

## CHANGE NOTICE

**Affected Document:**

IS-GPS-705 Rev F

**IRN/SCN Number**

XXX-XXXX-XXX

**Date:**

DD-MMM-YYYY

**Authority:**

RFC-00403

**Proposed Change Notice**

PCN-IS-705F\_RFC403

**Date:**

18-OCT-2019

**CLASSIFIED BY:** N/A**DECLASSIFY ON:** N/A**Document Title:** NAVSTAR GPS Space Segment/User Segment L5 Interfaces**RFC Title:** Health Bit Clarification**Reason For Change (Driver):**

The CNAV & CNAV-2 health summary bits for L1, L2, and L5 are not clearly defined and can be interpreted in multiple ways.

Documents affected: IS-GPS-200, IS-GPS-705, IS-GPS-800, and ICD-GPS-870

(Pre-RFC 788)

**Description of Change:**

Clarify the definition of the health summary bits. In addition, establish precedence for health indicators that eliminates ambiguity. May require a fix to message types.

**Authored By: RE: Jennifer Lemus****Checked By: RE: Albert Sicam****AUTHORIZED SIGNATURES****REPRESENTING****DATE**

GPS Directorate  
Space & Missile Systems Center (SMC) – LAAFB

DISTRIBUTION STATEMENT A: Approved For Public Release; Distribution is Unlimited

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

**IS705-1596 :**

Insertion after object IS705-1399:

#### **6.4.4 PRNs 33 through 63**

**Section Number :**

6.4.5

**WAS :**

N/A

**Redlines :**

<INSERTED OBJECT>

**IS :**

User Protocol for Signal Availability and Health Information

**Rationale :**

Operational protocols section to address health bit ambiguity and provide users with interpretation for conflicting health information

---

**IS705-1597 :**

Insertion below object IS705-1596

**Section Number :**

6.4.5.0-1

**WAS :**

N/A

**Redlines :**

<INSERTED OBJECT>

**IS :**

See paragraph 6.4.6 of IS-GPS-200

**Rationale :**

Operational protocols section to address health bit ambiguity and provide users with interpretation for conflicting health information

---

**IS705-1599 :**

Insertion after object IS705-1597

**Section Number :**

6.4.5.1

**WAS :**

N/A

**Redlines :**

<INSERTED OBJECT>

**IS :**

Alarm Indications

**Rationale :**

Operational protocols section to address health bit ambiguity and provide users with interpretation for conflicting health information

---

**IS705-1600 :**

Insertion below object IS705-1599

**Section Number :**

6.4.5.1.1

**WAS :**

N/A

**Redlines :**

<INSERTED OBJECT>

**IS :**

Specific Alarm Indications

**Rationale :**

Operational protocols section to address health bit ambiguity and provide users with interpretation for conflicting health information

---

**IS705-1601 :**

Insertion below object IS705-1600

**Section Number :**

6.4.5.1.1.0-1

**WAS :**

N/A

**Redlines :**

<INSERTED OBJECT>

**IS :**

The following alarm indications are specific to the code signals listed below.

IS-Code Signal

- (a) The failure of the CRC on 5 successive CNAV messages (30 seconds) (see paragraph 20.3.5).
- (b) The broadcast  $t_{oe}$  is not current (i.e. not within the current curve-fit) or does not match the broadcast  $t_{oc}$  (excluding normal data set cutovers, see paragraphs 20.3.3.1.1 and 20.3.4.4).
- (c) The broadcast  $t_{op}$  is not consistent across the Message Types 10, 11 and Type 30's messages which comprise the current (i.e. not within the current curve-fit) CEI data set (excluding normal data set cutovers, see paragraph 20.3.4.4).
- (d) The transmitted bits (bits 39-276) in Message Types 10, 11 and Type 30's are all set to 0's or all set to 1's.
- (e) The 8-bit preamble does not equal  $10001011_2$ , decimal 139, or hexadecimal 8B (see paragraph 20.3.3).

*Notes:*

1. *A SIS alarm indication exists when the satellite is not trackable because it is not transmitting the standard PRN code modulation on the L-band carrier signal. These SIS alarm indications are specifically called out above because of their relatively high probability of occurrence.*
2. *The SIS alarm indications related to the CNAV message data are considered "weak" indications since receivers do not necessarily continuously read each satellite's CNAV message data either by design or by circumstance (e.g., radio-frequency interference [RFI] can prevent reading CNAV message data). These weak SIS alarm indications are assumed to have a five-minute lag time before receivers take notice of them for alerting purposes.*
3. *The SIS alarm indications related to the CNAV message data are indicative of a problem onboard the satellite. GPS receivers may perceive similar indications caused by local effects that are unrelated to the broadcast SIS.*
4. *In addition to SIS alarm indications, other conditions may also cause GPS signals to become temporarily untrackable, such as ionospheric signal fades, local signal masking, or local interference.*

**Rationale :**

Operational protocols section to address health bit ambiguity and provide users with interpretation for conflicting health information

---

**IS705-1602 :**

Insertion after object IS705-1599

**Section Number :**

6.4.5.2

**WAS :**

N/A

**Redlines :**

<INSERTED OBJECT>

**IS :**

“Marginal” Indications.

**Rationale :**

Operational protocols section to address health bit ambiguity and provide users with interpretation for conflicting health information

---

**IS705-1603 :**

Insertion below object IS705-1602

**Section Number :**

6.4.5.3.0-1

**WAS :**

N/A

**Redlines :**

<INSERTED OBJECT>

**IS:**

The health of the I5-code and Q5-code signals is marginal when the signals would otherwise have been defined as healthy except that one or more of the following three warning conditions is or are present:

1. Default CNAV data (i.e., Message Type 0) is being transmitted on the I5-code signal in lieu of Message Types 10, 11 and/or Type 30's (e.g., a current and consistent CEI data set is not available within the maximum broadcast interval defined in paragraph 20.3.4.1). See paragraph 20.3.3.
2. The URA alert flag is raised (i.e., bit 38 of each CNAV message is set to 1) and therefore the I5-code signal URA components do not apply to the I5-code and Q5-code signals. This means the I5-code and Q5-code signal URA may be worse than indicated by the URA index components transmitted in Message Type 10 and Type 30's. See paragraph 20.3.3.
3. Either or both the  $URA_{ED}$  index in Message Type 10 and the  $URA_{NED0}$  index in Message Type 30's transmitted in the I5-code signal are equal to 15 or -16 ("N"=15 or "N"=-16). See paragraphs 20.3.3.1.1.4 and 20.3.3.2.4.

**Rationale :**

Operational protocols section to address health bit ambiguity and provide users with interpretation for conflicting health information

---

**IS705-224 :**

**Section Number :**

20.3.3.1.1.2.0-1

**WAS :**

The three, one-bit, health indication in bits 52 through 54 of message type 10 refers to the L1, L2, and L5 signals of the transmitting SV. The health of each signal is indicated by,

0 = Signal OK,

1 = Signal bad or unavailable.

**Redlines :**

The three, one-bit, health indication in bits 52 through 54 of message type 10 refers to the L1, L2, and L5 ~~signals~~carrier of the transmitting SV. These health indication bits only apply to codes and data as defined in IS-GPS-200, IS-GPS-705, and IS-GPS-800. The health of each ~~signal~~carrier is indicated by,

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

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

**IS :**

The three, one-bit, health indication in bits 52 through 54 of message type 10 refers to the L1, L2, and L5 carrier of the transmitting SV. These health indication bits only apply to codes and data as defined in IS-GPS-200, IS-GPS-705, and IS-GPS-800. The health of each carrier is indicated by,

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

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

**Rationale :**

Clarify definition of health bits in this section to specify carriers; if a carrier is bad, all codes on the carriers are bad. Resolves health bit ambiguity.

---

**IS705-225 :**

**Section Number :**

20.3.3.1.1.2.0-2

**WAS :**

The predicted health data will be updated at the time of upload when a new CEI data set has been built by the CS. The transmitted health data may not correspond to the actual health of the transmitting SV.

**Redlines :**

The [health indication shall be given relative to the capabilities of each SV as designated by the configuration code in the LNAV message \(see paragraph 20.3.3.5.1.4 of IS-GPS-200\). Accordingly, the health bit for any SV which does not have a certain capability will be indicated as “healthy” if the lack of this capability is inherent in its design or if it has been configured into a mode which is normal from a user standpoint and does not require that capability; however, the Operating Command may choose to set the health bit “unhealthy” for an SV without a certain capability. Single-frequency L5 users or users who have not received or choose not to use configuration code should assume that every signal is available on every SV.](#) The predicted health data will be updated at the time of upload when a new CEI data set has been built by the CS. ~~Therefore, The~~the transmitted health data may not correspond to the actual health of the transmitting SV. [For more information about user protocol for interpreting health indications see paragraph 6.4.5.](#)

**IS :**

The health indication shall be given relative to the capabilities of each SV as designated by the configuration code in the LNAV message (see paragraph 20.3.3.5.1.4 of IS-GPS-200). Accordingly, the health bit for any SV which does not have a certain capability will be indicated as “healthy” if the lack of this capability is inherent in its design or if it has been configured into a mode which is normal from a user standpoint and does not require that capability; however, the Operating Command may choose to set the health bit “unhealthy” for an SV without a certain capability. Single-frequency L5 users or users who have not received or choose not to use configuration code should assume that every signal is available on every SV. The predicted health data will be updated at the time of upload when a new CEI data set has been built by the CS. Therefore, the transmitted health data may not correspond to the actual health of the transmitting SV. For more information about user protocol for interpreting health indications see paragraph 6.4.5.

**Rationale :**

Clarify that health bit will be set relative to the capability of each SV as assigned by the SV configuration code. Additionally as established with LNAV health data, the SV will be set as "healthy" if lack of a capability is inherent relative to the SV configuration code. Add reference to the new user protocol section for further clarification of health indications.



**Section Number :**

20.3.3.4.4.0-1

**WAS :**

The three, one-bit, health indication in bits 155, 156 and 157 of message type 37 and bits 29, 30 and 31 of each packet of reduced almanac refers to the L1, L2, and L5 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 midi almanac or 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.

**Redlines :**

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

The health of each health carrier indicator is indicated "by:

\_\_\_\_\_ 0" signifies = that all signals or all codes on and the data associated on frequency this carrier are okay OK,

\_\_\_\_\_ 1 = All codes and "1" data signifies on that this some carrier are bad or all unavailable.

The signals health on bit indication shall be given relative to the associated capabilities frequency of are each bad SV as designated by the configuration code in the LNAV message (see paragraph 20.3.3.5.1.4 of IS-GPS-200). Accordingly, the health bit for any SV which does not have a certain capability will be indicated as "healthy" if the lack of this capability is inherent in its design or if it has been configured into a mode which is normal from a user standpoint and does not require that capability; however, the Operating Command may choose to set the health bit "unhealthy" for an SV without a certain capability. Single-frequency L5 users or users who have not received or choose not to use configuration code should assume that every signal is available on every SV. The predicted health data will be updated at the time of upload when a new midi almanac or reduced almanac has been built by the CS. ~~The~~Therefore, the transmitted health data may not correspond to the actual health of the transmitting SV or other SVs in the constellation. For more information about user protocol for interpreting health indications see paragraph 6.4.5.

**IS :**

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

The health of each carrier is indicated by:

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

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

The health bit indication shall be given relative to the capabilities of each SV as designated by the configuration code in the LNAV message (see paragraph 20.3.3.5.1.4 of IS-GPS-200). Accordingly, the health bit for any SV which does not have a certain capability will be indicated as "healthy" if the lack of this capability is inherent in its design or if it has been configured into a mode which is normal from a user standpoint and does not require that capability; however, the Operating Command may choose to set the health bit "unhealthy" for an SV without a certain capability. Single-frequency L5 users or users who have not received or choose not to use configuration code should assume that every signal is available on every SV. The predicted health data will be updated at the time of upload when a new midi almanac or reduced almanac has been built by the CS. Therefore, the transmitted health data may not correspond to the actual health of the transmitting SV or other SVs in the constellation. For more information about user protocol for interpreting health indications see paragraph 6.4.5.

**Rationale :**

Clarify definition of health bits in this section to specify carriers; if a carrier is bad, all codes and data on the carriers are bad. Also clarify that health bit will be set relative to the capability of each SV as assigned by the SV configuration code. Additionally as established with LNAV health data, the SV will be set as "healthy" if lack of a capability is inherent relative to the SV configuration code. Add reference to the new user protocol section for further clarification of health indications. Resolves health bit ambiguity.

---