dBm	
8	Noise tolerance	S/N Cas	tbd	20	tbd	dB	**
9	Speech tolerance		tbd	tbd	tbd	dB	***

* Referenced to a 600Ω termination at the CPE Tip and Ring interface (See schematic application)

** Band limited random noise 300-3400HZ. Present only when tone is present.

*** Speech level is in ASL (active speech level). Over the CAS signal level range -16dBm to -30 dBm per performance objectives stated in SR-TSV-002476 appendices A&B.

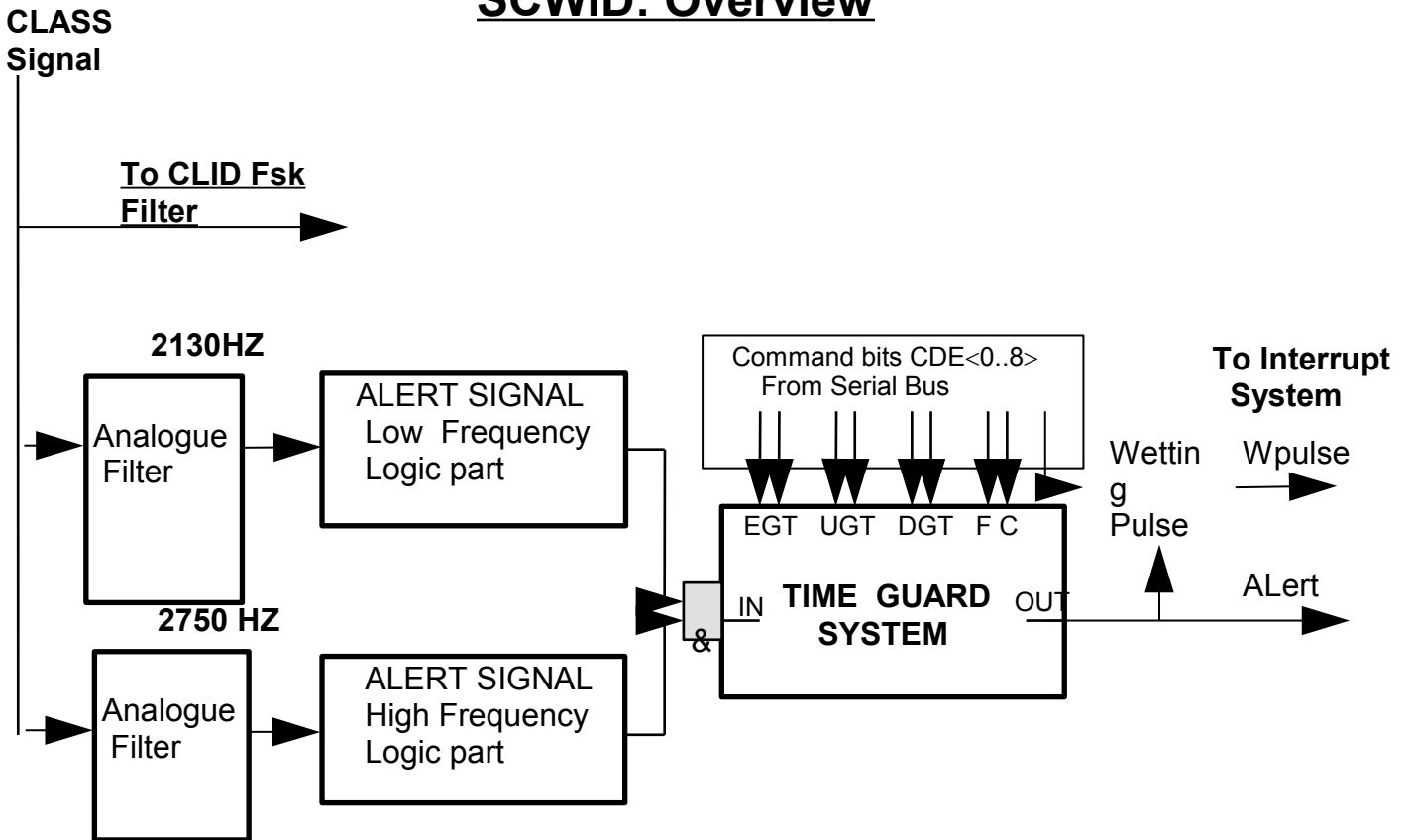
6. Electrical Characteristics. Tone Alert Guard Time and Wetting Pulse signal

	Characteristics	Sym	Min	Typ	Max	Units	Notes
1	Early guard time - 1 - 2 - 3 - 4	egt	-	-	-	ms	disabled
			8.3	8.5	8.7		
			10.1	10.3	10.5		
			13.4	13.7	14.0		
2	Up guard time - 1 - 2 - 3 - 4	ugt	19.5	20	20.5	ms	
			24.5	25	25.5		
			29.5	30	30.5		
			34.5	35	35.5		
3	Down guard time - 1 - 2 - 3 - 4	dgt	14.5	15	15.5	ms	
			16.5	17	17.5		
			17.5	18	18.5		
			18.5	19	19.5		
4	Wetting Pulse signal delay	wpd	14.8	15	15.2	ms	*

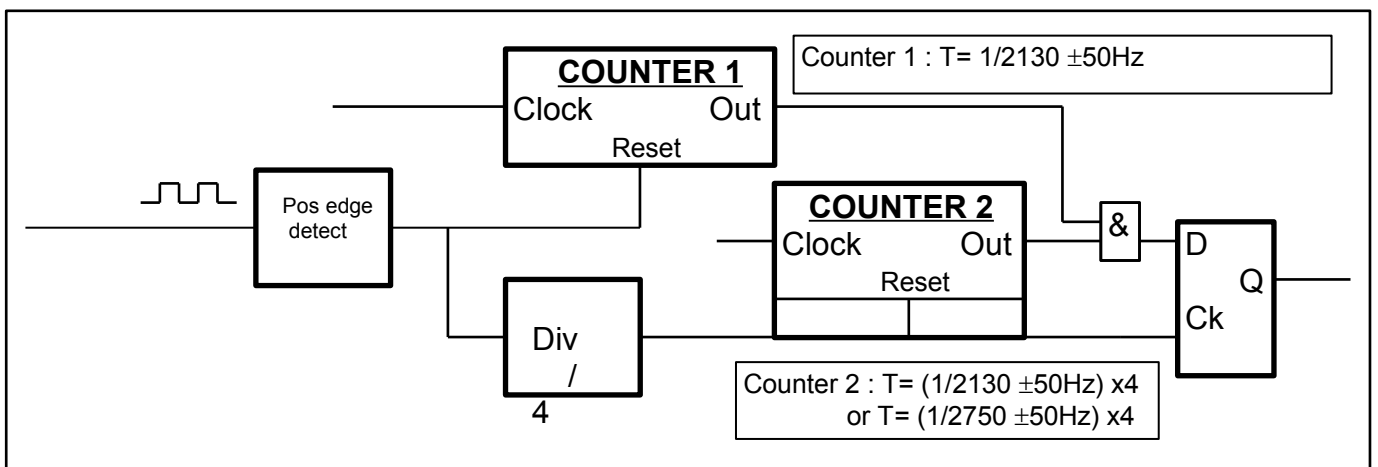
* Delay after the Alert Signal falling edge.

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SCWID: Overview



ALERT SIGNAL High and low frequencies. Logic part



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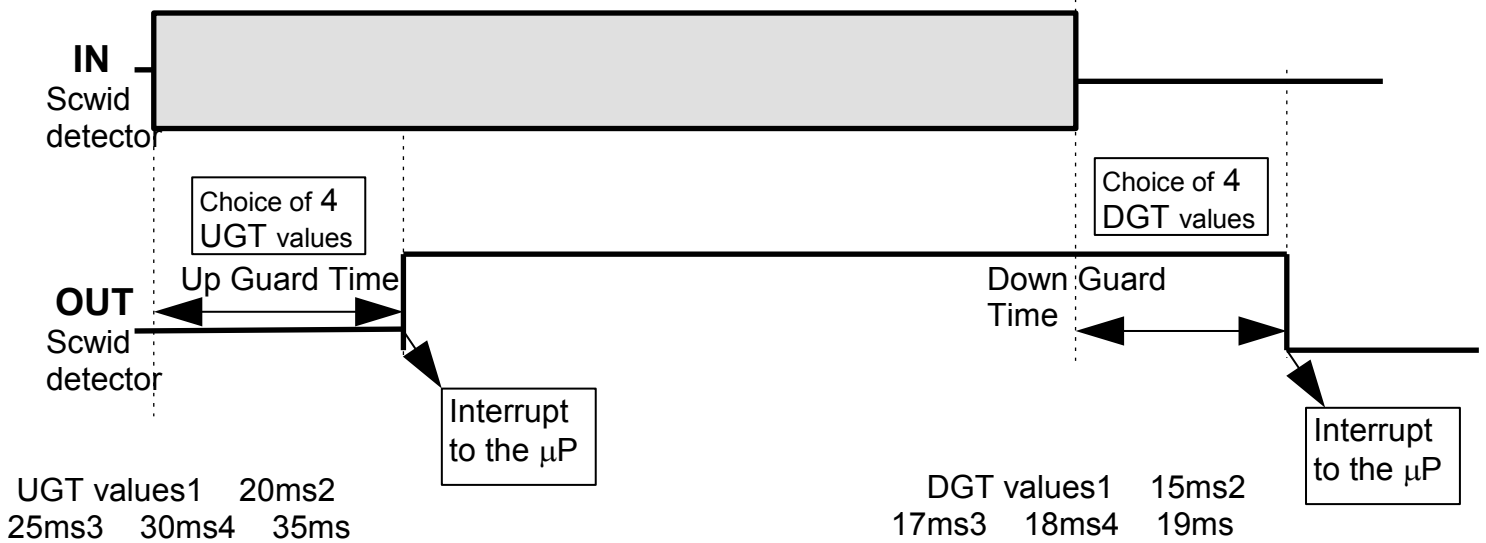
CAS DETECT

PROCESS :

1 : Typical Application : the incoming signal from the C.O is not polluted with speech or music. (The feature Early Guard Time is not used)

CAS signal duration : 80 ± 5ms

Frequencies : 2130 Hz + 2750 Hz



If any drop, in the CAS signal, occurs before the end of the UGT specified value then the time counter restarts and the **OUT scwid detector remains low** .

If any spike, in the blank signal, occurs before the end of the DGT specified value then the time counter restarts and the **OUT scwid detector remains high** .

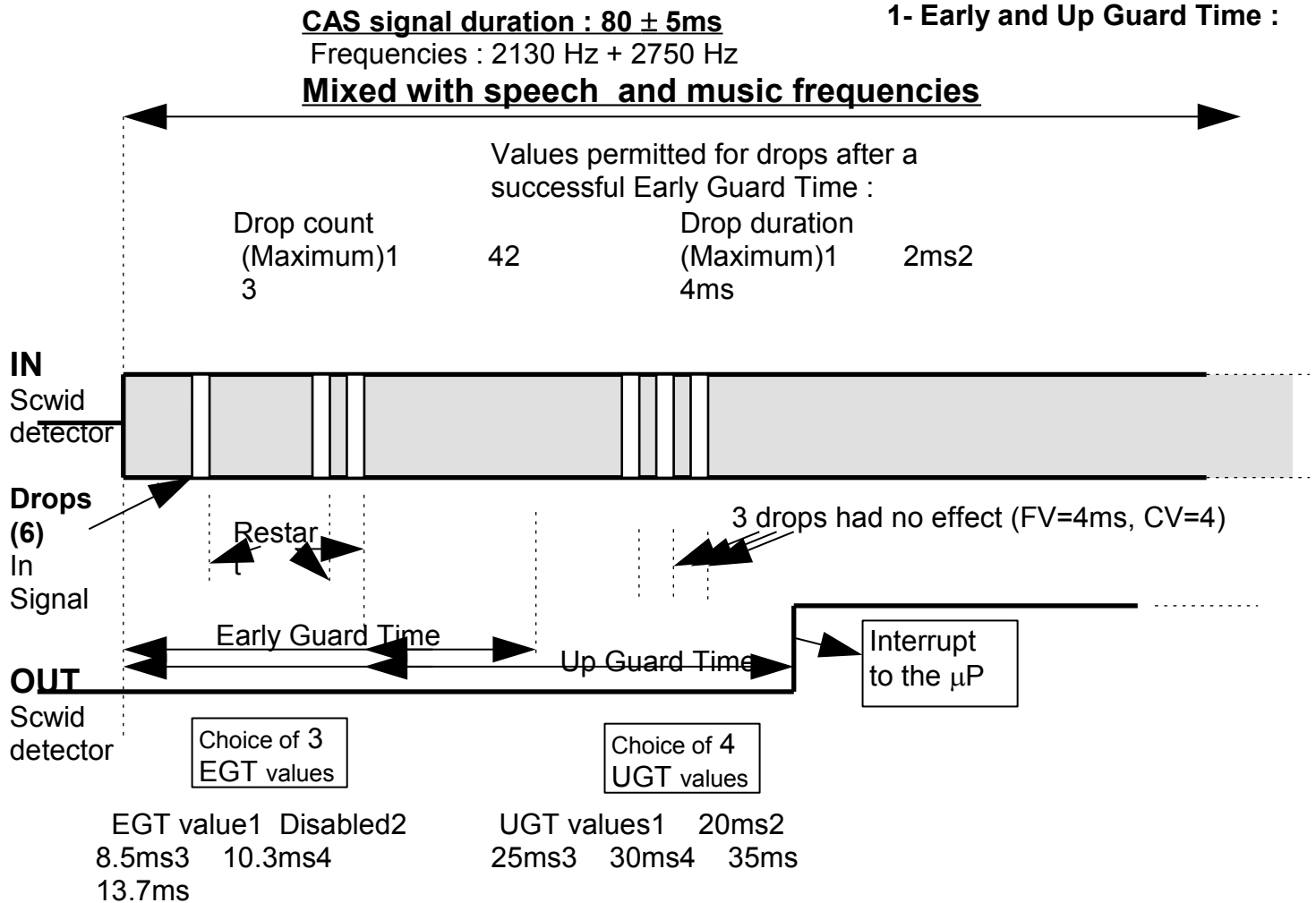
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CAS DETECT

PROCESS :

2a : Improved Process :

To prevent false detection from speech and music by the far and the near end (Talk-off), and to detect the incoming CAS signal from the C.O, polluted with speech or music by the near end (Talkdown), a new feature is used : the Early Guard Time



Note : In the case above the EGT counter restarted 3 times. After a successful 10.3ms EGT, 3 drops occurred but without any effect because the duration and the number is less than the maximum permitted.

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CAS DETECT

PROCESS :

2b : Improved Process :

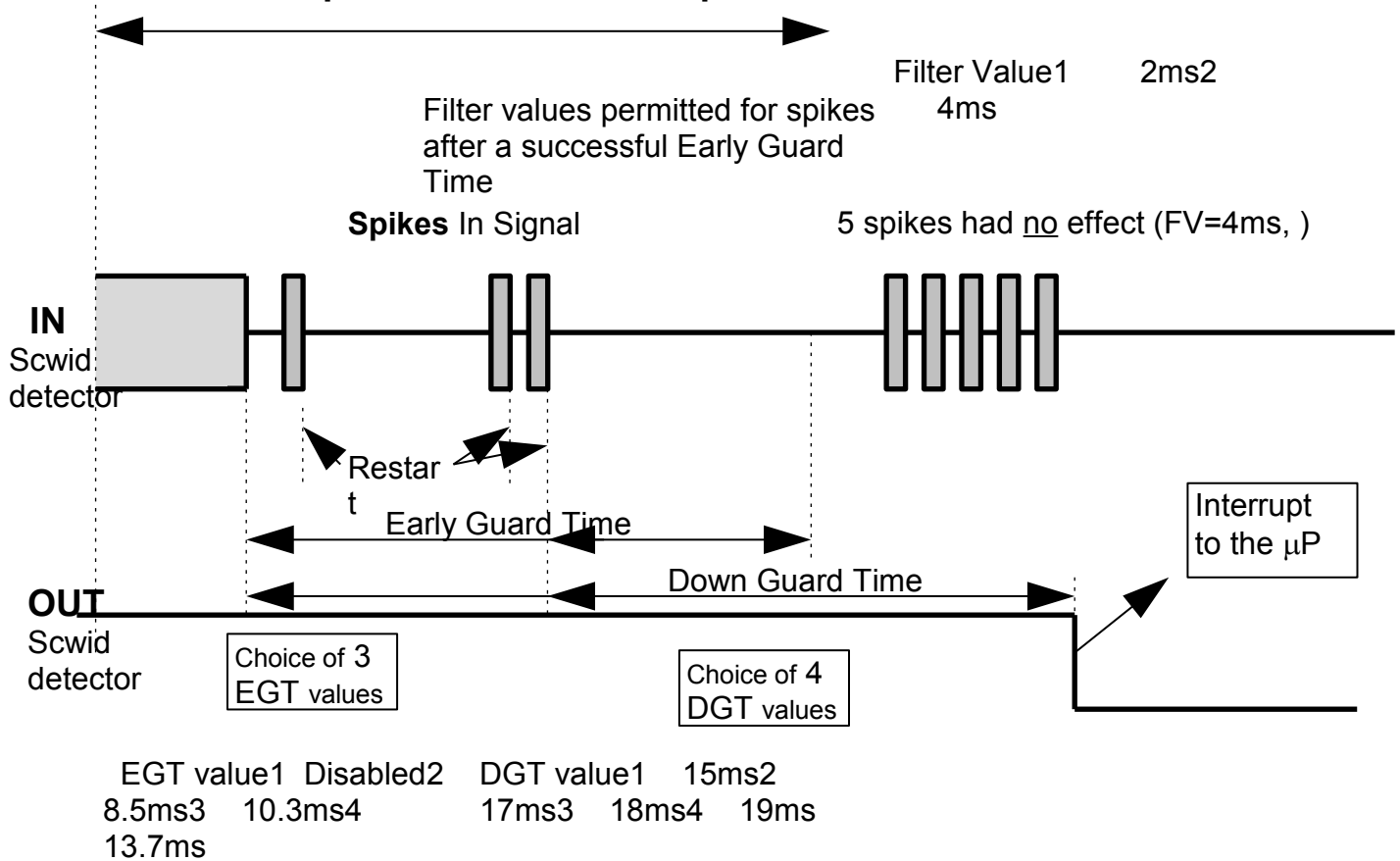
To prevent false detection from speech and music by the far and the near end (Talk-off), and to detect the incoming CAS signal from the C.O, polluted with speech or music by the near end (Talkdown), a new feature is used : the **Early Guard Time**

2- Early and Down Guard

CAS signal duration : 80 ± 5 ms

Time Frequencies : 2130 Hz + 2750 Hz

Mixed with speech and music frequencies



Note : In the case above the EGT counter restarted 3 times. After a successful 13.7ms EGT, 5 spikes occurred but without any effect because the duration is less than the maximum permitted.

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