CHANGE NOTICE

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Document Title:
NAVSTAR GPS Space Segment / Navigation User Interfaces

RFC Title: 2020 Document Proposed Changes

Reason For Change (Driver): For the upcoming 2020 Public ICWG, there is an opportunity to clarify the documents for better understanding such as:

1. The public user community has expressed interest in adding a new clock error rate equation that aids in their calculations.
2. User equations involving time calculations need to be clarified.
3. To improve consistency in IS-GPS-200, clarify that a LNAV T_{GD} value of '10000000' means that the group delay value is unavailable, which aligns with the clarification of CNAV T_{GD}.
4. Administrative clarification and clean-up, identified in past Public ICWGs and as newly-identified changes of administrative nature.

Description of Change:

1. Recommend new SV Clock Relativistic Correction rate equation.
2. Clarify equations by recommending examples or clarifying instructions.
3. Delete the statement that clarifies whether a LNAV T_{GD} value of '10000000' indicates that the group delay value in unavailable.
4. Provide clarity and clean up identified administrative changes in all public documents.

Authored By: RE: Dylan Nicholas **Checked By: RE: Kevin Cano**

AUTHORIZED SIGNATURES	REPRESENTING	DATE
	PNT Capability Area Integration, Portfolio Architect, Space and Missile Systems Center - LAAFB	

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CODE IDENT 66RP1

IS200-1762 :

Section Number :
6.4.6.3.0-1

WAS :
The C/A-code signal is marginal when the C/A-code signal would otherwise have been defined as healthy except that one or more of the following three warning conditions is or are present:

1. The C/A-code signal indicates that any one of the satellite's SIS components may not be fully capable. More specifically, the Most Significant Bit (MSB) of the six-bit health status word given in subframe 1 of the LNAV message is set to 0_2 ("all LNAV data are OK") and the 5 Least Significant Bits (LSBs) of the six-bit health status word in subframe 1 of the LNAV message are set to anything other than 00000_2 (all signals are OK), 00010_2 (all signals dead), or 11100_2 ("SV is temporarily out"). See paragraphs 20.3.3.3.1.4 and 20.3.3.5.1.3.
2. The URA alert flag is raised (i.e., bit 18 of the LNAV HOW is set to 1) and the URA does not apply. This means the URA may be worse than the URA index value transmitted in subframe 1. See paragraph 20.3.3.2.
3. The transmitted URA index in subframe 1 is equal to 15 ("N"=15). See paragraph 20.3.3.3.1.3.

The health of the CM-code and CL-code signals is marginal when the signals would otherwise have been defined as healthy except that one or more of the following three warning conditions is or are present:

1. Default CNAV data (i.e., Message Type 0) is being transmitted in lieu of Message Type 10, 11 and/or Message Type 30's on the CM-code signal (e.g., a current and consistent CEI data set is not available within the maximum broadcast interval defined in paragraph 30.3.4.1). See paragraph 30.3.3.
2. The URA alert flag is raised (i.e., bit 38 of each CNAV message is set to 1) and therefore the CM-code signal URA components do not apply to the CM-code and CL-code signals. This means the CM-code and CL-code signal URA may be worse than indicated by the URA index components transmitted in Message Type 10 and Message Type 30's. See paragraph 30.3.3.
3. Either or both the URA_{ED} index in Message Type 10 and the URA_{NED0} index in Message Type 30's transmitted in the CM-code signal are equal to 15 or -16 ("N"=15 or "N"=-16). See paragraphs 30.3.3.1.1.4 and 30.3.3.2.4.

The P(Y)-code SIS health is marginal when the P(Y)-code SIS would otherwise have been defined as healthy except that one or more of the following three warning conditions is or are present:

1. The Most Significant Bit (MSB) of the six-bit health status word given in subframe 1 of the LNAV message is set to 0_2 and the 5 Least Significant Bits (LSBs) of the six-bit health status word in subframe 1 of the LNAV message are set to anything other than 00000_2 (all signals are OK), 00010_2 (all signals dead), or 11100_2 (SV is temporarily out). See paragraphs 20.3.3.3.1.4 and 20.3.3.5.1.3.
2. The URA alert flag transmitted as bit 18 of the HOW is set to 1 and the URA does not apply as defined in ICD-GPS-224 and ICD-GPS-225.
3. The transmitted URA index "N"=15.

Redlines :

The C/A-code signal is marginal when the C/A-code signal would otherwise have been defined as healthy except that one or more of the following three warning conditions is or are present:

4. The C/A-code signal indicates that any one of the satellite's SIS components may not be fully capable. More specifically, the Most Significant Bit (MSB) of the six-bit health status word given in subframe 1 of the LNAV message is set to 0_2 ("all LNAV data are OK") and the 5 Least Significant Bits (LSBs) of the six-bit health status word in subframe 1 of the LNAV message are set to anything other than 00000_2 (all signals are OK), 00010_2 (all signals dead), or 11100_2 ("SV is temporarily out"). See paragraphs 20.3.3.3.1.4 and 20.3.3.5.1.3.

5. The URA alert flag is raised (i.e., bit 18 of the LNAV HOW is set to 1) and the URA does not apply. This means the URA may be worse than the URA index value transmitted in subframe 1. See paragraph 20.3.3.2.

6. The transmitted URA index in subframe 1 is equal to 15 ("N"=15). See paragraph 20.3.3.3.1.3.

The health of the CM-code and CL-code signals is marginal when the signals would otherwise have been defined as healthy except that one or more of the following three warning conditions is or are present:

4. Default CNAV data (i.e., Message Type 0) is being transmitted in lieu of Message Type 10, 11 and/or Message Type 30's on the CM-code signal (e.g., a current and consistent CEI data set is not available within the maximum broadcast interval defined in paragraph 30.3.4.1). See paragraph 30.3.3.

5. The URA alert flag is raised (i.e., bit 38 of each CNAV message is set to 1) and therefore the CM-code signal URA components do not apply to the CM-code and CL-code signals. This means the CM-code and CL-code signal URA may be worse than indicated by the URA index components transmitted in Message Type 10 and Message Type 30's. See paragraph 30.3.3.

6. Either or both the URA_{ED} index in Message Type 10 and the URA_{NED0} index in Message Type 30's transmitted in the CM-code signal are equal to 15 or -16 ("N"=15 or "N"=-16). See paragraphs 30.3.3.1.1.4 and 30.3.3.2.4.

The P(Y)-code SIS health is marginal when the P(Y)-code SIS would otherwise have been defined as healthy except that one or more of the following three warning conditions is or are present:

4. The Most Significant Bit (MSB) of the six-bit health status word given in subframe 1 of the LNAV message is set to 0_2 and the 5 Least Significant Bits (LSBs) of the six-bit health status word in subframe 1 of the LNAV message are set to anything other than 00000_2 (all signals are OK), 00010_2 (all signals dead), or 11100_2 (SV is temporarily out). See paragraphs 20.3.3.3.1.4 and 20.3.3.5.1.3.

5. The URA alert flag transmitted as bit 18 of the HOW is set to 1 and the URA does not apply as defined in ICD-GPS-224 and ICD-GPS-225.

6. The transmitted URA index "N"=15.

A more restrictive 'marginal indications' (e.g., the transmitted URA index in subframe 1 greater than or equal to 8) may apply in the context of specified minimum performance standards such as are given in the GPS Standard Positioning Service Performance Standard (SPS PS).

IS :
The C/A-code signal is marginal when the C/A-code signal would otherwise have been defined as healthy except that one or more of the following three warning conditions is or are present:

1. The C/A-code signal indicates that any one of the satellite's SIS components may not be fully capable. More specifically, the Most Significant Bit (MSB) of the six-bit health status word given in subframe 1 of the LNAV message is set to 0_2 ("all LNAV data are OK") and the 5 Least Significant Bits (LSBs) of the six-bit health status word in subframe 1 of the LNAV message are set to anything other than 00000_2 (all signals are OK), 00010_2 (all signals dead), or 11100_2 ("SV is temporarily out"). See paragraphs 20.3.3.3.1.4 and 20.3.3.5.1.3.

2. The URA alert flag is raised (i.e., bit 18 of the LNAV HOW is set to 1) and the URA does not apply. This means the URA may be worse than the URA index value transmitted in subframe 1. See paragraph 20.3.3.2.

3. The transmitted URA index in subframe 1 is equal to 15 ("N"=15). See paragraph 20.3.3.3.1.3.

The health of the CM-code and CL-code signals is marginal when the signals would otherwise have been defined as healthy except that one or more of the following three warning conditions is or are present:

1. Default CNAV data (i.e., Message Type 0) is being transmitted in lieu of Message Type 10, 11 and/or Message Type 30's on the CM-code signal (e.g., a current and consistent CEI data set is not available within the maximum broadcast interval defined in paragraph 30.3.4.1). See paragraph 30.3.3.

2. The URA alert flag is raised (i.e., bit 38 of each CNAV message is set to 1) and therefore the CM-code signal URA components do not apply to the CM-code and CL-code signals. This means the CM-code and CL-code signal URA may be worse than indicated by the URA index components transmitted in Message Type 10 and Message Type 30's. See paragraph 30.3.3.

3. Either or both the URA_{ED} index in Message Type 10 and the URA_{NED0} index in Message Type 30's transmitted in the CM-code signal are equal to 15 or -16 ("N"=15 or "N"=-16). See paragraphs 30.3.3.1.1.4 and 30.3.3.2.4.

The P(Y)-code SIS health is marginal when the P(Y)-code SIS would otherwise have been defined as healthy except that one or more of the following three warning conditions is or are present:

1. The Most Significant Bit (MSB) of the six-bit health status word given in subframe 1 of the LNAV message is set to 0_2 and the 5 Least Significant Bits (LSBs) of the six-bit health status word in subframe 1 of the LNAV message are set to anything other than 00000_2 (all signals are OK), 00010_2 (all signals dead), or 11100_2 (SV is temporarily out). See paragraphs 20.3.3.3.1.4 and 20.3.3.5.1.3.

2. The URA alert flag transmitted as bit 18 of the HOW is set to 1 and the URA does not apply as defined in ICD-GPS-224 and ICD-GPS-225.

3. The transmitted URA index "N"=15.

A more restrictive 'marginal indications' (e.g., the transmitted URA index in Subframe 1 greater than or equal to 8) may apply in the context of specified minimum performance standards such as are given in the GPS Standard Positioning Service Performance Standard (SPS PS).

IS200-1812 :

Insertion after object IS200-1927:

The Control Segment will utilize the following alternative but equivalent expression for the relativistic effect when estimating the LNAV/CNAV parameters:

$$\Delta t_r = -\frac{2\,\vec{R}\bullet\vec{V}}{c^2}$$

where

$\vec{R}$ is the instantaneous position vector of the SV,

$\vec{V}$ is the instantaneous velocity vector of the SV, and

c is the speed of light. (Reference paragraph 20.3.4.3).

It is immaterial whether the vectors $\vec{R}$ and $\vec{V}$ are expressed in earth-fixed, rotating coordinates or in earth-centered, inertial coordinates.

Section Number :
20.3.3.3.3.1.0-7

WAS :
<INSERTED OBJECT>

Redlines :
The user can compute the first and second derivative of the clock error for the SV, if required, utilizing the two equations shown below. Additional parameters can be found in Table 20-IV.

IS :
The user can compute the first and second derivative of the clock error for the SV, if required, utilizing the two equations shown below. Additional parameters can be found in Table 20-IV.

IS200-1813 :
Insertion after object IS200-1812

Section Number :
20.3.3.3.3.1.0-8

WAS :
<INSERTED OBJECT>

Redlines :
<INSERTED OBJECT>

IS :

$$\Delta \dot{t}_{SV} = a_{f1} + 2\, a_{f2}\,(t - t_{oc}) + \frac{nFe\sqrt{A}\cos E}{1 - eCos\ E}\frac{Sec}{Sec}$$

$$\Delta \ddot{t}_{SV} = 2\, a_{f2} - \frac{n^2 Fe\,\sqrt{A}\sin E}{(1 - eCos\ E)^2}\frac{Sec}{Sec^2}$$

IS200-441 :

Section Number :
20.3.3.5.2.4.0-1

WAS :
Page 18 of subframe 4 includes: (1) the parameters needed to relate GPS time to UTC, and (2) notice to the user regarding the scheduled future or recent past (relative to LNAV message upload) value of the delta time due to leap seconds (Δt_{LSF}), together with the week number (WN_{LSF}) and the day number (DN) at the end of which the leap second becomes effective. "Day one" is the first day relative to the end/start of week and the WN_{LSF} value consists of eight bits which shall be a modulo 256 binary representation of the GPS week number (see paragraph 6.2.4) to which the DN is referenced. The user must account for the truncated nature of this parameter as well as truncation of WN, WN_t, and WN_{LSF} due to rollover of full week number (see paragraph 3.3.4(b)).

Redlines :
Page 18 of subframe 4 includes: -(1) the parameters needed to relate GPS time to UTC, and (2) notice to the user regarding the scheduled future or recent past (relative to LNAV message upload) value of the delta time due to leap seconds (Δt_{LSF}), together with the GPS week number (WN_{LSF}) and the GPS day number (DN) ~~at~~near the end of which the leap second becomes effective.- "Day one" is the first day relative to the end/start of week and the WN_{LSF} value consists of eight bits which shall be a modulo 256 binary representation of the GPS week number (see paragraph 6.2.4) to which the DN is referenced.- The user must account for the truncated nature of this parameter as well as truncation of WN, WN_t, and WN_{LSF} due to rollover of full week number (see paragraph 3.3.4(b)). The CS shall manage these parameters such that, when Δt_{LS} and Δt_{LSF} differ, the absolute value of the difference between the untruncated WN and WN_{LSF} values shall not exceed 127.

IS :
Page 18 of subframe 4 includes: (1) the parameters needed to relate GPS time to UTC, and (2) notice to the user regarding the scheduled future or recent past (relative to LNAV message upload) value of the delta time due to leap seconds (Δt_{LSF}), together with the GPS week number (WN_{LSF}) and the GPS day number (DN) near the end of which the leap second becomes effective. "Day one" is the first day relative to the end/start of week and the WN_{LSF} value consists of eight bits which shall be a modulo 256 binary representation of the GPS week number (see paragraph 6.2.4) to which the DN is referenced. The user must account for the truncated nature of this parameter as well as truncation of WN, WN_t, and WN_{LSF} due to rollover of full week number (see paragraph 3.3.4(b)). The CS shall manage these parameters such that, when Δt_{LS} and Δt_{LSF} differ, the absolute value of the difference between the untruncated WN and WN_{LSF} values shall not exceed 127.

IS200-2082 :

Section Number :
20.3.3.5.2.4.0-6

WAS :
a. Whenever the effectivity time indicated by the WN_{LSF} and the DN values is not in the past (relative to the user's present time), and the user's present time does not fall in the time span which starts at six hours prior to the effectivity time and ends at six hours after the effectivity time, the UTC/GPS-time relationship is given by

$$t_{UTC} = (t_E - \Delta t_{UTC}) \text{ [modulo 86400 seconds]}$$

where t_{UTC} is in seconds and

Δt_{UTC} = $\Delta t_{LS} + A_0 + A_1 (t_E - t_{ot} + 604800 (WN - WN_t))$, seconds;
t_E = GPS time as estimated by the user after correcting t_{SV} for factors described in paragraph 20.3.3.3.3 as well as for selective availability (SA) (dither) effects;

Δt_{LS} = delta time due to leap seconds;
A_0 and A_1 = constant and first order terms of polynomial;
t_{ot} = reference time for UTC data (reference 20.3.4.5);
WN = current week number (derived from subframe 1);
WN_t = UTC reference week number.

Redlines :
NOTE: Whenever ($\Delta t_{LS} = \Delta t_{LSF}$), the determination of an effectivity time of Δt_{LSF}, as indicated by the WN_{LSF} and the DN, is not necessary, and in such a circumstance the user may assume a UTC/GPS-time relationship given by 20.3.3.5.2.4.a, below.

a. Whenever either:

(1) ($\Delta t_{LS} = \Delta t_{LSF}$), or

(2) the effectivity time indicated by the WNLSF and the DN values is not in the past (relative to the user's present time), and the user's present time does not fall in the time span which starts at six hours prior to the effectivity time and ends at six hours after the effectivity time, the UTC/GPS-time relationship is given by

$$t_{UTC} = (t_E - \Delta t_{UTC}) \text{ [modulo 86400 seconds]}$$

where t_{UTC} is in seconds and

Δt_{UTC} = $\Delta t_{LS} + A_0 + A_1 (t_E - t_{ot} + 604800 (WN - WN_t))$, seconds;
t_E = GPS time as estimated by the user after correcting t_{SV} for factors described in

paragraph 20.3.3.3.3 as well as for selective availability (SA) (dither) effects;

Δt_{LS} = delta time due to leap seconds;
A_0 and A_1 = constant and first order terms of polynomial;

t_{ot} = reference time for UTC data (reference 20.3.4.5);

WN = current week number (derived from subframe 1);

WN_t = UTC reference week number.

IS :

NOTE: Whenever ($\Delta t_{LS} = \Delta t_{LSF}$), the determination of an effectivity time of Δt_{LSF}, as indicated by the WN_{LSF} and the DN, is not necessary, and in such a circumstance the user may assume a UTC/GPS-time relationship given by 20.3.3.5.2.4.a, below.

a. Whenever either:

(1) ($\Delta t_{LS} = \Delta t_{LSF}$), or

(2) the effectivity time indicated by the WN_{LSF} and the DN values is not in the past (relative to the user's present time), and the user's present time does not fall in the time span which starts at six hours prior to the effectivity time and ends at six hours after the effectivity time, the UTC/GPS-time relationship is given by

t_{UTC} = $(t_E - \Delta t_{UTC})$ [modulo 86400 seconds]

where t_{UTC} is in seconds and

Δt_{UTC} = $\Delta t_{LS} + A_0 + A_1 (t_E - t_{ot} + 604800 (WN - WN_t))$, seconds;
t_E = GPS time as estimated by the user after correcting t_{SV} for factors described in

paragraph 20.3.3.3.3 as well as for selective availability (SA) (dither) effects;

Δt_{LS} = delta time due to leap seconds;
A_0 and A_1 = constant and first order terms of polynomial;

t_{ot} = reference time for UTC data (reference 20.3.4.5);

WN = current week number (derived from subframe 1);

WN_t = UTC reference week number.

IS200-468 :

Section Number :
20.3.4.4.0-14

WAS :

Days Spanned	Transmission Interval (hours) (Note 5)	Curve Fit Interval (hours)	IODC Range
1	2 (Note 4)	4	(Note 2)
2-14	4	6	(Note 2)
15-16	6	8	240-247 (Note 1)
17-20	12	14	248-255, 496 (Note 1) (Note 3)
21-62	24	26	497-503, 1021-1023

Note 1: For transmission intervals of 6 and 12 hours, the IODC values shown will be transmitted in increasing order.

Note 2: IODC values for blocks with 1-, 2- or 4-hour transmission intervals (at least the first 14 days after a new CEI data sequence propagation) shall be any number in the range 0 to 1023 excluding those values of IODC that correspond to IODE values in the range 240-255, subject to the constraints on re-transmission given in paragraph 20.3.4.4. The CS can define the GPS III and GPS IIIF SV time of transition from the 4 hour curve fits into extended navigation (beyond 4 hour curve fits). Following the transition time, the SV will follow the timeframes defined in the table, including appropriately setting IODC values.

Note 3: The ninth 12-hour data set may not be transmitted.

Note 4: The first CEI data set of a new CEI data sequence propagation may be cut-in at any time and therefore the transmission interval may be less than the specified value.

Redlines :

Days Spanned	Transmission Interval (hours) (Note 5)	Curve Fit Interval (hours)	IODC Range
1	2 ~~(Note 4)~~	4	(Note 2)
2-14	4	6	(Note 2)
15-16	6	8	240-247 (Note 1)
17-20	12	14	248-255, 496 (Note 1) (Note 3)
21-62	24	26	497-503, 1021-1023

Note 1: For transmission intervals of 6 and 12 hours, the IODC values shown will be transmitted in increasing order.

Note 2: IODC values for blocks with 1-, 2- or 4-hour transmission intervals (at least the first 14 days after a new CEI data sequence propagation) shall be any number in the range 0 to 1023 excluding those values of IODC that correspond to IODE values in the range 240-255, subject to the constraints on re-transmission given in paragraph 20.3.4.4. The CS can define the GPS III and GPS IIIF SV time of transition from the 4 hour curve fits into extended navigation (beyond 4 hour curve fits). Following the transition time, the SV will follow the timeframes defined in the table, including appropriately setting IODC values.

Note 3: The ninth 12-hour data set may not be transmitted.

Note 4: Reserved

Note 5: The first CEI data set of a new CEI data sequence propagation may be cut-in at any time and therefore the transmission interval may be less than the specified value.

Days Spanned	Transmission Interval (hours) (Note 5)	Curve Fit Interval (hours)	IODC Range
1	2	4	(Note 2)
2-14	4	6	(Note 2)
15-16	6	8	240-247 (Note 1)
17-20	12	14	248-255, 496 (Note 1) (Note 3)
21-62	24	26	497-503, 1021-1023

Note 1: For transmission intervals of 6 and 12 hours, the IODC values shown will be transmitted in increasing order.

Note 2: IODC values for blocks with 1-, 2- or 4-hour transmission intervals (at least the first 14 days after a new CEI data sequence propagation) shall be any number in the range 0 to 1023 excluding those values of IODC that correspond to IODE values in the range 240-255, subject to the constraints on re-transmission given in paragraph 20.3.4.4. The CS can define the GPS III and GPS IIIF SV time of transition from the 4 hour curve fits into extended navigation (beyond 4 hour curve fits). Following the transition time, the SV will follow the timeframes defined in the table, including appropriately setting IODC values.

Note 3: The ninth 12-hour data set may not be transmitted.

Note 4: Reserved

Note 5: The first CEI data set of a new CEI data sequence propagation may be cut-in at any time and therefore the transmission interval may be less than the specified value.

IS200-1730 :

Section Number :
30.3.3.1.3.0-13

WAS :

Table 30-II. Part 3

Element/Equation	Description
SV Velocity	
$\dot{E}_k = n/(1 - e\cos E_k)$	Eccentric Anomaly Rate
$\dot{v}_k = \dot{E}_k \sqrt{1-e^2}/(1 - e\cos E_k)$	True Anomaly Rate
$(di_k/dt) = (\text{IDOT}) + 2\dot{v}_k(c_{is}\cos 2\phi_k - c_{ic}\sin 2\phi_k)$	Corrected Inclination Angle Rate
$\dot{u}_k = \dot{v}_k + 2\dot{v}_k(c_{us}\cos 2\phi_k - c_{uc}\sin 2\phi_k)$	Corrected Argument of Latitude Rate
$\dot{r}_k = eA\dot{E}_k \sin Ek + 2\dot{v}_k(c_{rs}\cos 2\phi_k - c_{rc}\sin 2\phi_k)$	Corrected Radius Rate
$\dot{\Omega}_k = \dot{\Omega} - \dot{\Omega}_e$	Longitude of Ascending Node Rate
$\dot{x}'_k = \dot{r}_k \cos u_k - r_k \dot{u}_k \sin u_k$	In- plane *x* velocity
$\dot{y}'_k = \dot{r}_k \sin u_k + r_k \dot{u}_k \cos u_k$	In- plane *y* velocity
$\dot{x}_k = -x'_k \dot{\Omega}_k \sin\Omega_k + \dot{x}'_k\cos\Omega_k - \dot{y}'_k \sin\Omega_k \cos i_k - y'_k(\dot{\Omega}_k \cos\Omega_k \cos i_k - (di_k/dt)\sin\Omega_k \sin i_k)$	Earth- Fixed *x* velocity (m/s)
$\dot{y}_k = x'_k \dot{\Omega}_k \cos\Omega_k + \dot{x}'_k\sin\Omega_k + \dot{y}'_k \cos\Omega_k \cos i_k - y'_k(\dot{\Omega}_k \sin\Omega_k \cos i_k + (di_k/dt)\cos\Omega_k \sin i_k)$	Earth- Fixed *y* velocity (m/s)
$\dot{z}_k = \dot{y}'_k \sin i_k + y'_k (di_k/dt)\cos i_k$	Earth- Fixed *z* velocity (m/s)

Redlines:

Table 30-II. Part 3

Element/Equation	Description
SV Velocity	
$\dot{E}_k = n/(1 - e\cos E_k)$	Eccentric Anomaly Rate
$\dot{v}_k = \dot{E}_k \sqrt{1-e^2}/(1 - e\cos E_k)$	True Anomaly Rate
$(di_k/dt) = (\text{IDOT}) + 2\dot{v}_k(c_{is}\cos 2\phi_k - c_{ic}\sin 2\phi_k)$	Corrected Inclination Angle Rate
$\dot{u}_k = \dot{v}_k + 2\dot{v}_k(c_{us}\cos 2\phi_k - c_{uc}\sin 2\phi_k)$	Corrected Argument of Latitude Rate
~~$\dot{r}_k = eA\dot{E}_k \sin Ek + 2\dot{v}_k(c_{rs}\cos 2\phi_k - c_{rc}\sin 2\phi_k)$~~	~~Corrected Radius Rate~~
$\dot{r}_k = \dot{A}(1-e\cos(E_k)) + A\,e\sin(E_k)\dot{E}_k + 2(c_{rs}\cos(2\phi_k) - c_{rc}\sin(2\phi_k))\dot{v}_k$	Corrected Radius Rate for CNAV
$\dot{\Omega}_k = \dot{\Omega} - \dot{\Omega}_e$	Longitude of Ascending Node Rate
$\dot{x}'_k = \dot{r}_k\cos u_k - r_k\dot{u}_k\sin u_k$	In- plane *x* velocity
$\dot{y}'_k = \dot{r}_k\sin u_k + r_k\dot{u}_k\cos u_k$	In- plane *y* velocity
$\dot{x}_k = -x'_k\dot{\Omega}_k\sin\Omega_k + \dot{x}'_k\cos\Omega_k - \dot{y}'_k\sin\Omega_k\cos i_k - y'_k(\dot{\Omega}_k\cos\Omega_k\cos i_k - (di_k/dt)\sin\Omega_k\sin i_k)$	Earth- Fixed *x* velocity (m/s)
$\dot{y}_k = x'_k\dot{\Omega}_k\cos\Omega_k + \dot{x}'_k\sin\Omega_k + \dot{y}'_k\cos\Omega_k\cos i_k - y'_k(\dot{\Omega}_k\sin\Omega_k\cos i_k + (di_k/dt)\cos\Omega_k\sin i_k)$	Earth- Fixed *y* velocity (m/s)
$\dot{z}_k = \dot{y}'_k\sin i_k + y'_k(di_k/dt)\cos i_k$	Earth- Fixed *z* velocity (m/s)

IS :

Table 30-II. Part 3

Element/Equation	Description
SV Velocity	
$\dot{E}_k = n/(1 - e\cos E_k)$	Eccentric Anomaly Rate
$\dot{v}_k = \dot{E}_k \sqrt{1-e^2}/(1 - e\cos E_k)$	True Anomaly Rate
$(di_k/dt) = (\text{IDOT}) + 2\dot{v}_k(c_{is}\cos 2\phi_k - c_{ic}\sin 2\phi_k)$	Corrected Inclination Angle Rate
$\dot{u}_k = \dot{v}_k + 2\dot{v}_k(c_{us}\cos 2\phi_k - c_{uc}\sin 2\phi_k)$	Corrected Argument of Latitude Rat
$\dot{r}_k = \dot{A}(1\text{-}e\cos(E_k)) + A\,e\sin(E_k)\dot{E}_k + 2(c_{rs}\cos(2\phi_k) - c_{rc}\sin(2\phi_k))\dot{v}_k$	Corrected Radius Rate for CNAV
$\dot{\Omega}_k = \dot{\Omega} - \dot{\Omega}_e$	Longitude of Ascending Node Rate
$\dot{x}'_k = \dot{r}_k\cos u_k - r_k\dot{u}_k\sin u_k$	In- plane *x* velocity
$\dot{y}'_k = \dot{r}_k\sin u_k + r_k\dot{u}_k\cos u_k$	In- plane *y* velocity
$\dot{x}_k = -x'_k\dot{\Omega}_k\sin\Omega_k + \dot{x}'_k\cos\Omega_k - \dot{y}'_k\sin\Omega_k\cos i_k - y'_k(\dot{\Omega}_k\cos\Omega_k\cos i_k - (di_k/dt)\sin\Omega_k\sin i_k)$	Earth- Fixed *x* velocity (m/s)
$\dot{y}_k = x'_k\dot{\Omega}_k\cos\Omega_k + \dot{x}'_k\sin\Omega_k + \dot{y}'_k\cos\Omega_k\cos i_k - y'_k(\dot{\Omega}_k\sin\Omega_k\cos i_k + (di_k/dt)\cos\Omega_k\sin i_k)$	Earth- Fixed *y* velocity (m/s)
$\dot{z}_k = \dot{y}'_k\sin i_k + y'_k(di_k/dt)\cos i_k$	Earth- Fixed *z* velocity (m/s)

IS200-562 :

Section Number :
30.3.3.2.1.1.0-1

WAS :
Any one of Message Types 30 through 37, Figure 30-3 through Figure 30-10, contains the parameters needed by the users for apparent SV clock correction. Bits 61 to 71 contain t_{oc}, clock data reference time of week. Bits 72 to 127 contain SV clock correction coefficients. The related algorithm is given in paragraph 20.3.3.3.3.1.

Redlines :
Any one of Message Types 30 through 37, Figure 30-3 through Figure 30-10, contains the parameters needed by the users for apparent SV clock correction. Bits 61 to 71 contain t_{oc}, clock data reference time of week. Bits 72 to 127 contain SV clock correction coefficients. The related algorithm is given in paragraph 20.3.3.3.3.1. Refer to IS-GPS-200, Section 20.3.3.3.3.1 for optional first and second derivative of the SV clock correction equation.

IS :
Any one of Message Types 30 through 37, Figure 30-3 through Figure 30-10, contains the parameters needed by the users for apparent SV clock correction. Bits 61 to 71 contain t_{oc}, clock data reference time of week. Bits 72 to 127 contain SV clock correction coefficients. The related algorithm is given in paragraph 20.3.3.3.3.1. Refer to IS-GPS-200, Section 20.3.3.3.3.1 for optional first and second derivative of the SV clock correction equation.

IS200-581 :

Section Number :
30.3.3.3.1.1.0-1

WAS :
The group delay differential correction terms, T_{GD}, $ISC_{L1C/A}$, ISC_{L2C} for the benefit of single frequency L1 P, L1 C/A, L2 P, L2C users and dual frequency L1/L2 users are contained in bits 128 through 166 of Message Type 30 (see Figure 30-3 for complete bit allocation). The bit length, scale factors, ranges, and units of these parameters are given in Table 30-IV. The bit string of "1000000000000" shall indicate that the group delay value is not available. The related algorithm is given in paragraphs 30.3.3.3.1.1.1 and 30.3.3.3.1.1.2.

Redlines :
The group delay differential correction terms, T_{GD}, $ISC_{L1C/A}$, ISC_{L2C} for the benefit of single frequency L1 P, L1 C/A, L2 P, L2C users and dual frequency L1/L2 users are contained in bits 128 through 166 of Message Type 30 (see Figure 30-3 for complete bit allocation). The bit length, scale factors, ranges, and units of these parameters are given in Table 30-IV. ~~The bit string of "1000000000000" shall indicate that the group delay value is not available.~~ The related algorithm is given in paragraphs 30.3.3.3.1.1.1 and 30.3.3.3.1.1.2.

IS :
The group delay differential correction terms, T_{GD}, $ISC_{L1C/A}$, ISC_{L2C} for the benefit of single frequency L1 P, L1 C/A, L2 P, L2C users and dual frequency L1/L2 users are contained in bits 128 through 166 of Message Type 30 (see Figure 30-3 for complete bit allocation). The bit length, scale factors, ranges, and units of these parameters are given in Table 30-IV. The related algorithm is given in paragraphs 30.3.3.3.1.1.1 and 30.3.3.3.1.1.2.

IS200-598 :

Section Number :
30.3.3.4.4.0-1

WAS :
The three, one-bit, health indication in bits 155, 156, and 157 of Message Type 37 and bits 29, 30 and 31 of each packet of reduced almanac refers to the L1, L2, and L5 carrier of the SV whose PRN number is specified in the message or in the packet. These health indication bits only apply to codes and data as defined in IS-GPS-200, IS-GPS-705, and IS-GPS-800.

The health of each carrier is indicated by:

0 = Some or all codes and data on this carrier are OK,

1 = All codes and data on this carrier are bad or unavailable.

The health bit indication shall be given relative to the capabilities of each SV as designated by the configuration code in the LNAV message (see paragraph 20.3.3.5.1.4). Accordingly, the health bit for any SV which does not have a certain capability will be indicated as "healthy" if the lack of this capability is inherent in its design or if it has been configured into a mode which is normal from a user standpoint and does not require that capability; however, the Operating Command may choose to set the health bit "unhealthy" for an SV without a certain capability. Single-frequency L2C users or users who have not recieved or choose not to use configuration code should assume that every signal is available on every SV. The predicted health data will be updated at the time of upload when a new CEI data set has been built by the CS. Therefore, the transmitted health data may not correspond to the actual health of the transmitting SV. For more information about user protocol for interpreting health indications see paragraph 6.4.6.

Redlines :
The three, one-bit, health indication in bits 155, 156, and 157 of Message Type 37 and bits 29, 30 and 31 of each packet of reduced almanac refers to the L1, L2, and L5 carrier of the SV whose PRN number is specified in the message or in the packet. These health indication bits only apply to codes and data as defined in IS-GPS-200, IS-GPS-705, and IS-GPS-800.

The health of each carrier is indicated by:

0 = Some or all codes and data on this carrier are OK,

1 = All codes and data on this carrier are bad or unavailable.

The health bit indication shall be given relative to the capabilities of each SV as designated by the configuration code in the LNAV message (see paragraph 20.3.3.5.1.4). Accordingly, the health bit for any SV which does not have a certain capability will be indicated as "healthy" if the lack of this capability is inherent in its design or if it has been configured into a mode which is normal from a user standpoint and does not require that capability; however, the Operating Command may choose to set the health bit "unhealthy" for an SV without a certain capability. Single-frequency L2C users or users who have not ~~recieved~~received or choose not to use configuration code should assume that every signal is available on every SV. The predicted health data will be updated at the time of upload when a new CEI data set has been built by the CS. Therefore, the transmitted health data may not correspond to the actual health of the transmitting SV. For more information about user protocol for interpreting health indications see paragraph 6.4.6.

IS :
The three, one-bit, health indication in bits 155, 156, and 157 of Message Type 37 and bits 29, 30 and 31 of each packet of reduced almanac refers to the L1, L2, and L5 carrier of the SV whose PRN number is specified in the message or in the packet. These health indication bits only apply to codes and data as defined in IS-GPS-200, IS-GPS-705, and IS-GPS-800.

The health of each carrier is indicated by:

0 = Some or all codes and data on this carrier are OK,

1 = All codes and data on this carrier are bad or unavailable.

The health bit indication shall be given relative to the capabilities of each SV as designated by the configuration code in the LNAV message (see paragraph 20.3.3.5.1.4). Accordingly, the health bit for any SV which does not have a certain capability will be indicated as "healthy" if the lack of this capability is inherent in its design or if it has been configured into a mode which is normal from a user standpoint and does not require that capability; however, the Operating Command may choose to set the health bit "unhealthy" for an SV without a certain capability. Single-frequency L2C users or users who have not received or choose not to use configuration code should assume that every signal is available on every SV. The predicted health data will be updated at the time of upload when a new CEI data set has been built by the CS. Therefore, the transmitted health data may not correspond to the actual health of the transmitting SV. For more information about user protocol for interpreting health indications see paragraph 6.4.6.

IS200-1379 :

Section Number :
40.3.3.5.1.4.0-1

WAS :
Page 25 of subframe 4 shall contain a four-bit-long term for each of up to 31 SVs to indicate the A-S status and the configuration code of each SV transmitting with a PRN number in the range of 33 through 63.

Redlines :
~~Page 25 of~~See ~~subframe~~Section 20.3.3.5.1.4 ~~shall contain a four-bit-long term~~ for ~~each of up to 31 SVs to indicate the A-S status and the configuration code of each~~ A-S flags and SV ~~transmitting with a PRN number in the range of 33 through~~Configuration ~~63~~codes.

IS :
See Section 20.3.3.5.1.4 for A-S flags and SV Configuration codes.

IS200-2109 :

Section Number :
40.3.3.5.1.4.0-2

WAS :
The MSB of each four-bit term shall be the A-S flag with a "1" indicating that A-S is ON.

Redlines :
~~The MSB of each four-bit term shall be the A-S flag with a "1" indicating that A-S is ON.~~

IS :
<DELETED OBJECT>

IS200-2110 :

Section Number :
40.3.3.5.1.4.0-3

WAS :
The three LSBs shall indicate the configuration of each SV using the following code:

Code SV Configuration

000 Reserved in order to preserve future use of these values in a future revision of this IS. Until such a revision, the User Segment developing to this version of this IS should interpret these values as indicating that no information in this data field is presently usable as a means to identify the actual SV configuration.

001 A-S capability, plus flags for A-S and "alert" in HOW; memory capacity as described in paragraph 20.3.2 (e.g. Block II/Block IIA/IIR SV).

010 A-S capability, plus flags for A-S and "alert" in HOW; memory capacity as described in paragraph 20.3.2, M-code signal capability, L2C signal capability (e.g., Block IIR-M SV).

011 A-S capability, plus flags for A-S and "alert" in HOW; memory capacity as described in paragraph 20.3.2, M-code capability, L2C signal capability, L5 signal capability (e.g., Block IIF SV).

100 A-S capability, plus flags for A-S and "alert" in HOW; memory capacity as described in paragraph 20.3.2, M-code capability, L1C signal capability, L2C signal capability, L5 signal capability, no SA capability (e.g., GPS III SVs).

101, 110, 111 Reserved in order to preserve future use of these values in a future revision of this IS. Until such a revision, the User Segment developing to this version of this IS should interpret these values as indicating that no information in this data field is presently usable as a means to identify the actual SV configuration.

Redlines :
~~The three LSBs shall indicate the configuration of each SV using the following code:~~

~~Code SV Configuration~~

~~000 Reserved in order to preserve future use of these values in a future revision of this IS. Until such a revision, the User Segment developing to this version of this IS should interpret these values as indicating that no information in this data field is presently usable as a means to identify the actual SV configuration.~~

~~001 A-S capability, plus flags for A-S and "alert" in HOW; memory capacity as described in paragraph 20.3.2 (e.g. Block II/Block IIA/IIR SV).~~

~~010 A-S capability, plus flags for A-S and "alert" in HOW; memory capacity as described in paragraph 20.3.2, M-code signal capability, L2C signal capability (e.g., Block IIR-M SV).~~

~~011 A-S capability, plus flags for A-S and "alert" in HOW; memory capacity as described in paragraph 20.3.2, M-code capability, L2C signal capability, L5 signal capability (e.g., Block IIF SV).~~

~~100 A-S capability, plus flags for A-S and "alert" in HOW; memory capacity as described in paragraph 20.3.2, M-code capability, L1C signal capability, L2C signal capability, L5 signal capability, no SA capability (e.g., GPS III SVs).~~

~~101, 110, 111 Reserved in order to preserve future use of these values in a future revision of this IS. Until such a revision, the User Segment developing to this version of this IS should interpret these values as indicating that no information in this data field is presently usable as a means to identify the actual SV configuration.~~

IS :
<DELETED OBJECT>

IS200-1656 :

Section Number :
40.3.3.5.1.4.0-4

WAS :
These four-bit terms shall occupy bits 9 through 24 of word three, the 24 MSBs of words four through seven, and the 12 MSBs of word eight, all in page 25 of subframe 4.

Redlines :
~~These four-bit terms shall occupy bits 9 through 24 of word three, the 24 MSBs of words four through seven, and the 12 MSBs of word eight, all in page 25 of subframe 4.~~

IS :
<DELETED OBJECT>

IS200-1657 :

Section Number :
40.3.3.5.1.4.0-5

WAS :
Since the anti-spoof information is updated by the CS at the time of upload, the anti-spoof data may not correspond to the actual anti-spoof status of the transmitting SV or other SVs in the constellation.

Redlines :
~~Since the anti-spoof information is updated by the CS at the time of upload, the anti-spoof data may not correspond to the actual anti-spoof status of the transmitting SV or other SVs in the constellation.~~

IS :
<DELETED OBJECT>