

Using Trimble CenterPoint RTX with the CEESCOPE RTK Echo Sounder

The CEESCOPE BD990 and BD9250 can receive Trimble's precise 2.5cm RTX corrections allowing single antenna surveying with no connection to a base station or network / VRS. Users must understand the L2 or L5 frequency selection required for the BD9250 to ensure data quality when switching between RTX and non-RTX corrections sources. Testing the CEESCOPE's RTX performance in a static position highlights the reliable positioning offered by RTX and the superiority of the L1/L5 frequency band over the L1/L2 band selection.

The CEESCOPE™ echo sounder with the Trimble BD990 and BD9250 integrated GNSS receivers can receive Trimble's precise CenterPoint RTX L-Band subscription corrections service. RTX offers precise position and elevation data without the need for a local base station or connection to an internet network / VRS corrections stream. RTX provides a very convenient acquisition method, however with only a single antenna solution achievable accuracy is somewhat lower than possible with conventional RTK. Still, for many applications the accuracy of the RTX elevation data means it is a viable option for real time tide / level correction in Hydrographic surveying.

On the CEESCOPE RTCM menu, SATELLITE denotes Trimble RTX. The subscription date is shown on the RTCM screen and must be active to receive RTX correction data.

The **Trimble BD990** CEESCOPE is multi-frequency multi-constellation and has L1, L2, and L5 bands activated. In this case RTX (and RTK) performance will be always maximized and no user input is required to select available frequencies.

The **Trimble BD9250** CEESCOPE will offer the same general level of performance but with some limitations from the Trimble receiver's available features. The BD9250 can operate in L1 and L2 OR L1 and L5 bands. L2 and L5 bands **CANNOT** be operated simultaneously. The user can select which of L2 or L5 bands is active in the position solution.

Why select L2 or L5?

For RTX, the factory default L5 selection should always be used. If you only plan to use RTX corrections, you do not have to worry about anything further! The L5 frequency band is inherently of higher accuracy and provides better performance in multipath environments.

When using network / VRS corrections received over the internet / NTRIP then it is important to determine if the incoming stream has the L5 band corrections. It is possible that the corrections stream only uses the L1 and L2 bands, especially if it is a free service.

If the CEESCOPE 9250 GNSS receiver is set to L1 / L5 and your corrections stream is L1 / L2 then the position solution will never achieve an RTK FIX.

Selecting L2 or L5 Frequency Bands

Switching between frequency bands is easy. Simply connect to the CEESCOPE with an Ethernet cable as usual and type the GNSS IP address into any browser (an internet connection is not required). Navigate to the Receiver Configuration / Tracking menu to access the L2/L5 switch. The frequency selected will remain even after power-cycling the CEESCOPE.

GNSS IP: 192.168.2.2

The logon credentials are: user: admin PW: password

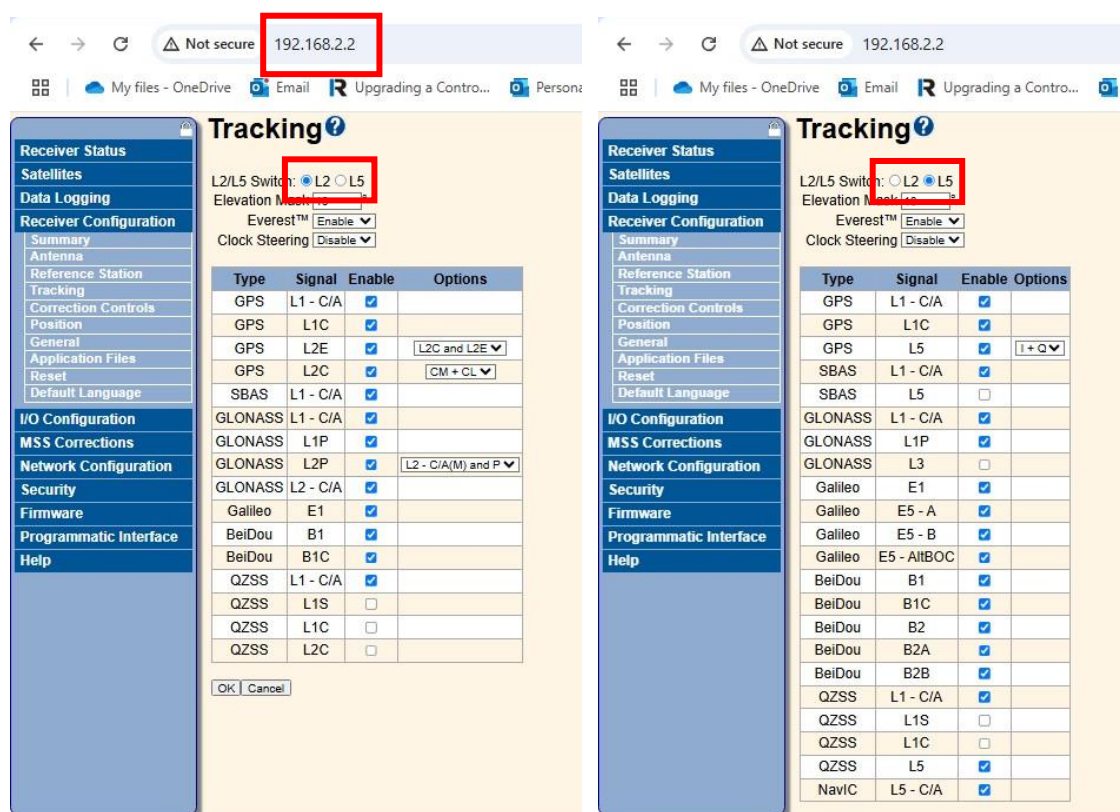


Figure 1. CEESCOPE 9250 Frequency Band Switch.

Comparing the L2 and L5 Band Performance

To demonstrate performance that might be expected from the Trimble RTX service, a CEESCOPE 9250 was set up with a non-ideal antenna position close to several buildings and trees that would approximate real world suboptimal conditions. The receiver was operated for several hours in various modes to demonstrate the position data spread.

As shown in Figure 2 and 3, the CenterPoint RTX position was excellent in comparison to autonomous (uncorrected) and SBAS (WAAS) basic corrections. In the same location, a basic L1/L2 network RTK solution (11-13SV) showed only slightly lower point spread than RTX L5. The RTX L1/L2 data exhibited more scatter than the L1/L5 data, likely because of

the high multipath environment used for the test. Open water performance during surveying will likely be better than these test results because of a higher satellite count and lower multipath effects. In addition, over a longer test period the AUTONOMOUS and SBAS points would have continued to spread out over a far greater area.

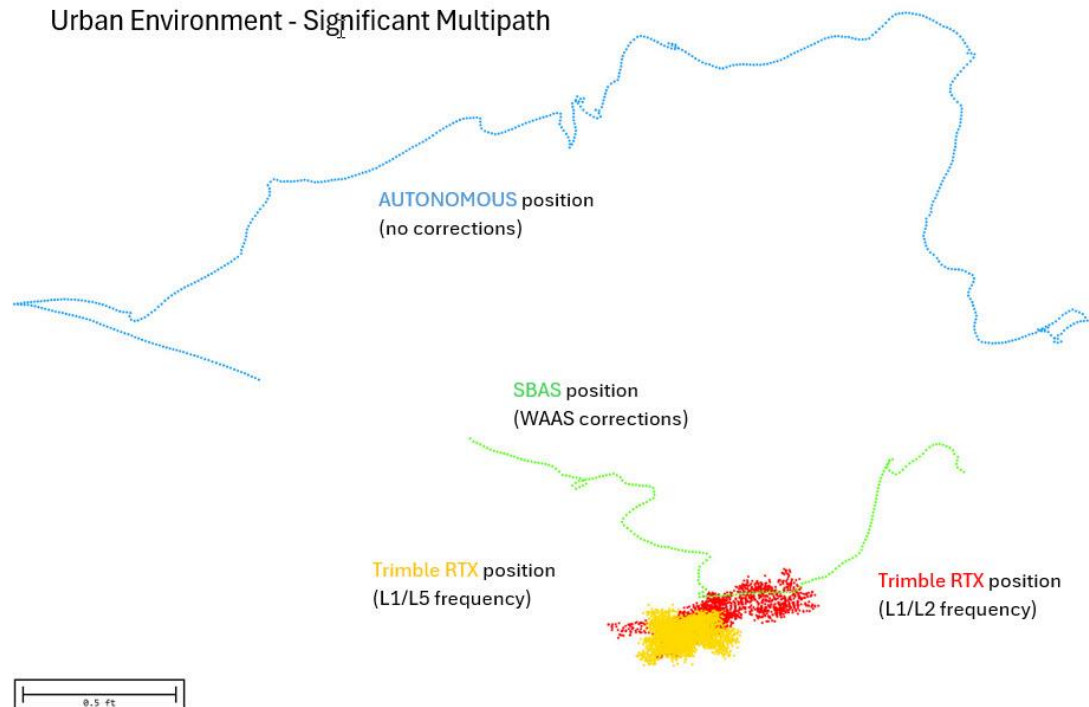


Figure 2. Trimble RTX Position Data over 120 minutes compared to uncorrected and SBAS corrected data.

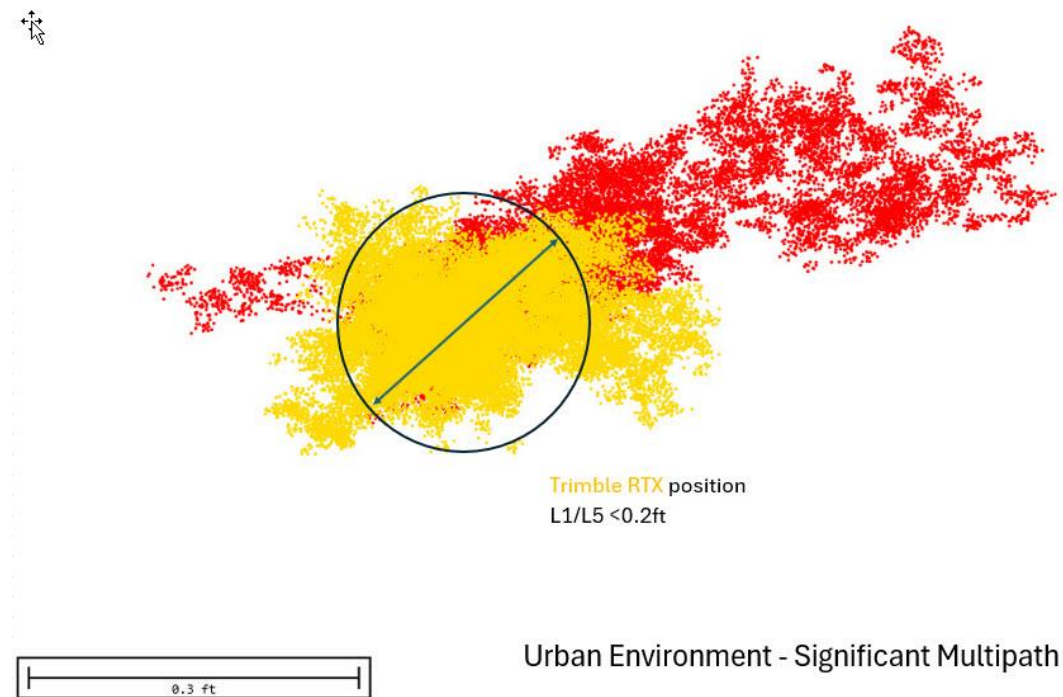


Figure 3. Close View of L2 and L5 Data Showing Majority of L5 Points within 0.2ft.

In terms of elevation accuracy, the L2 and L5 RTX data were compared to basic L1/L2 network RTK on Figure 4. Both L2 and L5 elevation data were less precise than the network RTK however the L5 RTX was close. Note that the elevation datums were different resulting in an offset between the RTX and network RTK results.

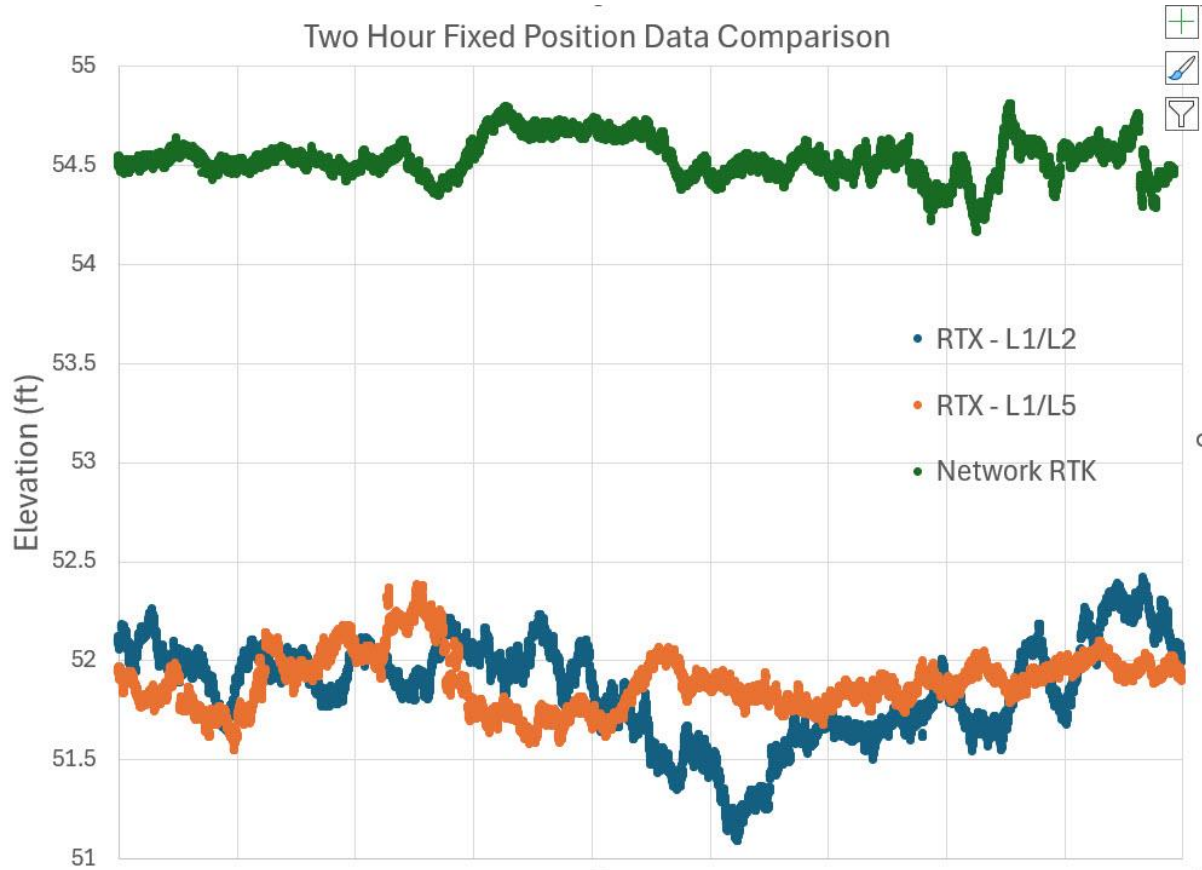


Figure 4. Trimble CenterPoint RTX L1/L2 and L1/L5 Compared to Network RTK Elevation (120 minute period).

Using Trimble RTX with the CEESCOPE

The RTX signal when properly converged is coded as an “RTK Fixed” GNSS message with a GGA quality code of “4”. So, on software such as Hydromagic the RTK FIX quality is shown. The diff age should remain <10 seconds.

GNSS Information	
Sats	22
Fix	RTK FIX
Diff Age	8.4
Beacon	0004
Position Error	
Longitude	0.033 ft
Latitude	0.043 ft
Elevation	0.180 ft
Dilution Of Precision	
PDOP	0.00
HDOP	0.70
VDOP	0.00
Recording	
Status	RECORDING
File	RAW00014

Lat / Long position error should typically be < 0.05ft with fully converged RTX solution

Figure 5. Hydromagic Navigation Information for CenterPoint RTX.

The RTX signal will not reach maximum accuracy until some time after power-up. The length of time required will vary based on the location, with fastest convergence in North America and Europe. Typically, in these regions the RTX FIX condition will be achieved in about 1 minute however this does not mean accuracy will be maximized at that time. On figure 6, the position data for L1/L5 RTX are shown starting immediately after the RTX FIX is indicated; a further 3 minutes are required before the position is accurate.

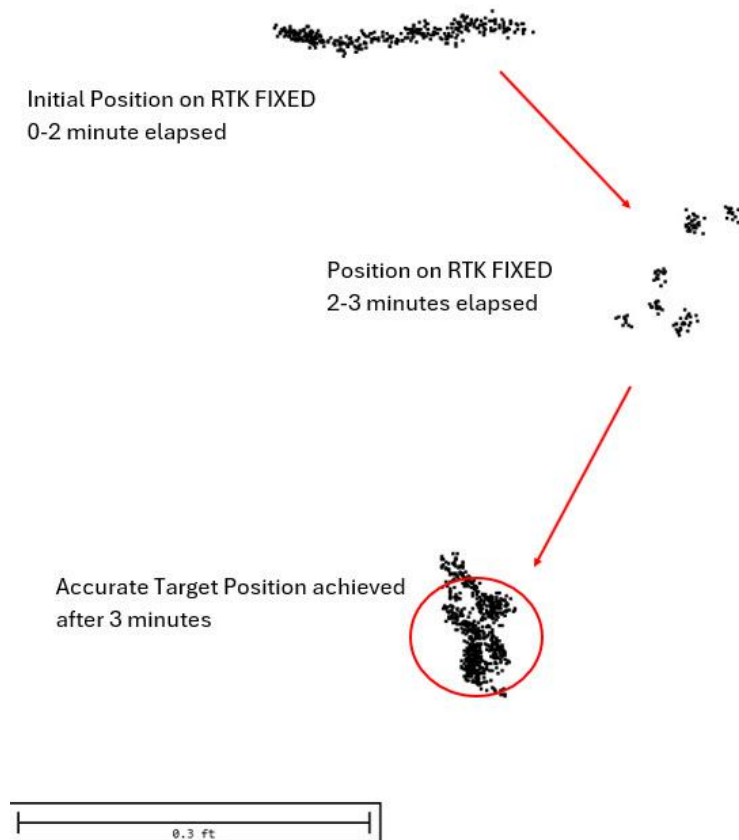


Figure 6. Startup Position Error for CenterPoint RTX L1/L5.

It is recommended that 5-10 minutes elapse after CEESCOPE startup before surveying commences, and position error values are monitored to ensure accurate data is recorded.

Updating the RTX Subscription

CEESCOPE echo sounders with Trimble GNSS receivers are supplied with a one-year subscription to CenterPoint RTX. This will either be activated at the CEE factory before shipping or the user will need to perform the activation procedure when the one-year subscription should start. An activation code will be supplied by CEE HydroSystems (or Trimble) that must be loaded into the CEESCOPE to turn on the RTX service.

To activate RTX, the Trimble GNSS browser interface (IP address 192.168.2.2) is used.

Navigate to the Receiver Status / Receiver Options menu and paste the activation code into the Option Code field.

Receiver Options?

Firmware Warranty Date: 2027-11-30

Precision Capability	Base	RTK	
	Rover	Precise RTK	
Frequency	Triple Frequency Tracking	Installed	
Constellation	GPS	Installed	L1-C/A, L1C, L2E, L2C, L5
	SBAS	Installed	L1-C/A, L5
	GLONASS	Installed	L1-C/A, L1P, L2-C/A, L2P, L3
	Galileo	Installed	E1, E5-A, E5-B
	BeiDou	Installed	B1, B1C
	QZSS	Installed	L1-C/A, L1S, L1C, L2C, L5
	NavIC	Installed	L5-C/A
Correction Services	xFill	Installed	
	CenterPoint RTX Fast	2026-06-17	Subscribed
	OmniSTAR HP/XP/G2/G4/G2+/G4+	2019-9-4	Expired
	OmniSTAR VBS	2012-7-13	Expired
Maximum Measurement Rate	10 Hz	Installed	
Communication	Internal Radio	Not Installed	
Additional Features	Heading	Installed	
	Moving Base	Installed	
	Binary Outputs	Installed	
	1PPS	Installed	
	Data Logging	14.55 MB	

Option Code:

Figure 7. Updating RTX Subscription.