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Maritime Information:

TIME OF TRANSMISSION (TOT)

## Time of Transmission Control (TOT)

### NOTICE:

The Great Lakes (8970) and North East US (9960) Loran Chains are operating under TOT Control as of 0300Z on 17 Jan 2007

**Background:** Under the System Area Monitor (SAM) Control method each Master station's transmissions are synchronized to Universal Time Coordinated (UTC) as provided by the U.S. Naval Observatory (USNO). By law, the Master stations transmissions should be within 100 nanoseconds of UTC. Intra-Chain timing (the time difference between the Master and each Secondary station) is monitored and controlled through the use of remote monitor receivers located in the advertised coverage area. This method of control can lead to large offsets in the stations timing, predominately caused by weather. Another source of error is the UTC offset on the master stations. Although the Master stations are tied to the same reference, cross chain navigation errors increase the further the two chains are separated from the UTC reference and each other.

**TOT Control:** The basic chain structure will continue unchanged, but under TOT Control timing is held constant at each transmitting station rather than in the far field. This method of timing control will no longer rely on the remote monitor sites to control the intra-chain timing. The Master station's transmissions will continue to be synchronized to Universal Time Coordinated (UTC). Rather than controlling the local station clocks independently, they have been grouped into an ensemble that further improves their accuracy and stability with respect to UTC. By removing the monitor sites as the control point for intra-chain timing, each secondary station will also be synchronized to UTC and will transmit after master using a predetermined emission delay. This will improve the timing stability within the chain as well as reducing the potential errors involved with cross chain, or all in view, navigation. Synchronizing the secondary stations to UTC will also improve the delivery of absolute time to the timing community. Timing users will be able to lock onto the strongest signal available vice just the Master Stations.

**Accuracy:** This change in control methods is expected to improve the absolute accuracy of the system for navigation and timing users. These changes however are expected to reduce the level of repeatable accuracy that the current control method provides.

- [USCG "Homeport" Website](#)
- [Vessel Traffic Services](#)
- [Global Maritime Distress and Safety System](#)
- [CG Nat'l Distress System](#)
- [Digital Selective Calling](#)
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**Timing Users:** Timing corrections will no longer be needed to compensate for clock drift and propagation effects in the far field (i.e. weather, diurnal variations, etc). Timing users will see a reduction in the amount of timing corrections they have traditionally seen while the system was operating in SAM Control.

**Navigation and Positioning Users:** Users of Loran (e.g. users not using an all in view receiver) will likely see some change in service resulting from shifting to TOT control. In order to minimize these impacts the CG will:

- Keep the Master Stations synchronized to UTC-USNO
- Retain the current Blink criteria:
  - The timing tolerance remains at +/- 100nSec for Maritime users and +/- 500nSec for Aviation users. However, these values are now measured at the transmitting stations vice a location in the user area.
  - The ECD tolerances remain unchanged. We will continue to blink if the pulse shape exceeds the specified tolerances.
  - The stations will continue to blink when their output power falls below 70.7% of their rated power output.
- Blink all secondary stations when the Master station is out of tolerance (except for confirmed off air periods).
- Detect propagation conditions & solar events that may impact the user's ability to lock on and properly track the signal and blink when the signals are outside the specifications.
- Continue to solicit for user objections for all scheduled outages.
- Notify the users of all scheduled and unscheduled signal outages.

**Implementation:** The initial testing of this control concept will be conducted on the Great Lakes (Rate 8970) and North East US (Rate 9960) Chains on 17 Jan 2007. Once the testing is completed and the system is certified, we plan on implementing this control method on a chain-by-chain basis.

**Emission Delay Values:** The Coast Guard has determined there will be changes in the Emission Delay values published in the Specification of the Transmitted Loran-C Signal, COMDTINST M16562.4A (1994)\*. As we transition to TOT Control the Emission Delay values will be updated on this website and later included in an update to the Signal Specification. All values below are in microseconds.

**8970 – Great Lakes**

Station	Published Value*	Emission Delay Number
M	N/A	0.00
W	14355.110	14355.780
X	31162.060	31162.200
Y	47753.740	47753.420
Z	63669.460	63669.660

**9960 – North East US**

<b>Station</b>	<b>Published Value*</b>	<b>Emission Delay Number</b>
M	N/A	0.00
W	13797.200	13797.580
X	26969.930	26969.430
Y	42221.650	42221.460
Z	57162.060	57162.000

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