



## **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<sub>2</sub>C / L<sub>5</sub> Data and Messages, and L<sub>1</sub>M / L<sub>2</sub>M Data and Messages.

## **GPS DATABASE EDITOR**



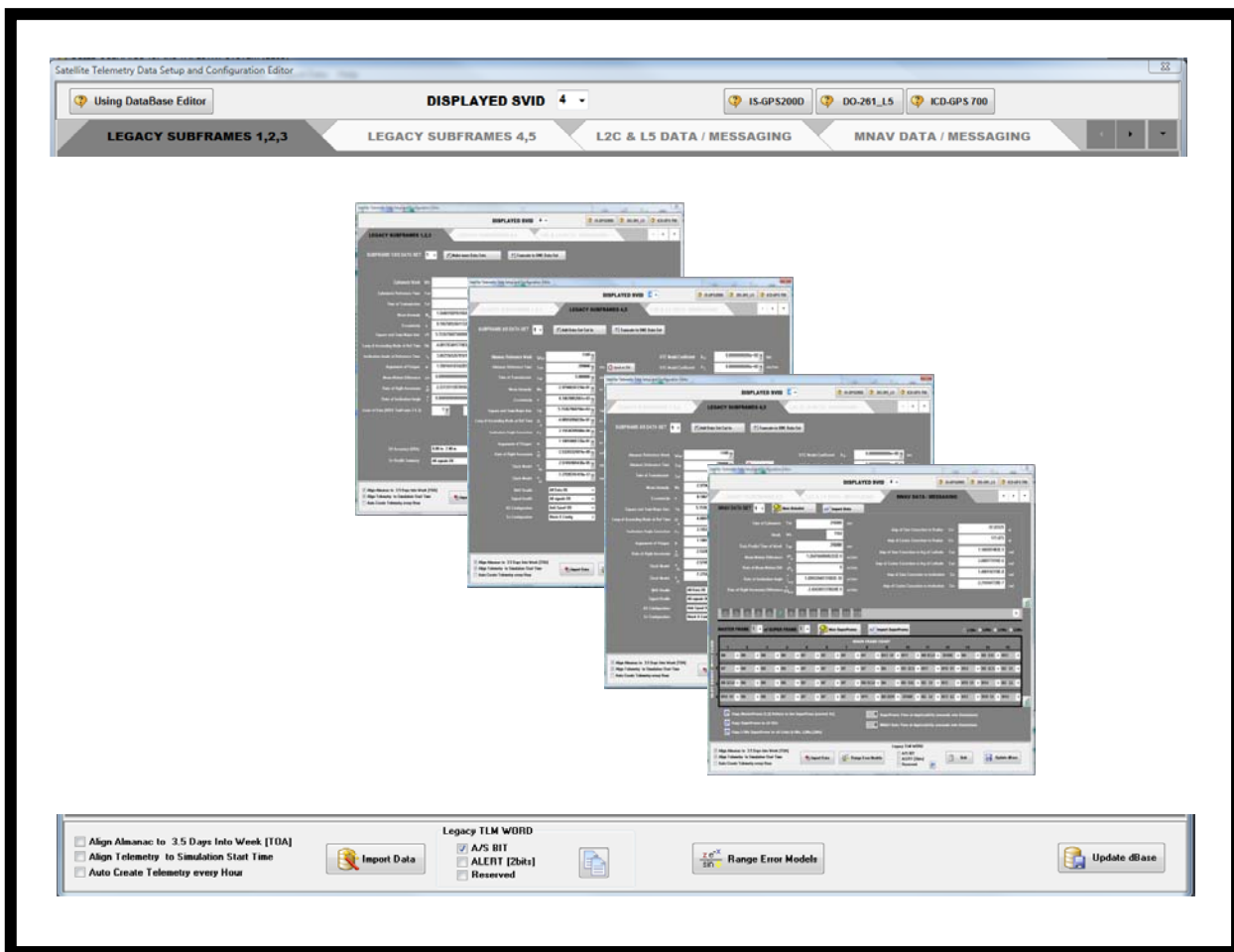
# GPS DATABASE EDITOR

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

## INTERFACE ELEMENTS FOR GPS DATABASE EDITOR





## 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 2<sup>nd</sup> 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

# 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<sub>2</sub>C, L<sub>5</sub>, L<sub>1</sub>M, and L<sub>2</sub>M (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

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 <sub>0</sub>	1.544015691615641e-01	sc	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	√A	5.153679687500000e+03	m	Amplitude of Cosine Correction to Inclination	Cic	0.000000000000000e+00	rad
Long of Ascending Node at Ref Time	Ω <sub>0</sub>	-4.081783401779830e-01	sc	Estimated Group Delay	Tgd	0.000000000000000e+00	sec
Inclination Angle at Reference Time	i <sub>0</sub>	3.002156526781619e-01	sc	Clock Reference Time	Toe	7200	sec
Argument of Perigee	ω	1.180104147642851e-01	sc	Clock Model	a <sub>fo</sub>	-2.5749206543e-05	sec
Mean Motion Difference	Δn	0.000000000000000e+00	sc/sec	Clock Model	a <sub>f1</sub>	-7.2759576142e-12	sec/sec
Rate of Right Ascension	Ω̇	-2.531351128709503e-09	sc/sec	Clock Model	a <sub>f2</sub>	0.0000000000e+00	sec/sec <sup>2</sup>
Rate of Inclination Angle	i̇	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    SV Health: All Data OK    Curve Fit Interval: 4 hour Interval

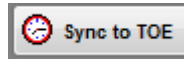
Sv Health Summary: All signals OK    L2 F Data Flag: Nav Data On    Code on L2: P Code On

Click for details associated with the item

**Mean Anomaly**

Mean Anomaly at reference time

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



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.

**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**

Almanac Reference Week	$w_{na}$	1189 ?	UTC Model Coefficient	$A_0$	0.0000000000e+00 ?	sec	
Almanac Reference Time	$T_{oa}$	299008 ?	<input type="button" value="Synch to TOA"/>	UTC Model Coefficient	$A_1$	0.0000000000e+00 ?	sec/sec
Time of Transmission	$T_{ot}$	5.000000 ?		UTC Delta Time due to Leap Seconds	$\Delta T_{ls}$	14 ?	sec
Mean Anomaly	$M_o$	-2.97948241234e-01 ?		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	$\sqrt{A}$	5.15367968750e+03 ?	$\sqrt{m}$	UTC Leap Second Effectivity Week	$w_{N_{lsf}}$	1189 ?	
Long of Ascending Node at Ref Time	$\Omega_o$	-4.08916950226e-01 ?	sec	UTC Leap Second Effectivity Day	$DN$	1 ?	
Inclination Angle Correction	$\delta_i$	2.15530395508e-04 ?	sec	UTC Past Delta Time Leap Seconds	$\Delta T_{lsf}$	14 ?	sec
Argument of Perigee	$\omega$	1.18010401726e-01 ?	sec	Iono Model Parameter	$\alpha_0$	2.23517417908e-08 ?	sec
Rate of Right Ascension	$\dot{\Omega}$	-2.53203324974e-09 ?	sec/sec	Iono Model Parameter	$\alpha_1$	1.49011611938e-08 ?	sec/sc <sup>2</sup>
Clock Model	$a_{fo}$	-2.57492065430e-05 ?	sec	Iono Model Parameter	$\alpha_2$	-1.19209289551e-07 ?	sec/sc <sup>3</sup>
Clock Model	$a_{fl}$	-7.27595761418e-12 ?	sec/sec	Iono Model Parameter	$\alpha_3$	-5.96046447754e-08 ?	sec/sc
NAV Health		All Data OK		Iono Model Parameter	$\beta_0$	124928.00000 ?	sec
Signal Health		All signals OK		Iono Model Parameter	$\beta_1$	65536.00000 ?	sec/sc
AS Configuration		Anti Spoof Off		Iono Model Parameter	$\beta_2$	-196608.00000 ?	sec/sc <sup>2</sup>
Sv Configuration		Block II Config		Iono Model Parameter	$\beta_3$	65536.00000 ?	sec/sc <sup>3</sup>

# MODERNIZED DATA

## 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 Dat:**

**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**

Satellite Telemetry Data Setup and Configuration Editor

Using DataBase Editor

DISPLAYED SVID 1

IS-GPS200D DO-261\_L5 ICD-GPS 700

LEGACY SUBFRAMES 2,3 LEGACY SUBFRAMES 4,5 L2C & L5 DATA MESSAGING MNAV DATA / MESSAGING

MNAV DATA SET 1 Append Import Tapestry Data Import MEVTP Data Reset using Legacy Data

Time of Ephemeris	Toe	7200	sec	Amp of Sine Correction to Radius	Crs	1.45519291061546E-11	m
Week	Wn	1918		Amp of Cosine Correction to Radius	Crc	220.5625	m
Data Predict Time of Week	Top	0	sec	Amp of Sine Correction to Arg of Latitude	Cus	7.90134072304E-6	rad
Mean Motion Difference	$\Delta n_o$	1.55239376909E-9	sc/sec	Amp of Cosine Correction to Arg of Latitude	Cuc	-2.44565308094E-6	rad
Rate of Mean Motion Diff.	$\Delta \dot{n}_o$	0	sc/sec	Amp of Sine Correction to Inclination	Cis	-8.00937414169E-8	rad
Rate of Inclination Angle	$\dot{i}_o-n$	-1.26647137222E-10	sc/sec	Amp of Cosine Correction to Inclination	Cic	5.58793544769E-8	rad
Rate of Right Ascension Difference	$\Delta \dot{\Omega}_{o-n}$	1.45519152284E-11	sc/sec	Ephemeris User Range Accuracy Index	URA <sub>op</sub>	13.65 < URA < 24.00	
Change Rate Semi-major Axis	$\dot{A}$	0	m/sec				

Insert into Stream

2 ST 1 2 ST 2 3 ST 123 4 5 ST 1 5 ST 2 6 7 8 9 ST 1 9 ST 2 10 11 12 13 FOOT

MASTER FRAME 1 of SUPER FRAME 1

MNAV DATA Time-of-Transmission 1

SUPERFRAME Time-of-Transmission 1

New SF Import SF

MINOR FRAME COUNT

1	M6S0P0	M6S0P0	M6S0P0	M6S0P0	M6S0P0	M6S0P0	M6S0P0	M6S0P0	M6S0P0	M6S0P0	M6S0P0	M6S0P0	M6S0P0	M6S0P0	M6S0P0
2	M7S0P0	M7S0P0	M7S0P0	M7S0P0	M7S0P0	M7S0P0	M7S0P0	M7S0P0	M7S0P0	M7S0P0	M7S0P0	M7S0P0	M7S0P0	M7S0P0	M7S0P0
3	M9S1P1	M11S0P0	M9S1P1	M9S1P2	M9S3P2	M9S2P1	M9S3P1	M8S1P0	M8S3P0	M9S0P0	M9S0P0	M11S0P0	M2S0P0	M9S0P0	M9S0P0
4	M10S0P1	M12S0P0	M9S2P1	M9S2P2	M0S0P0	M10S0P1	M9S0P0	M8S2P0	M0S0P0	M9S0P0	M10S0P1	M12S0P0	M2S0P0	M0S0P0	M0S0P0

SLOT COUNT FLOW

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

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: 0

Next Slot

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

M750P0 ...

- 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														
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
SLOT COUNT ← FLOW	1	M6S0P0	M6S0P0	M6S0P0	M6S0P0	M6S0P0	M6S0P0	M6S0P0	M6S0P0	M6S0P0	M6S0P0	M6S0P0	M6S0P0	M6S0P0	M6S0P0	M6S0P0
	2	M7S0P0	M7S0P0	M7S0P0	M7S0P0	M7S0P0	M7S0P0	M7S0P0	M7S0P0	M7S0P0	M7S0P0	M7S0P0	M7S0P0	M7S0P0	M7S0P0	M7S0P0
	3	M9S0P1	M11S0P0	M0S0P0	M4S0P0	M4S0P0	M9S0P1	M11S0P0	M5S1P1	M5S3P1	M0S0P0	M9S1P1	M11S0P0	M2S1P1	M2S1P1	M0S0P0
	4	M10S0P1	M12S0P0	M0S0P0	M4S0P0	M0S0P0	M10S0P1	M12S0P0	M5S2P1	M5S4P1	M0S0P0	M10S0P0	M12S0P0	M2S1P2	M2S1P2	M0S0P0

