

GLOBAL POSITIONING SYSTEM (GPS)
PSEUDORANDOM NOISE (PRN) CODE ASSIGNMENT PROCESS
Version 3.2



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Executive Summary

The Global Positioning System (GPS) is a U.S. space-based radionavigation system that provides reliable positioning, navigation, and timing services to civilian users on a continuous worldwide basis—freely available to all. The United States Space Force (USSF) is the executive agent of GPS and is directly responsible for acquiring, operating, and sustaining survivable, effective, and affordable global positioning services for its worldwide customers. The Space and Missile Systems Center (SMC), United States Space Force, is responsible for developing, procuring, and sustaining GPS satellites, ground systems, and military user equipment.

With the advent of Satellite Based Augmentation Systems (SBAS) and other Radionavigation Satellite Service (RNSS) systems, managing the issuance and use of GPS pseudorandom noise (PRN) codes to minimize intra- and inter-system interference has become critical. PRN code management is the responsibility of the GPS PRN Coordination Office (PRNCO), an entity within the Space and Missile Systems Center (SMC) located in Los Angeles, CA.

This document describes the process for requesting and assigning the GPS PRN codes defined in GPS interface specifications IS-GPS-200, IS-GPS-705, and IS-GPS-800. The objectives of this PRN code assignment process are (1) to establish PRNCO as the single focal point for L1, L2, and L5 GPS PRN code assignments; (2) to prevent multiple assignments of the same PRN code sets; (3) to assign PRN codes that assure compatibility and interoperability; and (4) to assign PRN codes in a transparent and equitable manner.

Table of Contents

Executive Summary 2

1. Pseudorandom Noise (PRN) Code Assignment Background 3

2. Process Overview 4

3. Request for a PRN Code Assignment 5

4. Review of a PRN Code Assignment Application 5

5. Retention of a PRN Code Assignment 9

6. Modification of a PRN Code Assignment 10

7. GPS PRN Coordination Office Contact Information 10

Appendix A: Application for PRN Code Assignment 11

1. Pseudorandom Noise (PRN) Code Assignment Background

- 1.1. **Intro.** Many national and international radionavigation systems seek a high level of interoperability with GPS, including the use of PRN codes from the spreading code families developed for GPS. Signals that employ PRN codes from the GPS spreading code families achieve an established level of code performance, including compatibility and interoperability with GPS. Additionally, the use of PRN codes from the GPS spreading code families fosters the development of receivers capable of seamlessly using signals from multiple radionavigation systems. The resulting compatibility and interoperability are beneficial to all systems using GPS PRN codes.
- 1.2. **Definition of Terms.** In this document, the term *subject system* will refer to the system transmitting GPS PRN codes. Common examples of a subject system would be a regional satellite navigation system or a satellite payload leased by an SBAS service provider. The term *applicant* will refer to the requesting agency or sponsoring government administration that is either operating the subject system or acting as the SBAS service provider.
- 1.3. **Scope.** The procedures established in this document apply to systems other than GPS planning to transmit GPS-like signals using one or more of the following PRN codes: L1 Coarse/Acquisition (C/A)-code, L2 Civil-Moderate (L2 CM)-code, L2 Civil-Long (L2 CL)-code, L5 In-Phase (L5 I5)-code, L5 Quadrature-Phase (L5 Q5)-code, L1 Civil-Pilot (L1C_P), and L1 Civil-Data (L1C_D) as defined in IS-GPS-200, IS-GPS-705, and IS-GPS-800. While this process is most commonly used by SBAS service providers, this application process should also be followed by other applicants.
- 1.4. **PRN Definitions.** The GPS Pseudorandom Noise spreading codes are defined in IS-GPS-200, IS-GPS-705, and IS-GPS-800 for L1 and L2C, L5, and L1C, respectively. Baseline sets of PRN codes are reserved exclusively for use by GPS satellites. Additional sets of PRN codes are defined for use by cooperating radionavigation systems. A PRN code set consists of a matching quadruplet of distinct PRN codes for each of the GPS L1, L2, and L5 civil signals. See Table 1 for a summary of the various PRN allocations.

Table 1. PRN Codes and Associated PRN Code Applications

PRN Code	PRN Code Application
L1 C/A	
1 – 63	Reserved (GPS)
64 – 119	Other Augmentation Systems
120 – 158*	Satellite-Based Augmentation Systems (SBASs)
159 – 210	Other RNSS Elements & Applications
L1C	
1 – 63	Reserved (GPS)
64 – 119	Other Augmentation Systems
120 – 158*	Reserved (SBASs)
159 – 210	Other RNSS Elements & Applications
L2C	
1 – 63	Reserved (GPS)
64 – 119	Other Augmentation Systems
120 – 158*	Reserved (SBASs)
159 – 210	Other RNSS Elements & Applications
L5	
1 – 63	Reserved (GPS)
64 – 119	Other Augmentation Systems
120 – 158*	SBASs
159 – 210	Other RNSS Elements & Applications
* See Section 4.4.4 for SBAS-specific guidance	

2. Process Overview

- 2.1. **Overview.** A formal request for a PRN code is initiated when an applicant submits the “Application for PRN Code Set Assignment” to PRNCO (smc.gp.prn@us.af.mil). If the review criteria in Sections 4.4 and 4.5 are satisfied and PRN codes are available, PRNCO will issue a PRN code set assignment to the applicant. All four civil signals, i.e. L1 C/A, L1C, L2C, L5, with the matching PRN code numbers will be assigned at the same time; unused signals will be held by PRNCO as “reserved” portions of the assignment. The assignment duration will be based on the needs of the subject system and the criteria described in Section 4.6. The applicant may renew the assigned PRN code set by resubmitting an application with any relevant changes before the assignment expiration date.
- 2.2. **Website.** All pertinent documentation, to include the PRN code application and the current lists of assignments, is located at <https://www.gps.gov/technical/prn-codes/>.

3. Request for a PRN Code Assignment

- 3.1. **Application Submittal.** To request the initial assignment *or* renewal of one or more PRN code sets, an applicant must fill out the “Application for PRN Code Assignment.” This form is found at <https://www.gps.gov/technical/prn-codes/> and an example is included in Appendix A of this document. Once the application is complete, it should be emailed to PRNCO per the instructions described on the application. Thorough completion of the application and compliance with the instructions will aid PRNCO review.
- 3.2. **Application Content.** The purpose of the application is for PRNCO to obtain sufficient technical and programmatic information in order to determine the appropriate PRN code set and assignment duration. This decision is influenced by the applicant’s request and PRNCO’s evaluation of the application according to the criteria described in Section 4.
- 3.3. **Timeline for Submittal.** Informal coordination (e.g. email or in-person communication) on the status of the applicant’s program, intentions for PRN code assignment renewal, or intentions to apply for a new PRN code set can be conducted at any time. However, formal application submittal should be accomplished no earlier than 1 year and no later than 4 months prior to the desired PRN assignment notification date (Note: PRN assignment notification date is the date of issuance, not the date of system broadcast).

4. Review of a PRN Code Assignment Application

- 4.1. **Receipt and Clarifying Questions.** PRNCO will normally reply within 3 weeks of application submittal to confirm receipt of the Application for PRN Code Assignment. If no confirmation is received within that time, PRNCO recommends forwarding the application to the alternate focal points (See Section 7). Once received, PRNCO will contact the applicant if any additional information is necessary.
- 4.2. **Timeline for Review.** PRNCO will review applications as quickly as possible, in the order they are received. If the application is complete, clear, and accurate, an adjudication can be expected within 2 months after confirmation of receipt. Applicants should specify the PRN code notification need date on the application.
- 4.3. **Types of PRN Code Assignments.** There are two types of PRN code assignments: Temporary and Final. The maximum duration of a Final PRN code assignment is 10 years, while the maximum duration of a Temporary assignment is 3 years. There is no limit on the number of times a Temporary or Final assignment can be renewed.
- 4.4. **Requirements for PRN Code Assignments.** This section contains the requirements for obtaining a PRN code assignment. Section 4.4.5 contains a summary table of requirements for Temporary and Final assignments.
 - 4.4.1. **Completed application.** All relevant sections of the PRN code application must be complete in order to obtain a PRN code assignment. For applicants requesting multiple PRNs,

technical justification must be provided for the quantity of PRNs requested. Furthermore, for subject systems broadcasting L5 PRN codes, applicants must provide evidence of participation in the ITU Resolution 609 (Rev. WRC-07) Consultation meetings and the associated preparatory process.

- 4.4.2. **Demonstrated Compliance with Governing Spectrum Authorities.** The applicant (i.e. the organization or government administration either operating the subject system or acting as the SBAS service provider), is responsible for ensuring the subject system complies with governing spectrum regulatory agencies, to include submitting radio frequency filings. In the case of SBASs transmitting from leased payloads, the SBAS service provider may not necessarily be the organization that submits the radio frequency filings, but the burden is on the service provider to ensure the appropriate filings are complete, accurate, and approved before the SBAS broadcasts a PRN code. PRNCO will use the ITU filing reference info in the Application for PRN Code Assignment to verify compliance. If the ITU is not the governing spectrum authority for the subject system, the applicant must attach evidence of compliance to the applicable spectrum authority (i.e. radiofrequency filing or certification). For Final PRN code assignments, the subject system must have a notification published by ITU, signifying the system completed coordination and is currently in use.
- 4.4.3. **Program Schedule and Updates.** Applicants must submit a program status and schedule that includes the high-level development, implementation, and operation timeline, including when the PRN codes will be required. It should also include any planned updates or changes that would affect PRN code usage (e.g. system decommission, fielding a new system, etc.).
- 4.4.4. **SBAS-Unique Requirements (PRNs 120-158).** PRN codes 120-158 are designated for use by SBASs compliant with ICAO Standards and Recommended Practices (SARPs). Applicants requesting PRNs 120-158 must meet the following requirements:
- 4.4.4.1. **SBAS Service Provider ID.** The subject system must be recognized by the ICAO Navigation Systems Panel (NSP) as an Operational or Planned SBAS. The ICAO SBAS Service Provider ID must be indicated on the application.
- 4.4.4.2. **Letter from Civil Aviation Authority.** The applicant must submit a letter from the Civil Aviation Authority (CAA) or Aviation Safety Body confirming compliance with ICAO SARPs. For Temporary assignments, the letter must include the expected date of operational service for certified aviation. For Final assignments, the letter must include confirmation that the system is operational and certified for aviation. *Note:* The requesting or endorsing CAA may reside in a different state from where the SBAS service provider is licensed in accordance with respective national regulations.
- 4.4.5. **Summary of Requirements.** Completed applications should address all the items listed in Table 2 which correspond to the desired PRN type. The required items should be included in

the application itself or attached as supporting documents.

Table 2. Requirements for Temporary and Final Assignments

Type of PRN Code	Temporary Assignment (max 3 years)	Final Assignment (max 10 years)
SBAS PRNs (120-158)	<ul style="list-style-type: none"> • Technical justification for the number of PRNs / satellites • If broadcasting L5, provide evidence of participation in ITU Resolution 609 Consultation meetings • ITU filing (provide reference info in application) • Program updates (purpose of service, users, schedule for test and operational service). Attach a PDF and/or ICAO Information Paper. • SBAS Service Provider ID • Letter from the Civil Aviation Authority or Aviation Safety Body stating compliance with ICAO SARPs and expected date of operational SBAS service 	<ul style="list-style-type: none"> • Technical justification for the number of PRNs / satellites • If broadcasting L5, provide evidence of participation in ITU Resolution 609 Consultation meetings • ITU Notification (provide reference info in application) • Program updates (purpose of service, users, schedule for test and operational service). Attach a PDF and/or ICAO Information Paper. • SBAS Service Provider ID • Letter from the Civil Aviation Authority or Aviation Safety Body stating that the system is certified for aviation
Other PRNs (64-119, 159-210)	<ul style="list-style-type: none"> • Technical justification for the number of PRNs / satellites • If broadcasting L5, provide evidence of participation in ITU Resolution 609 Consultation meetings • ITU filing (provide reference info in application) OR other appropriate radiofrequency filing (attach evidence to application) • Program updates (purpose of service, users, schedule for test and operational service). Attach a PDF. 	<ul style="list-style-type: none"> • Technical justification for the number of PRNs / satellites • If broadcasting L5, provide evidence of participation in ITU Resolution 609 Consultation meetings • ITU Notification (provide reference info in application) OR other appropriate radiofrequency certification (attach evidence to application) • Program updates (purpose of service, users, schedule for test and operational service). Attach a PDF.

4.5. **Evaluation of PRN Code Requests.** PRNCO will evaluate whether the applicant meets all requirements in Section 4.4. PRNCO will also consider the following factors when determining whether or not to issue a PRN code, and which PRN code number can be issued.

- 4.5.1. **Compatibility and Interference.** PRNCO will conduct initial compatibility and interference screening to include, but not limited to, verifying the transmitter characteristics are in compliance with ITU Radio Regulations and reviewing compliance with any existing GPS operator-to-operator agreements.
- 4.5.2. **Requested PRN code.** If other review criteria in Section 4.4 are satisfied, PRNCO will attempt to issue the requested PRN code if it is available. When the requested PRN code is unavailable, PRNCO will attempt to issue a PRN code within the same range of PRNs. For example, if PRN 125 is requested but unavailable, PRNCO will attempt to issue another PRN within the legacy PRN range of 120-138.
- 4.5.3. **Existing PRN Code Assignment.** If a specific PRN code is requested by multiple applicants, and all other review criteria are satisfied, priority will be given to the incumbent (e.g. if Applicant A possesses a Temporary assignment for PRN 137, preference will be given to Applicant A for renewal of PRN 137).
- 4.5.4. **Quantity of PRN Codes.** As an increasing number of systems request use of this finite resource, the number of PRNs assigned to an applicant must be managed to ensure the assignment process is equitable. For SBAS PRNs, PRNCO will issue an SBAS service provider no more than three PRN codes in the legacy range (120-138), and no more than four PRNs in total (120-158). The applicant should contact PRNCO if there are extenuating circumstances such as exceptionally large coverage requirements. Any applicant requesting an exception must provide written justification, including traceability to minimum coverage requirements.
- 4.5.5. **Users.** Assessment of the operational users and geographic area serviced by the subject system. In the event of limited operational PRNs, the number of operational users and geographic area may be considered to determine whether a particular PRN code is assigned.
- 4.5.6. **SBAS Legacy PRN Considerations (PRNs 120-138).** Due to the proliferation of SBASs designed for safety-of-life aviation use in accordance with Annex 10 Volume 1 of the Convention on International Civil Aviation, the original allocation of SBAS PRNs (120-138) does not meet the demand of current and planned systems. While PRN codes 139-158 are currently allocated for SBAS use, updates to all civil aviation standards and guidance were not effective until 2016¹. As such, aircraft equipped to accept the full 120-158 range are not expected to appear in great numbers for some time. Therefore, when issuing Legacy PRNs (120-138), PRNCO will give preference to subject systems that 1) already provide ICAO-recognized safety-of-life service using Legacy PRNs and 2) meet the requirements for a Final assignment (See Table 2). Additionally, in order to support future expansion of internationally harmonized SBAS PRN codes, PRNCO recommends use of PRNs 139-158 for systems under test and development.

¹ RTCA DO-229E Minimum Operational Performance Standards, Table A-1 (15 Dec 2016)

4.6. **Duration of a PRN Code Assignment**

4.6.1. **Maximum Duration.** The maximum duration of the PRN code depends on the type of PRN code assigned. If it is Temporary, the maximum duration is 3 years. If it is Final, the maximum duration is 10 years. An applicant desiring to extend a PRN code assignment beyond the maximum duration must renew their assignment by submitting another application and incorporating any pertinent changes.

4.6.2. **Assigned Duration.** Applicants must specify the requested PRN assignment duration on the Application for PRN Code Assignment. PRNCO will attempt to accommodate the requested duration as long as it is aligned with the submitted program schedule (Section 4.4.3).

4.7. **Issuance of PRN Code Assignment.** If the review criteria are satisfied, PRNCO will issue a PRN code assignment letter to the applicant.

4.7.1. **Issuance of PRN Code Set.** When PRNCO issues a PRN code, the entire code set with matching L1 C/A, L1C, L2C, and L5 PRN codes will be assigned to the applicant at the same time. Any of the four civil signals not requested by the applicant will be held by PRNCO as “reserved.”

4.7.2. **Recipient of the Assignment.** The applicant will be the recipient of the PRN code assignment. The desired addressee for the assignment letter should be included in the Application for PRN Code Assignment. In the case of SBASs transmitting from leased payloads, PRN codes are assigned to the government administration acting as the SBAS service provider, not to the operator of the satellite host.

4.7.3. **Published Update.** PRNCO will publish updates to the L1 C/A, L1C, L2C, and/or L5 PRN Code Assignment Tables on the GPS PRN Website at <https://www.gps.gov/technical/prn-codes/>. Any questions about more recent changes to the PRN code assignments should be directed to the PRNCO Org Box (smc.gp.prn@us.af.mil).

4.7.4. **Disclaimer.** Issuance of a PRN code does not indicate the PRNCO, Space and Missile Systems Center (SMC), or United States Space Force endorses or approves of the applicant’s operations. A PRN code assignment does not convey the authority to radiate in the L1, L2, or L5 frequency bands. SMC assumes no responsibility for ensuring subject systems comply with domestic or international radio frequency regulations or ensuring subject systems do not cause radio frequency interference. The applicant and appropriate national and/or international regulatory bodies are responsible for the operation of the system in accordance with all applicable rules and regulations.

4.7.5. **Expiration.** The PRN code assignment will expire the last day of the last month of the effective assignment. For example, if the PRN code assignment is effective thru April 2023, it will expire on 30 Apr 2023.

5. Retention of a PRN Code Assignment

In order to retain the issued PRN code assignment, the applicant must adhere to the following requirements:

5.1. **Notification of Changes.** Applicants must notify PRNCO when the dates of test or operational service have changed significantly with respect to the original application package. Significant changes include permanent cease of transmission or greater than 6-month delay of broadcasts.

5.2. SBAS-Specific Requirements

5.2.1. **Maintaining Operations.** If an SBAS ceases broadcasts for an extended period of time (e.g. 2 consecutive years) during the assigned duration, PRNCO reserves the right to rescind the PRN Code Assignment unless there is sufficient justification (proof of current or planned broadcasts). Note: SBAS service providers have the option of transferring the PRN (Section 6.4) to another existing operational system or a newly fielded system.

5.2.2. **Compliance to Civil Aviation Standards.** Subject systems must remain compliant with civil aviation standards and guidance, including but not limited to ICAO SARPs.

5.2.3. **Non-safety-of-life Services.** If the SBAS is not approved for aviation services, the SBAS service provider must implement protective measures to ensure transmissions are not erroneously used for safety-of-life services. This includes, but is not limited to, transmitting messages of Type 0.

5.2.4. **Issue or Anomaly Reporting.** In the event that an issue or anomaly related to the assigned PRN code is identified with an SBAS system, the SBAS service provider should be notified directly. PRNCO should be included on the correspondence. The SBAS service provider contact sheet and process for anomaly reporting are located on the ICAO NSP portal.

5.2.5. **Impact to Safety-of-life Services.** The SBAS service provider must cease transmission (Section 6.4) of the assigned PRN code if it is determined that the system's transmissions impact SBAS safety of life services (as per the ICAO process for SBAS anomaly reporting described in Section 5.2.4). Also see Section 6.2 on suspension and revocation.

6. Modification of a PRN Code Assignment

6.1. **PRN Transfer Initiated by PRNCO.** PRNCO may request to transfer PRN codes, i.e. to assign a different PRN code than the original, while an assignment is still active. All applicants with affected PRN code assignments must approve of the transfer before it is accomplished.

6.2. **Revocation or Suspension.** PRNCO reserves the right to revoke or suspend any active PRN code assignment if (1) the system is found to not be in compliance with international or national regulations, standards, or guidance or (2) the system does not meet the criteria in Section 5 (e.g. not using the PRN code assignment for 2+ years). PRNCO will attempt to

discuss any issues with the applicant before revoking or suspending the PRN code assignment.

- 6.3. **Advanced Notice Requirement.** When negotiating PRN code assignment modifications, PRNCO will be mindful of the SBAS service provider's obligation to provide ICAO with six years notice in advance of planned system termination².
- 6.4. **PRN Transfer Initiated by Applicant.** Applicants that desire to transfer PRN code assignments between two satellites within their systems must contact PRNCO for approval. At a minimum, the applicant must complete Part 2 of the Application for PRN Code Assignment for the satellite planned to broadcast the PRN code.

7. GPS PRN Coordination Office Contact Information

Below is the primary contact for GPS PRNs:

PRNCO Org Box: smc.gp.prn@us.af.mil

All applications, questions, or concerns about GPS PRN codes should be submitted to the PRNCO Org Box. The following alternate contacts should only be used for time sensitive requests:

Jeffrey Auerbach: AuerbachJM@state.gov

Karl Kovach: karl.l.kovach@aero.org

Appendix A: Application for PRN Code Assignment

To initiate the PRN code assignment process, an applicant must (1) fill out the "Application for PRN Code Assignment" located on the GPS PRN Website (<https://www.gps.gov/technical/prn-codes/>) and (2) email the completed application to PRNCO at smc.gp.prn@us.af.mil. Below is an example of a completed application.

² Annex 10 to the Convention on International Civil Aviation, Volume I with Amendment 90, Section 2.1.4.1 (2006)

INSTRUCTIONS

Complete this page for each broadcasting satellite Annotate the desired PRN Code in 20a.

SATELLITE ORBIT PARAMETERS

Please fill out the following info for each satellite

20a. PRN Code(s) Broadcasted	
20b. GLAN (degrees) *GEO only*	20c. SEMI-MAJOR AXIS, SMA (meters)
20d. RAAN (degrees)	20e. INCLINATION, i (degrees)
20f. ARGUMENT OF PERIGEE (degrees)	20g. ECCENTRICITY, e
20h. MEAN ANOMALY (degrees)	20i. UTC TIME OF EPOCH

RADIOFREQUENCY COMPATIBILITY

21. MAXIMUM RECEIVED ISOTROPIC POWER (RIP) ON SURFACE OF EARTH (dBW)

21a. L1 C/A 21b. L1 Cp 21c. L1 Cd 21d. L2 CL 21e. L2 CM 21f. L5 I5 21g. L5 Q5

22. RIP ON SURFACE OF EARTH AS A FUNCTION OF ELEVATION

Please provide RIP for each applicable signal in dBW

Elevation (degrees)	-5	0	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	
L1 C/A																					
L1 Cp																					
L1 Cd																					
L2 CL																					
L2 CM																					
L5 I5																					
L5 Q5																					

23. RIP REMARKS

24. INTERFERENCE ANALYSIS

Describe measures taken to avoid interference. If broadcasting L5, provide evidence of participation in ITU Resolution 609 Meetings.

ADDITIONAL INFORMATION FOR TERRESTRIAL TRANSMITTERS (e.g. Pseudolites)

25. POWER LEVELS AND MODE OF OPERATIONS
(Effective Isotropic Radiated Power, dBW)

26. TRANSMIT ANTENNA GAIN PATTERN

27. PULSED MODE 27a. PULSE DUTY CYCLE

27b. PULSE REPETITION RATE

ATTACHMENTS

The following attachments are required to process this application.

- Program overview/schedule update
- Letter from civil aviation authority stating compliance to ICAO SARPs and date of operational service (for SBAS PRN 120-158 applicants)

GEO – Geosynchronous

GLAN – Geographic Longitude of the Ascending Node

ICAO – International Civil Aviation Organization

PRN – Pseudorandom Noise

RAAN – Right Ascension of the Ascending Node

SARPs – Standards and Recommended Practices

SBAS – Satellite Based Augmentation System

UTC – Universal Coordinate Time