

HRC Event Time Tag Investigation

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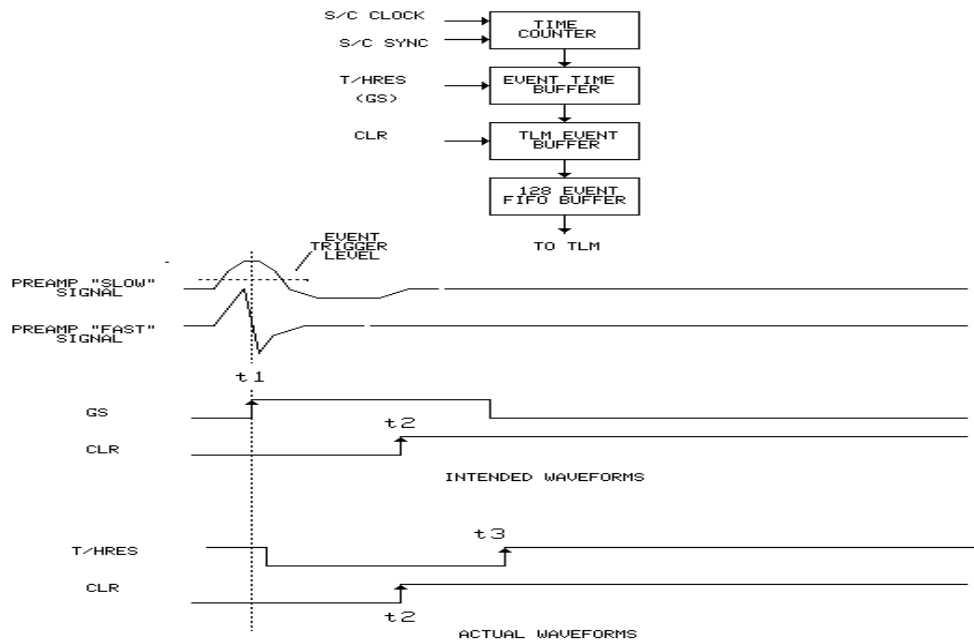
1. Summary

We found that an incorrect signal on the HRC motherboard was connected to the time tag circuit, the effect of which is to cause each telemetered event to have a time tag which is associated with the previous event, whether that previous event was telemetered or not.

2. Details

As shown in the diagram below, the HRC starts processing each event that exceeds the amplitude of the event trigger level at time t_1 . Time t_1 is derived from the zero crossing of the "FAST" signal, which occurs at a fixed time ($\sim 2\mu s$) after the onset of the event waveform. A signal called "GS", which is used to initiate many event processing functions, begins at this time. One of the functions of "GS" was to latch the content of the Time Counter into the Event Time Buffer. At time t_2 ($10\mu s$ after the onset of "GS"), a signal called "CLR" transfers the Event Time Buffer contents to the TLM Event Buffer for events that meet the criteria to be telemetered.

We found that a signal called T/HRES was connected to the Event Time Buffer instead of "GS". T/HRES is an inverted version of "GS", delayed by 0 to $1\mu s$. Since the time buffers transfer their data on the positive-going edge of their clock waveforms, this error delays the clocking of the Event Time Buffer until t_3 , which is *after* the Tlm Event Buffer transfer time, thus the time tag telemetered with each event actually belongs to the previous event. It is important to note that that previous event may or may not be telemetered. Events which are not telemetered are those excluded by the "validity" criteria (upper level discriminator, center blank, etc.) or those that are excluded because the event fifo is full, or the event processor is busy.



T1 INTENDED TIME TO LATCH TIME COUNTER READING INTO THE EVENT TIME BUFFER
T2 TIME WHEN EVENT TIME BUFFER CONTENTS ARE TRANSFERRED TO THE TLM EVENT BUFFER
T3 ACTUAL TIME WHEN TIME COUNTER READING IS LATCHED INTO THE EVENT TIME BUFFER

