IS-GPS-200 WAS-IS MATRIX

Section #	WAS	IS	Rationale
Figure 20-1 (All sheets)	C = TLM BITS 23 AND 24 WHICH ARE RESERVED	C = TLM BITS 23 AND 24. BIT 23 IS THE INTEGRITY STATUS FLAG AND BIT 24 IS RESERVED	Changed table to reflect the new Integrity Status Flag
20.3.2	The memory retentivity for the Block IIR/IIR-M/IIF SVs is designed and guaranteed for at least 60 days.	The memory retentivity is guaranteed for at least 60 days for SVs subsequent to Block IIA.	updated to include GPS III-specific information.
20.3.2	(d) if a control element cannot be located, this default action will be applied to all subframes and all subframes will indicate ID = 1 (Block II/IIA only) (i.e., an ID-code of 001) in the HOW (reference paragraph 20.3.3.2) (Block IIR/IIR-M, and IIF SVs indicate the proper subframe ID for all subframes).	(d) if a control element cannot be located, this default action will be applied to all subframes and all subframes will indicate ID = 1 (Block II/IIA only) (i.e., an ID-code of 001) in the HOW (reference paragraph 20.3.3.2) (Block IIR/IIR-M, IIF, and IIIA SVs indicate the proper subframe ID for all subframes).	Added Block IIIA
20.3.2	Block IIR SVs have the capability, with current memory margin, to store at least 60 days of uploaded NAV data in the Block IIA mode and to store at least 60 days of CS data needed to generate NAV data on-board in the Autonav mode. Alternating ones and zeros will be transmitted in words 3 through 10 in place of the normal NAV data whenever the SV cannot locate the requisite valid control or data element in its on-board computer memory.	Block IIR SVs have the capability, with current memory margin, to store at least 60 days of uploaded NAV data in the Block IIA mode and to store at least 60 days of CS data needed to generate NAV data on-board in the Autonav mode. Block IIIA SVs have the capability to support operation for at least 60 days without contact from the CS. Alternating ones and zeros will be transmitted in words 3 through 10 in place of the normal NAV data whenever the SV cannot locate the requisite valid control or data element in its on-board computer memory.	Added Block IIIA
6.3.7	NEW	6.3.7 Pre-Operational Use. Before any new signal or group of signals (e.g., L2C, L5, M, L1C, etcetera) is declared operational, the availability of and/or the configuration of the broadcast signal or group of signals may not comply with all requirements of the relevant IS or ICD. For example, the pre-operational broadcast of L2C signals from the IIR-M satellites did not include any NAV or CNAV data as required by IS-GPS-200. Pre-operational use of any new signal or group of signals is at the users own risk.	Notifies users that performance of any new signal or group of signals cannot be guaranteed prior to IOC. Language taken from Karl Kovach PPIRN. Modified by B. Carrol of A5P.
6.3.6.3	An additional set of 80 78 L2 CM-/L2 CL-code PRN sequence pairs are selected and assigned with PRN numbers in this section as shown in Table 6-II. Among the 80 78 additional sequences, PRN numbers 38 through 63 are reserved for future GPS SVs, and PRN numbers 159 through 210 are reserved for other GNSS applications.	An additional set of 80 78 L2 CM-/L2 CL-code PRN sequence pairs are selected and assigned with PRN numbers in this section as shown in Table 6-II. Among the 80 78 additional sequences, PRN numbers 38 through 63 are reserved for future GPS SVs, and PRN numbers 159 through 210 are reserved for other GNSS applications.	
6.1	See document	See document	Several acronyms were included for the reader's convenience.

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	The most significant bits of the Z-count are a binary representation of the sequential number assigned to the current GPS week (see paragraph 6.2.4). This is modulo representation, limited by the physical space available. The most common limit is 10.The ten most significant bits of the Z-count are a modulo 1024 binary representation of the sequential number assigned to the current GPS week (see paragraph 6.2.4). The range of this count is from 0 to 1023 with its zero state being defined as the GPS week number zero and every integer multiple of 1024 weeks, thereafter (i.e. 0, 1024, 2048, etc.).	The most significant bits of the Z-count are a binary representation of the sequential number assigned to the current GPS week (see paragraph 6.2.4).	No rationale is provided, however, this was presented in the Nov 08 ICWG and stakeholders all concurred.
3.3.4	Time stated in this manner is referred to as Z-count, which is given as a 29-bit binary number consisting of two parts as follows:	Time stated in this manner is referred to as Z-count, which is given as a binary number consisting of two parts as follows:	GPS III uses a 32 bit Z count; removed reference to 29-bit Z count which is specific to the GPS II implementation.
3.3.4	The NAV data contains the requisite data for relating GPS time to UTC. The accuracy of this data during the transmission interval shall be such that it shall relate GPS time (maintained by the MCS of the CS) to UTC (USNO) within 90 nanoseconds (one sigma).	The NAV data 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 (maintained by the MCS of the CS) to UTC (USNO) within 90 nanoseconds (one sigma).	Consistency with IS-GPS-705 and IS-GPS-800
3.3.1.9	The transmitted signal shall be right-hand circularly polarized (RHCP). For the angular range of ±14.3 degrees from boresight, L1 ellipticity shall be no worse than 1.2 dB for Block II/IIA and shall be no worse than 1.8 dB for Block IIR/IIR-M/IIF SVs. L2 ellipticity shall be no worse than 3.2 dB for Block II/IIA SVs and shall be no worse than 2.2 dB for Block IIR/IIR-M/IIF over the angular range of ±14.3 degrees from boresight.	The transmitted signal shall be right-hand circularly polarized (RHCP). For the angular range of ±13.8 degrees from nadir, L1 ellipticity shall be no worse than 1.2 dB for Block II/IIA and shall be no worse than 1.8 dB for Block IIR/IIR-M/IIF/IIIA SVs. L2 ellipticity shall be no worse than 3.2 dB for Block II/IIA SVs and shall be no worse than 2.2 dB for Block IIR/IIR-M/IIF/IIIA over the angular range of ±13.8 degrees from nadir.	New text added to specifically address the L2 ellipticity for GPS III SVs. The reason that the angular range is different from the GPS II SVs is that the 14.3 degrees in the other requirements allows for up to 0.5 degree pointing error. LM historical performance for IIR/IIR-M has been much better than that with less that 0.1 degree pointing error. New text with a smaller angular range value allows LM to take advantage of better pointing error. 11/19/08: Revised the comment to read: "For the angular range of ±13.8 degrees from nadir, L1 ellipticity shall be no worse than 1.8 dB for GPS III SVs." Matches the 800 language. Changes made in real time. Stakeholders concur.
3.3.1.7.1	Group Delay Uncertainty. The effective uncertainty of the group delay shall not exceed 3.0 nanoseconds (two sigma).	Group Delay Uncertainty. The effective uncertainty of the group delay shall not exceed 3.0 nanoseconds (95% probability).	Change from Sept 09 ICWG to force contractor to take more data points

Section #	WAS	IS	Rationale
3.3.1.7.2	The random variations about the mean shall not exceed 3.0 nanoseconds (two sigma). Corrections for the bias components of the group delay differential are provided to the US in the Nav message using parameters designated as TGD (reference paragraph 20.3.3.3.3.2) and Inter-Signal Correction (ISC) (reference paragraph 30.3.3.3.1.1).	The random plus non-random variations about the mean shall not exceed 3.0 nanoseconds (95% probability), when including consideration of the temperature and antenna effects during a vehicle orbital revolution. Corrections for the bias components of the group delay differential are provided to the US in the NAV/CNAV message using parameters designated as TGD (reference paragraph 20.3.3.3.3.2) and Inter-Signal Correction (ISC) (reference paragraph 30.3.3.3.1.1).	Changes from CL/PCN WG
3.3.1.7.3	The group delay differential between the radiated L1 and L2 signals with respect to the Earth Coverage signal for users of the Space Service Volume shall be given as values by the Block III Space Contractor (TBD). The details are provided in TBD.	The group delay differential between the radiated L1 and L2 signals with respect to the Earth Coverage signal for users of the Space Service Volume are provided in TBD.	Removed 1 TBD
3.3.1.8	All transmitted signals for a particular SV shall be coherently derived from the same on-board frequency standard; all digital signals shall be clocked in coincidence with the PRN transitions for the P-signal and occur at the P-signal transition rate. On the L1 channel the data transitions of the two modulating signals (i.e., that containing the P(Y)-code and that containing the C/A-code), L1 P(Y) and L1 C/A, shall be such that the average time difference between the transitions does not exceed 10 nanoseconds (two sigma).	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 modulating signals, C/A and L1P(Y), and on the L2 carrier the chip transitions of L2P(Y) and L2C, shall be such that the average time difference between the chips on the same carrier do not exceed 10 nanoseconds. The variable time difference shall not exceed 1 nanosecond (95% probability), when including consideration of the temperature and antenna effect changes during a vehicle orbital revolution. Corrections for the bias components of the time difference are provided to the US in the CNAV message using parameters designated as ISCs (reference paragraph 30.3.3.3.1.1).	Changes from CL/PCN WG

Section #	WAS	IS	Rationale
6.2.1	User Range Accuracy. User range accuracy (URA) is a statistical indicator of the ranging accuracies obtainable with a specific SV. URA is a one-sigma estimate of the user range errors in the navigation data for the transmitting satellite. It includes all errors for which the Space and Control Segments are responsible. It does not include any errors introduced in the user set or the transmission media. While the URA may vary over a given subframe fit interval, the URA index (N) reported in the NAV message corresponds to the maximum value of URA anticipated over the fit interval.	User Range Accuracy (URA) is a statistical indicator of the GPS ranging accuracy obtainable with a specific signal and SV. Whether the integrity status flag is 'off' or 'on', 4.42 times URA bounds instantaneous URE under all conditions with 1 -1e-5 per hour probability. When the integrity status flag is 'on', 5.73 times URA bounds instantaneous URE under all conditions with 1-1e-8 per hour probability. Integrity properties of the URA are specified with respect to the upper bound values of the URA index. Note #1: URA applies over the curve fit interval that is applicable to the NAV data from which the URA is read, for the worst-case location within the intersection of the satellite signal and the terrestrial service volume. Note #2: The URA for a particular signal may be represented by a single parameter in the NAV data or by more than one parameter representing components of the total URA. Specific URA parameters and formulae for calculating the total URA for a signal are defined in the applicable Space Segment to Navigation User Segment ICD's.	Update URA definition. Added definition of UDRA and integrety assured URA.
6.2.1.1	NEW	Integrity Assured URA. When the integrity assurance monitoring is available, as indicated by a the “integrity status flag” being set to “1”, the URA value is chosen such that the probability of the “actual” URE exceeding a threshold is met (see section 3.5.3.10 for probability values). The URA value is conveyed to the user in the form of a URA index values. The URA index represents a range of values; for integrity assurance applications.	Update URA definition. Added definition of UDRA and integrety assured URA.
6.2.1.2	NEW	User Differential Range Accuracy. User Differential Range Accuracy (UDRA) is a statistical indicator of the GPS ranging accuracy obtainable with a specific signal and SV after the application of the associated differential corrections (DC parameters).	Definition added to address concern of Rhonda Slattery (comment #254)
6.2.2.2	The operational satellites are designated Block II, Block IIA, Block IIR, Block IIR-M, and Block IIF SVs.	The operational satellites are designated Block II, Block IIA, Block IIR, Block IIR-M, Block IIF and Block III SVs.	Added Block III

Section #	WAS	IS	Rationale
6.2.2.2.6	The block of operational replenishment SVs are designated as SVNs 74-105 and are termed “Block III” SVs; the first acquisition of Block III SVs is designated “Block IIIA”. This is the first block of operational SVs that transmit the L1C signal. These SVs will provide at least 60 days of positioning service without contact from the CS.	The block of operational replenishment SVs are designated as SVNs 74-81. This is the first block of operational SVs that transmit the L1C signal. These SVs will provide at least 60 days of positioning service without contact from the CS.	Updated block III definition
6.3.3	NEW	Extended Navigation Mode (Block IIIA). The Block IIIA SVs shall be capable of being uploaded by the CS with a minimum of 60 days of data to support a 60 day positioning service. Under normal conditions, the CS will provide daily uploads to each SV, which will allow the SV to maintain normal operations as defined in paragraph 6.2.3.1 and described within this IS. If the CS is unable to upload the SVs (the CS is unavailable or the SV is unable to accept and process the upload), each SV shall individually transition to short-term extended operations and eventually to long-term extended operations (based on time from each SV’s last upload) as defined in paragraph 6.2.3.2 and 6.2.3.3, and as further described throughout this IS. As time from upload continues through these three operational intervals, the user range error (URE) of the SV will increase, causing a positioning service accuracy degradation.	

Section #	WAS	IS	Rationale
6.3.5	The Block IIR/IIR-M and Block IIF SV, in conjunction with a sufficient number of other Block IIR/IIR-M or Block IIF SVs, operates in an Autonav mode when commanded by the CS. Each Block IIR/IIR-M/IIF SV in the constellation determines its own ephemeris and clock correction parameters via SV-to-SV ranging, communication of data, and on-board data processing which updates data uploaded by the CS. In the Autonav mode the Block IIR/IIR-M/IIF SV will maintain normal operations as defined in paragraph 6.2.3.1 and as further described within this IS, and will have a URE of no larger than 6 meters, one sigma for Block IIR/IIR-M. URE of 6 meters, one sigma, is expected to support 16 meter SEP accuracy under a nominal position dilution of precision. If the CS is unable to upload the SVs, the Block IIR/IIR-M/IIF SVs will maintain normal operations for period of at least 60 days after the last upload.	The Block IIR/IIR-M, Block IIF, and directional crosslink-capable Block III SV in conjunction with a sufficient number of other Block IIR/IIR-M, Block IIF or directional crosslink-capable Block III SVs, operates in an Autonav mode when commanded by the CS. Each Block IIR/IIR-M/IIF/directional crosslink-capable III SV in the constellation determines its own ephemeris and clock correction parameters via SV-to-SV ranging, communication of data, and on-board data processing which updates data uploaded by the CS. In the Autonav mode the Block IIR/IIR-M/IIF/directional crosslink-capable III SV will maintain normal operations as defined in paragraph 6.2.3.1 and as further described within this IS, and will have a URE of no larger than 6 meters, one sigma for Block IIR/IIR-M. URE of 6 meters, one sigma, is expected to support 16 meter SEP accuracy under a nominal position dilution of precision. If the CS is unable to upload the SVs, the Block IIR/IIR-M/IIF/directional crosslink-capable III SVs will maintain normal operations for period of at least 60 days after the last upload.	Added Block III
20.3.2	Block IIIA SVs have the capability to store at least 60 days of uploaded data.	Block IIIA SVs have the capability to support operation for at least 60 days without contact from the CS.	Clarified wording.

Section #	WAS	IS	Rationale
20.3.3.1	Each TLM word is 30 bits long, occurs every six seconds in the data frame, and is the first word in each subframe/page. The format shall be as shown in Figure 20-2. Bit 1 is transmitted first. Each TLM word shall begin with a preamble, followed by the TLM message, two reserved bits, and six parity bits. The TLM message contains information needed by the authorized user and by the CS, as described in the related SS/CS interface documentation.	Each TLM word is 30 bits long, occurs every six seconds in the data frame, and is the first word in each subframe/page. The format shall be as shown in Figure 20-2. Bit 1 is transmitted first. Each TLM word shall begin with a preamble, followed by the TLM message, the integrity status flag, one reserved bit, and six parity bits. The TLM message contains information needed by the precise positioning service (PPS) user (authorized user) and by the CS, as described in the related SS/CS interface documentation. Bit 23 of each TLM word is the Integrity Status Flag (ISF). A "0" in bit position 23 indicates that the conveying signal is provided with the legacy level of integrity assurance. That is, the probability that the instantaneous URE of the conveying signal exceeds 4.42 times the upper bound value of the current broadcast URA index, for more than 5.2 seconds, without an accompanying alert, is less than 1E-5 per hour. A "1" in bit-position 23 indicates that the conveying signal is provided with an enhanced level of integrity assurance. That is, the probability that the instantaneous URE of the conveying signal exceeds 5.73 times the upper bound value of the current broadcast URA index, for more than 5.2 seconds, without an accompanying alert, is less than 1E-8 per hour. The probabilities associated with the nominal and lower bound values of the current broadcast URA index are not defined. In this context, an "alert" is defined as any indication or characteristic in the conveying signal, as specified elsewhere in this document, which signifies that the conveying signal may be invalid and should not be used, such as, not Operational-Healthy, Non-Standard Code, parity error, etc.	Clarified wording for URA, URAoe and URAoc as it pertains to integrity.
20.3.3.2	Bit 18 is an "alert" flag. When this flag is raised (bit 18 = "1"), it shall indicate to the unauthorized user that the SV URA may be worse than indicated in subframe 1 and that he shall use that SV at his own risk.	Bit 18 is an "alert" flag. When this flag is raised (bit 18 = "1"), it shall indicate to the standard positioning service (SPS) user (unauthorized user) that the SV URA may be worse than indicated in subframe 1 and that he shall use that SV at his own risk.	Changed "unauthorized user" to standard positioning service (SPS) user. This change was also done for all other instances in the document. Please refer to the document (date 15 October 2009) for all changes.
20.3.3.3.1	The clock parameters describe the SV time scale during the period of validity. The parameters in a data set shall be valid during the interval of time in which they are transmitted and shall remain valid for an additional period of time after transmission of the next data set has started. The timing information for subframes, pages, and data sets is covered in Section 20.3.4.	The clock parameters describe the SV time scale during the period of validity. The parameters are applicable during the time in which they are transmitted. Beyond that time, they are still applicable, however, the most recent data set should be used since the accuracy degrades over time. The timing information for subframes, pages, and data sets is covered in Section 20.3.4.	Clarification.

Section #	WAS	IS	Rationale
20.3.3.3.1.1	The ten MSBs of word three shall contain the ten MSBs of the 29-bit Z-count as qualified herein.	The ten MSBs of word three shall contain the ten LSBs of the Week Number as defined in 3.3.4.	11/19/08: Removed entire sentence "On IIF, these 13 bits are comprised of 10 LSBs (WN) that represent the ten MSBs (WNe) of the 29-bit Z-count as qualified in paragraph 20.3.3.3.1.1, and 3 MSBs which are three extra bits that extend the range of transmission week number from 10 to 13 bits." Changes made in real time during ICWG. Stakeholders concur.
20.3.3.3.1.3	APPEND	Integrity properties of the URA are specified with respect to the upper bound values of the URA index (see 20.3.3.1). URA accounts for signal-in-space contributions to user range error that include, but are not limited to, the following: the net effect of clock parameter and code phase error in the transmitted signal for single-frequency L1C/A or single-frequency L2C users who correct the code phase as described in Section 30.3.3.3.1.1.1, as well as the net effect of clock parameter, code phase, and intersignal correction error for dual-frequency L1/L2 and L1/L5 users who correct for group delay and ionospheric effects as described in Section 30.3.3.3.1.1.2.	Change made real time at ICWG to address GPC concern of what URA bound to use for Integrity. Also addressing Rhonda Slattery comment #254.
20.3.3.5.2.3	During extended operations (short-term and long-term) the almanac time parameter may not provide the specified time accuracy or URE component.	During extended operations (short-term and long-term) the almanac time parameter may not provide the specified time accuracy or URE component. Additionally, occasional CS actions to manage clock offsets may also inhibit the ability to provide specified almanac time parameter accuracies.	Clarification of reality. As one example, after we perform a necessary, periodic timing adjustment on a satellite, it can and will take literally hours [empirically, on average about 24 hours], before we will have uploaded the entire constellation with new almanac time parameters reflecting the timing adjustment. Additionally, user sets that download almanacs based on the time of applicability (tOA), can and will experience the elapsing of additional hours [empirically, as much as 24 hours], before such user equipment will recognize the update.

Section #	WAS	IS	Rationale
20.3.3.4.1	The CS shall assure that the toe value, for at least the first data set transmitted by an SV after an upload, is different from that transmitted prior to the cutover (reference paragraph 20.3.4.5).	The CS (Block II/IIA/IIR/IIR-M/IIF) and SS (Block IIIA) shall assure that the toe value, for at least the first data set transmitted by an SV after an upload, is different from that transmitted prior to the cutover (reference paragraph 20.3.4.5).	Block IIIA specific changes. This same change was also made to section 20.3.3.4.3, 20.3.3.4.3.1 among others. Please refer to document (dated 15 October 2009 or later) to view all instances.
Table 20-XII	IODC Values and Data Set Lengths (Block IIR/IIR-M/IIF	IODC Values and Data Set Lengths (Block IIR/IIR-M/IIF/IIIA	Added Block IIIA
20.3.4.4	The range of IODC will be as given in Table 20-XI for Block II/IIA SVs and Table 20-XII for Block IIR/IIR-M/IIF SVs.	The range of IODC will be as given in Table 20-XI for Block II/IIA SVs and Table 20-XII for Block IIR/IIR-M/IIF/IIIA SVs.	Added Block IIIA
30.3.2.2.4	NEW	Clock-related URA (URAoc) accounts for signal-in-space contributions to user range error that include, but are not limited to, the following: the net effect of clock parameter and code phase error in the transmitted signal for single-frequency L1C/A or single-frequency L2C users who correct the code phase as described in Section 30.3.3.3.1.1.1, as well as the net effect of clock parameter, code phase, and intersignal correction error for dual-frequency L1/L2 and L1/L5 users who correct for group delay and ionospheric effects as described in Section 30.3.3.3.1.1.2.	Addressing Rhonda Slattery comment #254
30.3.2.2.4	NEW	Integrity properties of the URA are specified with respect to the upper bound values of the URA index (see 20.3.3.1).	Change made real time at ICWG to address GPC concern of what URA bound to use for Integirty.
30.3.3	When the value of the message TOW count is multiplied by 6, it represents SV time in seconds at the start of the next 12-second message. An “alert” flag, when raised (bit 38 = “1”), indicates to the user that the SV URA and/or the SV User Differential Range Accuracy (UDRA) may be worse than indicated in the respective message types, and the SV should be used at the user’s own risk.	When the value of the message TOW count is multiplied by 6, it represents SV time in seconds at the start of the next 12-second message. An “alert” flag, when raised (bit 38 = “1”), indicates to the user that the SV URA and/or the SV User Differential Range Accuracy (UDRA) may be worse than indicated in the respective message types.	Change made real time at ICWG due to a complaint from Mike Dash that the last part of the sentence did not make sense.

Section #	WAS	IS	Rationale
30.3.3.1.1	Any change in the Message Type 10 and 11 ephemeris data will be accomplished with a simultaneous change in the toe value. The CS will assure that the toe value, for at least the first data set transmitted by an SV after an upload, is different from that transmitted prior to the cutover. See Section 20.3.4.5 for additional information regarding toe.	Any change in the Message Type 10 and 11 ephemeris data will be accomplished with a simultaneous change in the toe value. The CS (Block IIR-M/IIF) and SS (Block III) will assure that the toe value, for at least the first data set transmitted by an SV after an upload, is different from that transmitted prior to the cutover. See Section 20.3.4.5 for additional information regarding toe. The CNAV message will contain information that allows users to operate when integrity is assured. This is accomplished using an integrity assured URA value in conjunction with an integrity status flag. The URA value is the RSS of URAoe and URAoc; URA is integrity assured to the enhanced level only when the integrity status flag is “1”. Bit 272 of Message Type 10 is the Integrity Status Flag (ISF). A "0" in bit position 272 indicates that the conveying signal is provided with the legacy level of integrity assurance. That is, the probability that the instantaneous URE of the conveying signal exceeds 4.42 times the upper bound value of the current broadcast URA valueindex, for more than 5.2 seconds, without an accompanying alert, is less than 1E-5 per hour. A "1" in bit-position 272 indicates that the conveying signal is provided with an enhanced level of integrity assurance. That is, the probability that the instantaneous URE of the conveying signal exceeds 5.73 times the upper bound value of the current broadcast URA valueindex, for more than 5.2 seconds, without an accompanying alert, is less than 1E-8 per hour. The probabilities associated with the nominal and lower bound values of the current broadcast URA index are not defined. In this context, an "alert" is defined as any indication or characteristic in the conveying signal, as specified elsewhere in this document, which signifies that the conveying signal may be invalid and should not be used, such as, not Operational-Healthy, Non-Standard Code, parity error, etc. In this context, the term URA refers to the composite URA, calculated as the root-sum-squared of the individual URA components in the conveying signal.	Added wording to describe Integrity Assurance and the ISF.

Section #	WAS	IS	Rationale
	Bits 39 through 51 of message type 10 shall contain 13 bits which are a modulo-8192 binary representation of the current GPS week number at the start of the data set transmission interval (see paragraph 6.2.4). These 13 bits are comprised of 10 LSBs that represent the ten MSBs of the 29-bit Z-count as qualified in paragraph 20.3.3.3.1.1, and 3 MSBs which are extra bits that extend the range of transmission week number from 10 to 13 bits.	Bits 39 through 51 of message type 10 shall contain 13 bits which are a modulo-8192 binary representation of the current GPS week number at the start of the data set transmission interval (see paragraph 6.2.4).	To synch up with IS-GPS-705 document
30.3.3.1.4	APPEND	Integrity properties of the URA are specified with respect to the upper bound values of the URA index (see 20.3.3.1).	Change made real time at ICWG due to a complaint from Mike Dash that the last part of the sentence did not make sense.
20.3.3.5.1.4	Code 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/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., Block IIIA SV).	Code SV Configuration 000 Reserved 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/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., Block IIIA SV).	Reserved the code 000

Section #	WAS	IS	Rationale
30.3.3	Each message starts with an 8-bit preamble – 10001011, followed by a 6-bit PRN number of the transmitting SV, a 6-bit message type ID with a range of 0 (000000) to 63 (111111), and the 17-bit message time of week (TOW) count. When the value of the message TOW count is multiplied by 6, it represents SV time in seconds at the start of the next 12-second message. An “alert” flag, when raised (bit 38 = “1”), indicates to the user that the SV URA and/or the SV User Differential Range Accuracy (UDRA) may be worse than indicated in the respective message types. For each default message (Message Type 0), bits 39 through 276 shall be alternating ones and zeros and the message shall contain a proper CRC parity block.	Each message starts with an 8-bit preamble – 10001011, followed by a 6-bit PRN number of the transmitting SV, a 6-bit message type ID with a range of 0 (000000) to 63 (111111), and the 17-bit message time of week (TOW) count. When the value of the message TOW count is multiplied by 6, it represents SV time in seconds at the start of the next 12-second message. An “alert” flag, when raised (bit 38 = “1”), indicates to the user that the SV URA and/or the SV User Differential Range Accuracy (UDRA) may be worse than indicated in the respective message types, and the SV should be used at the user’s own risk. For each default message (Message Type 0), bits 39 through 276 shall be alternating ones and zeros and the message shall contain a proper CRC parity block.	Included a disclaimer
30.3.3.1	Bit 272 of Message Type 10 is the Integrity Status Flag (ISF). A "0" in bit position 272 indicates that the conveying signal is provided with the legacy level of integrity assurance. That is, the probability that the instantaneous URE of the conveying signal exceeds 4.42 times the current broadcast URA value, for more than 5.2 seconds, without an accompanying alert, is less than 1E-5 per hour. A "1" in bit-position 272 indicates that the conveying signal is provided with an enhanced level of integrity assurance. That is, the probability that the instantaneous URE of the conveying signal exceeds 5.73 times the current broadcast URA value, for more than 5.2 seconds, without an accompanying alert, is less than 1E-8 per hour.	The CNAV message will contain information that allows users to operate when integrity is assured. This is accomplished using an integrity assured URA value in conjunction with an integrity status flag. The URA value is the RSS of URAoe and URAoc; URA is integrity assured only when the integrity status flag is ‘true’. When the integrity flag is ‘false’, these values are not integrity assured and should not be depended upon by users requiring integrity assurance. Bit 272 of Message Type 10 is the Integrity Status Flag (ISF). A "0" in bit position 272 indicates that the conveying signal is provided with the legacy level of integrity assurance. That is, the probability that the instantaneous URE of the conveying signal exceeds 4.42 times the upper bound value of the current broadcast URA index, for more than 5.2 seconds, without an accompanying alert, is less than 1E-5 per hour. A "1" in bit-position 272 indicates that the conveying signal is provided with an enhanced level of integrity assurance. That is, the probability that the instantaneous URE of the conveying signal exceeds 5.73 times the upper bound value of the current broadcast URA index, for more than 5.2 seconds, without an accompanying alert, is less than 1E-8 per hour. The probabilities associated with the nominal and lower bound values of the current broadcast URA index are not defined.	Clarified definition of ISF and URA as it pertains to integrity.

Section #	WAS	IS	Rationale
30.3.3.2.1	The clock parameters in any one of message types 30 through 37 describe the SV time scale during the period of validity. The clock parameters in a data set shall be valid during the interval of time in which they are transmitted and shall remain valid for an additional period of time after transmission of the next data set has started.	The clock parameters in any one of message types 30 through 37 describe the SV time scale during the period of validity. The parameters are applicable during the time in which they are transmitted. Beyond that time, they are still applicable, however, the most recent data set should be used since the accuracy degrades over time.	Clarification.
30.3.3.7.5	The UDRA and UDRA indices are signed, two's complement integers in the range of +15 to –16 and has the following relationship	The UDRAop-D and UDRA indices are signed, two's complement integers in the range of +15 to –16 and has the following relationship	
30.3.3.9	Text messages are provided either in message type 36, Figure 30-9, or type 15, Figure 30-14. The specific contents of text message will be at the discretion of the Operating Command. Message type 36 can accommodate the transmission of 18 eight-bit ASCII characters. Message type 15 can accommodate the transmission of 29 eight-bit ASCII characters. The requisite bits shall occupy bits 39 through 270 of message type 15 and bits 128 through 275 of message type 36. The eight-bit ASCII characters shall be limited to the set described in paragraph 20.3.3.5.1.8.	Text messages are provided either in message type 36, Figure 30-9, or type 15, Figure 30-14. The specific contents of text message will be at the discretion of the Operating Command. Message type 36 can accommodate the transmission of 18 eight-bit ASCII characters. Message type 15 can accommodate the transmission of 29 eight-bit ASCII characters. The requisite bits shall occupy bits 39 through 274 of message type 15 and bits 128 through 275 of message type 36. The eight-bit ASCII characters shall be limited to the set described in paragraph 20.3.3.5.1.8	correction
30.3.3.5.1	Message type 32, Figure 30-5, provides SV clock correction parameters (ref. Section 30.3.3.2) and earth orientation parameters. The EOP message provides users with parameters to construct the ECEF and ECI coordinate transformation (a simple transformation method is defined in Section 20.3.3.4.3.3.2). The number of bits, scale factors (LSBs), the range, and the units of all EOP fields of message type 32 are given in Table 30-VII.	Message type 32, Figure 30-5, provides SV clock correction parameters (ref. Section 30.3.3.2) and earth orientation parameters. The EOP message provides users with parameters to construct the ECEF and ECI coordinate transformation (a simple transformation method is defined in Section 20.3.3.4.3.3.2). The number of bits, scale factors (LSBs), the range, and the units of all EOP fields of message type 32 are given in Table 30-VII. The equations described in this section are based on (International Earth Rotation and Reference Systems Service) IERS Technical Note 21. However, these equations will be updated to a new Technical Note in the next revision.	Included a disclaimer

Section #	WAS	IS	Rationale
3.2.1	Three PRN ranging codes are transmitted: the precision (P) code which is the principal NAV ranging code; the Y-code, used in place of the P-code whenever the anti-spoofing (A-S) mode of operation is activated; and the coarse/acquisition (C/A) code which is used for acquisition of the P (or Y) code (denoted as P(Y)) and as a civil ranging signal. Code-division-multiple-access techniques allow differentiating between the SVs even though they may transmit at the same frequencies. The SVs will transmit intentionally "incorrect" versions of the C/A and the P(Y) codes where needed to protect the users from receiving and utilizing anomalous NAV signals as a result of a malfunction in the SV's reference frequency generation system. These two "incorrect" codes are termed non-standard C/A (NSC) and non-standard Y (NSY) codes. For Block IIR-M, IIF, and subsequent blocks of SVs, two additional PRN ranging codes are transmitted. They are the L2 civil-moderate (L2 CM) code and the L2 civil-long (L2 CL) code. The SVs will transmit intentionally "incorrect" versions of the L2 CM and L2 CL codes where needed to protect the users from receiving and utilizing anomalous NAV signals as a result of a malfunction in the SV's reference frequency generation system. These "incorrect" codes are termed non-standard L2 CM (NSCM) and non-standard L2 CL (NSCL) codes. The SVs shall also be capable of initiating and terminating the broadcast of NSCM and/or NSCL code(s) independently of each other, in response to CS command.	Three PRN ranging codes are transmitted: the precision (P) code which is the principal navigation ranging code; the Y-code, used in place of the P-code whenever the anti-spoofing (A-S) mode of operation is activated; and the coarse/acquisition (C/A) code which is used for acquisition of the P (or Y) code (denoted as P(Y)) and as a civil ranging signal. Code-division-multiple-access techniques allow differentiating between the SVs even though they may transmit at the same frequencies. The SVs will transmit intentionally "incorrect" versions of the C/A and the P(Y) codes where needed to protect the users from receiving and utilizing anomalous navigation signals. These two "incorrect" codes are termed non-standard C/A (NSC) and non-standard Y (NSY) codes. For Block IIR-M, IIF, and subsequent blocks of SVs, two additional PRN ranging codes are transmitted. They are the L2 civil-moderate (L2 CM) code and the L2 civil-long (L2 CL) code. The SVs will transmit intentionally "incorrect" versions of the L2 CM and L2 CL codes where needed to protect the users from receiving and utilizing anomalous navigation signals. These "incorrect" codes are termed non-standard L2 CM (NSCM) and non-standard L2 CL (NSCL) codes. The SVs shall also be capable of initiating and terminating the broadcast of NSCM and/or NSCL code(s) independently of each other, in response to CS command.	The cause of anomalous NAV signals is not limited to “a malfunction in the SV’s reference frequency generation system.” For example, there might be a malfunction of OCX state vector generation that results in erroneous NAV data while there is no fault or malfunction onboard SV’s reference frequency generation system.
3.2.1.6	The NSC, NSCM, NSCL, and NSY codes, used to protect the user from a malfunction in the SV's reference frequency system (reference paragraph 3.2.1), are not for utilization by the user and, therefore, are not defined in this document.	The NSC, NSCM, NSCL, and NSY codes, used to protect the user from tracking anomalous navigation signals, are not for utilization by the user and, therefore, are not defined in this document.	The Non-standard codes protect the user from receiving timely-detected anomalous NAV data. The cause of anomalous NAV signals is not limited to “a malfunction in the SV’s reference frequency system.

Section #	WAS	IS	Rationale
3.3.1.1	The signals shall be contained within two 20.46-MHz bands centered about L1 and L2. The carrier frequencies for the L1 and L2 signals shall be coherently derived from a common frequency source within the SV. The nominal frequency of this source -- as it appears to an observer on the ground -- is 10.23 MHz. The SV carrier frequency and clock rates -- as they would appear to an observer located in the SV -- are offset to compensate for relativistic effects. The clock rates are offset by f/f = -4.4647E-10, equivalent to a change in the P-code chipping rate of 10.23 MHz offset by a f = -4.5674E-3 Hz. This is equal to 10.22999999543 MHz. The nominal carrier frequencies (f0) shall be 1575.42 MHz, and 1227.6 MHz for L1 and L2, respectively.	For Block IIA, IIR, IIR-M, and IIF satellites, the requirements specified in this IS shall pertain to the signal contained within two 20.46 MHz bands; one centered about the L1 nominal frequency and the other centered about the L2 nominal frequency (see Table 3-Vb). For Block III and subsequent satellites, the requirements specified in this IS shall pertain to the signal contained within two 30.69 MHz bands; one centered about the L1 nominal frequency and the other centered about the L2 nominal frequency (see Table 3-Vc). The carrier frequencies for the L1 and L2 signals shall be coherently derived from a common frequency source within the SV. The nominal frequency of this source -- as it appears to an observer on the ground -- is 10.23 MHz. The SV carrier frequency and clock rates -- as they would appear to an observer located in the SV -- are offset to compensate for relativistic effects. The clock rates are offset by f/f = -4.4647E-10, equivalent to a change in the P-code chipping rate of 10.23 MHz offset by a f = -4.5674E-3 Hz. This is equal to 10.2299999954326 MHz. The nominal carrier frequencies (f0) shall be 1575.42 MHz, and 1227.6 MHz for L1 and L2, respectively.	Made changes to differentiate bandwidths of various generations of SVs.
3.3.1.2	Correlation loss is defined as the difference between the SV power received in a 20.46 MHz bandwidth and the signal power recovered in an ideal correlation receiver of the same bandwidth. On the L1 and L2 channels, the worst case correlation loss occurs when the carrier is modulated by the sum of the P(Y) code and the NAV data stream. For this case, the correlation loss apportionment shall be as follows: 1. SV modulation imperfections 0.6 dB 2. Ideal UE receiver waveform distortion 0.4 dB (due to 20.46 MHz filter)	The correlation loss is defined as the difference between the SV power received in the bandwidth defined in 3.3.1.1 (excluding signal combining loss) and the signal power recovered in an ideal correlation receiver of the same bandwidth using an exact replica of the waveform within an ideal sharp-cutoff filter bandwidth, whose bandwidth corresponds to that specified in 3.3.1.1 and whose phase is linear over that bandwidth. The total allowable correlation loss due to SV modulation and filtering imperfections, which is a function of signal, shall be: Code Correlation Loss (IIF and prior SVs) Correlation Loss (Block III SVs) C/A & L2C 0.6 dB 0.3 dB L1P(Y) & L2P(Y) 0.6 dB 0.6 dB	From CL/PCN WG. Made changes real-time at the ICWG. Stakeholders have all concurred to language. 18 Feb 2010: Added a column to distinguish IIF and prior blocks from GPS III correlation loss)

Section #	WAS	IS	Rationale
3.3.1.4	In-band spurious transmissions shall be at least 40 dB below the unmodulated L1 and L2 carriers over the allocated 20.46 MHz channel bandwidth.	In-band spurious transmissions, from the SV, shall be at or below -40 dBc over the respective bands specified in 3.3.1.1.In-band spurious transmissions, from the SV, shall be at least 40 dB below the unmodulated L1 carrier over the band specified in 3.3.1.1. In-band spurious transmissions are defined as transmissions within the bands specified in 3.3.1.1 which are not expressly components of the L1 and L2 waveformssignals. In-band spurious transmissions shall be at least 40 dB below the unmodulated L1 and L2 carriers over the allocated 20.46 MHz channel bandwidth.	From CL/PCN WG. Made changes real-time at the ICWG. Stakeholders have all concurred to language.
3.3.1.5.1	For Block IIR-M, IIF, and subsequent blocks of SVs, phase quadrature relationship between the two L2 carrier components can be the same as for the two L1 carrier components as described above. However, for the L2 case, the civil signal carrier component is modulated by any one of three (IIF) or four (IIR-M) different bit trains as described in paragraph 3.2.3. Moreover, the two L2 carrier components can be in same phase.	For Block IIR-M, IIF, and subsequent blocks of SVs, phase quadrature relationship between the two L2 carrier components shall be either in phase quadrature or in the same phase (within ±100 miliradians) – see paragraph 3.3.1.5.3 for additional information. can be the same as for the two L1 carrier components as described above. However, for the L2 case, the civil signal carrier component is modulated by any one of three (IIF) or four (IIR-M) different bit trains as described in paragraph 3.2.3. The resultant composite transmitted signal phases will vary as a function of the binary state of the modulating signals as well as the signal power ratio and phase quadrature relationship. Beyond these considerations, additional carrier components in Block IIR-M, IIF, and subsequent blocks of SVs will result in composite transmitted signal phase relationships other than the nominal special case of Table 3-IV. The current phase relationship of the two L2 carrier components (L2C and L2P(Y)) shall be indicated by means of bit 273 of the CNAV Type 10 Message (See section 30.3.3), where zero indicates phase quadrature, with the L2C lagging the L2P(Y) by 90 degrees, and one indicates that L2C and L2P(Y) are in-phase. If the CNAV message is not available, then the L2C and L2P(Y) shall be fixed in phase quadrature.	Added verbiage to describe performance of signal phasing. Changes were also made real-time at the ICWG. Stakeholders have all concurred. 12 Feb 2010: Added L2C phasing language to end of paragraph.

Section #	WAS	IS	Rationale
3.3.1.5.3	NEW	3.3.1.5.3 Phase Continuity. While the satellite is broadcasting standard C/A, P(Y), and L2C codes with data that indicates that C/A, P(Y), and L2C signal health (respectively) is OK, the CS/SS will not command an operation causing an intentional phase discontinuity. This does not apply to phase discontinuities caused by signal modulation. Prior to health data being available on L2C, satellites will be set unhealthy using the non-standard code.	From CL/PCN WG. Made changes real-time at the ICWG. Stakeholders have all concurred to language. 18 Feb 2010: Added sentence to paragraph for L2C phasing comment.
3.3.1.6	The SV shall provide L1 and L2 navigation signal strength at end-of-life (EOL), worst-case, in order to meet the minimum levels specified in Table 3-V. The minimum received power is measured at the output of a 3 dBi linearly polarized user receiving antenna (located near ground) at worst normal orientation, when the SV is above a 5-degree elevation angle. The received signal levels are observed within the inband allocation defined in para. 3.3.1.1. The Block IIF SV shall provide L1 and L2 signals with the following characteristic: the L1 off-axis power gain shall not decrease by more than 2 dB from the Edge-of-Earth (EOE) to nadir, nor more than 10 dB from EOE to 20 degrees off nadir, and no more than 18 dB from EOE to 23 degrees off nadir; the L2 off-axis power gain shall not decrease by more than 2 dB from EOE to nadir, and no more than 10 dB from EOE to 23 degrees off nadir; the power drop off between EOE and ±23 degrees shall be in a monotonically decreasing fashion.	The SV shall provide L1 and L2 navigation signal strength at end-of-life (EOL), worst-case, in order to meet the minimum levels specified in Table 3-V. Any combining operation done by the SV and associated loss is compensated by an increase in SV transmitted power and thus transparent to the user segment. The minimum received power is measured at the output of a 3 dBi linearly polarized user receiving antenna (located near ground) at worst normal orientation, when the SV is above a 5-degree elevation angle. The received signal levels are observed within the in-band allocation defined in para. 3.3.1.1. The Block IIF SV shall provide L1 and L2 signals with the following characteristic: the L1 off-axis relative power (referenced to peak transmitted power)off-axis power gain shall not decrease by more than 2 dB from the Edge-of-Earth (EOE) to nadir, nor more than 10 dB from EOE to 20 degrees off nadir, and no more than 18 dB from EOE to 23 degrees off nadir; the L2 off-axis power gain shall not decrease by more than 2 dB from EOE to nadir, and no more than 10 dB from EOE to 23 degrees off nadir; the power drop off between EOE and ±23 degrees shall be in a monotonically decreasing fashion. The Block III SV shall provide L1 and L2 signals with the following characteristic: the L1 off-axis relative power (referenced to peak transmitted power) shall not decrease by more than 2 dB from the Edge-of-Earth (EOE) to nadir; the L2 off-axis power gain shall not decrease by more than 2 dB from EOE to nadir; the power drop off between EOE and ±26 degrees shall be in a monotonically decreasing fashion. Additional related data is provided as supporting material in paragraph 6.3.1.	Added text to rule out combining losses and described power levels in terms of off axis relative power.

Section #	WAS	IS	Rationale
3.3.1.6.1	NEW	The SV shall provide L1 and L2 navigation signal strength at end-of-life (EOL), worst-case, in order to meet the minimum levels specified in Table 3-Vc. The minimum received power is measured at the output of a 0 dBi right-hand circularly polarized (i.e. 0 dB axial ratio) user receiving antenna at normal orientation, at the off-nadir angles defined in Table 3-Vc. The received signal levels are observed within the in-band allocation defined in paragraph. 3.3.1.1.	Added requirements for SVs the produce proper signal strengths for SSV users
30.3.3.8.1	tGNSS = tE – (A0GGTO + A1GGTO (tE – totGGTO + 604800 (WN – WNotGGTO)) + A2GGTO (tE – totGGTO + 604800 (WN – WNotGGTO))2)	tGNSS = tE – (A0GGTO + A1GGTO (tE – tGGTO + 604800 (WN – WNGGTO)) + A2GGTO (tE – totGGTO + 604800 (WN – WNotGGTO))2)	Consistency with Figure 30-8
30.3.3.3.1.1.1	Inter-Signal Group Delay Differential Correction. The correction terms, TGD, ISCL1C/A and ISCL2C, are initially provided by the CS to account for the effect of SV group delay differential between L1 P(Y) and L2 P(Y), L1 P(Y) and L1 C/A, and between L1 P(Y) and L2 C, respectively, based on measurements made by the SV contractor during SV manufacture.	Inter-Signal Correction. The correction terms, TGD, ISCL1C/A and ISCL2C, are initially provided by the CS to account for the effect of inter-signal biases between L1 P(Y) and L2 P(Y), L1 P(Y) and L1 C/A, and between L1 P(Y) and L2 C, respectively, based on measurements made by the SV contractor during SV manufacture.	Change from Karl Kovach to address comment by Soon Yi.
Table 30-IX		Unable to capture changes to figures/tables. Please see redlines for exact changes.	GPSW review comment. Changed table subscripts and bits to match the associated figure. Scale factor and effective range was also changed to be technically correct.
Figure 30-1		Unable to capture changes to figures/tables. Please see redlines for exact changes.	Updated figure to now show the L2C phase information bit (in response to GPC comment)
Note: Administrative changes (i.e. spelling corrections, grammar, minor clarifications) may not be represented in this Was/Is matrix.			