

# Dynamic Delay Control in the Intraplex<sup>®</sup> SynchroCast3<sup>™</sup> System



Intraplex<sup>®</sup> SynchroCast3<sup>™</sup>, the latest simulcasting system from Harris, provides a tightly controlled, scalable solution for single-frequency FM networks of overlapping transmitters. The system uses proven Intraplex T1/E1/IP multiplexers, together with the precision of GPS digital timing, to enable a network of transmitters to work together to increase broadcast coverage areas and reduce interference between adjacent transmitters.

Key to the successful operation of the system is a mechanism that provides dynamic, hitless delay control. When a SynchroCast3 system is first installed, the system engineers determine the precise amount of audio transport delay — referred to as the target delay — that they want from the studio to each transmitter and booster site. This enables an optimum coverage pattern with minimal interference in the most important reception areas.

The SynchroCast3 system achieves delay control by first determining the actual delay on the circuit using a comparison of the time stamps derived from GPS clocks at the studio and the transmitter site. Then, SynchroCast3 calculates and adds the exact amount of additional delay to reach the target delay, which is then locked to an accuracy of  $\pm 0.2 \mu\text{s}$ . Maintaining a high level of target delay accuracy is critical to the performance of any synchronous FM system.

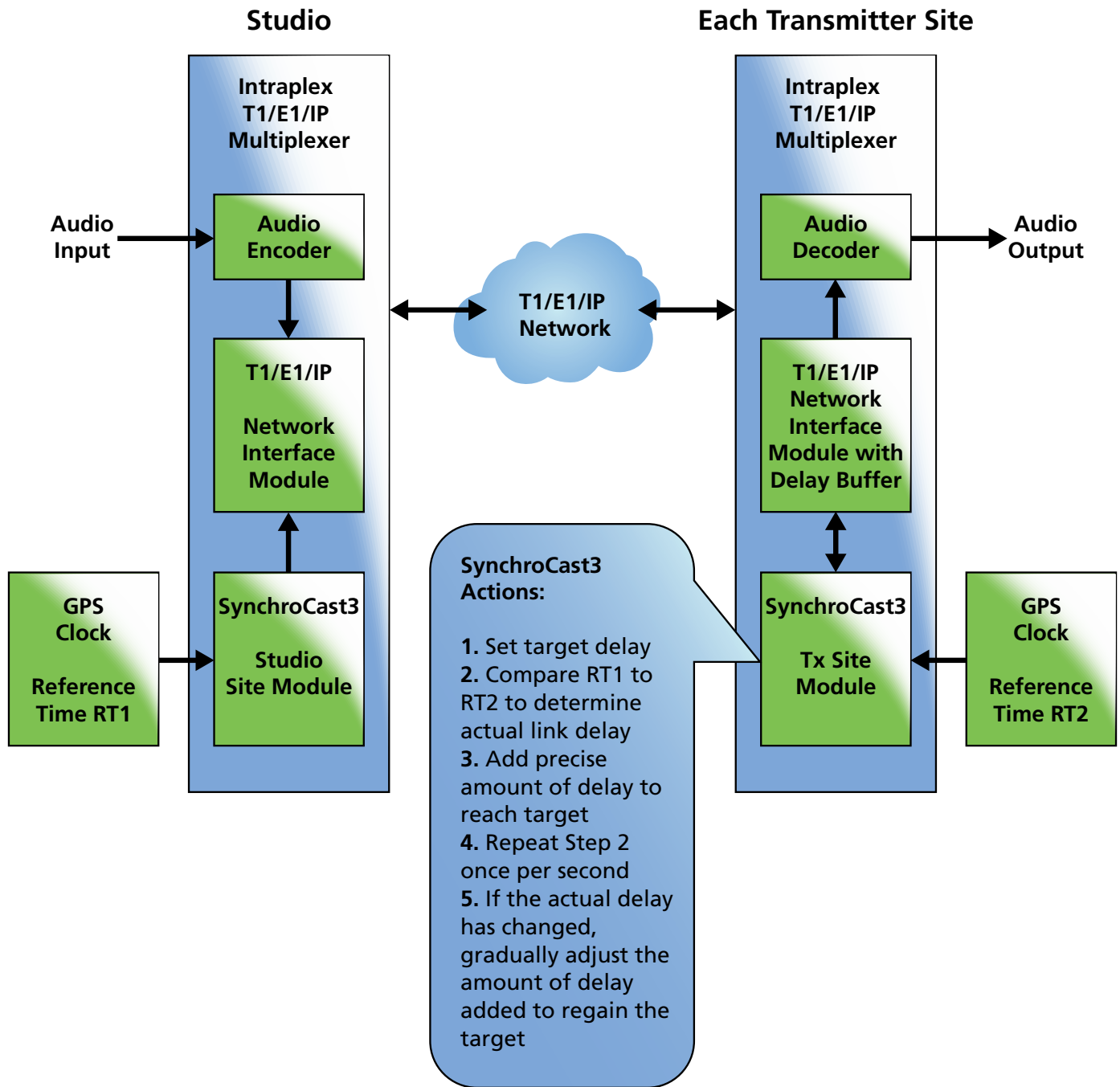
Another critical element is the fact that the actual delay on the studio-to-transmitter link (STL) circuit can change over time. T1 and E1 circuits tend to have fairly stable delay characteristics, typically in the 3-8 mS range. Public

networks, however, are subject to rerouting. This means that the phone company or service provider can shift the data to a different physical network path in the event of hardware fault or excessive congestion. Rerouting can cause a sudden and dramatic change in the overall circuit delay and can happen as often as several times each day, without warning.

IP packet networks are even more prone to delay variation than T1/E1, in the form of jitter due to packet routing and buffering. Even point-to-point microwave links can be subject to variable delays as a result of data buffering in modems or other equipment.

To counteract this, the SynchroCast3 system constantly monitors the actual STL path delay, and as soon as it varies beyond the  $\pm 0.2 \mu\text{s}$  window, the system automatically changes the amount of added delay to restabilize the total to the predetermined target amount. What's more, SynchroCast3 performs this hitlessly — that is, with no interruption whatsoever to the broadcast audio signal — and at a controlled rate to prevent overshooting the target.

Only SynchroCast3 provides this type of dynamic and hitless delay adjustment in single-frequency networking. With the proven reliability of Intraplex technology and the flexibility to operate over T1, E1 and IP networks (and even a combination of T1/E1 and IP), SynchroCast3 offers the highest level of quality obtainable on synchronous FM networks today.



For more information, please visit [www.broadcast.harris.com](http://www.broadcast.harris.com).

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