# Connecting to Network RTK using the CEESCOPE Trimble BD990 / 9250 Internal NTRIP Client via the Ubiquiti UMR-Industrial Router

*The CEESCOPE's Trimble BD990 and BD9250 GNSS receivers can directly receive network / NTRIP corrections, eliminating the need for a connected survey PC to provide a corrections stream. Using the Ubiquiti UMR-industrial router, conveniently powered by the CEESCOPE-R (dual-Ethernet option) through a powered (POE) Ethernet RJ45 cable offers a robust connection to the server and enables the user to collect network RTK data recorded on the CEESCOPE's internal memory without a connected PC.*

Support for the CEESCOPE's built-in Trimble BD990 and BD9250 GNSS receivers' NTRIP CLIENT feature has been added to the CEESCOPE[1]. This change allows the NTRIP login details from free or subscription-based network RTK services to be entered into the Trimble GNSS receiver inside the CEESCOPE using a web browser (instead of in external hydrographic software such as HYPACK or Hydromagic running simultaneously on a connected PC). The login will remain active even after the CEESCOPE is powered off / on. To use this feature, the CEESCOPE can be directly connected to an LTE modem / router to provide a route to receive the network corrections from the web server. The CEESCOPE-R option (with two powered Ethernet ports) is preferable, to provide a streamlined setup with the CEESCOPE itself powering a POE-enabled router such as the Ubiquiti UMR-Industrial outlined here.



*CEESCOPE-R*



*Ubiquiti UMR-Industrial LTE router*

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[1] The NTRIP CLIENT RTCM source was added to the CEESCOPE software in version 4.2.0 (August 2025)

The advantages of using the CEESCOPE's NTRIP CLIENT feature to manage the connection to the web-based NTRIP caster are:

- The link from the CEESCOPE's GNSS receiver to the corrections server is robust. If the data connection is interrupted, the BD990 / 9250 and the UMR-Industrial router will both re-open the connection to the NTRIP caster without user intervention.
- Once properly configured, the connection will open automatically when the CEESCOPE is powered up.
- The survey PC is not required for interfacing to the NTRIP caster. When combined with the internal logging capability of the CEESCOPE, this permits an NTRIP survey to be completed without a survey PC.
- The UMR-Industrial includes a Wi-Fi interface that permits other equipment (such as the surveyor's mobile phone or survey PC) to share its internet connection.

For the CEESCOPE's NTRIP CLIENT RTCM source option to function, three separate pieces of equipment must be properly configured. These are:

1. The Ubiquiti UMR-Industrial router.
2. The CEESCOPE.
3. The BD990 / 9250 GNSS receiver within the CEESCOPE.

The CEESCOPE does not manage all the BD990 / 9250's parameters itself, so some of these must be set via the BD990 / 9250's embedded web server. All of these settings (UMR-Industrial, CEESCOPE and BD990 / 9250) are non-volatile: they only need to be made once and they will "stick", until a factory reset is performed.

**Equipment required**

- CEESCOPE-R with built-in Trimble BD990 / 9250 GNSS receiver
- Ubiquiti UMR Industrial LTE Router with two antennas (RP-SMA)
- Nano SIM card, activated and with credit (if prepaid)
- Ruggedised Ethernet cable
- CEELINK-R cable, CSC-2K008-RJ45-L050-01WP (if Ethernet survey PC is used)
- 12V or 24V DC power supply or battery
- CEESCOPE power cable, CSC-1K002-YRBCC-L025-02EP

**Physical connections**



*CEESCOPE-R – right hand side connections*
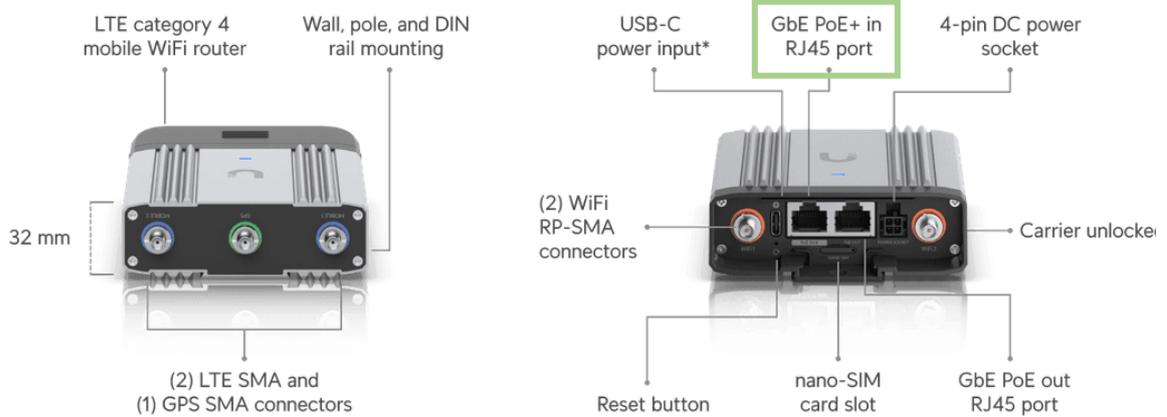
*Ubiquiti UMR-Industrial LTE router connections*

- Make sure you use the "PoE+ In RJ45 port" on the UMR-Industrial for the CEESCOPE connection.
- Plug the UMR-Industrial into the RJ45 socket on the CEESCOPE using the waterproof / rugged cable. Do not connect the UMR-Industrial to the 2K LEMO socket next to it.



*Ruggedised Ethernet cable*

- Ensure both LTE SMA antennas are screwed to the UMR-Industrial.
- The CEESCOPE-R does not source the active PoE interface power from its internal battery. This means the UMR-Industrial cannot be powered from the CEESCOPE-R battery. **An external 12V or 24V DC supply must be connected to the CEESCOPE-R for the UMR-Industrial to be powered from the CEESCOPE-R**. If this is not possible, then the UMR-Industrial must be powered from another USB or DC power source.
- If a survey computer is used, plug the CEESCOPE into the survey PC. The CSC-2K008-RJ45-L050-01WP (CEELINK-R) cable can be used for this. This connection is not necessary if the UMR-Industrial Wi-Fi is being used for the CEESCOPE to survey computer link.

*CSC-2K008-RJ45-L050-01WP cable*

**Adopting the UMR-Industrial (only necessary to perform once):**

Note that Ubiquiti require the router to be "adopted" before any settings can be changed. The device has an embedded web server, but it will not permit any settings to be changed until the unit is adopted. The adoption steps are:

1. Insert SIM. This is a nano size and is quite fiddly.
2. Power from USB C PD supply. Plug into PC via Ethernet.
3. Wait about one minute.
4. Set PC IP address to 192.168.105.10
5. Open browser, enter 192.168.105.1
6. Password is "ui".
7. LED will flash white.
8. You can't change any settings via Ethernet or Wi-Fi without activating/adopting.
9. Click activate and log in to your Ubiquiti account.

Once adopted, the Ubiquiti website (mobility.ui.com) will automatically update the UMR-Industrial to the latest software. Therefore, all routers have been delivered with the latest software (at the time of delivery).

**Configuring the UMR-Industrial (only necessary to perform once):**

Configure the following

| Name | We recommend a name that identifies the UMR Industrial |
|---|---|
| Network address | 192.168.2.5 |
| DHCP range | 192.168.2.6 to 192.168.2.254 |
| Password | Set as desired. MAKE A NOTE OF THIS! |
| Wi-Fi SSID | We recommend the serial number of the CEESCOPE, eg: 2533501CSR |
| Wi-Fi password | We recommend the serial number of the CEESCOPE, eg: 2533501CSR |

| Internet | Ensure that the Ethernet and WiFi "Internet" options are disabled as shown in the image below.  If these are not disabled then the router will not use the cellular link for internet access. |
|---|---|
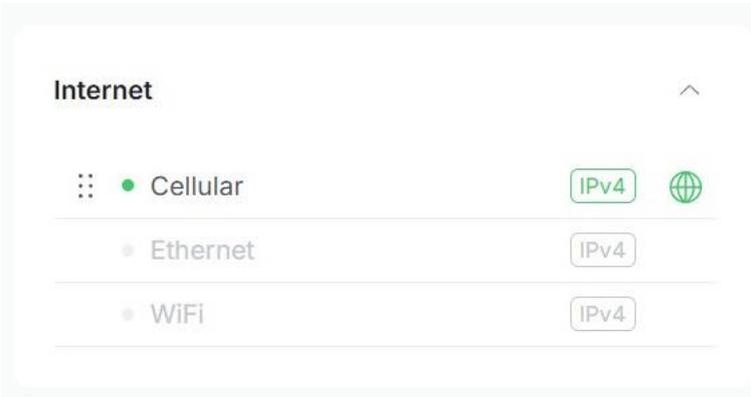


*Recommended UMR-Industrial Internet selection*

**Setting up the BD990 / 9250:**

Remember that the default BD990 / 9250 username and password for the embedded web interface are "admin" and "password". These can be changed if you choose. The default IP address to log into the BD990 / 9250 web browser is 192.168.2.2.

Make sure you set the BD990 / 9250 gateway to be the UMR-Industrial IP address. Without this value the BD990 / 9250 won't be able to 'find' the router (and therefore won't find the internet).
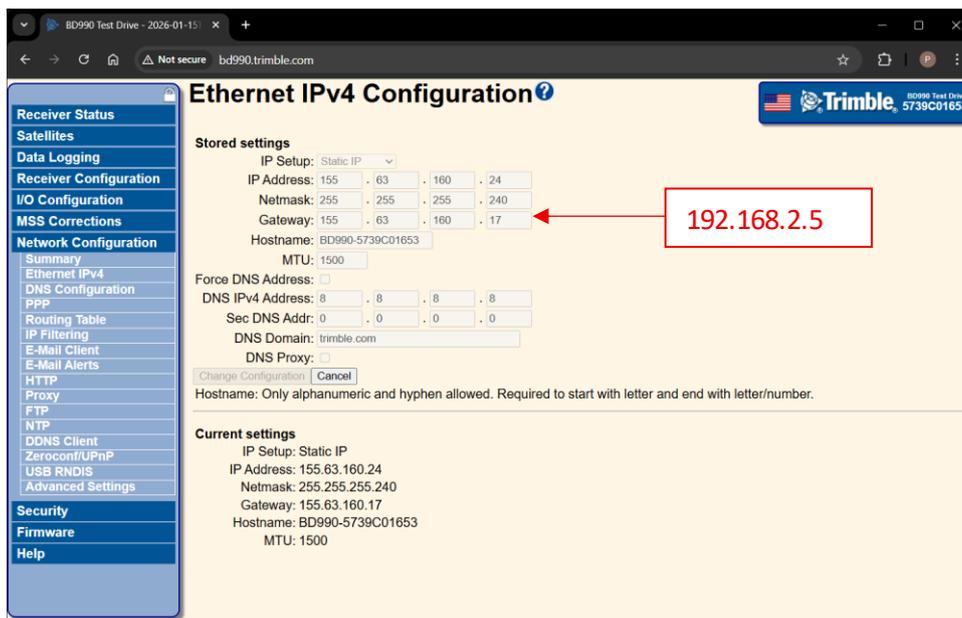


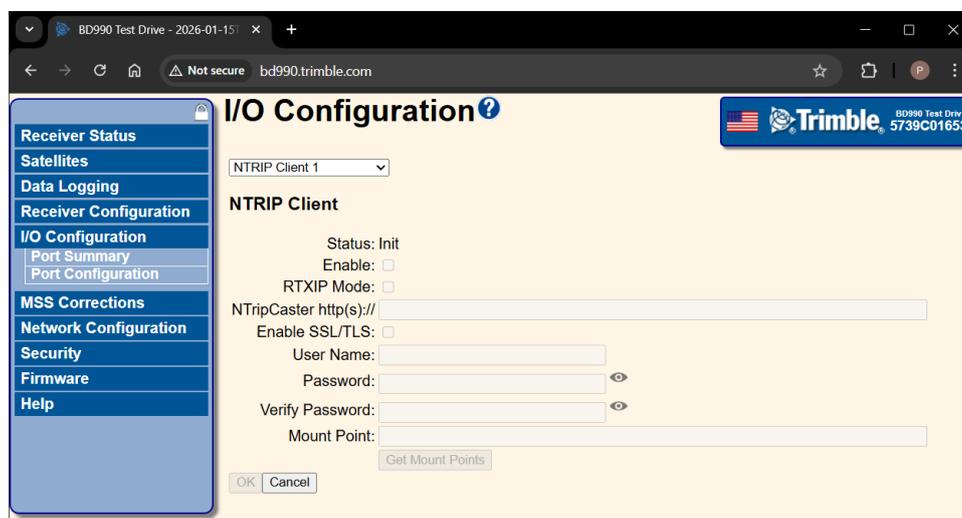*Trimble webserver – network configuration page*

The settings are:

| IP Setup | Leave this as Static IP.  The CEESCOPE controls this field. |
|---|---|
| IP Address | Do not set.   The CEESCOPE controls this field. |
| Netmask | Do not set.   The CEESCOPE controls this field. |
| Gateway | **Set this to the IP address of the UMR-Industrial.** |

Press the 'Change Configuration' button to save the changes.

The UMR-Industrial routers have been delivered with their Wi-Fi interface enabled. This interface can be used by any Wi-Fi enabled device on the boat for internet, or CEESCOPE access.  For example, the Wi-Fi interface can be used by your survey computer to allow your hydrographic software to communicate with the CEESCOPE instead of using an Ethernet connection. However, tsting has shown that the Ethernet interface is more reliable and is the preferred option.

Set up the NTRIP parameters in the BD990 / 9250 NTRIP CLIENT page. This is found on the I/O Configuration->Port Configuration page:



*Trimble webserver – I/O configuration page*

The CEESCOPE will only make use of the NTRIP Client 1 interface, so please use Client 1 only. Do not set the Enable field: the CEESCOPE will control this.

The settings are:

| Enable | Do not set.  The CEESCOPE controls this field. |
|---|---|
| RTXIP Mode | Leave this unchecked |

| NTripCaster http(s):// | your NTRIP service URL or IP address (e.g. ntrip.data.gnss.ga.gov.au) |
|---|---|
| User Name | Your NTRIP account username |
| Password and Verify Password | Your NTRIP service password |
| Mount Point | The selected mountpoint.  With the other details entered, this field can be auto-filled using the 'Get Mount Points' button. |

Press the 'OK' button to save the settings.

It is recommended that the primary and secondary DNS addresses be set in the BD990 / 9250 to 8.8.8.8 and 8.8.4.4 respectively. These are IP addresses of the Google Public DNS. Setting this allows you to specify a URL for the NTRIP caster address, rather than an IP address. The IP address associated with a URL may occasionally change, so you may find that specifying an IP address rather than a URL will eventually be the source of a problem that is difficult to diagnose.
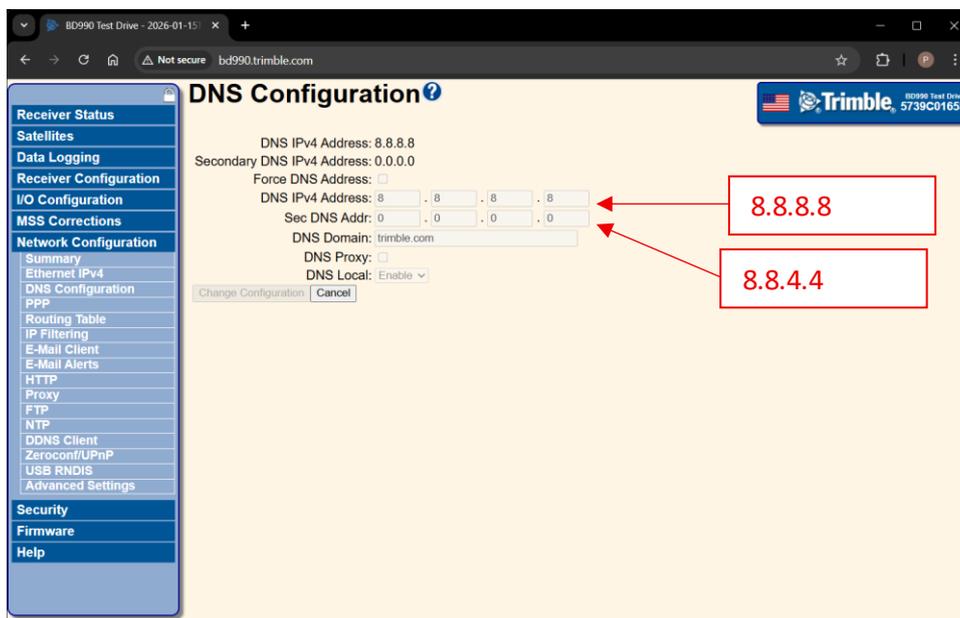


*Trimble webserver – DNS configuration page*

**CEESCOPE-R settings**

- Enable the 802.3af supply via the CEESCOPE's System (8/8) LCD screen.  Pressing the battery symbol on the CEESCOPE's home screen is a shortcut to the same screen.  The CEESCOPE menu page refers to the 2K LEMO Ethernet as the 'Wi-FI'

port, this is intended for powering 'passive' PoE devices such as the Ubiquiti Bullet and cannot power the UMR-Industrial.

- Set the RTCM source to "NTRIP_CLIENT". Another option is "NTRIP OR SATELLITE" if you would like the BD990 / 9250 to revert to SBAS, HAS or CP-RTX corrections if the NTRIP correction fail.
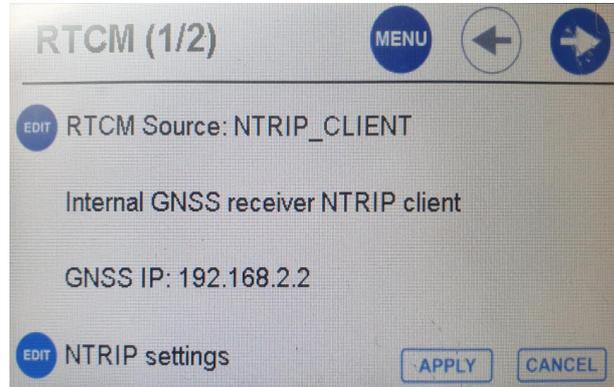


*CEESCOPE-R RTCM screen*

**Expected Behaviour**

With all the appropriate settings made, the start-up behaviour of the CEESCOPE and UMR-Industrial was tested:

| Time (seconds) | Event |
|---|---|
| 0 | ON/OFF button pressed on CEESCOPE |
| 32 | CEESCOPE applies power (PoE) to UMR-Industrial. UMR-Industrial LED switches on (solid white). |
| 70 | UMR-Industrial LED begins white flashing (booting up). |
| 143 | Fixed RTK reported by BD990/CEESCOPE. The GNSS quality indicator on the home screen of the CEESCOPE LCD will switch to '4'. |
| 157 | UMR-Industrial LED goes solid blue (normal operating mode). |

Therefore, if the CEESCOPE, BD990 / 9250 and UMR-Industrial router are configured correctly, the CEESCOPE should report a fixed RTK solution 143s (about 2.5 minutes) after the CEESCOPE is switched on.

**UMR-Industrial LED behaviour**

| | |
|---|---|
| **Off** | The device is powered off. |
| **Flashing White (1.5s interval)** | The device is initializing and booting up. |
| **Rapid flashing white** | The device is connecting. |
| **Steady White** | The device is ready for adoption or connected via LTE. |
| **Steady Blue** | The device is adopted and in normal operating mode. |
| **Flashing Blue (3s On, 0.2s Off)** | Network/Wi-Fi error (Device is on but not connected to the Internet). |
| **Flashing White (3s On, 0.2s Off)** | SIM card initialization failed (SIM card locked or deactivated). |