APN-089

IP Delivery for Global TerraStar Corrections

Table of Contents

Introduction: IP Delivery for Global TerraStar Corrections

Introduced in the 7.04.00 firmware release, L-Band IP (LBIP) subscriptions allow users to receive Global TerraStar Corrections over both L-Band and IP. There are many benefits of using IP delivery, especially in environments where L-Band signals are difficult to track. When used simultaneously with L-Band, IP delivery adds redundancy to the solution, creating a layer of resiliency in challenging environments. IP delivery can also be used as the single correction delivery method if the hardware combination is not L-Band capable.

This document provides an overview of LBIP delivery for Global TerraStar corrections, with in depth instructions for IP delivery specifically. For more detailed information on configuring the receiver for L-Band delivery, refer to Enabling PPP or APN-061: Using TerraStar Corrections.

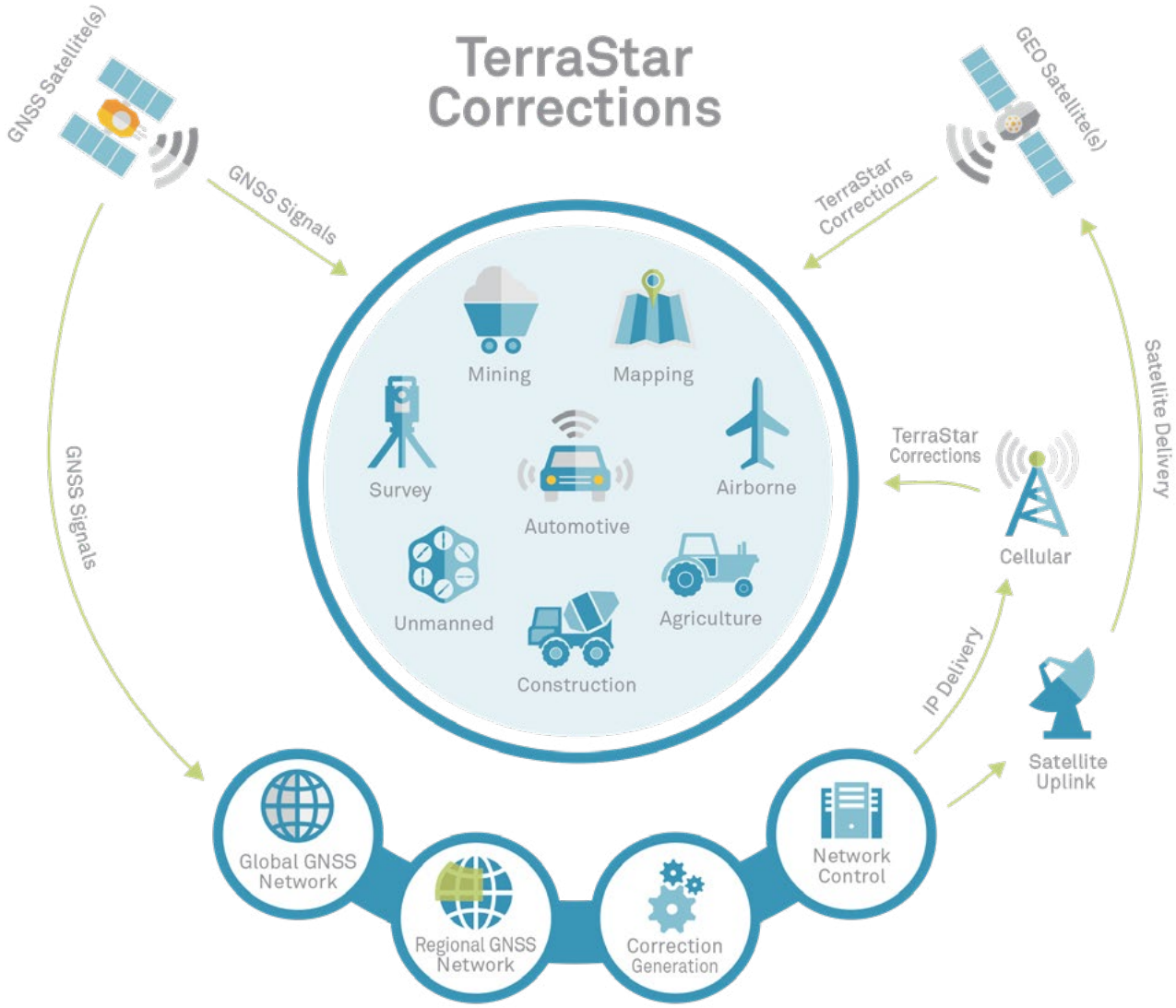

Figure 1: Global TerraStar Corrections Delivery

L-Band and IP (LBIP) Subscriptions

Overview of LBIP Delivery
With an L-Band and IP (LBIP) subscription, users can access TerraStar Corrections over either delivery method, selecting the configuration most suitable to the hardware setup and application. As the correction data and activation messages are identical through both delivery channels, users can operate on a single source or a combination of the two for added ease of use, reliability and redundancy.

The following are examples of when each configuration might be used:
- L-Band and IP delivery: added reliability and redundancy for varied positioning environments; use IP to activate indoors and start L-Band tracking once outside
- L-Band delivery: user does not have cellular service for IP delivery
- IP delivery: hardware is not L-Band capable

IP corrections are sent through a cellular network, requiring the user to establish an internet connection to receive the corrections. If IP delivery is the only configured source (no L-Band), this cellular connection must be maintained for the duration of the positioning application. As IP delivery is not dependent on L-Band satellite visibility, this delivery method may extend the serviceable region if the application area does not have L-Band coverage, or if the built environment blocks L-Band signals.

If possible, it is recommended to have both L-Band and IP delivery sources configured. This redundancy will ensure the best coverage and positioning experience should one of the sources be temporarily unavailable. When both delivery methods are configured, they are used simultaneously; one source is not prioritized over the other. This means that the receiver will use the most recent correction data packet received, regardless of which source it comes from.

The correction data and activation messages are identical over both IP and L-Band delivery, and the difference in correction age between the two sources is negligible. If using both delivery methods, there may be slight changes in correction age if one source is temporarily lost and regained, however the user should not notice any impact on the positioning performance. As long as one correction source is still available, the user should not expect any interruptions or delay in corrections. Once the second source becomes available again, the receiver will seamlessly reconnect and use both sources as before.

Requirements for LBIP Delivery

Firmware
LBIP delivery is only available on OEM7 products on firmware versions >= 7.04.00.

Hardware
OEM7 hardware is required for an LBIP subscription.

IP Hardware: In order to use IP delivery, the receiver must have a configurable Ethernet, USB, or serial port available for IP delivery. A built-in NTRIP client is available on all OEM7 products equipped with an Ethernet port. Alternatively, an external NTRIP client can be used to re-direct the IP corrections over an available serial or USB port on the receiver. The port used for IP delivery should be exclusively used for correction delivery and it is not recommended to configure any other logs to be transmitted/received on this port.

L-Band Hardware: To use L-Band delivery, both the receiver and antenna must capable of tracking L-Band signals.

Model
To access and use Global TerraStar Corrections, the software model on the receiver must be PPP capable. To meet TerraStar performance specifications, the model must be at least dual-constellation, dual-frequency.

Subscription
The TerraStar subscription part number must include 'LBIP' (L-Band & IP) for IP Delivery to be enabled. For example: *TSCP-GL-LA-1YR-LBIP: TerraStar-C Pro, Global L-Band and IP, Land, 1yr, L-Band and IP delivery.*

Setting Up IP Delivery

Method #1 – Receiver NTRIP Client
The following steps can be referred to for configuring a receiver for TerraStar IP delivery. This method requires that the receiver card has an Ethernet port.

Setup the Receiver as an NTRIP Client for IP Delivery
The first necessary step is to confirm that the receiver has internet connectivity. The receiver's Ethernet port can be configured with a static or dynamic IP address. More information on setting up static or dynamic IP address configuration can be found on the OEM7 Receiver Documentation Portal.

Once configured, IP address assignment can be confirmed by the IPSTATUS log. It should report similar to below:

```
#IPSTATUSA,COM1,0,90.5,FINESTEERING,
1609,500464.121,02000000,7fe2,6259;1,
ETHA,"10.4.44.131","255.255.255.0","
10.4.44.1",1,"198.161.72.85"*ec22236c
```

In the above example **ETHA** has been assigned the IP address **10.4.44.131**.

Now that we have established the receiver has an IP address assigned, the following commands should be sent to the receiver in order to configure the receiver as an NTRIP client:

```
NTRIPCONFIG NCOM1 CLIENT V1 sidoutput.
com:2101 SID08 SID MELs9tPw4 ALL
INTERFACEMODE NCOM1 VERIPOS NONE OFF
```

The 'NCOM1' port is used in the above commands but this can be changed to any free NCOM port, as long as both commands are issued to the same NCOM port. The username (SID) and password (MELs9tPw4) used are the same for all receivers.

Verify Subscription Activation
The receiver should report that it is '**locked**' to the TerraStar beam as per the TERRASTARSTATUS log below:

```
#TERRASTARSTATUS,COM1,0,53.0,
FINESTEERING,2074,339035.394,02004120,
32bc,15824;DISABLE,LOCKED,0,DIABLLED,
DISABLED*1087cb3f
```

The receiver can now acquire the activation message over the IP connection. Refer to this document's section Receiving the Subscription Activation Message for more details.

Monitor PPP Solution
Once the activation message is acquired, the receiver should now have incoming corrections on the configured Ethernet port, 'NCOM1' in this example. The user can verify the PPP solution with the PPPPOS log.

```
#PPPPOSA,USB2,0,31.0,FINESTEERING,2076,
159185.000,02000000,ec34,15824;
SOL_COMPUTED,PPP_CONVERGING,51.1503919
4531,-114.03069801746,1096.0146,
-17.0001,WGS84,1.9853,1.5026,4.0140,
"TSTR",15.000,0.000,35,33,33,27,00,00,
15,33*9d7a2c41

#PPPPOSA,USB2,0,25.5,FINESTEERING,2076,
159625.000,02000000,ec34,15824;SOL_COMP
UTED,PPP,51.15038830176,-114.0306981631
4,1097.3369,-17.0001,WGS84,0.1675,0.211
4,0.2227,"
```

Method #2 – External NTRIP Client
This method must be used if the receiver does not have an Ethernet port. This is an alternative method for receivers that do have an Ethernet port.

Setup External NTRIP Client for IP Delivery
The IP corrections can be received using an external NTRIP client (for example, Lefebure NTRIP Client) to re-distribute them to the NovAtel receiver. The Lefebure NTRIP Client is a small and lightweight program, which can receive corrections over the internet from TerraStar and re-direct them to a serial or USB (virtual serial) port on the NovAtel receiver. It is available for download here.

The External NTRIP Client must be configured, similarly to the receiver card in Method #1.

Click '**Edit**' on the NTRIP Stream, and enter the NTRIP Caster Settings as per below:

Address: **sid-output.com**
Port: **2101**
Username: **SID**
Password: **MELs9tPw4**

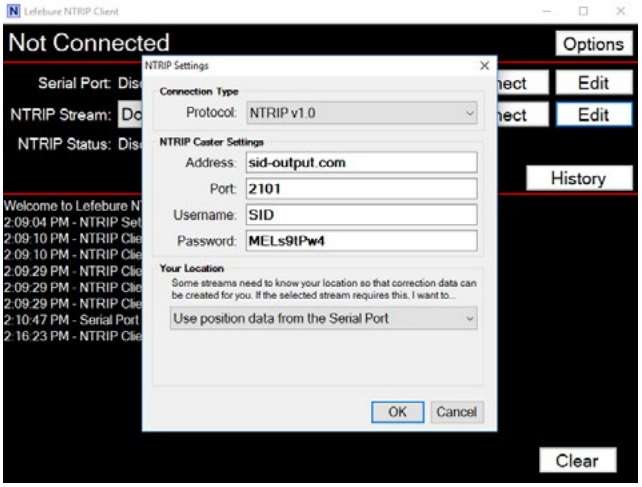

Figure 2 - Lefebure NTRIP Client: NTRIP Settings

Click the drop-down menu in NTRIP Stream and select '**Download Source Table**' and select the NTRIP Stream (mountpoint) 'SID08'.

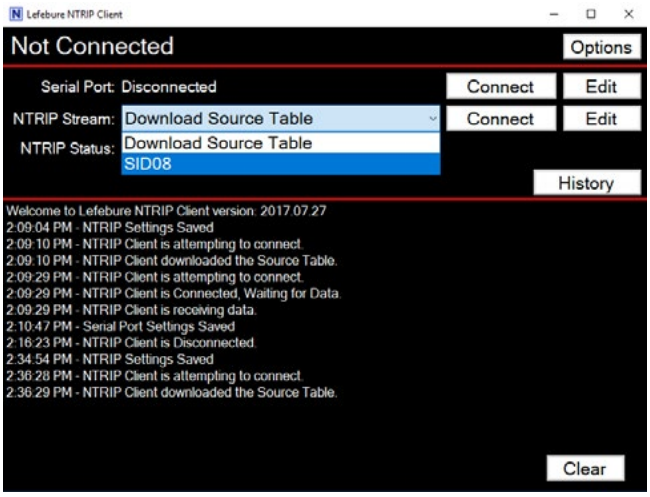

Figure 3 - Lefebure NTRIP Client: Selecting the correct mountpoint 'SID08'

Click **'Connect'** on the NRTIP Stream and the NTRIP Status will change to indicate the number of incoming bytes received:

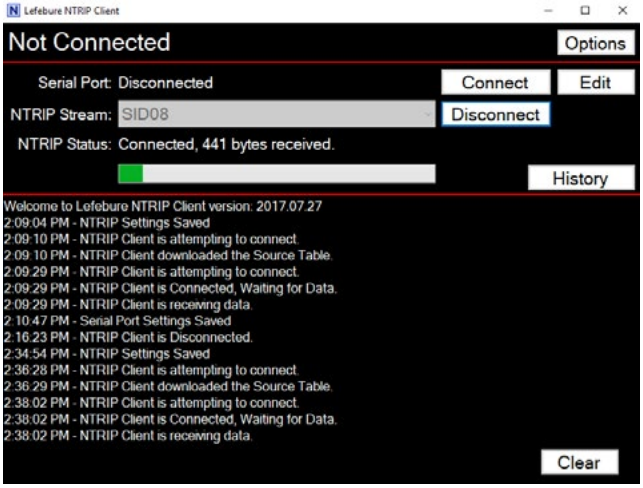

Figure 4 - Lefebure NTRIP Client: NTRIP Status Connected

Click **'Edit'** on the Serial Port and select the desired 'PC' Serial Port to deliver the corrections to the receiver. The Baud Rate can be left as default at 115200 bits/second.

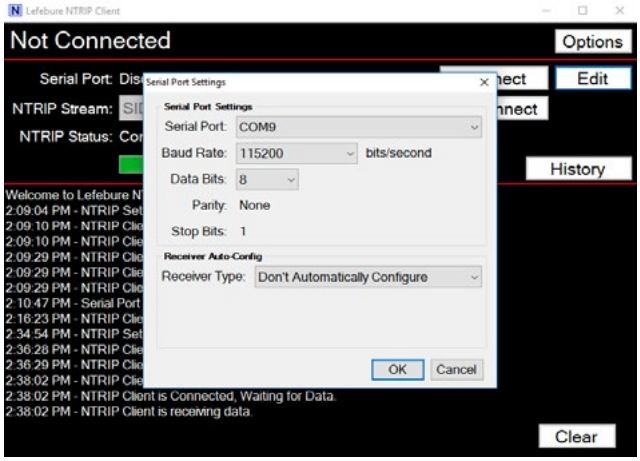

Figure 5 - Lefebure NTRIP Client: Serial Port Settings

Click **'Connect'** on the Serial Port and the corrections will be streamed from the NTRIP Client software to the specified port on the receiver. In this example, the PC COM9 port is connected to COM3 of the NovAtel receiver.

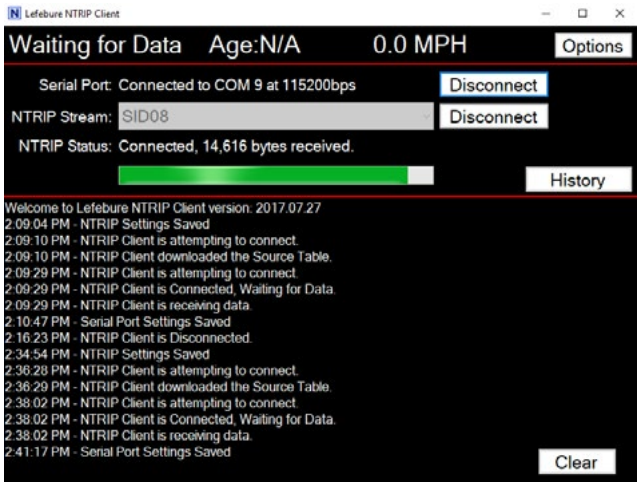

Figure 6 - Lefebure NTRIP Client: Configuration Complete

Configure Receiver

In order to receive the corrections from the NTRIP Client software on the receiver, it is necessary to change the SERIALCONFIG command settings to match those in the NTRIP Client Software, and change the INTERFACEMODE of the designated COM port to allow the corrections:

For example:

```
SERIALCONFIG COM3 115200
INTERFACEMODE COM3 VERIPOS NONE OFF
```

Note: COM3 is an example port, other available COM or USB ports can be used. If a USB virtual serial port is used, the SERIALCONFIG command does not apply.

To monitor the TerraStar status, configure the following two logs:

```
LOG TERRASTARINFOA ONCHANGED
LOG TERRASTARSTATUSA ONCHANGED
```

Verify Subscription Activation

The receiver should report that it is '**locked**' to the TerraStar beam as per the TERRASTARSTATUS log below:

```
#TERRASTARSTATUSA,COM1,0,53.0,
FINESTEERING,2074,339035.394,02004120,
32bc,15824;DISABLE,LOCKED,0,DISABLED,
DISABLED*1087cb3f
```

The receiver can now acquire the activation message over the IP connection. Refer to this document's section Receiving the Subscription Activation Message for more details.

Monitor PPP Solution

The receiver should now have incoming corrections on the configured USB or serial port, 'COM3' in this example. The user can verify the PPP solution, by logging PPPPOS.

Appendix A: Activating an LBIP Subscription

The TerraStar LBIP subscription activation message can be received via IP and/or L-Band, so a connection to at least one of the delivery methods is required. For information on configuring the receiver for IP delivery, refer to this document's section on Setting Up IP Delivery. For information on configuring the receiver for L-Band delivery, refer to Enabling PPP or APN-061: Using TerraStar Corrections.

The subscription activation details on the receiver can be verified by logging the following:

```
LOG TERRASTARINFOA ONCHANGED
LOG TERRASTARSTATUSA ONCHANGED
```

When the LBIP subscription activation message has been received, Bit 31 of the TerraStar Subscription Permissions field of the TERRASTARINFO log will be set to indicate that IP delivery is enabled.

```
#TERRASTARINFOA,USB1,0,87.5,
FINESTEERING,2078,423463.839,02000000,
91ea,15824;"QW152:7638:0615",TERM,
80002700,325,2019,0,NEARSHORE,0.00000,
0.00000,0*baa88eb5
```

If Bit 31 of the TerraStar Subscription Permissions field is not set, the receiver has not yet received the subscription activation message enabling IP delivery.

Once the receiver has acquired a valid subscription activation message the TERRASTARINFO log should report similar to the below, with the 'Access' Field showing '**ENABLE**':

```
#TERRASTARSTATUSA,USB1,0,86.0,
FINESTEERING,2078,423475.801,02000000,
32bc,15824;ENABLE,LOCKED,0,DISABLED,
ONSHORE*950318eb
```

Appendix B: Evaluating LB and IP Delivery Methods Independently

Some users may wish to test individual delivery methods by turning off the second delivery method.

IP-Only Delivery

IP-only delivery is a valid configuration for equipment setups that don't have an L-Band antenna connected. If the antenna used is L-Band capable, L-Band delivery can be turned off by using the ASSIGNLBANDBEAM command:

```
ASSIGNLBANDBEAM IDLE
```

The LBANDTRACKSTAT log will then show that all of the L-Band channels have been idled, meaning that L-Band tracking is disabled.

```
<LBANDTRACKSTAT USB2 0 33.0
FINESTEERING 2076 157605.000 02000000
29e3 15824
< 5
< "" 0 0 0000 0003 0 0.000 0.000 0.0000
0.000 0 0 0 0 0 0.0000
< "" 0 0 0000 0003 0 0.000 0.000 0.0000
0.000 0 0 0 0 0 0.0000
< "" 0 0 0000 0003 0 0.000 0.000 0.0000
0.000 0 0 0 0 0 0.0000
< "" 0 0 0000 0003 0 0.000 0.000 0.0000
0.000 0 0 0 0 0 0.0000
< "" 0 0 0000 0003 0 0.000 0.000 0.0000
0.000 0 0 0 0 0 0.0000
```

To re-enable L-Band tracking, send the following command:

```
ASSIGNLBANDBEAM AUTO
```

L-Band-Only Delivery

For information on configuring the receiver for L-Band delivery, refer to Enabling PPP or APN-061: Using TerraStar Corrections.

To turn off IP delivery, the receive function of INTERFACEMODE can be set to 'NONE':

```
INTERFACEMODE NCOM1 NONE NONE OFF
```

To re-enable it, send the following:

```
INTERFACEMODE NCOM1 VERIPOS NONE OFF
```

Please note: The 'NCOM1' port is used in the above commands, as NCOM1 was the port used for IP delivery in the example configuration in the Method #1 section of this document. When disabling IP delivery use the corresponding port that was configured originally for IP delivery.

If using an external NTRIP client, the IP stream can be disabled by disconnecting the NTRIP Stream or the Serial Port inside the NTRIP Client.

Appendix C: Additional Resources

Commands and Logs
Commands (new and legacy):
- ASSIGNLBANDBEAM
- NTRIPCONFIG
- INTERFACEMODE
- SERIALCONFIG

Logs (new and legacy):
- TERRASTARSTATUS
- TERRASTARINFO
- IPSTATUS
- PPPPOS

References
APN-061: Using TerraStar Corrections
APN-085-TerraStar-RSS-Feed
APN-087-Advanced-TerraStar-Services

NovAtel Support
To help answer questions and/or diagnose any technical issues that may occur, the NovAtel Support website is a first resource.

Remaining questions or issues, including requests for test subscriptions or activation resends, can be directed to NovAtel Support Contact. To enable the online form and submit a ticket, first select a "Product Line" and then an associated "Product" from the list.

Before contacting Support, it is helpful to collect data from the receiver to help investigate and diagnose any performance-related issues. In those cases, if possible, collect the following list of logs (the LOG command with the recommended trigger and data rate is included):

LOG VERSIONA ONCE
LOG RXSTATUSA ONCHANGED
LOG RAWEPHEMB ONCHANGED
LOG GLORAWEPHEMB ONCHANGED
LOG RANGEB ONTIME 1
LOG BESTPOSB ONTIME 1
LOG PPPPOSB ONTIME 1
LOG PORTSTATSA ONTIME 5
LOG PPPSATSB ONTIME 1
LOG LBANDTRACKSTATB ONTIME 1
LOG TERRASTARINFOA ONCHANGED
LOG TERRASTARSTATUSA ONCHANGED
LOG LBANDBEAMTABLEA ONCHANGED
LOG IPSTATUSA ONCE
LOG RXCONFIGA ONCE

The data described above can be collected using a terminal program that supports binary data logging, or NovAtel's Connect utility can be downloaded and installed from the NovAtel website.

Documentation
All logs and commands described below can be found in the documentation for OEM7: OEM7 Receiver Documentation Portal

Contact Hexagon | NovAtel

support@novatel.com 1-800-NOVATEL (U.S. and Canada) or 1-403-295-4900
For the most recent details of this product: https://www.novatel.com/#latestNews