

CHANGE

U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION

6860.2
CHG 4

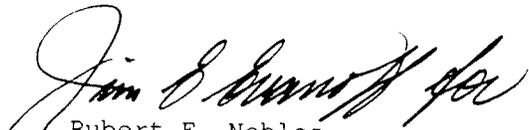
5/27/94

SUBJ: MAINTENANCE OF LORAN-C MONITOR EQUIPMENT

1. PURPOSE. This change provides geographic location information for the various LORAN-C transmitter chains in the continental United States (CONUS) This change implements Configuration Control Decision (CCD) No. N16697, Include Transmitter Chain Information in Order 6860.2.
2. DISTRIBUTION. This directive is distributed to selected offices and services within Washington headquarters, regional Airway Facilities divisions, the FAA Technical Center, the Mike Monroney Aeronautical Center, and Airway Facilities field offices having the following facilities/equipment: ARTCC, VOR, and RMCF.
3. DISPOSITION OF TRANSMITTAL. Retain this transmittal.

PAGE CONTROL CHART

Remove pages	Dated	Insert pages	Dated
v	3/21/90	v	5/27/94
3 and 4	3/21/90	3	3/21/90
		4	5/27/94
		4-1 thru 4-3 (and 4-4)	5/27/94



Rubert E. Nobles
Acting Director, Operational Support

Distribution: Selected Airway Facilities Field
and Regional Offices, ZAF-601

Initiated By: AOS-240

Chapter 6. SECURITY

120.	General	35
121.	Security Safeguards	35

Appendix 1. CERTIFICATION REQUIREMENTS

Table 1.	LORAN-C Monitor System	1
----------	------------------------------	---

LIST OF ILLUSTRATIONS

<i>Figure</i>		<i>Page</i>
2-1.	LORAN-C Measured Position	3
2-2.	LORAN-C Chain Timing	4
* 2-2A.	Great Lakes Chain	4-1
2-2B.	Northeast U.S. Chain	4-1
2-2C.	U.S. West Coast Chain	4-2
2-2D.	Southeast U.S. Chain	4-2
2-2E.	South Central U.S. Chain	4-3
2-2F.	North Central U.S. Chain	4-3
2-3.	LORAN-C Pulse	5
2-4.	LORAN-C Signal Transmission	5
2-5.	LORAN-C Monitor VORTAC/Facility Interface	6
2-6.	Relationship of Units	7
2-7.	Receiver Functional Block Diagram	8
2-8.	Monitor Processor Functional Block Diagram	9
2-9.	Simulator Functional Block Diagram	10
2-10.	Power Supply/Battery Pack Functional Block Diagram	10
2-11.	Front Panel Display Functional Block Diagram	11
2-12.	Antenna Coupler Functional Block Diagram	12

CHAPTER 2. TECHNICAL CHARACTERISTICS

20. PURPOSE.

The LORAN-C monitor provides continuous monitoring of the LORAN-C signals from a single chain of stations

and compares the measured values with expected values for the geographic position of the monitor.

21.-29. RESERVED.

Section 1. DESCRIPTION

30. GENERAL.

This section contains a general discussion of the LORAN transmitter and the LORAN-C monitor system operation, concepts, and usage. Detailed descriptions can be found in the equipment instruction book.

are received from each ground station. By noting the time when each signal arrives at the receiver, a time difference between signals can be computed. This TD establishes a hyperbola upon which the receiving antenna must lie. This is called line of position (LOP). Correctly fixing a position requires computing at least two LOP's from two station pairs. The intersection of two LOP's determines a single position on the earth's surface where the receiving antenna is located. Adding more LOP's enhances the accuracy of this position-determining process. Figure 2-1 shows the LOP when the measured position is calibrated against the known position of a fixed, surveyed location.

31. BASIC CONCEPTS.

a. General. The LORAN (LONG-RANGE Navigation) is a pulse-type radio navigational system consisting of several ground-based transmitters. A navigation receiver precisely measures the time difference (TD) when signals

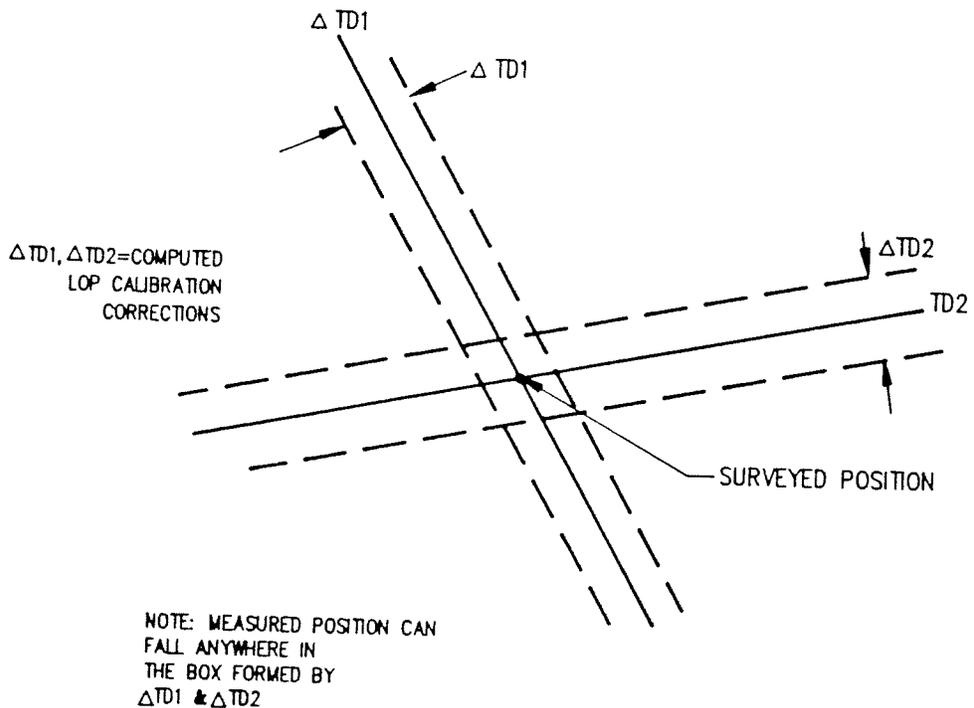


Figure 2-1. LORAN-C Measured Position

(1) Chains. LORAN stations are grouped into "chains," with each chain consisting of a single master station and two to four secondary stations. Typically, the LORAN stations for a given chain are positioned several hundred miles apart and are selected and organized to provide service to a particular primary area. Each secondary station transmits a group of eight radio pulses at precisely timed delays after the master transmits its nine pulses. Each delay is so picked that the stations are always received in transmission order anywhere in the coverage area. Knowing these delays and the precise location of each transmitter, the receiver can establish a LOP for each of the master-secondary pairs.

may be distinguished by different phase codes. The phase of the carrier for each of the eight pulses is set for 00 or 180 degrees in a predetermined pattern. The receiver can use this pattern to differentiate master and secondary stations.

(2) Phase Codes. Master and secondary stations

(3) Group Repetition Interval. Each station in a chain transmits its pulses repeatedly on a previously determined interval called a group repetition interval (GRI). The GRI's typically range in time periods from 40,000 to 1,000,000 microseconds. Each chain is assigned a unique GRI, which the receiver uses to identify the LORAN chain of interest. Figure 2-2 shows LORAN-C chain timing. Figures 2-2A through 2-2F show LORAN-C transmitter chain locations. *

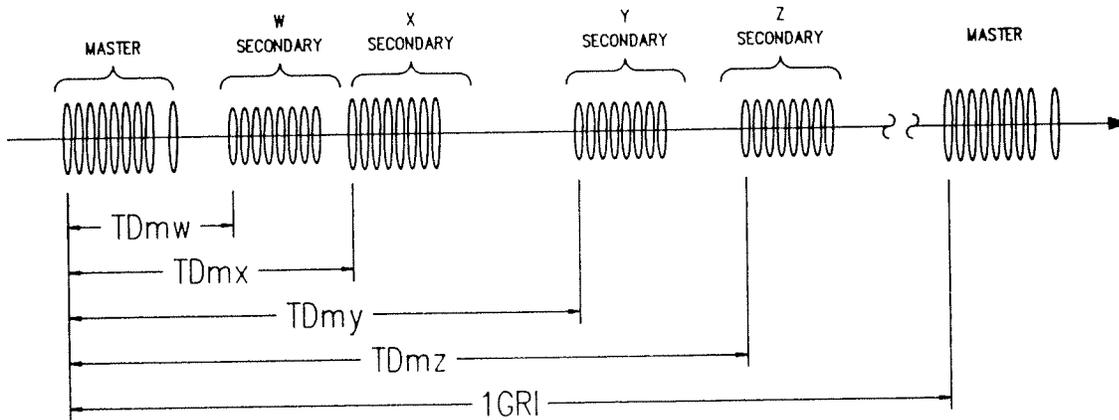


Figure 2-2. LORAN-C Chain Timing

(4) Signal Transmission. Each of the pulses that are transmitted by a station consists of a 100kHz carrier and an exponential envelope, as shown in figure 2-3. The low frequency carrier travels very well along the ground, but a part of the transmission is reflected off the ionosphere.

This portion of the signal (called the skywave) is received later than the portion which travels along the ground (groundwave). Figure 2-4 shows the groundwave/skywave transmission.

GREAT LAKES CHAIN
GROUP REPETITION INTERVAL (GRI) 8970
BAUDETTE, MN



Figure 2-2A. Great Lakes Chain

NORTHEAST U.S. CHAIN
GROUP REPETITION INTERVAL (GRI)

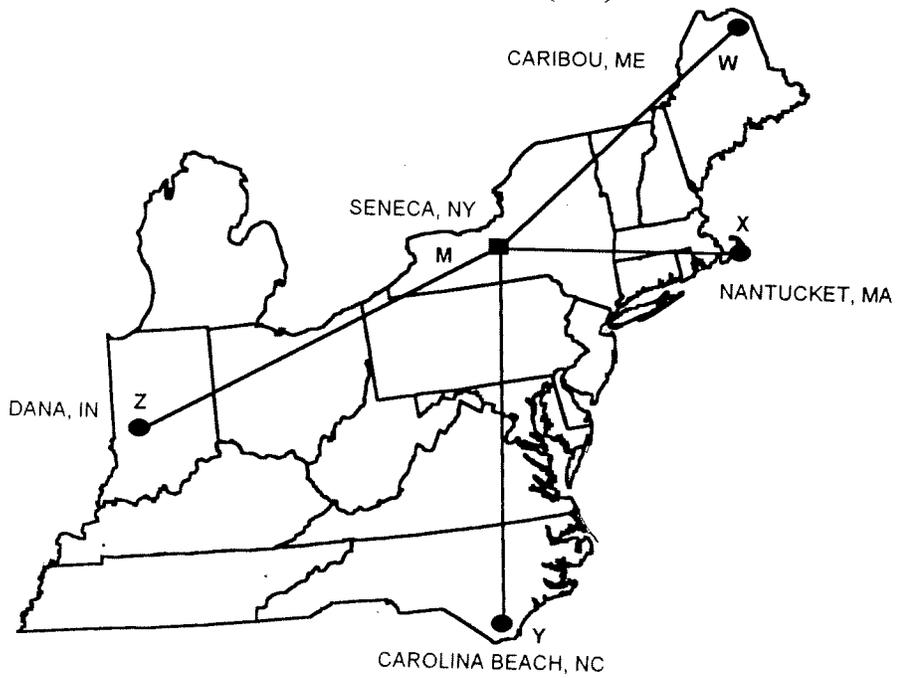


Figure 2-2B. Northeast U.S. Chain

**U.S WEST COAST CHAIN
GROUP REPETITION INTERVAL (GRI) 9940**

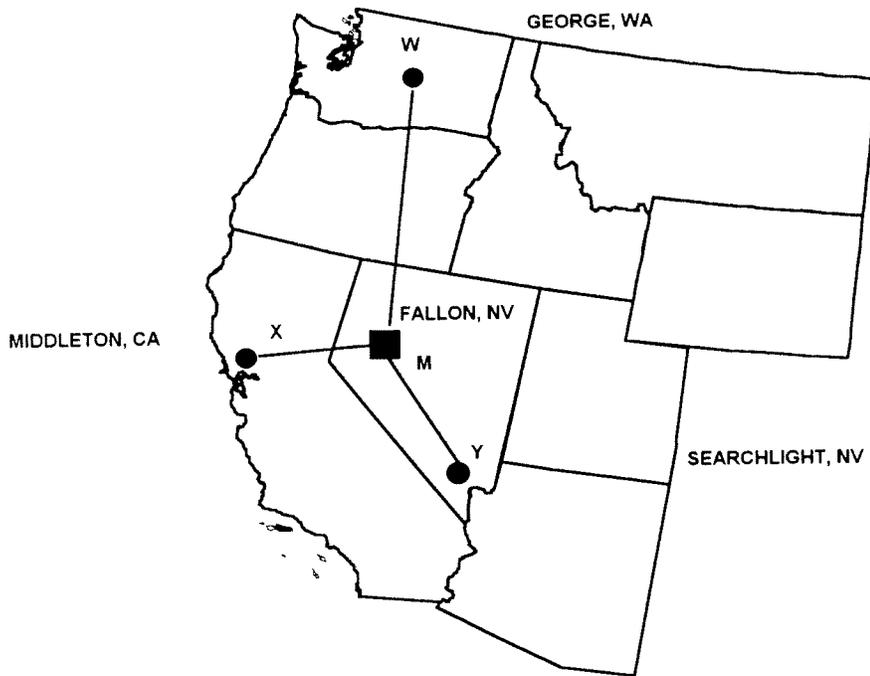


Figure 2-2C. U.S West Coast Chain

**SOUTHEAST U.S. CHAIN
GROUP REPETITION INTERVAL (GRI) 7980**

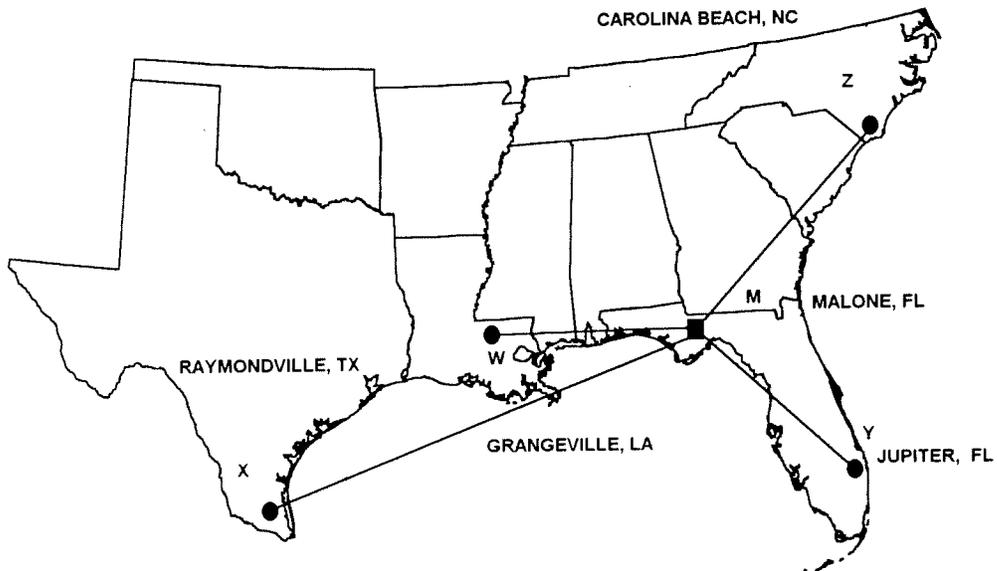


Figure 2-2D. Southeast U.S. Chain

**SOUTH CENTRAL U.S. CHAIN
GROUP REPETITION INTERVAL (GRI) 9610**

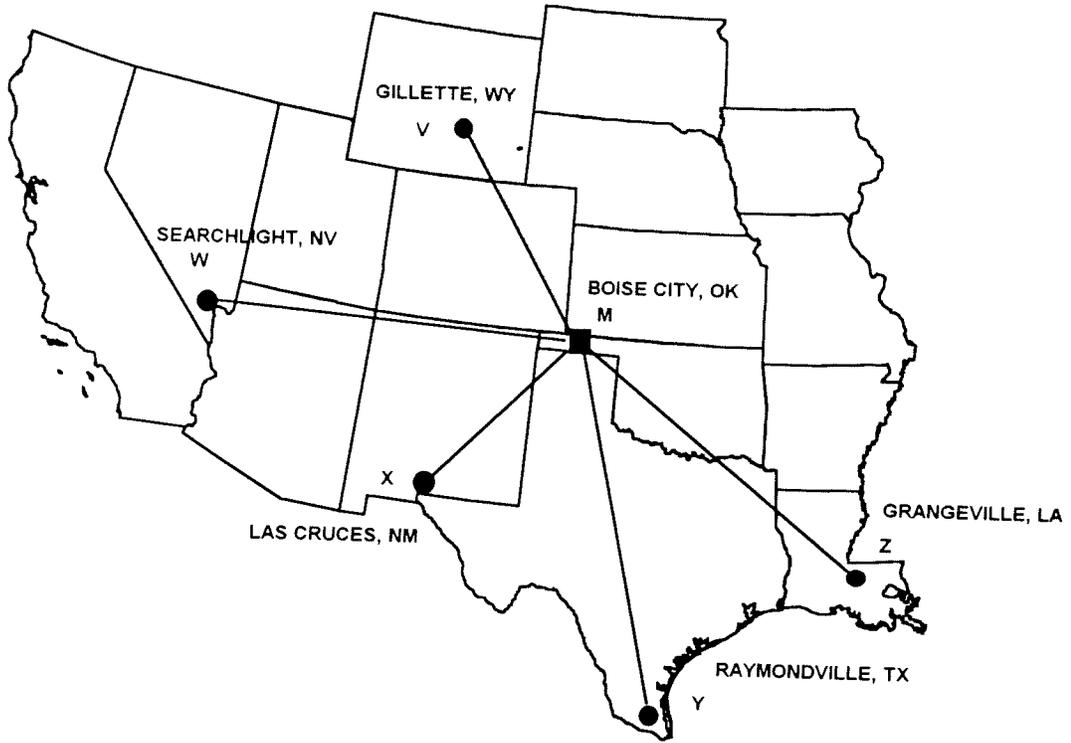


Figure 2-2E. South Central U.S. Chain

**NORTH CENTRAL U.S. CHAIN
GROUP REPETITION INTERVAL (GRI) 8290**

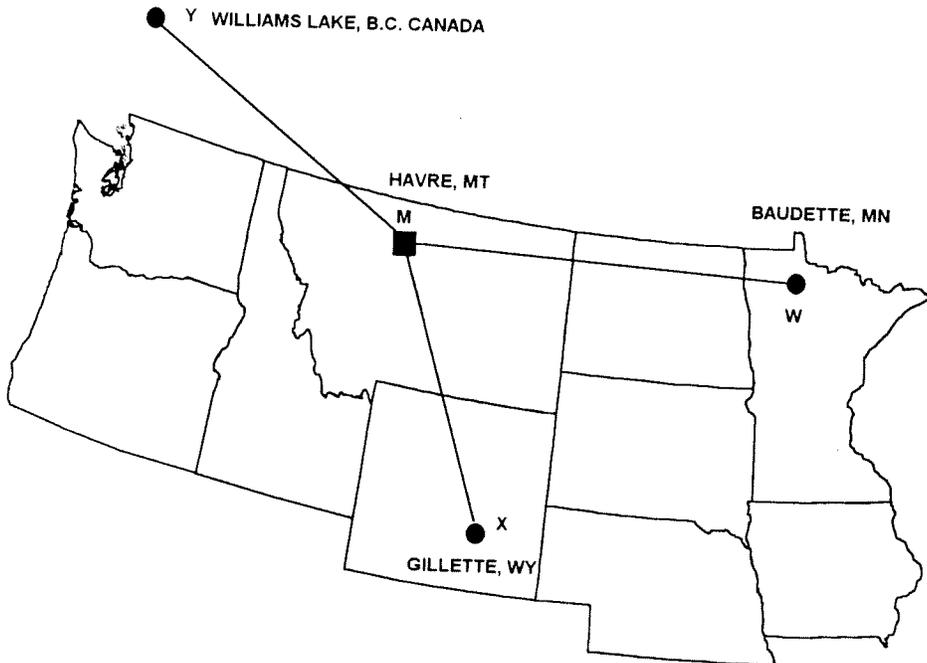


Figure 2-2F. North Central U.S. Chain

