



NEWS from the **Radio Technical Commission for Maritime Services (RTCM)**

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The Radio Technical Commission for Maritime Services (RTCM) Publishes Revised Standard for Differential Global Navigation Satellite Systems

Summary: RTCM Special Committee 104 has just published the latest edition of its "Version 3" standard for Differential Global Navigation Satellite System (GNSS) services. The standard supports very high accuracy navigation and positioning through a broadcast to mobile GNSS receivers, which allows the receivers to compensate for errors that exist in satellite positioning without augmentation. This latest edition includes an interoperable definition for Network Real-Time Kinematic (Network RTK) operation, which supports centimeter-level accuracy positioning service over large regions. Using the new standard, Network RTK services providers can serve their customers with reliable information regardless of the brand of equipment their customers are using. Designated as RTCM 10403.1, the standard is available from RTCM at its secure online publication store. Visit www.rtc.org and click on "Publications."

Global Navigation Satellite Systems (GNSS) provide geographical positioning information from a constellation of satellites in orbit to receivers at sea, on the ground, and in the air. The best known of these systems is the U.S. Global Positioning System (GPS), but the Russian GLONASS system provides a similar service, as will the European Galileo system. Together they are known as Global Navigation Satellite Systems, and they can provide position accuracies in the 10 meter to 15 meter range without augmentation. Although the satellites have the potential to provide more accurate positions, atmospheric and other effects degrade the quality of the satellite signals.

Much higher accuracies can be achieved by broadcasting data from reference stations at precisely known locations. This technique is known as Differential GNSS (DGNSS) service, and it has enabled precise navigation by ships, aircraft, and ground vehicles, as well as highly accurate surveying applications. RTCM's standards for DGNSS services are widely used protocols for communication between the reference stations, and mobile receivers at the location being determined. The use of RTCM standards allows interoperation between equipment from different manufacturers.

Governments and service providers around the world are establishing networks of reference stations for precise positioning. The Real-Time Kinematic (RTK) method allows immediate and precise determination of a mobile receiver's position, without having to post-process data, as was necessary with earlier techniques. RTCM's new "Version 3" standard, identified as RTCM 10403.1, supports the dissemination of Network RTK information over large areas covered by a network of reference stations. It is designed to support a variety of networking techniques, while maintaining interoperability of service provider and user equipment.

The RTCM "Version 3" message format is optimized especially for RTK operation, which requires more data than earlier differential correction techniques as in "Version 2". The new message formats for RTK baseline operation have reduced the requirement for available throughput by 70 percent. The older RTCM "Version 2" standard (the most recent is RTCM 10402.3) inherited the legacy of the somewhat bulky data structure from previous versions. In the mid-1990s the desire for shorter, more compact messages than the ones defined in "Version 2" arose and some manufacturers started to establish proprietary message structures for RTK operation. One of the motivations for developing these proprietary messages was to overcome the throughput limitation of the data links typically used in RTK surveying. A full set of "Version 2" RTK messages requires at least a data link supporting 9600 baud. The new RTCM 10403.1 standard not only supports efficient use of expensive bandwidth for RTK operations, but also is designed to efficiently communicate the critical information from the reference stations in the network.

Design changes and future plans for new improved global navigation satellite systems have also been considered in the RTCM "Version 3" standard. The new standard avoids inadequate arrangements of the bit structure and ambiguities, while improving data integrity by use of a three-byte redundancy check instead of the one-byte check of "Version 2".

In addition to the messages defined in the new standard, RTCM Special Committee 104 is also developing a number of new messages. As new messages and capabilities are demonstrated through validity and interoperability testing, they will be incorporated into future editions of the "Version 3" standard. Registered owners of RTCM 10403.1 will receive electronic updates as SC 104 completes new messages, until RTCM 10403.2 is released at some future date. RTCM will also continue to maintain RTCM "Version 2" standard to support existing hardware.

RTCM SC 104 believes that RTCM 10403.1 for DGNSS services will prove useful in supporting highly accurate differential and kinematic positioning as well as a wide range of navigation applications and survey worldwide throughout the next two decades.