

Contact Details

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RTN Web Portal: C4Gnet.XYZ
C4G Website: C4G.LSU.EDU
C4G Webstore: STORE.C4G.LSU.EDU

LSU C4G Best Practice Videos are available on YouTube
[youtube.com/user/LSUC4G](https://www.youtube.com/user/LSUC4G)

Topics you will find include the following and much more...

Determining Elevations with GNSS

- ◆ Coastal Issues Facing Southeast Coastal Louisiana What to Do? (Tim Osborn, NOAA)
- ◆ Subsidence in the Gulf Coast (Dr. R. Dokka, LSU)
- ◆ Vertical geodetic control in southern Louisiana: Providing the National Spatial Reference System in dynamic regions (Ms. R. Shields, NGS)
- ◆ Introduction to GNSS (Mr. C. Mugnier, LSU)
- ◆ Guidelines for establishing GPS-derived ellipsoid heights: NGS Technical Publication 58 (Mr. D. Zilkoski, Director-Emeritus, NGS)
- ◆ Guidelines for establishing GPS-derived orthometric heights: NGS Technical Publication 59 (Mr. D. Zilkoski, Director-Emeritus, NGS)
- ◆ Improvements to the Geoid model (Dr. G. Mader, NGS)
- ◆ OPUS products (Dr. M. Schenewerk, NGS)

Real-time Kinematic Surveying and Best Practices

- ◆ RTK best practices (Mr. W. Henning, NGS)
- ◆ Introduction to Real-time GNSS networks (Dr. R. Dokka, LSU)
- ◆ NGS support for Real-time networks (Mr. W. Henning, NGS)

Information provided in this document is intended as a guide only and its accuracy is not guaranteed.



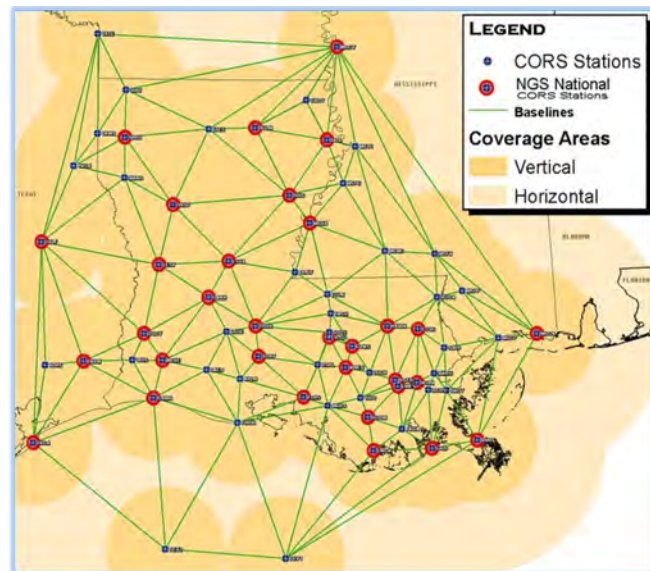
The cover of the "RTN INFORMATION & USER GUIDE" is a vertical rectangle with a dark blue background. At the top left is a logo of a person with arms raised over a map of Louisiana. To the right of the logo, the title "RTN INFORMATION & USER GUIDE" is written in large, white, sans-serif font. Below the title, there is a horizontal band with a yellow background on the left containing the C4G logo (a blue circle with horizontal lines) and the text "C 4 G". To the right of this band is a purple background with the text "LSU Center for Geoinformatics" in white. The right half of the cover features a large, vibrant image of the Earth from space, with the text "C4Gnet.XYZ" in large white font across the top. At the bottom right, the slogan "Positioning Louisiana for the future" is written in a white, italicized font. The bottom left corner shows a satellite constellation orbiting the Earth.

What is a CORS?

Most people are now familiar with the use of Global Navigation Satellite Systems (GNSS) like the ones used for in-car and handheld navigation. They calculate position using signals from GNSS, such as the United States' Global Positioning System (GPS), and have an accuracy of somewhere between a few and several tens of meters. This is the result of minute errors in the satellite orbits, the clocks installed in the satellites and receivers, as well as the tendency for the earth's atmosphere to bend or delay the GNSS radio signal. There are, however, GNSS receivers used by surveyors and researchers which can be used to accurately calculate position at the centimeter level. To obtain this accuracy these receivers and associated software *need to be able to* include sophisticated error corrections in their position calculations.

A Continuously Operating Reference Station “**CORS**” is a high precision GNSS antenna/receiver set on a stable monument. While continuously logging position data, the CORS are used to generate the information needed by high precision GNSS receivers for error corrections in real-time or post processing.

How GULFNet became C4Gnet



C4Gnet Stations at roll-out December 2011

LSU Center for Geoinformatics (C4G) was created by founding director Dr. Roy K. Dokka & LSU's College of Engineering in 2001, C4G became the home of Louisiana Spatial Reference Center (LSRC), in 2002 through a partnership with NGS-NOAA to create a CORS infrastructure across the state of Louisiana. These CORS provided the positional infrastructure needed for a state-of-the-art active control network that C4G used to re-establish the National Spatial Reference System (NSRS) within the state as defined and managed by the National Geodetic Survey (NGS). In 2007 C4G launched a Real-time Network (RTN) utilizing LSRC's state-wide active control networks' GPS CORS infrastructure and called it GULFNet.

GULFNet was based on a constrained adjustment of

a prior NGS reference frame NAD 83 (CORS96) Position (Epoch 2002.0) which was the basis for the NAD 83(2007) adjustment. NGS stopped supporting this reference frame on July 15th, 2012. In anticipation of the reference frame change, C4G launched a second RTN named C4Gnet, running on a newer infrastructure software and a constrained adjustment to the coming NGS reference frame. This allowed users to work in either reference frame by logging into GULFNet or C4Gnet. Once NGS stopped support for the prior (CORS96) reference frame, C4G took the GULFNet RTN offline and reconfigured equipment to become redundant servers for the C4Gnet RTN, and all GULFNet RTN clients were switched over to the C4Gnet RTN on or before July 15th, 2012. C4Gnet RTN data are always based on the current NGS CORS reference frame coordinates which are presently NAD 83(2011) Position (Epoch 2010.00) adjustment. The C4Gnet RTN currently runs on Trimble's Pivot Platform which supports multiple reference frames within the infrastructure software making transitions to future reference frames simple and painless for everyone.

Glossary of Terms

Term	Definition
GNSS	<i>Global Navigation Satellite System</i> - A satellite navigation or SAT NAV system is a system of satellites that provide autonomous geo-spatial positioning with global coverage. As of October 2011, the United States NAVSTAR Global Positioning System (GPS), the Russian GLONASS, European Galileo and Chinese BeiDou are fully globally operational GNSSs.
GRIM	<i>Geometric Residual Integrity Monitoring</i>
IRIM	<i>Ionospheric Residual Integrity Monitoring</i>
GULFNet	The CORS system offered in Louisiana prior to December 1, 2011.
LSRC	<i>Louisiana Spatial Reference Center</i> - Founded in 2002 by C4G with a grant from NOAA to establish a network of high precision GPS reference stations throughout Louisiana.
Machine Guidance	A system which utilizes positioning information to guide or auto-steer machinery along a specified path.
Mountpoint	Mountpoints define the format GNSS corrections are sent to your rover. Before transmitting GNSS data to a rover, you must select mountpoint from the source table generated by the host NTRIP Server.
NRTK	<i>Network RTK</i> - An enhancement of RTK which utilizes data from multiple CORS to provide a uniform level of accuracy across the network.
NTRIP	<i>Networked Transport of RTCM via Internet Protocol</i> - A method for streaming RTCM messages over the internet.
PPP	<i>Precise Point Positioning</i> - a GNSS positioning method to calculate very precise positions using a single (GNSS) receiver. PPP approach combines precise clocks and orbits calculated from a global network to calculate a precise position with a single receiver.
RINEX	<i>Receiver Independent Exchange</i> - An international standard for the storage of GNSS data.
RTCM	<i>The Radio Technical Commission for Maritime Services</i> - An international standard for real-time data streaming of GNSS data.
RTK	<i>Real Time Kinematic</i> - A sophisticated method of processing GNSS data to achieve centimeter level accuracies.
RTX	RTX Technology infrastructure is a unified framework for estimating satellite parameters for any GNSS satellite.
RTXNet	Is a processor that uses PPP in real-time to provide comprehensive GNSS solutions using GPS, GLONASS, Galileo, Beidou and QZSS
VRS	<i>Virtual Reference Station</i> - A method of processing Network RTK which generates virtual data from data collected at nearby CORS for a specified location.

Glossary of Terms

Term	Definition															
BeiDou	The Chinese BeiDou Navigation Satellite System is named after the Big Dipper asterism, which is known in Chinese as Běidǒu. The name literally means "Northern Dipper", the name given by ancient Chinese astronomers to the seven brightest stars of the Ursa Major constellation.															
CMR	<i>Compact Measurement Record</i> - A Trimble proprietary format for real-time data streaming, designed for RTK applications and radio transmissions with low bandwidth. Published in 1996 it holds messages for observations, position, antenna and Primary Base Stations.															
CMRp	<i>Compact Measurement Record plus</i> - A Trimble proprietary format for real-time data streaming, position is trickled over 10 epochs for further bandwidth savings. Commonly used in agricultural and construction applications.															
CMRx	<i>Most recent, strictly Trimble proprietary format</i> - Published in 2009 is for real-time data streaming using orbit information to highly compress data on encoding and decoding position, antenna, PBS and VRS residuals are trickled over several epochs (8 per default). Designed for current and future GNSS systems and applications															
	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="background-color: #d9e1f2;">Format</th> <th style="background-color: #d9e1f2;">Bytes</th> <th style="background-color: #d9e1f2;">Compression levels in C4Gnet</th> </tr> </thead> <tbody> <tr> <td>RTCM</td> <td>32000</td> <td>1 minute of data, Single Station (no PBS, no VRS residuals)</td> </tr> <tr> <td>RTCM 3.x</td> <td>12600</td> <td>11 satellites</td> </tr> <tr> <td>CMR (CMR+)</td> <td>12000</td> <td>Position and antenna every 8 epochs (or trickled over 8 epochs)</td> </tr> <tr> <td>CMRx</td> <td>5500</td> <td></td> </tr> </tbody> </table>	Format	Bytes	Compression levels in C4Gnet	RTCM	32000	1 minute of data, Single Station (no PBS, no VRS residuals)	RTCM 3.x	12600	11 satellites	CMR (CMR+)	12000	Position and antenna every 8 epochs (or trickled over 8 epochs)	CMRx	5500	
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CMRx	5500															
CORS	<i>Continuously Operating Reference Station</i> - An installation that is precisely located and continuously observing GNSS data. Arrays of CORS are often linked together as part of a network to deliver precise positioning solutions over large areas.															
DGNSS	<i>Differential GNSS</i> - A basic method of processing GNSS data to achieve sub-meter level accuracies (often referred to as DGPS).															
DGPS	<i>Differential GPS</i> - A basic method of processing GNSS data to achieve sub-meter level accuracies.															
DSC	<i>Dynamic Station Coordinates</i> - uses Trimble RTX technology to compute the so-called "Dynamic Station Coordinates" for each reference station. These coordinates are dynamically re-computed and updated to best fit the reference stations' position.															
C4Gnet.XYZ	The CORS system offered in Louisiana since December 1, 2011.															
GALILEO	Galileo went live in 2016, created by the European Union through the European Space Agency (ESA), operated by the European Union Agency for the Space Programme (EUSPA), the project is named after the Italian astronomer Galileo Galilei.															
GLONASS	GLO bal'naya NA vigatsionnaya S putnikovaya S istema – This is the name of the satellite-navigation network maintained by the Russian government. The English translation of this name is "GLObal NAVigation Satellite System," or more commonly named "GLONASS."															

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Surveying Application of C4Gnet RTN



Features behind C4Gnet.XYZ Services

RTX Technology RTXNet Processor

If you are interested in how the technology used to deliver C4Gnet.XYZ's services actually work, please read the following information on the software features running in the background.

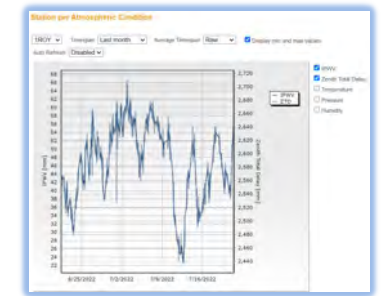
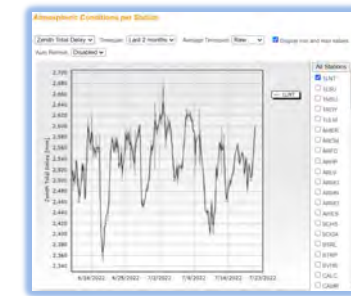
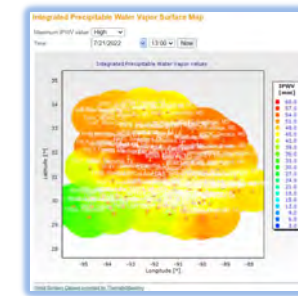
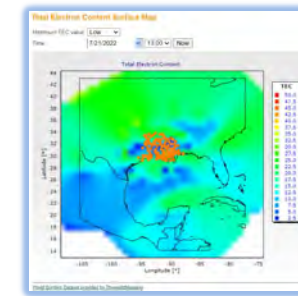
RTX Technology

The RTX Technology infrastructure is a unified framework for estimating satellite parameters for any GNSS satellite. Trimble RTX Technology is revolutionizing global access to high accuracy positioning by creating a system using a worldwide GNSS network to estimate centimeter level real-time satellite orbit and clock corrections and delivers them to any point on earth via satellite broadcast or the Internet. Using multiple network operations centers and redundant communication links, RTX Technology's infrastructure ensures the availability of corrections to users across the globe. GNSS field receivers use advanced Precise Point Positioning (PPP) processing algorithms to combine RTX corrections with local measurements and produce cm-level accurate absolute positions. RTX corrections are used in a variety of real-time and post-processed positioning applications. RTX based precise absolute positioning is especially useful in remote regions or for coordinate monitoring in locations subject to seismic or subsidence activity.

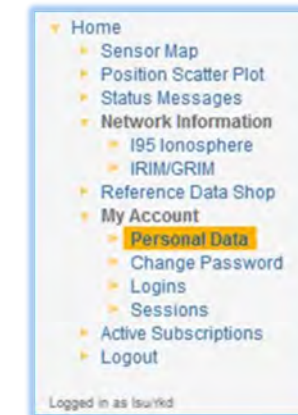
RTXNet Processor

RTX Technology enables the RTXNet Processor to develop corrections for a full range of satellite systems and delivers Network-RTK corrections for GPS, GLONASS, BeiDou, Galileo, and QZSS. Complete GNSS Network-RTK corrections are available in the industry standard RTCM 3.2 format, Trimble's CMRx format, or the CMR format. Trimble's RTX Technology also improves robustness when working with weak satellite signal transmission or reception and reduces the time to identify and respond to satellite system or signal integrity issues, allowing the delivery of the most complete, reliable, and accurate corrections possible to users. The RTXNet Processor enables real-time network operators to manage stable, highly reliable networks of virtually any size with full multi-GNSS support, now and in the future.

The RTXNet Processor uses satellite corrections to perform independent processing of reference station data. During processing, additional corrections are applied to measurements, including satellite code bias calibrations, corrections for the yaw angle of the satellite antenna, phase wind-up in the signal path, and the effect of the pole tide. Geometric and ionospheric error models used in Network-RTK corrections are derived from processed observation residuals. This new processing architecture significantly reduces server CPU loading. The RTXNet processing technique also results in increased tolerance for varying station spacing. This allows data from regions with dense station spacing to be processed with data from regions with wider spacing and even allows a single network processor to handle two or more separate networks. The ability to process very large or mixed geometry networks in Network-RTK mode on a single server and deliver full range real-time GNSS network modeled RTK corrections is unmatched in the industry. This allows very large networks or a combination of networks to be processed by a single module on one server with full GNSS correction support.

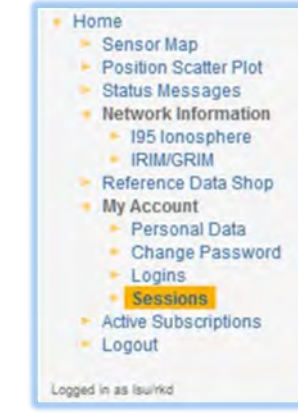


My Account: Personal Data



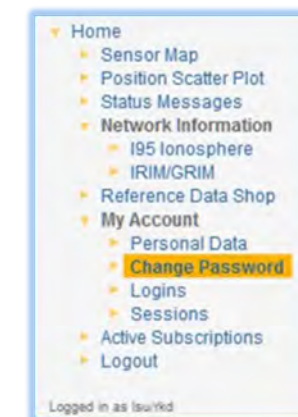
This link allows you to change your personal data for your primary login. Please keep your Personal Data and Profile up to date so we can communicate with you when needed.

My Account: Sessions



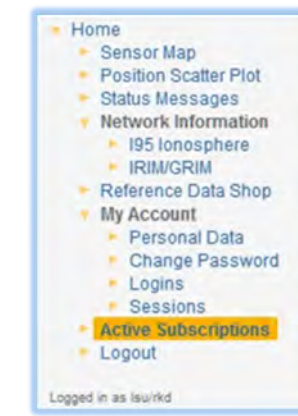
This link allows you to view your C4Gnet RTN usage history over various periods of time. Usage history is summarized in terms of total organization usage, total login usage and total resource usage (e.g. RINEX or real-time).

My Account: Change Password



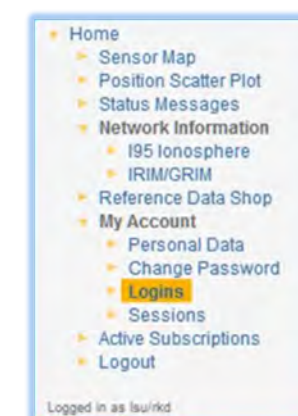
This link allows you to change the password for your primary login. It is advisable to regularly change your password to maintain security.

Active Subscriptions



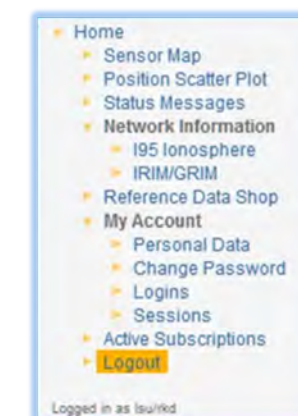
Click on this link to view your current valid subscriptions. Click on **Details** to view further information.

My Account: Logins



Here you are able to view your primary login and supplementary real-time logins. By clicking on one of the logins you are able to change its password. It is advisable to regularly change your password to maintain security.

Logout



This link will take you back to the logged out environment home page. Click on **Logout** once you have completed accessing C4Gnet RTN data and information.

Here you can choose to download the data or send it via email. Please be aware that the data files are quite large and may be blocked by email systems. You also have the choice of downloading the data in a number of formats. These are RINEX 2.11, RINEX 3.0, DAT, TGD, T01 and T02. While the RINEX formats should be recognized by most software packages, the last four options are not international standards but may be of use to some users. When your delivery options selection is complete click **Next: Generate Data >>**.

A table indicating the **Processing Status** of the order will appear. You can close this screen and the data generation will still continue. For large orders it may be preferable to return at a later time to retrieve the data once this generation is completed. Once the data generation is complete, click on **Next: Order Details >>**.

Here you will see a summary of the order including the completeness of the data. Select an order item and click on **Details** to see further information. Click on **Remove** to delete an order item from the list. Click on **Download** or **Send by e-mail** to retrieve the data.

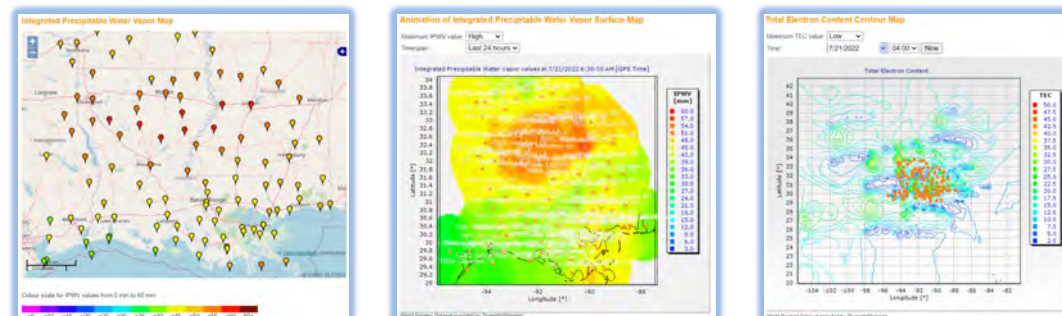
Station	Start time	End time	Duration (min.)	Interval (sec.)	Epochs req./available	Eff. Minutes	Price
1LSU, Baton Rouge, LA	12/8/2011 8:00 PM	8:30 PM	30	15	120 / 120	30	0.00
Total:			30		120 / 120	30	0.00

The data will be delivered in a compressed zip file. Within the zip file you will find three RINEX files: the observation file and navigation files for each station-session chosen. You will also find a text file which summarizes the data ordered including the completeness of the data.

Atmospheric Conditions

- Home
- Sensor Map
- Position Scatter Plot
- Status Messages
- Network Information**
 - I95 Ionosphere
 - IRIM/GRIM
- Online Post Processing
- Reference Data Shop
- Atmospheric Conditions**
 - IPWV Map**
 - Station Chart
 - Condition Chart
 - IPWV Contour Map
 - IPWV Surface Map
 - IPWV Surface Map Animation
 - TEC Contour Map
 - TEC Surface Map
 - TEC Surface Map Animation

This tool will let you see the current and historical weather conditions at any station in the RTN. This tool currently tracks Integrated Precipitable Water Vapor and Total Electron Content. If you need to see how the weather conditions may have impacted data you collected, this is a good place to find out what was happening anywhere our coverage area.



The RTXNet Processor incorporates RTX Technology as the core of a Network-RTK solution that supports the expanding range of GNSS systems and signals while at the same time reducing the network processing CPU load. Our new RTXNet Processors deliver the next generation of real-time GNSS network modeling taking full use of all available GNSS signals, i.e. - GPS, GLONASS, Galileo, Beidou and QZSS. Rovers connected to mountpoints using RTXNet-based processors are sent corrections based on advanced Precise Point Positioning (PPP) processing algorithms to combine RTX corrections with local measurements and produce cm-level accurate absolute positions.

As illustrated above, our RTXNet Processors currently deliver additional satellites from Galileo and BeiDou in solutions sent to rovers connecting to our new PPP mountpoints in the formats of CMRx or RTCM 3.2 Multi-Signal Message (MSM). Rovers wishing to take advantage of these additional SV's need to connect to a PPP mountpoint that delivers corrections in CMRx or

VRSNet Processor

Station Name	Station	Tracke	Processed	Solved
1NSU, Natchitoches, LA	1NSU	18	16	16
AMER, Amerada Pass, LA	AMER	16	16	16
AWES, Donaldsonville, LA	AWES	16	16	16
BCHS, Belle Chasse, LA	BCHS	16	16	16
BSRL, Bayou Sorrel, LA	BSRL	16	16	16
CALC, Calcasieu Pass, LA	CALC	16	16	16
COVG, Covington, LA	COVG	16	16	16
CYPR, Cypremort Point, LA	CYPR	16	16	16
DOTD, Baton Rouge, LA	DOTD	16	16	16
DQCY, Dequincy, LA	DQCY	16	16	16
DSTR, Destrehan, LA	DSTR	16	16	16

RTXNet Processor

Station Name	Station	Tracke	Processed	Solved
1NSU, Natchitoches, LA	1NSU	38	35	30
AMER, Amerada Pass, LA	AMER	39	37	33
AWES, Donaldsonville, LA	AWES	39	37	32
BCHS, Belle Chasse, LA	BCHS	37	35	32
BOGA, Bogalusa, LA	BOGA	29	27	23
BSRL, Bayou Sorrel, LA	BSRL	38	37	33
BVHS, Boothville, LA	BVHS	39	37	32
CAMR, Cameron, LA	CAMR	38	37	30
COVG, Covington, LA	COVG	34	34	30
CYPR, Cypremort Point, LA	CYPR	39	37	32
DOTD, Baton Rouge, LA	DOTD	39	36	31

RTCM 3.2 Multi-Signal Message (MSM) format.

Using a PPP mountpoint also gives your rover a second real-time processing method to collect data. By taking a point with a PPP mountpoint and then with a VRS mountpoint, you can compare these positions as a way to check data collected within real-time! If data collected with both PPP and RTK agree, you have a very high confidence that the data collected is accurate.

Please Note: VRS RTK mountpoints only support GPS and GLONASS constellations currently, only our PPP mountpoints in CMRx or RTCM 3.2 MSM formats currently have the ability to support GPS, GLONASS, Galileo and BeiDou satellite constellations.

C4Gnet.XYZ Web Portal Features

Log into the C4Gnet.XYZ Web Portal to access the following tools that help clients interact with C4Gnet.XYZ services.

Positioning Tools:

- GNSS Online Post Processing (OPP)
- VRS iScope and iScope Live!
- Real Time RTXnet Processor using Precise Point Positioning (PPP)
- New Mountpoints and a new mountpoint naming convention
- Atmospheric Conditions Monitoring Tools

Online Post Processing (OPP)

- Home
 - Sensor Map
 - Position Scatter Plot
 - Status Messages
 - Network Information**
 - I95 Ionosphere
 - IRIM/GRIM
 - Online Post Processing
 - Reference Data Shop
 - My Account**
 - Personal Data
 - Change Password
 - Logins
 - Sessions
 - VRS iScope
 - VRS iScope Live!
 - Active Subscriptions
 - Logout
 - User Guide
 - External Links
 - C4G
 - Trimble

C4Gnet GNSS Online Post Processing is an OPUS-like online post processing service that allows you to upload raw static GNSS observation data and receive absolute positioning calculations based on reference stations in the C4Gnet network. Note that the C4Gnet GNSS Online Post Processing service **uses GPS, GLONASS, Galileo and BeiDou satellite data** and has access to all of the LSRC CORS network of over 100 reference stations, whereas the NGS OPUS tool is limited to only 31 LSRC CORS reference stations.

Supported data formats are RINEX 2.xx, RINEX 3.xx, Hatanaka- compressed RINEX files and Trimble proprietary data formats (DAT, TGD, T01 and T02). Data files must be a minimum of 10 minutes of static only (no kinematic) and data files must contain

dual frequency pseudorange and carrier phase observations (L1 and L2).

If your observation data consists of several files from the same station, please compress them to a ZIP archive and upload the zipped file. All files inside the archive must belong to the same station and have identical header information regarding receiver type and antenna type as these are read from your file and entered automatically and will appear in the order solution report.

The user interface is quite simple, just hit the Browse button and select a file to upload, enter your email address and hit Submit. If you hit the My Orders link in the header menu you will find a list of your Orders in Progress and Processed Orders. The C4Gnet GNSS OPP system automatically sends notices with links to the solutions to the email you entered when submitting the order but links to the XDF and PDF copies of the reports can be found under your My Orders listings.

Solution datums are NAD83-2011 @ epoch 2010.00 and include Ellipsoidal and Orthometric heights, X, Y, Z and Lat/Lon. NAVD88 and GEOID18 (Conus) are used for the Orthometric heights.

C4Gnet GNSS Online Post Processing Report

Order Information
 Order ID: 10512
 Uploaded File(s): 1LSU2011P00.220
 Upload date: 07/20/2022 17:38:31 UTC
 Receiver: TRIMBLE ALLOY
 Antenna: TRM15000.00 NONE
 Height [m]: 0.000
 Reference: Bottom of antenna mount

Processing Information
 Session: 07/20/2022 15:00:00 UTC
 Start time: 07/20/2022 15:29:45 UTC
 End time: 07/20/2022 15:29:45 UTC
 Solution type: Static
 Processing interval: 30 s
 Ephemeris type(s): Broadcast
 Reference frame: NAD83-2011
 Tectonic plate: North America

Station Code	Distance [km]	Observations (# total / # usable / # used) satellites
1LSU	0.00	1786 / 60 / 100% 11 GPS / 8 GLN / 7 GAL / 2 BDS
DOTD	5.76	1786 / 60 / 100% 10 GPS / 8 GLN / 7 GAL / 2 BDS
ZACH	26.78	1786 / 60 / 100% 11 GPS / 6 GLN / 7 GAL / 2 BDS
GVMS	28.52	1786 / 60 / 100% 11 GPS / 6 GLN / 7 GAL / 2 BDS
BSRL	33.29	1786 / 60 / 100% 11 GPS / 6 GLN / 7 GAL / 2 BDS
AWES	38.99	1786 / 60 / 100% 11 GPS / 6 GLN / 7 GAL / 2 BDS

Final Results for: 1LSU
 NAD83-2011 @ epoch 2010.00
 Measurement method: Antenna Ground Point (AGP)
 Geoid model: GEOID18 (Conus)

Coordinate	Value	σ [m]
X [m]	-113402.135	0.003
Y [m]	-5304302.749	0.008
Z [m]	3209404.339	0.005
Latitude	30° 24' 26.70974" N	0.003
Longitude	91° 10' 48.91344" W	0.003
Ellipsoidal height [m]	-5.278	0.009
Orthometric height [m]	21.791	0.009

Report Information
 Software version: 4.7.2
 Creation date: 07/20/2022 17:39:03 UTC

LSU Center for Geoinformatics
 C4Gnet.XYZ Web Portal Post-Processing My Orders Admin

Welcome to the C4Gnet.XYZ Online Processing service.
 This service allows you to upload GNSS observation data and receive absolute positioning calculations based on the reference stations in the network.

Additional information and requirements:

- Supported data formats are RINEX 2.xx, RINEX 3.xx, Hatanaka-compressed RINEX files, Trimble proprietary data formats (DAT, TGD, T01 and T02).
- Data files must be static only.
- Data files must contain dual frequency pseudorange and carrier phase observations (L1 and L2).
- If your observation data consists of several files, please compress them to a ZIP archive and upload the zipped file. All files inside the archive must belong to the same station and have identical header information regarding receiver type and antenna type.

Select a file to upload (.t01, .t02, .7to, .tgd, .dat, .zip)
 Browse

Your email address:
 rosbor1@lsu.edu

Overwrite rod height in file

Submit Reset

Reference Data Shop - Date & Time Selection

You have selected the following reference station(s):

1LSU, Baton Rouge, LA

Please enter your desired observation period:

Observation Period	
Date:	12/8/2011
Start time:	20 h 0 m 0 s
Duration:	0 h 30 m
Interval:	1 s
Time system:	GPS
<input style="width: 150px;" type="button" value=" << Back: Reference Stations "/> <input style="width: 150px;" type="button" value=" Next: Add to order >> "/>	

Select the date, start time, duration and interval. Please note that the time system used is GPS time and not a standard zone such as Central Standard Time. You will need to add 6 hours to Central Standard Time (or five hours to Daylight Savings Time) to determine the appropriate GPS time.

Once your **Time Selection** details are complete click **Next: Add to order >>**.

Reference Data Shop - Your current Order

The following items are currently in your order. You may add further items, remove items or proceed with delivery options and data generation.

	Station	Start time	End time	Duration (min.)	Interval (sec.)	Epochs	Est. Price*
<input checked="" type="radio"/>	1LSU, Baton Rouge, LA	12/8/2011 8:00 PM	8:30 PM	30	15	120	0.00
Total:				30		120	0.00

Applying to selected item:

Choose the login on which to book the order: Oz

* Note: The displayed price is just an estimate. The true price may be lower due to missing epochs and cannot be determined until the final GNSS data files are generated.

All times are in the GPS time system.

Here you can either select to add additional order items through a number of options. Ensure you book the order under your primary login as real-time logins do not have access to **Reference Data Shop** data. **Note: Data is Unlimited, so no additional fees apply.**

Once your order is complete, click **Next: Delivery Options >>**.

Status Messages

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Logged in as lsu/rkd

Status messages are used to inform users of important information about C4Gnet RTN. Three levels of messages exist: **Info**, **Warning** and **Alert**. These will be highlighted **green**, **yellow** and **red** respectively to indicate the severity of the message. **Info** messages will be used to inform users of general news and tips for using C4Gnet RTN. **Warning** messages will be used to inform users of planned maintenance and any issues associated with C4Gnet RTN. **Alert** messages will be used for major issues and unplanned outages of service.

Users are advised to subscribe to the RSS feed to ensure that they keep up to date with the latest information available. This feed can be accessed by some mobile phones in the field.

Subject	Description	Start Date	End Date	Severity
Network Software Upgrade	Version 1.4.1 of VRS3Net and Web Advanced have been installed and are currently online. We will be converting all of the current GPSNet accounts over to VRS3Net and sending login information by email.	10/22/2011	12/31/2011	Info

Reference Data Shop

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Logged in as lsu/rkd

This is where you can access archived GNSS data as RINEX files or alternatively in a number of other formats in whatever durations and interval you desire.

The first time you access the **Reference Data Shop** you will be asked to start a new order. After that you will be given the options of choosing to **View/submit order**, **Add order items** or **Cancel** order. You can also view a list of orders not yet downloaded and already downloaded orders. When ordering data you are given the option of ordering **Continuously Operating Reference**

Reference Data Shop - Reference Stations

Choose the login on which to book the order: Admin

Choose one or more reference stations by clicking in the list or in the map. If you want to select multiple stations from the list, press and hold down the CTRL key and click with the mouse.

Available Reference Stations

- COVG, Covington, LA
- CYPR, Cypremont Point, LA
- DEV1, Eugénie Island, LA
- DOTD, Baton Rouge, LA
- DQCY, Dequincy, LA
- DSTR, Destrehan, LA
- FBCH, Fernandina Beach, FL
- FOLK, Jackson, LA
- FSMS, Franklin, LA
- FWTR, Freshwater Bayou, LA
- GRIS, Grand Isle, LA
- GVMS, Galvez, LA
- HAMM, Hammond, LA
- HOMA, Houma, LA
- HOUR, Houma, LA
- INRI, Loyola University, NO, LA
- KPLN, Kaplan, LA
- LAES, Lake Arthur, LA
- LESV, Leesville, LA
- LMCN, Cocodrie, LA
- LSUA, Alexandria, LA
- LSUE, Eunice, LA
- LTEC, Ruston, LA
- LUCH, Lusher, LA
- LWES, Luling, LA

<< Back: Station Type Selection | Next: Time Selection >>

Station (CORS) data or **Virtual Reference Station (VRS)** data. CORS data is the data observed at the CORS sites while VRS data is virtual data generated for a user specified location.

When selecting the **Reference Stations** for which you would like to download data, you can either select one or many stations from the list or select them by clicking on the map.

Once your selection is complete, click **Next: Time Selection >>**

C4Gnet GNSS Online Post Processing Report Layout



Center for GeoInformatics

C4Gnet GNSS Online Post Processing Report

http://C4Gnet.XYZ

Order Information

Order ID: 1051
 Uploaded file(s): 1LSU
 Upload date: 07/20/2022
 Receiver: TRIMBLE
 Name: TRIMBLE
 Antenna: TRM115000.00 NONE
 Name: TRM115000.00 NONE
 Height [m]: 0.000
 Reference: Bottom of antenna mount

Order Information

- Uploaded file
- Receiver and Antenna name
- Height (Reference)

Processing Information

Session: 07/20/2022
 Start time: 07/20/2022 17:39:03 UTC
 End time: 07/20/2022 17:39:03 UTC
 Solution type: Static
 Processing interval: 30 s
 Ephemeris type(s): Broadcast
 Reference frame: NAD83-2011
 Tectonic plate: North America

Processing Information

- Session start and end time
- Processing interval
- Reference frame and tectonic plate

Baselines

Station Code	Distance [km]	Observations	Used satellites
1LSU	0.00	11 GPS / 8 GLN / 7 GAL / 2 BDS	10 GPS / 8 GLN / 7 GAL / 2 BDS
DOTD	5.76	11 GPS / 8 GLN / 7 GAL / 2 BDS	10 GPS / 8 GLN / 7 GAL / 2 BDS
ZACH	26.78	1786 / 60 / 60 / 100%	11 GPS / 6 GLN / 7 GAL / 2 BDS
GVMS	28.52	1786 / 60 / 60 / 100%	11 GPS / 6 GLN / 7 GAL / 2 BDS
BSRL	33.29	1786 / 60 / 60 / 100%	11 GPS / 6 GLN / 7 GAL / 2 BDS
AWES	38.99	1786 / 60 / 60 / 100%	11 GPS / 6 GLN / 7 GAL / 2 BDS

Baselines

- Distance to processed CORS
- Observations
- Used satellites

Final Results for: 1LSU

Coordinate	Value	σ [m]
X [m]	-113402.135	0.003
Y [m]	-5504362.749	0.008
Z [m]	3209404.339	0.005
Latitude	30° 24' 26.70974" N	0.003
Longitude	91° 10' 48.91344" W	0.003
Ellipsoidal height [m]	-5.278	0.009
Orthometric height [m]	21.791	0.009

Final Results

- Geocentric coordinates
- Geographic coordinates
- Standard deviation

PLEASE NOTE!

C4Gnet GNSS Online Post Processing Measurement Method: Antenna Ground Point (AGP) assumes that you have input the correct antenna offset and subtracts this from the measured position by reading the offset from the data files you submit.

Report Information

Software version: 4.7.2
 Creation date: 07/20/2022 17:39:03 UTC

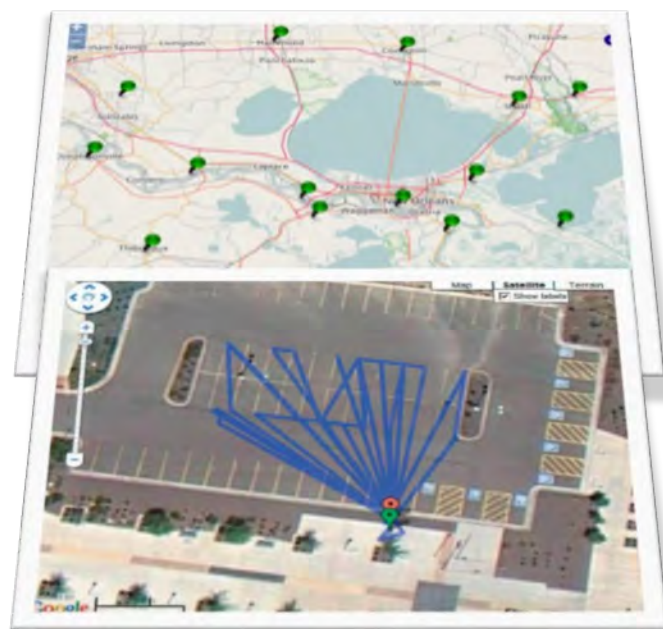
The LSU Center for GeoInformatics does not guarantee availability, reliability, and performance of this service and accepts no legal liability arising from, or connected to, the use of information in this document or use of this service.

VRS iScope and iScope Live!

- Home
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 - VRS iScope Live!
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 - Logout
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 - External Links
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 - Trimble

If you manage multiple field crew rover accounts the new VRS iScope Live! service provides an interactive map that can be used to view the location of your rovers that are currently logged into the RTN and receiving corrections.

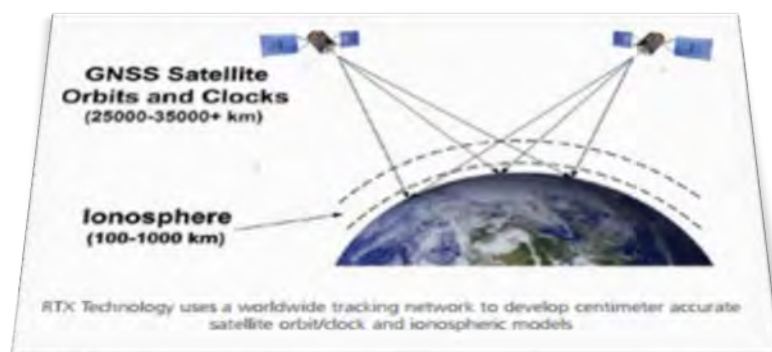
VRS iScope service provides a remotely accessible interactive map that shows recent rover sessions for each rover account and the current activity or the trajectory of recent sessions; making it easy for field crew managers to schedule, track, and manage projects more efficiently. These iScope tools are a great way for managers in the office to keep up with



their connected rovers in the field and review previous survey sessions for each rover account.

If you would like VRS iScope and iScope Live! added to your account, contact C4G by email and we will setup your accounts to access these rover monitoring tools.

Real Time RTXnet Processor using Precise Point Positioning (PPP)



Rovers can access the New RTXnet processors for their real-time data solutions using one of our New PPP mountpoints. These PPP mountpoints give rovers a second real-time method to collect data and/or to use as a real-time method of checking data collected with the real-time VRS RTK mountpoints. If data collected with both PPP and VRS agree, you will have a very high confidence that the data collected is accurate. Also while VRS mountpoints

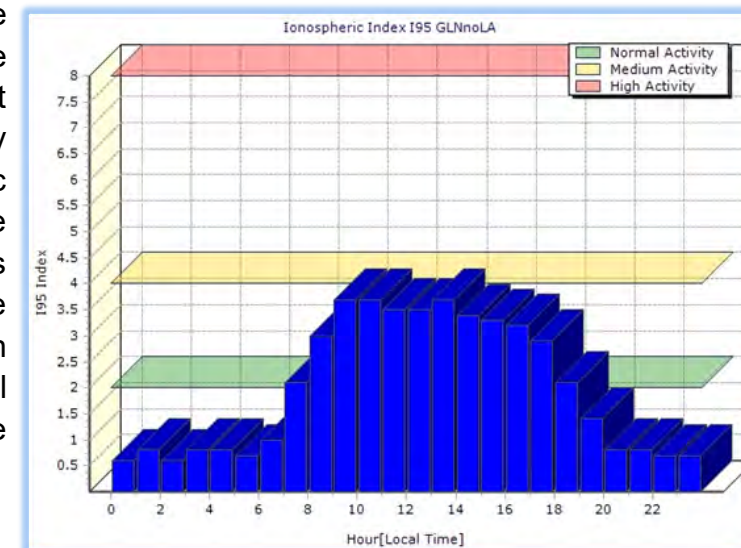
currently only support GPS and GLONASS constellations, C4Gnet's PPP CMRx and RTCM3.2 mountpoints currently support GPS, GLONASS, Galileo and BeiDou satellite constellations and are ready for other constellations if or when they are available in our coverage area. The additional constellations help with quicker initialization times and add additional satellites when rovers are in urban canyons or under canopy.

Note: Check with your GPS dealer to see if your rover is Galileo/BeiDou-ready in order for you to take full advantage of these additional Galileo and BeiDou satellites.

I95 Ionosphere

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The I95 Ionosphere link takes you to the Index 95 charts that reflect the intensity of ionospheric activity, i.e., the expected influences onto the relative GPS positions. Both current and historical I95 activity are available.



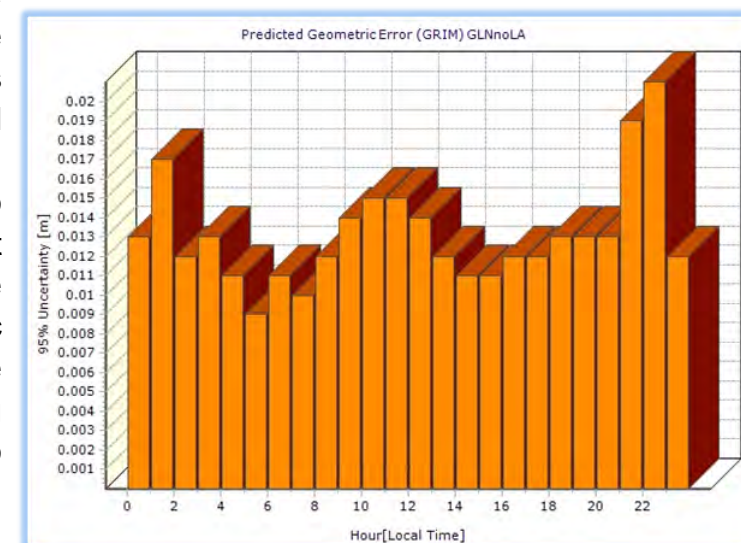
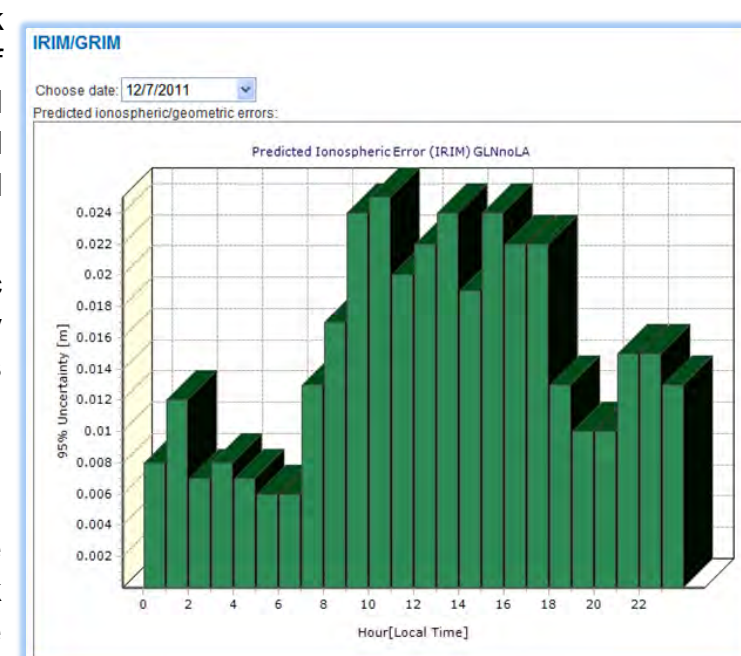
IRIM/GRIM 95

- Home
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 - I95 Ionosphere
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The IRIM/GRIM link takes you to charts of the current predicted and historical ionospheric and geometric errors.

IRIM is Ionospheric Residual Integrity Monitoring, GRIM is Geometric Residual Integrity Monitoring.

Under disturbed ionospheric condition, ionospheric residuals can not be considered as linear. The Network Processor module also describes the potential non-linear residual errors in the generated data stream transmitted to the user. This can also be considered as integrity monitoring for residual interpolation and ambiguity resolution in the network. It is a very useful tool to predict the rover performance. The C4Gnet Web Portal is the best way to find the current and historical predicted ionospheric and geometric errors. C4Gnet removes the linear parts of these effects by applying ionospheric and geometric corrections to the raw data.



Logged In Environment

Sensor Map



The Sensor Map link takes you to a dynamic map of all C4Gnet.XYZ RTN CORS stations. You can come here to check on the status of the network. The sensor map uses the OpenStreetMap application to visualize the location and health status of the sensors (GNSS Receivers) to users.

C4Gnet subscribers can click on the sensor symbols to see more information such as Station Overviews and other detailed reporting.

Station Overview	
Company:	LSU Center for Geoinformatics
Operator:	Admin
Address:	Room 200, Engineering Research and Development Building Baton Rouge, LA 70803 United States
Creation Date:	12/21/2022 12:54:57 PM
Time System:	Local time
Time Zone Name:	Coordinated Universal Time
Time Zone Offset:	00:00:00
Report Interval:	Start Time: End Time: Duration:
Station Specific Settings:	
LSU, Baton Rouge, LA	
Receiver:	TRIMBLE TRIMBLE ALLOY
Station ID:	101
Station name:	LSU, Baton Rouge, LA
Station code:	LSU
Reference position:	X = -113402.1723 m Y = -5504362.8128 m Z = 3209404.3673 m
Coordinate system:	NAD83-2011
Time reference epoch:	1/1/2000 12:00:00 AM
Tectonic plate:	North America
Velocity:	X = 0.0017 m/year Y = 0.0026 m/year Z = -0.0011 m/year
Antenna:	TRIMBLE TRM115000.00 NONE
Antenna height:	0.0000 m

C4Gnet RTN Rover Users Guide

How to Log-in to the NTRIP caster for real-time corrections

Registered users with active Subscriptions will be able to log in to the C4Gnet.XYZ NTRIP caster for real-time corrections for their field rovers using the following information in their NTRIP client settings:

Host Address: C4Gnet.XYZ

(if your rover will not accept a DNS for the host address, call 225 578-4609 or email rosbor1@lsu.edu for the current IP address. Note that using the direct IP address will disable the automatic failover feature therefore using DNS is preferable.)

Port Address: 9000

Once connected to the NTRIP caster your rover can request a list of available mountpoints.

What are Mountpoints?

A mountpoint defines the type of processor used, what satellite constellations are supported, the format of the correction messages and the reference frame that relates to a real-time data stream. When connecting to the C4Gnet Real Time Network, a mountpoint list is generated from which a user selects the desired mountpoint. If a mountpoint is hard coded in a rover setup the mountpoint list will not be displayed.

NOTE: All mountpoints except the legacy ones use this naming structure:

TYPE_SATS_FORMAT_REFERENCE FRAME

Also Note: The Legacy mountpoint names are obsolete!

Since legacy mountpoints like *GLN_RTCM3_2*, *GLN_CM Rx* and *GLN_NetDGPS* do not follow the new naming convention, it was hard to know what is being provided in their solutions. Therefore, some have been removed from the mountpoint list already and others will be removed soon.

If you currently use a legacy mountpoint, you must change to one of the new mountpoints using the new naming convention. While legacy mountpoints will work for a short while the same as the new ones, you will have to figure out what each one contains after connecting to it and since it will be removed soon, we recommend that you do not use them anymore and move to a new mountpoints ASAP.

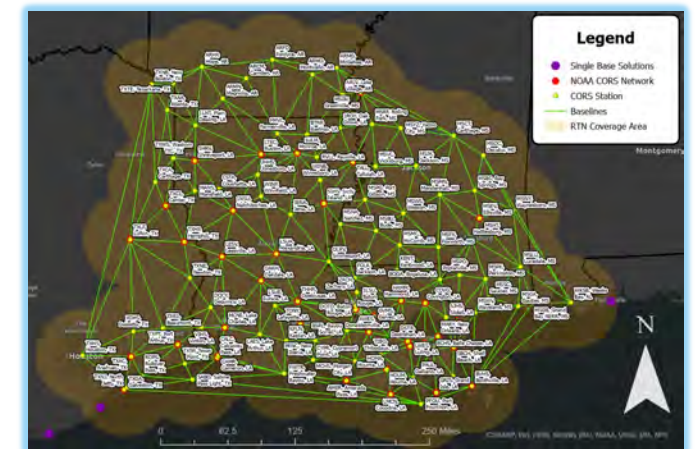
Like with all Global Navigation Satellite System-based positioning, C4Gnet RTN is related to orthometric datums like NAVD88 by way of a geoid model or through a local network adjustment; the latter is accomplished by including and holding fixed several NGS benchmarks with valid coordinates. C4Gnet RTN data are based on coordinates in IGS08 epoch 2005.00 and NAD 83(2011) Position (Epoch 2010.00) adjustment.

Using C4Gnet RTN in Real-time

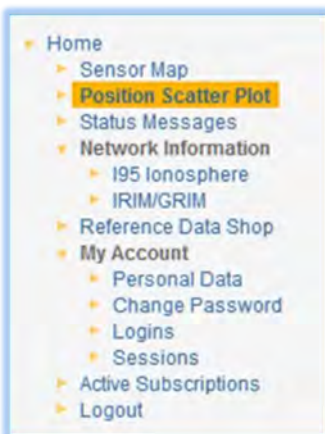
Live station status, coordinates & the current network solution coverage area are available on the **C4Gnet.XYZ** web portal by selecting the Sensor Map link from the left hand menu or by directing your browser to this address: <http://C4Gnet.XYZ/Map/SensorMap.aspx>.

You can also manage your real-time rover login passwords, get rover session details and update your personal data when logged into the C4Gnet RTN Web Portal. All of these options are located under the **My Account menu item**.

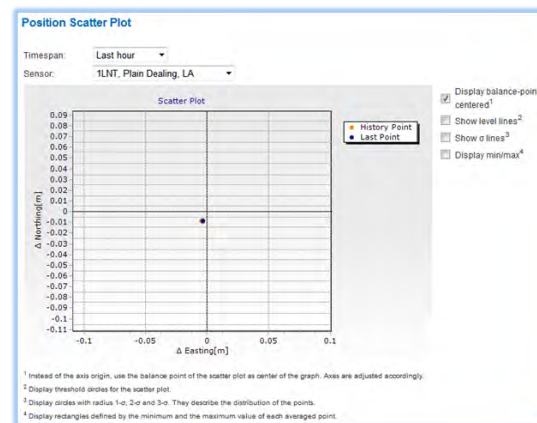
Real-time rover logins are in the format of **username** and **password** while web portal logins require **organization**, **username** and **password**. The number of concurrent real-time rover logins will depend on the number of subscriptions licensed by you.



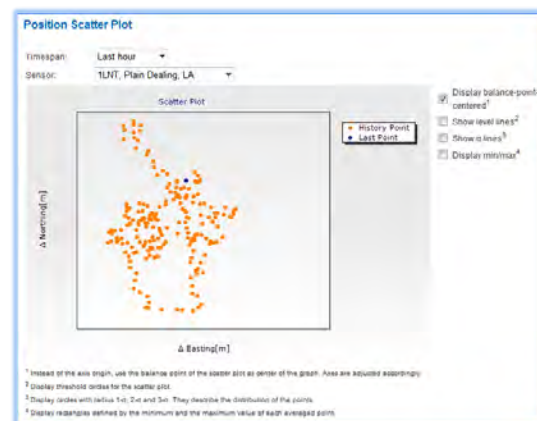
Position Scatter Plot



The Position Scatter Plot link takes you to a dynamic scatter plot of the station selected. This interactive tool lets you check in the 2D position of a station over a period of time that you set.



To zoom in and out you just drag a bounding box around the area you want to see. Start Top Left to Bottom right to Zoom In and Bottom right to Top Left to Zoom Out



PPP Mountpoints and Mountpoint Naming Convention for the C4Gnet.XYZ RTN

In order to differentiate between traditional VRS RTK solutions, Precise Point Positioning (PPP) RTX RTK solutions and Nearest Single Base RTK, we have added additional mountpoints to our RTN. Most mountpoints follow a naming structure that lets you know the solution type, satellite constellation(s), message format and reference frame that each mountpoint is using. Once you understand this naming structure you can easily choose any mountpoint and know exactly what kind of solutions are being sent to your rover.

New Mountpoint Naming Convention uses 4 Groupings:

(1)TYPE_(2)SATS_(3)FORMAT_(4)REFERENCE FRAME

Each character grouping is separated by an under bar before the next set of characters.

1. The first set of characters is the **SOLUTION TYPE**. **VRS**, **PPP** or **NSB** are the current processing methods that you can choose:

VRS or **Virtual Reference Station**: Uses a Network RTK Processor to create a Virtual Reference Station and applies network corrections in RTK accuracy from the parent processor to the receiver data.

PPP or **Precise Point Positioning**: Uses a Network RTXNet Processor to create a Virtual Reference Station and applies network corrections in RTK accuracy from the parent processor to the receiver data.

NSB or **Nearest Single Base**: Selects the nearest suitably operating reference station using the position reported by the rover and propagates that receiver's observation data to the rover.

2. The second set of characters points out the **SATELLITES** ;

GPS: Mountpoints with GPS in the name use GPS satellite vehicles only.

GNSS: Mountpoints with GNSS in the name use both GPS and GLONASS SVs in the solutions.

GREC: Mountpoints with GREC in the name include 4 satellite constellations, which include Galileo, BeiDou, GPS and GLONASS Satellite Vehicles in their solutions. Mountpoints with GREC in the name only appear in mountpoints in the CMRx or RTCM3_2 format that use the PPP or NSB processing methods.

3. The next set of characters define the **MESSAGE FORMAT**.

The following explains each available format:

CMRx This is the latest Trimble proprietary format for Network RTK mountpoints: CMRx allows Real-Time Kinematic (RTK) users to use more satellite constellations and signals as they become available, with faster initializations and improved performance near obstructions and under canopies. It offers significant compression (around 40%) over the already compact CMR/CMR+ format to help users receive corrections within less bandwidth. Trimble rovers that support CMRx should use it exclusively.

RTCM 3.2 Carrier and Code Differential Corrections for High-Precision RTK, Network RTK, and PPP-type applications. Recently modernized with so-called Multiple Signals Messages (MSM), for generic inclusion of new constellations and signals. MSM Currently supports GPS, GLONASS, Galileo, QZSS, BeiDou, SBAS.

CMRp Network RTK mountpoint (e.g., CMRp_All): This is intended for legacy equipment in industry groups where CMR plus has been used as a quasi-standard format (such as precision agriculture). CMR plus is a Trimble format so non-Trimble users are advised to use the RTCM 3.x format unless you are sure your device fully supports CMR+.

RTCM 3.1 Network RTK mountpoint (e.g., GLN_RTCM3_1): This format supports both GPS and GLONASS SV's and will supply a network RTK data stream optimized for the user's location.

DGPS Virtual Base mountpoint (e.g., NetDGPS): This will supply a sub-meter differential solution optimized for the user's location.

4. The fourth and last set of characters is the **REFERENCE FRAME** e.g.: **NAD83** and **ITRF2014**

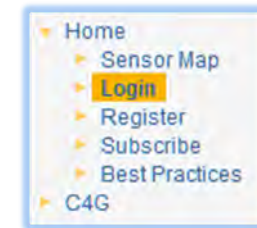
NAD83 and **ITRF2014** are different reference frames, and we call them out in the mountpoint name so that users may tell them apart by simply looking at the mountpoint names. C4Gnet.XYZ can support any reference frame users need to work in so if or when we get requests for additional reference frames or when a new datum is published by National Geodetic Survey (NGS), we can add these and make them easy to select by looking at the reference frame being used at the end of each mountpoint name.

Recommended Survey Mountpoints:

- Trimble Rovers – **PPP_GREC_CMRx_NAD83**
- Other Rovers – **PPP_GREC_RTCM3_2_NAD83**

NOTE: We encourage you to try other mountpoints if you are not getting the expected precisions or number of SV's.

Login

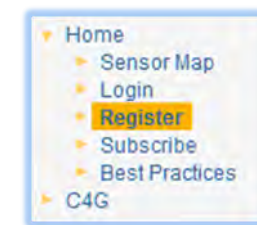


To login to C4Gnet RTN you are required to enter your **Organization** name, **User Name** and **Password**. When an account is created for you, this information will be provided through an automated email.

The login form is titled "Login" and contains the following fields and options:

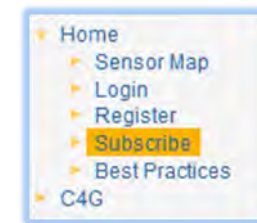
- Organization: [Text Input]
- User Name: [Text Input]
- Password: [Text Input]
- Remember me next time
- Login [Submit Button]

Register



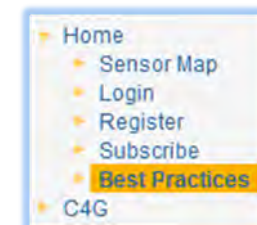
The Register link takes you to a form to create a new account. Once you have registered, the network administrator will be notified by email and once your account is approved you will receive notification sent to the email address submitted in your registration request.

Subscribe



The Subscribe link takes you to the C4G web store and provides product and subscription information as well as pricing for all C4Gnet RTN products.

Best Practices



This link is where technical support information can be found on many topics important to users about GPS/GNSS technology for precision positioning. Videos, Podcasts and PowerPoint presentations from the 2011 National Static and Real-Time Network GPS/GNSS Best Practices Seminar in June of 2011 held in New Orleans can be found here.

C4G



This link takes you to the LSU Center for Geoinformatics website. This is the official website for C4G and the Louisiana Spatial Reference Center (LSRC), GULFNet and C4Gnet RTN's.

C4Gnet RTN Web Portal Instructions

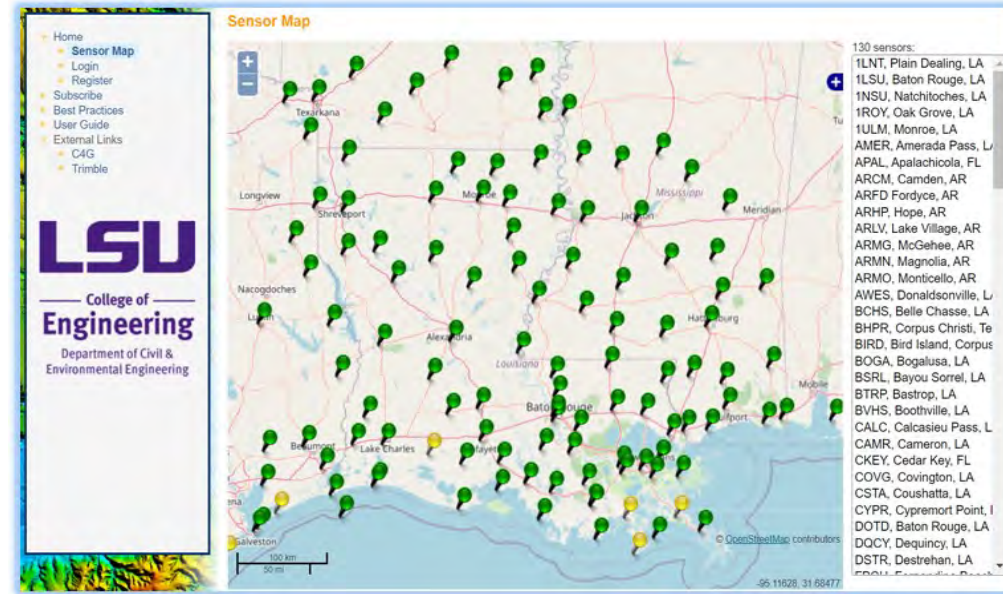
The webpage for C4Gnet RTN is available at the following URL: <http://C4Gnet.XYZ>

Logged Out Environment

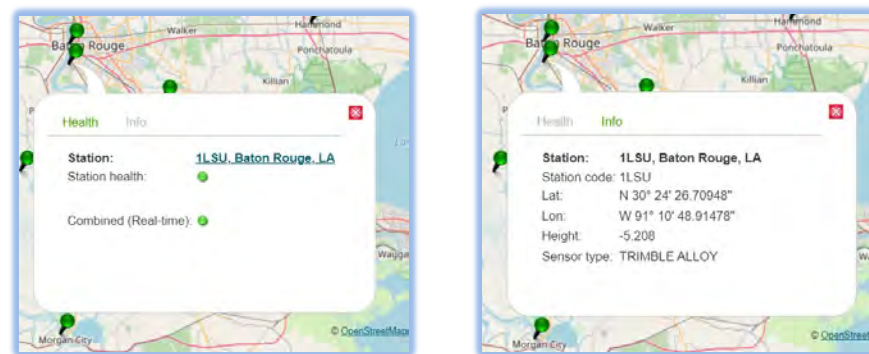
Sensor Map

- Home
- Sensor Map**
- Login
- Register
- Subscribe
- Best Practices
- C4G

The Sensor Map link takes you to a dynamic map of all C4Gnet RTN CORS stations. You can come here to check on the status of the network.



The public map is interactive and by clicking a station, you will get a popup bubble that lets anyone see station information such as station health, RTN health, station name, location, code, ID, Lat, Lon, height and type of receiver.



Additional information will also be available to subscribers once they have successfully logged into the C4Gnet.XYZ Web Portal.

The messages used in each mountpoint can be found by directing your browser to C4Gnet.XYZ:9000 where you will see a source table like the following:

MOUNTPOINT SOURCE TABLE

SOURCETABLE 200 OK
 Server: NTRIP Trimble Ntrip Caster 4.7
 Content-Type: text/plain
 Content-Length: 5400
 Date: Wed, 21 Dec 2022 12:45:07 UTC

```
STR;GLN_CMRx;GLN_CMRx;CMRx;1004(1),1005/1007(5),PBS(10);2;GPS+GLONASS;C4Gnet.XYZ;USA;0;0;1;1;Trimble Pivot Platform;None;B;Y;0;;
STR;GLN_NetDGPS;GLN_NetDGPS;RTCM 3.2;1004(1),1005/1007(5),1014(1, 1 msg),1015(1, all msg),1016(1, all msg);2;GPS+GLO;C4Gnet.XYZ;USA;0;0;1;1;Trimble Pivot Platform;None;B;Y;0;;
STR;GLN_RTCM3_2;GLN_RTCM3_2;RTCM 3.2;1004(1),1005/1007(5),1014(1, 1 msg),1015(1, all msg),1016(1, all msg);2;GPS+GLO+GAL+BDS;C4Gnet.XYZ;USA;0;0;1;1;Trimble Pivot Platform;none;B;Y;0;;
STR;PPP_GNSS_CMRp_NAD83;PPP_GNSS_CMRp_NAD83;CMR+;1004(1),1005/1007(5),PBS(10);2;GPS+GLONASS;C4Gnet.XYZ;USA;0;0;1;1;Trimble Pivot Platform;none;B;N;0;;
STR;PPP_GNSS_CMRx_NAD83;PPP_GNSS_CMRx_NAD83;CMRx;1004(1),1005/1007(5),PBS(10);2;GPS+GLO+GAL+BDS;C4Gnet.XYZ;USA;0;0;1;1;Trimble Pivot Platform;none;B;Y;0;;
STR;PPP_GNSS_NetDGPS_NAD83;PPP_GNSS_NetDGPS_NAD83;CMRx;1004(1),1005/1007(5),PBS(10);2;GPS+GLO+GAL+BDS;C4Gnet.XYZ;USA;0;0;1;1;Trimble Pivot Platform;none;B;N;0;;
STR;PPP_GNSS_RTCM3_1_NAD83;PPP_GNSS_RTCM3_1_NAD83;RTCM 3.1;1004(1),1005/1007(5),1014(1, 1 msg),1015(1, all msg),1016(1, all msg);2;GPS+GLONASS;C4Gnet.XYZ;USA;0;0;1;1;Trimble Pivot Platform;none;B;N;0;;
STR;PPP_GNSS_RTCM3_2_NAD83;PPP_GNSS_RTCM3_2_NAD83;RTCM 3.2;1004(1),1005/1007(5),1014(1, 1 msg),1015(1, all msg),1016(1, all msg);2;GPS+GLO+GAL+BDS;C4Gnet.XYZ;USA;0;0;1;1;Trimble Pivot Platform;none;B;N;0;;
STR;NSB_RTCM3_2_NAD83;NSB_RTCM3_2_NAD83;RTCM 3.2;1004(1),1005/1007(5),1014(1, 1 msg),1015(1, all msg),1016(1, all msg);2;GPS+GLO+GAL+BDS;C4Gnet.XYZ;USA;0;0;1;0;Trimble Pivot Platform;none;B;Y;0;;
STR;VRS_GNSS_CMRp_NAD83;VRS_GNSS_CMRp_NAD83;CMR+;1004(1),1005/1007(5),PBS(10);2;GPS+GLONASS;C4Gnet.XYZ;USA;0;0;1;1;Trimble Pivot Platform;none;B;N;0;;
STR;VRS_GNSS_CMRx_NAD83;VRS_GNSS_CMRx_NAD83;CMRx;1004(1),1005/1007(5),PBS(10);2;GPS+GLONASS;C4Gnet.XYZ;USA;0;0;1;1;Trimble Pivot Platform;none;B;N;0;;
STR;VRS_GNSS_NetDGPS_NAD83;VRS_GNSS_NetDGPS_NAD83;RTCM 3.1;1004(1),1005/1007(5),1014(1, 1 msg),1015(1, all msg),1016(1, all msg);2;GPS+GLONASS;C4Gnet.XYZ;USA;0;0;1;1;Trimble Pivot Platform;none;B;N;0;;
STR;VRS_GNSS_RTCM3_1_NAD83;VRS_GNSS_RTCM3_1_NAD83;RTCM 3.1;1004(1),1005/1007(5),1014(1, 1 msg),1015(1, all msg),1016(1, all msg);2;GPS+GLONASS;C4Gnet.XYZ;USA;0;0;1;1;Trimble Pivot Platform;none;B;N;0;;
STR;VRS_GNSS_RTCM3_2_NAD83;VRS_GNSS_RTCM3_2_NAD83;RTCM 3.2;1004(1),1005/1007(5),1014(1, 1 msg),1015(1, all msg),1016(1, all msg);2;GPS+GLONASS;C4Gnet.XYZ;USA;0;0;1;1;Trimble Pivot Platform;none;B;N;0;;
STR;VRS_GPS_CMRp_NAD83;VRS_GPS_CMRp_NAD83;CMR+;1004(1),1005/1007(5),PBS(10);2;GPS;C4Gnet.XYZ;USA;0;0;1;1;Trimble Pivot Platform;none;B;N;0;;
STR;VRS_GPS_CMRx_NAD83;VRS_GPS_CMRx_NAD83;CMRx;1004(1),1005/1007(5),PBS(10);2;GPS;C4Gnet.XYZ;USA;0;0;1;1;Trimble Pivot Platform;none;B;N;0;;
STR;VRS_GPS_NetDGPS_NAD83;VRS_GPS_NetDGPS_NAD83;RTCM 2.3;1004(1),1005/1007(5),1014(1, 1 msg),1015(1, all msg),1016(1, all msg);2;GPS;C4Gnet.XYZ;USA;0;0;1;1;Trimble Pivot Platform;none;B;N;0;;
STR;VRS_GPS_RTCM2_1_NAD83;VRS_GPS_RTCM2_1_NAD83;RTCM 2.1;1004(1),1005/1007(5),1014(1, 1 msg),1015(1, all msg),1016(1, all msg);2;GPS;C4Gnet.XYZ;USA;0;0;1;1;Trimble Pivot Platform;none;B;N;0;;
STR;VRS_GPS_RTCM2_3_NAD83;VRS_GPS_RTCM2_3_NAD83;RTCM 2.3;1004(1),1005/1007(5),1014(1, 1 msg),1015(1, all msg),1016(1, all msg);2;GPS;C4Gnet.XYZ;USA;0;0;1;1;Trimble Pivot Platform;none;B;N;0;;
STR;PPP_GNSS_RTCM3NET_NAD83;PPP_GNSS_RTCM3NET_NAD83;RTCM3Net;1004(1),1005/1007(5),1014(1, 1 msg),1015(1, all msg),1016(1, all msg);2;GPS+GLO;C4Gnet.XYZ;USA;0;0;1;1;Trimble Pivot Platform;none;B;N;0;;
STR;PPP_GNSS_CMRx_ITRF2014;PPP_GNSS_CMRx_ITRF2014;CMRx;1004(1),1005/1007(5),PBS(10);2;GPS+GLO+GAL+BDS;C4Gnet.XYZ;USA;0;0;1;1;Trimble Pivot Platform;none;B;N;0;;
STR;PPP_GNSS_RTCM3_2_ITRF2014;PPP_GNSS_RTCM3_2_ITRF2014;RTCM 3.2;1004(1),1005/1007(5),1014(1, 1 msg),1015(1, all msg),1016(1, all msg);2;GPS+GLO+GAL+BDS;C4Gnet.XYZ;USA;0;0;1;1;Trimble Pivot Platform;none;B;N;0;;
STR;NSB_CMRx_NAD83;NSB_CMRx_NAD83;CMRx;1004(1),1005/1007(5),PBS(10);2;GPS+GLO+GAL+BDS;C4Gnet.XYZ;USA;0;0;1;0;Trimble Pivot Platform;none;B;Y;0;;
STR;NSB_GREC_CMRx_NAD83;NSB_GREC_CMRx_NAD83;CMRx;1004(1),1005/1007(5),PBS(10);2;GPS+GLO+GAL+BDS;C4Gnet.XYZ;USA;0;0;1;0;Trimble Pivot Platform;none;B;Y;0;;
STR;NSB_GREC_RTCM3_2_NAD83;NSB_GREC_RTCM3_2_NAD83;RTCM 3.2;1004(1),1005/1007(5),1014(1, 1 msg),1015(1, all msg),1016(1, all msg);2;GPS+GLO+GAL+BDS;C4Gnet.XYZ;USA;0;0;1;0;Trimble Pivot Platform;none;B;Y;0;;
STR;PPP_GREC_CMRx_NAD83;PPP_GREC_CMRx_NAD83;CMRx;1004(1),1005/1007(5),PBS(10);2;GPS+GLO+GAL+BDS;C4Gnet.XYZ;USA;0;0;1;1;Trimble Pivot Platform;none;B;N;0;;
STR;PPP_GREC_RTCM3_2_ITRF2014;PPP_GREC_RTCM3_2_ITRF2014;RTCM 3.2;1004(1),1005/1007(5),1014(1, 1 msg),1015(1, all msg),1016(1, all msg);2;GPS+GLO+GAL+BDS;C4Gnet.XYZ;USA;0;0;1;1;Trimble Pivot Platform;none;B;N;0;;
STR;PPP_GREC_NetDGPS_NAD83;PPP_GREC_NetDGPS_NAD83;RTCM 2.4;1004(1),1005/1007(5),1014(1, 1 msg),1015(1, all msg),1016(1, all msg);2;GPS+GLO+GAL+BDS;C4Gnet.XYZ;USA;0;0;1;1;Trimble Pivot Platform;none;B;N;0;;
STR;PPP_GREC_CMRx_ITRF2014;PPP_GREC_CMRx_ITRF2014;CMRx;1004(1),1005/1007(5),PBS(10);2;GPS+GLO+GAL+BDS;C4Gnet.XYZ;USA;0;0;1;1;Trimble Pivot Platform;none;B;N;0;;
STR;NetDGPS;NetDGPS;RTCM 2.3;1004(1),1005/1007(5),1014(1, 1 msg),1015(1, all msg),1016(1, all msg);2;GPS;C4Gnet.XYZ;USA;0;0;1;1;Trimble Pivot Platform;none;B;Y;0;;
ENDSOURCETABLE
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Network Real-time Solutions



GNSS Network solutions are available throughout the state of Louisiana and the network density will continue to increase as C4G/LSRC rolls out new CORS across the state and replaces current CORS with Multi-Constellation CORS. For those who have not used a network solution before, they will look and feel, in a practical sense, like single base solutions. Field procedures should remain the same, particularly in relation to performing site calibrations (localizations).

GPS is based on an Earth Centered Earth Fixed 3-D reference frame, so local vertical is not a product of GPS. Therefore, C4Gnet RTN corrections are not directly connected to NAVD 88. The user must determine the appropriate adjustment to local vertical datums, including NAVD 88.

Most often this is accomplished by means of a recent geoid model, the current one being GEOID18. GEOID18 is intended for use with coordinates in the North American Datum of 1983 (2011) [NAD 83 (2011) epoch 2010.00]. It provides orthometric heights consistent with the North American Vertical Datum of 1988 (NAVD 88),

In areas tested to date, network solutions perform as well or better than single base solutions. It is important to ensure that your equipment settings match the particular mountpoint you intend to use.

Antenna Settings in C4Gnet

Please be advised that the Trimble Infrastructure software being used by C4Gnet RTN will adjust **real-time data** so that all CORS antennas are uniformly described as a null antenna (ADVNULLANTENNA). As such, no base station antenna model needs to be applied to adjust CORS observations from the **Antenna Phase Centre** to the **Antenna Reference Point**. Users will still need to apply the appropriate absolute antenna model for their rover.

Absolute antenna modeling, (instead of relative antenna modeling), is used in the infrastructure management software used by C4Gnet RTN. These should be the absolute antenna models derived by the **International GNSS Service (IGS)** and users are advised to contact their local GNSS supplier for the required information. Users should also use absolute antenna models when post processing for both the user and CORS antennas. Any mix of absolute and relative antenna modeling will introduce significant systematic errors.

All post process RINEX files and post process files in other formats will continue to hold raw data to the **Antenna Phase Center**, in line with international standards.

Always Check Your Work

Precision is dependent upon equipment and procedures. Accuracy should be checked relative to a known or assumed standard. C4G constrains its RTN to the currently published NGS NSRS reference frame.

Rovers wanting to check RTN data collected with C4Gnet, typically compare RTN RTK (VRS) positions to static GPS positions in a Post Processing tool like (OPUS) or **C4G's New GNSS Online Post Processing** service. While this method works well, it takes some time to do these post processed checks. C4G now offers an entirely new method of doing real-time data collection using RTXnet processors producing Precise Point Positioning (PPP) solutions. These PPP solutions give rovers a second real-time method to collect data and/or use as a real-time method of checking data collected using real-time VRS RTK processed solutions. If data collected with both PPP and VRS agree, you have a very high confidence that the data collected is accurate. For the highest level of confidence, all accuracy assessments should also include connections to realizations of local coordinate systems and datums.

Network RTK Best Practice Procedures:

- I. **Be In The Box:** Users should be aware of the Network Boundaries. Best results will be achieved when you work inside the Network Boundaries.
- II. **Planning:** Be aware of satellite geometry as it will have an effect on performance. Well distributed satellites in your sky plot work better than tight groupings of satellites.
- III. **Observing Control:** A minimum of one hundred eighty (180) epochs is recommended with a starting rms <30. For best results, a second set of measurements should be taken no sooner than 45 minutes later. This gap in time is important for the establishment of a different satellite constellation. The measurements need to be made with different satellite geometries. The difference between the two measurements is double the probable error. If it exceeds project requirements, re-observe after a three hour change in satellite geometry. Repeat this method until accuracy meets project requirements. (If repeat measurements are made one after the other you must re-initialize the receiver between measurements.)
- IV. **Observing Topo:** One five (5) second measurement with an rms <30. If initialization is lost due to high rms, measurements within that initialization should be checked.
- V. **Site Calibration:** A site calibration fits the measurements to local control. Errors in the control will change the observed values. In most cases the reported values will provide the best fit to local control.

