



USING THE GPS DATABASE EDITOR

The **GPS DATABASE EDITOR** (aka **TELEMETRY DATA EDITOR**) is the mechanism by which you can apply and modify GPS Telemetry data on the output signal channels. Telemetry data is composed of Legacy Subframes (1-5), L₂C / L₅ Data and Messages, and L₁M / L₂M Data and Messages.



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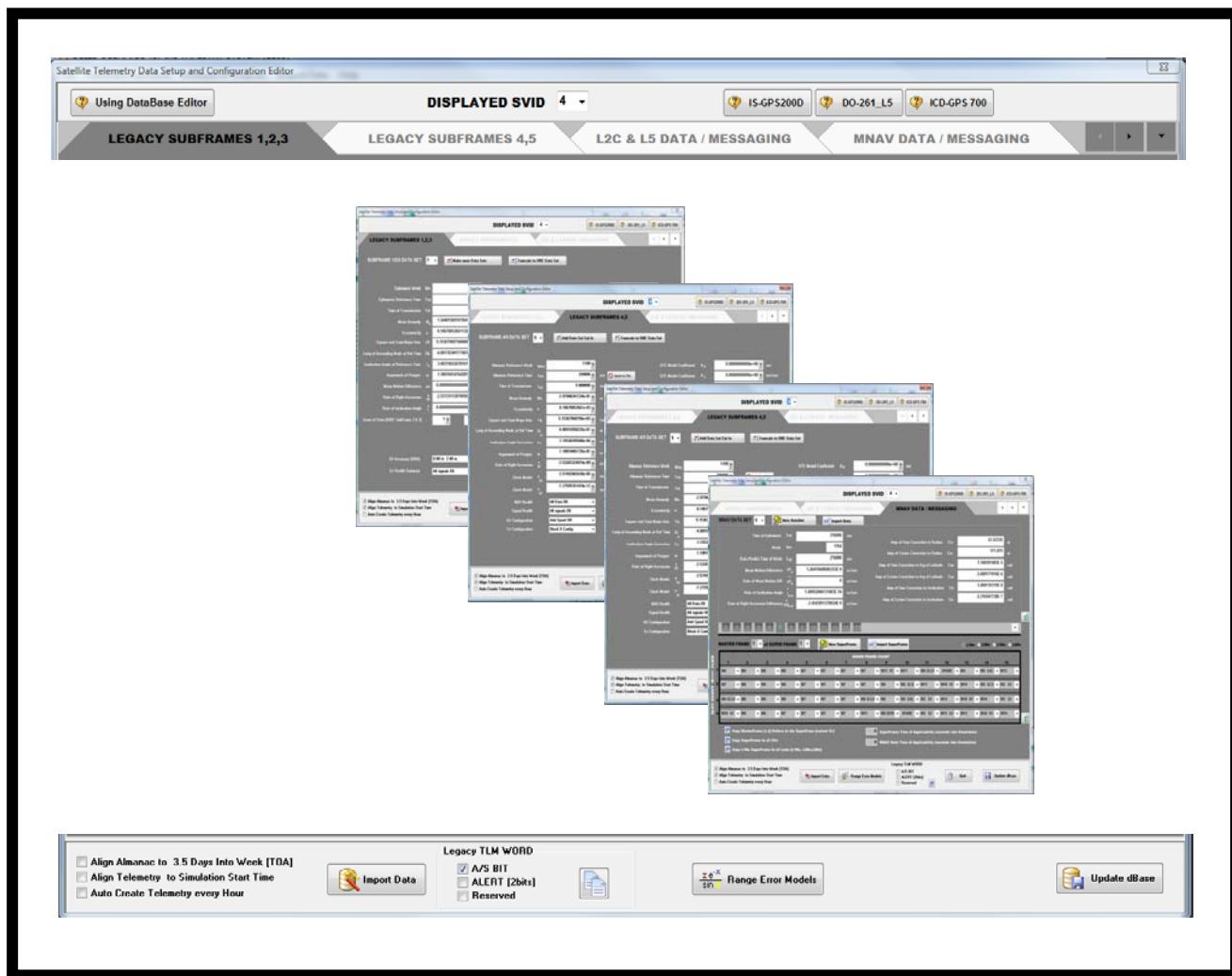
GPS DATABASE EDITOR

The **GPS DataBase Editor** is a component of the Tapestry system accessed through the **Build Scenario Application**.

Access the **DATABASE EDITOR** using the main pulldown menu

 GPS Space (SS) and Control (CS) Segments

The **DATABASE EDITOR** is comprised of 3 interactive components; the **Tab Bar**, **Data Forms**, and **Setting & Control**. Their location is shown below with a description of their use.



INTERFACE ELEMENTS FOR GPS DATABASE EDITOR



TAB BAR

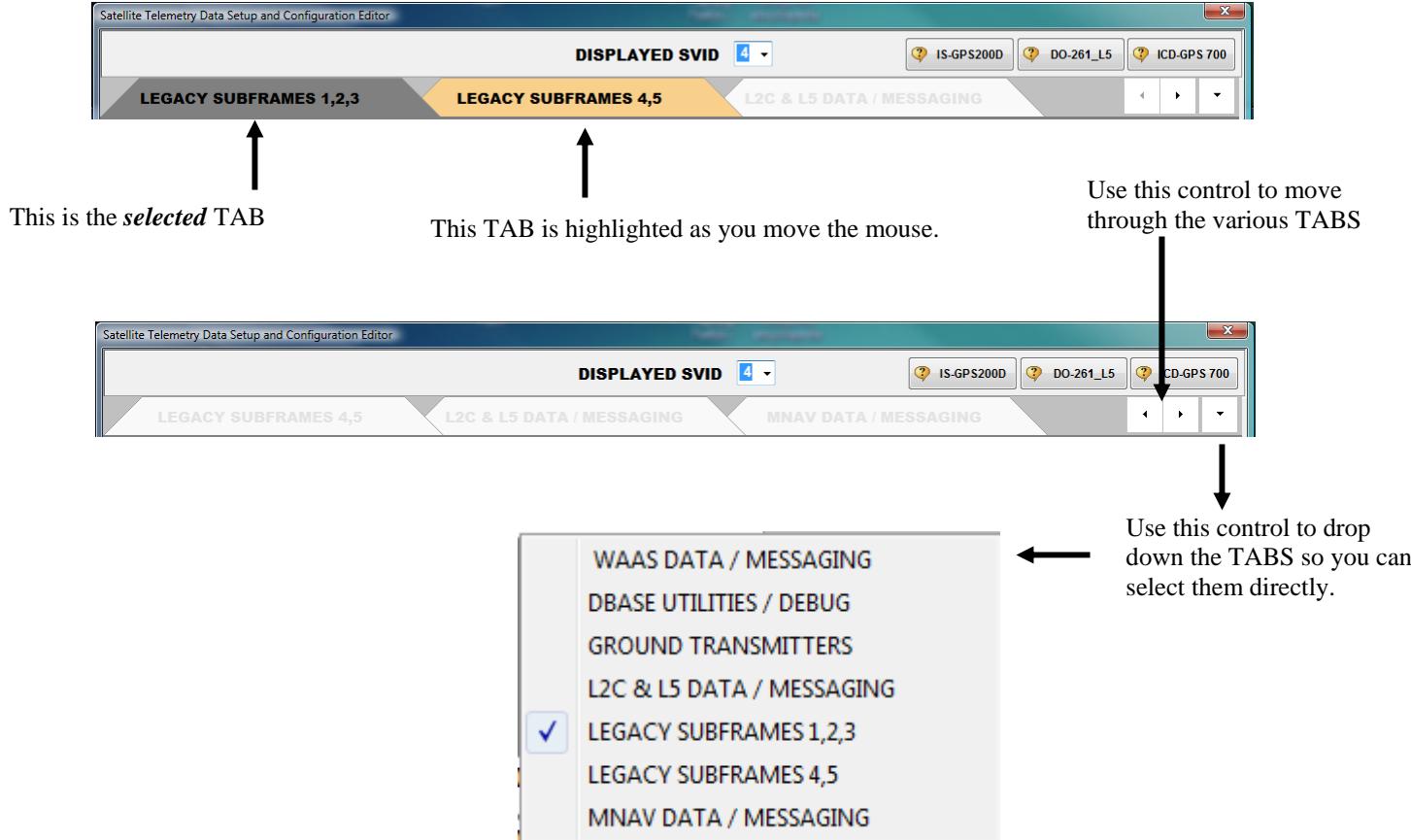
This is the gateway to GPS Telemetry data. As you work through the various pages and tabs note that ALL displayed data applies to the **DISPLAYED SVID**. Use this control to access and edit the satellite specific content of the data forms.

TAB BAR

- Set the applicable SVID
- Select TAB leading to the desired Telemetry data form



Due to screen real-estate limitations, not all of the data forms will fit on the TAB bar. Move the mouse over the other tabs and they become highlighted.

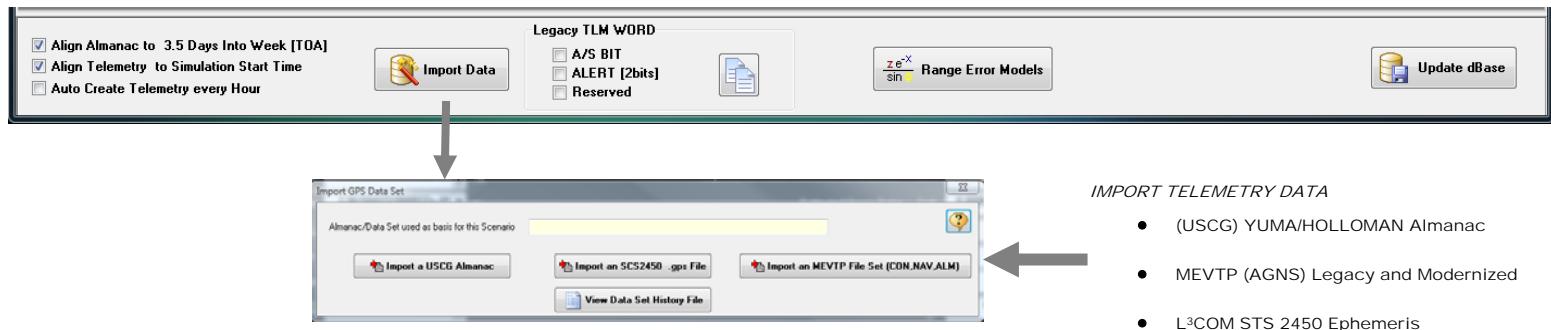




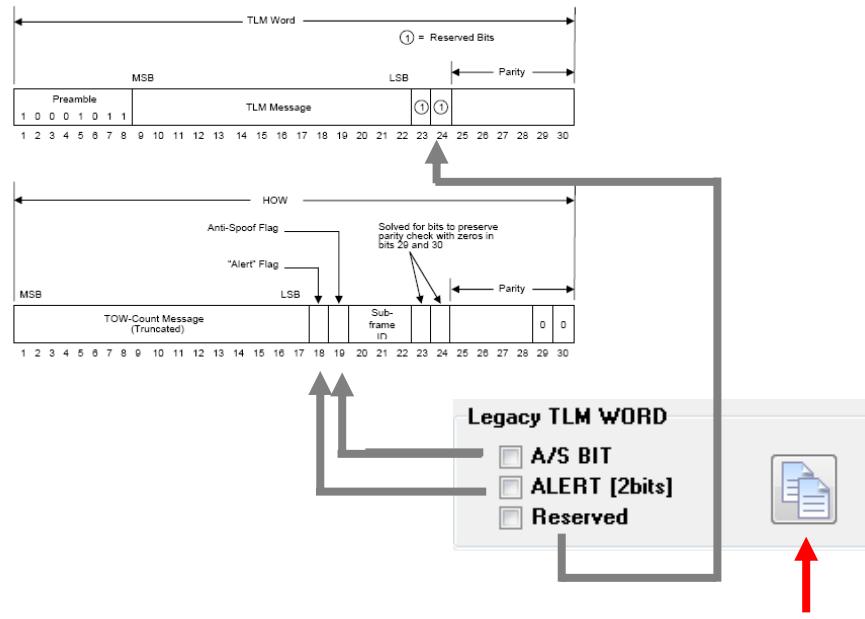
GPS FUNCTION BAR

GPS FUNCTION BAR

The function Bar provides a gateway to the Range Error Models, the Legacy Telemetry word, data alignment, and dBase functions.



Legacy Telemetry (TLM) Word



This moves the ALMANAC TOA to middle of the week (*real-world*) → Align Almanac to 3.5 Days Into Week [TOA]
TELEMETRY Data is propagated to Simulation Start Time → Align Telemetry to Simulation Start Time
 Auto Create Telemetry every Hour

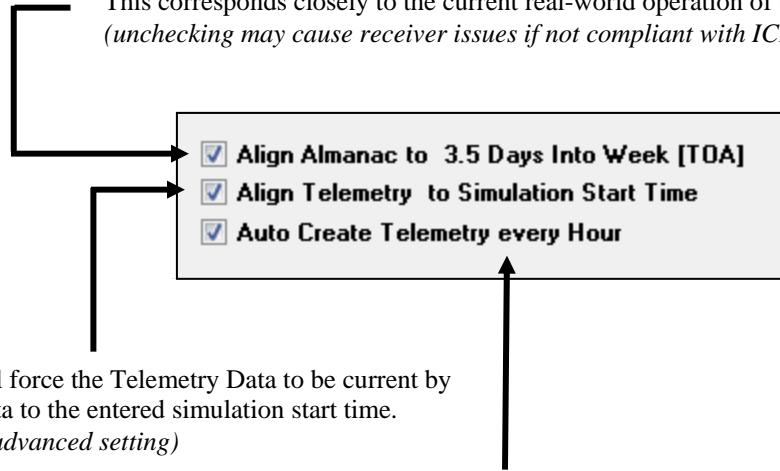
See these Documents for a detailed description of the DataBase Editor and Alignment options. [FREQUENTLY ASKED QUESTIONS.PDF](#)



EPOCH ALIGNMENT FUNCTIONS

EPOCH ALIGNMENT FUNCTIONS

Set this item to force the Time-of-Almanac to be moved to the middle of the current week.
This corresponds closely to the current real-world operation of the Control Segment.
(unchecked may cause receiver issues if not compliant with ICD-GPS-200D)



Build Scenario will force the Telemetry Data to be current by propagating the data to the entered simulation start time.
(unchecked is an advanced setting)

Build Scenario will create Legacy Telemetry Data every-hour-on-the-hour if checked. *(Unchecking requires the user to manually build additional Legacy data if the simulation is > 4 hours)*

The GPS TLM word provides bit settings for system alerts. To enable a TLM alert for the current SVID check the appropriate item.
(unchecked is the nominal TLM operation)

Press to replicates the settings across all satellites.

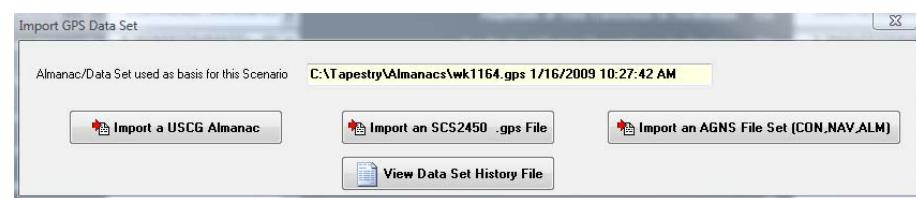




IMPORTING DATA (SUBFRAMES 1-5)



The Legacy Data, SUBFRAMES [123 / 45], is the basis for the GPS truth model calculations in addition to the construction of apriori L₂C, L₅, L₁M, and L₂M Broadcast Data and Messaging content. Keplerian parameters and other components of the Legacy Data can be hand-entered by the simulator user; however, this is rarely the case. Typically, the simulator user **Imports Data** composed of a reduced set of elements used to construct the complete GPS TELEMETRY package. Press **Import Data** and the following form will popup.



Tapestry supports three input formats for the reduced data sets. Each format will result in you transferring /downloading file(s) to the Tapestry computer. While not required, the folder

c:\Tapestry\Almanacs

is provided as a destination for the downloaded telemetry data. Tapestry will default to this folder when prompting for a TELEMETRY file. The accepted formats are:

- **USCG:** The U.S. Coast Guard maintains a website with a library of reduced Almanacs. Data consists of the (almanac) orbital elements and health settings. It does not provide values for Ephemeris, UTC, Modernized Data, or Ionosphere. These data types are constructed from the USCG data by Tapestry.
- **SCS2450:** This format is used by the Interstate Electronics STS2450 GPS Constellation Simulator. It contains all data components of the Almanac and Ephemeris, UTC, and Ionosphere parameters in textual format. Tapestry uses this data to construct the Modernized Data. We've included an example in the Almanac folder mentioned previously. These files end with the suffix .GPS.
- **MEVTP/AGNS:** This is the format used by the Advanced GPS Navigation Simulator as implemented in the MEVTP test and certification procedures. These files contain all of the modeling data required in textual format. Tapestry requires a set of *.CON files which in turn read *.NAV files. Examples of these data files are in the Almanacs folder.

Follow this link for the details of importing new Satellite Telemetry data and how it is used and manipulated within Tapestry. [UPDATEALMANACDETAILS.PDF](#)



RANGE ERROR MODELS



GPS Range data-signals travel through the earth atmosphere and Ionosphere as well interacting with the earth's gravitation field and reflective objects in its path. Additionally, modeling errors in the Control Segment (CS) corrupt the Legacy Data. Component malfunction of the satellites is also of concern for safety applications.

The screenshot shows the 'RANGE ERROR MODELS' software interface with five tabs:

- TROPOSPHERE MODEL:** Contains checkboxes for 'NO TROPOSPHERE' (selected), 'Standard Model' (selected), 'RTCA 229C Model', 'Hopfield Wet/Dry Model', and 'IEC 65 Model'. It includes input fields for 'Altitude Scale Factor' (6900.0 meters), 'Zenith Delay' (2.2 meters), 'Po' (1013.0 mb), 'rH' (80.0 %), 'To' (288.0 K), 'Ho' (100.0 mm), and 'Ellipsoid - Geod Offset' (0 meters).
- IONOSPHERE MODEL:** Contains checkboxes for 'NO IONOSPHERE' (selected) and 'IS-GPS-200D Model' (selected). It includes input fields for 'Import Zenith TEC values' and 'Shell Model' with parameters R_1 (500.0 Km) and R_2 (700.0 Km).
- SOFTWARE GENERATED MULTIPATH:** Contains 'Gauss Markov Multipath Model' with parameters σ (0.00 meters) and τ (300.00 seconds).
- RTCA SELECTIVE AVAILABILITY:** Contains 'Gauss Markov Range-Dither Model' with parameters σ (0.00 meters) and τ (120.00 seconds), and 'Gauss Markov Range Error' with parameters σ (0.00 meters) and τ (3600.0 seconds). It includes dropdowns for 'Initial Value' and 'Applicable SVID' (set to 1, ALL selected).
- APPLIED RANGE ERROR (URE):** Contains 'Initial Value' and 'Applicable SVID' dropdowns (set to 1, ALL selected).

At the bottom are buttons for '?', 'CANCEL', and 'APPLY'.

This is an important component of the GPS Line-of-Sight measurements. These model controls applied effects for:

- Troposphere
- Ionosphere
- Control Segment Errors (Ephemeris Errors) via 2nd order Gauss Markov model drawn randomly for each SVID
- Software implemented Multipath Model provided by Lockheed Martin to be used for exo-atmospheric missiles.
- Simulated SA/AS as described in RTCA-DO-204 for civilian applications

Follow this [link](#) for details on these important models:

If you want to suppress Troposphere and/or Ionosphere check the **NO Troposphere** and **NO Ionosphere** check boxes – entering “0” for the parameters will not result in zero effect.

Note that the RANGETRUTH1.DAT file (Range Truth Data) will reflect the settings made here. **Unless you are an expert, accept the detailed settings for these models.**



LEGACY DATA

The term “Legacy Data” refers to the GPS NAVDATA implemented as a 50-BPS telemetry and timing message as specified in ICD-GPS-200D. This nomenclature is required to differentiate the enhanced message structure and content afforded through the addition of L₂C, L₅, L₁M, and L₂M (*referred to within Tapestry as Modernized Data*).

SUBFRAMES 1, 2, 3

Nominally, uploads occur every hour on the hour. Press this button to create additional data sets

This TRUNCATES all DATASETS but the first. Use this link for details on # of DATASETS. [FAQ](#)

LEGACY SUBFRAMES 1,2,3

SUBFRAME 1/2/3 DATA SET 1 **Make more Data Sets** **Truncate to ONE Data Set**

Ephemeris Week	Wn	1189 ? sec	Amplitude of Sine Correction to Radius	Crs	0.000000000000000e+00 ? m
Ephemeris Reference Time	Toe	7200 ? sec	Amplitude of Cosine Correction to Radius	Crc	0.000000000000000e+00 ? m
Time of Transmission	Tot	5 ? sec	Amplitude of Sine Correction to Arg of Latitude	Cus	0.000000000000000e+00 ? rad
Mean Anomaly	M ₀	1.544015691615641e-01 ? sec	Amplitude of Cosine Correction to Arg of Latitude	Cuc	0.000000000000000e+00 ? rad
Eccentricity	e	8.106708526611328e-03 ?	Amplitude of Sine Correction to Inclination	Cis	0.000000000000000e+00 ? rad
Square root Semi Major Axis	\sqrt{A}	5.15367968750000e+03 ? \sqrt{m}	Amplitude of Cosine Correction to Inclination	Cic	0.000000000000000e+00 ? rad
Long of Ascending Node at Ref Time	Ω_0	-4.081783401779830e-01 ? sec	Estimated Group Delay	Tgd	0.000000000000000e+00 ? sec
Inclination Angle at Reference Time	i ₀	3.002156526781619e-01 ? sec	Clock Reference Time	Toc	7200 ? sec
Argument of Perigee	ω	1.180104147642851e-01 ? sec	Clock Model	a _{f0}	-2.5749206543e-05 ? sec
Mean Motion Difference	Δn	0.000000000000000e+00 ? sc/sec	Clock Model	a _{f1}	-7.2759576142e-12 ? sec/sec
Rate of Right Ascension	Ω	-2.531351128709503e-09 ? sc/sec	Clock Model	a _{f2}	0.0000000000e+00 ? sec/sec ²
Rate of Inclination Angle	\dot{i}	0.000000000000000e+00 ? sc/sec	Issue of Data Clock	IODC	1 ?
Issue of Data (IODE SubFrame 2 & 3)		1 ?			

SV Accuracy (URA) 0.00 to 2.40 m ? NW Health All Data OK ? Curve Fit Interval 4 hour Interval ?

Sv Health Summary All signals OK ? L2 F Data Flag Nav Data On ? Code on L2 P Code On ?

Mean Anomaly at reference time

Minimum Value -1.000000
Maximum Value 1.000000
LSB (Scale Factor) 2⁻³¹
Output Value 0.271204
Unit semi-circles
Raw Hex Value b0cc22d
USCG Format 8.520119e-01 rad

Sync to TOE

Click for details associated with the item

Press this Button and the time-dependant parameters will be propagated to the new Time of Transmission



SUBFRAMES 4, 5

SubFrame 4 & 5 contains the simulation Almanac, the Ionosphere Parameters, and UTC Data. When you create a new simulation or change the simulation start time, Tapestry propagates the SubFrame Data to always be “current”.

If you upload a new USCG formatted Almanac file, Tapestry creates, in the same way, a “current” set of SubFrame 4 & 5 Data including the UTC and Ionosphere Data. If you want to modify the default behavior read this document:

[UPDATEALMANACDETAILS.PDF](#)

Tapestry synchronizes the Almanac Time of Applicability (TOA) deterministically relative to the Simulation Start Time. To program an additional Control Station upload, use this control.

LEGACY SUBFRAMES 4,5

SUBFRAME 4/5 DATA SET **1** ▾ **Add Data Set Cut In** **Truncate to ONE Data Set**

Almanac Reference Week	w _{na}	1189 ?	UTC Model Coefficient	A ₀	0.0000000000e+00 ? sec
Almanac Reference Time	Toa	299008 ? sec	UTC Model Coefficient	A ₁	0.0000000000e+00 ? sec/sec
Time of Transmission	Tot	5.000000 ? sec	UTC Delta Time due to Leap Seconds	ΔT _{ls}	14 ? sec
Mean Anomaly	M ₀	-2.97948241234e-01 ? sc	UTC Reference Time for Data	T _{_ot}	0 ? sec
Eccentricity	e	8.10670852661e-03 ?	UTC Reference Week	W _{nt}	1189 ?
Square root Semi Major Axis	√A	5.15367968750e+03 ? √m	UTC Leap Second Effectivity Week	W _{N_{lsf}}	1189 ?
Long of Ascending Node at Ref Time	Ω ₀	-4.08916950226e-01 ? sc	UTC Leap Second Effectivity Day	DN	1 ?
Inclination Angle Correction	δ _i	2.15530395508e-04 ? sc	UTC Past Delta Time Leap Seconds	ΔT _{lsf}	14 ? sec
Argument of Perigee	ω	1.18010401726e-01 ? sc	Iono Model Parameter	α ₀	2.23517417908e-08 ? sec
Rate of Right Ascension	Ω̇	-2.53203324974e-09 ? sc/sec	Iono Model Parameter	α ₁	1.49011611938e-08 ? sec/sc ²
Clock Model	a _{f0}	-2.57492065430e-05 ? sec	Iono Model Parameter	α ₂	-1.19209289551e-07 ? sec/sc ³
Clock Model	a _{f1}	-7.27595761418e-12 ? sec/sec	Iono Model Parameter	α ₃	-5.96046447754e-08 ? sec/sc
NAV Health	All Data OK		Iono Model Parameter	B ₀	124928.00000 ? sec
Signal Health	All signals OK		Iono Model Parameter	B ₁	65536.00000 ? sec/sc
AS Configuration	Anti Spoof Off		Iono Model Parameter	B ₂	-196608.00000 ? sec/sec ²
Sv Configuration	Block II Config		Iono Model Parameter	B ₃	65536.00000 ? sec/sc ³



MODERNIZED DATA

In response to the needs of various users and government agencies, GPS has undergone a MODERNIZATION upgrade. To this end, there are four new signals:

L₂C Primarily to provide higher indoor signal power. This link uses a newly developed Messaging structure and Enhanced Orbital Parameters for increased accuracy. The Data content and definition is the same as L₅

L₅ Primarily for Aviation Applications and enhanced Ionosphere. This link uses a newly developed Messaging structure and Enhanced Orbital Parameters for increased accuracy. The Data content and definition is the same as L₂C

L₁M / L₂M These are military signals with no commercial application. These links use a messaging scheme and data structure collectively referred to as MNAV. MNAV

All of the various modernized signals are initialized through the Legacy Data discussed uses a newly developed Messaging structure and Enhanced Orbital Parameters for increased accuracy, error correction, and system robustness.



MNAV DATA

MNAV data has two independent components within Tapestry:

- This is the Message Output Time-Line. It specifies the sequential order and rate of Telemetry Data. It can be initialized from ICD-GPS-700 [Figure 6.4](#) or from and MEVTP-AGNS Message Schedule File (DES)
- MNAV Data Content. This is the Data that goes into the various messages. It can be initialized either from Legacy Data, or MEVTP-AGNS profiles. MNAV Message Schedule.

Shows Definition of displayed Message Data:

CREATE a new DATASET after Current DATASET

IMPORT a DATASET made by Tapestry

IMPORT a DATASET using MEVTP-AGNS Format

RESET DATASET using LEGACY SUBFRAMES

Shows ICD-GPS-700 [FIG 6.4](#)



MNAV Message Construction

Message Selection: 7 [0x7] MILITARY IMPROVED CLOCK AND EPHemeris (MICE-II)

SubType: NA

Page: NA

Applicable SVIDS:

SuperFrame: 1 MasterFrame: 1 Minor Frame: 5 Slot: 2 OutputTime: 73 Sec

MINOR FRAME COUNT

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1 M6S0PO ...	2 M6S0PO ...	3 M6S0PO ...	4 M6S0PO ...	5 M6S0PO ...	6 M6S0PO ...	7 M6S0PO ...	8 M6S0PO ...	9 M6S0PO ...	10 M6S0PO ...	11 M6S0PO ...	12 M6S0PO ...	13 M6S0PO ...	14 M6S0PO ...	15 M6S0PO ...
2 M7S0PO ...	3 M7S0PO ...	4 M7S0PO ...	5 M7S0PO ...	6 M7S0PO ...	7 M7S0PO ...	8 M7S0PO ...	9 M7S0PO ...	10 M7S0PO ...	11 M7S0PO ...	12 M7S0PO ...	13 M7S0PO ...	14 M7S0PO ...	15 M7S0PO ...	
3 M9S0P1 ...	M11S0P0 ...	M0S0PO ...	M4S0PO ...	M4S0PO ...	M9S0P1 ...	M11S0P0 ...	M5S1P1 ...	M5S3P1 ...	M0S0PO ...	M9S1P1 ...	M11S0P0 ...	M2S1P1 ...	M2S1P1 ...	M0S0PO ...
4 M10S0P1 ...	M12S0PO ...	M0S0PO ...	M4S0PO ...	M0S0PO ...	M10S0P1 ...	M12S0PO ...	M5S2P1 ...	M5S4P1 ...	M0S0PO ...	M10S0PO ...	M12S0PO ...	M2S1P2 ...	M2S1P2 ...	M0S0PO ...

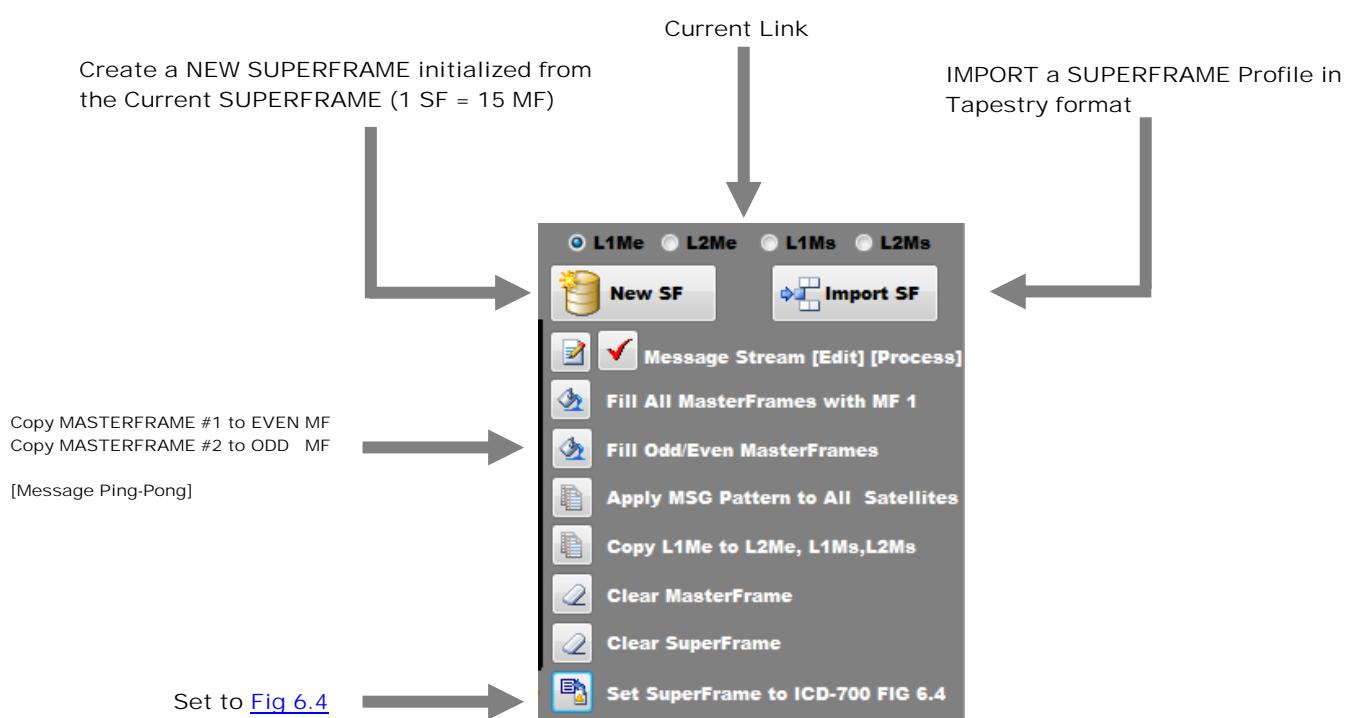
MASTER FRAME 1 of SUPER FRAME 1

MNAV DATA Time-of-Transmission 1
SUPERFRAME Time-of-Transmission 1

FLOW ↓
SLOT COUNT ↓

MINOR FRAME COUNT

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1 M6S0PO ...	2 M6S0PO ...	3 M6S0PO ...	4 M6S0PO ...	5 M6S0PO ...	6 M6S0PO ...	7 M6S0PO ...	8 M6S0PO ...	9 M6S0PO ...	10 M6S0PO ...	11 M6S0PO ...	12 M6S0PO ...	13 M6S0PO ...	14 M6S0PO ...	15 M6S0PO ...
2 M7S0PO ...	3 M7S0PO ...	4 M7S0PO ...	5 M7S0PO ...	6 M7S0PO ...	7 M7S0PO ...	8 M7S0PO ...	9 M7S0PO ...	10 M7S0PO ...	11 M7S0PO ...	12 M7S0PO ...	13 M7S0PO ...	14 M7S0PO ...	15 M7S0PO ...	
3 M9S0P1 ...	M11S0P0 ...	M0S0PO ...	M4S0PO ...	M4S0PO ...	M9S0P1 ...	M11S0P0 ...	M5S1P1 ...	M5S3P1 ...	M0S0PO ...	M9S1P1 ...	M11S0P0 ...	M2S1P1 ...	M2S1P1 ...	M0S0PO ...
4 M10S0P1 ...	M12S0PO ...	M0S0PO ...	M4S0PO ...	M0S0PO ...	M10S0P1 ...	M12S0PO ...	M5S2P1 ...	M5S4P1 ...	M0S0PO ...	M10S0PO ...	M12S0PO ...	M2S1P2 ...	M2S1P2 ...	M0S0PO ...





L₂C & L₅ DATA

L2C & L5 DATA / MESSAGING

L2C DATA SET	1	L5 DATA SET	1																																								
<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 25%;">Time of Ephemeris: Toe</td> <td style="width: 15%; text-align: right;">7200</td> <td style="width: 25%;">Reference Right Ascension Angle: Ω</td> <td style="width: 35%; text-align: right;">-0.129927201071906</td> </tr> <tr> <td>Week Wn</td> <td style="text-align: right;">1189</td> <td>Rate of Right Ascension Difference: $\dot{\Omega}_o$</td> <td style="text-align: right;">-8.0575408967073E-10</td> </tr> <tr> <td>Data Predict Time of Week: Top</td> <td style="text-align: right;">7200</td> <td>Inclination Angle at Reference Time: i_{o-n}</td> <td style="text-align: right;">0.0955616102345779</td> </tr> <tr> <td>Semi-major Axis Difference: Δa</td> <td style="text-align: right;">0</td> <td>Rate of Inclination Angle: \dot{i}_{o-n}</td> <td style="text-align: right;">0</td> </tr> <tr> <td>Semi-major Axis Rate: \dot{a}</td> <td style="text-align: right;">0</td> <td>Amp of Sine Correction to Radius: Crsn</td> <td style="text-align: right;">0</td> </tr> <tr> <td>Mean Motion Difference: Δn_o</td> <td style="text-align: right;">0</td> <td>Amp of Cosine Correction to Radius: Crcn</td> <td style="text-align: right;">0</td> </tr> <tr> <td>Rate of Mean Motion Diff.: $\dot{\Delta n}_o$</td> <td style="text-align: right;">0</td> <td>Amp of Sine Correction to Arg of Latitude: Cusr</td> <td style="text-align: right;">0</td> </tr> <tr> <td>Mean Anomaly at Ref. Time: M_{o-n}</td> <td style="text-align: right;">0.0491475458662365</td> <td>Amp of Cosine Correction to Arg of Latitude: Cucn</td> <td style="text-align: right;">0</td> </tr> <tr> <td>Eccentricity: e_n</td> <td style="text-align: right;">0.00810670852661133</td> <td>Amp of Sine Correction to Inclination: Cisan</td> <td style="text-align: right;">0</td> </tr> <tr> <td>Argument of Perigee: ω_n</td> <td style="text-align: right;">0.0375638816921214</td> <td>Amp of Cosine Correction to Inclination: Cicn</td> <td style="text-align: right;">0</td> </tr> </table>				Time of Ephemeris: Toe	7200	Reference Right Ascension Angle: Ω	-0.129927201071906	Week Wn	1189	Rate of Right Ascension Difference: $\dot{\Omega}_o$	-8.0575408967073E-10	Data Predict Time of Week: Top	7200	Inclination Angle at Reference Time: i_{o-n}	0.0955616102345779	Semi-major Axis Difference: Δa	0	Rate of Inclination Angle: \dot{i}_{o-n}	0	Semi-major Axis Rate: \dot{a}	0	Amp of Sine Correction to Radius: Crsn	0	Mean Motion Difference: Δn_o	0	Amp of Cosine Correction to Radius: Crcn	0	Rate of Mean Motion Diff.: $\dot{\Delta n}_o$	0	Amp of Sine Correction to Arg of Latitude: Cusr	0	Mean Anomaly at Ref. Time: M_{o-n}	0.0491475458662365	Amp of Cosine Correction to Arg of Latitude: Cucn	0	Eccentricity: e_n	0.00810670852661133	Amp of Sine Correction to Inclination: Cisan	0	Argument of Perigee: ω_n	0.0375638816921214	Amp of Cosine Correction to Inclination: Cicn	0
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L1 Signal Health: L1 Signal 0 ▾ L2 Signal Health: L2 Signal 0 ▾ L5 Signal Health: L5 Signal 0 ▾ Accuracy: 0.00 to 2.40 m ▾																																											
<input type="button" value="1"/> <input type="button" value="2"/> <input type="button" value="3"/> <input type="button" value="4"/> <input type="button" value="5"/> <input type="button" value="6"/> <input type="button" value="7"/> <input type="button" value="8"/> <input type="button" value="9"/>																																											

<p>L2C Message Queue</p> <p>Select Message: 10 - Ephemeris 1</p> <p><input type="button" value="Insert Msg"/> <input type="button" value="Remove Msg"/></p> <p>Message output start time: 0 Seconds into Simulation</p> <p>Message Queue repeat cycle: 0 Seconds into Simulation</p> <p><input type="button" value="Edit Message Profile"/> <input type="button" value="Import Message Profile"/></p>	<p>L5 Message Queue</p> <p>Select Message:</p> <p><input type="button" value="Insert Msg"/> <input type="button" value="Remove Msg"/></p> <p>Message output start time: 0 Seconds into Simulation</p> <p>Message Queue repeat cycle: 0 Seconds into Simulation</p> <p><input type="button" value="Edit Message File"/> <input type="button" value="Import Message Profile"/></p>
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