RTK Corrections Formats and Troubleshooting.

The RTK-equipped CEESCOPE™ echo sounders can receive real time corrections from a UHF or network RTK / VRS (virtual reference station) base station. Connectivity issues, poor GNSS position quality, and inadequate UHF radio range performance may result from an incorrectly configured setup. Of particular importance is the understanding of inter-equipment compatibility and appropriate format selection.

When using the CEESCOPE RTK-enabled echo sounders, it is important to understand the format and transmission parameters of RTK corrections being received otherwise corrections may not be received at all, or position fix consistency may be poor. As the RTK method requires the rover and base (or base network) to be viewing the same satellites, maximizing the potential number of satellites in view leads to improved performance.

The development of RTK corrections formats has aimed to minimize the size of the transmitted message while at the same time increasing the data contained within it. As new satellite constellations and frequencies are added to GNSS receivers, the amount of data that needs to be received within the RTK corrections message has increased. UHF radios are often still used to transmit corrections, and these have limited data (baud) rates. Therefore, compact corrections messages are desirable allowing radio longer range and/or an increased number of selectable constellations available from the base station.

RTK Formats

Independent of how RTK corrections are received, the corrections will be formatted in one the message formats as follows.

RTCM 3.x:	Industry standard corrections message. Will operate with any GNSS receiver and includes corrections from all constellations.
CMR:	Old Trimble format originally proprietary but rarely used.
CMR+:	Improved compressed CMR format.
CMRx:	Significantly compressed proprietary message only usable with Trimble receivers. Highest performance option. All constellations.
RTX:	This is not an RTK format but rather a corrections supply service that uses the CMRx message that may be transmitted by a satellite L-Band signal.

The desired format selection will depend on the method of transmission of corrections. If using network RTK over an internet connection it is unlikely bandwidth will be a constraint. However it is still important to understand receiver compatibility as follows:

Trimble: Any message may be selected.

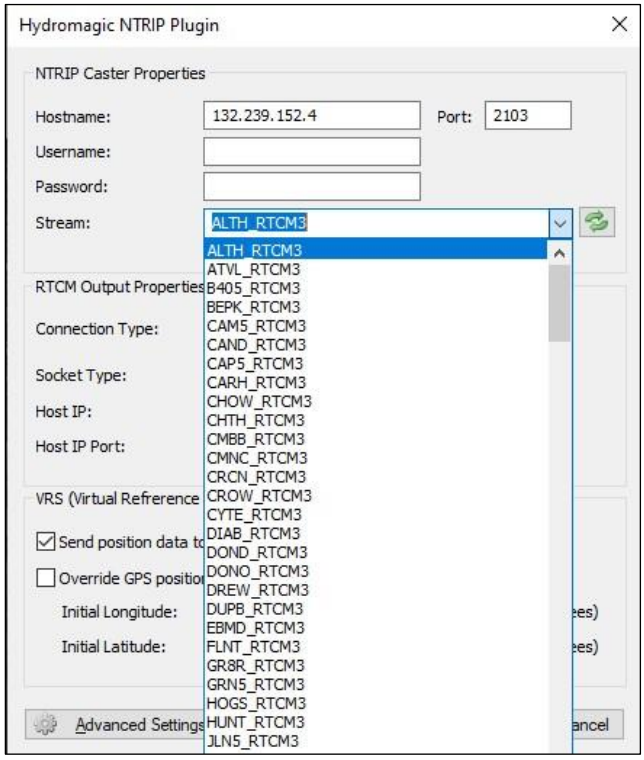
NovAtel: CMRx cannot be selected.

CMR+ may be selected but will be GPS only (no GLONASS). This will lead to significantly lower satellite availability.

RTCM 3.x should be used.

Receiving Network RTK

If using a network RTK provider, the login method will require a web or IP address and username / password. Streams may be selected from individual base stations or a virtual reference network, likely with different corrections format options. Note that virtual reference networks require that you transmit your position to the server.



Example Network RTK Login.

The available corrections list will likely populate without a correct (or any) user name or password. Populating the list DOES NOT mean your login is correct. Login issues occur when the user assumes the presence of the corrections list means the login is correct. With an incorrect user name or password, selected corrections will simply fail to stream.

Receiving Corrections using the 403-470MHz UHF Radio

The CEESCOPE may include a built-in Satel UHF radio for receipt of corrections from a local base station. This radio is not part of the GNSS receiver but is a separate module and must be configured to match the transmitting base station. The UHF radio protocol and RTK corrections format are separate. Both the RTK corrections stream format and the UHF radio transmission protocol must be matched to properly receive RTK corrections.

Frequency:	The CEESCOPE UHF frequency must be matched to the base.
Channel Spacing:	Typically 12.5kHz equates to 4800 baud 25kHz is 9600 baud however this is protocol-dependent.
Modulation:	Select the format to match the base station radio.
	TrimTalk (Trimble radios), Pac Crest or Satel

The radio modulation will strongly affect the range performance and GNSS RTK quality by potentially limiting the ability to receive corrections for multiple constellations. For example, the Pacific Crest FST format has a 9600 baud data rate at 12.5kHz channel spacing allowing greater data transfer than the Trimtalk V1 which is limited to 4800 baud at 12.5kHz. If too many constellations are active on the base station output, the RTK performance will be severely affected as the corrections data packet cannot be completely received within the allotted time interval. In this case, constellation outputs need to be deactivated until the fix quality is stable.

RTK Fixed versus Float

The FLOAT status (position code 5) occurs when the GNSS receiver is processing corrections but has not yet resolved the ambiguities to an integer value. In RTK positioning, resolving these ambiguities to integers significantly enhances accuracy and when this is achieved the position quality changes to FIXED (position code 4) with cm-accuracy realized.

For receiving corrections, the FLOAT status is important as a diagnostic tool as it indicates that corrections are being received, and the UHF radio or network communications are working normally. For example, turning on a CEESCOPE RTK in Australia and logging into a European network corrections service will still give a FLOAT position quality indicated even though the position will never become FIXED.

If you have a float RTK solution, your rover position quality is too low – typically increasing the number of visible satellites or removing multipath interference will result in a FIXED solution. Your radio or network setup is NOT the problem.