Improving MT9122 Convergence time

Application Note

Contents

August 2003

Introduction

The MT9122 was primarily designed for network echo where the end path during a call is fixed. This allows the assumption that there will be no large fluctuations in echo speed (the echo delay, ERL and echo tail). For this type of system the MT9122 uses two different convergence speeds, fast and slow. Fast convergence is performed by adjusting the coefficients in large steps. This allows the FIR coefficients to converge quickly to the approximate values. When the coefficients are close to the proper values, the MT9122 switches to slow convergence. When in slow convergence, the coefficients are adjusted in small steps. This allows the coefficients to “fine tune” themselves to the echo path. The slow/fast convergence speed thresholds are shown in figure 2. The above description is true for echo paths with a Linear Echo Loss (LEL) of less than 30dB. For echo paths with LEL of more that 30 dB the MT9122 will always be in fast convergence. This can be allowed because at levels above 30dB the user cannot distinguish between the coefficient steps in fast convergence and the coefficient steps in slow convergence.

Since the MT9122 was developed for systems where the initial convergence would be on the desired end path, it was believed that the parameters of the slow/ fast convergence speed would not have to be change. It was intended that for all cases the default values would be used, therefore the upper convergence speed threshold register information was omitted from the data sheet, but is still accessible by the user. In developing the default convergence speed thresholds, Zarlink was very conservative. Convergence speed can be changed by modifying the value of the upper convergence speed threshold register.

Figure 1 shows the relevant power measurement points in the MT9122.

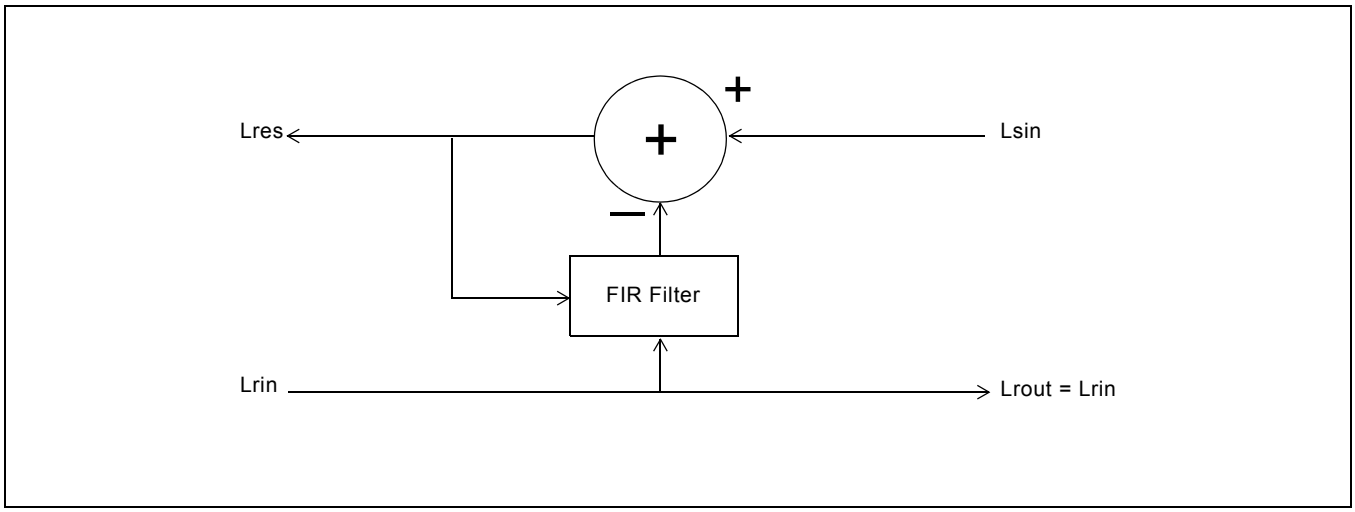

Figure 1 - MT9122 reference points

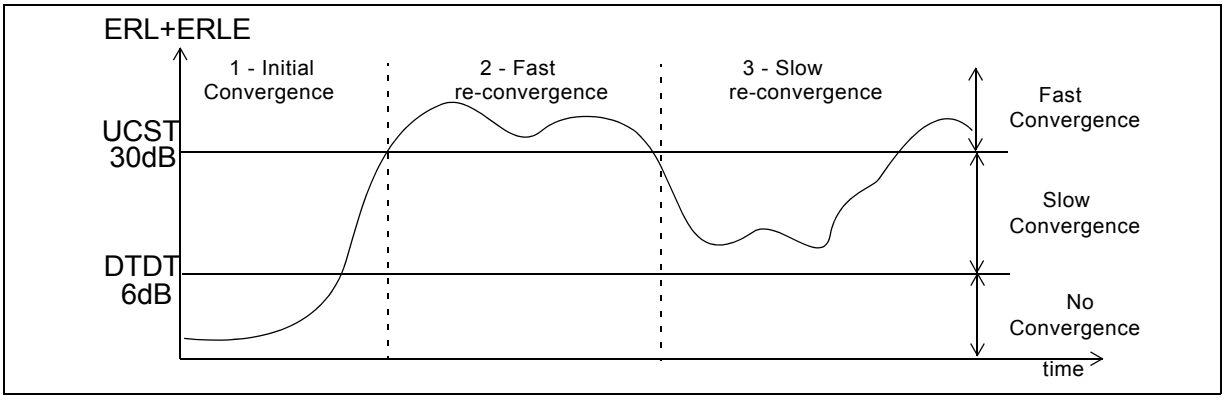

Figure 2 - Convergence Speed

Where:

ERL= Lrin - Lsin

ERLE=Lsin - Lres

UCST - Upper Convergence Speed Threshold (Default 30dB)

DTDT - Double Talk Detection Threshold (Default 6dB)

Explanation of Figure 2

The curve shown in Figure 2 represents the Linear echo loss (LEL) of the linear echo canceller portion of the MT9122 (ERL+ERLE). During initial convergence (section 1) the echo canceller is forced into fast convergence, once the LEL reaches the UCST (default = 30dB) the convergence algorithm is taken out of forced high convergence. Section 2 of figure 2, where the LEL is greater than 30dB, is the level were the MT9122 is always in fast convergence. Section 3 of figure 2, where the LEL drops below 30dB, is the level where the MT9122 performs a slow convergence. If the LEL decreases to less than the DTDT, the adaptation of the coefficients is frozen (double talk conditions).

Improving Convergence Time Performance

In developing the default convergence speed thresholds of the MT9122, Zarlink was very conservative. Convergence speed can be improved by changing the value of the UCST register (address 16hex & 17hex). This register is not discussed in the data sheet. By decreasing the UCST value (in dB), the LEL threshold, where the MT9122 switches into fast convergence, is lowered. This causes the MT9122 to converge faster on lower ERL signals. By setting the UCST to 12 dB, the convergence speed of the MT9122 is significantly decreased while still meeting all the G.165 requirements. Table 1 gives the register input values for corresponding UCST value.

Address 17/37hex (MSB)	Address 16/36hex (LSB)	UCST Value
04hex	00 hex	30dB
08 hex	00 hex	24dB
10 hex	00 hex	18dB
20 hex	00 hex	12dB
40 hex	00 hex	6dB

Table 1 - Register values vs. UCST values

For more information about all Zarlink products
visit our Web Site at

www.zarlink.com

TECHNICAL DOCUMENTATION - NOT FOR RESALE