
Trimble RTX®
Correction Services
FAQ
Trimble®

What are Trimble RTX Correction Services?

Trimble RTX® GNSS correction services provide users with real-time, high-accuracy positioning via satellite or Internet, worldwide without the need for terrestrial infrastructure such as cellular networks, radios or modems, and without the need for base stations. Surveyors and mappers can easily receive the service and get to work, significantly reducing field setup time. Trimble RTX is a Real-Time Service utilizing an Absolute Positioning method known as Precise Point Positioning (PPP).

What correction services are available?

Service	Accuracy RMS (cm)[1]	Initialization mins (Fast / Standard) [2]
CenterPoint® RTX	2 cm (horizontal) 5 cm (vertical)	< 1 / < 3 mins
FieldPoint® RTX	10 cm (h)	< 1 / < 3 mins
ViewPoint® RTX	50 cm (h)	<1 or <3 mins
xFill® Premium	2 cm (h)	<1 or <3 mins

[1] RMS performance based on repeatable in field measurements. Achievable accuracy and initialization time may vary based on type and capability of receiver and antenna, user's geographic location and atmospheric activity, scintillation levels, GNSS constellation health and availability and level of multipath including obstructions such as large trees and buildings.

[2] <3 min for Trimble ProPoint capable receivers only. Global average initialization time when using GPS, GLONASS, Galileo, and BeiDou.

What are Trimble RTX corrections used for?

Trimble RTX corrections are used for high-accuracy GNSS positioning in place of, or to complement traditional RTK single-base or VRS Now networks. Surveyors and mappers use Trimble RTX corrections in many industries such as land survey, construction, mining, cadastral mapping, oil and gas, forestry, utilities, and more.

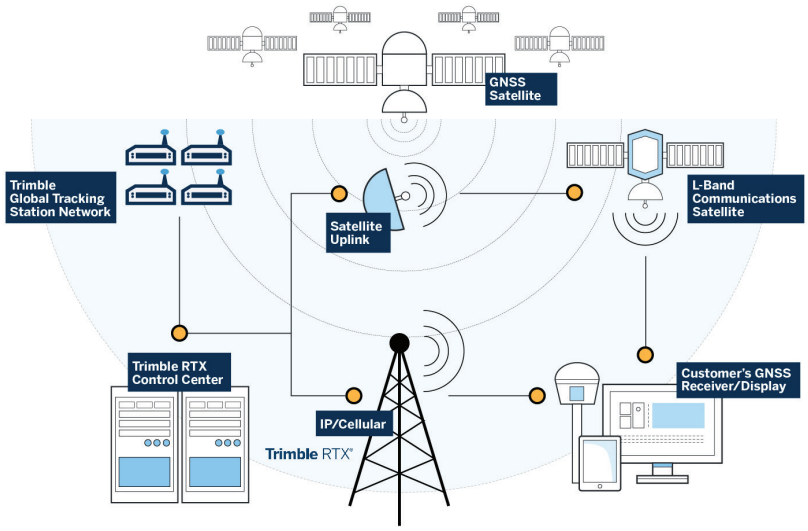
About Trimble RTX Technology

What does RTX mean?

RTX stands for Real Time eXtended (RTX). It is the technology that powers Trimble RTX correction services.

How does Trimble RTX technology work?

Trimble RTX real-time GNSS corrections consist of precise satellite ephemeris, along with highly accurate atmospheric models. The corrections are generated by using satellite measurements from a global network of ground based GNSS tracking stations. These corrections are broadcast to the receiver via regional geostationary satellites or over the Internet, which the GNSS receiver uses to improve the accuracy of its positions by resolving biases in the carrier phase observable.



What is xFill Premium?

xFill Premium is an unlimited backup solution for RTK and VRS. It can be used to bridge correction signal interruptions with high accuracy for the duration of the interruption.

How does xFill Premium work?

xFill Premium runs seamlessly in the background calculating Trimble RTX positions and will automatically bridge positioning gaps if a user's RTK or VRS correction source is interrupted; these interruptions typically occur due to cellular signal disruption or loss of radio connectivity. The Trimble RTX corrections are delivered via satellite, allowing continued field operations during correction stream signal interruptions. xFill Premium delivers centimeter-level positioning accuracy for the duration of the interruption, extending Trimble's standard xFill service, which is limited to 5 minutes.

Performance and Operation

What performance can I expect from Trimble RTX correction services?

Service	Accuracy RMS (cm)[1]	Initialization mins (Fast / Standard) [2]
CenterPoint® RTX	2 cm Horizontal 5 cm Vertical	< 1 / < 3 mins
FieldPoint® RTX	10 cm Horizontal	< 1 / < 3 mins
ViewPoint® RTX	50 cm Horizontal	<1 or <3 mins
xFill® Premium	2 cm Horizontal	<1 or <3 mins

The performance specifications for Trimble RTX correction services are listed in the table, dependent on receiver type and region of operation.

[1] RMS performance based on repeatable in field measurements. Achievable accuracy and initialization time may vary based on type and capability of receiver and antenna, user's geographic location and atmospheric activity, scintillation levels, GNSS constellation health and availability and level of multipath including obstructions such as large trees and buildings.

[2] <3 min for Trimble ProPoint capable receivers only. Global average initialization time when using GPS, GLONASS, Galileo, and BeiDou, available globally via IP and regionally via L-band satellite.

What is initialization?

Initialization is the initial procedure when a GNSS session is begun in which the unit searches for satellites, locks onto them, and begins to calculate its position. When the position of the receiver reaches the accuracy specification, then it is considered to be fully initialized. Once initialized, the receiver will maintain that level of accuracy unless initialization is lost through extended corrections or GNSS disruptions. With PPP, a similar term "convergence" is used to describe the initialization process in which carrier phase ambiguities converge to constant values and a position solution reaches an optimal, precise value.

How long does initialization or convergence take?

Trimble RTX correction services have different convergence times ranging from 1-3 minutes for Trimble ProPoint receivers, and 1-15 minutes for non-ProPoint Trimble receivers, based on the location of use, and the correction service type. Refer to the performance specifications table above for details.

Can I start working before the receiver is fully converged?

Yes, you may begin operating the receiver before it has fully converged, however, to work with the correction service's full accuracy, it is recommended that your receiver has been fully converged. Most Trimble RTX capable receivers will allow you to set a "convergence threshold", which determines what accuracy level must be reached before you can begin working.

Does the receiver need to remain stationary while converging?

No, you may move the receiver while waiting for it to converge. The convergence time will be similar whether the receiver is static or not.

How long will I need to wait for convergence if I temporarily lose the Trimble RTX correction stream or GNSS satellites?

The GNSS receiver will rapidly re-converge to specified accuracies after the loss of GNSS signals and/or the Trimble RTX correction stream. The Trimble RTX correction stream may be lost for up to 200 seconds, while GNSS signals may be lost for up to four minutes before the receiver requires full re-initialization.

What is Trimble RTX Fast?

Trimble RTX Fast is a regionally available service that significantly reduces the convergence time for Trimble RTX services to less than a 1 minute for 2 cm horizontal accuracy. This is included with all Geospatial and Construction Trimble RTX subscriptions.

What is CenterPoint RTX QuickStart?

CenterPoint RTX QuickStart is a feature that allows rapid convergence of CenterPoint RTX on a precisely known point. By starting the receiver on a known point, or in the same location that it was in when it was turned off, CenterPoint RTX can fully converge in less than 5 minutes. When in a Trimble RTX Fast region, this feature is not required because the solution can fully converge in less than 1 minute.

Why do some Trimble RTX services have two convergence times listed?

When the service has two convergence times listed, it is available with the faster convergence times in specific Fast regions.

Which GNSS constellations do Trimble RTX corrections support?

Trimble RTX correction services support GPS, GLONASS, Galileo, BeiDou, and QZSS.

In which coordinate reference frame are Trimble RTX positions calculated and stored?

Trimble RTX coordinates are computed in ITRF2014 at the time of measurement (current epoch); these coordinates will be transformed to a fixed epoch dependent on the receiver and field software. For example, older versions of Trimble Access will transform the coordinates of an R10 GNSS receiver using RTX to ITRF2014 Epoch 2005.0; Trimble Access 2020.20 or later will store the initially calculated RTX positions as ITRF2014 current epoch, and also transform them to your local reference frame - in many cases, with mm-level transformation accuracy!

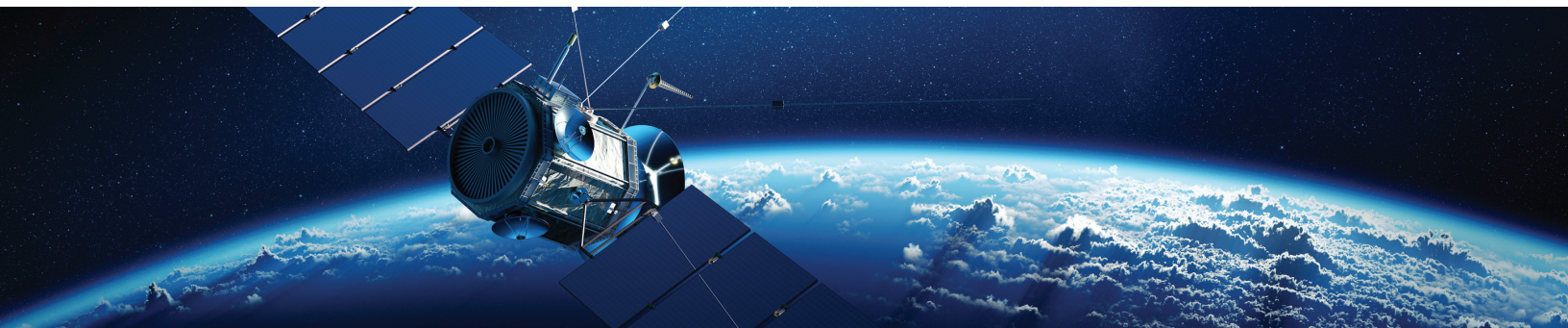
xFill Premium applies an offset to the Trimble RTX positions resulting in positions that match the RTK/VRS coordinate reference frame that is being used.

What are ITRF and ITRF2014?

The International Terrestrial Reference Frame (ITRF) is a terrestrial reference frame established and maintained by the International Earth Rotation and Reference Systems Service (IERS). ITRF is the realization of an ideal reference frame, the International Celestial Reference System (ICRS), which is also maintained by IERS; this realization is based on estimates of position and velocity of terrestrial stations observed by VLBI, LLR, GPS, SLR, and DORIS. Due to the motion of the Earth's crust, the terrestrial positions of points on Earth are constantly changing. A position at a specific instance in time will have both a reference frame (e.g. ITRF2014) and an epoch (e.g. epoch 2005.00); the epoch is the time the realization refers to.

What is the difference between ITRF and WGS84?

Both ITRF and WGS84 are global datums; WGS84 is used by GPS, and is based on a specific realization being updated periodically. Since 1997, WGS84 has been maintained generally within 1 cm of the then current ITRF realization. While Trimble RTX positions are computed in ITRF2014 current epoch, autonomous GPS positions are provided in the current realization of WGS84. This discrepancy in time will usually result in a small difference between the coordinates of a position in ITRF and the coordinates of the same position in WGS84.



What is the difference between CenterPoint RTX and RTK?

CenterPoint RTX and RTK both offer GNSS corrections however they differ in several ways:

	CenterPoint® RTX	RTK
Availability	Globally	Regionally via the VRS Now network, or locally via local base station connection or regional VRS network
Delivery	Via satellite (no modem, radio or base station required), and /or via Internet	Via radio or Internet
Accuracy	Horizontal: 2 cm RMS Vertical: 5 cm RMS	Horizontal: 1-2 cm RMS Vertical: 1-3 cm RMS
How it works	Using a Trimble managed ground network, CenterPoint RTX estimates precise ephemeris, and models atmospheric and ionospheric errors on a global scale, transmitting these corrections in real-time to the rover via satellite or IP.	Using local or regional base stations RTK works on the basis of cancelling GNSS error sources between the local base and rover, and delivers these corrections via radio, or Internet.
Support	24/7 Trimble Support	Yourself if using a base station and 24/7 Trimble Support for Trimble VRS Now networks

How are Trimble RTX correction services different from SBAS systems such as WAAS and EGNOS?

SBAS systems typically use only one GNSS constellation, such as GPS to generate corrections. Trimble RTX technology is compatible with multiple GNSS constellations, including GPS, GLONASS, Galileo, BeiDou and QZSS. Trimble RTX technology provides more accurate, consistent and repeatable positioning than WAAS or EGNOS. Trimble RTX correction services are also available worldwide; SBAS systems (such as WAAS and EGNOS) are limited to certain regions.

How do Trimble RTX correction services compare to other GNSS correction methods?

Solution	Availability	Delivery Method	Horizontal Accuracy (RMS)	Vertical Accuracy (RMS)	Initialization Time	Additional hardware
Trimble RTX® (no base station required)	Global Local (Fast)	Satellite/Internet	2 - 50 cm (subscription level dependant)	5 cm (subscription level dependent) CenterPoint RTX only	< 3 minutes (subscription level dependent)	N/A
Virtual Reference Station (VRS) (Network RTK)	Regional	Internet	8 mm + 0.5 ppm1 (2 cm or better in most networks)	15 mm + 0.5 ppm1 (3 cm or better in most networks)	Instant	Modem (with data plan)
Real Time Kinematic (RTK) (Single-Baseline RTK)	Local	Radio Internet	8 mm + 1.0 ppm1 (2 cm when 12 km from the base station)	15 mm + 1.0 ppm1 (2.7 cm when 12 km from the base station)	Instant	Radio or Modem (with data plan)
SBAS – WAAS, EGNOS, etc	Continental	Satellite	1 min	2 mins	Instant	N/A
Autonomous	Global	N/A	3 – 5 mins	6 – 10 m	Instant	N/A

1 ppm refers to parts per million, e.g. 1 ppm is equivalent to 1 mm in additional error for every 1 km in distance from the closest base station

Are there any factors that can cause errors or outages of Trimble RTX correction services?

There are some environmental factors that might degrade accuracy and convergence or cause temporary outages in GNSS systems when using any correction source:

- **Solar activity:** GNSS signals can be impacted by solar activity as they pass through the Earth's ionosphere.
- **Obstructions:** Any objects that prevent a receiver from receiving information from GNSS satellites or the Trimble RTX correction stream can impact accuracy or cause outages. Tall trees, buildings, overpasses, and steep terrain are common obstructions that impact GNSS users.

  Trimble RTX delivered via IP can help mitigate outages when the Trimble RTX satellite is blocked by obstructions, but won't help with obstructions limiting GNSS satellite availability or causing a degradation in GNSS signals.
- **Interference:** Any localized interference on similar or adjacent frequencies of GNSS signals or the correction signal may disrupt the reception of those signals.

Will Trimble RTX corrections work indoors?

No. Similar to any form of GNSS positioning, unless there is a clear line of sight between the GNSS receiver and positioning satellites, Trimble RTX positioning will not work very well, or at all inside. Trimble recommends using Trimble RTX outside, with an unobstructed view of the sky.

How reliable are Trimble RTX services?

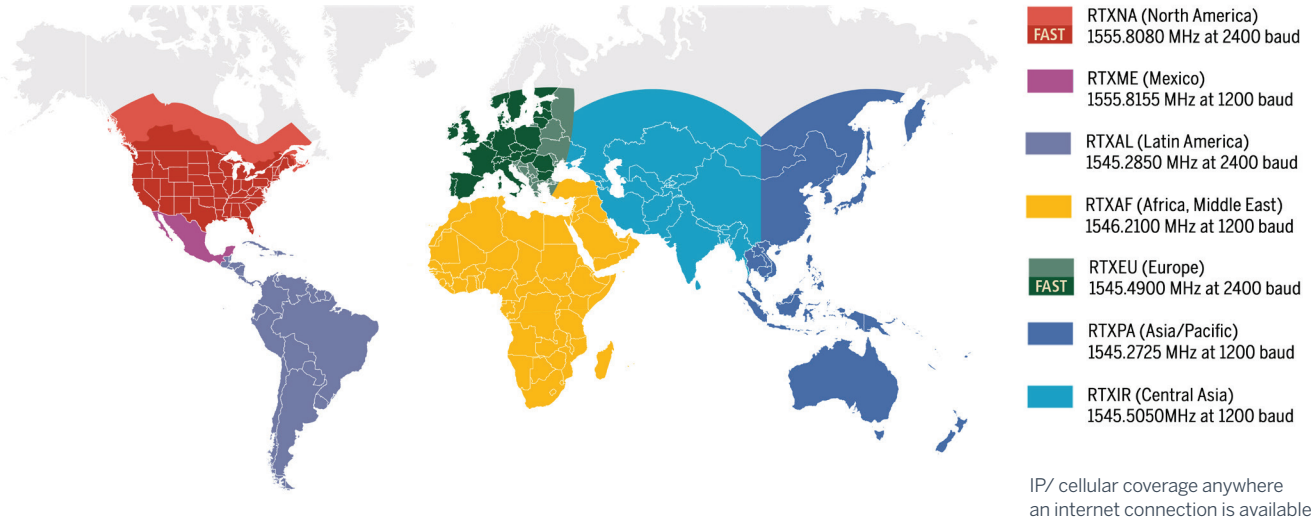
The Trimble RTX services have exceptional up-time because they use a worldwide network of base stations, with redundancy in the entire infrastructure system used to calculate and deliver the correction services. All base stations, correction solutions, and delivery mechanisms are monitored 24/7/365 by Trimble's global team of network engineers and IT specialists to ensure reliability in worldwide positioning and broadcasting.

Delivery and Availability

Where are Trimble RTX corrections available?

Trimble RTX corrections are available worldwide via satellite and internet delivery. The satellite coverage area is shown on this map: Trimble RTX Fast is available in most of North America and Europe.

Trimble RTX® Satellite Broadcast Frequency Coverage Map



Can I use Trimble RTX correction services over water?

Yes, Trimble RTX correction services are available for coastal and regional offshore use. Contact your local Trimble dealer for more information.

What geospatial receivers are compatible with Trimble RTX correction services?

Trimble RTX correction services are available for the following list of receivers:

Trimble ProPoint Survey GNSS Receivers		Accuracy[1]	Convergence Time (Fast Regions)[1]	Convergence Time (Global)[2]
CenterPoint RTX	R12i, R12, R10-2*, R750, R780	2 cm Horizontal 5 cm Vertical	< 1 min	< 3 mins
xFill Premium	R12i, R12, R10-2*, R750, R780	3 cm Horizontal 7 cm Vertical	< 1 min	< 3 mins

*Valid for receiver's running Trimble ProPoint firmware
[1]RMS performance based on repeatable in field measurements.
Achievable accuracy and initialization time may vary based on type and capability of receiver and antenna, user's geographic location and atmospheric activity, scintillation levels, GNSS constellation health and availability and level of multipath including obstructions such as large trees and buildings.
[2]<3 min for Trimble ProPoint capable receivers only. Global average initialization time when using GPS, GLONASS, Galileo, and BeiDou, available globally via IP and regionally via L-band satellite.

Trimble Survey GNSS Receivers		Accuracy[1]	Convergence Time (Fast Regions)[1]	Convergence Time (Global)[2]
CenterPoint RTX	R12i, R12, R10-2*, R750, R780	2 cm Horizontal 5 cm Vertical	< 1 min	< 3 mins
xFill Premium	R12i, R12, R10-2*, R750, R780	3 cm Horizontal 7 cm Vertical	< 1 min	< 3 mins

**IP Only
[1]RMS performance based on repeatable in field measurements. Achievable accuracy and initialization time may vary based on type and capability of receiver and antenna, user's geographic location and atmospheric activity, scintillation levels, GNSS constellation health and availability and level of multipath including obstructions such as large trees and buildings.

Trimble MGIS GNSS Receivers		Accuracy[1]	Convergence Time (Fast Regions)[1]	Convergence Time (Global)[2]
CenterPoint RTX	R2, R750, R780	2 cm Horizontal 5 cm Vertical	< 1 mins	<3 mins
CenterPoint RTX	SP60	4 cm Horizontal 9 cm Vertical	< 5 mins	<3 mins
FieldPoint RTX	SP20	10 cm Horizontal	< 1 mins	<3 mins
ViewPoint RTX	PG-200	50 cm Horizontal	< 5 mins	

Subscriptions

What types of Trimble RTX subscriptions are available?

Trimble offers different levels of accuracy to suit your requirements. For information on specific subscriptions available in your region, please contact your local Trimble Dealer, Trimble Customer Care.

positioningservices.trimble.com/contact/ or visit our online store at **tpsstore.trimble.com**

How are Trimble RTX correction services activated?

After purchasing your RTX subscription it can be activated either over-the-air (OTA) or through a manual passcode entry on your GNSS receiver.

- **Over-The-Air Activation:** This is an activation that is sent via satellite and/or Internet directly to the receiver. Once this activation is received, the service will be ready to use.
- **Manual Activation:** With manual activation, an activation passcode is emailed to you when you purchase a Trimble RTX subscription. You then key this passcode into your receiver to activate your subscription, which can be used right away.

I missed the over-the-air activation. What can I do?

If you received a passcode, you may manually enter the passcode into the receiver. You may resend the OTA activation yourself at **resend.trimble.com** You may also contact your local Trimble reseller or Correction Services Customer Care and request the activation broadcast be re-sent. Please have your account information and/or serial number on hand when contacting Customer Care

Does Trimble automatically renew my subscription?

Your subscription will automatically renew if you are enrolled in Automatic Renewal. For more information, contact Correction Services Customer Care. If you are not enrolled in Automatic Renewal, you'll need to renew your subscriptions by going to **tpsstore.trimble.com** or contacting Correction Services Customer Care.

More information about auto-renewal can be found in our Terms & Conditions:

trimble.com/TPS_Terms

How will I know when my current subscription will expire?

You will receive a renewal notice about 4-6 weeks before your subscription is due to expire advising you of your expiration date and the renewal process. All subscription information is also available by logging into your account on **tpsstore.trimble.com**

Most receivers will show the expiration date on the display or user interface. If you are unsure on how to find this, you can contact Correction Services Customer Care and a member of our team will be able to advise you.

Purchasing and Support

Are there Trimble RTX demo subscriptions available?

Free 30-day demo subscriptions are available for all compatible receivers. This can be generated **here** or by contacting Correction Services Customer Care.

How do you purchase Trimble RTX services?

You can purchase Trimble RTX correction services through the **online store**, through a local **Trimble dealer** or by contacting **Trimble Customer Care** by phone or email. Subscriptions can be managed directly through the online store.

How much will Trimble RTX services cost for my device?

Pricing is available on the Positioning Services online store at: **tpsstore.trimble.com**

Please contact your local Trimble dealer or Correction Services Customer Care for any further details.

What kind of customer support is available for Trimble RTX correction services?

With regional offices worldwide, phone and email support is available anytime.

For more information and contact details, refer to **http://www.trimble.com/positioning-services/contact-us.aspx.**

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