Application Note

Oceanix on OEM7

HEXAGON AUTONOMY & POSITIONING DIVISION
CONFIDENTIAL AND PROPRIETARY DATA

Contents

Oceanix

Oceanix Correction Services deliver exceptional sub-decimeter positioning for diverse nearshore marine applications including dredging, hydrographic survey, and mapping. The high-rate of corrections facilitate carrier phase ambiguity resolution within the GNSS receiver. Integrating this process within the receiver enhances the accuracy and speeding recovery from GNSS signal interruptions.

Oceanix includes precise GNSS clock and orbit correction data providing high accuracy sub-decimeter solutions worldwide. Oceanix is offered with multiple subscription durations designed to meet the unique needs of marine nearshore applications, including dredging and hydrographic survey.

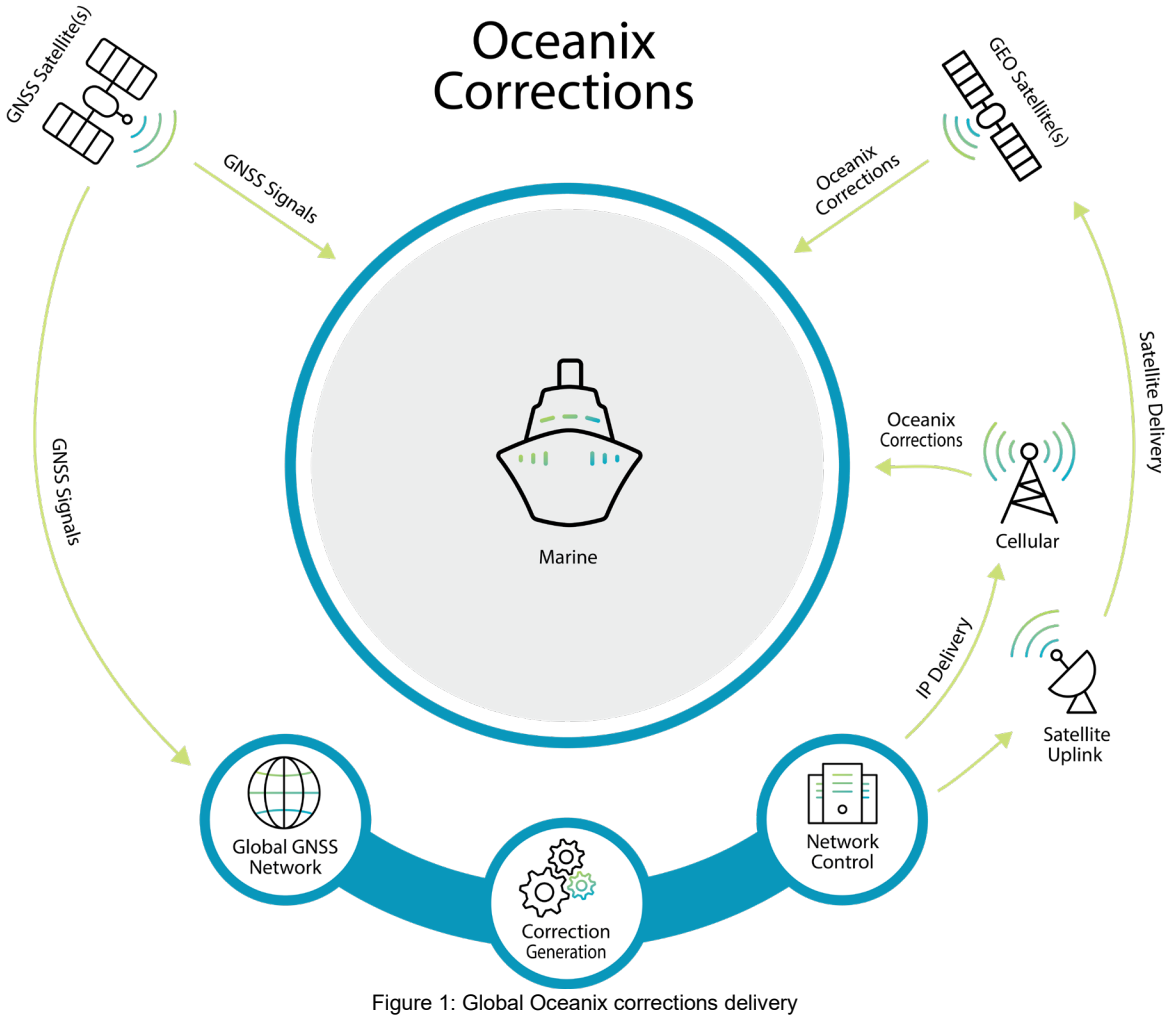

Figure 1: Global Oceanix corrections delivery

Coverage

There are five different L-band satellites that broadcast Oceanix corrections for specific regions and the distribution of the L-band satellites allows for dual coverage in virtually any location. To provide additional coverage and redundancy, especially in large regions or countries, information for regional subscriptions is broadcast on the three beams best suited for that region.

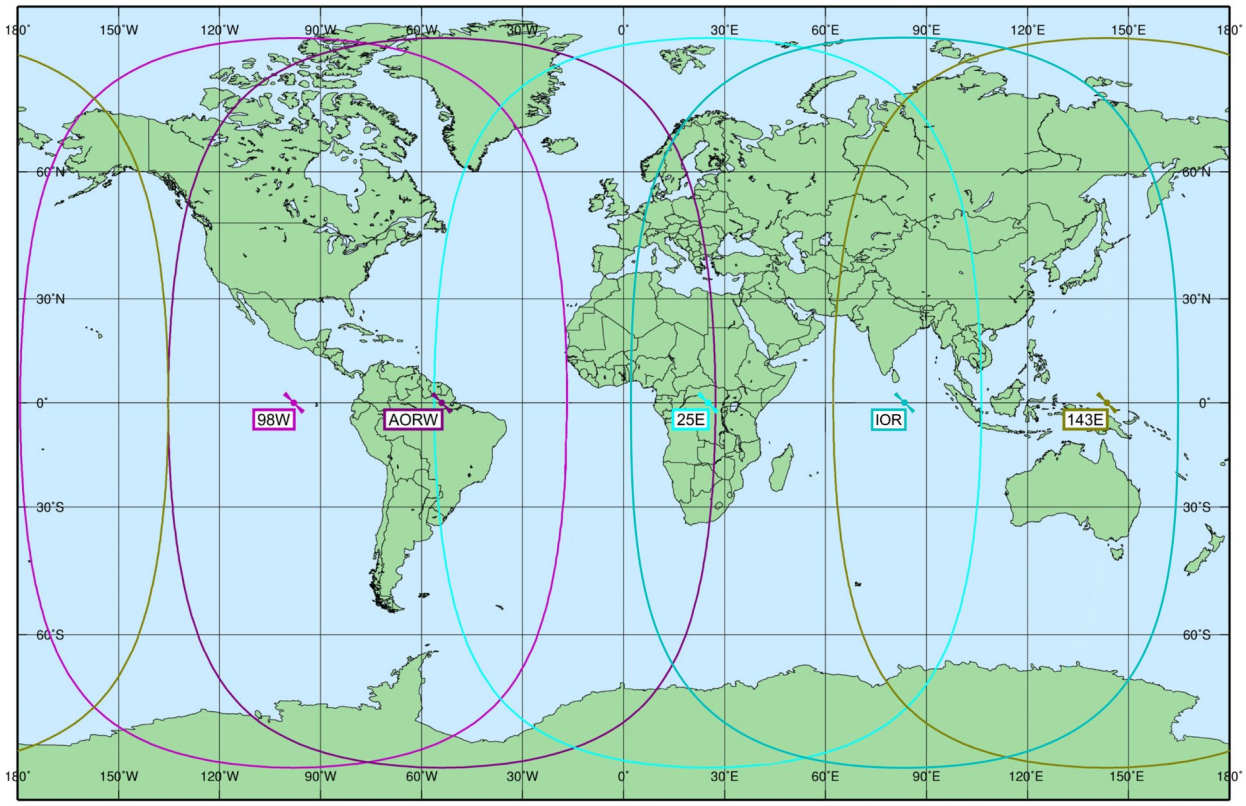

Figure 2: Global Oceanix coverage

More detail on coverage areas for specific beams can be viewed in the interactive coverage map.

Using Oceanix

In addition to an Oceanix subscription, there are specific hardware and software requirements that must be met to use Oceanix corrections and obtain a PPP solution.

Hardware Requirements

To use Oceanix corrections and obtain the best performance, the following hardware is required:

- A MarinePak7 receiver, or a NovAtel OEM7 receiver card or enclosure.
- Best performance is achieved through an antenna with full GNSS signal support.

Table 1 Full GNSS signal support

GPS	L1	L2	L5	
GLO	L1	L2		
GAL	E1	E5b	E5a	E6
BDS	B1C	B2a	B2b	B3

Firmware Requirements

Oceanix requires firmware version 7.05.00 or later.

- 7.08.14 or later is required for best Oceanix convergence performance.

Model Requirements

Oceanix subscriptions require the “P” designator or better in the char[4] position under the Positioning Options of the firmware model. For example:

- MP7720-DDN-**P**NN-TMN-A

Positioning Options	
CORRECT Positioning	
char[4]	
N	None
L	Low End Positioning
P	**L** + High Accuracy PPP
R	**P** + RTK --> RTK / Fast Convergence PPP
B	R + RTKAssist

Figure 3: Letter designators for positioning option character [4]

Configuration

Enable L-band Tracking

Before a receiver can start using corrections through an Oceanix service, it first must be configured to track the L-band signal from an Oceanix geostationary satellite.

To enable L-band tracking, the AUTO setting is recommended in most cases:

```
ASSIGNLBANDBEAM AUTO
```

The AUTO setting allows the receiver to automatically track the highest elevation Oceanix satellite for best performance. The receiver firmware includes a default list of Oceanix satellites beams (see LBANDBEAMTABLE).

To determine which Oceanix signal is the best to use in a particular location, the receiver must have a position solution available first.

To verify the L-band tracking status, the "LBANDTRACKSTAT" log can be used. For example:

```
#LBANDTRACKSTATA,COM1,0,71.0,FINESTEERING,2045,331169.000,02004008,29e3,32768;
5,
"SP98W1",1545885000,1200,974c,00c2,0,-32.095,42.138,3.9499,2395.248,45504,0,0,
5824512,0,0.0000,
"98W",1545865000,1200,974c,00c2,0,-138.875,41.949,4.0328,2421.916,46080,0,0,
5898240,0, 0.0000,
"AORW",1545845000,1200,974c,00c2,0,-190.871,45.021,4.5517,2417.987,45952,0,0,
5881856,0, 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
```

This log reports the L-band tracking status of the Oceanix beams. Some important fields are highlighted above for three beams that the receiver is tracking and are described below for beam "98W":

- **98W**: This is the name of the Oceanix beam or transmitting satellite being tracked. Additional details for the tracked beam can be output and viewed with the LBANDBEAMTABLE log.
- **00c2**: This is the "Tracking Status Word". A tracking status of "00c2" indicates that the receiver is tracking the Oceanix signal.
- **41.949**: This is the C/No or "Carrier to Noise Density Ratio" (in dB-Hz). The C/No is typically about 40-45 dB-Hz in ideal tracking conditions. A low C/No can result in missed corrections and correspondingly degraded performance.
- **2421.916**: This is the "Lock Time" (in seconds). This field can be monitored to ensure that the L-band signal is being tracked continuously without any loss of lock.

While the actual tracking of the L-band beam does not require a subscription, the receiver will not decode and use the Oceanix corrections until a valid subscription is activated.

Subscriptions

A valid subscription is required to use Oceanix services. To purchase an Oceanix subscription, users should contact their NovAtel dealer or sales office[1]. NovAtel's eStore also allows purchasing Oceanix subscriptions.

Test subscriptions can be made available for test and demonstration purposes. Please contact NovAtel Customer Support[2] for more information.

For purchase or trial subscription purposes, NovAtel receiver's Product Serial Number (PSN) is needed. Before contacting your NovAtel sales office, obtain the PSN for the receiver you wish to activate using the LOG VERSION command. In the example VERSION log below, the PSN is "DMMU18180047T":

```
[ICOM1]<VERSION ICOM1 0 50.5 FINESTEERING 2236 396805.636 02000020 3681 17022
<     11
<          GPSCARD "MFDRYNTBEP1" "DMMU18180047T" "OEM7720-1.00" "OM7CR0814RN0000"
"OM7BR0002RB0000" "2022/Oct/13" "15:43:28"
<          OEM7FPGA "" "" "" "OMV070001RN0000" "" "" ""
<          DEFAULT_CONFIG "" "" "" "EP7CD0814RN0001" "" "2022/Oct/13" "15:43:41"
<          APPLICATION "" "" "" "EP7AR0814RN0000" "" "2022/Oct/13" "15:43:35"
<          PACKAGE "" "" "" "EP7PR0814RN0000" "" "2022/Oct/13" "15:43:38"
<          DB_WWWISO "WWWISO" "0" "" "1.9.0" "" "2022/Aug/08" "16:09:50"
<          ENCLOSURE "PWRPAK7D" "NMPL18210009A" "" "" "" "" ""
<          WIFI "RS9113" "" "" "1.7.12" "" "2022/Oct/13" "15:43:48"
<          REGULATORY "EU" "" "" "" "" "" ""
```

Once a subscription is activated, the subscription activation signal will be broadcast at the specified start date and time. The receiver must be tracking the Oceanix signal prior to the subscription start time.

The subscription activation message is broadcast for a period of 30 days from the specified date/time (UTC) of the activation. The subscription activation is re-sent every hour for the first 24 hours. For the following 29 days (or the remaining days of the subscription if <30 days) the subscription activation message is sent every approximately 3-6 hours.

Customers can also contact NovAtel Customer Support or use NovAtel's eStore to resend the subscription in cases where the initial activation was missed.

When an active but expiring subscription is renewed, the updated subscription information gets broadcast during the last seven days of the active, expiring subscription. If the receiver tracks the Oceanix signal during that time, there will be no disruption in service when the renewal subscription begins. The activation information for the renewal subscription continues to be broadcast for the subsequent 30 days.

[1] www.novatel.com/where-to-buy/sales-offices/
[2] Contact support.novatel@hexagon.com for more details. Maximum of 3 test subscriptions allowed per receiver.

To verify the Oceanix subscription and status, use the command “LOG OCEANIXSTATUS” to output the OCEANIXSTATUS log, for example:

```
<OCEANIXSTATUS ICOM1 0 16.0 FINESTEERING 2236 386840.270 02040020 049a 16860
<      ENABLE LOCKED IN REGION
```

In this example, the access status “ENABLE” indicates that the subscription is valid.

The OCEANIXINFO log reports the subscription type and in the case of an Oceanix subscription:

```
<OCEANIXINFO ICOM1 0 19.5 FINESTEERING 2236 386825.270 03040020 9ce8 16860
<      "QW769:6770:5633" TERM 80001803 326 2022 0 NEARSHORE
```

Positioning with Oceanix

When the receiver is configured to track the Oceanix signal and has downloaded a valid subscription, it will then begin decoding the correction data coming from the Oceanix beams to compute a PPP position. To verify the availability of a PPP position solution, the following position logs can be output using the LOG command:

- PPPPOS
- BESTPOS
- GPGGA

Here is an example command that will request the PPPPOS log on the COM1 port every second:

```
LOG COM1 PPPPOS ONTIME 1
```

The PPPPOS log will always output the PPP solution when available, whereas the BESTPOS and GPGGA logs will output the “best available” solution. When using BESTPOS or GPGGA logs, another solution will be output in some cases, typically an autonomous (SINGLE) or SBAS (WAAS) position type, until the accuracy of the PPP solution becomes the best available.

At first, the PPP solution will be flagged as converging in the position logs. After the convergence completes, the position type will change to indicate a converged solution with the position types as shown in the table below:

Table 2: PPP position status by log and GPS quality

PPP Solution Status	BESTPOS/PPPPOS	GPGGA (Quality Indicator)
Oceanix Converging	PPP_CONVERGING	**2**
Oceanix Converged	PPP	**5**

For example, the Oceanix solution below transitions from PPP_CONVERGING to PPP based on the PPPCONVERGEDCRITERIA command setting. By default, the solution is flagged as converged when the estimated horizontal (2D) standard deviation of the solution is under 0.32 meters:

```
<PPPPOS ICOM1 0 49.5 FINESTEERING 2236 396084.000 02000020 9078 17022
<     SOL_COMPUTED PPP_CONVERGING 57.20141200494 -2.19225807515 64.4741 50.3999
WGS84 0.2368 0.2175 0.4808 "OCXH" 14.000 0.000 28 27 27 27 00 00 37 07

<PPPPOS ICOM1 0 48.0 FINESTEERING 2236 396085.000 02000020 9078 17022
<     SOL_COMPUTED PPP 57.20141205446 -2.19225805624 64.4886 50.3999 WGS84 0.2346
0.2160 0.4768 "OCXH" 15.000 0.000 28 27 27 27 00 00 37 07
```

Subscription Managed Channel Configuration (SMCC)

For the receiver to maximize the benefit of all constellations and frequencies available, it will enable additional channels upon receipt of an Oceanix subscription and a subsequent power cycle or reset.

This feature automatically changes the channel configuration to the best needed for the subscribed service.

This allows the receiver to use the entirety of the applicable correction messages for the given receiver hardware and subscription combination without user intervention or configuration.

Note: If the channel configuration was changed using SELECTCHANGONFIG, it must be removed using the FRESET command for SMCC to function properly. The FRESET command will remove all configuration and set the receiver to a factory reset mode.

Table 3: SMCC behavior and model requirements

	Oceanix	
	OEM7700, OEM719, OEM729, PwrPak7, CPT7700	OEM7720, OEM7500, CPT7, PwrPak7D FW 7.08.14 and newer only
Minimum model required to purchase a subscription	DDN-P	DDN-P
Model that supports full subscription functionality	FFN-P	MFN-P
Once active subscription is received, receiver automatically applies SMCC	FFN FF config (7)	MFN MF config (6) MFD MF config (6)

The CHANCONFIGLIST log will show the new channel configuration number, as per the table above.

SMCC is enabled by default. It can be changed using the TERRASTARAUTOCHANCONFIG command.

This functionality is disabled for the MarinePak7. The MarinePak7 will function with the receivers paid model and will not automatically change.

If a FRESET is sent after SMCC has changed the channel configuration, a power cycle or RESET must be done once the receiver boots for SMCC to re-enable and change the channel configuration as described above.

Additional Resources

Commands

For general information about issuing commands to a NovAtel receiver, please visit our online documentation for Commands.

- ASSIGNLBANDBEAM
- PPPCONVERGEDCRITERIA
- PPPDYNAMICS
- PPPRESET
- PPPSEED
- PPPSOURCE
- PPPTIMEOUT
- TERRASTARAUTOCHANCONFIG

Logs

Any of the logs described below can be output using the LOG command. For general information about requesting logs from a NovAtel receiver, please visit our online documentation for Logs.

- LBANDBEAMTABLE
- LBANDTRACKSTAT
- PPPPOS
- PPPSATS
- OCEANIXINFO
- OCEANIXSTATUS

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.

Before contacting Support, it is helpful to collect data from the receiver to help investigate and diagnose any performance-related issues. A list of appropriate troubleshooting logs can be found on the OEM7 Documentation Portal (the LOG command with the recommended trigger and data rate is included with each log).

The data can also be collected using NovAtel Application Suite.

Documentation

For any questions on logs and commands, please visit the OEM7 Documentation Portal.