CCSDS NAVIGATION STANDARDS NORMATIVE ANNEXES

COVARIANCE MATRIX TYPES REGISTRY

**Policy:**  Expert Review

**Authority:**  CCSDS.MOIMS.NAV

**OID:**  1.3.112.4.57.6

**References:**

* [[ccsds-502.0-B-2]](https://public.ccsds.org/Pubs/502x0b2c1.pdf)

This registry contains allowable values for specifying covariance matrix types in the accompanying referenced standards.

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| --- | --- | --- | --- |
| **Name** | **Description and reference** | **Nomenclature** | **Default Units/Type** |
| TADBARV | 7x7: Time & Spherical 6-element set errors (: right ascension +E°, declination +N°, inertial flight path angle measured from the radial direction to inertial velocity direction (e.g. 90° for circular orbit), inertial azimuth angle measured from local North to projection of inertial velocity in local horizontal plane, radius magnitude, and velocity magnitude) | T, | ,  , |
| TCARTP | 4x4: Time & Cartesian 3-element position errors (X, Y, Z) | T, X, Y, Z | , |
| TCARTPV | 7x7: Time & Cartesian 6-element position and velocity errors (X, Y, Z, XD, YD, ZD) | T, X, Y, Z, XD, YD, ZD | ,  , |
| TCARTPVA | 10x10: Time & Cartesian 9-element position, velocity, and acceleration errors (X, Y, Z, XD, YD, ZD, XDD, YDD, ZDD) | T, X, Y, Z, XD, YD, ZD, XDD, YDD, ZDD | ,  ,  , |
| TDELAUNAY | 7x7: Time & Delaunay element errors as defined in David A. Vallado, Fundamentals of Astrodynamics and Applications, 4th Ed., Microcosm Press and Springer, ISBN 978-1881883180. Delaunay elements employ a set of canonical action-angle variables, which are commonly used in general perturbation theories. The element set consists of three conjugate action-angle pairs. Lower case letters represent the angles while upper case letters represent the conjugate actions. Delaunay variables coordinate type is not available if a Fixed coordinate system is selected. | T,  ,  ,  ,  ,  , | ,  , |
| TDELAUNAYMOD | 7x7: Time & Modified Delaunay element errors (where the Modified Delaunay elements are a geometric version of the Delaunay set independent of the central body, with “action” variables of the standard Delaunay element set divided by the square root of the central-body gravitational constant). | T,  ,  ,  ,  ,  , | ,  , |
| TEIGVAL3EIGVEC3 | 13x13: Time & 12-element eigenvalue/eigenvector representation time history errors (corresponding to the 3x3 position covariance time history, with each line containing Time, the three (major, medium and minor) eigenvalues IN DESCENDING ORDER, and the corresponding three eigenvectors matching the major, medium, and minor eigenvalues). | T,  EigMaj,  EigMed,  EigMin,  EigVecMaj,  EigVecMed,  EigVecMin | ,  , |
| TEQUINOCTIAL\_P | 7x7: Time & Equinoctial 6-element set errors as defined in David A. Vallado, Fundamentals of Astrodynamics and Applications, 4th Ed., Microcosm Press and Springer, ISBN 978-1881883180 (omitting from the set, with valid for all orbits except for inclinations at or near 180°). | T,  a,  ,  ,  ,  ,  L= | ,  ,  , |
| TEQUINOCTIAL\_N | 7x7: Time & Equinoctial 6-element set errors as defined in David A. Vallado, Fundamentals of Astrodynamics and Applications, 4th Ed., Microcosm Press and Springer, ISBN 978-1881883180 (omitting from the set, with valid for all orbits except for inclinations at or near 0°). | T,  a,  ,  ,  ,  ,  L= | ,  ,  , |
| TEQUINOCTIALMOD\_P | 7x7: Time & Modified Equinoctial element set errors per David A. Vallado, Fundamentals of Astrodynamics and Applications, 4th Ed., Microcosm Press and Springer, ISBN 978-1881883180, (omitting from the set, with valid for all orbits except for inclinations at or near 180°). | T,  ,  ,  ,  ,  , | ,  ,  , |
| TEQUINOCTIALMOD\_N | 7x7: Time & Modified Equinoctial element set errors per David A. Vallado, Fundamentals of Astrodynamics and Applications, 4th Ed., Microcosm Press and Springer, ISBN 978-1881883180, omitting from the set, with valid for all orbits except for inclinations at or near 0°). | T,  ,  ,  ,  , | ,  ,  , |
| TGEODETIC | 7x7: Time & geodetic elements errors (longitude, geodetic latitude, fixed frame flight path angle, fixed frame azimuth, altitude above oblate spheroid, and velocity relative to the fixed frame). | T, | ,  , |
| TKEPLERIAN | 7x7: Time & Keplerian 6-element classical set errors (semi-major axis, eccentricity, inclination, right ascension of the ascending node, argument of perigee, and true anomaly). | T, | ,  ,  , |
| TKEPLERIANMEAN | 7x7: Time & Keplerian 6-element classical set errors (semi-major axis, eccentricity, inclination, right ascension of the ascending node, argument of perigee, and mean anomaly). | T, | ,  ,  , |
| TLDBARV | 7x7: Time & modified spherical 6-element set errors (Earth longitude +E°, declination +N°, inertial flight path angle measured from the radial direction to inertial velocity direction (e.g. 90° for circular orbit), inertial azimuth angle measured from local North to projection of inertial velocity in local horizontal plane, radius magnitude, and velocity magnitude). | T, | ,  , |
| TPOINCARE | 7x7: Time & canonical counterpart of equinoctial 6-element set errors. See David A. Vallado, Fundamentals of Astrodynamics and Applications, 4th Ed., Microcosm Press and Springer, ISBN 978-1881883180). | T,  gp,  hp,  Lp,  Gp,  Hp | ,  ,  ,  , |