Change Topic: Public Signals-in-Space (SiS) Updates

This change package accommodates the text changes to support the proposed solution (see table below) within the public Signals-in-Space (SiS) documents. All comments must be submitted in Comments Resolution Matrix (CRM) form.

The columns in the WAS/IS table following this page are defined below:

Section Number: This number indicates the location of the text change within the document.

Proposed Heading: Contains existing and/or proposed changes to section titles and/or the titles to new sections

(WAS) <Document Title>: Contains the baseline text of the impacted document.

Proposed Object Text: Contains proposed changes to baseline text.

Proposed Rationale: Contains the supporting information to explain the reason for the proposed changes.

PROBLEM STATEMENT:
There are eight areas of obsolete/ambiguous language in the Signals-in-Space (SiS) specifications (mean anomaly equation, convolutional encoding, LNAV special messages reference, Universal Coordinated Time Offset Error (UTCOE), User Range Accuracy (URA) Note #3, Right Ascension Angle Language, and the signal health versus navigation data terminology, publication errors). If this language were interpreted incorrectly it could result in UE developers designing receivers that don't work.
SOLUTION: *(Proposed)*
Resolve the obsolete/ambiguous language in the areas above to avoid the potential for misinterpretation.
Note: For the changes with respect to IS-GPS-800B, IRN-001 there are ***three*** areas that are being amended: i. Coordinated Universal Coordinated Time Offset Error (UTCOE), (1 proposed change) ii. Signal health versus navigation data terminology), (1 proposed change) iii. Publication Errors (24 proposed changes)

Start of WAS/IS for IS-GPS-800B, IRN-001 Changes

Section Number	IS-GPS-800 RevB IRN001 (17 Apr 2012) Navstar GPS Space Segment/User Segment L1C Interface	Proposed Object Heading	Proposed Public Signals-in-Space (SiS) Updates Object Text	Proposed Rationale
3.2.1.7.1	All transmitted signals for a particular SV shall be coherently derived from the same on-board frequency standard. On the L1 carrier, the chip transitions of the two modulating signals, $L1C_D$ and $L1C_P$, shall be such that the average time difference between them (i.e. $L1C_D/L1C_P$), and between each and the transitions of L1P(Y) (i.e. $L1C_D$/L1 P(Y), $L1C_P$/L1 P(Y)), do not exceed 10 nanoseconds.		All transmitted signals for a particular SV shall be coherently derived from the same on-board frequency standard. On the L1 carrier, the chip transitions of the two modulating signals, $L1C_D$ and $L1C_P$, shall be such that the average time difference between them (i.e. $L1C_D/L1C_P$), and between each and the transitions of L1P(Y) (i.e. $L1C_D$/L1P(Y), $L1C_P$/L1P(Y)), do not exceed 10 nanoseconds.	The term L1P(Y) was inadvertently changed to L1 (space) P(Y) in RevB (extra space between L1 and P(Y). The terms have been changed back to L1P(Y) (no space between L1 and P(Y)).
3.2.2.1.1	The unique length-10223 sequence for each ranging code is derived from a single fixed length-10223 sequence called a Legendre sequence L(t), for t = 0, …, 10222. L(t) is defined as, L(0) = 0 ; L(t) = 1, if there exists an integer x such that t is congruent to x^2 modulo 10223; L(t) = 0, if there exists no integer x such that t is congruent to x^2 modulo 10223. Table 6.2-1 in Section 6.2.3 provides the generated sequence of the above defined L(t).		The unique length-10223 sequence for each ranging code is derived from a single fixed length-10223 sequence called a Legendre sequence L(t), for t = 0, …, 10222. L(t) is defined as, L(0) = 0 ; L(t) = 1, if there exists an integer x such that t is congruent to x^2 modulo 10223; L(t) = 0, if there exists no integer x such that t is congruent to x^2 modulo 10223. Table 6.2-1 in Section 6.2.3 provides the generated sequence of the above defined L(t).	Publication error during Word export. Spacing between equations and text have is now correct in Word/PDF. An extra carriage return had been inserted between the text "L(t) is

Section Number	IS-GPS-800 RevB IRN001 (17 Apr 2012) Navstar GPS Space Segment/User Segment L1C Interface	Proposed Object Heading	Proposed Public Signals-in-Space (SiS) Updates Object Text	Proposed Rationale
				defined as," and "L(0) = 0." This carriage return has now been deleted.
3.2.2.1.2	The two sequences, denoted as S1 and S2, are each derived from a PRN signal number-dependent code generator polynomial represented by $P_i(x)$. The generator polynomial for S1 is defined as, $P_i(x) = \sum_{j=0}^{11} m_{i,j} x^j$, where the coefficient $m_{i,j}$ is defined for each PRN signal number, i. For PRN signal numbers 1 - 63, only the sequence S1 is used and, as such, S2 is not needed. The sequence S2 is added to S1 sequence to generate the additional PRN signal numbers 64 through 210 as further described in Section 6.3.1.2.		The two sequences, denoted as S1 and S2, are each derived from a PRN signal number-dependent code generator polynomial represented by $P_i(x)$. The generator polynomial for S1 is defined as, $P_i(x) = \sum_{j=0}^{11} m_{i,j} x^j$, where the coefficient $m_{i,j}$ is defined for each PRN signal number, i. For PRN signal numbers 1 - 63, only the sequence S1 is used and, as such, S2 is not needed. The sequence S2 is added to S1 sequence to generate the additional PRN signal numbers 64 through 210 as further described in Section 6.3.1.2.	Fixed alignment of summation symbol in the $P_i(x)$ equation.

Section Number	IS-GPS-800 RevB IRN001 (17 Apr 2012) Navstar GPS Space Segment/User Segment L1C Interface	Proposed Object Heading	Proposed Public Signals-in-Space (SiS) Updates Object Text	Proposed Rationale

3.2.2.1.2

Table 3.2-2 L1C Ranging Codes Parameter Assignments (sheet 2 of 3)

GPS PRN Signal No.	$L1C_P$				$L1C_D$			
	Weil Index (*w*)	Insertion Index (*p*)	Initial 24 Chips (Octal)	Final 24 Chips (Octal)	Weil Index (*w*)	Insertion Index (*p*)	Initial 24 Chips (Octal)	Final 24 Chips (Octal)
22	5014	5955	27600270	37672235	5096	6142	16027175	73662313
23	5004	9805	66101627	32201230	4983	190	26267340	55416712
24	4980	670	17717055	37437553	4783	644	36272365	22550142
25	4915	464	47500232	23310544	4991	467	67707677	31506062
26	4909	29	52057615	07152415	4815	5384	07760374	44603344
27	4893	429	76153566	02571041	4443	801	73633310	05252052
28	4885	394	22444670	52270664	4769	594	30401257	70603616
29	4832	616	62330044	61317104	4879	4450	72606251	51643216
30	4824	9457	13674337	43137330	4894	9437	37370402	30417163
31	4591	4429	60635146	20336467	4985	4307	74255661	20074570
32	3706	4771	73527653	40745656	5056	5906	10171147	26204176
33	5092	365	63772350	50272475	4921	378	12242515	07105451
34	4986	9705	33564215	75604301	5036	9448	17426100	31062227
35	4965	9489	52236055	52550266	4812	9432	75647756	36516016
36	4920	4193	64506521	15334214	4838	5849	71265340	07641474
37	4917	9947	73561133	53445703	4855	5547	74355073	35065520
3	4858	824	12647121	71136024	4904	9546	45253014	03155010
39	4847	864	16640265	01607455	4753	9132	12452274	34041736
40	4790	347	11161337	73467421	4483	403	07011213	20162561
41	4770	677	22055260	54372454	4942	3766	35143750	01603755
42	4318	6544	11546064	11526534	4813	3	26442600	40541055

NOTES:

3.2-2 L1C Ranging Codes Parameter Assignments (sheet 2 of 3)

GPS PRN Signal No.	$L1C_P$				$L1C_D$			
	Weil Index (*w*)	Insertion Index (*p*)	Initial 24 Chips (Octal)	Final 24 Chips (Octal)	Weil Index (*w*)	Insertion Index (*p*)	Initial 24 Chips (Octal)	Final 24 Chips (Octal)
22	5014	5955	27600270	37672235	5096	6142	16027175	73662313
23	5004	9805	66101627	32201230	4983	190	26267340	55416712
24	4980	670	17717055	37437553	4783	644	36272365	22550142
25	4915	464	47500232	23310544	4991	467	67707677	31506062
26	4909	29	52057615	07152415	4815	5384	07760374	44603344
27	4893	429	76153566	02571041	4443	801	73633310	05252052
28	4885	394	22444670	52270664	4769	594	30401257	70603616
29	4832	616	62330044	61317104	4879	4450	72606251	51643216
30	4824	9457	13674337	43137330	4894	9437	37370402	30417163
31	4591	4429	60635146	20336467	4985	4307	74255661	20074570
32	3706	4771	73527653	40745656	5056	5906	10171147	26204176
33	5092	365	63772350	50272475	4921	378	12242515	07105451
34	4986	9705	33564215	75604301	5036	9448	17426100	31062227
35	4965	9489	52236055	52550266	4812	9432	75647756	36516016
36	4920	4193	64506521	15334214	4838	5849	71265340	07641474
37	4917	9947	73561133	53445703	4855	5547	74355073	35065520
3	4858	824	12647121	71136024	4904	9546	45253014	03155010
39	4847	864	16640265	01607455	4753	9132	12452274	34041736
40	4790	347	11161337	73467421	4483	403	07011213	20162561
41	4770	677	22055260	54372454	4942	3766	35143750	01603755
42	4318	6544	11546064	11526534	4813	3	26442600	40541055

NOTES:

Publication error during Word export.

Table title is now correct in Word/PDF.

The word "Table" was incorrectly inserted into the table header.

The word "Table" has been removed.

Section Number	IS-GPS-800 RevB IRN001 (17 Apr 2012) Navstar GPS Space Segment/User Segment L1C Interface	Proposed Object Heading	Proposed Public Signals-in-Space (SiS) Updates Object Text	Proposed Rationale
3.2.2.1.2				Publication error during Word export. Table title is now correct in Word/PDF. The word "Table" was incorrectly inserted into the table header. The word "Table" has been removed.

Table 3.2-2 L1C Ranging Codes Parameter Assignments (sheet 3 of 3)

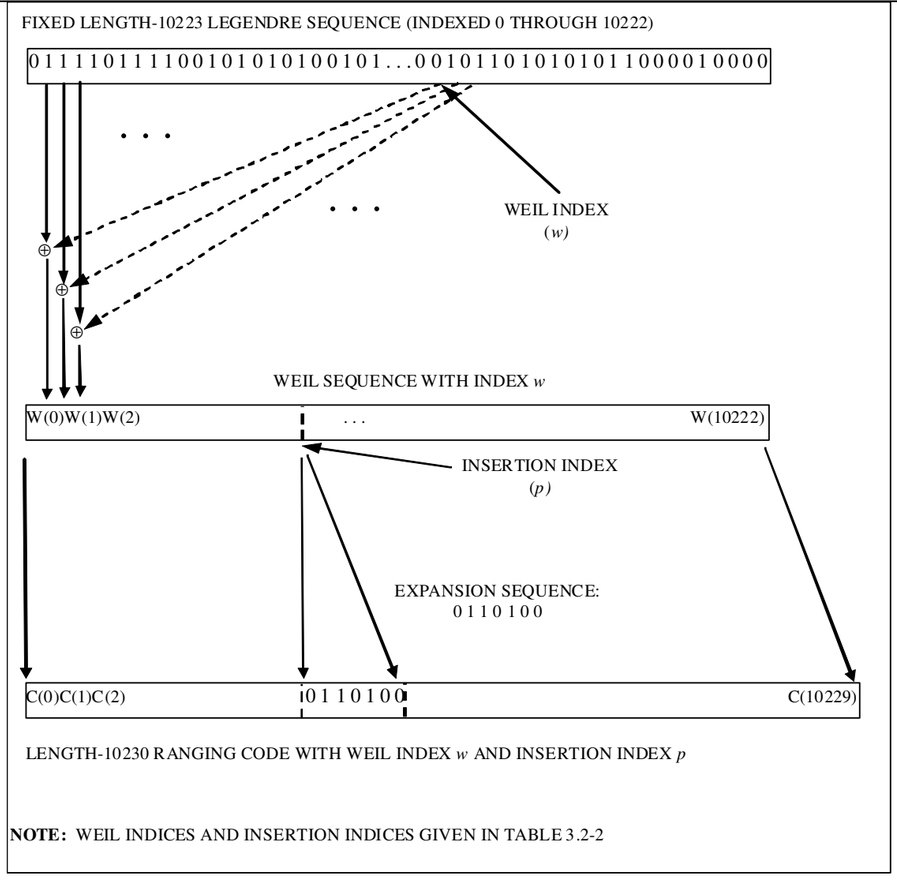
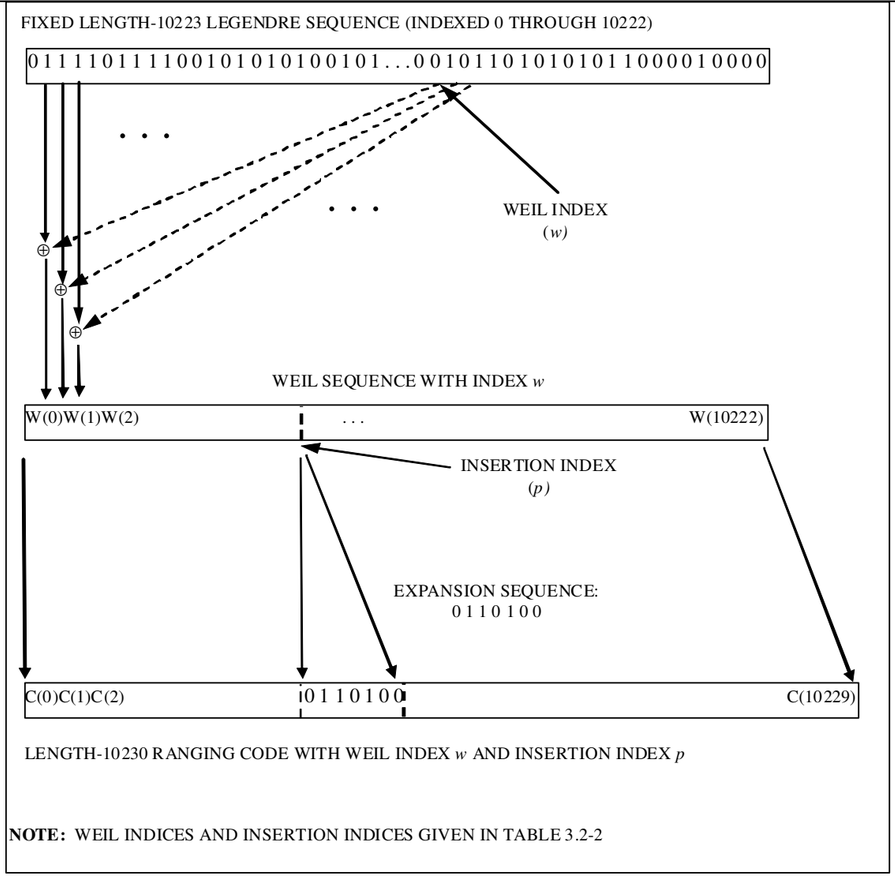
GPS PRN Signal No.	$L1C_P$				$L1C_D$			
	Weil Index (*w*)	Insertion Index (*p*)	Initial 24 Chips (Octal)	Final 24 Chips (Octal)	Weil Index (*w*)	Insertion Index (*p*)	Initial 24 Chips (Octal)	Final 24 Chips (Octal)
43	4126	6312	24765004	16522173	4957	684	67214123	64750626
44	3961	9804	14042504	74053703	4618	9711	62274362	72550016
45	3790	278	53512265	52211303	4669	333	23371051	36130364
46	4911	9461	15317006	72655147	4969	6124	25121057	25236175
47	4881	444	16151224	01212152	5031	10216	20362622	43732204
48	4827	4839	67454561	10410122	5038	4251	33050463	02316015
49	4795	4144	47542743	22473073	4740	9893	65334051	00212370
50	4789	9875	65057230	63145220	4073	9884	65523456	35163655
51	4725	197	77415771	65734110	4843	4627	53741004	33771603
52	4675	1156	75364651	25167435	4979	4449	66360341	41161255
53	4539	4674	75664330	17524136	4867	9798	34421651	76257261
54	4535	10035	44600202	47064764	4964	985	04530741	33512503
55	4458	4504	23211425	14016156	5025	4272	12621031	16237466
56	4197	5	51504740	11723025	4579	126	62330452	24120336
57	4096	9937	47712554	76760325	4390	10024	67510404	11103121
58	3484	430	67325233	04724615	4763	434	00726605	36467526
59	3481	5	61517015	72504743	4612	1029	00200154	66444010
60	3393	355	43217554	51215201	4784	561	37533004	70455364
61	3175	909	52520062	00630473	3716	289	73771510	26726105
62	2360	1622	77073716	71217605	4703	638	44071707	63663333
63	1852	6284	56350460	50200707	4851	4353	34665654	42142704

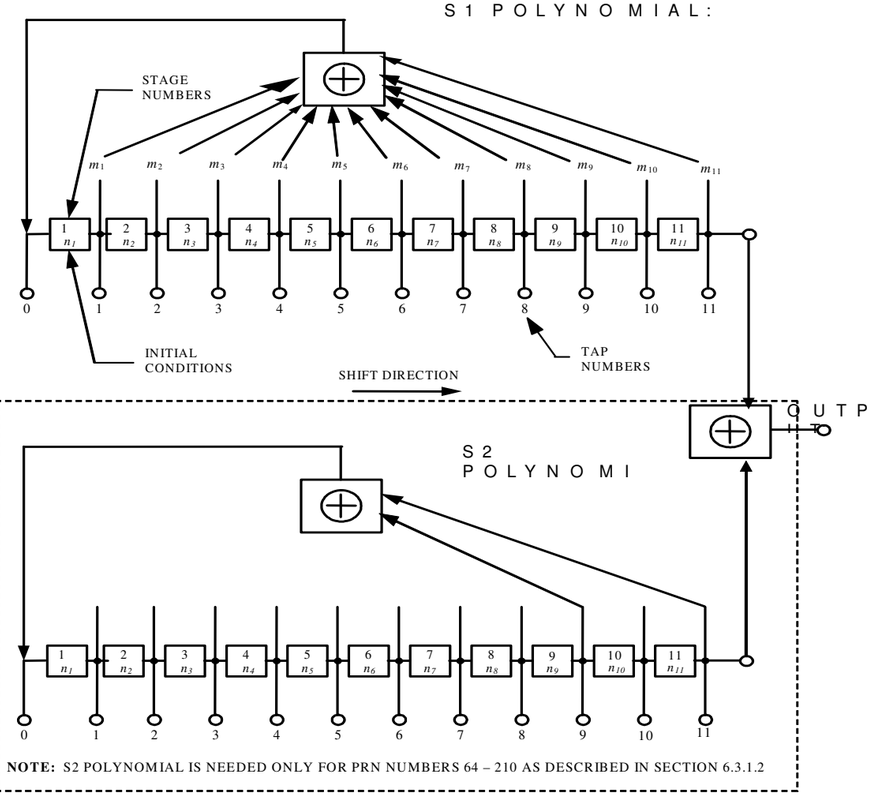
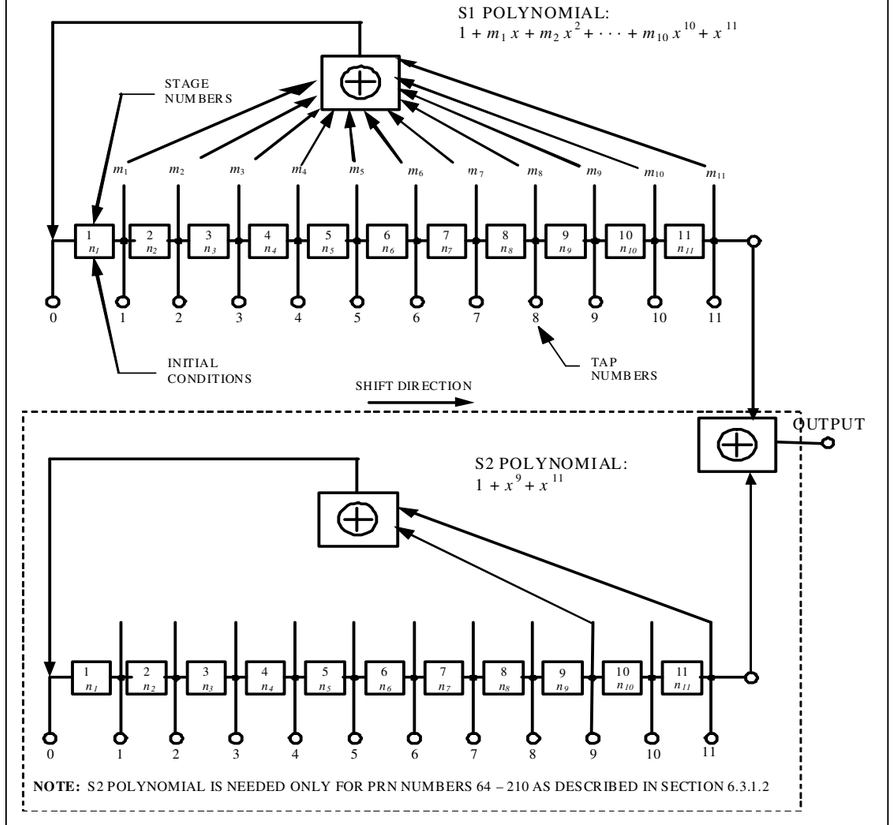
NOTES:

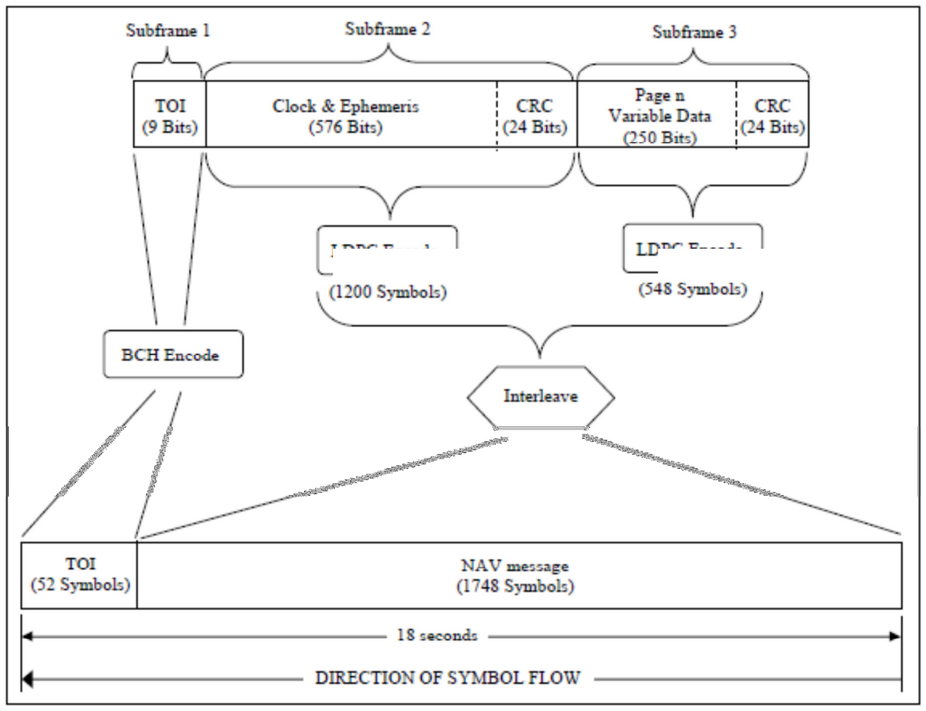
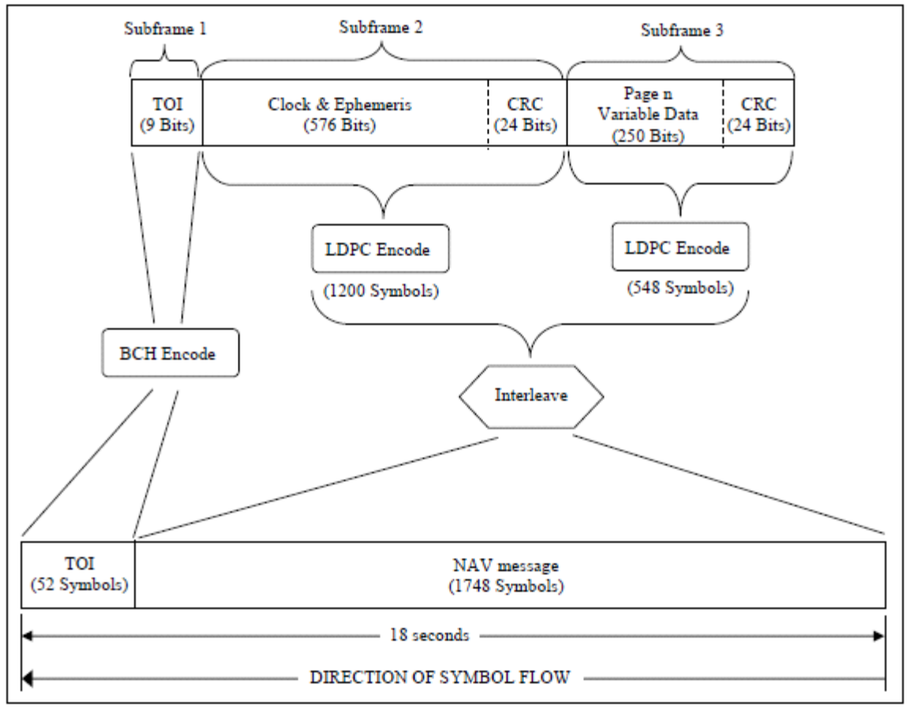
3.2-2 L1C Ranging Codes Parameter Assignments (sheet 3 of 3)

GPS PRN Signal No.	$L1C_P$				$L1C_D$			
	Weil Index (*w*)	Insertion Index (*p*)	Initial 24 Chips (Octal)	Final 24 Chips (Octal)	Weil Index (*w*)	Insertion Index (*p*)	Initial 24 Chips (Octal)	Final 24 Chips (Octal)
43	4126	6312	24765004	16522173	4957	684	67214123	64750626
44	3961	9804	14042504	74053703	4618	9711	62274362	72550016
45	3790	278	53512265	52211303	4669	333	23371051	36130364
46	4911	9461	15317006	72655147	4969	6124	25121057	25236175
47	4881	444	16151224	01212152	5031	10216	20362622	43732204
48	4827	4839	67454561	10410122	5038	4251	33050463	02316015
49	4795	4144	47542743	22473073	4740	9893	65334051	00212370
50	4789	9875	65057230	63145220	4073	9884	65523456	35163655
51	4725	197	77415771	65734110	4843	4627	53741004	33771603
52	4675	1156	75364651	25167435	4979	4449	66360341	41161255
53	4539	4674	75664330	17524136	4867	9798	34421651	76257261
54	4535	10035	44600202	47064764	4964	985	04530741	33512503
55	4458	4504	23211425	14016156	5025	4272	12621031	16237466
56	4197	5	51504740	11723025	4579	126	62330452	24120336
57	4096	9937	47712554	76760325	4390	10024	67510404	11103121
58	3484	430	67325233	04724615	4763	434	00726605	36467526
59	3481	5	61517015	72504743	4612	1029	00200154	66444010
60	3393	355	43217554	51215201	4784	561	37533004	70455364
61	3175	909	52520062	00630473	3716	289	73771510	26726105
62	2360	1622	77073716	71217605	4703	638	44071707	63663333
63	1852	6284	56350460	50200707	4851	4353	34665654	42142704

NOTES:

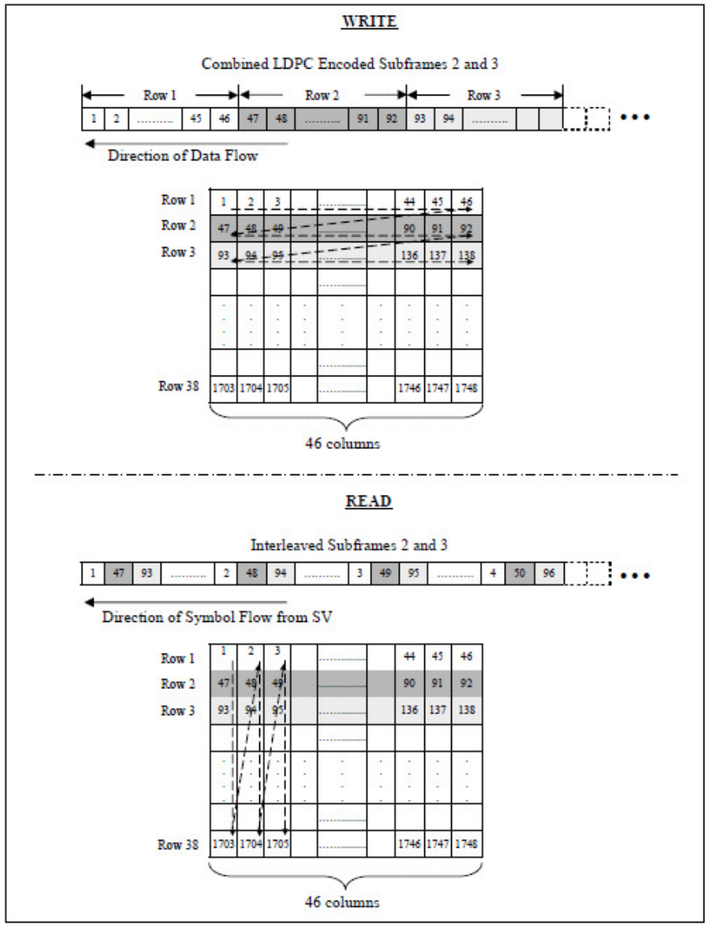
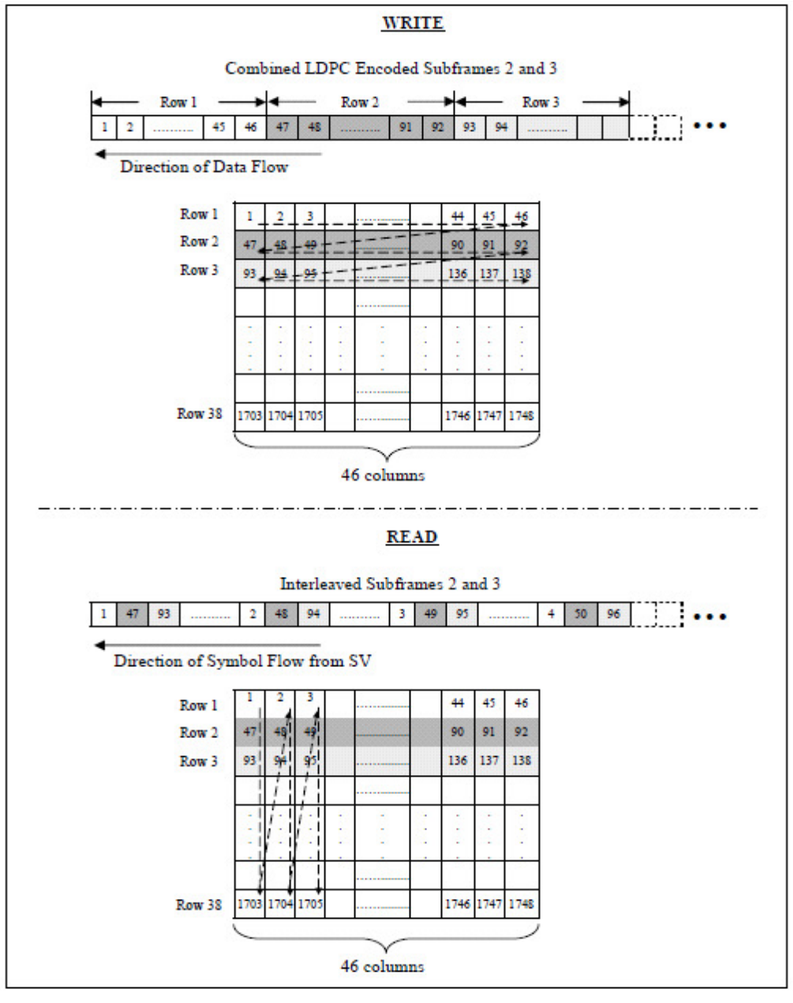
Section Number	IS-GPS-800 RevB IRN001 (17 Apr 2012) Navstar GPS Space Segment/User Segment L1C Interface	Proposed Object Heading	Proposed Public Signals-in-Space (SiS) Updates Object Text	Proposed Rationale
3.2.2.1.2	 Figure 3.2-1. Generation of L1CP-/L1CD-Codes		 Figure 3.2-1. Generation of $L1C_P$-/$L1C_D$-Codes	Publication error during Word export. Figure caption is now correct in Word/PDF. The subscripts in the title "Generation of L1Cp-/L1CD-Codes" were incorrectly changed. The correct title is "Generation of $L1C_P$-/$L1C_D$-Codes."

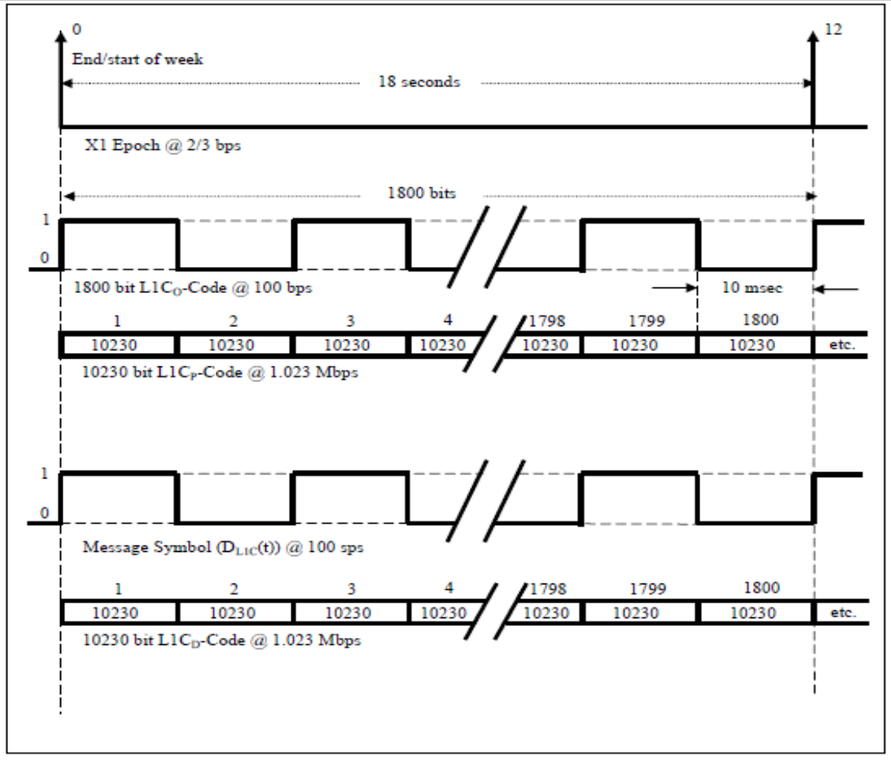
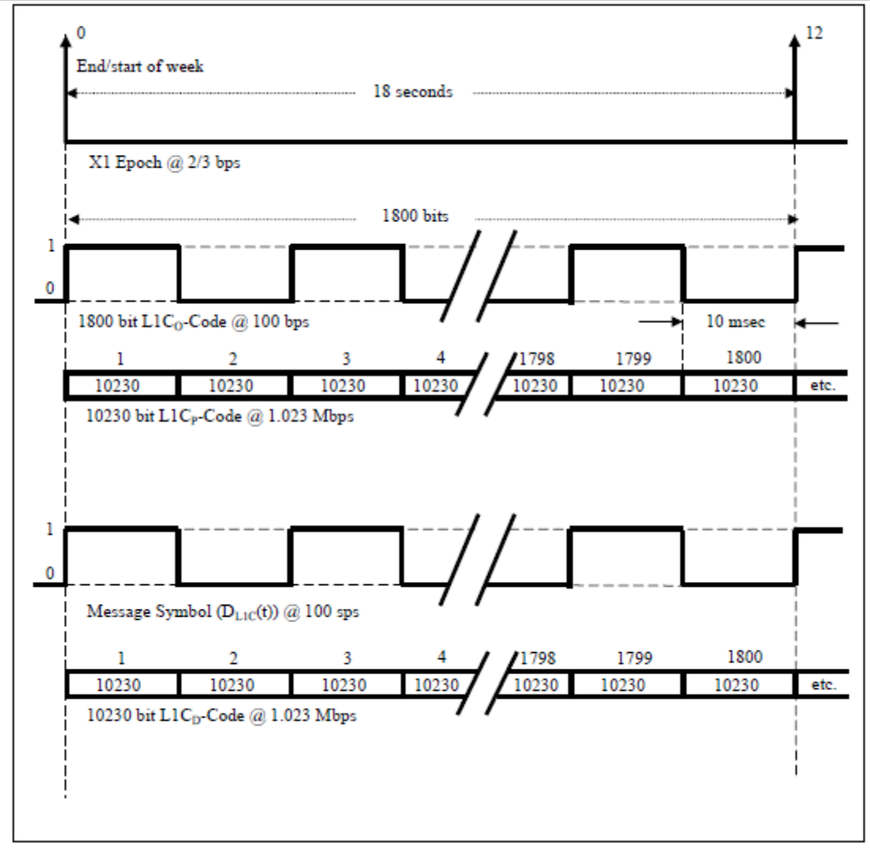
Section Number	IS-GPS-800 RevB IRN001 (17 Apr 2012) Navstar GPS Space Segment/User Segment L1C Interface	Proposed Object Heading	Proposed Public Signals-in-Space (SiS) Updates Object Text	Proposed Rationale
3.2.2.1.2	 NOTE: S1 POLYNOMIAL COEFFICIENTS AND INITIAL CONDITIONS ARE GIVEN IN TABLE 3.2-3 MSB OF INITIAL CONDITION GIVEN IN TABLE 3.2-3 IS IN STAGE 11 FIRST BIT OF THE OUTPUT IS THE MSB OF THE OUTPUT SEQUENCE FOR S1 POLYNOMIAL, m_{11} IS EQUAL TO 1 Figure 3.2-2. L1C$_O$-Code Generator Configuration		 NOTE: S1 POLYNOMIAL COEFFICIENTS AND INITIAL CONDITIONS ARE GIVEN IN TABLE 3.2-3 MSB OF INITIAL CONDITION GIVEN IN TABLE 3.2-3 IS IN STAGE 11 FIRST BIT OF THE OUTPUT IS THE MSB OF THE OUTPUT SEQUENCE FOR S1 POLYNOMIAL, m_{11} IS EQUAL TO 1 Figure 3.2-2. L1C$_O$-Code Generator Configuration	Publication error during Word export. Figure is now correct in Word/PDF. The S1 and S2 polynomials have been reinserted.

Section Number	IS-GPS-800 RevB IRN001 (17 Apr 2012) Navstar GPS Space Segment/User Segment L1C Interface	Proposed Object Heading	Proposed Public Signals-in-Space (SiS) Updates Object Text	Proposed Rationale
3.2.3.1	 Figure 3.2-3. L1C Message Structure		 Figure 3.2-3. L1C Message Structure	Publication error during Word export. Figure is now correct in Word/PDF. The Low Data Parity Check (LDPC) text boxes were compromised during the publication process. These text boxes have been repaired to and read "LDPC Encode."
3.2.3.3	Twenty-four bits of CRC will provide protection against burst as well as random errors with a probability of undetected error ≤ 2-24 = 5.96×10^{-8} for all channel bit error probabilities ≤ 0.5. The CRC word is calculated in the forward direction on a given message using a seed of 0. The sequence of 24 bits ($p_1,p_2,...,p_{24}$) is generated from the sequence of information bits ($m_1,m_2,...,m_k$) (MSB to LSB sequence) in a given message. This is done by means of a code that is generated by the polynomial		Twenty-four bits of CRC will provide protection against burst as well as random errors with a probability of undetected error ≤ 2-24 = 5.96×10^{-8} for all channel bit error probabilities ≤ 0.5. The CRC word is calculated in the forward direction on a given message using a seed of 0. The sequence of 24 bits ($p_1,p_2,...,p_{24}$) is generated from the sequence of information bits ($m_1,m_2,...,m_k$) (MSB to LSB sequence) in a given message. This is done by means of a code that is generated by the polynomial	p(X) equation has been repaired and now fits on one line. The lower case x in R(x)

Section Number	IS-GPS-800 RevB IRN001 (17 Apr 2012) Navstar GPS Space Segment/User Segment L1C Interface	Proposed Object Heading	Proposed Public Signals-in-Space (SiS) Updates Object Text	Proposed Rationale
	$g(X)=\sum_{i=0}^{24} g_i X^i$ where $g_i = 1 \text{for} i = 0,1,3,4,5,6,7,10,11,14,17,18,23,24$ $= 0 \text{otherwise}$ This code is called CRC-24Q. The generator polynomial of this code is in the following form (using binary polynomial algebra): $g(X)=(1+X)p(X)$ where p(X) is the primitive and irreducible polynomial $p(X)=X^{23}+X^{17}+X^{13}+X^{12}$ $+X^{11}+X^9+X^8+X^7+X^5+X^3+1$. When, by the application of binary polynomial algebra, the above g(x) is divided into m(x)x^{24}, where the information sequence m(x) is expressed as $m(X)=m_k+m_{k-1}X+m_{k-2}X^2+\cdots+m_1X^{k-1}$.		$g(X)=\sum_{i=0}^{24} g_i X^i$ where $g_i = 1 \text{for } i = 0,1,3,4,5,6,7,10,11,14,17,18,23,24$ $= 0 \text{otherwise}$ This code is called CRC-24Q. The generator polynomial of this code is in the following form (using binary polynomial algebra): $g(X)=(1+X)p(X)$ where p(X) is the primitive and irreducible polynomial $p(X)=X^{23}+X^{17}+X^{13}+X^{12}+X^{11}+X^9+X^8+X^7+X^5+X^3+1$ When, by the application of binary polynomial algebra, the above g(X) is divided into m(X)X^{24}, where the information sequence m(X) is expressed as $m(X)=m_k+m_{k-1}X+m_{k-2}X^2+\cdots+m_1X^{k-1}$. The result is a quotient and a remainder R(X) of degree < 24. The bit sequence formed by this remainder represents the CRC sequence. CRC bit p_i, for any i from 1 to 24, is the coefficient of	has been amended to correctly read R(X).

Section Number	IS-GPS-800 RevB IRN001 (17 Apr 2012) Navstar GPS Space Segment/User Segment L1C Interface	Proposed Object Heading	Proposed Public Signals-in-Space (SiS) Updates Object Text	Proposed Rationale
	The result is a quotient and a remainder R(x) of degree < 24. The bit sequence formed by this remainder represents the CRC sequence. CRC bit p_i, for any i from 1 to 24, is the coefficient of x^{24-i} in R(x). This code has the following characteristics: It detects all single bit errors per code word. It detects all double bit error combinations in a codeword because the generator polynomial g(X) has a factor of at least three terms. It detects any odd number of errors because g(X) contains a factor 1+X. It detects any burst error for which the length of the burst is ≤ 24 bits. It detects most large error bursts with length greater than the CRC length r = 24 bits. The fraction of error bursts of length b > 24 that are undetected is: $2^{-24} = 5.96 \times 10^{-8}$, if b > 25 bits $2^{-23} = 1.19 \times 10^{-7}$, if b = 25 bits		X^{24-i} in R(X). This code has the following characteristics: It detects all single bit errors per code word. It detects all double bit error combinations in a codeword because the generator polynomial g(X) has a factor of at least three terms. It detects any odd number of errors because g(X) contains a factor 1+X. It detects any burst error for which the length of the burst is ≤ 24 bits. It detects most large error bursts with length greater than the CRC length r = 24 bits. The fraction of error bursts of length b > 24 that are undetected is: $2^{-24} = 5.96 \times 10^{-8}$, if b > 25 bits $2^{-23} = 1.19 \times 10^{-7}$, if b = 25 bits	

Section Number	IS-GPS-800 RevB IRN001 (17 Apr 2012) Navstar GPS Space Segment/User Segment L1C Interface	Proposed Object Heading	Proposed Public Signals-in-Space (SiS) Updates Object Text	Proposed Rationale
3.2.3.5				Publication error during Word export. The clarity of this figure in Rev B had been degraded and has now been restored. Figure is now correct in Word/PDF.
	Figure 3.2-6. Conceptual Block Interleaver		Figure 3.2-6. Conceptual Block Interleaver	

Section Number	IS-GPS-800 RevB IRN001 (17 Apr 2012) Navstar GPS Space Segment/User Segment L1C Interface	Proposed Object Heading	Proposed Public Signals-in-Space (SiS) Updates Object Text	Proposed Rationale
3.3	 Figure 3.3-1. L1CP-/L1CD-/L1CO-Code Timing Relationships		 Figure 3.3-1. L1C$_P$-/L1C$_D$-/L1C$_O$-Code Timing Relationships	Corrected subscripts in figure caption. The subscripts in the title "Generation of L1CP-/L1CD/L1CO-Code Timing Relationships " were incorrectly changed. The correct title is "L1C$_P$-/L1C$_D$-/L1C$_O$-Code Timing Relationships ."
3.4.1	The L1C message (henceforth referred to as CNAV-2) contains the requisite data for relating GPS time to UTC. The accuracy of this data during the transmission interval shall be such that it relates GPS time to UTC (USNO) to within 1.5 nanoseconds (RMS over 30 days). This data is generated by the GPS CS; therefore, the accuracy of this relationship may degrade if for some reason the GPS CS is unable to upload data to a SV. Propagation delay errors and receiver equipment biases unique		The L1C message (henceforth referred to as CNAV-2) contains the requisite data for relating GPS time to UTC. This data is generated by the GPS CS; therefore, the accuracy of this relationship may degrade if for some reason the GPS CS is unable to upload data to a SV.	The text "The accuracy of this data during the transmission

Section Number	IS-GPS-800 RevB IRN001 (17 Apr 2012) Navstar GPS Space Segment/User Segment L1C Interface	Proposed Object Heading	Proposed Public Signals-in-Space (SiS) Updates Object Text	Proposed Rationale
	to the user add to this time transfer uncertainty.			interval shall be such that it relates GPS time (maintained by the MCS of the CS) to UTC (USNO) within 90 nanoseconds (one sigma)" has been deleted. The rationale is that the time accuracy stated (1.5 nanoseconds (RMS over 30 days)) is not aligned to the PPS PS and the SPS PS (40ns).

Section Number	IS-GPS-800 RevB IRN001 (17 Apr 2012) Navstar GPS Space Segment/User Segment L1C Interface	Proposed Object Heading	Proposed Public Signals-in-Space (SiS) Updates Object Text	Proposed Rationale
3.5.3	Table 3.5-1. Subframe 2 Parameters (2 of 3) Parameter | No. of Bits** | Scale Factor (LSB) | Effective Range*** | Units $\Omega_{0\text{-}n}$**** Reference right ascension angle | 33* | 2^{-32} | | semi-circles $\Delta\dot{\Omega}$***** Rate of right ascension difference | 17* | 2^{-44} | | semi-circles/sec $i_{0\text{-}n}$ Inclination angle at reference time | 33* | 2^{-32} | | semi-circles $i_{0\text{-}n}$ –DOT Rate of inclination angle | 15* | 2^{-44} | | semi-circles/sec $C_{is\text{-}n}$ Amplitude of the sine harmonic correction term to the angle of inclination | 16* | 2^{-30} | | radians $C_{ic\text{-}n}$ Amplitude of the cosine harmonic correction term to the angle of inclination | 16* | 2^{-30} | | radians $C_{rs\text{-}n}$ Amplitude of the sine correction term to the orbit radius | 24* | 2^{-8} | | meters $C_{rc\text{-}n}$ Amplitude of the cosine correction term to the orbit radius | 24* | 2^{-8} | | meters $C_{us\text{-}n}$ Amplitude of the sine harmonic correction term to the argument of latitude | 21* | 2^{-30} | | radians $C_{uc\text{-}n}$ Amplitude of the cosine harmonic correction term to the argument of latitude | 21* | 2^{-30} | | radians * Parameters so indicated are in two's complement notation; ** See Figure 3.5-1 for complete bit allocation in Subframe 2; *** Unless otherwise indicated in this column, effective range is the maximum range attainable with indicated bit allocation and scale factor. **** $\Omega_{0\text{-}n}$ is the right ascension angle at the weekly epoch propagated to the reference time at the rate of right ascension {$\dot{\Omega}_{REF}$ Table 3.5-1}. ***** Relative to $\dot{\Omega}_{REF} = -2.6 \times 10^{-9}$ semi-circles/second.		Table 3.5-1. Subframe 2 Parameters (2 of 3) Parameter | No. of Bits** | Scale Factor (LSB) | Effective Range*** | Units $\Omega_{0\text{-}n}$ Longitude of Ascending Node of Orbit Plane at Weekly Epoch | 33* | 2^{-32} | | semi-circles $\Delta\dot{\Omega}$**** Rate of right ascension difference | 17* | 2^{-44} | | semi-circles/sec $i_{0\text{-}n}$ Inclination angle at reference time | 33* | 2^{-32} | | semi-circles $i_{0\text{-}n}$ –DOT Rate of inclination angle | 15* | 2^{-44} | | semi-circles/sec $C_{is\text{-}n}$ Amplitude of the sine harmonic correction term to the angle of inclination | 16* | 2^{-30} | | radians $C_{ic\text{-}n}$ Amplitude of the cosine harmonic correction term to the angle of inclination | 16* | 2^{-30} | | radians $C_{rs\text{-}n}$ Amplitude of the sine correction term to the orbit radius | 24* | 2^{-8} | | meters $C_{rc\text{-}n}$ Amplitude of the cosine correction term to the orbit radius | 24* | 2^{-8} | | meters $C_{us\text{-}n}$ Amplitude of the sine harmonic correction term to the argument of latitude | 21* | 2^{-30} | | radians $C_{uc\text{-}n}$ Amplitude of the cosine harmonic correction term to the argument of latitude | 21* | 2^{-30} | | radians * Parameters so indicated are in two's complement notation; ** See Figure 3.5-1 for complete bit allocation in Subframe 2; *** Unless otherwise indicated in this column, effective range is the maximum range attainable with indicated bit allocation and scale factor. **** Relative to $\dot{\Omega}_{REF} = -2.6 \times 10^{-9}$ semi-circles/second.	The orbit parameter "Reference right ascension angle Ω_{O-N} **** in Table 3.5-1, is defined as Ω_{O-N} is the right ascension angle at the weekly epoch (Ω_{O-w}) propagated to the reference time at the rate of right ascension." This definition is consistent with the term used in IS-GPS-200 Table 20-II, but the name of the term is inconsistent- "Reference right ascension angle" in

Section Number	IS-GPS-800 RevB IRN001 (17 Apr 2012) Navstar GPS Space Segment/User Segment L1C Interface	Proposed Object Heading	Proposed Public Signals-in-Space (SiS) Updates Object Text	Proposed Rationale
				Table 3.5-I and "Longitude of Ascending Node of Orbit Plane at Weekly Epoch" in IS-GPS-200 Table 20-II. Recommend that the identical terms be used since they are have identical definitions. Also recommending deleting the 4-star note, and thus renumbering the old 5-star note to a 4-star note.
3.5.3.8	The user shall calculate the NED-related URA with the equation (in meters); $IAURA_{NED} = URA_{NED0} + URA_{NED1} (t - top + 604,800*(WN - WNop))$		The user shall calculate the NED-related URA with the equation (in meters); $IAURA_{NED} = URA_{NED0} + URA_{NED1} (t - top + 604,800*(WN - WN_{op}))$	Correcting superscripting of WN_{op}, t_{op}, and also corrected the term from

Section Number	IS-GPS-800 RevB IRN001 (17 Apr 2012) Navstar GPS Space Segment/User Segment L1C Interface	Proposed Object Heading	Proposed Public Signals-in-Space (SiS) Updates Object Text	Proposed Rationale
	for $t - t_{op} + 604{,}800*(WN - WNop) \leq 93{,}600$ seconds $IAURA_{NED} = URA_{NED0} + URA_{NED1}*(t - top + 604{,}800*(WN - WNop)) + URA_{NED2}*(t - t_{op} + 604800*(WN - WNop) - 93{,}600)^2$ for $t - t_{op} + 604{,}800*(WN - WNop) > 93{,}600$ seconds where t is the GPS system time WNop -- Data Predict Week Number, identifying the GPS week to which the t_{op} term refers. See IS-200, Section 3.5.3.3.		for $t - t_{op} + 604{,}800*(WN - WN_{op}) \leq 93{,}600$ seconds $IAURA_{NED} = URA_{NED0} + URA_{NED1}*(t - t_{op} + 604{,}800*(WN - WN_{op})) + URA_{NED2}*(t - t_{op} + 604{,}800*(WN - WN_{op}) - 93{,}600)^2$ for $t - t_{op} + 604{,}800*(WN - WN_{op}) > 93{,}600$ seconds where t is the GPS system time WN_{op} -- Data Predict Week Number, identifying the GPS week to which the t_{op} term refers. See IS-200, Section 30.3.3.1.1.3.	604800 to 604,800. Also corrected the Data Predict Week Number reference to Section 30.3.3.1.1.3.
3.5.3.9.2	For the preceding equations, the following definitions apply: PR = pseudorange corrected for ionospheric effects, PR_i = pseudorange measured on the channel indicated by the subscript, ISC_i = inter-signal correction for the channel indicated by the subscript (see paragraph 3.5.3.9.1, see paragraph 30.3.3.3.1.1 of IS-GPS-200 for ISC_{L2C}), T_{GD} = see paragraph 20.3.3.3.3.2 of IS-GPS-200, c = speed of light, and, denoting the nominal center frequencies of L1 and L2 as f_{L1} and f_{L2} respectively,		For the preceding equations, the following definitions apply: PR = pseudorange corrected for ionospheric effects, PR_i = pseudorange measured on the channel indicated by the subscript, ISC_i = inter-signal correction for the channel indicated by the subscript (see paragraph 3.5.3.9.1, see paragraph 30.3.3.3.1.1 of IS-GPS-200 for ISC_{L2C}), T_{GD} = see paragraph 20.3.3.3.3.2 of IS-GPS-200, c = speed of light,	Publication error during Word export. Alignment is now correct in Word/PDF. The ISC_i term is now aligned with all of the other terms.

Section Number	IS-GPS-800 RevB IRN001 (17 Apr 2012) Navstar GPS Space Segment/User Segment L1C Interface	Proposed Object Heading	Proposed Public Signals-in-Space (SiS) Updates Object Text	Proposed Rationale
	$\gamma_{12} = (f_{L1}/f_{L2})^2 = (1575.42/1227.6)^2 = (77/60)^2$.		and, denoting the nominal center frequencies of L1 and L2 as f_{L1} and f_{L2} respectively, $\gamma_{12} = (f_{L1}/f_{L2})^2 = (1575.42/1227.6)^2 = (77/60)^2$.	
3.5.4.2.1.1	The GPS/GNSS-time relationship is given by, $t_{GNSS} = t_E - (A_{0GGTO} + A_{1GGTO}(t_E - t_{GGTO} + 604800\,(WN - WN_{GGTO})) + A_{2GGTO}(t_E - t_{GGTO} + 604800\,(WN - WN_{GGTO}))^2)$ where t_{GNSS} is in seconds, t_E and WN are as defined in Section 20.3.3.5.2.4 of IS-GPS-200, and the remaining parameters are as defined in Table 3.5-4. The GGTO parameters provide a global average of the time offset between GPS time and the other GNSS time scales modulo one second. Users must also apply any integer seconds difference between the systems using definitions of each system time scale as defined in respective signal interface documents.		The GPS/GNSS-time relationship is given by, $t_{GNSS} = t_E - (A_{0GGTO} + A_{1GGTO}(t_E - t_{GGTO} + 604,800\,(WN - WN_{GGTO})) + A_{2GGTO}(t_E - t_{GGTO} + 604,800\,(WN - WN_{GGTO}))^2)$ where t_{GNSS} is in seconds, t_E and WN are as defined in Section 20.3.3.5.2.4 of IS-GPS-200, and the remaining parameters are as defined in Table 3.5-4. The GGTO parameters provide a global average of the time offset between GPS time and the other GNSS time scales modulo one second. Users must also apply any integer seconds difference between the systems using definitions of each system time scale as defined in respective signal interface documents.	Commas inserted into 604,800 to be consistent with other equations using this number.
3.5.4.3.4	The three, one-bit, health indication in bits 44, 45 and 46 of subframe 3, page 4 and bits 31, 32 and 33 of each packet of reduced almanac refers to the L1, L2, and L5 signals of the SV whose PRN number is specified in the message or in the packet. For each health indicator, a “0” signifies that all navigation data are valid and “1” signifies that some or all navigation data are invalid. The predicted health data will be updated at the time of upload when a new reduced almanac has been built by the CS. The transmitted health data may not correspond to the actual health of the transmitting SV or other SVs in the constellation.		The three, one-bit, health indication in bits 44, 45 and 46 of subframe 3, page 4 and bits 31, 32 and 33 of each packet of reduced almanac refers to the L1, L2, and L5 signals of the SV whose PRN number is specified in the message or in the packet. For each health indicator, a “0” signifies that all signals on the associated frequency are okay and “1” signifies that some or all signals on the associated frequency are bad. The predicted health data will be updated at the time of upload when a new reduced almanac has been built by the CS. The transmitted health data may not correspond to the actual health of the transmitting SV or other SVs in the constellation.	The current language states that "For each health indicator, a “0” signifies that all navigation data are okay and “1” signifies that some or all navigation

Section Number	IS-GPS-800 RevB IRN001 (17 Apr 2012) Navstar GPS Space Segment/User Segment L1C Interface	Proposed Object Heading	Proposed Public Signals-in-Space (SiS) Updates Object Text	Proposed Rationale
				data are bad." This language is misleading in that it implies that one bit designated with a "1" means that all navigation data (L1, L2, and L5) are bad, which may not be true. Recommended text clarifies that a “1” signifies that some or all signals on the associated frequency are bad. The terms "valid" and "invalid" have also been changed to "okay" and "bad" to be consistent

Section Number	IS-GPS-800 RevB IRN001 (17 Apr 2012) Navstar GPS Space Segment/User Segment L1C Interface	Proposed Object Heading	Proposed Public Signals-in-Space (SiS) Updates Object Text	Proposed Rationale
				with IS-GPS-200 and IS-GPS-705.
3.5.4.3.5.1.1			An 8-bit value of “00000000” in the PRN_a field shall indicate that no further Status Words are contained in the remainder of the data block. In this event, all subsequent bits in the data block field shall be filler bits, i.e., alternating ones and zeros beginning with one.	This language is being supplied so that users now know how to interpret dummy SVs for the L1C signal.
3.5.4.4.3		Time of Differential Correction Data.		The section number 3.5.4.5 Time of Differential Correction Data has moved to Section 3.5.4.4.3 Time of Differential Correction Data to revert to the Rev A numbering scheme. All associated text with

Section Number	IS-GPS-800 RevB IRN001 (17 Apr 2012) Navstar GPS Space Segment/User Segment L1C Interface	Proposed Object Heading	Proposed Public Signals-in-Space (SiS) Updates Object Text	Proposed Rationale
				3.5.4.5 will be moved to Section 3.5.4.4.3.
3.5.4.4.4		DC Data Packet.		The section number 3.5.4.5.1 DC Data Packet has moved to Section 3.5.4.4.4 DC Data Packet to revert to the Rev A numbering scheme. All associated text with 3.5.4.5.1 will be moved to Section 3.5.4.4.4
3.5.4.4.4.1		SV PRN Identification.		The section number 3.5.4.5.1.1 SV PRN Identification has moved to Section 3.5.4.4.4.1 SV PRN Identification to revert to

Section Number	IS-GPS-800 RevB IRN001 (17 Apr 2012) Navstar GPS Space Segment/User Segment L1C Interface	Proposed Object Heading	Proposed Public Signals-in-Space (SiS) Updates Object Text	Proposed Rationale
				the Rev A numbering scheme. All associated text with 3.5.4.5.1.1 will be moved to Section 3.5.4.4.4.1.
3.5.4.4.4.2		Application of DC Data.		The section number 3.5.4.5.1.2 Application of DC Data has moved to Section 3.5.4.4.4.2 Application of DC Data to revert to the Rev A numbering scheme. All associated text with 3.5.4.5.1.2 will be moved to Section 3.5.4.4.4.2
3.5.4.5	Time of Differential Correction Data.	Subframe		The section number

Section Number	IS-GPS-800 RevB IRN001 (17 Apr 2012) Navstar GPS Space Segment/User Segment L1C Interface	Proposed Object Heading	Proposed Public Signals-in-Space (SiS) Updates Object Text	Proposed Rationale
		3, Page 6		3.5.4.5 Time of Differential Correction Data has been renamed due to reverting to the Rev A numbering scheme. 3.5.4.5 is now Subframe 3, Page 6 . All associated text with 3.5.4.5 has been moved to Section 3.5.4.4.3 and all associated text for 3.5.4.6-Subframe 3, Page 6 will be moved to Section 3.5.4.5
3.5.4.6	Subframe 3, Page 6	Subframe 3, Page 7 (Reserved)		The section number 3.5.4.6 Subframe 3, Page 6 has been

Section Number	IS-GPS-800 RevB IRN001 (17 Apr 2012) Navstar GPS Space Segment/User Segment L1C Interface	Proposed Object Heading	Proposed Public Signals-in-Space (SiS) Updates Object Text	Proposed Rationale
				renamed due to reverting to the Rev A numbering scheme. 3.5.4.6 is now Subframe 3, Page 7. . All associated text with 3.5.4.6 has been moved to Section 3.5.4.5.
3.5.4.7	Subframe 3, Page 7 (Reserved)	<DELETE>		This section has been moved to Section 3.5.4.6. Section 3.5.4.7 will be deleted. All associated text with 3.5.4.7 has been moved to Section 3.5.4.6.

End of WAS/IS for IS-GPS-800B, IRN-001 Changes