

Configuring GNSS

This chapter describes how to configure the Global Navigation Satellite System (GNSS) on Cisco NX-OS devices.

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Global Navigation Satellite System

The Global Navigation Satellite System (GNSS) are worldwide navigation infrastructures that

- provide multi-constellation support for receiving,
- offer advanced timing and location integrity features, and
- ensure compatibility with a wide range of satellite services through specific PRN ranges.

Supported GNSS constellations and PRN ranges

The Global Navigation Satellite System (GNSS) receiver is designed to operate on the GPS, Galileo, GLONASS, BeiDou and QZSS L1 frequencies 1551MHz to 1614MHz, standard position service, and Coarse Acquisition code.

When connected to an external GNSS antenna, the receiver contains all the circuitry necessary to automatically acquire GNSS satellite signals, track up to 32 GNSS satellites, and compute location, speed, heading, and time. It provides an accurate one pulse-per-second (PPS) and stable 10-MHz frequency output for internal system use.

It automatically initiates a self-survey upon acquisition of GNSS satellites. When the survey is completed, the receiver switches into the `Over-Determined` timing mode. In this mode, the reference position from the self-survey is maintained in memory and the receiver solves only for clock error and clock bias. The receiver provides for both Position and Time Receiver Autonomous Integrity Monitoring (T-RAIM) which allows the receiver to self-determine position change or to remove a satellite providing incorrect information to the timing solution.

Note No signals are transmitted out of GNSS ports (Antenna port).

The Global Navigation Satellite System (GNSS) supports various satellite constellations, each with specific Pseudo-Random Noise (PRN) numbers. The supported PRN ranges for different GNSS systems are:

- GPS – Supports PRN 1 through 32 only
- GLONASS – Supports PRN 65 through 96 only
- BeiDou – Supports PRN 201 through 237 only
- Galileo – Supports PRN 97 through 133 only
- QZSS – Supports PRN 193 through 195 only
- SBAS – Supports PRN 33 through 54 only

Guidelines and limitations for GNSS

GNSS has these guidelines and limitations.

- Beginning with NX-OS Release 10.3(2)F, the GNSS is supported on the Nexus 93180YC-FX3 switch.

Enable the GNSS receiver

Use this procedure to enable the GNSS Receiver as input.

Procedure

Step 1 Enter global configuration mode and then enable feature frequency-synchronization using the **configure terminal** and **feature frequency-synchronization** commands.

Example:

```
switch# configure terminal
switch(config)# feature frequency-synchronization
switch(config)#
```

Step 2 Enable the GNSS Receiver as input using the **gnss-receiver sync 1/2** command.

Example:

```
switch(config)# gnss-receiver sync 1/2
switch(config-gnss-if)# no shutdown
switch(config-gnss-if)#
```

Step 3 Configure the frequency synchronization on GNSS Receiver using the **frequency synchronization** command.

Example:

```
switch(config-gnss-if)# frequency synchronization
switch(config-gnss-freqsync)# selection input
switch(config-gnss-freqsync)# wait-to-restore 0
switch(config-gnss-freqsync)# exit
```

Step 4 (Optional) Configure the GNSS module to automatically track any satellite or configure it to explicitly use a specific constellation using the **constellation** <*type*> command. The default constellation configuration is **AUTO**.

A list of specific constellations include:

- Auto
- GPS
- GALILEO
- BEIDOU
- QZSS
- GLONASS

Example:

```
switch(config-gnss)# constellation gps
switch(config-gnss)#
```

Step 5 (Optional) Configure the delay that is introduced by the antenna cable using the **cable-delay compensation** command.

For long cable runs, this delay can be significant. The range is –1000000, +1000000 nanoseconds.

Note
The cable delay is about 5.9 nanoseconds per meter of cable.

Example:

```
switch(config-gnss)# cable-delay compensation 0
switch(onfig-gnss)#
```

Step 6 (Optional) Configure the required thresholds.

a) (Optional) Configure the lowest satellite elevation for fixes using the **elevation threshold** command.

The range is from 0 to 90°. The default value is 10°.

Example:

```
switch(config-gnss)# elevation threshold 10
switch(onfig-gnss)#
```

b) (Optional) Configure the Carrier to Noise ratio (C/No) using the **snr threshold** command.

The range is 0 to 15db-Hz. The default value is 0.0 C/No.

Note
Applicable only in Over-Determined Clock. Not applicable during selfsurvey.

Example:

```
switch(config-gnss)# snr threshold 10
switch(onfig-gnss)#
```

c) (Optional) Configure the Position Dilution of Precision (PDOP) threshold using the **pdop threshold** command.

PDOP indicates the confidence level of a position fix. Low DOP values indicate a high confidence level, while high DOP values indicate a low confidence level. The range is from 0 to 10. The default value is 6.

Example:

```
switch(config-gnss)# pdop threshold 6
switch(onfig-gnss)#
```

Step 7 (Optional) Configure the polarity of the GNSS receiver using the **1pps polarity** command.

It can be set to either positive or negative. The default option is positive.

Example:

```
switch(config-gnss)# 1pps polarity positive
switch(onfig-gnss)#
```

Step 8 (Optional) Enable or disable the jamming occurred when the receiver function is disturbed by external RF sources that interfere with GNSS signals or saturate the antenna LNA or receiver front end using the **anti-jam disable** command. Values are Enable or Disable.

Note
If enabled, minimum of two satellites required for fix in Over-Determined Clock mode.

Example:

```
switch(config-gnss)# anti-jam disable
switch(onfig-gnss)#
```

Commands for verifying GNSS configuration

After performing the GNSS configuration tasks, use this reference to check for configuration errors and verify the configuration.

show gnss-receiver

The output of this command displays details of GNSS configuration.

This is an example of the output of the **show gnss-receiver** command.

```
switch(config-gnss-if)# sh gnss-receiver
GNSS-receiver SYNC 01/02
Status: Available, Up
Position: 41:11:660 N 74:0:0 W -12.805 m
Time: 1648046422 (UTC offset: 18s)
Firmware version: 1.7
Lock Status: Phase Locked, Receiver Mode: 3D-fix
Survey Progress: 100, Holdover Duration: 0
Major Alarm: Not used
Minor Alarm: Antenna shorted
Anti-jam: Disabled, Cable-delay compensation: 1000
1PPS polarity: Negative
PDOP: 0.000, HDOP: 0.000, VDOP: 0.000, TDOP: 0.001
Constellation: Auto, Satellite Count: 7
Satellite Thresholds:
SNR - 0 dB-Hz, Elevation - 0 degrees, PDOP - 5, TRAIM - 1 us
Satellite Info:
PRN   Channel Acquisition Ephemeris  SV     Signal
No.   No.     Flag        Flag       Type   Strength   Elevat'n  Azimuth
--- ------- ----------- --------- ----------- -------- -------- --------
11     0      On          On         GPS     0.036     0.076      0.024
```

```
28      1       On          On          GPS     0.036     0.025      0.272
1       2       On          On          GPS     0.037     0.089      0.002
19      3       On          On          GPS     0.037     0.036      0.151
14      5       On          On          GPS     0.036     0.019      0.045
17      6       On          On          GPS     0.037     0.025      0.314
23      7       On          On          GPS     0.037     0.014      0.178
switch(config-gnss-if)#
```

show frequency synchronization selection

This is an example of the output of the **show frequency synchronization selection** command.

```
switch(config-gnss-if)# sh frequency synchronization selection
==============
Selection point: System Clock (T0) Selector (2 inputs, 1 selected)
Last programmed 00:53:56 ago, and selection made 00:53:35 ago
Next selection points
Node scoped :
Uses frequency selection
Used for local line interface output
S Input Last Selection Point QL Pri Status
== ======================== ======================== ===== === ===========
Internal0[1] n/a SEC 255 Available
11 GNSS2[1] n/a PRC 100 Locked
==============
Selection point: IEEE 1588 Clock Selector (2 inputs, 1 selected)
Last programmed 00:53:56 ago, and selection made 00:53:55 ago
Next selection points
Node scoped :
Uses frequency selection
S Input Last Selection Point QL Pri Status
== ======================== ======================== ===== === ===========
21 Internal0[1] n/a SEC 255 Holdover
GNSS2[1] n/a PRC 100 Unmonitored
==============
switch(config-gnss-if)#
```