Real-Time Distributed Embedded Oscillator Operating Frequency Monitoring

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A document discusses the utilization of embedded clocks inside of operating network data links as an auxiliary clock source to satisfy local oscillator monitoring requirements. Modern network interfaces, typically serial network links, often contain embedded clocking information of very tight precision to recover data from the link. This embedded clocking data can be utilized by the receiving device to monitor the local oscillator for tolerance to required specifications, often important in high-integrity fault-tolerant applications.

A device can utilize a received embedded clock to determine if the local or the remote device is out of tolerance by using a single link. The local device can determine if it is failing, assuming a single fault model, with two or more active links. Network fabric components, containing many operational links, can potentially determine faulty remote or local devices in the presence of multiple faults.

Two methods of implementation are described. In one method, a recovered clock can be directly used to monitor the local clock as a direct replacement of an external local oscillator. This scheme is consistent with a general clock monitoring function whereby clock sources are clocking two counters and compared over a fixed interval of time. In another method, overflow/underflow conditions can be used to detect clock relationships for monitoring. These network interfaces often provide clock compensation circuitry to allow data to be transferred from the received (network) clock domain to the internal clock domain. This circuit could be modified to detect overflow/underflow conditions of the buffering required and report a fast or slow receive clock, respectively.

This work was done by Julie Pollock, Brett Oliver, and Christopher Brickner of Honeywell, Inc. for Johnson Space Center. For further information, contact the JSC Innovation Partnerships Office at (281) 483-3809. Title to this invention has been waived under the provisions of the National Aeronautics and Space Act (42 U.S.C. 2457(f)), to Honeywell, Inc. Inquiries concerning licenses for its commercial development should be addressed to:

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