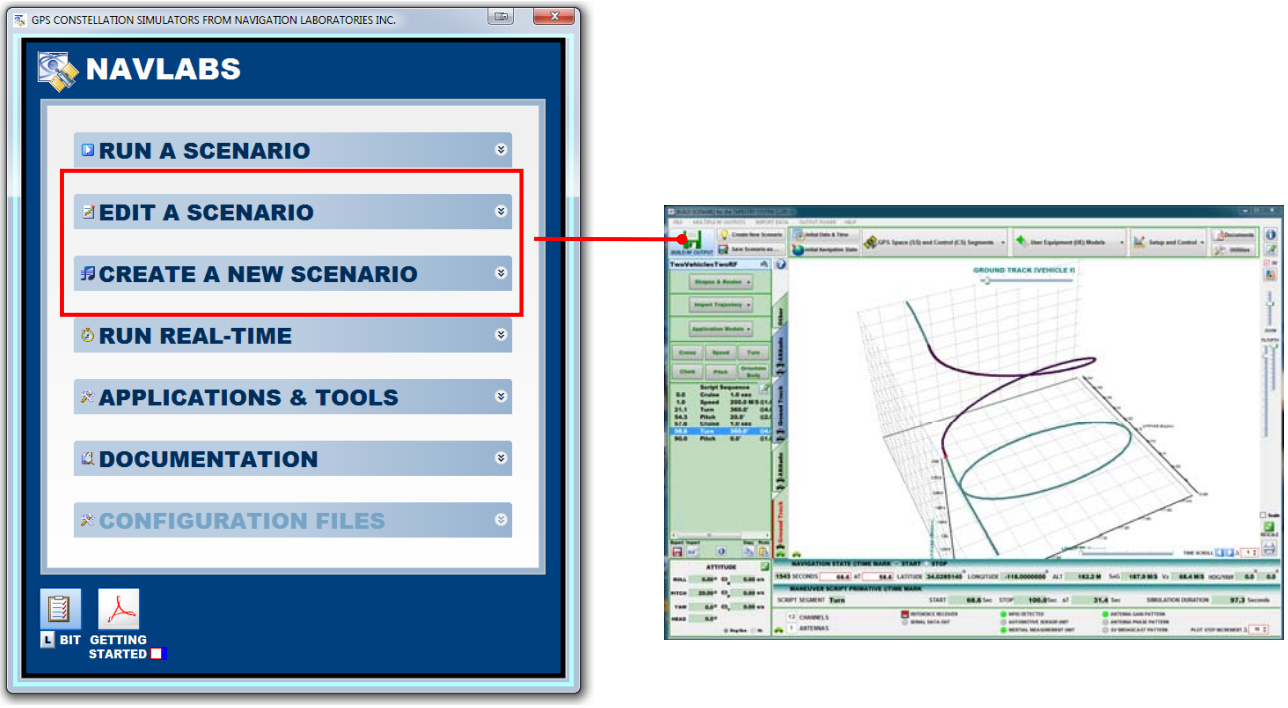
USING BUILD SCENARIO

BUILD SCENARIO for the Tapestry System is the Windows Application that constructs and maintains the Scenario Data Base in its entirety.

Access **BUILD SCENARIO** from **TAPESTRY SHELL** on the computer desktop. The **BUILD SCENARIO** Main Form encapsulates all of the functions you will need to productively use the simulator.

The build number can be found in the main pull down menu **Help | About** or on the Main Form title bar.

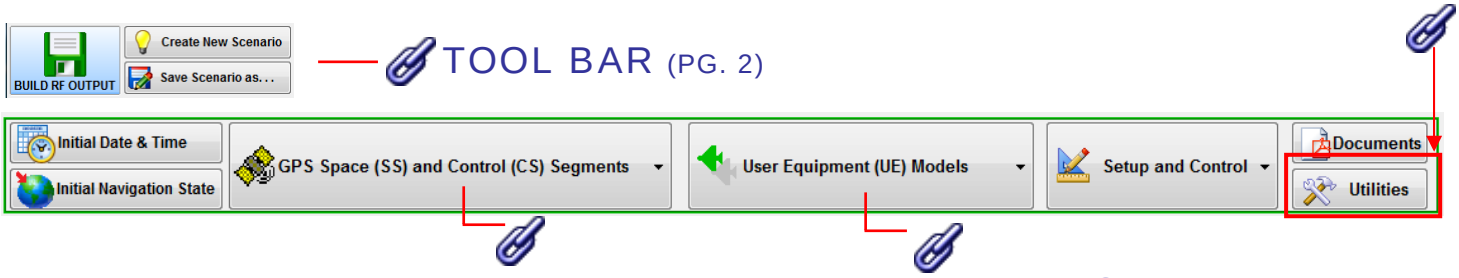
For additional reference, this document, and other useful documents can be found in:
C:TAPESTRY\DOCUMENTATION



A word about Color Schemes: Tapestry is a multi-RF/Multi-Vehicle system. To keep track of the current vehicle and its models, the ICON identifies Vehicle I and Vehicle II. Forms that apply to specific vehicle match the color of the ICON. A Grey form applies to both Vehicles – such as Simulation Start Time .

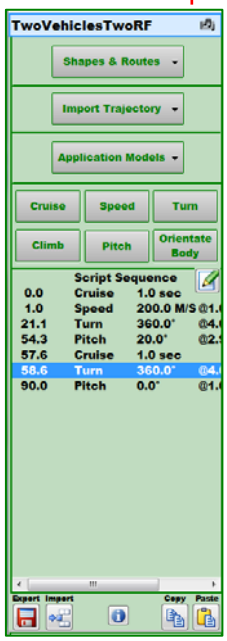
BUILD SCENARIO MAIN FORM

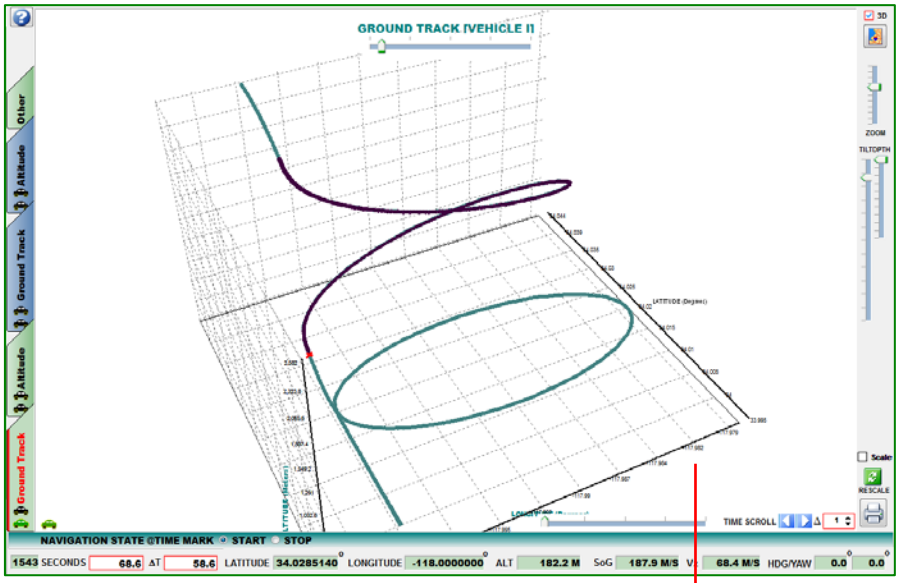
There are five group-together elements of the **BUILD SCENARIO** Main Form. The **Users Guide** is organized according to these groupings – to hot link.



TOOL BAR (PG. 2)

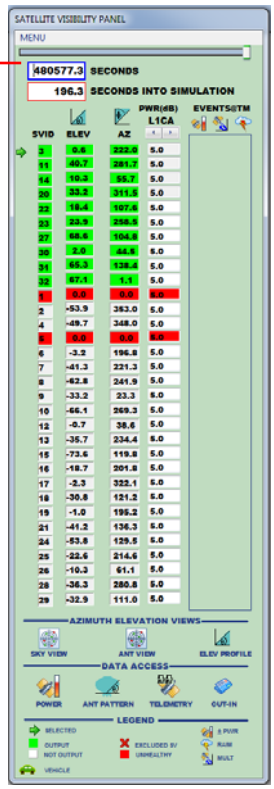
VEHICLE MOTION PANEL (PG. 9)



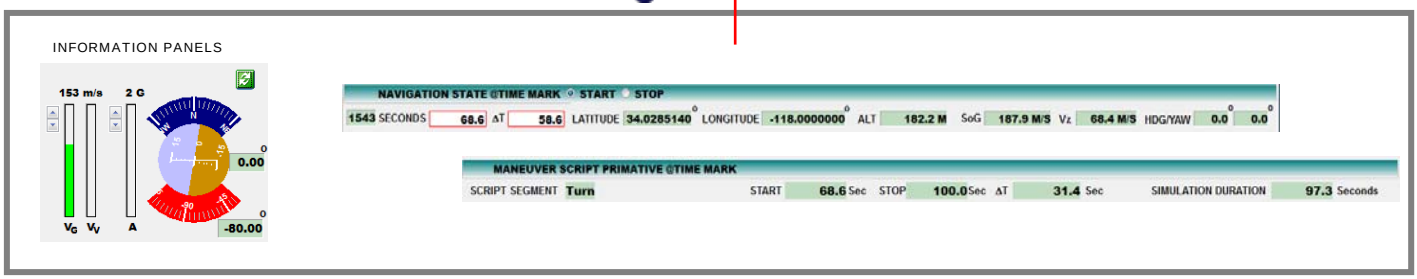


PLOTTING PANEL (PG. 19)

SATELLITE PANEL (PG. 23)

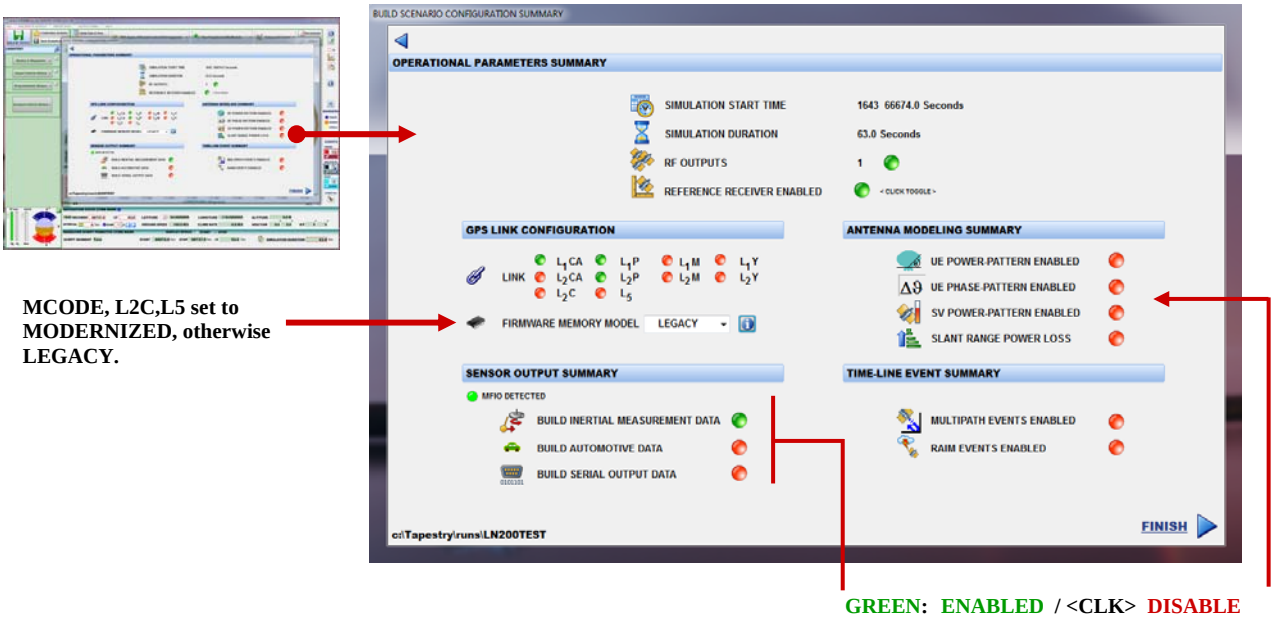


SUMMARY PANELS (PG. 17)



BUILD RF OUTPUT

Scenarios must be BUILT before they can be Saved, Edited, or Run. Select this ICON to present the BUILD SUMMARY PANEL



MCODE, L2C,L5 set to MODERNIZED, otherwise LEGACY.

GREEN: ENABLED / <CLK> DISABLE

From the SUMMARY PANEL you may verify the initial condition, the number of hardware channels, the frequency links generated, and the configuration of the attached Sensors.

When satisfied, press NEXT.

1. The Scenario Data Base is created in it's entirety.
2. The *just-built* data base is saved.
3. Temporary files are deleted from the Scenario Folder.
4. The Scenario is ready to be RUN.

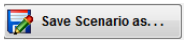
To QUIT and restore the Scenario to *how-it-was*, use **FILE | Quit** or Windows **Close**.

CREATE NEW SCENARIO

Operationally, **a Scenario** is a folder within Windows located off of **c:\Tapestry\Runs**. When a new **Scenario** is created, the contents of the *Default* **Scenario** are copied into the folder associated with the new **Scenario**[1].

To create a new **Scenario**, use the Create-Scenario Wizard. It will handle all of the tasks associated with the creation and initialization of the simulation data base. All that is required is you enter a NAME for the Scenario.

It is recommended you create the new Scenario using TAPESTRY SHELL Create a New Scenario.

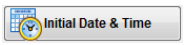


SAVE SCENARIO AS ...

Saves the *CURRENT* Scenario Data Base to another Folder with the Name as specified. The Scenario Name you specify must not already exist.

For experts, the TMP file dBase is saved as the SCN dBase in the Named Scenario. Therefore, no files have been saved in the PARENT folder - whether you do or do not save the parent, these is no effect on the child.

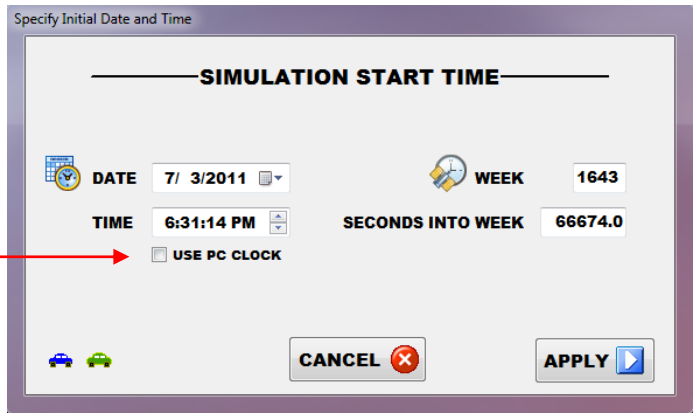
[1] *See, "Using the TapShell Application" for other methods of initializing and customizing your new Scenario*



INITIAL DATE AND TIME

Enter the Initial Simulation Time in either Time-of-Date or GPS format.

Click to set to Current Time



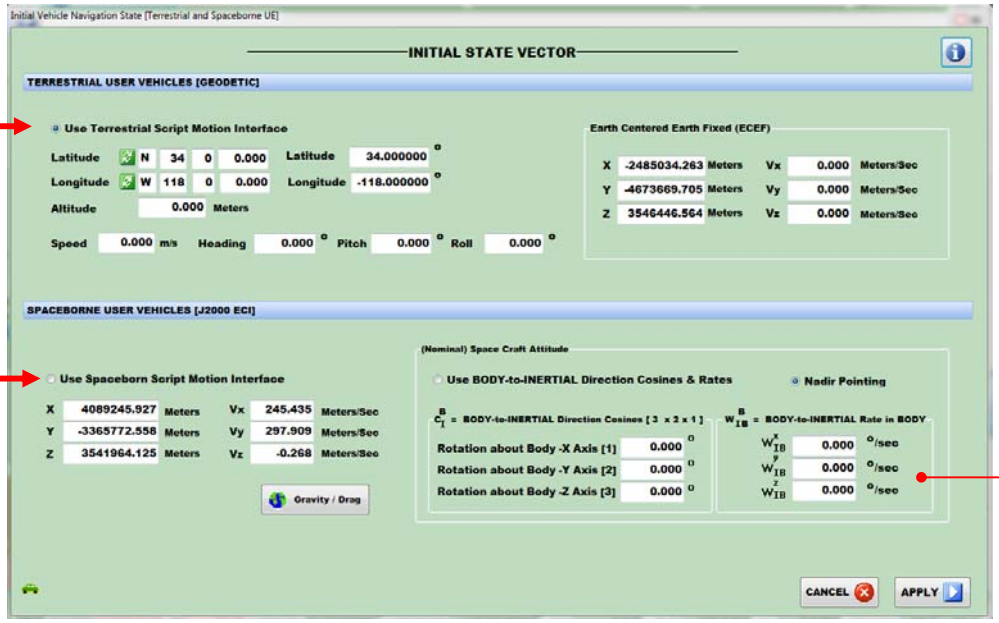
The Initial Simulation time must be at least 1 second into the week. If you are simulating a two Vehicle Scenario, both Vehicles will be constrained to start at the same simulation start time and remain synchronized in time throughout any Scenario.

INITIAL LOCATION

Enter the Initial Simulation Location. Use LLA, ECEF, ECI formats most suitable to your application.

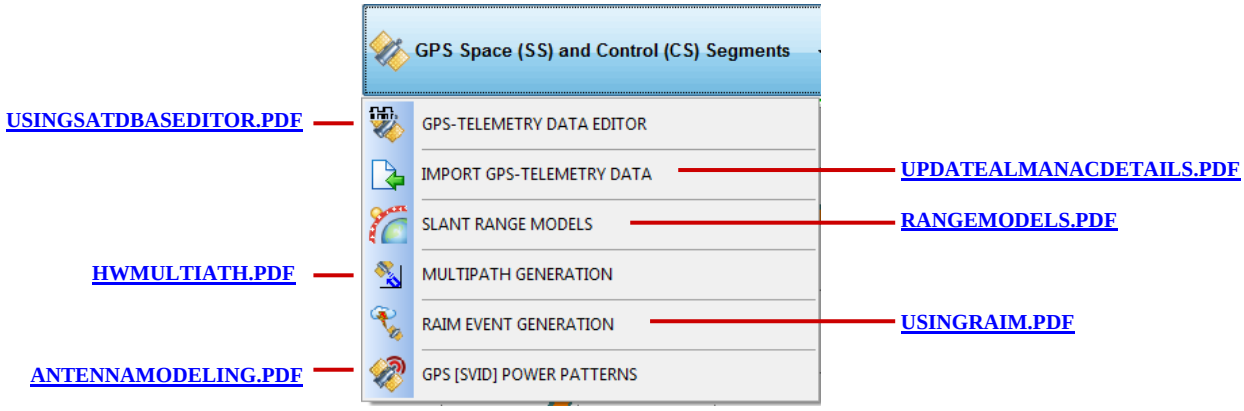
Check for Terrestrial Motion and Projectiles

Check for Spaceborne Motion



$C_B^I = -W_{IB}^B \times C_B^I$

GPS SPACE AND CONTROL SEGMENT



The Space and Control Segment is comprised of the elements of GPS responsible for determination of the Satellite Telemetry, the Propagation media, errors associated with Receiver Autonomous Integrity Monitoring (RAIM and T-RAIM), GPS SV Antenna Pattern, and Signal Composition, and Multipath.

The GPS Space and Control Segments (SS / CS) are comprehensively modeled by the TAPESTRY System. This document presents the details of the modeling encapsulated in the REVIEW / MODIFY TELEMETRY Form.

C:\TAPESTRY\DOCUMENTATION\MANUALS\ USINGSATDBASEEDITOR.PDF

The document provides details of Antenna Modeling and Lever Arms;

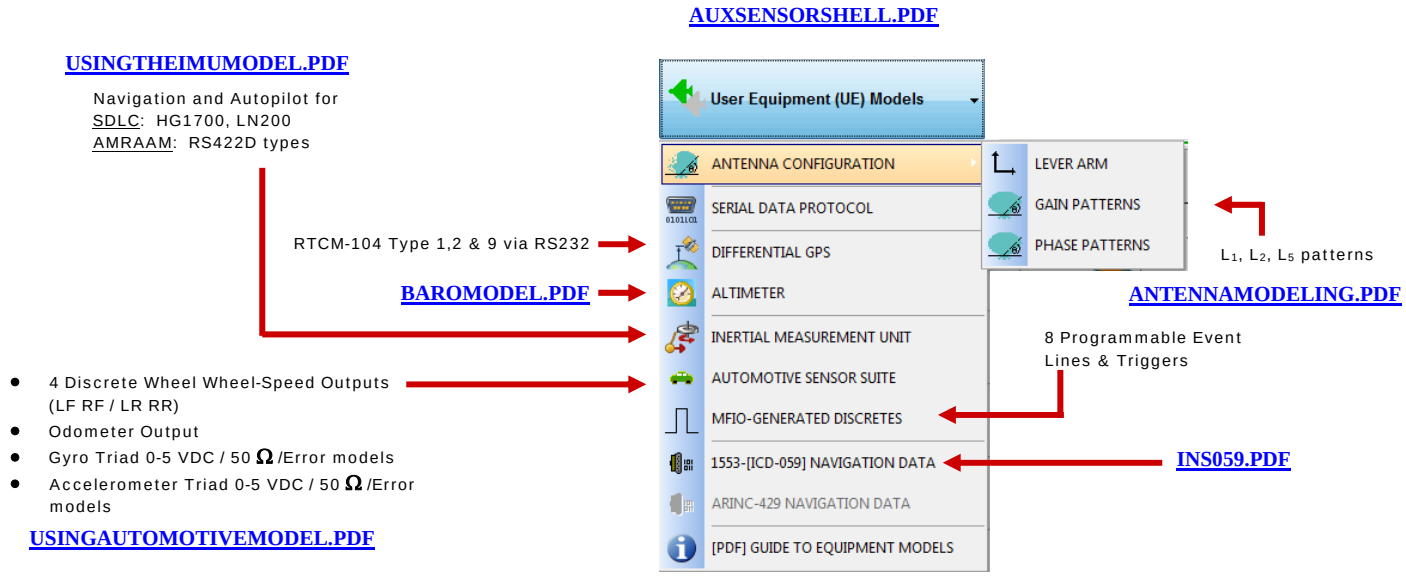
C:\TAPESTRY\DOCUMENTATION\MANUALS\ ANTENNAMODELING.PDF

The document provides details of the Ionosphere and Troposphere modeling and other line-of-sight models.

C:\TAPESTRY\DOCUMENTATION\MANUALS\ RANGEMODELS.PDF

MULTIPATH and RAIM details can be found here
C:\TAPESTRY\DOCUMENTATION\MANUALS\USINGRAIM.PDF
C:\TAPESTRY\DOCUMENTATION\MANUALS\HWMULTIPATH.PDF

USER SEGMENT (HOST VEHICLE SENSORS)



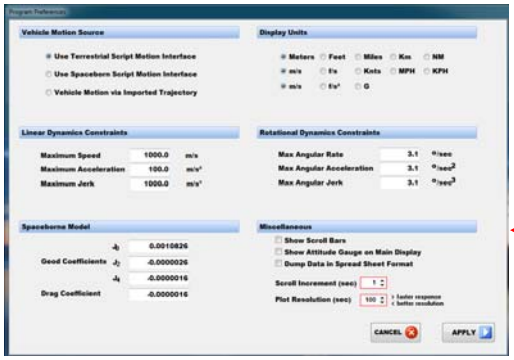
TAPESTRY was designed from the outset to to combine the GPS line-of-sight data with Auxiliary Sensors that enhance system performance when GPS availability/quality is degraded. The Tapestry System was designed with these types of distributed systems in mind.

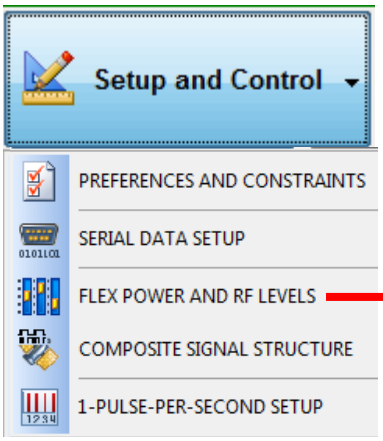
As a component of a distributed simulation environment, The Tapestry System provides:

- High Speed Closed Loop Operation for minimal transport delay and maximum update rate.
- ± 10 nanosecond pulse output synchronized with our 1 second GPS rollover.
- Slave operation where we respond to an incoming pulse.
- 10 MHz input/output phase locked to our internal 10.23 MHz OCX.

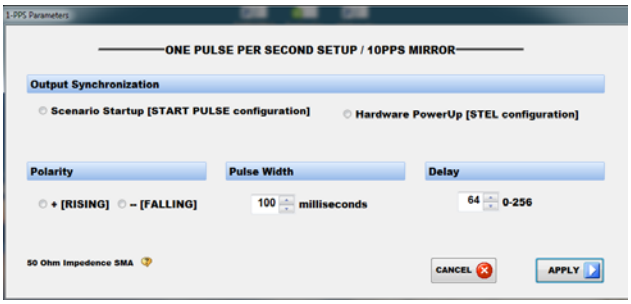
Additionally, **TAPESTRY** can emulate the outputs of additional auxiliary sensors. Using our proprietary PCI expansion card [**M**ulti **F**unction **I**nput **O**utput **MFIO**] we can produce data and electrical outputs that mimic those from SDLC/RS422D Inertial Measurement Units (IMU). Analog and digital/serial outputs that support automotive sensors such as the SiRFSTAR-I/II.

Setup and Control SETUP AND PREFERENCES

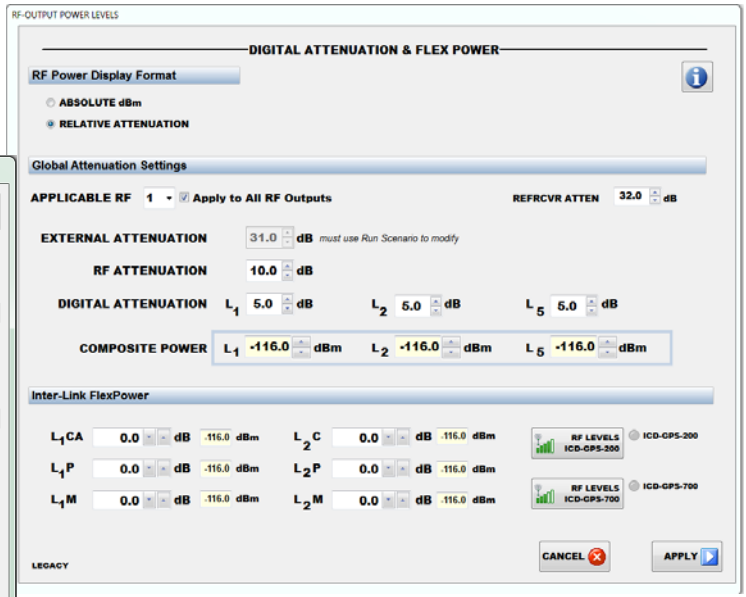


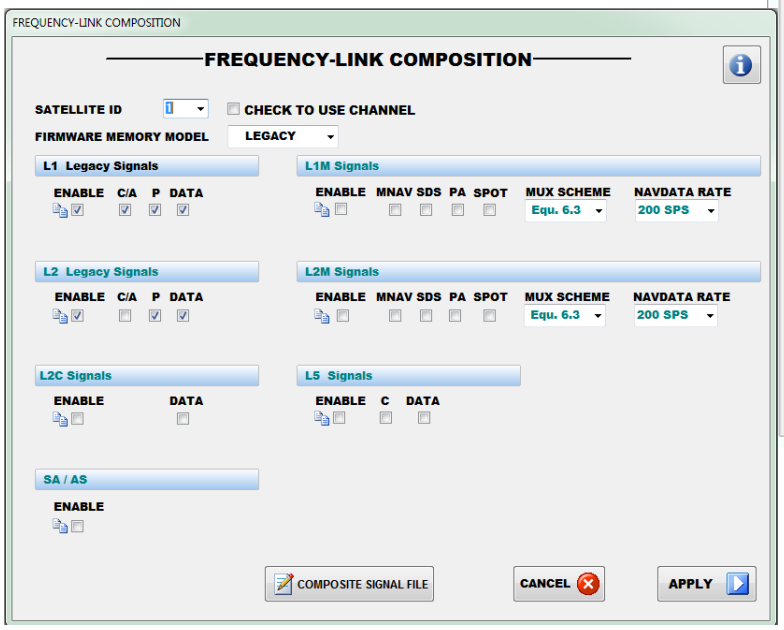


USING SERIAL DATA.PDF

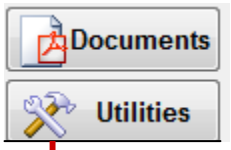


HARDWARE CONFIGURATION.PDF

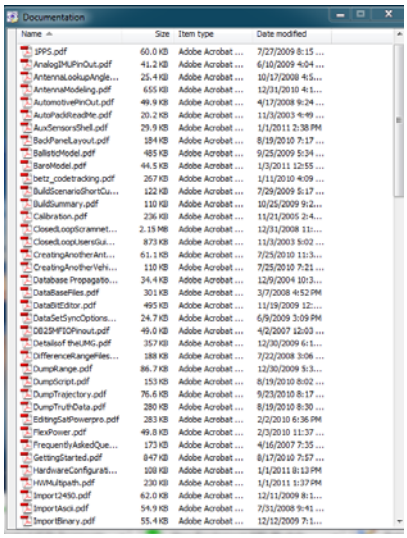




MANUALS AND DATA ACCESS UTILTIES



Browse the Documents Folder

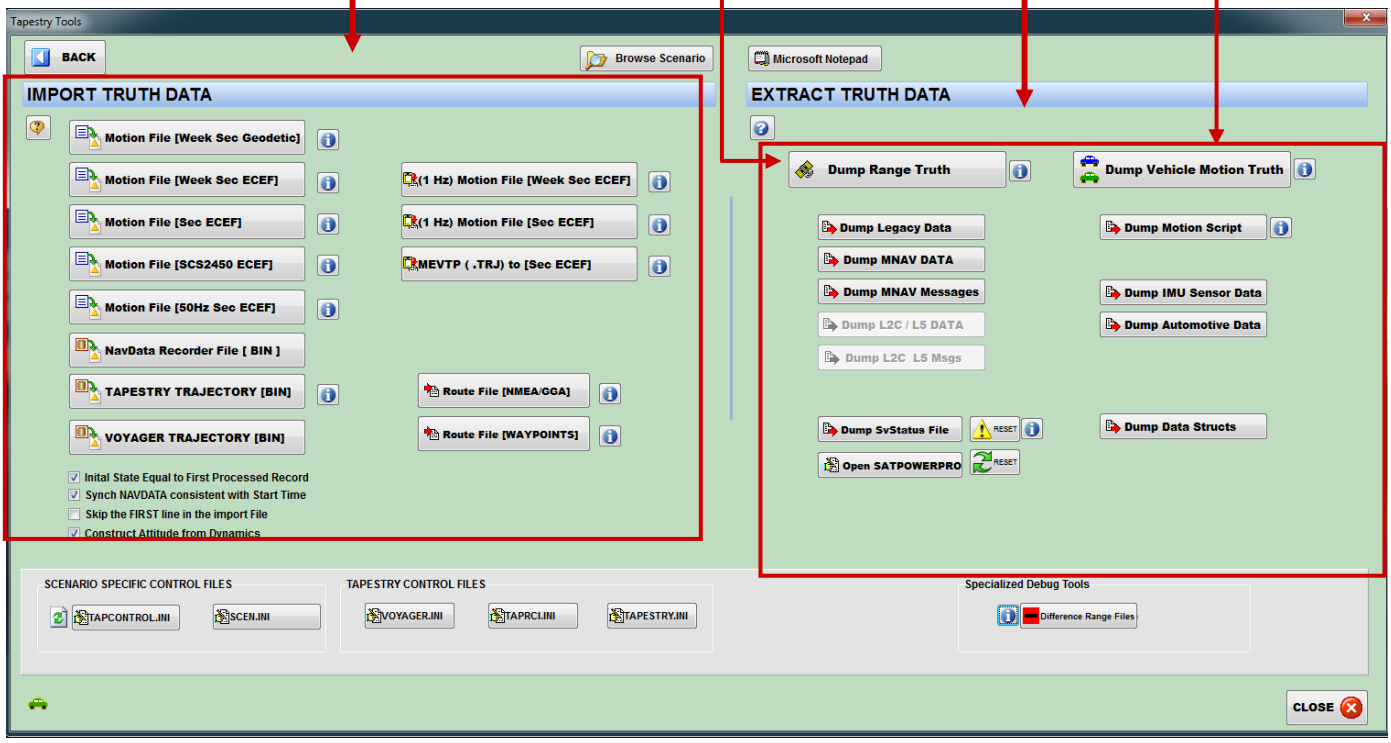


[IMPORT SHELL.PDF]

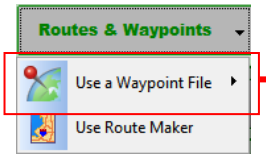
[DUMP TRUTH DATA.PDF]

[DUMP RANGE.PDF]

[DUMP TRAJECTORY.PDF]

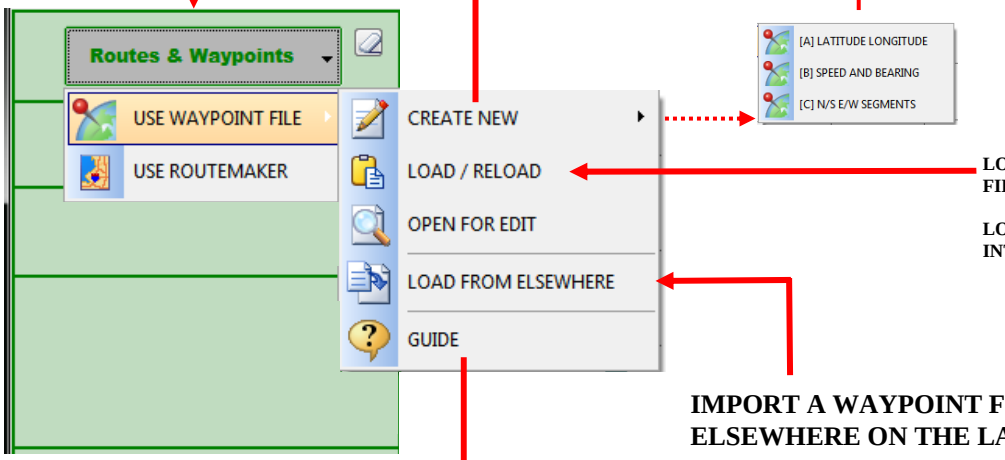


ROUTES & WAYPOINTS



CREATE A NEW WAYPOINT FILE WITHIN THE SCENARIO FOLDER

SELECT DESIRED FORMAT



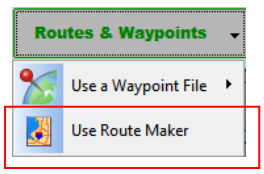
LOADS NEWLY CREATED WAYPOINTS FILE INTO THE SCENARIO

LOADS EDITED WAYPOINTS FILE INTO THE SCENARIO

IMPORT A WAYPOINT FILE FROM ELSEWHERE ON THE LABPRO COMPUTER

WAYPOINT FORMAT DESCRIPTION

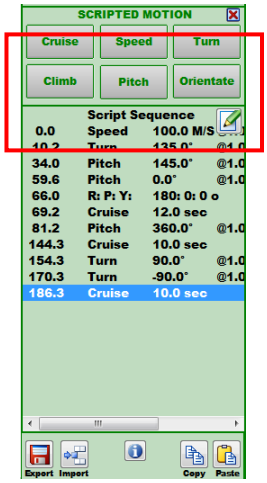
OPENS WAYPOINTS.TXT. IF CHANGED FILE MUST BE (RE) LOADED



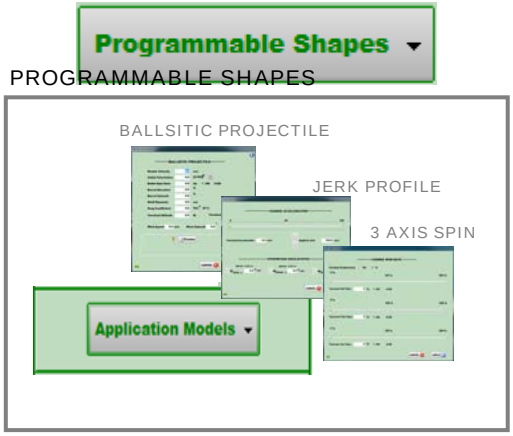
see this document for details: USING ROUTE MAKER.PDF

SCRIPTED VEHICLE MOTION

Tapestry provides a highly accurate 6-DOF Vehicle-Motion Generator. Construct a Motion Trajectory for your tests by chaining together maneuver primitives.
The maneuver-primitive-chain is collectively referred to as the **SCRIPT**.

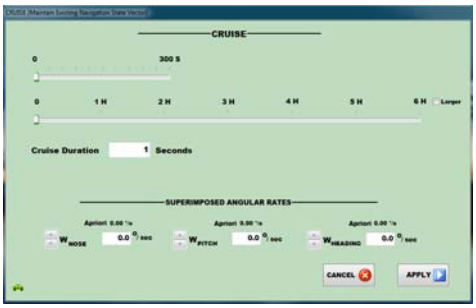


MANEUVER PRIMATIVES



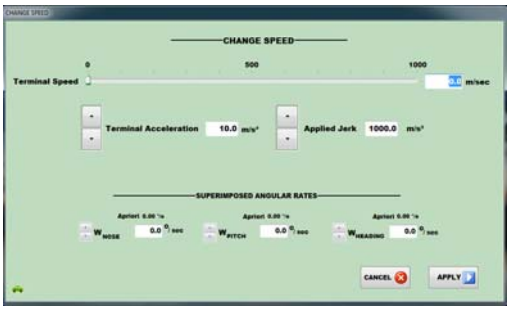
MAINTAIN STATE

PROGRAMMED
- DURATION



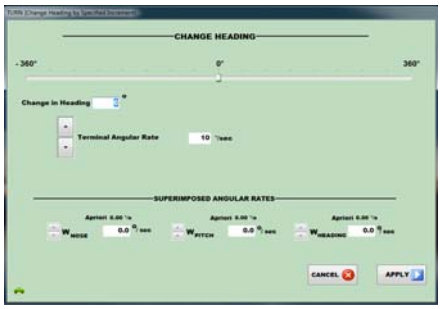
CHANGE SPEED

PROGRAMMED
- TERMINAL SPEED
- ACCELERATION / JERK



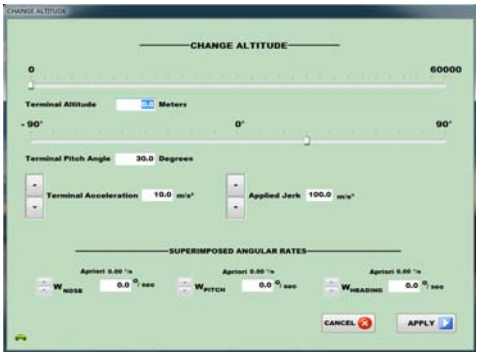
CHANGE HEADING

PROGRAMMED
- TERMINAL HEADING
- BANK ANGLE AND RATE
- ACCELERATION / JERK



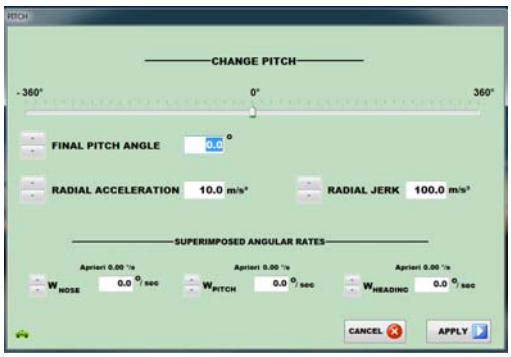
CHANGE ALTITUDE

PROGRAMMED
- TERMINAL ALTITUDE
- PITCH ANGLE
- RADIAL ACCELERATION / JERK



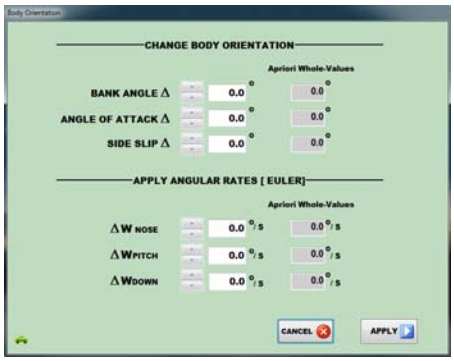
CHANGE PITCH

PROGRAMMED
- PITCH ANGLE AND RATE
- ACCELERATION / JERK

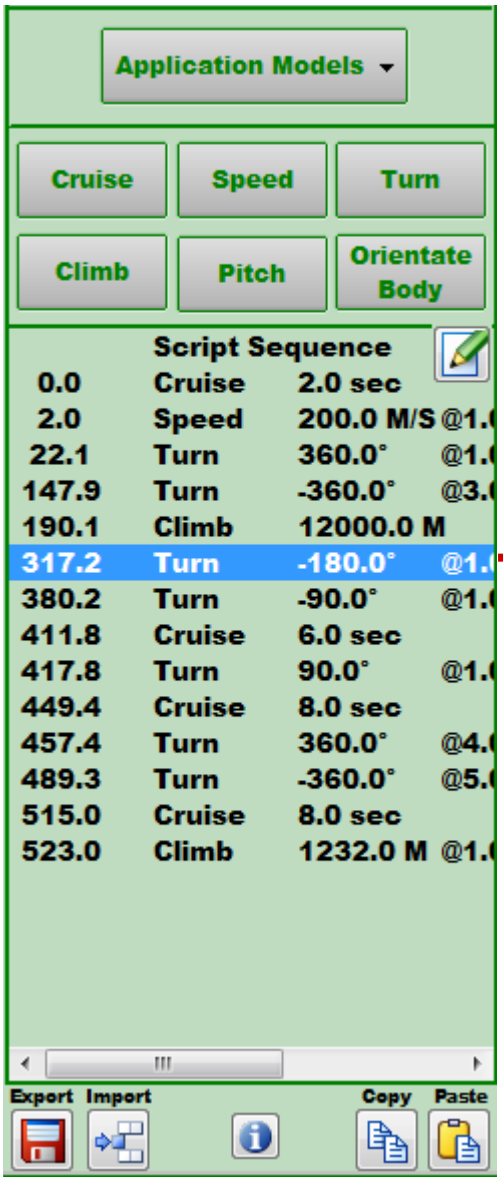


CHANGE BODY ORIENTATION

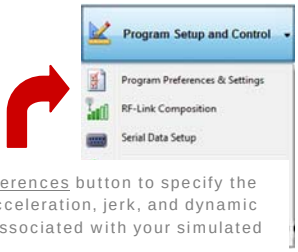
PROGRAMMED
- ATTITUDE
- BODY RATES
- ACCELERATION / JERK



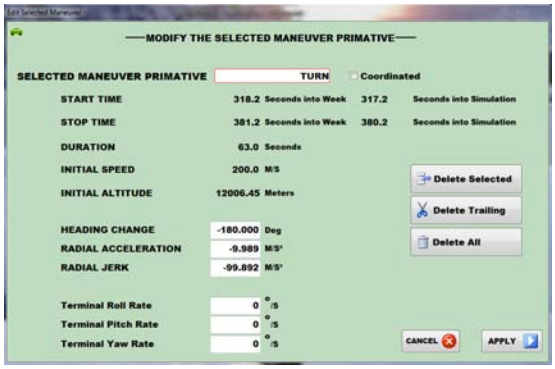
MODIFY SEGMENT

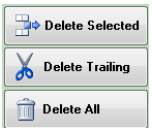


Select desired maneuver primitive



Use the Preferences button to specify the maximum acceleration, jerk, and dynamic conditions associated with your simulated vehicle.





Delete the highlighted segment

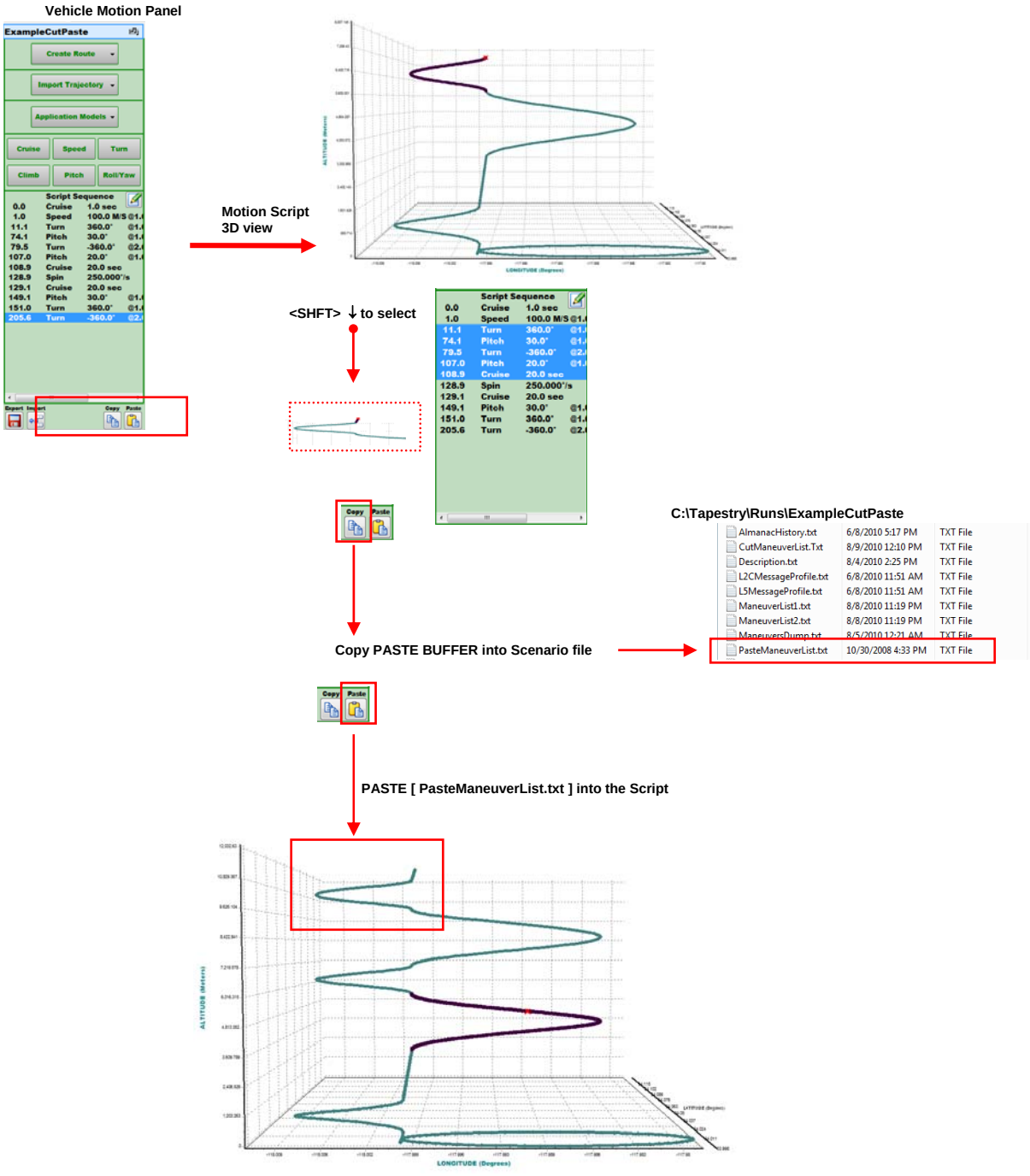
Delete ALL segments AFTER selected segment

Delete ALL the segments

SCRIPT EDITOR CONTROLS

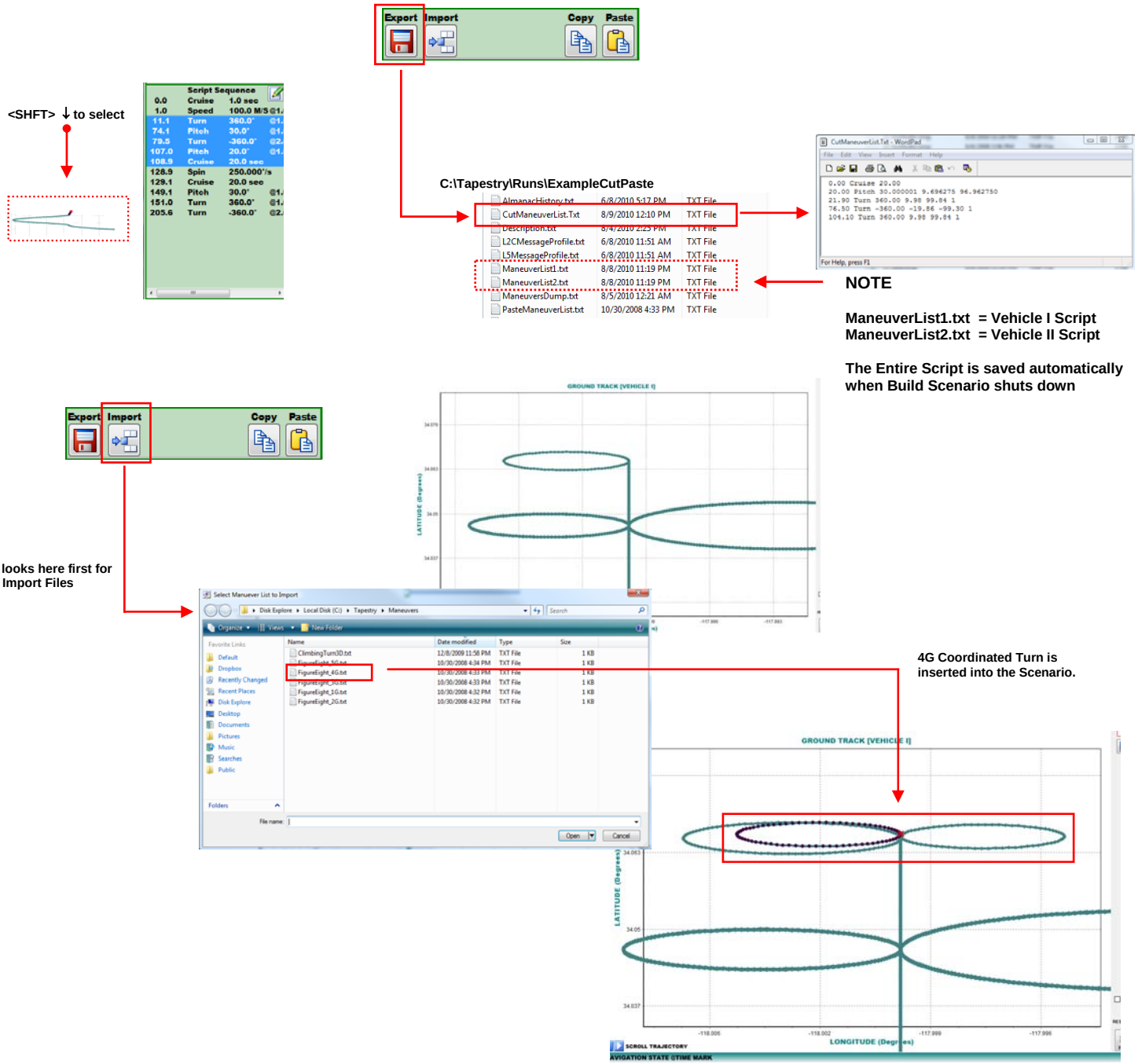
The Vehicle Motion Panel includes controls and keystroke-macros for use in the construction of the Vehicle Motion *Script*.

< CTRL C > COPY
< CTRL X > CUT
< CTRL V > PASTE

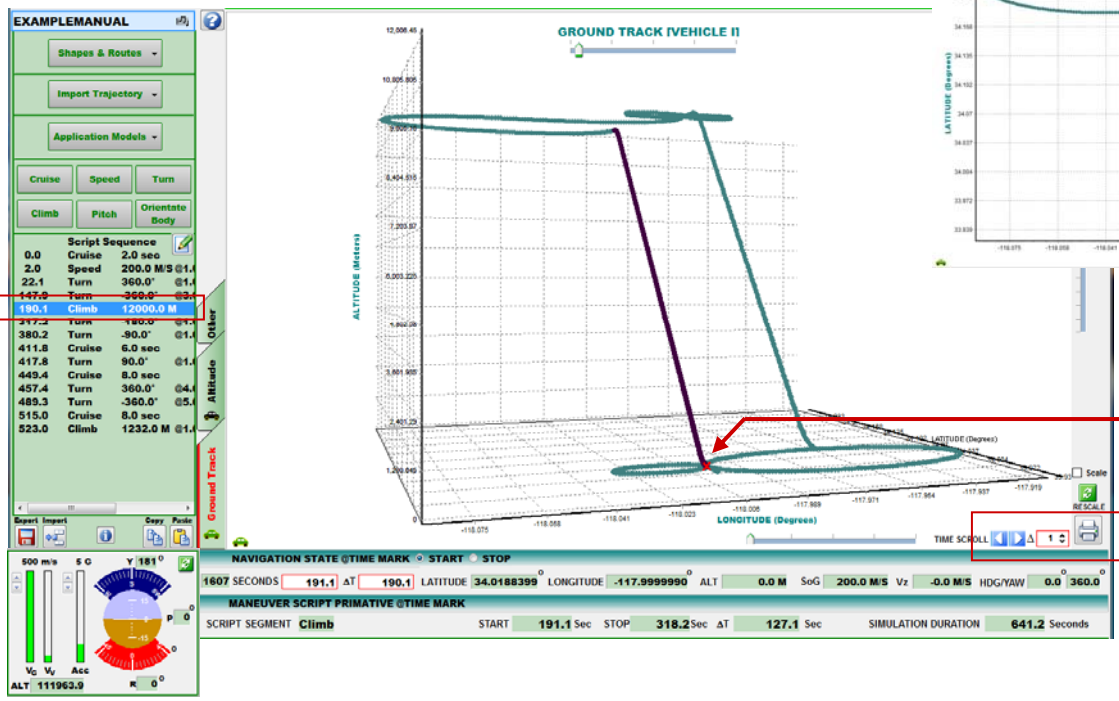


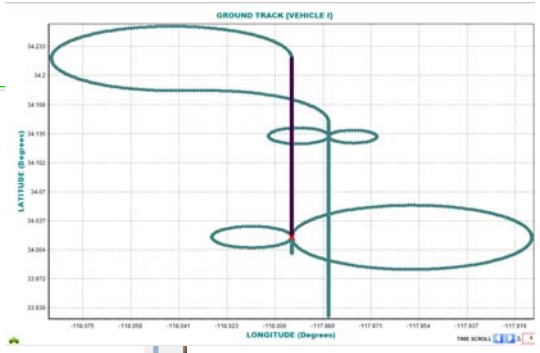
Use **EXPORT** to select a group of maneuver segments and outputs them into a file than can be IMPORTED into *this* or other Scenario's. By construction, when **BUILD SCENARIO** updates the dBase, the **Motion Script** for both Vehicle I and II are saved within the Scenario Folder: [**CUTMANEUVERLIST.TXT].**

If you want to use this file later, copy it elsewhere so it won't be overwritten. For your convenience, we have created a folder C:**\TAPESTRY\MANEUVERS** for this purpose. When you use the **IMPORT** command, Tapestry will look in this folder first for a segments file.



MANEUVER SCRIPT
POINT & CLICK / BROWSING / SETTING THE CURRENT TIME





2D VIEW

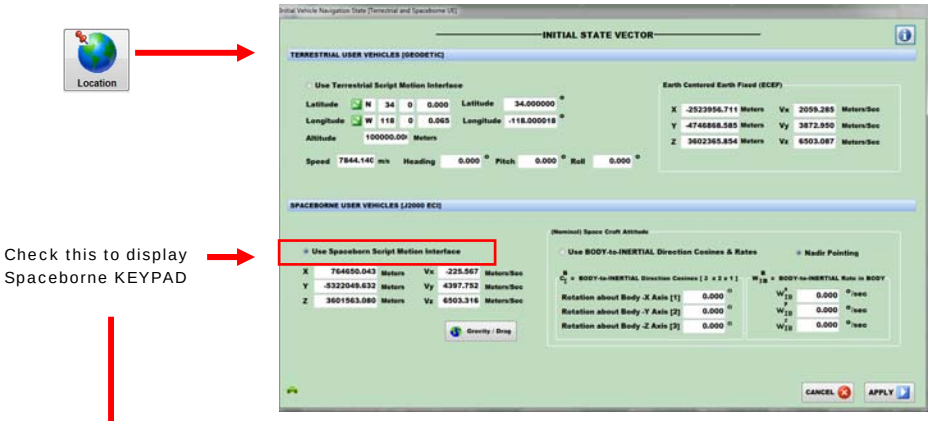
Click on the maneuvers in the script and the entire Main Form will synchronize depending upon the SHOW MANEUVER settings.

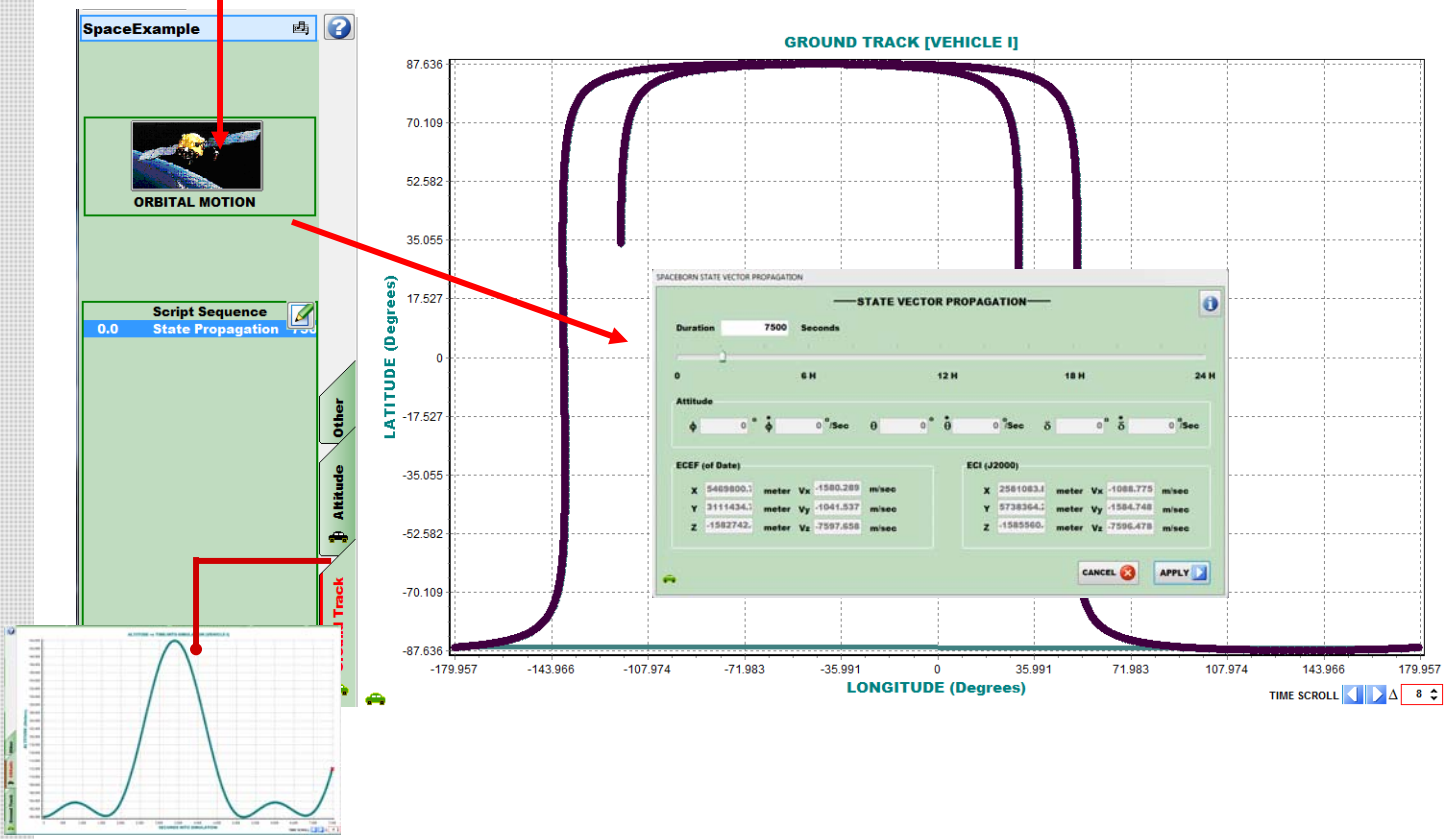
BROWSE through the maneuver one-step-at-a-time using the SCROLL control. The selected point on the GROUND TRACK DISPLAY will be marked with a RED CROSS: X

SPACEBORNE MANEUVERS

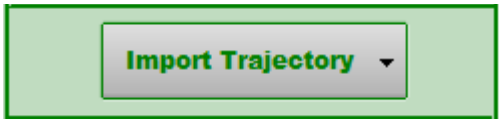
Tapestry simulates Spaceborne Vehicles in Earth Orbits. Unlike the Terrestrial Maneuvers, Spaceborne Maneuvers are not analytic and a coupled 6th order state vector equation is integrated. The Gravity model used conforms to WGS84 with three harmonics. Drag, spin, orientation, and thrust can all be specified. You may work in ECEF or Earth Centered Inertial (ECI) referenced to the J2000 epoch.

Switch to the Orbital (spaceborne) Maneuver-Keypad by using the **Preferences** or **Location** button and select **Spaceborne Script Motion Interface.** The following Maneuver Keypad will appear from which you access the state vector propagation form .

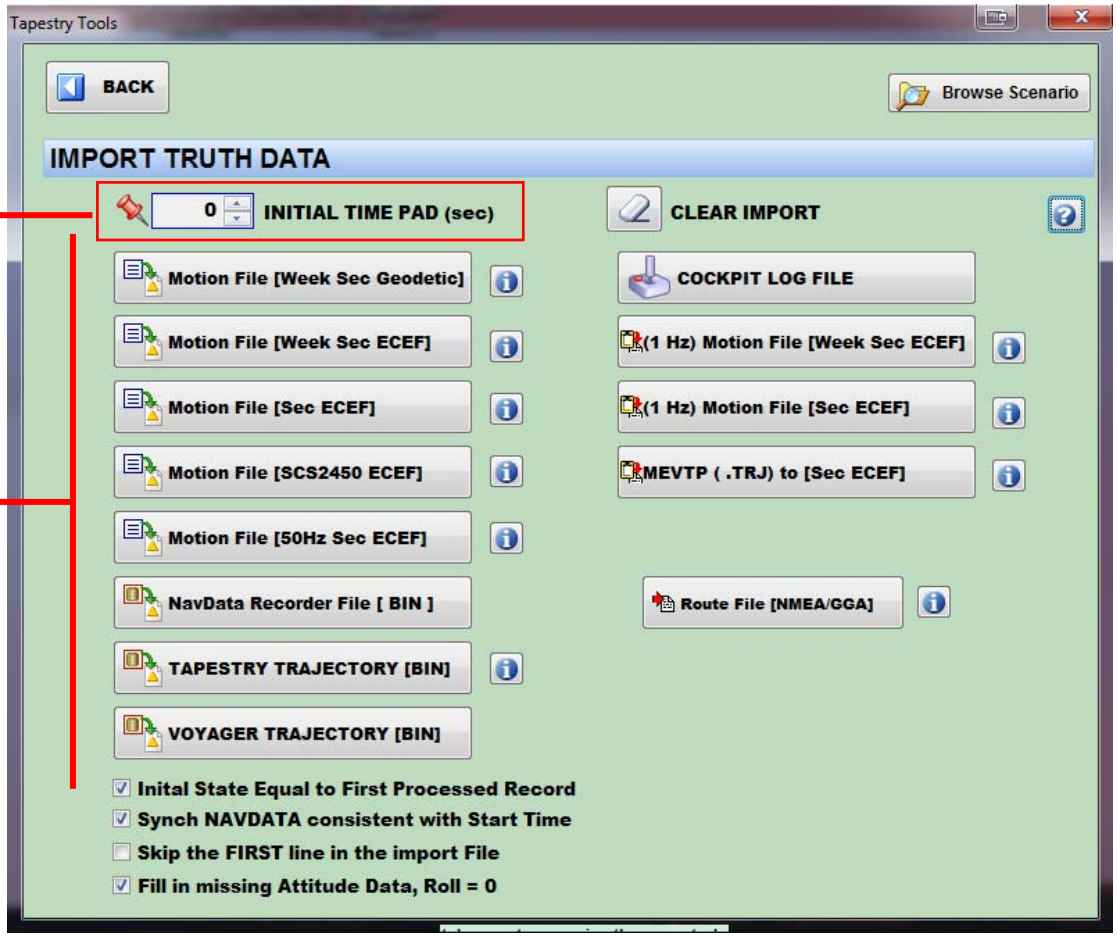




IMPORT VEHICLE MOTION



Insert a (*stationary*) pad to the front of your imported file



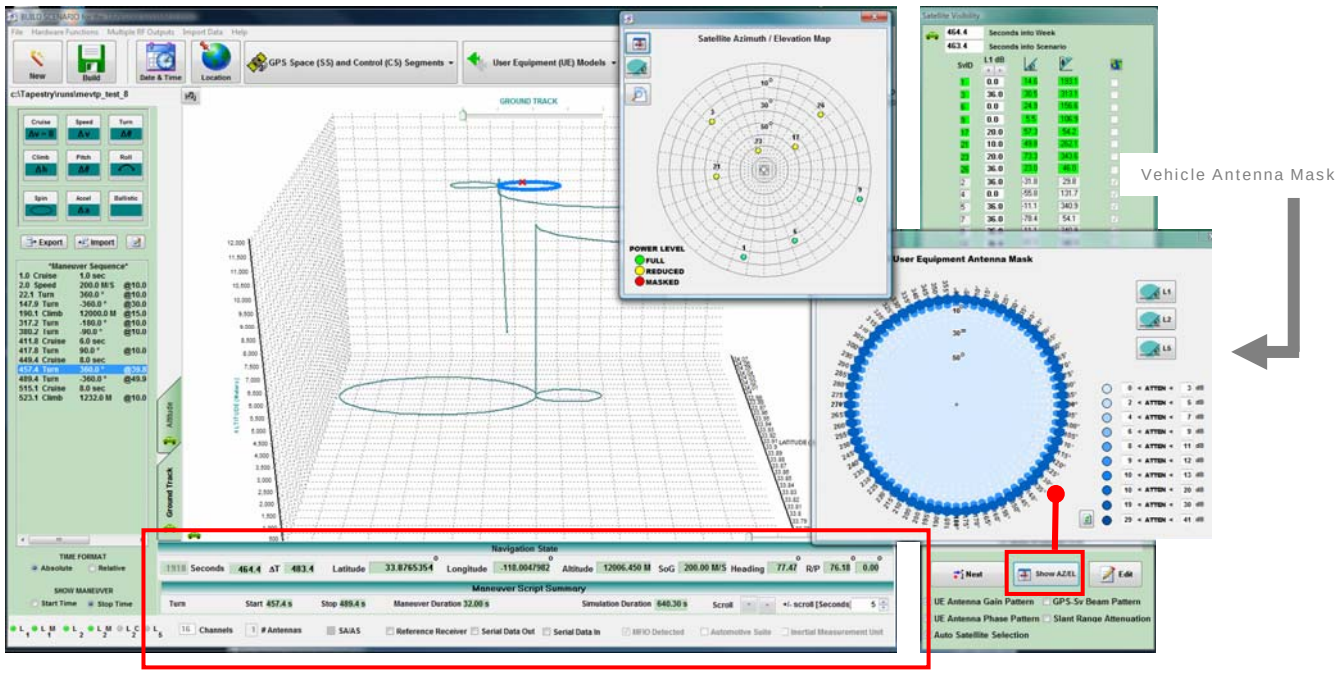
IMPORT Vehicle motion is a gateway for the end-user to develop their own motion profile and incorporate it into the Scenario.

See this document for the Format and other Information
IMPORTTRAJECTORYFILE.PDF

DISPLAY PANELS

Clicking on the plot display, the Maneuver Script, the Scroll ± buttons, or entering the epoch into one of the time edit controls, results in Tapestry synchronizing all of the data forms and displaying a Summary in the **Maneuver Script Summary Bar** and **Navigation State Bar**. These two summary bars are located just below the **Plot Display**.

For example, the display captured below *(how the azimuth/elevation plots are accessed is explained in the section on the Satellite Visibility Display)* shows the contents of the GUI at Time = 483.4 Seconds into Simulation.

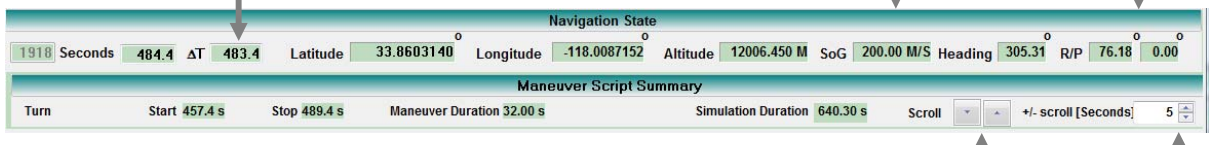


Enter the time 483.4 into this (*or any of the Time Controls*) and the GUI Form synchronizes along with all popup data forms and controls.

Speed over Ground

Roll & Pitch

Navigation State @ 483.4 seconds



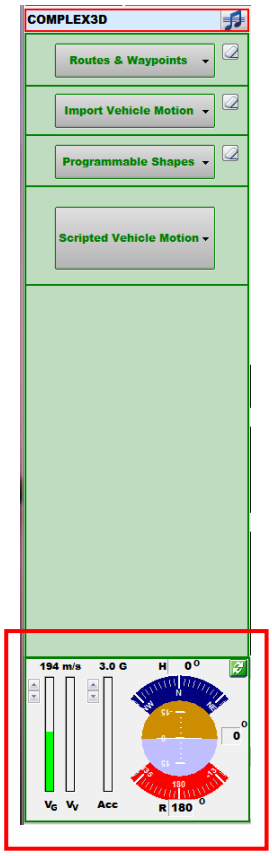
(Bracketing) Maneuver Summary @ 483.4 seconds
Coordinated 4G Turn @ 483.4 seconds (Banked 76°)

Scroll ± through the Trajectory Data

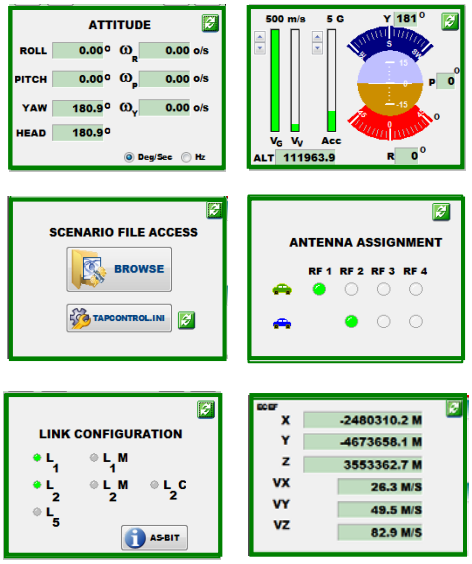
Set the step size as desired

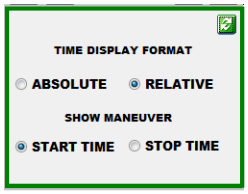
If you have imported a Vehicle Trajectory, the Maneuver Script Display is replaced with the Import Summary Bar

INFORMATION PANELS



cycles thru panels





Display time in Seconds-into-Simulation or Absolute Time.

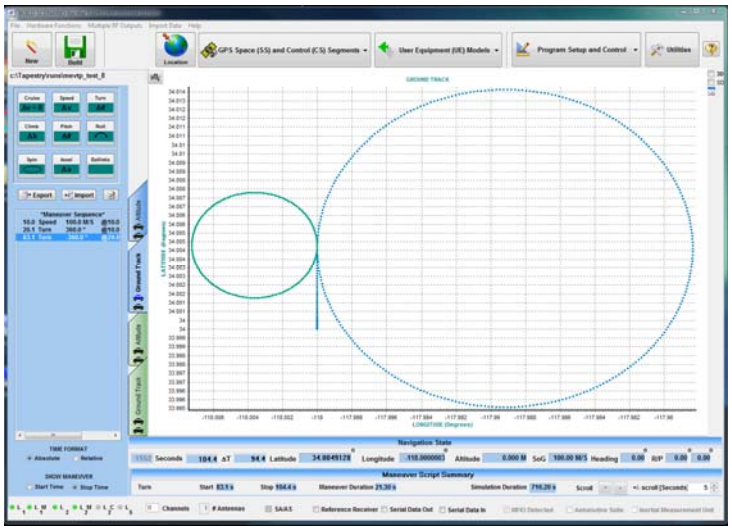
START displays the Initial conditions of the maneuver
STOP displays the Terminal conditions of the maneuver

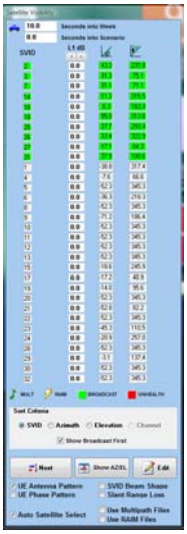
ELEMENTS OF THE PLOT DISPLAY

The plot display dominates the MAIN SCREEN of the ***Build Scenario***. For power users creating event driven simulations, the plot screen provides a gateway to advanced functions and displays.

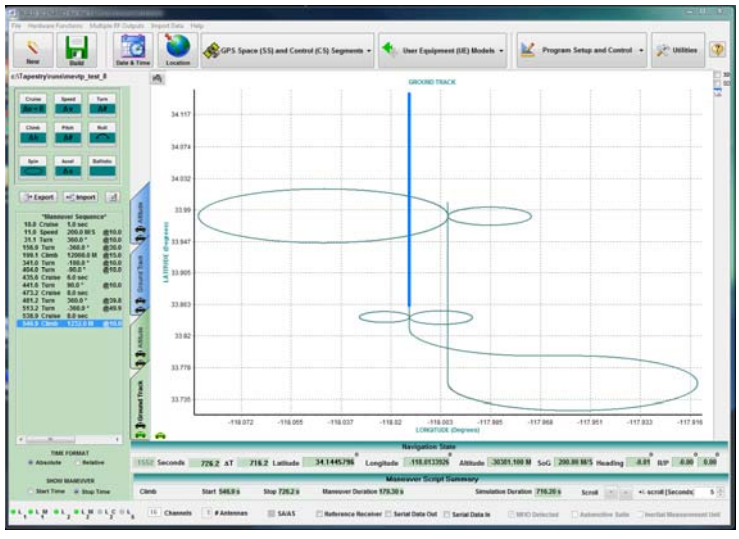
The plot display is synchronized though a mouse-click-handler such that ALL data forms, displays, and summary bars will display data associated with the point you have clicked on the screen. You may also browse-in-time through the vehicle motion profile accessing the simulation event timeline.

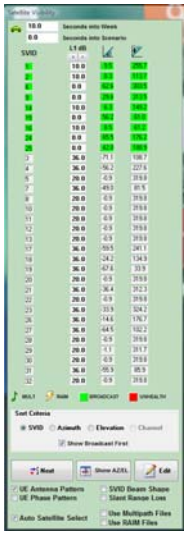
Use the BLUE TABS to access Vehicle II





Use the GREEN TABS to access Vehicle I



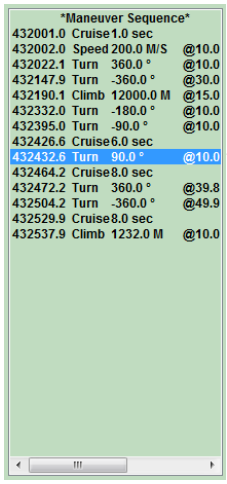


NOTE: If you don't have multiple RF outputs, the BLUE TABS will not be accessible.

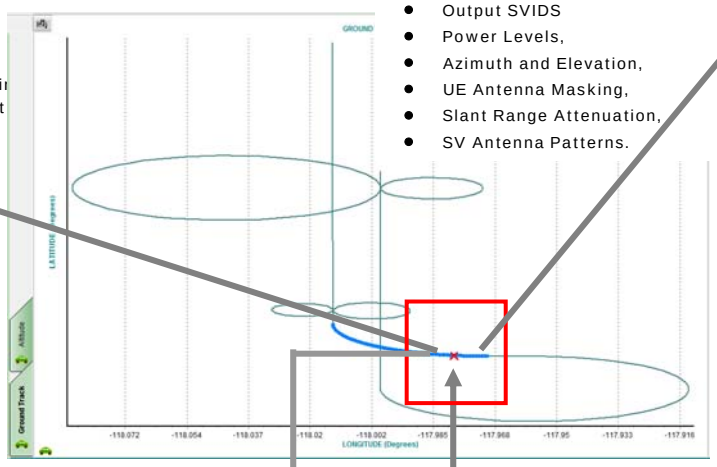
BROWSING

The Plot Display is synchronized with all data forms within Tapestry. The simulation time-line, reflected in the Navigation State Summary Bar, can be browsed in several different ways. As you browse, the complete simulation time line is displayed on;

MAIN FORM

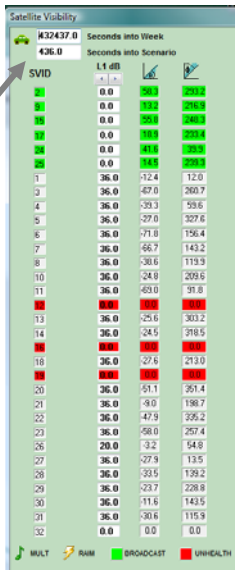


Maneuver containi
the "clicked" point
highlighted



Satellite Summary at the "clicked" point is displayed:

- Output SVIDS
- Power Levels,
- Azimuth and Elevation,
- UE Antenna Masking,
- Slant Range Attenuation,
- SV Antenna Patterns.



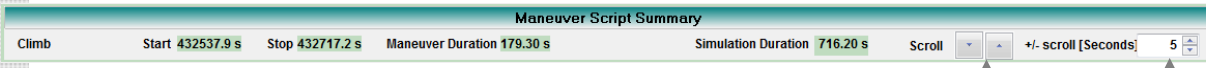
Left Click here. The point is marked with a X cross.

"Clicked" Maneuver summary

Instantaneous NAVIGATION STATE at the "clicked" point is displayed

NAVIGATION STATE SUMMARY

MANEUVER SUMMARY BAR



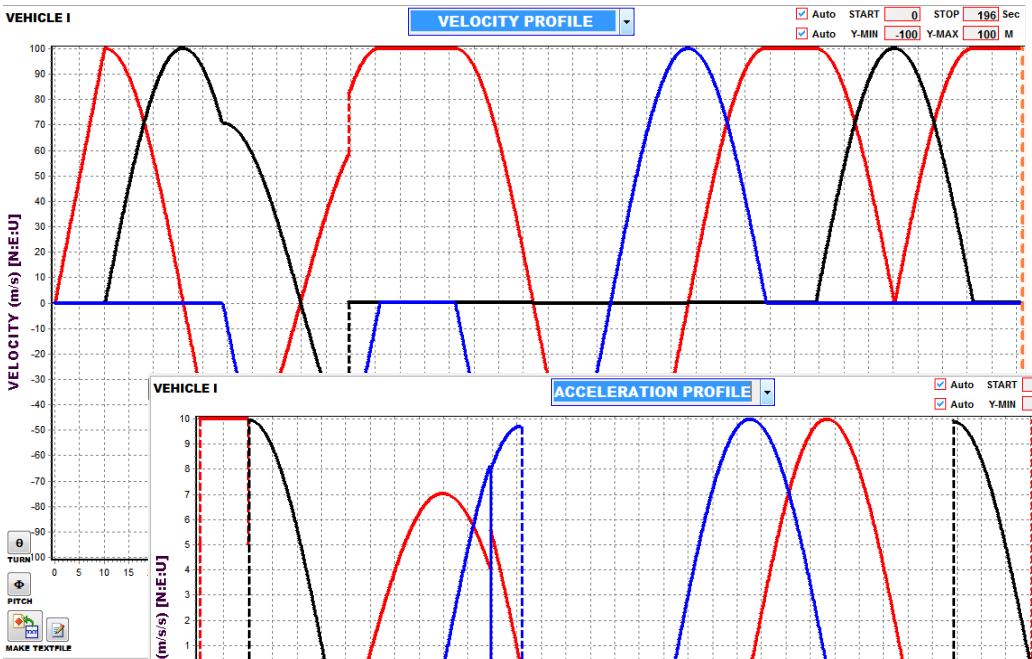
STEP (Browse) through the TIME-LINE backwards and forwards

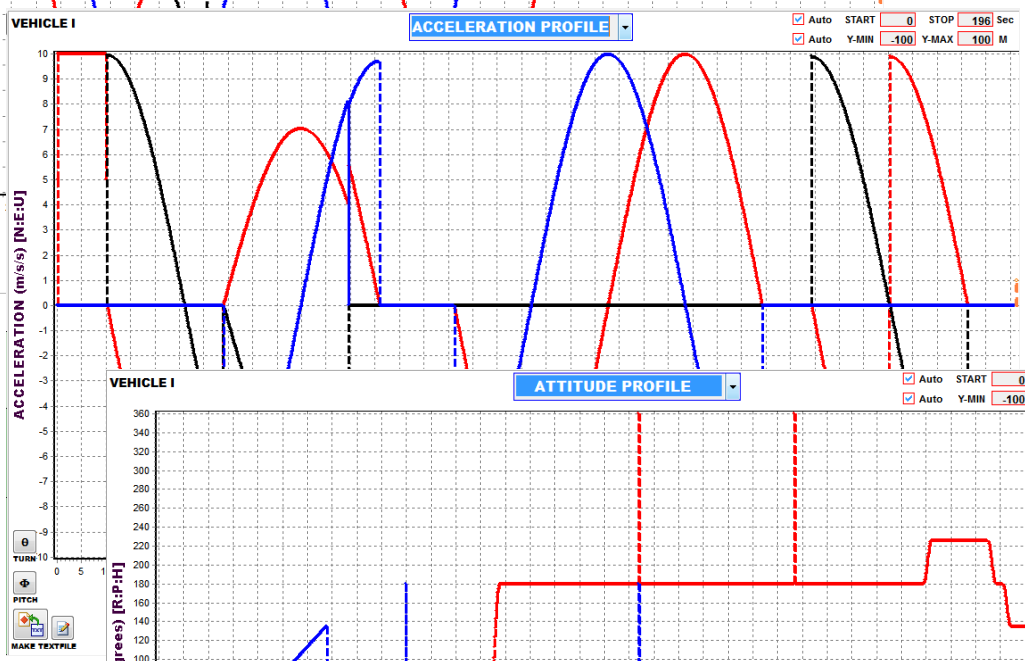
TIME-LINE Step size

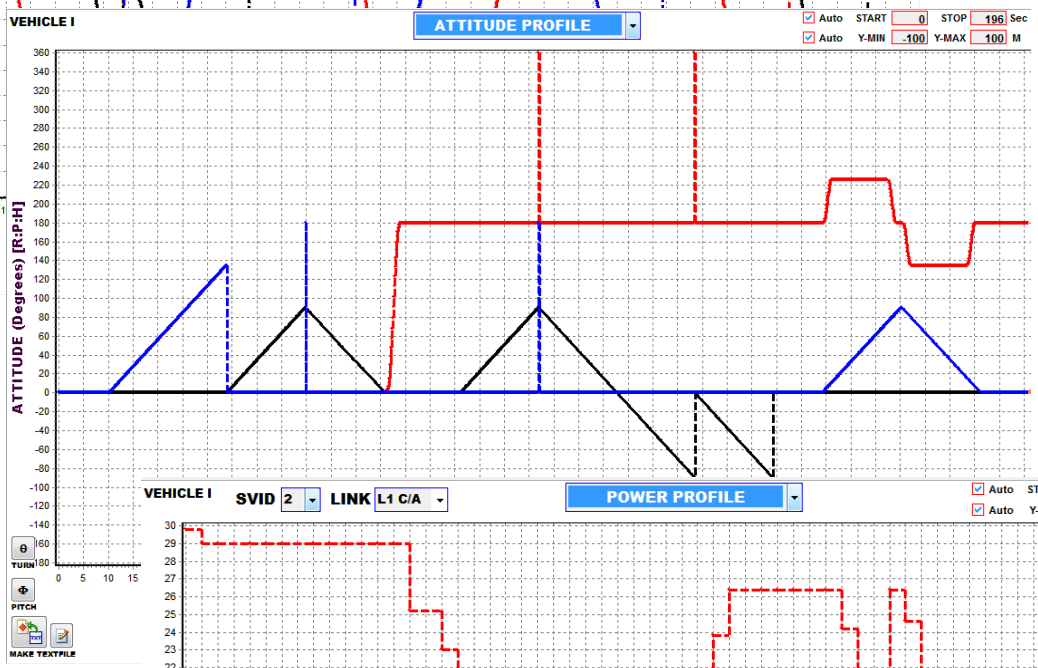
If you have IMPORTED a vehicle trajectory file, the Maneuver Summary Bar is replaced with the **Imported Motion Profile Summary Bar**

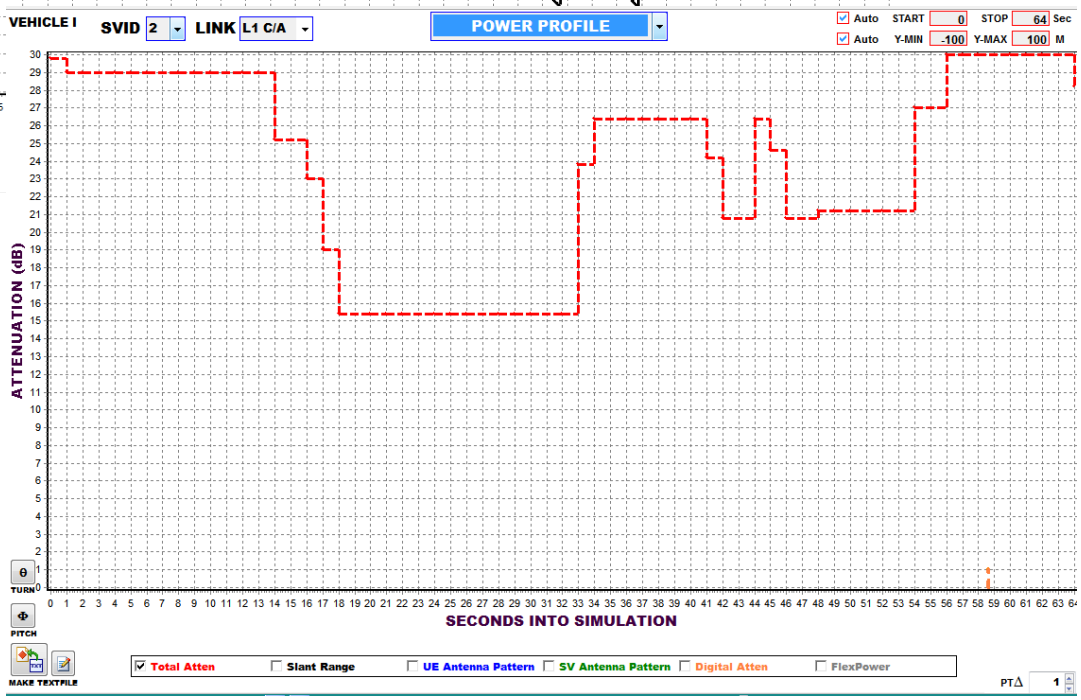
IMPORT TRAJECTORY source

PLOTTING PANELS





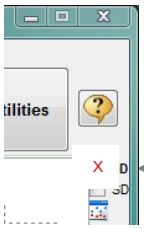




Other

3D DISPLAY

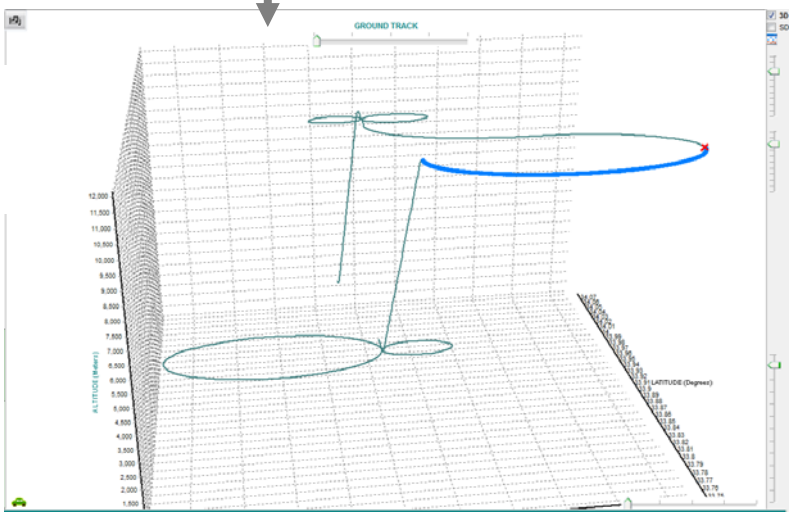
A Three dimensional display is available on the primary vehicle (Vehicle I). To access this feature, locate the CHECKBOX in the upper right hand corner of the Plot Display.

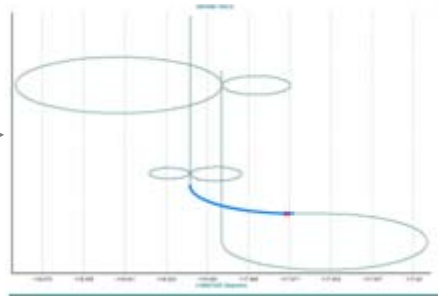


This is the SAME trajectory as shown on the previous page. 3D plotting provides a more comprehensive display of the flight profile.

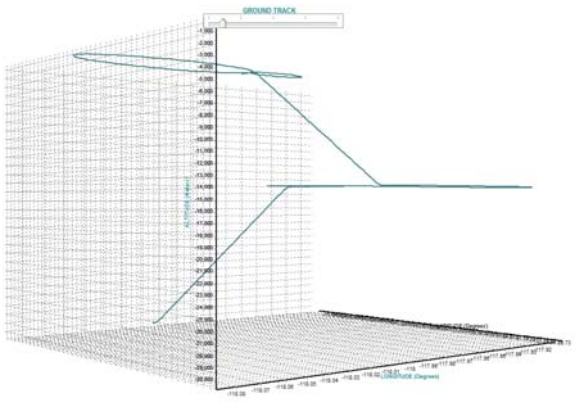
(However, the longer the simulation the more sluggish the response)

NOTE FROM AUTHOR: If you wrap yourself around a pole in 3D – go back to 2D and click in the center of the plot and the Display will reset!



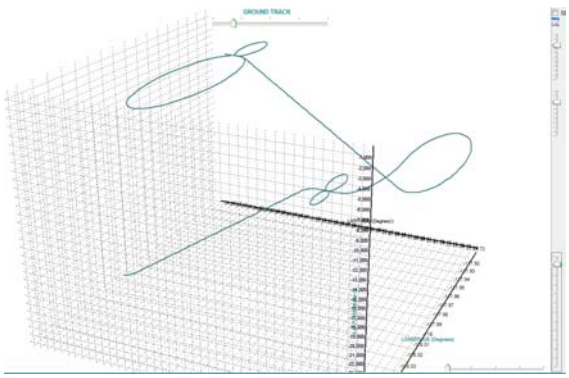


ROTATE



ZOOM

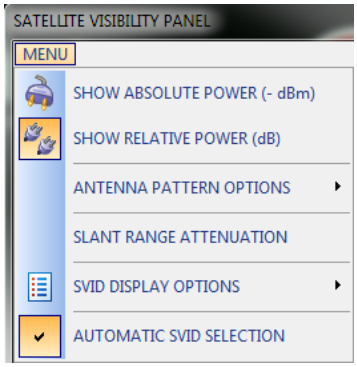
TILT



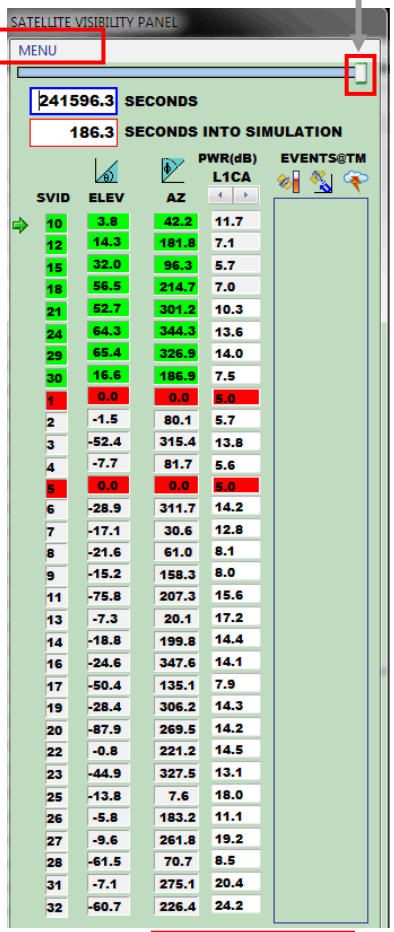
If you should want a plot of the Vehicle Trajectory, within the ***Scenario*** Folder you will find the plot display saved as a Windows Media File (WMF) that can be inserted into a document.

SATELLITE VISIBILITY PANEL

PREFERENCES AND MODEL SETTINGS



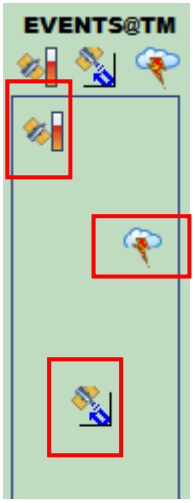
SLIDE TO SET TIME



MULTIPATH / RAIM / POWER EVENTS

CLICK ON SVID
EVENT POPUP

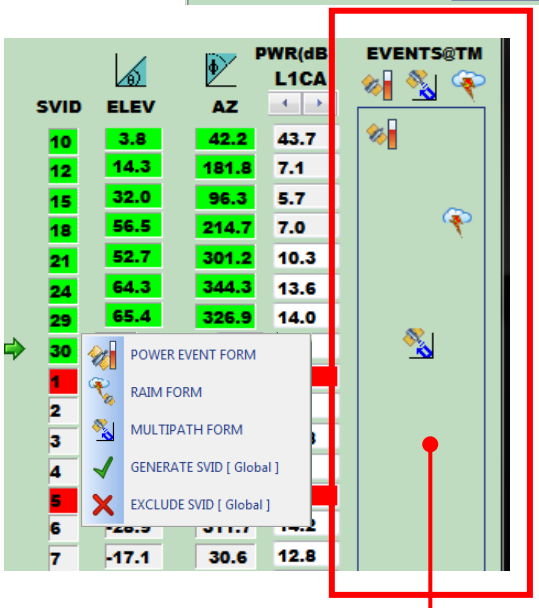
EVENT IS ACTIVE
WHEN ICON SHOWN



PROGRAMABLE POWER
SETTINGOUTPUTPOWERLEVELS.PDF

PROGRAMABLE RAIM
USINGRAIM.PDF

PROGRAMABLE MULTIPATH
HWMULTIPATH.PDF

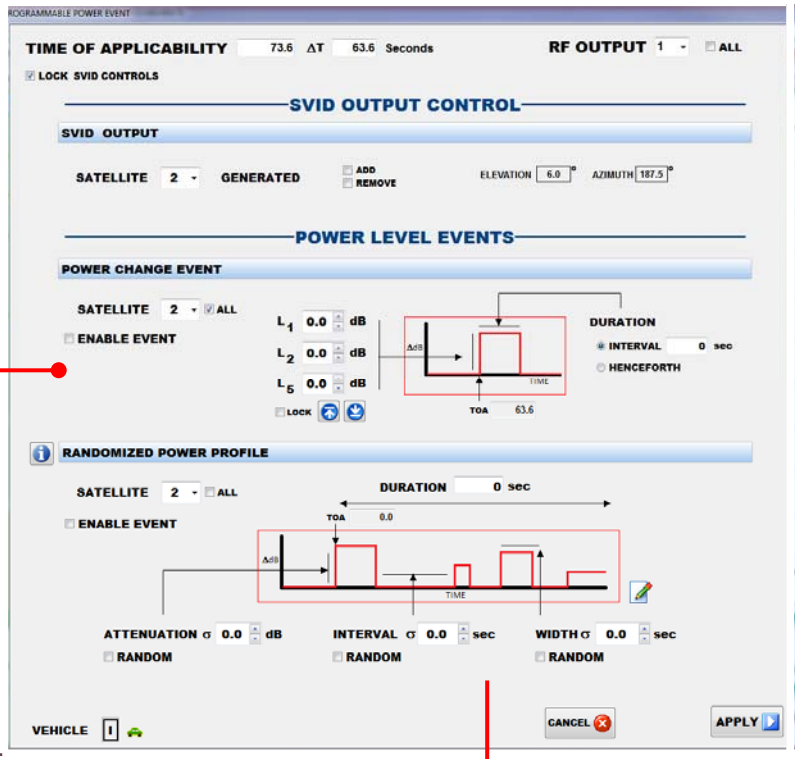


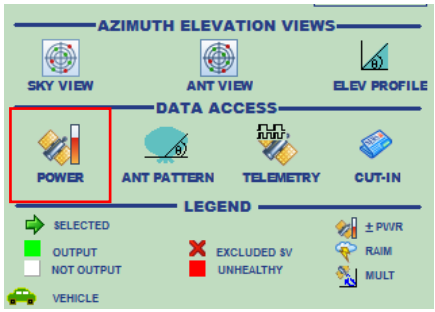
EVENT WINDOW TIME-LINE

Programming POWER, MULTIPATH and RAIM details;

SETTINGOUTPUTPOWERLEVELS.PDF
HWMULTIPATH.PDF
USINGRAIM.PDF

PROGRAMMABLE POWER LEVELS



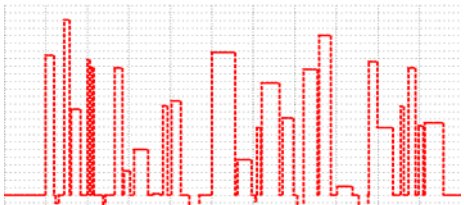


Power can be controlled for L1C/A, L1P, L2P, L2C, and L5, ML1, and ML2.

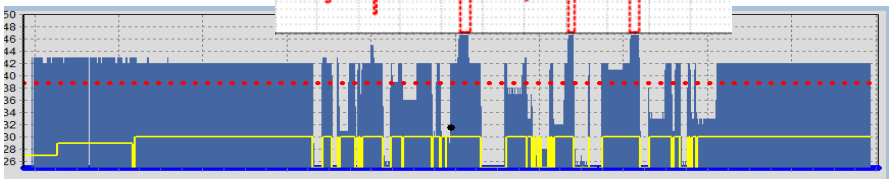
RANDOMIZE power provides a method for simulating a varying power environment due to partial blockage, foliage, or some other attenuation media.

Follow this link for details
RANDOMATTENUATION.PDF

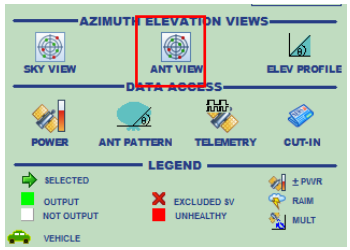
PROGRAMMED POWER PROFILE →

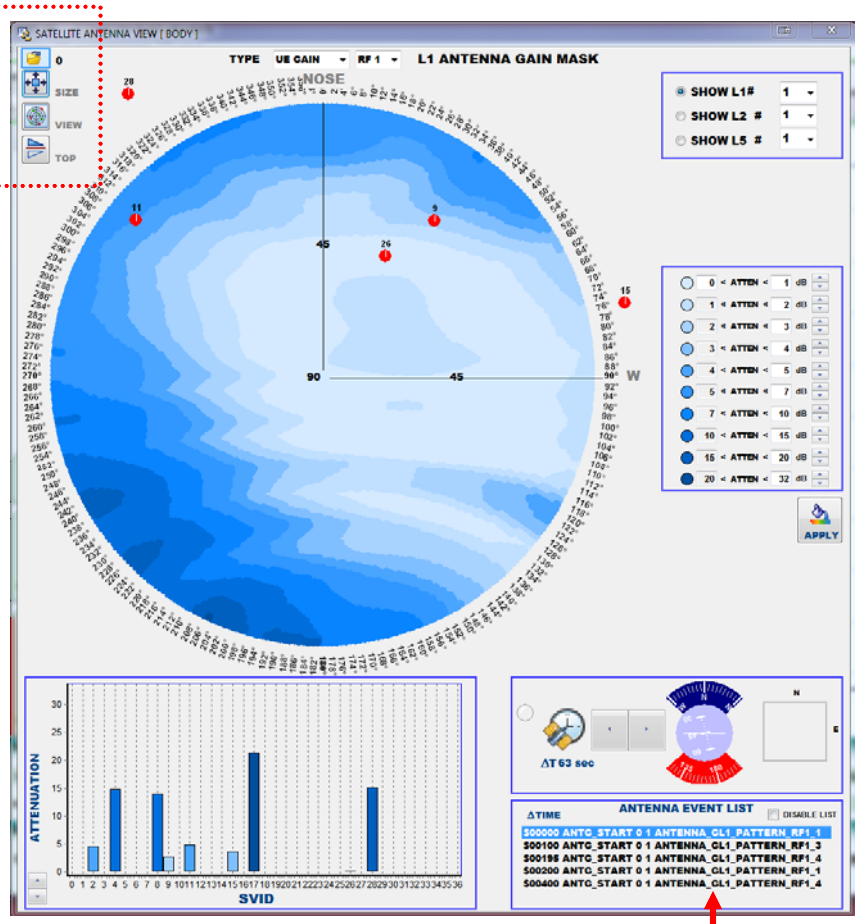


MEASURED POWER PROFILE SV 14 →



ANTENNA PATTERN VIEWER





PROGRAMMABLE BINS

ATTENUATION HISTOGRAM PER SVID

MULTIPLE-ANTENNA EVENTS

Follow this link for details

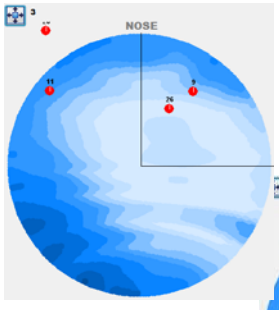
[IMPORTI NG MULTIPLE ANTENNA ATTERNS.PDF ANTENNA MODEL.PDF (PAGE 8)]

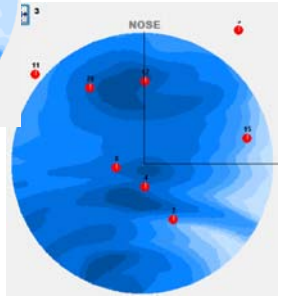
UNIQUE ANTENNA FILES IN FOLDER

OPEN PATTERN FILES

SHOW SKY MAP

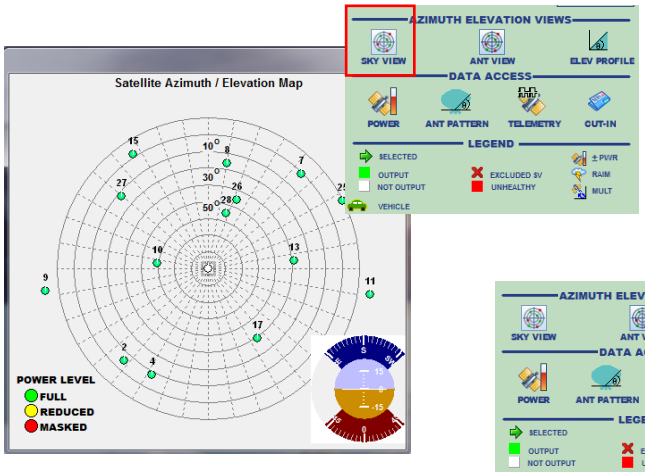
CHANGE SIZE (4 SIZES)

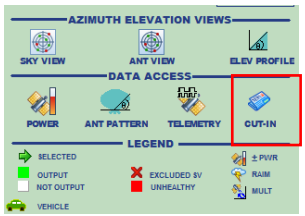


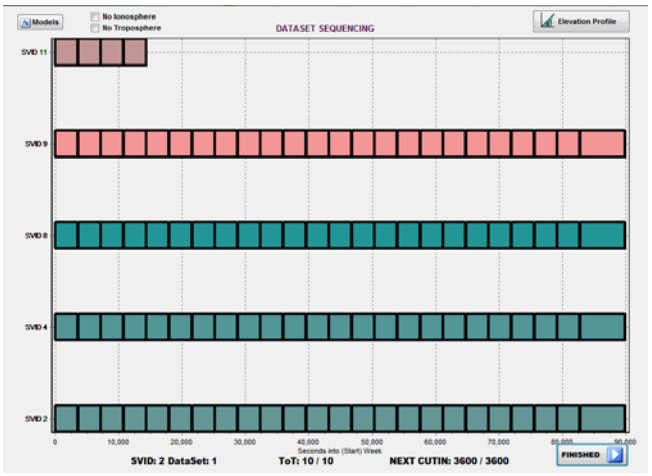


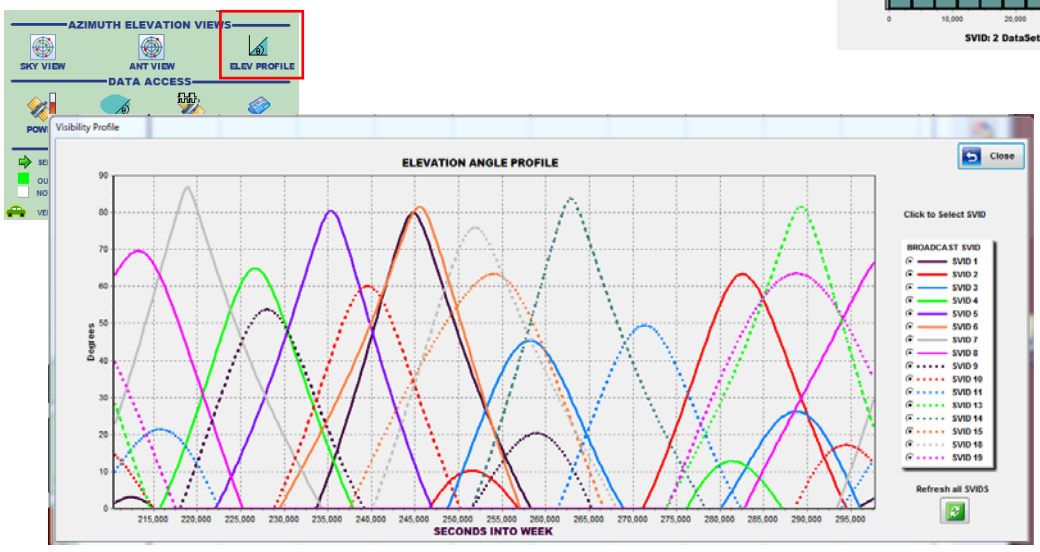
FLIP TOP : BOTTOM

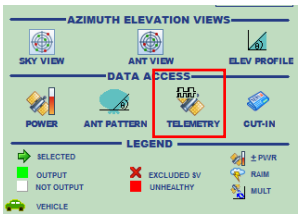
SATELLITE VISIBILITY PANEL



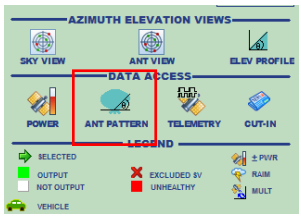








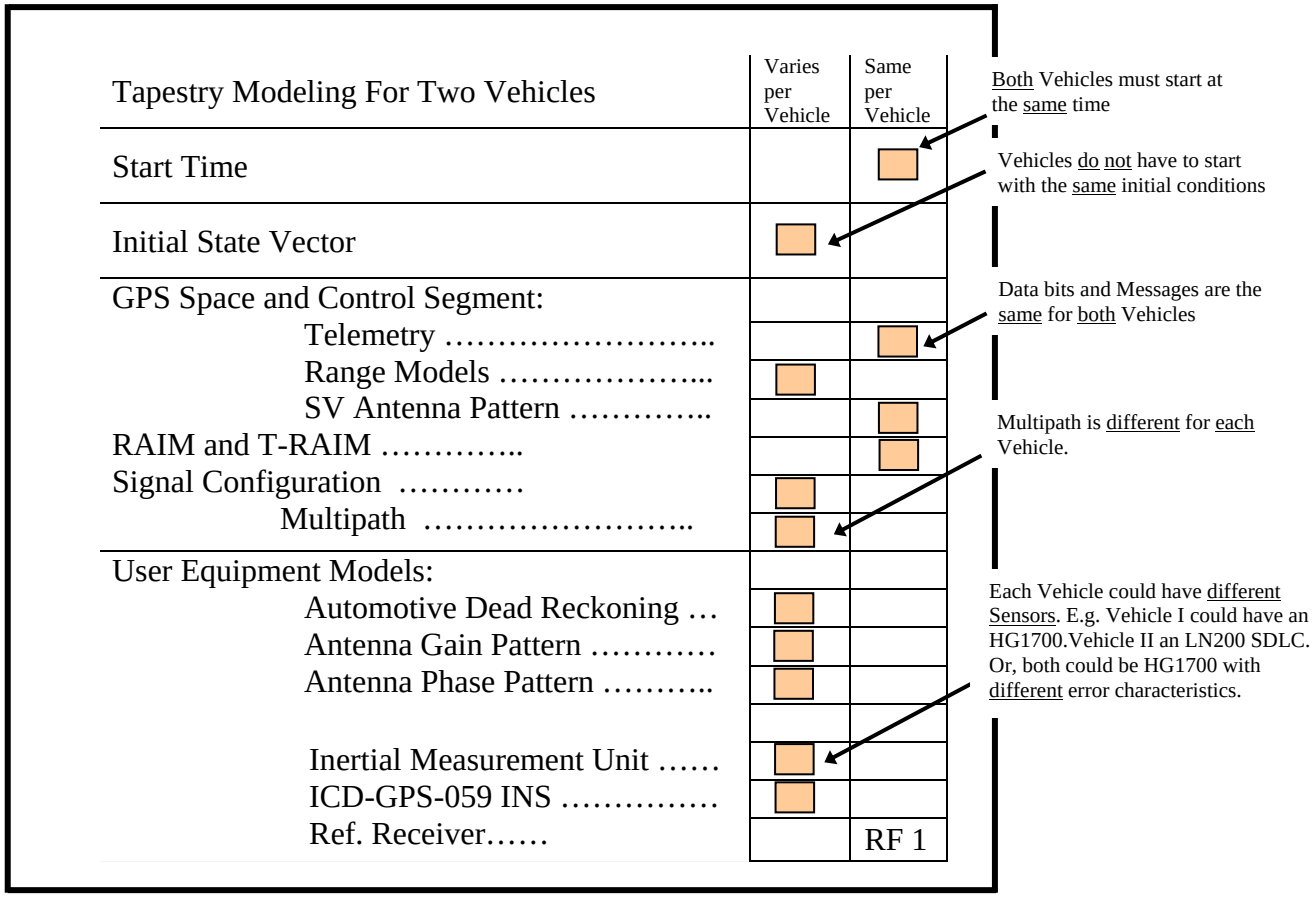
C:\TAPESTRY\DOCUMENTATION\MANUALS\ USINGSATDBASEEDITOR.PDF



C:\TAPESTRY\DOCUMENTATION\MANUALS\ ANTENNAMODELING.PDF

Two Vehicles and the Sensor Models

The Tapestry system can simulate two dynamic vehicles each with their own independent error modeling, parameterization, and host vehicle configuration. The following table differentiates the Tapestry modeling that is vehicle specific from those that are vehicle independent.



To facilitate keeping track of which error models apply to which Vehicle, Build Scenario implements the following color scheme throughout the user interface.

1 RF Output — 1 Simulated Vehicle denoted by a Green Icon:

2 RF Output — 1 Simulated Vehicle denoted by a Green Icon:

1 Simulated Vehicle denoted by a Blue Icon:

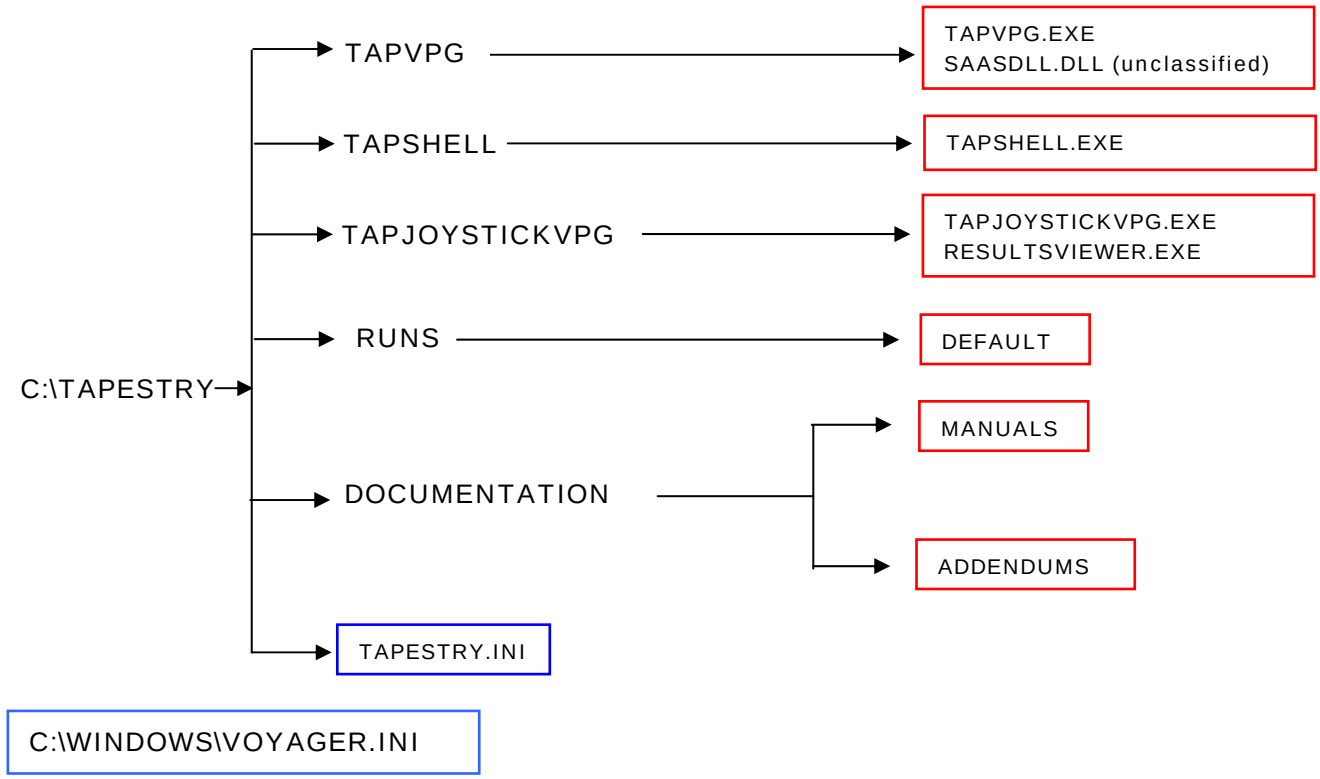
When Build Scenario is displaying a vehicle specific data form, the background color of the form will reflect the *Active Vehicle*. To change the *Active Vehicle*, select the appropriately colored Tab on the plot display. In addition, an appropriately colored Vehicle Icon is displayed on forms that apply to a specific vehicle. If a particular data form is in Gray, then this model is independent of vehicle. For example GPS Sub-Frame data; both Vehicles would download the same data bits and messages.

PORTING TAPVPG TO ANOTHER COMPUTER

BUILD SCENARIO for the Tapestry system is a windows application. You may install copies of BUILD SCENARIO on computers within your facility to be used exclusively to create Scenario Folders that can be transferred to the simulation hardware or to support simulator use.

Do so as follows:

HOST MACHINE (Tapestry Simulator)



Create the folder structure shown above on the TARGET Machine – all **RED** items are File Folders and you should copy the entire contents to your machine. – **BLUE** items are FILES that must be copied.

- **Set** the TARGET machine Resolution to **1900 x 1200**
- Copy any desired SCENARIO FOLDERS from the HOST machine to the TARGET machine. The must hang off the RUNS folder and DEFAULT is required.