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), L_2C / L_5 Data and Messages, and L_1M / L_2M Data and Messages.

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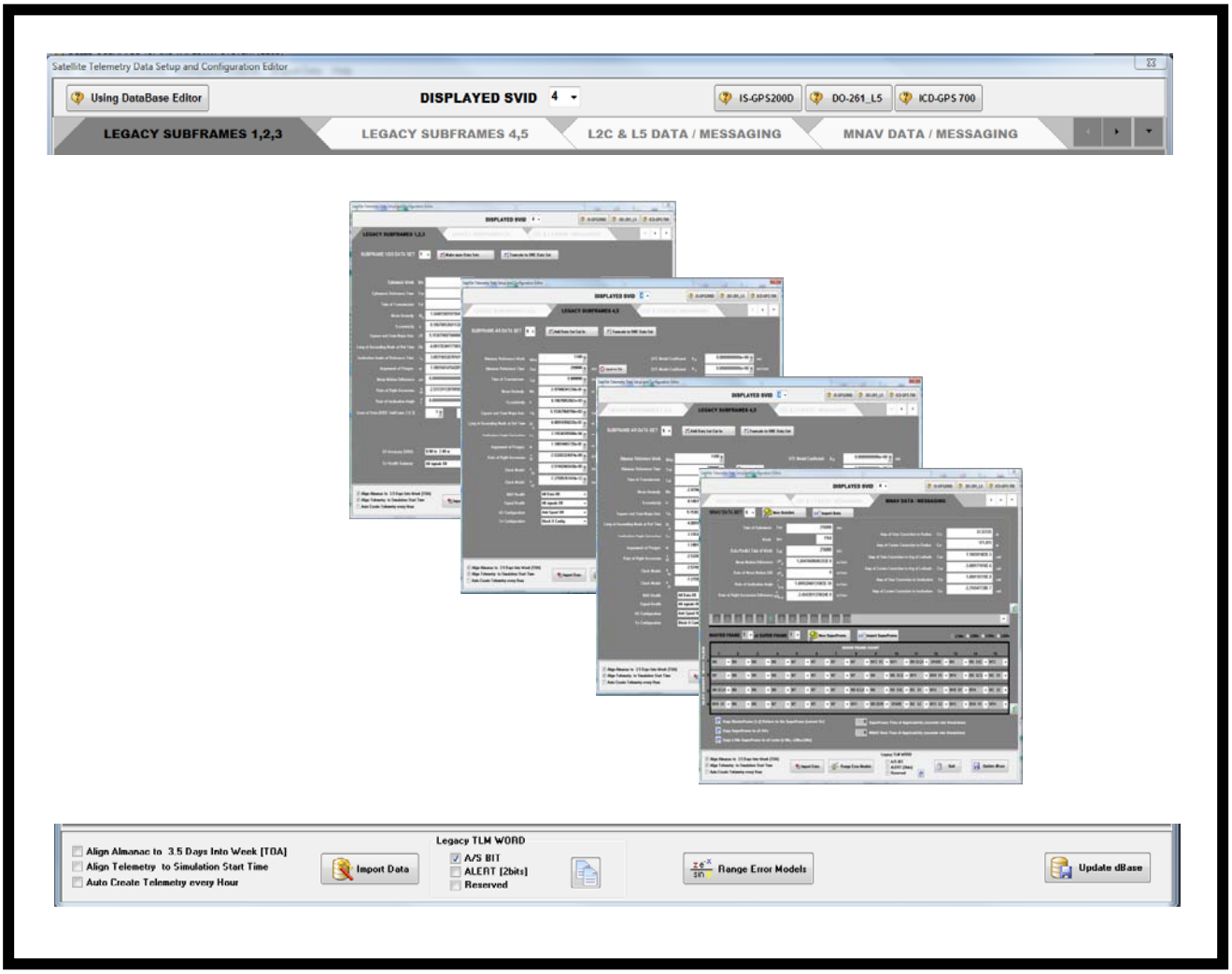
GPS DATABASE EDITOR

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 

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.

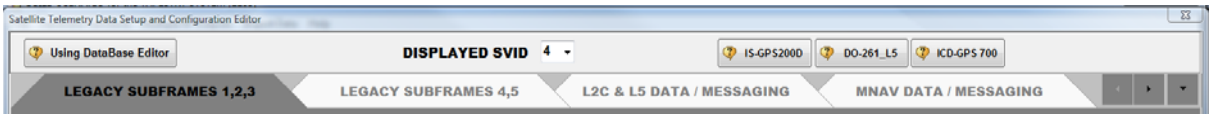


INTERFACE ELEMENTS FOR GPS DATABASE EDITOR

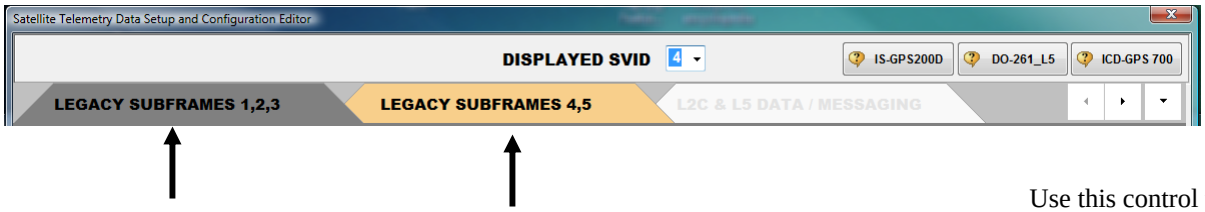
This is the gateway to GPS Telemetry data. As you work through the various pages and tabs note that ALL displayed data applies to the **DISPLAYED SVID**. Use this control to access and edit the satellite specific content of the data forms.

TAB BAR

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



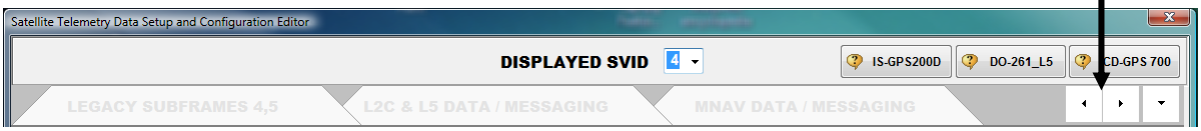
Due to screen real-estate limitations, not all of the data forms will fit on the TAB bar. Move the mouse over the other tabs and they become highlighted.

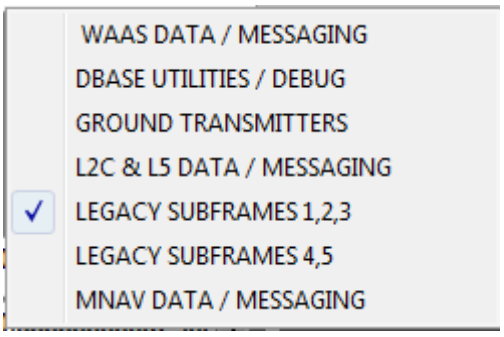


This is the ***selected*** TAB

This TAB is highlighted as you move the mouse.

Use this control to move through the various TABS

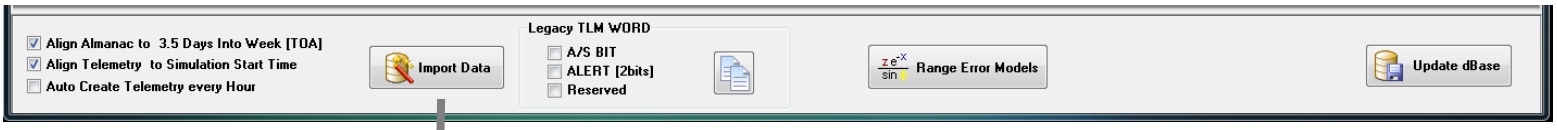


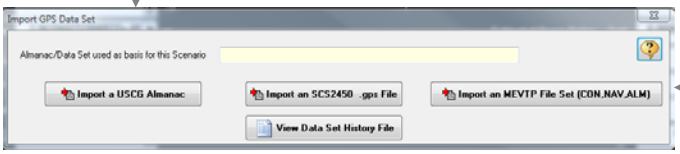


Use this control to drop down the TABS so you can select them directly.

GPS FUNCTION BAR

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

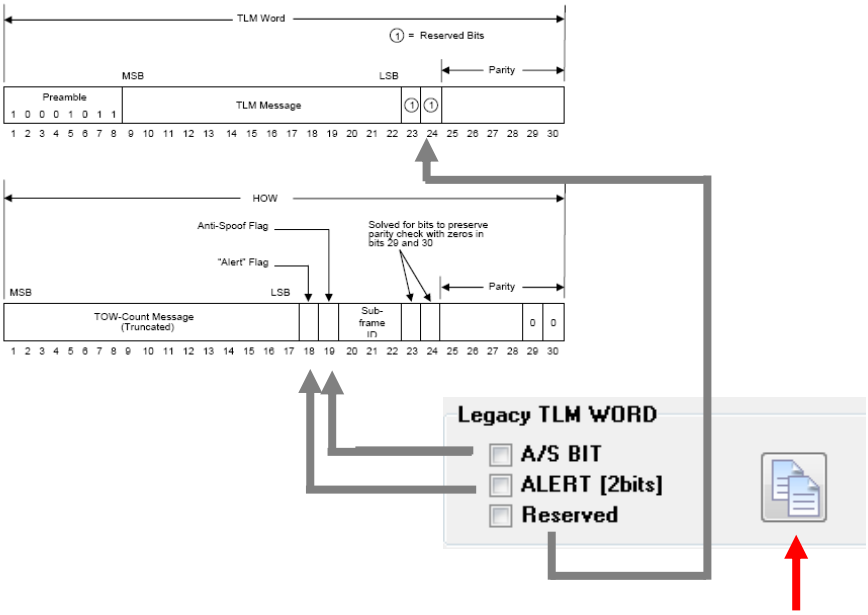




IMPORT TELEMETRY DATA

- (USCG) YUMA/HOLLOMAN Almanac
- MEVTP (AGNS) Legacy and Modernized
- L³COM STS 2450 Ephemeris

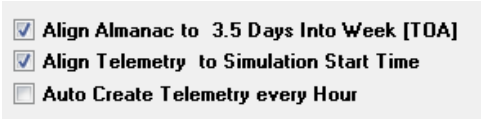
Legacy Telemetry (TLM) Word



Click to COPY the TLM settings to ALL Satellites

This moves the ALMANAC TOA to middle of the week (*real-world*)

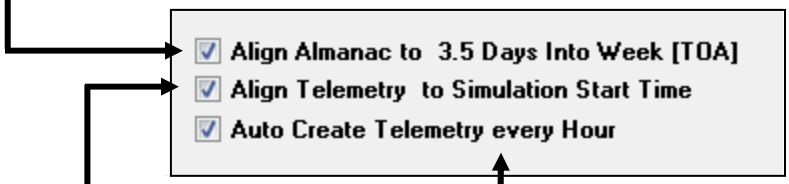
TELEMETRY Data is propagated to Simulation Start Time



See these Documents for a detailed description of the DataBase Editor and Alignment options. [FREQUENTLYASKEDQUESTIONS.PDF]

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. *(unchecking 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. *(unchecking is an advanced setting)*

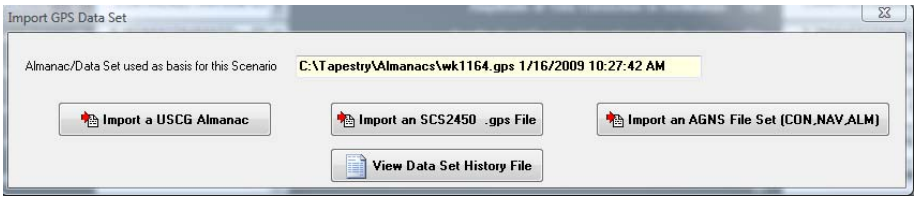
Build Scenario will create Legacy Telemetry Data every-hour-on-the-hour if checked. *(Unchecking requires the user to manually build additional Legacy data if the simulation is > 4 hours)*

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 L_2C, L_5, L_1M, and L_2M 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 I**mports 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.

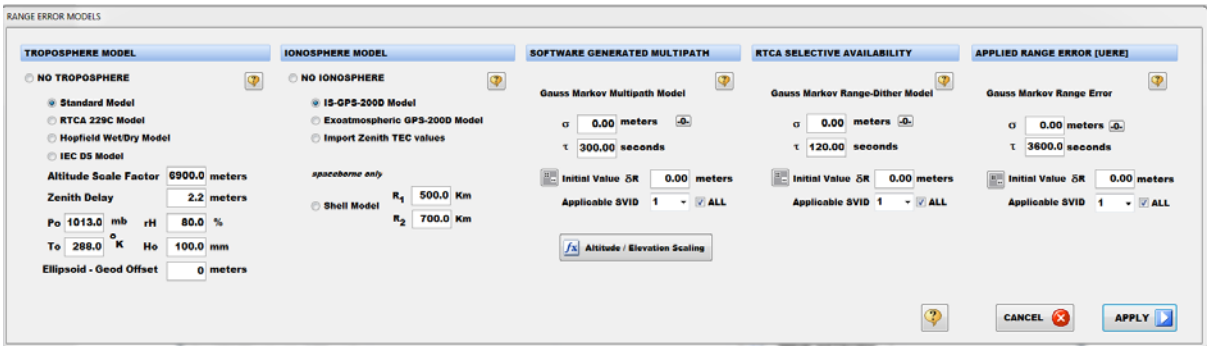
- **SCS2450:** This format is used by the Interstate Electronics STS2450 GPS Constellation Simulator. It contains all data components of the Almanac and Ephemeris, UTC, and Ionosphere parameters in textual format. Tapestry uses this data to construct the Modernized Data. We've included an example in 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 us 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.



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***.

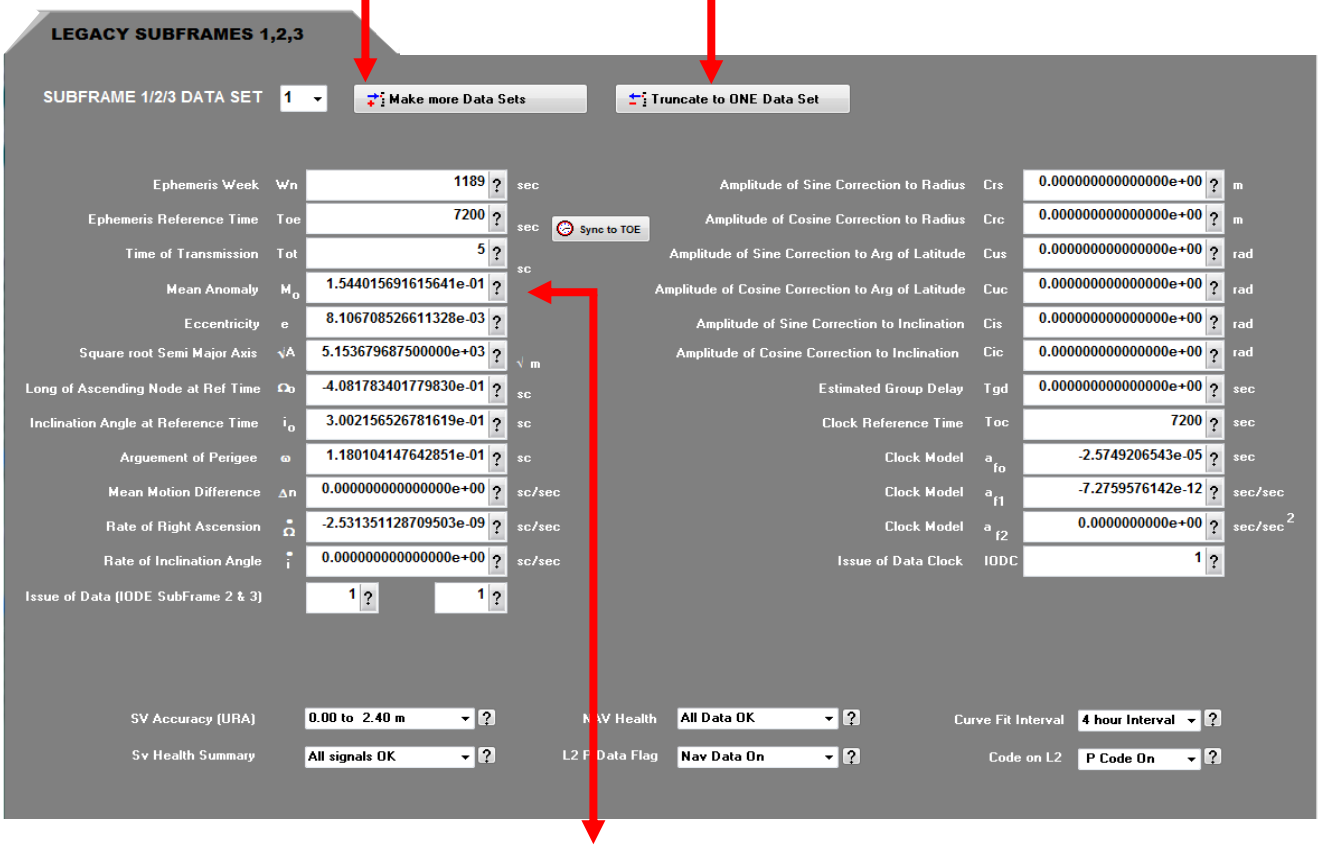
LEGACY DATA

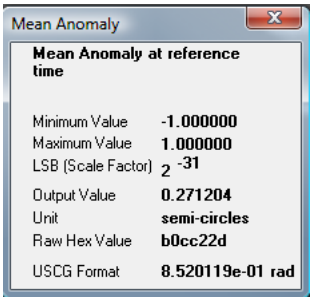
The term “Legacy Data” refers to the GPS NAVDATA implemented as a 50-BPS telemetry and timing message as specified in ICD-GPS-200D. This nomenclature is required to differentiate the enhanced message structure and content afforded through the addition of L_2C, L_5, L_1M, and L_2M (*referred to within Tapestry as* ***Modernized Data***).

SUBFRAMES 1, 2, 3

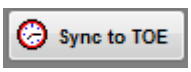
Nominally, uploads occur every hour on the hour. Press this button to create additional data sets

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





Click for details associated with the item



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

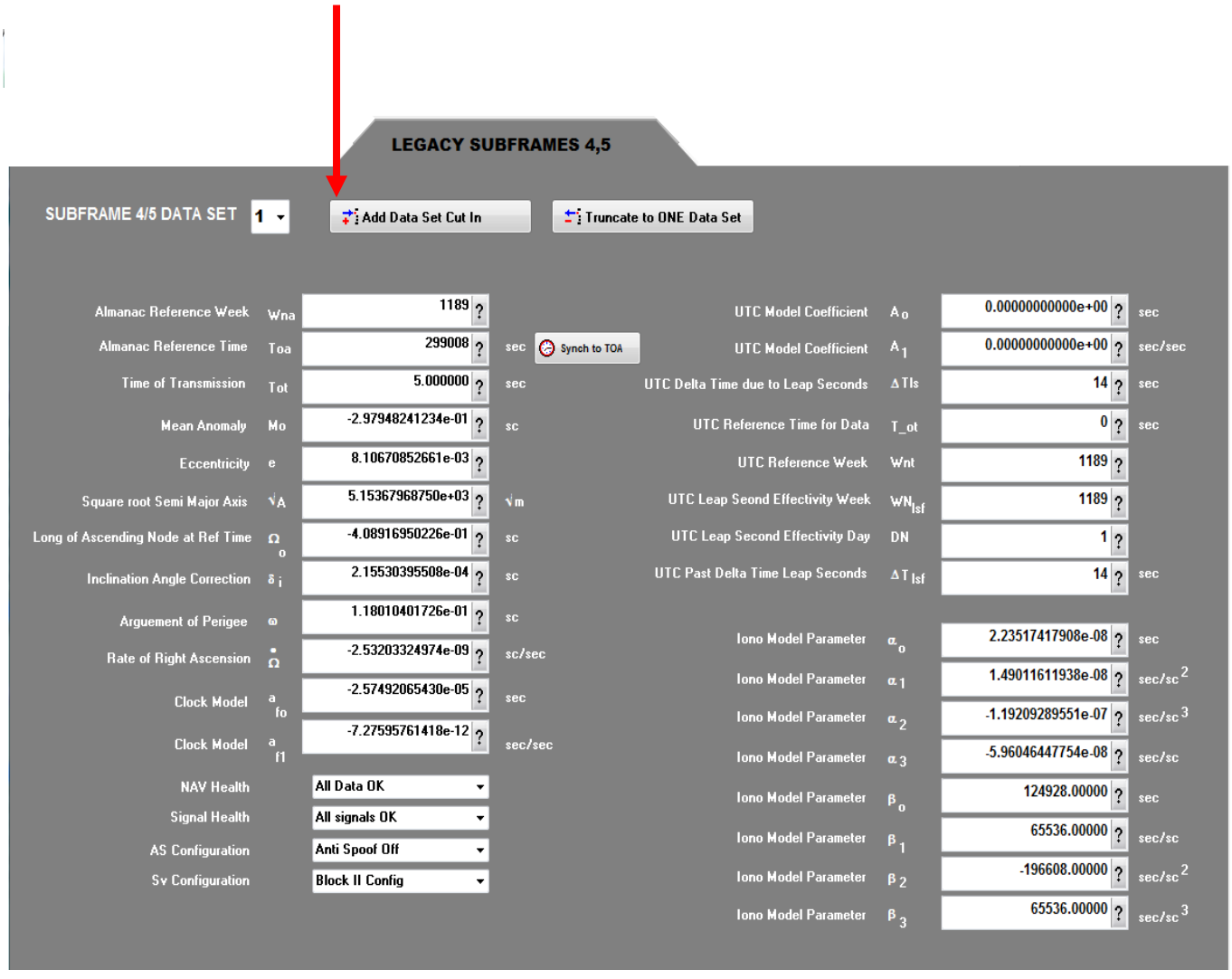
SUBFRAMES 4, 5

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.



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:

L_2C 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 L_5

L_5 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 L_2C

L_1M / L_2M These are military signals with no commercial application. These links use a messaging scheme and data structure collectively referred to as MNAV. MNAV

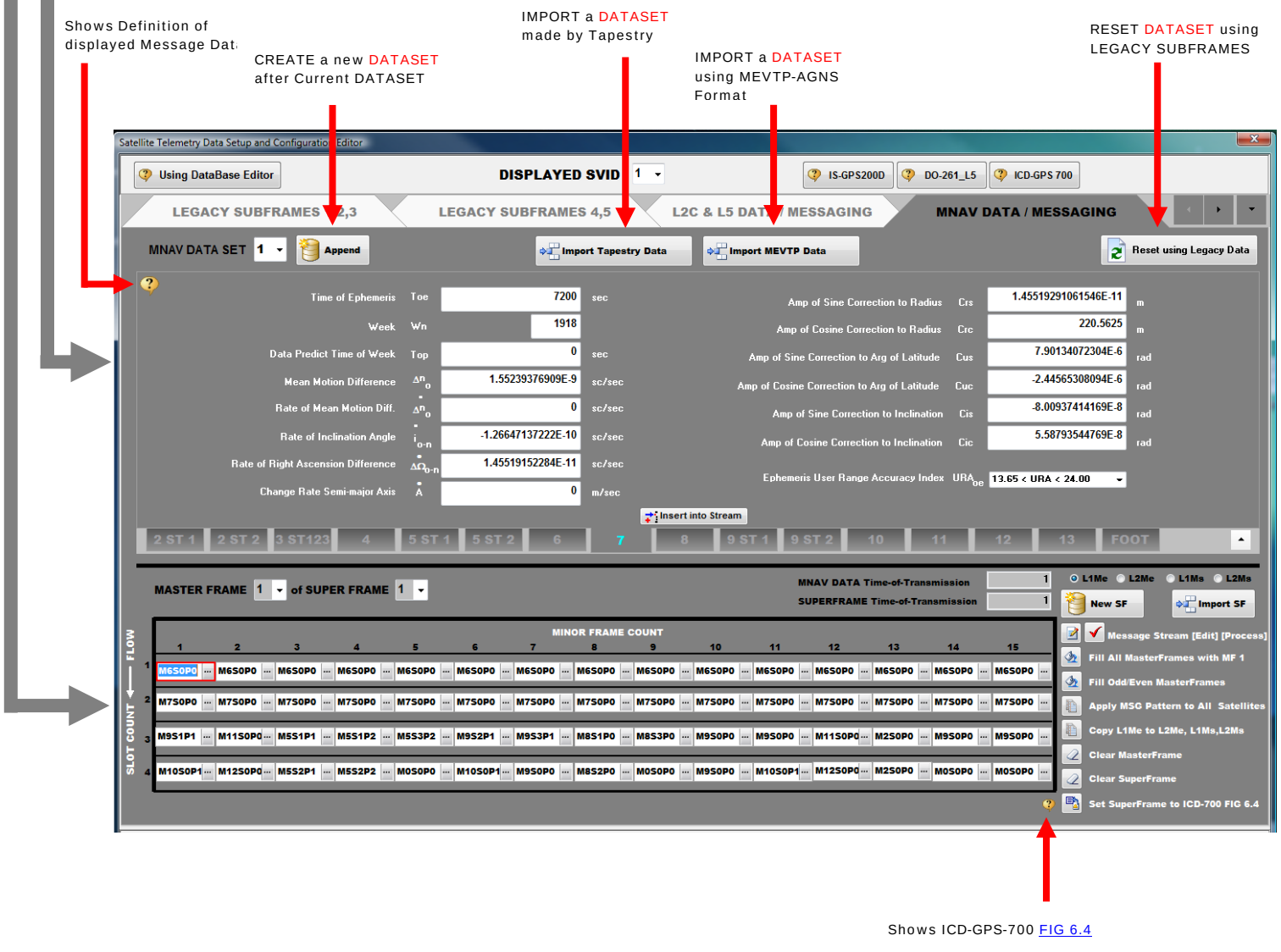
All of the various modernized signals are initialized through the Legacy Data discussed uses a newly developed Messaging structure and Enhanced Orbital Parameters for increased accuracy, error correction, and system robustness.

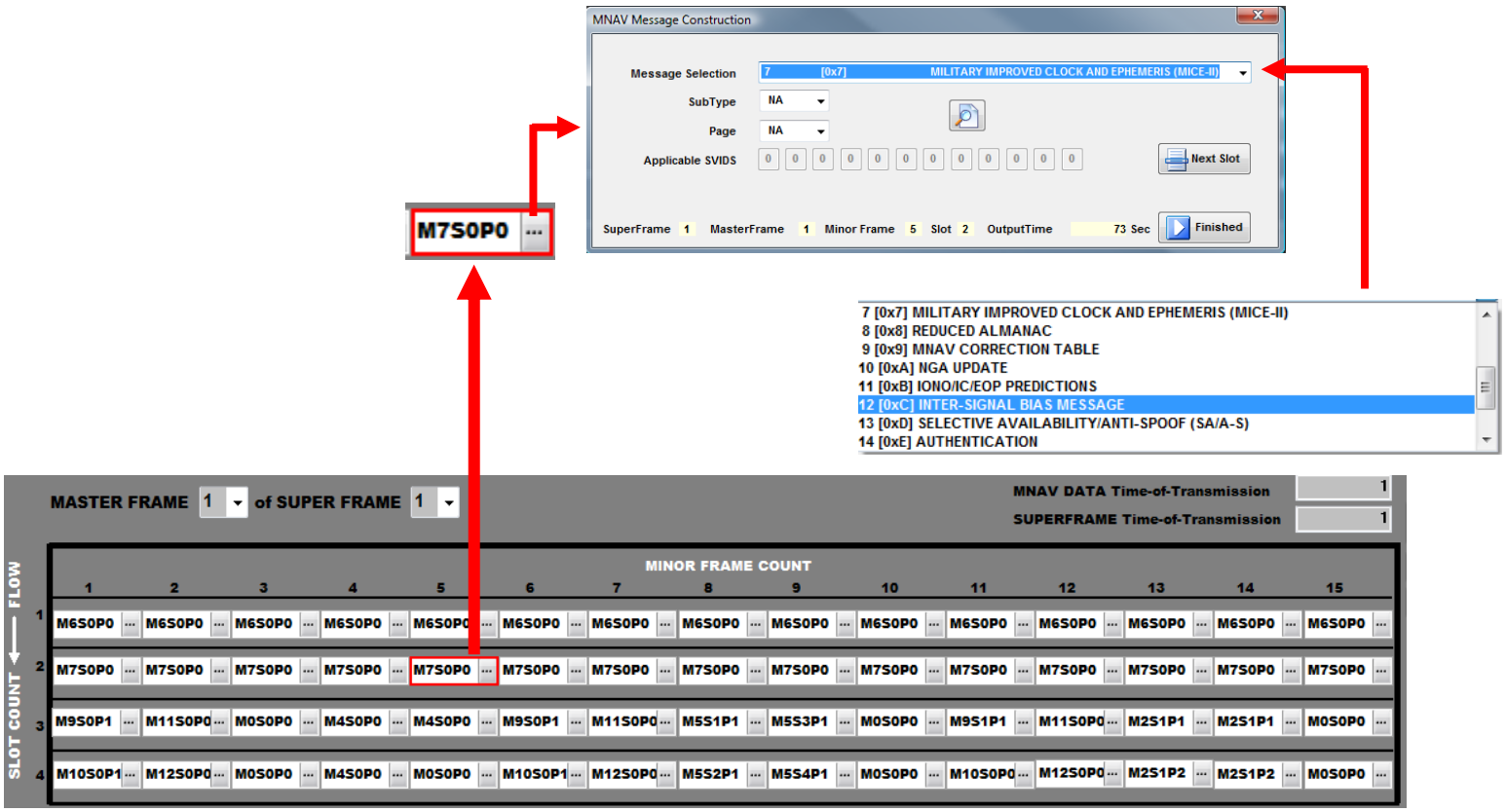
MNAV DATA

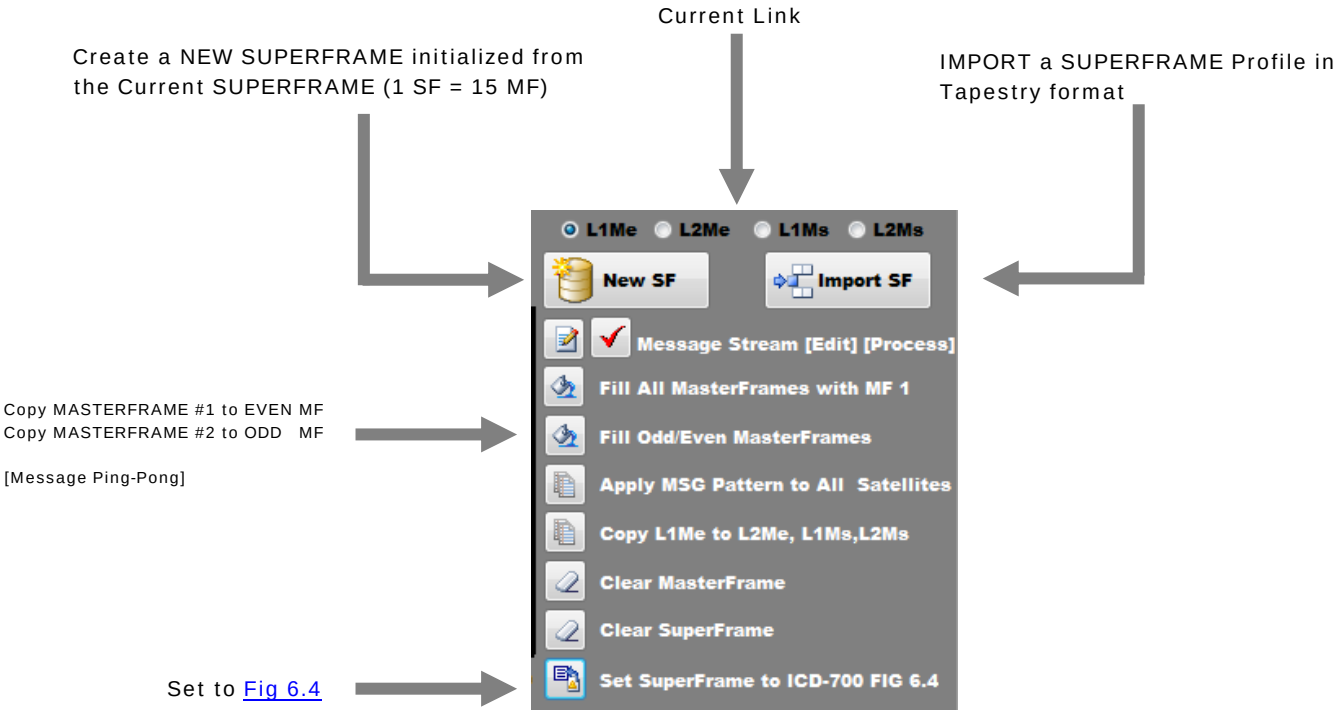
MNAV data has two independent components within Tapestry:

- 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)

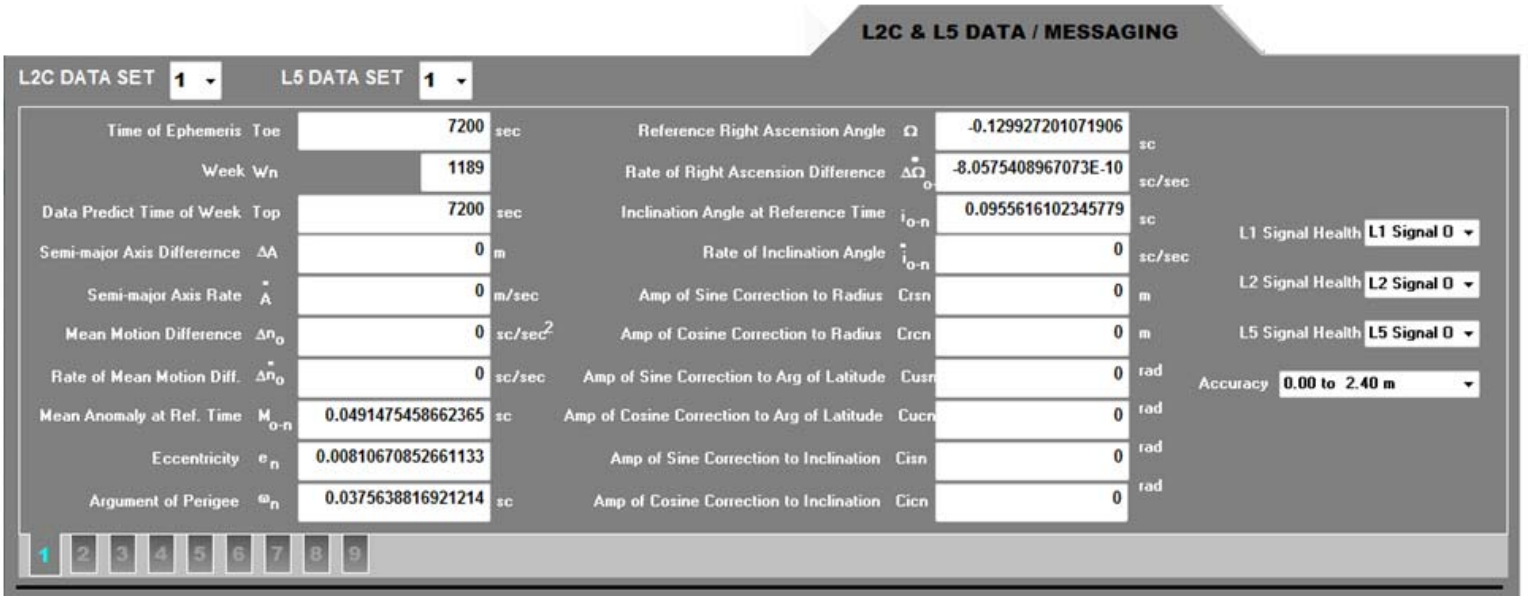
- MNAV Data Content. This is the Data that goes into the various messages. It can be initialized either from Legacy Data, or MEVTP-AGNS profiles. MNAV Message Schedule.




MNAV Message Construction
Message Selection
7 [0x7] MILITARY IMPROVED CLOCK AND EPHEMERIS (MICE-II)
SubType
NA
Page
NA
Applicable SVIDS
Next Slot
SuperFrame 1 MasterFrame 1 Minor Frame 5 Slot 2 OutputTime 73 Sec
Finished
M7S0P0
7 [0x7] MILITARY IMPROVED CLOCK AND EPHEMERIS (MICE-II)
8 [0x8] REDUCED ALMANAC
9 [0x9] MNAV CORRECTION TABLE
10 [0xA] NGA UPDATE
11 [0xB] IONO/IC/EOP PREDICTIONS
12 [0xC] INTER-SIGNAL BIAS MESSAGE
13 [0xD] SELECTIVE AVAILABILITY/ANTI-SPOOF (SA/A-S)
14 [0xE] AUTHENTICATION
MASTER FRAME 1 of SUPER FRAME 1
MNAV DATA Time-of-Transmission 1
SUPERFRAME Time-of-Transmission 1
MINOR FRAME COUNT
SLOT COUNT FLOW
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
M6S0P0
M7S0P0
M9S0P1 M11S0P0 M0S0P0 M4S0P0 M4S0P0 M9S0P1 M11S0P0 M5S1P1 M5S3P1 M0S0P0 M9S1P1 M11S0P0 M2S1P1 M2S1P1 M0S0P0
M10S0P1 M12S0P0 M0S0P0 M4S0P0 M0S0P0 M10S0P1 M12S0P0 M5S2P1 M5S4P1 M0S0P0 M10S0P0 M12S0P0 M2S1P2 M2S1P2 M0S0P0


Current Link
Create a NEW SUPERFRAME initialized from the Current SUPERFRAME (1 SF = 15 MF)
IMPORT a SUPERFRAME Profile in Tapestry format
L1Me L2Me L1Ms L2Ms
New SF
Import SF
Message Stream [Edit] [Process]
Fill All MasterFrames with MF 1
Fill Odd/Even MasterFrames
Apply MSG Pattern to All Satellites
Copy L1Me to L2Me, L1Ms,L2Ms
Clear MasterFrame
Clear SuperFrame
Set SuperFrame to ICD-700 FIG 6.4
Copy MASTERFRAME #1 to EVEN MF
Copy MASTERFRAME #2 to ODD MF
[Message Ping-Pong]
Set to Fig 6.4

L_2C & L_5 DATA


L2C & L5 DATA / MESSAGING
L2C DATA SET 1
L5 DATA SET 1
Time of Ephemeris Toe 7200 sec
Week Wn 1189
Data Predict Time of Week Top 7200 sec
Semi-major Axis Differernce ΔA 0 m
Semi-major Axis Rate Ȧ 0 m/sec
Mean Motion Difference Δn0 0 sc/sec2
Rate of Mean Motion Diff. Δṅ0 0 sc/sec
Mean Anomaly at Ref. Time M0-n 0.0491475458662365 sc
Eccentricity en 0.00810670852661133
Argument of Perigee ωn 0.0375638816921214 sc
Reference Right Ascension Angle Ω -0.129927201071906 sc
Rate of Right Ascension Difference Ω̇0 -8.0575408967073E-10 sc/sec
Inclination Angle at Reference Time i0-n 0.0955616102345779 sc
Rate of Inclination Angle i̇0-n 0 sc/sec
Amp of Sine Correction to Radius Crsn 0 m
Amp of Cosine Correction to Radius Crcn 0 m
Amp of Sine Correction to Arg of Latitude Cusn 0 rad
Amp of Cosine Correction to Arg of Latitude Cucn 0 rad
Amp of Sine Correction to Inclination Cisn 0 rad
Amp of Cosine Correction to Inclination Cicn 0 rad
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
1 2 3 4 5 6 7 8 9


L2C Message Queue
Select Message
10 - Ephemeris 1
Insert Msg
Remove Msg
Message output start time
0 Seconds into Simulation
Message Queue repeat cycle
0 Seconds into Simulation
Edit Message Profile
Import Message Profile
L5 Message Queue
Select Message
Insert Msg
Remove Msg
Message output start time
0 Seconds into Simulation
Message Queue repeat cycle
0 Seconds into Simulation
Edit Message File
Import Message Profile