International Loran Association - Receivers and Coordinate Conversion

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We often receive questions about Loran-C receivers, or about conversion of coordinates from Loran-C to GPS, or from Loran-C TDs to latitude and longitude. This page started with some references collected by ILA member Bill Brogdon. We'll add to this list from time to time. Your contributions are welcome!

Scroll down to see the entire list.

New! a link to Loran-C Coordinate Conversion Software from Dr. Paul Williams, Univ. Wales

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Converting Waypoints from Loran-C to GPS - Bill Brogdon, ca. 2000

Suppose you already have good, measured Loran-C waypoints, and want to enter them in a GPS receiver. This is a good idea; it allows you to use the two systems as a check on each other. But Loran-C waypoints are best described by time delay (TD) readings; the latitude and longitude that a Loran-C receiver calculates differs from the correct values by up to a few hundred yards. Using the latitude and longitude of a Loran-C waypoint as a GPS waypoint thus introduces large errors. Going to each Loran-C waypoint and storing the measured position with the GPS receiver gives excellent results, but is time-consuming.

Some GPS receivers can calculate Loran-C TD numbers from the GPS latitude and longitude. You can also enter a waypoint in Loran-C TDs in these receivers. However, these TD calculations also have the same inaccuracies that cause the latitude and longitude calculated by a Loran-C receiver to differ from the correct values.

Don't confuse these GPS receivers with ones that measure Loran-C TDs with an internal loran receiver. Trimble, Raytheon, and others have produces units that include both Loran-C and GPS receivers. They give TDs as accurate as any stand-alone Loran-C receiver.

If you are going to a waypoint well clear of hazards, marked by a large buoy, you can simply use the calculated latitude and longitude as the GPS waypoint. The problem occurs when it is foggy, or if you are heading to a waypoint marking an underwater wreck or rock. You must be as accurate as possible in these cases, or you will miss them entirely. We have worked out a way of converting Loran-C waypoints to GPS waypoints that has shown good accuracy in our tests.

First go to a convenient position clear of obstructions, and stop the boat. It's best to be in open water rather than in the marina. Large bridges can distort the Loran-C signals, and big buildings can reflect the GPS signals. You want to make a comparison free of such disturbances. Check both Loran-C and GPS receivers to be sure that the numbers aren't ``jumping around.'' Check that the Loran-C is locked on the usual TDs, that the SNR is high, and that the GPS has low PDOP and high signal quality. Save a Loran-C and a GPS waypoint at the same time. Shift the Loran-C receiver to indicate latitude and longitude, and compare them with the GPS position at the ``common waypoint.''

This is sample data taken in our area:
GPS   N 34? 42.040' W 76? 59.172'
Loran-C N 34? 41.97'   W 76? 59.13'

_____
difference   .07'   .042'

With these two receivers, in this area, adding these differences to Loran-C waypoints gives the latitude and longitude to be entered into the GPS receiver. It has shown good accuracy.

There are some precautions. First, use your own receivers. Two other receivers at the same spot gave corrections of +.23 minutes of latitude and and +.16 minutes of longitude. Second, the corrections are valid over relatively short distances. Due to the way that most Loran-C receivers apply ``ASF'' corrections, they will be most accurate within the one-degree square containing the common waypoint. The corrections in the example are most accurate from 34? N to 35? N, and from 76? W to 77? W. Only a few hundred yards to the west, beyond 77? W, new corrections are necessary for the highest accuracy. Third, when you do go to each waypoint, save it in the GPS receiver. That is the most accurate GPS data.

Some GPS receivers allow you to enter a waypoint as a range and bearing from a known position. You could use the Loran-C receiver to find range and bearing from the common waypoint to other waypoints, for entry as GPS waypoints. This is not a good idea; the bearings are only accurate to one degree. At ten miles, there will be an error of about 350 yards, at twenty miles, 700 yards. It's more accurate to use corrections to Loran-C receiver-determined latitude and longitude to establish GPS waypoints.

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From Captain Brogdon's book *Boat Navigation for the Rest of Us,* **International Marine**
available from the author: brog@clis.com

02/13/03

Avmar Technical Services
1541 Silverlace Ct.
Gulf Breeze FL 32563.
 850 432-8820

They repair Micrologic receivers and have parts, manuals, etc.

9/30/02

We don't know of any aviation Loran-C receivers being manufactured. There is one marine receiver on the market, and it is a good one:

http://www.furuno.co.jp/english/pdf/LC90MK2.pdf

It is available from the usual discounters such as:

http://www.cyber-marine.com/bridges/20582.html

From Bill Brogdon: The conversion from Loran TDs to latitude and longitude is quite complex and requires ground conductivity data that isn't available readily.

All Loran receivers except ancient ones can convert TDs to Latitude and Longitude. Just change the display from TD to L/L. Many GPS receivers can make the same conversion by entering a waypoint in Loran TDs and then displaying it in latitude and longitude. However, the error in these conversions are up to 500 yards or so. That's fine for clear-weather navigation, but not for foggy weather or for finding underwater objects.

There is a good commercial program to convert Loran TDs to latitude and longitude with reasonable accuracy, store waypoint data, and print charts showing the waypoints.

ANDREN SOFTWARE CO.
906 S. Ramona Ave.
Indialantic, FL 32903-3435
(321) 725-4115
Look at http://www.andren.com/

There is a public-domain program available here on the International Loran Association home page at

http://www.loran.org/   Click here to download gptotd.zip and GPtoTDNotes.txt

The NOS and USCG programs run under DOS, and aren't as accurate as the Andren program, or as easy to use, and do not create data bases, but they are free.

For somewhat improved accuracy with the NOS and USCG programs use the ASF tables available from NOS at http://chartmaker.ncd.noaa.gov:80/MCD/loranc.htm

For the highest accuracy with any of the programs you must establish local corrections by simultaneous Loran-C and GPS observations near the area of interest.

Bill Brogdon - 9/2002

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