



IGS Site Guidelines – Clarifications

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Notes and clarifications to the IGS Station Guidelines

2.1.1

The station log is the fundamental source for station installation details and configuration changes and it must be correct, complete and up to date throughout the lifetime of the station. Of particular importance are the contact details for the station, these must remain current and up-to-date together with all the other information. A blank station log can be found at <ftp://igs.org/pub/station/general/blank.log>, the station logs of all the active IGS stations can be found at <ftp://igs.org/pub/station/log/>. Detailed site log preparation instructions for the Station Operators can be found at ftp://igs.org/pub/station/general/sitelog_instr.txt

2.1.2

IGS stations need to have a permanent location designated at the selected site, which will host the GNSS antenna for the foreseeable future. Additional antenna mounting points at the site are desirable to support planned upgrades (see Section 2.4). The IGS station at each site needs to remain at the same location for its lifetime.

2.1.5

This guarantees that there is strong local/national/international interest in properly maintaining the site and observing these station guidelines over time, and there is no chance of the site being abandoned, or overtaken by other uses.

2.1.6

IGS permanent stations need to have long time series of continued stable measurements with as few disruptions and configuration changes as possible (see upgrade guidelines in Section 2.4).

2.1.7

The receiver should be set to have no elevation mask. The site antenna installation is therefore expected to be able to record measurements of satellites above 5 deg elevation, at least, this entails having no restrictions on the receiver side and a suitable site selection to minimize horizon blocks (buildings, trees, etc).

2.1.8

The "International GNSS Service" network needs to provide as many useful GNSS measurements as possible from each of the sites to support all the different activities.

All satellite measurements can potentially be used by the IGS to characterize station or satellite behavior, even those not declared useful or reliable by GPS command need to have measurements recorded by the IGS receiver

2.1.9

In the absence of anti-spoofing encryption all P-based observables shall be obtained directly.



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2.1.11

The instants of observation of the satellite signals need to be as close as possible to the integer second so that all the measurements across the network can be better correlated.

2.1.12

All IGS stations need to have properly calibrated antennas installed, see:

<ftp://igs.org/pub/station/general/igs08.atx>. An absolute calibration is therefore necessary for inclusion and to remain in the IGS network

(ftp://igs.org/pub/station/general/antenna_README.pdf).

For the cases when an antenna radome needs to be used, please see 2.1.17 and 2.1.18

2.1.13

To properly apply the absolute antenna calibrations, which have both azimuth- and elevation-dependent corrections, it is essential that the GNSS antenna is leveled and pointing north as required. This way the measurement correction from the absolute calibrations produce the expected effect.

2.1.15

Stations antenna monuments need to avoid close reflective surfaces directly below the bottom plane of the antenna, especially those that have dimensions greater than the antenna (see 2.2.25). Station Operators and Agencies shall mount GNSS antennas on solid monuments placed at locations not affected by winds, road vibrations, etc. See <http://igs.org/network/monumentation.html> for additional information.

2.1.17

Additional site monuments are to be used for parallel equipment. The long-term data series at a fixed location is what gives an IGS station its value within the network. Follow the guidelines in Section 2.4 if a move is necessary.

2.1.19

The antenna eccentricity relates the station permanent position marker to the GNSS antenna reference point and the distance must not be too great to minimize measurement error.

2.1.20

There are still concerns over the use of a radome over the antenna. The concerns include uncharacterized effects such as weathering, possible radome orientation issues, and the repeatability of the absolute calibration using different radome batches.

2.1.23

Having the 4 character ID for the GNSS Stations is essential for consideration into the IGS network. Therefore follow the <http://igs.org/network/guidelines/checklist.html> list to reserve the 4 character ID, and contact the IGS CB for additional help in securing a 4 character ID if there are any issues.

2.1.24

Follow the <http://igs.org/network/guidelines/checklist.html> list to obtain the DOMES number from the IGN

2.1.25

An M-type IERS DOMES number refers to a monument point such as a pillar, pole, brass mark, etc. Follow <http://igs.org/network/guidelines/checklist.html> to ensure a proper DOMES number is assigned.



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2.1.28

It is possible that station binaries could prove useful to extract additional information from the receiver data binaries. Therefore it is recommended that the receiver binaries be stored safely for some time (to be determined by the Station Operator) so that translation errors or improvements can be applied to past station data.

2.1.29

The Station Operator needs to check and confirm with the Data Centers the exact details of data file transmission and exchange and the accepted compression methods: Hatanaka, compress, gzip, bzip2, etc.

2.1.30

1 Hz data submission rules are covered in Section 7.1

2.1.31

Station operators need to have mechanisms to avoid possible inconsistencies between the real and the reported station configuration. The IGS will check the consistency of the submitted RINEX headers versus the official station logs regularly to warn station operators of inconsistencies.

2.1.32

The Station Operator needs to react and correct within one day, if possible, any email from the IGS CB advising of a station configuration inconsistency.

2.1.33

To minimize data file resubmissions the Station Operator shall implement checks at the time of data file delivery, which ensure that the file arrived at the Data Centers as expected. Correcting incorrect file delivery after the fact can lead to confusion and to loss of data availability at critical times for product generation.

2.1.38

Station Operators shall make available to the IGS, antenna pictures at regular intervals properly labeled and sorted, depending on site visit schedule, etc. Visual inspections of a variety of recent, and historic, antenna installation pictures is very useful to the IGS and to IGS researchers to identify environmental or equipment issues identified in present or future data processing.

2.1.39

The changes of equipment at a station are the main cause of Reference Frame station decay. The RFWG selects a number of stations based on these guidelines and their coordinate/velocity stability to be able to continue to access the ITRF into the future.

The IGS will contact SOs explicitly if selected by the RFWG to remind them of the commitments

2.1.40

Instructions on sending messages to the IGS email lists can be found at <http://igs.org/faqs.html#Maillists>

2.1.41

IGSMail communications on station issues shall include decommissioning, long-term outages (planned or unplanned longer than 1 week), major upgrades to new technology (new GNSS capabilities, external frequency, ...), etc.

IGSStation communications shall include short-term outages, data file resubmissions, firmware upgrades, problems or errors in the station or its site log as discovered and corrected (briefly describe in the message what was changed), etc.



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Stations Operators are advised to use their best judgment as to which list to use but to keep the IGS informed of station related issues.

2.1.42

Station issues to be reported to the IGS include, but are not limited to:

- *Changes in antenna, radome, monument, receiver, cabling, frequency standard, receiver settings such as elevation cutoff angle, or environment (such as tree removal or building construction); in general, any change which can affect position solutions. Briefly describe in the message what was changed.*
- *If a station is expected to be unavailable for more than one week.*
- *When a site is decommissioned permanently.*

2.1.43

For more information see the MAIL area of <http://www.igs.org/>

2.2.1

With the use of increasingly more sophisticated tropospheric mapping functions (GMF, etc) for GNSS data processing, it is important to have good quality measurements of the GNSS satellites down to as low an elevation as possible from all the sites. This would serve both to better characterize each station, and to be able to evaluate the performance of mapping functions, etc.

2.2.4

Station Operators should ensure that the vendor equipment installed at IGS stations is of high quality and has a proven track record to ensure no degradation in measurement quality.

New equipment should be properly characterized by one or more analysis centers. The station operator wanting to introduce new equipment shall contact the IGS Network Coordinator and IGS Analysis Centers as needed.

2.2.5

The antenna should be mounted directly above the permanent station marker if possible.

2.2.6

It is preferred that, except in very exceptional circumstances (i.e. extremely isolated locations), each station site only has one IGS station so as to avoid data duplication from the same location.

2.2.7

By having additional monuments available at a site the planned equipment upgrades/changes can fully implement the guidelines in Section 2.4

2.2.9

Partial Daily, Hourly (see section 4.1) or 15min (see section 7.1) data files are not encouraged so as to prevent multiple resubmissions and confusions. It is better to wait for the data a few more minutes and to get complete files so that the files have all the expected data.

2.2.10

Station Operators are encouraged to monitor their own data quality and to react and correct changes detected in the data quality before they can have an impact on the IGS product generation.

2.2.11

Hourly data file submissions help to support the Ultra-rapid and Rapid products of the IGS and many other Near-Real-Time efforts.



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2.2.15

Co-located sites are amongst the most important to the RFWG since they allow relating 2 or three techniques with high precision, which is essential for the ITRF definition.

2.2.17

The SINEX format is defined here

http://www.iers.org/IERS/EN/Organization/AnalysisCoordinator/SinexFormat/sinex_cont.html

2.2.18

Data smoothing is difficult to detect from the RINEX measurement except via a much lower than expected Multipath value for the station data. The IGS will monitor the MP values to try to detect and warn Station Operators of possible smoothing problems.

2.2.19

Many modern receivers in an attempt to provide more stable measurements implement their own Multipath reduction algorithms at times affecting the recorded measurements. It is the interest of the IGS to record the uncompromised measurements from the GNSS satellites at each station without any receiver manipulation.

2.2.22

The IGS will monitor the MP values to try to detect problems and warn Station Operators of problems.

2.2.23-26

The IGS will monitor the RINEX data quality values to try to detect problems and warn Station Operators of problems, for example using UNAVCO's teqc (<http://facility.unavco.org/software/teqc/teqc.html>).

2.3.1

Modern receivers can have a multitude of problems and errors corrected via the recommended vendor firmware upgrades. To guarantee the performance of the IGS network please make sure the receiver is being upgraded over time as directed by the vendor, and taking into consideration the shared experiences of all the IGS stakeholders. To this end the station operator shall stay informed via the IGSStation and IGSMail email lists for the shared experiences of firmware updates.

2.3.2

*The data for this parallel observing period shall **NOT** be generally distributed.*

Please get in touch with the IGS Central Bureau, cb@igs.org, so that appropriate advice, information and support can be made available to the Station Operator from the IGS Central Bureau, the Infrastructure Committee, the IGS Reference Frame Working group, the IGS Antenna Working Group, and the IGS Analysis Center Coordinator.

2.3.6

A new antenna monument is a new station (new name, new DOMES number, new station log, etc), therefore the installation should be done to the highest possible level of quality.

The decision whether to create a complete new station after the upgrade needs to be considered, versus keeping the continuity of the old monument and marker with a possible coordinate jump due to the new antenna.

*With **Co-located** and **Reference Frame Station upgrades** the Station Operator shall be in contact with the IGS, to minimize the negative impact over the network and the Reference Frame, and to maximize the opportunity to make significant long-lasting improvements.*



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2.3.7

The data sets in the overlap period of operations are essential to obtain a good tie between the previous and the new installation, and they shall be made available to the IGS in an accessible location.

2.3.8

*The data for these 4 weeks shall **NOT** be distributed, but made available to the IGS for processing in an accessible location.*

It is important to be able to measure the effect of the un-calibrated radome on the original station by operating without for some time.

2.3.9

Contact the Central Bureau at cb@igs.org for assistance. Calibrating old antennas even after removal is essential since the corrections can be used for the reprocessing campaigns when the entire data history for all the stations is re-considered. At these reprocessing campaigns having the correct absolute calibration from the un-calibrated antenna + radome pair is important to minimize station position jumps after antenna changes.

4.1/4.2

Additional meteorological measurements can be accommodated in the RINEX format and can be provided if available (<ftp://igs.org/pub/data/format/rinex211.txt>)

5.1.1/5.1.2

*See the RINEX 2.11 specification for details in naming, etc:
<ftp://igs.org/pub/data/format/rinex211.txt>*

5.2.2

RTCM code and phase observations should not be corrected to refer to the antenna reference point (correction is typically known as the antenna phase center correction).

5.2.5

The IGS Central Bureau can help to coordinate the streaming data accumulation into 15 min files between a station and a data center. Otherwise the Station Operator can reach agreement with a Data Center for this activity on its own. This can help to guarantee that 15 min files are available as quickly as possible publicly from the streaming stations.

5.2.6

To support the full receiver characteristics (which may not be fully supported by the range of streaming messages), and to avoid data holes (streaming is susceptible to "lost epochs") the regular hourly and daily files (observation, navigation, meteorological) shall be created by the Station Operators in their traditional mode of raw-to-RINEX translation.