

CHANGE NOTICE

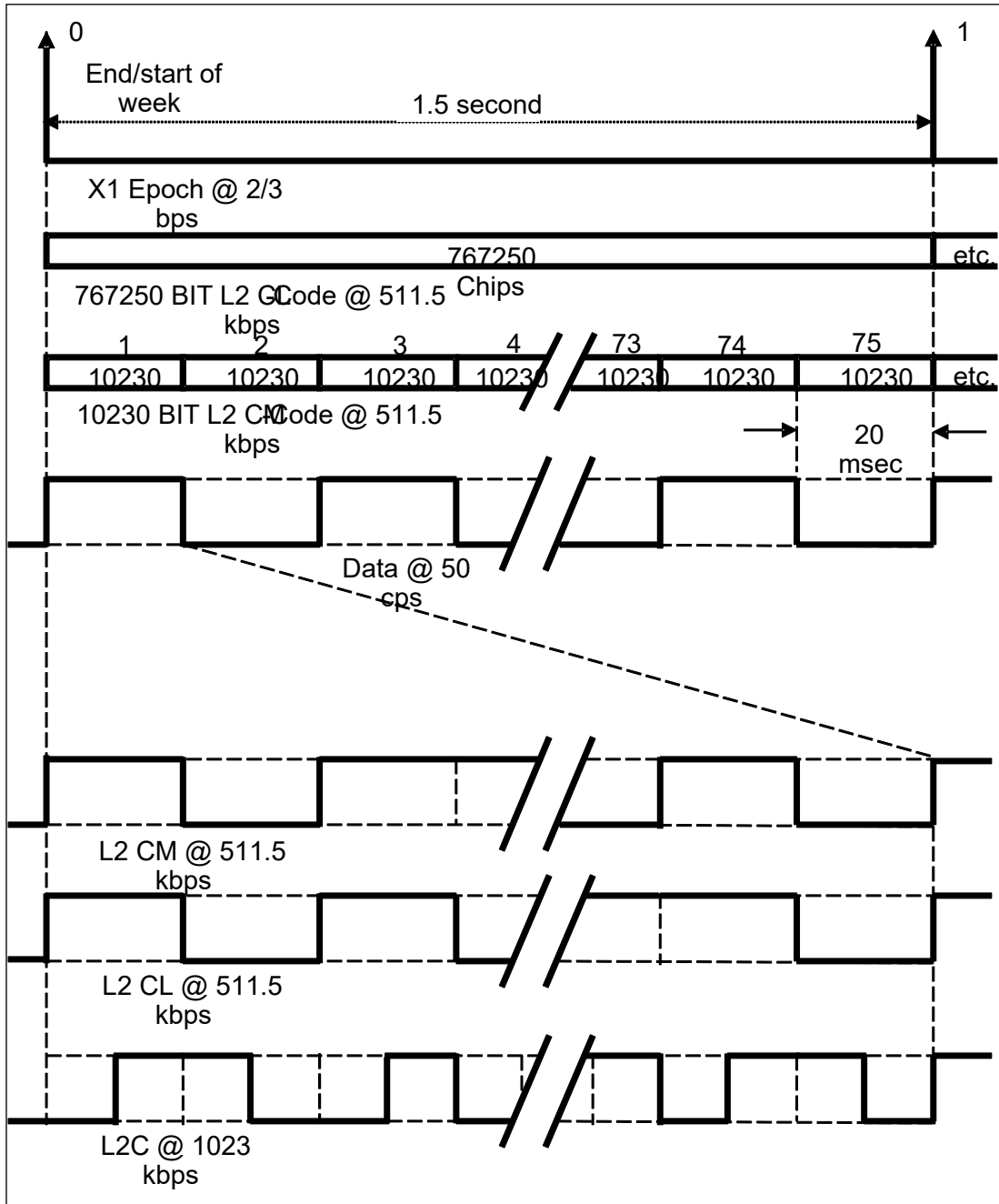
Affected Document: IS-GPS-200 Rev N	IRN/SCN Number XXX-XXXX-XXX	Date: DD-MMM-YYYY
Authority: RFC-00502	Proposed Change Notice PCN-IS-200N_RFC502	Date: 31-MAY-2023
Document Title: NAVSTAR GPS Space Segment/Navigation User Interfaces		
RFC Title: 2023 Proposed Changes to the Public Documents		
Reason For Change (Driver): <ol style="list-style-type: none">1. Finalize the CNAV Schedules Technical Baseline changes2. Resolve the Data ID Issue in IS-GPS-200 (a commercial vendor did not want Data IDs other than 2)3. Add the maximum power for GPS III/IIIF SVs to IS-GPS-2004. Accommodate all administrative fixes possible from Boeing's list of fixes		
Description of Change: <ol style="list-style-type: none">1. Update the CNAV message schedule information2. Publish the resolution for the Data ID Issue to IS-GPS-2003. Add the maximum power for GPS III/IIIF SVs to IS-GPS-2004. Fix the three figures that have the most readability problems		
Authored By: RE: Tony Anthony		Checked By: RE: Emily Hendrickson
AUTHORIZED SIGNATURES	REPRESENTING	DATE
	PNT Technical Director, MilComm & PNT Directorate, Space Systems Command (SSC)	
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THIS DOCUMENT SPECIFIES TECHNICAL REQUIREMENTS AND NOTHING HEREIN CONTAINED SHALL BE DEEMED TO ALTER THE TERMS OF ANY CONTRACT OR PURCHASE ORDER BETWEEN ALL PARTIES AFFECTED.		Interface Control Contractor: SAIC (GPS SE&I) 200 N. Pacific Coast Highway, Suite 1800 El Segundo, CA 90245 CODE IDENT 66RP1

IS200-133:

Section Number:

3.3.2.4.0-3

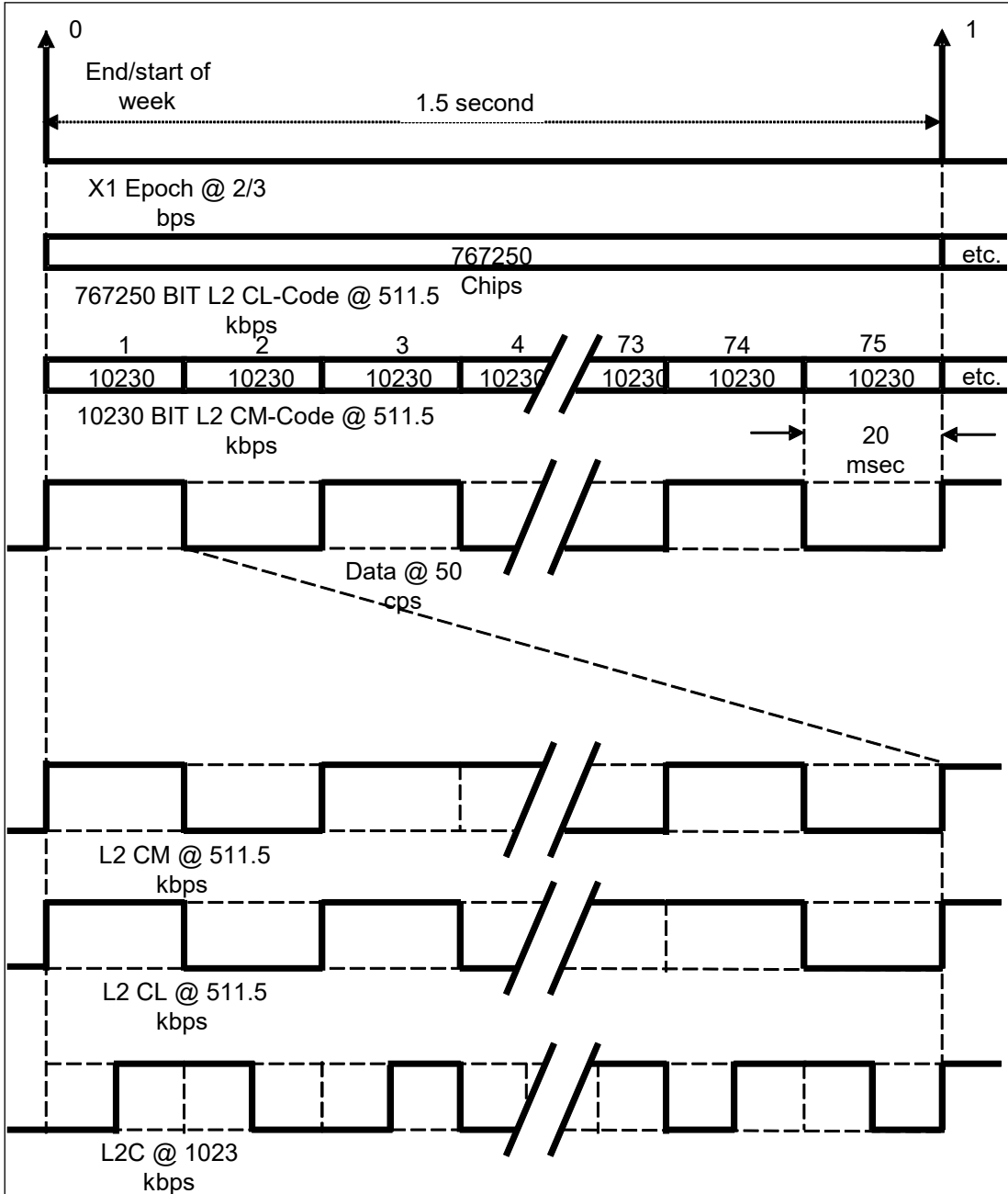
WAS:



Redlines: <not available graphically>

- Reworked the line beginning with “767250 BIT...” so text is no longer crowded
- Reworked the line beginning with “10230 BIT...” so text is no longer crowded

IS:



Rationale:

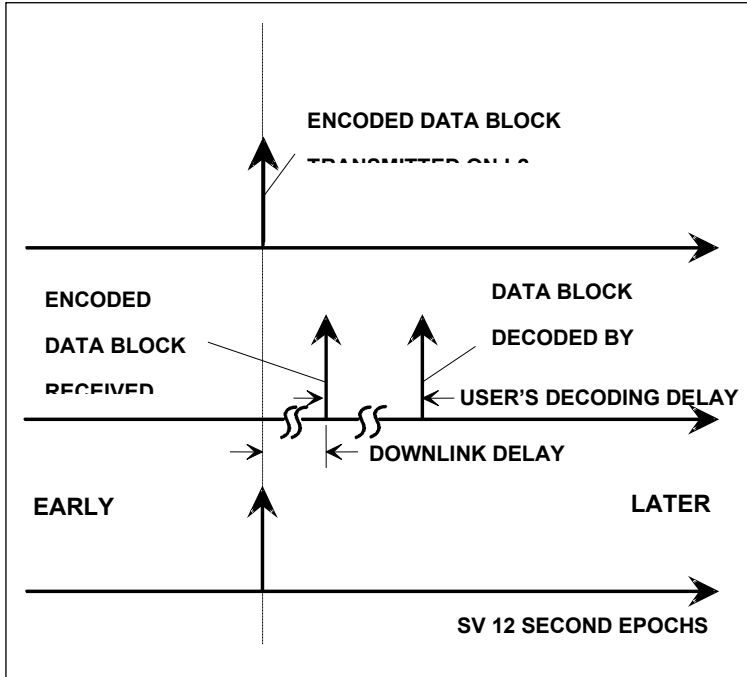
Fixed misaligned text around L2 CL-Code @ 511.5 kbps (T. Anthony)

IS200-144:

Section Number:

3.3.3.1.1.0-7

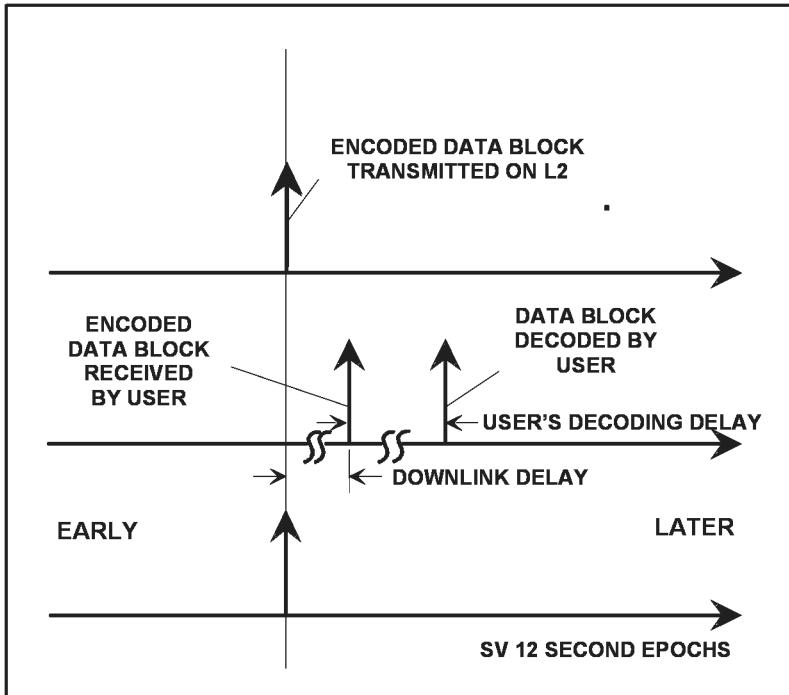
WAS:



Redlines: <not available graphically>

- Repaired the spacing on three text blocks to ensure they are single spaced so all lines of text can be seen

IS:



Rationale:

Fixed errant places of double spacing that obscured multiple line text boxes. (T. Anthony)

IS200-1508:

Section Number:

6.2.7.0-1

WAS:

Valid Range identifies the range of values used by GPS. The Valid Range is only for PRNs 1-63.

Redlines:

Valid Range identifies the range of values [of parameters](#) used by GPS. ~~The Valid Range is in only the for specified PRNs data 1-63 format.~~

IS:

Valid Range identifies the range of values of parameters used by GPS in the specified data format.

Rationale:

5/15/2023: Per the AWG, added "of parameters" per request. (T. Anthony)

5/4/2023: CRM #12 Section 6.3.6 addresses the valid range of PRNs better than having it here which confuses the concept of valid range with PRNs (T. Anthony)

IS200-2141:

Insertion after object IS200-2053

Section Number:

6.3.1.0-5

WAS:

<INSERTED OBJECT>

Redlines:

For GPS III and IIF SVs, the maximum received signal levels as a result of these factors are not expected to exceed -150.0 dBW for the P(Y) on the L1 and L2 channels, -153.0 dBW for C/A on the L1 channel, or -153.0 dBW for L2C on the L2 channel. In addition, due to programmable power output capabilities of GPS III and IIF SVs under certain operational scenarios, the maximum received signal levels are not expected to exceed -150 dBW.

Object Type: [Info-Only](#)

IS:

For GPS III and IIF SVs, the maximum received signal levels as a result of these factors are not expected to exceed -150.0 dBW for the P(Y) on the L1 and L2 channels, -153.0 dBW for C/A on the L1 channel, or -153.0 dBW for L2C on the L2 channel. In addition, due to programmable power output capabilities of GPS III and IIF SVs under certain operational scenarios, the maximum received signal levels are not expected to exceed -150 dBW.

Object Type: Info-Only

Rationale:

CRM #76 4/14/2023: Changed “and” to “or” at “and -153 dBW on L2C”. (T. Anthony)

3/7/2023: Added maximum power statement in IS-GPS-200 for GPS III/IIF similar to the existing statements for Block IIR-M/IIF. (T. Anthony)

IS200-2142:

Insertion after object IS200-1761

Section Number:

6.4.6.4

WAS:

<INSERTED OBJECT>

Redlines:

Object Heading 6.4.6.4 [Data ID Numbers Other Than 2](#)

Object Type: [Header](#)

IS:

Object Heading 6.4.6.4 Data ID Numbers Other Than 2

Object Type: Header

Rationale:

5/30/2023 Add paragraph resolving the PRAT 2021-5 promising that receivers that never checked Data ID for 2 will still respond reasonably if Data ID is another number. (T. Anthony)

IS200-2143:

Insertion below object IS200-2142

Section Number:

6.4.6.4.0-1

WAS:

<INSERTED OBJECT>

Redlines:

[The recommended user protocol is to determine the Data ID before decoding and using LNAV data. The broadcast of future data structures with Data ID numbers other than 2 will not impact LNAV Data ID 2 performance commitments for user equipment that does not follow this recommendation.](#)

Object Type: [Info-Only](#)

IS:

The recommended user protocol is to determine the Data ID before decoding and using LNAV data. The broadcast of future data structures with Data ID numbers other than 2 will not impact LNAV Data ID 2 performance commitments for user equipment that does not follow this recommendation.

Object Type: Info-Only

Rationale:

5/30/2023 Add paragraph resolving the PRAT 2021-5 promising that receivers that never checked Data ID for 2 will still respond reasonably if Data ID is another number. (T. Anthony)

IS200-387:

Section Number:

20.3.3.5.1.1.0-1

WAS:

The two MSBs of word three in each page shall contain data ID. Data ID number two (denoted by binary code 01) denotes the LNAV data structure of D(t) which is described in this Appendix and is the only valid value.

Redlines:

The two MSBs of word three in each page shall contain data ID. Data ID number two (denoted by binary code 01) denotes the LNAV data structure of D(t) which is described in this Appendix ~~and is the only valid value.~~

IS:

The two MSBs of word three in each page shall contain data ID. Data ID number two (denoted by binary code 01) denotes the LNAV data structure of D(t) which is described in this Appendix.

Rationale:

5/23/2023: Based on post AWG #1A input from the Aerospace SME's all prior changes are undone and replaced by repeal of "and is the only valid value". (T. Anthony)

5/3/2023: CRM #98 Expanded on the explanation for seeing section 20.1 and 40.1 (T. Anthony)

5/3/2023: CRM #123 Correct the capitalization to "Data ID" (T. Anthony)

3/7/2023 GPS reserves the right to use any possible Data ID value regardless of the PRN or current Data ID usage. (T. Anthony)

IS200-2090:

Section Number:

20.3.4.1.0-3

WAS:

Cutovers to newly updated data for subframes 1, 2, and 3 occur on frame boundaries (i.e., modulo 30 seconds relative to end/start of week). Newly updated data for subframes 4 and 5 may start to be transmitted with any of the 25 pages of these subframes.

Redlines:

~~Cutovers~~ [For Block IIF/IIR-M, GPS III/IIIF and all future SVs, cutovers](#) to newly updated data for subframes 1, 2, and 3 occur on frame boundaries (i.e., modulo 30 seconds relative to end/start of week). Newly updated data for subframes 4 and 5 may start to be transmitted with any of the 25 pages of these subframes.

IS:

For Block IIF/IIR-M, GPS III/IIIF and all future SVs, cutovers to newly updated data for subframes 1, 2, and 3 occur on frame boundaries (i.e., modulo 30 seconds relative to end/start of week). Newly updated data for subframes 4 and 5 may start to be transmitted with any of the 25 pages of these subframes.

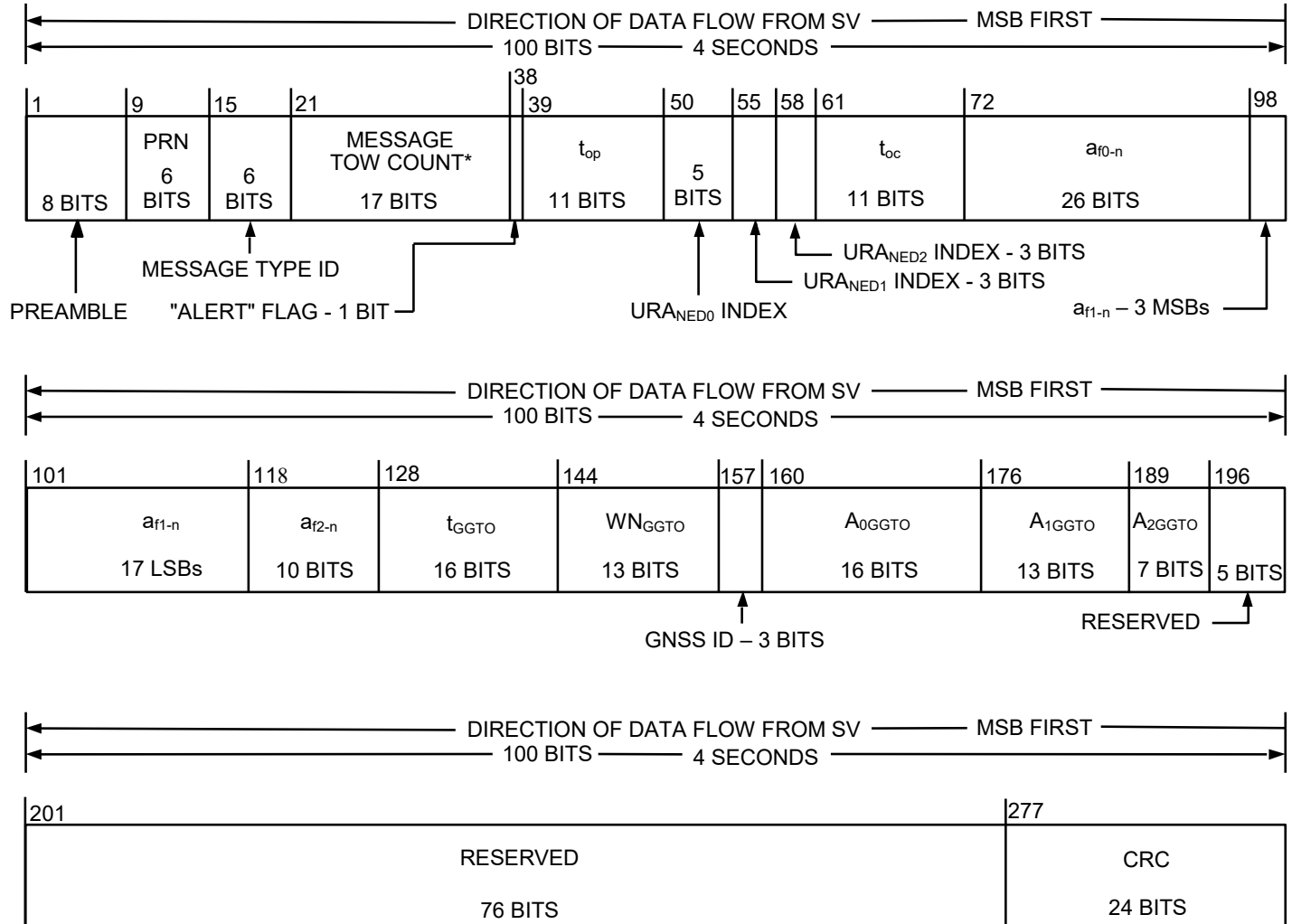
Rationale:

5/19/2023: CRM #74 Added the qualifier explaining exactly which series SVs do/shall faithfully cut over to new SF 1,2,3 data on frame boundaries. (T. Anthony)

IS200-523:

Section Number:
30.3.3.0-16

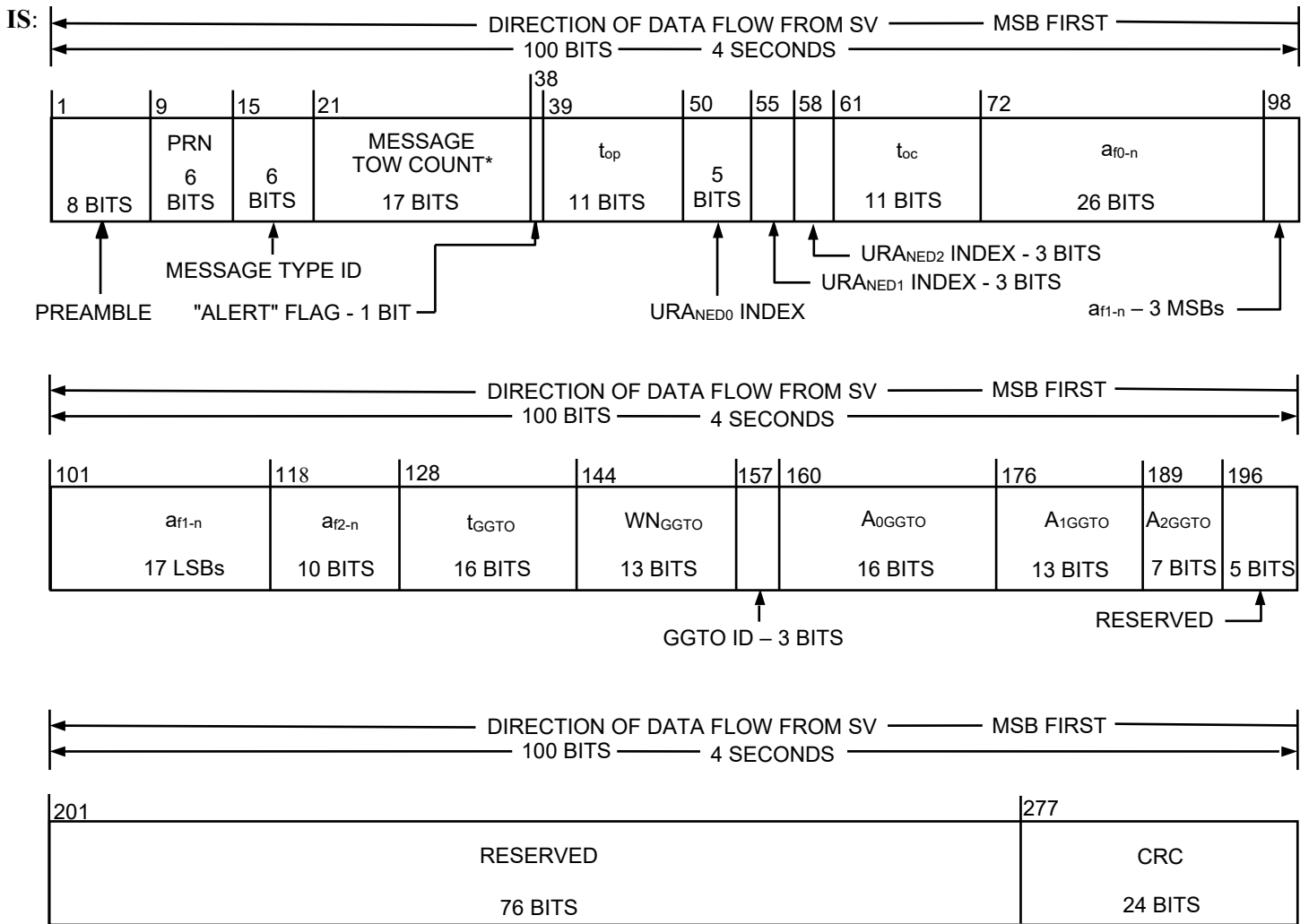
WAS:



* MESSAGE TOW COUNT = 17 MSB OF ACTUAL TOW COUNT AT START OF NEXT 12-SECOND MESSAGE

Redlines: <not available graphically>

- The GNSS ID field was renamed GGTO ID near the middle of the figure.



* MESSAGE TOW COUNT = 17 MSB OF ACTUAL TOW COUNT AT START OF NEXT 12-SECOND MESSAGE

Rationale:

5/19/2023: CRM #142 Renamed GNSS ID parameter associated with MT 35 to GGTO ID to eliminate overloading the GNSS ID definition. (T. Anthony)

IS200-2102:

Section Number:

30.3.3.8.1.0-2

WAS:

Bits 157 through 159 of Message Type 35 shall identify the other GPS like navigation system to which the offset data applies. The three bits are defined as follows;

000 = no data available,

001 = Galileo,

010 = GLONASS,

011 through 111 = Reserved in order to preserve 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 the GPS/GNSS Time Offset Parameter data, to which the GNSS Type ID applies, is presently unusable.

Redlines:

Bits 157 through 159 of Message Type 35 shall identify the other GPS like navigation system to which the offset data applies. The three bits are defined as follows:

000 = no data available,

001 = Galileo,

010 = GLONASS,

011 through 111 = Reserved in order to preserve 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 the GPS/GNSS Time Offset Parameter data, to which the ~~GNSS Type~~GGTO ID applies, is presently unusable.

IS:

Bits 157 through 159 of Message Type 35 shall identify the other GPS like navigation system to which the offset data applies. The three bits are defined as follows:

000 = no data available,

001 = Galileo,

010 = GLONASS,

011 through 111 = Reserved in order to preserve 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 the GPS/GNSS Time Offset Parameter data, to which the GGTO ID applies, is presently unusable.

Rationale:

5/19/2023: CRM #142 Renamed GNSS ID parameter associated with MT 35 to GGTO ID to eliminate overloading the GNSS ID definition. (T. Anthony)

IS200-663:

Section Number:
30.3.3.8.2.0-3

WAS:

Parameter		No. of Bits**	Scale Factor (LSB)	Valid Range***	Units
A _{0GGTO}	Bias coefficient of GPS time scale relative to GNSS time scale	16*	2 ⁻³⁵		seconds
A _{1GGTO}	Drift coefficient of GPS time scale relative to GNSS time scale	13*	2 ⁻⁵¹		sec/sec
A _{2GGTO}	Drift rate correction coefficient of GPS time scale relative to GNSS time scale	7*	2 ⁻⁶⁸		sec/sec ²
t _{GGTO}	Time data reference Time of Week	16	2 ⁴	0 to 604,784	seconds
W _{NGGTO}	Time data reference Week Number	13	2 ⁰		weeks
GNSS ID	GNSS Type ID	3			see text
<p>* Parameters so indicated shall be two's complement with the sign bit (+ or -) occupying the MSB;</p> <p>** See Figure 30-8 for complete bit allocation;</p> <p>*** Unless otherwise indicated in this column, valid range is the maximum range attainable with indicated bit allocation and scale factor.</p>					

Redlines:

Parameter		No. of Bits**	Scale Factor (LSB)	Valid Range***	Units
A _{0GGTO}	Bias coefficient of GPS time scale relative to GNSS time scale	16*	2 ⁻³⁵		seconds
A _{1GGTO}	Drift coefficient of GPS time scale relative to GNSS time scale	13*	2 ⁻⁵¹		sec/sec
A _{2GGTO}	Drift rate correction coefficient of GPS time scale relative to GNSS time scale	7*	2 ⁻⁶⁸		sec/sec ²
t _{GGTO}	Time data reference Time of Week	16	2 ⁴	0 to 604,784	seconds
WN _{GGTO}	Time data reference Week Number	13	2 ⁰		weeks
GNSSGG <u>TO ID</u>	GNSS Type ID	3			see text
<p>* Parameters so indicated shall be two's complement with the sign bit (+ or -) occupying the MSB.</p> <p>** See Figure 30-8 for complete bit allocation.</p> <p>*** Unless otherwise indicated in this column, valid range is the maximum range attainable with indicated bit allocation and scale factor.</p>					

IS:

Parameter		No. of Bits**	Scale Factor (LSB)	Valid Range***	Units
A _{0GGTO}	Bias coefficient of GPS time scale relative to GNSS time scale	16*	2 ⁻³⁵		seconds
A _{1GGTO}	Drift coefficient of GPS time scale relative to GNSS time scale	13*	2 ⁻⁵¹		sec/sec
A _{2GGTO}	Drift rate correction coefficient of GPS time scale relative to GNSS time scale	7*	2 ⁻⁶⁸		sec/sec ²
t _{GGTO}	Time data reference Time of Week	16	2 ⁴	0 to 604,784	seconds
WN _{GGTO}	Time data reference Week Number	13	2 ⁰		weeks
GGTO ID	GNSS Type ID	3			see text
<p>* Parameters so indicated shall be two's complement with the sign bit (+ or -) occupying the MSB.</p> <p>** See Figure 30-8 for complete bit allocation.</p> <p>*** Unless otherwise indicated in this column, valid range is the maximum range attainable with indicated bit allocation and scale factor.</p>					

Rationale:

5/19/2023: CRM #142 Renamed GNSS ID parameter associated with MT 35 to GGTO ID to eliminate overloading the GNSS ID definition. (T. Anthony)

IS200-669:

Section Number:

30.3.4.1.0-1

WAS:

Broadcast system of messages is completely arbitrary, but sequenced to provide optimum user performance. Message Types 10 and 11 shall be broadcast at least once every 48 seconds.

Redlines:

~~Broadcast~~The system broadcast schedule of messages CNAV message types is completely arbitrary, but sequenced to provide optimum user performance. - Message ~~Types~~types 10, 11, and ~~a~~a clock message shall be broadcast at least once every 60 seconds (with a nominal rate of 48 seconds) to provide system users the clock, ephemeris and integrity (CEI) data needed to access GPS. Among the broadcast clock messages, an MT 30 message will be broadcast once every 300 seconds. Other message types may not be broadcast, but when they are scheduled for broadcast, they will be broadcast in between these CEI messages. If a message type is scheduled for broadcast on L2C from a satellite, that satellite will broadcast that message type on L2C at least every 20 minutes, unless a message generation failure results in its replacement with a Message Type 0. Message types with constellation data (like almanac and differential corrections) will cycle through any allotted broadcast slots in these 20-minute intervals, and therefore, will take longer than 20 minutes to complete the broadcast of the entire data set. CNAV message broadcast schedules may differ between satellites, and between L2C and L5I on the same satellite.

IS:

The broadcast schedule of CNAV message types is completely arbitrary but sequenced to provide optimum user performance. Message types 10, 11, and a clock message shall be broadcast at least once every 60 seconds (with a nominal rate of 48 seconds) to provide system users the clock, ephemeris and integrity (CEI) data needed to access GPS. Among the broadcast clock messages, an MT 30 message will be broadcast once every 300 seconds. Other message types may not be broadcast, but when they are scheduled for broadcast, they will be broadcast in between these CEI messages. If a message type is scheduled for broadcast on L2C from a satellite, that satellite will broadcast that message type on L2C at least every 20 minutes, unless a message generation failure results in its replacement with a Message Type 0. Message types with constellation data (like almanac and differential corrections) will cycle through any allotted broadcast slots in these 20-minute intervals, and therefore, will take longer than 20 minutes to complete the broadcast of the entire data set. CNAV message broadcast schedules may differ between satellites, and between L2C and L5I on the same satellite.

Rationale:

5/17/2023 Per AWG 1A changed "in-between" to "in between" and "20 minute intervals" to "20-minute intervals" (T. Anthony)

5/16/2023 CRM #78 replaced "therefore may take longer" with "therefore will take longer" and replaced "within 20 minutes" with "at least every 20 minutes" (T. Anthony)

5/15/2023: Per AWG #1, change MT-30 interval from 288 seconds to 300 seconds. Also changed back to 60 second maximum interval. (T. Anthony)

5/3/2023: CRM #71 Added statement that MT-30s will be broadcast every 288 seconds. Emphasis on the "will". (T. Anthony)

5/3/2023: CRM #87 MGUE Increment 2 has complained that they want the required ephemeris rate to be 48 seconds - so accommodating by putting it back to what it was before this RFC, (T. Anthony)

5/3/2023: #102 Use present tense "broadcast" (T. Anthony)

3/14/2023: Added note about the exception for how long the interval will be between successive messages being broadcast and extended the possible interval for MT 10, 11 and clock messages. (T. Anthony)

IS200-2103:

Section Number:

30.3.4.1.0-2

WAS:

All other messages shall be broadcast in-between, not exceeding the maximum broadcast interval in Table 30-XII. Message Type 15 will be broadcast as needed, but will not reduce the maximum broadcast interval of the other messages. Type 15 messages that are longer than one page will not necessarily be broadcast consecutively.

Redlines:

~~All other messages shall be broadcast in-between, not exceeding the maximum broadcast interval in Table 30-XII. Message Type 15 will be broadcast as needed, but will not reduce the maximum broadcast interval of the other messages.~~
Type and 1536 messages that are longer than one [text](#) page will not necessarily be broadcast consecutively.

IS:

Message Type 15 and 36 messages that are longer than one text page will not necessarily be broadcast consecutively.

Rationale:

5/19/2023: CRM #79 per the AWG added "and 36" , inserted "text" before "page" and removed the parenthetical expression that associated page with TEXT_PAGE. (T. Anthony)

5/3/2023: CRM #79 Retained Message Type 15 relevant sentences while deleting the reference to Table 30-XII. Also define how one identifies pages (T. Anthony)

IS200-1624:

Section Number:

30.3.4.1.0-3

WAS:

Table 30-XII. Message Broadcast Intervals

Redlines:

Table 30-XII. ~~Message Broadcast Intervals~~[RESERVED](#)

IS:

Table 30-XII. RESERVED

Rationale:

5/3/2023: CRM #124 Suggested making the Table Caption RESERVED instead of deleting it. (T. Anthony)

2/28/2023: This change adds the Maximum Broadcast Interval for Message Type 30 series clock messages to 30.3.4.1 and drops Table 30-XII entirely per TIM #1 (T. Anthony)

IS200-670:

Section Number:
30.3.4.1.0-4

WAS:

Message Data	Message Type Number	Maximum Broadcast Intervals †
Ephemeris	10 & 11	48 sec
Clock	Type 30's	48 sec
ISC, IONO	30*	288 sec
Reduced Almanac	31* or 12	20 min**,****
Midi Almanac	37*	120 min**,****
EOP	32*	30 min****
UTC	33*	288 sec
Diff Correction	34* or 13 & 14	30 min***,****
GGTO	35*	288 sec****
Text	36* or 15	As needed****
Integrity Support Message+	40	288 sec ****
<p>* Also contains SV clock correction parameters. ** Complete set of SVs in the constellation. *** When Differential Corrections are available. **** Optional (interval applies if/when broadcast). + One ISM per maximum broadcast interval; However, users are not required but can accept multiple ISMs from any SVs. Users can refer to the future TSO and MSO for further details. † The intervals specified are maximum. As such, the broadcast intervals may be shorter than the specified value.</p>		

Redlines:

Message Data	Message Type Number	Maximum Broadcast Intervals[‡]
Ephemeris	10 & 11	48 sec
Clock	Type 30's	48 sec
ISC, IONO	30*	288 sec
Reduced Almanac	31* or 12	20 min ^{**,*}
Midi Almanac	37*	120 min ^{**,*}
EOP	32*	30 min ^{***}
UTC	33*	288 sec
Diff Correction	34* or 13 & 14	30 min ^{***,*}
GGTO	35*	288 sec ^{****}
Text	36* or 15	As needed ^{****}
Integrity Support Message ⁺	40	288 sec ^{****}
* — Also contains SV clock correction parameters. ** — Complete set of SVs in the constellation. *** — When Differential Corrections are available. **** — Optional (interval applies if/when broadcast). + — One ISM per maximum broadcast interval; However, users are not required but can accept multiple ISMs from any SVs. Users can refer to the future TSO and MSO for further details. ‡ — The intervals specified are maximum. As such, the broadcast intervals may be shorter than the specified value.		

IS:
<DELETED OBJECT>

Rationale:
2/28/2023: This change adds the Maximum Broadcast Interval for Message Type 30 series clock messages to 30.3.4.1 and drops Table 30-XII entirely per TIM #1 (T. Anthony)

IS200-1371:

Section Number:

40.3.3.5.1.1.0-1

WAS:

The two MSBs of word three in each page shall contain the data ID. Data ID number two (denoted by binary code 01) denotes the LNAV data structure of D(t) which is described in this Appendix and is the only valid value.

Redlines:

The two MSBs of word three in each page shall contain the data ID. Data ID number two (denoted by binary code 01) denotes the LNAV data structure of D(t) which is described in this Appendix ~~and is the only valid value.~~

IS:

The two MSBs of word three in each page shall contain the data ID. Data ID number two (denoted by binary code 01) denotes the LNAV data structure of D(t) which is described in this Appendix.

Rationale:

5/23/2023: Based on post AWG #1A input from the Aerospace SME's asked to repeal "and is the only valid value". (T. Anthony)
