

GPS Civil Interface Observations

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ICD Compliance Issues

- Provide non-attribution forum to
 - Inform the users community of recent past issues
 - Ensure correct balance btwn transparency & OPSEC
 - Seek feedback regarding clarification of IS-GPS-200
- Prevent future GPS receiver problems





Scenario 1: Af0 value indicates satellite clock instability

- Issue - User thought zero value for Af0 Subframe 4-5 could be used to indicate satellite clock instability and excluded satellite from solution regardless of satellite's actual health setting.
- Affected Data - Bits 271–278 & 290–292 of satellite-specific pages.
- Resolution – Zero value does not indicate instability in satellite clock and should not be used to determine satellite integrity.
 - There are a variety of constellation maintenance activities that could result in a zero value for a satellite that is still set HEALTHY and meeting all specification requirements.
 - IS-GPS-200E, “..occasional CS actions to manage clock offsets may also inhibit the ability to provide specified almanac time parameter accuracies.”





Scenario 2: Using almanac data from unhealthy satellites

- Issue - User attempted to use subframe 4-5 “almanac” data from satellites set to UNHEALTHY.
- Affected Data – All broadcast navigation data.
- Resolution –
 - Sections 20.3.3.3.1.4 and 20.3.3.5.1.3 of IS-GPS-200E define the health indicators broadcast by the constellation.
 - These indicators are used to warn users when *"some or all NAV data are bad"* for a specific satellite due to an on-orbit anomaly or maintenance activity.
 - Use of **any** portion of the navigation and timing signal from a satellite set to any status other than "HEALTHY" is at the user's own risk.





Scenario 3: Restricting possible WNa/toa combinations

- Issue – User reasoned that there would not be more than two WNa/toa combinations seen at any one time (previous day and current day).
- Affected Data – Bits 69-84 of Subframe 5 Page 25 and Bits 91-98 in satellite specific pages of Subframes 4 and 5.
- Resolution –
 - There are no restrictions in IS-GPS-200E that limit the CS to only two combinations. Section 20.3.3.5.2.2 states: “Within each upload, the CS shall ensure that all toa values in subframes 4 and 5 shall be the same for a given almanac data set and shall differ for successive data sets which contain changes in almanac parameters or SV health.”
 - Opportunity to clarify the standard?





User Comments

- **Comments received at the 2009 CGSIC meeting**
 - **There was a “General NANU” sent that predicted a high HDOP, no event was experienced, and no further explanation or follow-up was received.**
 - **Some satellites were taken “out of service until further notice” by a UNUSUFN NANU and another with a GENERAL NANU.**
 - **There has been a higher than normal amount of NANU errors recently.**





User Comments

- **Comments received at the 2009 CGSIC meeting**
 - **NANU's should be automated and automatically generated to keep humans out of the process.**
 - **Users would like to see NANU's delivered in "plain language text".**
 - **RAIM predictions are typically calculated for 72 hours into the future, our systems therefore rely on the availability of the latest constellation updates as they can impact the current prediction scenario period.**
 - **Manual intervention was required to generate a system-parsable outage type**





User Comments

- **User conclusions:**
 - *Standardization of event reporting required*
 - *Use computer readable fixed formats*
 - *Leave 'general' free text for information*
 - *Lets help one another to interpret NANUs for the user*





Response Actions

- **Improvements initiated by 2SOPS**
 - Increased quality control & standardization (new NANU types)
 - Improvements to operational transparency with increased NANU transmissions and improved text dialog
 - ICD-GPS-240 Updated
- **ICD-GPS-870, OCX User Interface**
 - Interface Control Working Group meetings
 - Address current issues
 - Update as required
 - Approved for public coordination
- **Solicit User Input**
 - ICD-GPS-870 Public Interface Control Working Group
 - NAVCEN Website
- **Information Dissemination Coordination Team**
 - Being Chartered under the National Space-Based PNT Executive Committee





IS-GPS-200 Clarification & Feedback

NAVIGATION CENTER
The Navigation Center of Excellence

U.S. Department of Homeland Security
UNITED STATES COAST GUARD

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CONTACT INFORMATION

Business hours at the Navigation Center are 8:00AM to 4:30PM EST, although we do maintain a 24-7 operational watch. The table below contains email and telephone information as well as other means of obtaining navigation information. You may also contact us via regular mail using the address below. Directions to the Navigation Center or Navigation Center Detachment are also available on this site.

Free Services and Reports:

- General Inquiries and Comments
- Receive Free LNM Updates
- Receive Free GPS Status Messages
- Receive NANU Updates
- Join CGSIC (free)
- Report an ATON Discrepancy or Outage
- Report a GPS Problem
- Report a DGPS Problem
- Report an AIS Problem
- Report an LRIT Problem

CONTACT THE NAVIGATION CENTER

You may contact the Navigation Center's **Navigation Information Service** by completing and submitting the form below.

The toll free phone number to submit an LRIT incident or inquiry is 1-866-944-LRIT (5748); alternatively, you may submit a report online.

* Denotes required field

Subject: *

Name: *

Phone Number: * (10 digit format, i.e. 7033135900)

Fax Number:

Email Address: *

Please enter any questions, comments, or concerns:

Subject:

- GPS
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- LORAN
- Navigation
- General Aids to Navigation
- LRIT
- Navigation Rules of the Road
- LNMs, Charts, Chart Corrections, or Light Lists
- Maritime Telecommunications
- Automatic Identification System
- Vessel Traffic Services
- Civil GPS Service Interface Committee (CGSIC)
- Other
- Web Site Issues

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NANU Template/Examples

FCSTDV TEMPLATE

NOTICE ADVISORY TO NAVSTAR USERS (NANU) YYYYSSS

SUBJ: SVNXX (PRNXX) FORECAST OUTAGE JDAY JJJ/HHMM - JDAY JJJ/HHMM

1. NANU TYPE: FCSTDV

NANU NUMBER: YYYYSSS

NANU DTG: DDHHMMZ MMM YYYY

REFERENCE NANU: N/A

REF NANU DTG: N/A

SVN: XX

PRN: XX

START JDAY: JJJ

START TIME ZULU: HHMM

START CALENDAR DATE: DD MMM YYYY

STOP JDAY: JJJ

STOP TIME ZULU: HHMM

STOP CALENDAR DATE: DD MMM YYYY

2. CONDITION: GPS SATELLITE SVNXX (PRNXX) WILL BE UNUSABLE ON JDAY JJJ
(DD MMM YYYY) BEGINNING HHMM ZULU UNTIL JDAY JJJ (DD MMM YYYY)
ENDING HHMM ZULU.

3. POC: CIVILIAN - NAVCEN AT 703-313-5900, [HTTP://WWW.NAVCEN.USCG.GOV](http://www.navcen.uscg.gov)
MILITARY - GPS Support Center at [HTTP://WWW.SCHRIEVER.AF.MIL/GPSSUPPORTCENTER](http://www.schriever.af.mil/gpssupportcenter), DSN 560-2541,
COMM 719-567-2493, GPS@SCHRIEVER.AF.MIL, [HTTP://WWW.SCHRIEVER.AF.MIL/GPS](http://www.schriever.af.mil/gps)
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NANU Template/Examples

FCSTMX TEMPLATE

NOTICE ADVISORY TO NAVSTAR USERS (NANU) YYYYSSS

SUBJ: SVNXX (PRNXX) FORECAST OUTAGE JDAY JJJ/HHMM - JDAY JJJ/HHMM

1. NANU TYPE: FCSTMX

NANU NUMBER: YYYYSSS

NANU DTG: DDHHMMZ MMM YYYY

REFERENCE NANU: N/A

REF NANU DTG: N/A

SVN: XX

PRN: XX

START JDAY: JJJ

START TIME ZULU: HHMM

START CALENDAR DATE: DD MMM YYYY

STOP JDAY: JJJ

STOP TIME ZULU: HHMM

STOP CALENDAR DATE: DD MMM YYYY

2. CONDITION: GPS SATELLITE SVNXX (PRNXX) WILL BE UNUSABLE ON JDAY JJJ
(DD MMM YYYY) BEGINNING HHMM ZULU UNTIL JDAY JJJ (DD MMM YYYY)
ENDING HHMM ZULU.

3. POC: CIVILIAN - NAVCEN AT 703-313-5900, [HTTP://WWW.NAVCEN.USCG.GOV](http://www.navcen.uscg.gov)
MILITARY - GPS Support Center at [HTTP://WWW.SCHRIEVER.AF.MIL/GPSSUPPORTCENTER](http://www.schriever.af.mil/gpssupportcenter), DSN
[560-2541](tel:560-2541),
COMM 719-567-2493, GPS@SCHRIEVER.AF.MIL, [HTTP://WWW.SCHRIEVER.AF.MIL/GPS](http://www.schriever.af.mil/gps)
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NANU Template/Examples

FCSTEXTD TEMPLATE

NOTICE ADVISORY TO NAVSTAR USERS (NANU) YYYYSSS

SUBJ: SVNXX (PRNXX) FORECAST OUTAGE EXTENDED UNTIL FURTHER NOTICE

1. NANU TYPE: FCSTEXTD

NANU NUMBER: YYYYSSS

NANU DTG: DDHHMMZ MMM YYYY

REFERENCE NANU: YYYYNNN

REF NANU DTG: DDHHMMZ MMM YYYY

SVN: XX

PRN: XX

START JDAY: JJJ

START TIME ZULU: HHMM

START CALENDAR DATE: DD MMM YYYY

STOP JDAY: UFN

STOP TIME ZULU: N/A

STOP CALENDAR DATE: N/A

2. CONDITION: THE FORECAST OUTAGE FOR GPS SATELLITE SVNXX (PRNXX) IS EXTENDED UNTIL FURTHER NOTICE.

3. POC: CIVILIAN - NAVCEN AT 703-313-5900, [HTTP://WWW.NAVCEN.USCG.GOV](http://www.navcen.uscg.gov)

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NANU Template/Examples

FCSTSUMM TEMPLATE

NOTICE ADVISORY TO NAVSTAR USERS (NANU) YYYYSSS

SUBJ: SVNXX (PRNXX) FORECAST OUTAGE SUMMARY JDAY JJJ/HHMM - JDAY JJJ/HHMM

1. NANU TYPE: FCSTSUMM

NANU NUMBER: YYYYSSS

NANU DTG: DDHHMMZ MMM YYYY

REFERENCE NANU: YYYYNNN

REF NANU DTG: DDHHMMZ MMM YYYY

SVN: XX

PRN: XX

START JDAY: JJJ

START TIME ZULU: HHMM

START CALENDAR DATE: DD MMM YYYY

STOP JDAY: JJJ

STOP TIME ZULU: HHMM

STOP CALENDAR DATE: DD MMM YYYY

2. CONDITION: GPS SATELLITE SVNXX (PRNXX) WAS UNUSABLE ON JDAY JJJ
(DD MMM YYYY) BEGINNING HHMM ZULU UNTIL JDAY JJJ (DD MMM YYYY)
ENDING HHMM ZULU.

3. POC: CIVILIAN - NAVCEN AT 703-313-5900, [HTTP://WWW.NAVCEN.USCG.GOV](http://www.navcen.uscg.gov)
MILITARY - GPS Support Center at [HTTP://WWW.SCHRIEVER.AF.MIL/GPSSUPPORTCENTER](http://www.schriever.af.mil/gpssupportcenter), DSN 560-2541,
COMM 719-567-2493, GPS@SCHRIEVER.AF.MIL, [HTTP://WWW.SCHRIEVER.AF.MIL/GPS](http://www.schriever.af.mil/gps)
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NANU Template/Examples

FCSTCANC TEMPLATE

NOTICE ADVISORY TO NAVSTAR USERS (NANU) YYYYSSS

SUBJ: SVN13 (PRN02) FORECAST OUTAGE CANCELLED

1. NANU TYPE: FCSTCANC

NANU NUMBER: YYYYSSS

NANU DTG: DDHHMMZ MMM YYYY

REFERENCE NANU: YYYYNNN

REF NANU DTG: DDHHMMZ MMM YYYY

SVN: XX

PRN: XX

START JDAY: JJJ

START TIME ZULU: HHMM

START CALENDAR DATE: DD MMM YYYY

STOP JDAY: CANCELLED

STOP TIME ZULU: N/A

STOP CALENDAR DATE: N/A

2. CONDITION: THE FORECAST OUTAGE FOR GPS SATELLITE SVNXX (PRNXX) SCHEDULED FOR JDAY JJJ (DD MMM YYYY) BEGINNING HHMM ZULU HAS BEEN CANCELLED.

3. POC: CIVILIAN - NAVCEN AT 703-313-5900, [HTTP://WWW.NAVCEN.USCG.GOV](http://www.navcen.uscg.gov)

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COMM 719-567-2493, GPS@SCHRIEVER.AF.MIL, [HTTP://WWW.SCHRIEVER.AF.MIL/GPS](http://www.schriever.af.mil/gps)

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NANU Template/Examples

FCSTRESCD TEMPLATE

NOTICE ADVISORY TO NAVSTAR USERS (NANU) YYYYSSS
SUBJ: SVNXX (PRNXX) FORECAST OUTAGE RESCHEDULED

1. NANU TYPE: FCSTRESCD

NANU NUMBER: YYYYSSS
NANU DTG: DDHHMMZ MMM YYYY
REFERENCE NANU: YYYYNNN
REF NANU DTG: DDHHMMZ MMM YYYY
SVN: XX
PRN: XX
START JDAY: JJJ
START TIME ZULU: HHMM
START CALENDAR DATE: DD MMM YYYY
STOP JDAY: JJJ
STOP TIME ZULU: HHMM
STOP CALENDAR DATE: DD MMM YYYY

2. CONDITION: GPS SATELLITE SVNXX (PRNXX) WILL BE UNUSABLE ON JDAY JJJ
(DD MMM YYYY) BEGINNING HHMM ZULU UNTIL JDAY JJJ (DD MMM YYYY)
ENDING HHMM ZULU. PLEASE REFERENCE NANU NUMBER YYYYNNN
DTG DDHHMMZ MMM YYYY FOR THE ORIGINAL OUTAGE TIME.

3. POC: CIVILIAN - NAVCEN AT 703-313-5900, [HTTP://WWW.NAVCEN.USCG.GOV](http://www.navcen.uscg.gov)
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NANU Template/Examples

UNUSUFN TEMPLATE

NOTICE ADVISORY TO NAVSTAR USERS (NANU) YYYYSSS

SUBJ: SVNXX (PRNXX) UNUSABLE JDAY JJJ/HHMM - UNTIL FURTHER NOTICE

1. NANU TYPE: UNUSUFN

NANU NUMBER: YYYYSSS

NANU DTG: DDHHMMZ MMM YYYY

REFERENCE NANU: N/A

REF NANU DTG: N/A

SVN: XX

PRN: XX

START JDAY: JJJ

START TIME ZULU: HHMM

START CALENDAR DATE: DD MMM YYYY

STOP JDAY: UFN

STOP TIME ZULU: N/A

STOP CALENDAR DATE: N/A

2. CONDITION: GPS SATELLITE SVNXX (PRNXX) WILL BE UNUSABLE ON JDAY JJJ
(DD MMM YYYY) BEGINNING HHMM ZULU UNTIL FURTHER NOTICE.

3. POC: CIVILIAN - NAVCEN AT 703-313-5900, [HTTP://WWW.NAVCEN.USCG.GOV](http://www.navcen.uscg.gov)

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NANU Template/Examples

UNUSABLE TEMPLATE

NOTICE ADVISORY TO NAVSTAR USERS (NANU) YYYYSSS

SUBJ: SVNXX (PRNXX) UNUSABLE JDAY JJJ/HHMM - JDAY JJJ/HHMM

1. NANU TYPE: UNUSABLE

NANU NUMBER: YYYYSSS

NANU DTG: DDHHMMZ MMM YYYY

REFERENCE NANU: YYYYNNN

REF NANU DTG: DDHHMMZ MMM YYYY

SVN: XX

PRN: XX

START JDAY: JJJ

START TIME ZULU: HHMM

START CALENDAR DATE: DD MMM YYYY

STOP JDAY: JJJ

STOP TIME ZULU: HHMM

STOP CALENDAR DATE: DD MMM YYYY

2. CONDITION: GPS SATELLITE SVNXX (PRNXX) WAS UNUSABLE ON JDAY JJJ
(DD MMM YYYY) BEGINNING HHMM ZULU UNTIL JDAY JJJ (DD MMM YYYY)
ENDING HHMM ZULU.

3. POC: CIVILIAN - NAVCEN AT 703-313-5900, [HTTP://WWW.NAVCEN.USCG.GOV](http://www.navcen.uscg.gov)
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NANU Template/Examples

UNUNOREF TEMPLATE

NOTICE ADVISORY TO NAVSTAR USERS (NANU) YYYYSSS

SUBJ: SVNXX (PRNXX) UNUSABLE JDAY JJJ/HHMM - JDAY JJJ/HHMM

1. NANU TYPE: UNUNOREF

NANU NUMBER: YYYYSSS

NANU DTG: DDHHMMZ MMM YYYY

REFERENCE NANU: N/A

REF NANU DTG: N/A

SVN: XX

PRN: XX

START JDAY: JJJ

START TIME ZULU: HHMM

START CALENDAR DATE: DD MMM YYYY

STOP JDAY: JJJ

STOP TIME ZULU: HHMM

STOP CALENDAR DATE: DD MMM YYYY

2. CONDITION: GPS SATELLITE SVNXX (PRNXX) WAS UNUSABLE ON JDAY JJJ
(DD MMM YYYY) BEGINNING HHMM ZULU UNTIL JDAY JJJ (DD MMM YYYY)
ENDING HHMM ZULU.

3. POC: CIVILIAN - NAVCEN AT 703-313-5900, [HTTP://WWW.NAVCEN.USCG.GOV](http://www.navcen.uscg.gov)
MILITARY - GPS Support Center at [HTTP://WWW.SCHRIEVER.AF.MIL/GPSSUPPORTCENTER](http://www.schriever.af.mil/gpssupportcenter), DSN 560-2541,
COMM 719-567-2493, GPS@SCHRIEVER.AF.MIL, [HTTP://WWW.SCHRIEVER.AF.MIL/GPS](http://www.schriever.af.mil/gps)
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NANU Template/Examples

USABINIT TEMPLATE

NOTICE ADVISORY TO NAVSTAR USERS (NANU) YYYYSSS

SUBJ: SVNXX (PRNXX) USABLE JDAY JJJ/HHMM

1. NANU TYPE: USABINIT

NANU NUMBER: YYYYSSS

NANU DTG: DDHHMMZ MMM YYYY

REFERENCE NANU: N/A

REF NANU DTG: N/A

SVN: XX

PRN: XX

START JDAY: JJJ

START TIME ZULU: HHMM

START CALENDAR DATE: DD MMM YYYY

STOP JDAY: N/A

STOP TIME ZULU: N/A

STOP CALENDAR DATE: N/A

2. CONDITION: GPS SATELLITE SVNXX (PRNXX) WAS USABLE AS OF JDAY JJJ
(DD MMM YYYY) BEGINNING HHMM ZULU.

3. POC: CIVILIAN - NAVCEN AT 703-313-5900, [HTTP://WWW.NAVCEN.USCG.GOV](http://www.navcen.uscg.gov)
MILITARY - GPS Support Center at [HTTP://WWW.SCHRIEVER.AF.MIL/GPSSUPPORTCENTER](http://www.schriever.af.mil/gpssupportcenter), DSN 560-2541,
COMM 719-567-2493, GPS@SCHRIEVER.AF.MIL, [HTTP://WWW.SCHRIEVER.AF.MIL/GPS](http://www.schriever.af.mil/gps)
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NANU Template/Examples

LEAPSEC TEMPLATE

NOTICE ADVISORY TO NAVSTAR USERS (NANU) YYYYSSS

SUBJ: LEAP SECOND

1. CONDITION: THE INTERNATIONAL EARTH ROTATION SERVICE (IERS) HAS ANNOUNCED THE INTRODUCTION OF A LEAP SECOND TO OCCUR AT THE END OF MMM YYYY

2. COORDINATED UNIVERSAL TIME (UTC) WILL SEQUENCE AS FOLLOWS:

DD MMM YYYY HH HOURS MM MINUTES SS SECONDS

DD MMM YYYY HH HOURS MM MINUTES SS SECONDS

DD MMM YYYY HH HOURS MM MINUTES SS SECONDS

3. FOR GPS, AS WITH PREVIOUS LEAP SECOND UPDATES, THE UTC DATA IN SUBFRAME 4, PAGE 18 OF THE NAVIGATION MESSAGE WILL CHANGE IN ACCORDANCE WITH ICD-GPS-200.

BEFORE THE LEAP SECOND

GPS-UTC IS XX (GPS IS AHEAD OF UTC BY XX SECONDS)

AFTER THE LEAP SECOND

GPS-UTC WILL BE XX (GPS WILL BE AHEAD OF UTC BY XX SECONDS)

4. POC: CIVILIAN - NAVCEN AT 703-313-5900, [HTTP://WWW.NAVCEN.USCG.GOV](http://www.navcen.uscg.gov)

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COMM 719-567-2493, GPS@SCHRIEVER.AF.MIL, [HTTP://WWW.SCHRIEVER.AF.MIL/GPS](http://www.schriever.af.mil/gps)

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NANU Template/Examples

LAUNCH TEMPLATE

1. NANU TYPE: LAUNCH

*** GENERAL MESSAGE TO ALL GPS USERS ***

2. GPS SATELLITE SVNXX (PRNXX) WAS LAUNCHED ON JDAY JJJ (DD MMM YYYY). A USABINIT NANU WILL BE SENT WHEN THE SATELLITE IS SET ACTIVE TO SERVICE.

3. POC: CIVILIAN - NAVCEN AT 703-313-5900, [HTTP://WWW.NAVCEN.USCG.GOV](http://www.navcen.uscg.gov)
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COMM 719-567-2493, GPS@SCHRIEVER.AF.MIL, [HTTP://WWW.SCHRIEVER.AF.MIL/GPS](http://www.schriever.af.mil/gps)
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*** GENERAL MESSAGE TO ALL GPS USERS ***