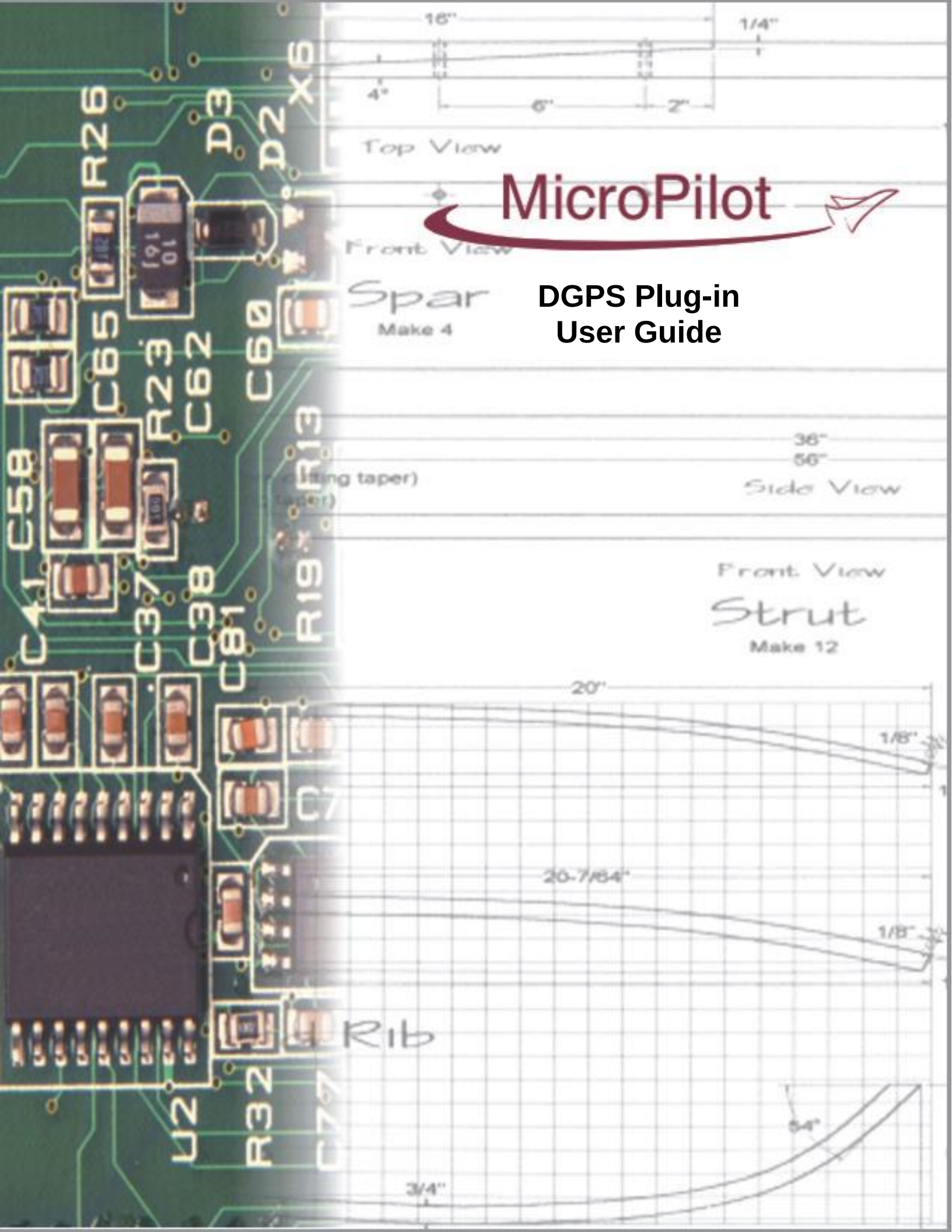

MicroPilot
DGPS Plug-in
User Guide

MicroPilot DGPS (Differential GPS) Plug-in Operation Guide

The MicroPilot DGPS (Differential GPS) Tool is a HORIZON^{mp} plug-in which sends differential correction data to your autopilot using the radio modem link between HORIZON^{mp} and your MicroPilot Autopilot. It also supports the Novatel Align feature when using the MP-Novatel Remote and Base receivers.

The Differential GPS (or DGPS) plug-in is included with HORIZON^{mp} from version 3.4.325.1 onwards and is pre-loaded into the HORIZON^{mp} Tools menu. It is preset by default to be available only when you are connected to your autopilot.

For Novatel Align features software of 3.6 and later is required.

Requirements

You must supply the plug-in with a source of differential correction data – this can be either a Differential Beacon receiver or your own Differential GPS Receiver Base Station. Your source of correction data is fed into a COM port on your computer.

The airborne GPS receiver may be either the Ublox receiver from MicroPilot, installed on your autopilot, or a Novatel OEM-V receiver with interface, available from MicroPilot as an option.

See note on page 6 about the Ublox GPS receiver on the first G2 autopilots.

The DGPS Plug-in Window

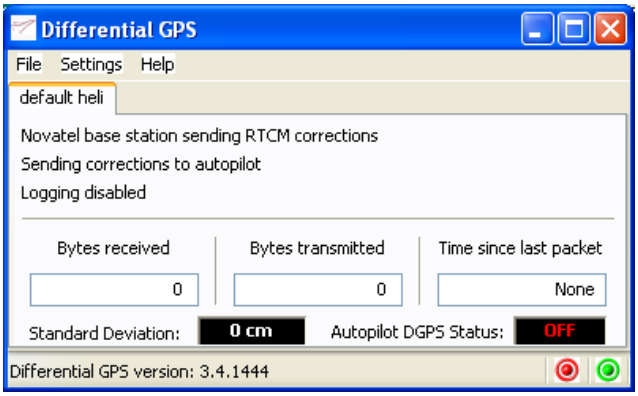


Figure 1 - DGPS plug-in

The name ‘default heli’ shown here on the tab of the DGPS plug-in in Figure 1 is the UAV name. If you have assigned a name to your autopilot by using the UAV Name plug-in tool or the VRS Editor, then that name will appear here. A separate tab will appear for every connected UAV.

Once the DGPS plug-in has started, you can access the settings menu to configure the Tool.

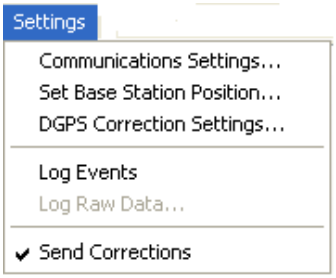


Figure 2 -Settings Menu

Note that the DGPS plug-in is configured by default to automatically disconnect from any open UAV & close. Therefore, in this configuration, to access the settings you must start the DGPS plug-in with NO UAV connected in Horizon.

Communications Settings

These settings are for the COM port where the DGPS plug-in will find the raw DGPS correction data from your source.

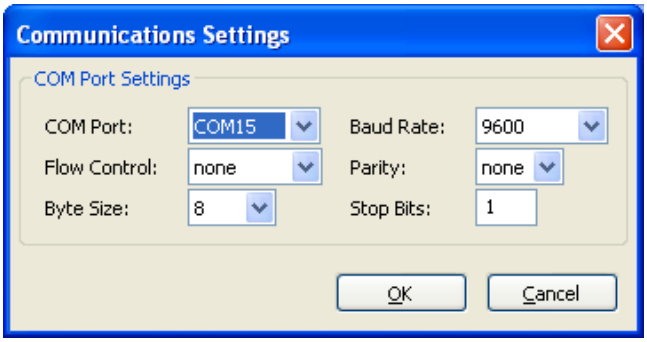


Figure 3 - Communications Settings Page

COM Port

Set this to the COM port on your computer where you supply the raw DGPS correction data.

Baud Rate

Set the baud rate of the selected COM port so it matches the source of your DGPS correction data. For the MP Novatel DGPS base, the baud rate should be *57600* unless you change the baud rate on the base station.

Set Base Station Position

The **Fix Base Station Position** Settings are for when you use your own base station. You set the position of your base station in this page. See *Figure 4.*

The Base Station position **must** be set when using the MP Novatel DGPS base station.

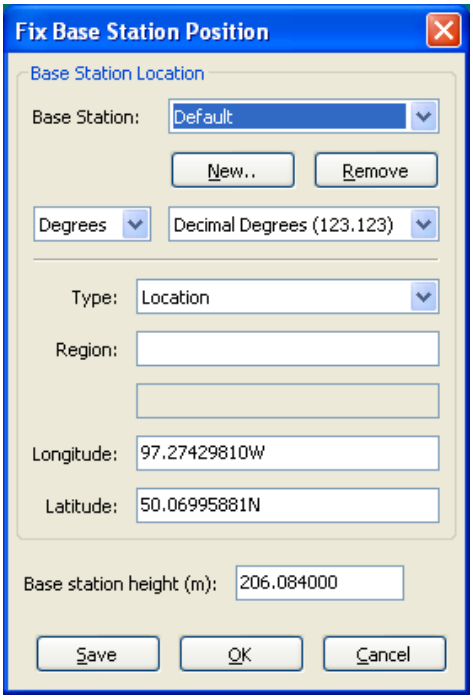


Figure 4 - Fix Base Station Position Settings

NOTE: when setting the base station position you must enter your exact position within 50 m or else the Novatel receiver will not send any data and the autopilot will never lock to DGPS mode.

The **Base Station** list box is used when you want to configure more than one DGPS Base Station. You can add a new Base station to the list and enter the co-ordinates of this Base Station then save the data. You must acquire the exact position of each base station as described below, so that you can enter the co-ordinates for each Base Station.
Once you have stored this data, you can then select the appropriate Base Station and operate the DGPS station from that location.

Set the format of your base station co-ordinates and then enter the **Latitude** and **Longitude** co-ordinates, followed by the **Base station height**.

Getting The Base Station Position Using Novatel Connect

The Base Station position **must** be set when using the MP Novatel DGPS base station.

With Novatel Connect software

The **Novatel Connect** software can be used to determine the base station position. (See *Novatel Connect Software* on page 12 to obtain this).

1. Place the antenna in the intended location where it will be used as a DGPS base.
2. Connect to the MP Novatel DGPS Base with the Novatel Connect software
3. Let it accumulate position fixes for a while, to calculate the average.
   The longer you leave this to accumulate its average position, the better. The Novatel manual recommends about 24 hours! We suggest you leave it for at least one hour.

Getting The Base Station Position Using A Terminal Program

Without Novatel Connect Software

Using a terminal program (HyperTerminal, TeraTerm) enter the following two commands:

1. posave on 1 <enter>
2. log bestpos ontime 1 <enter>

These commands will command the Novatel receiver to average the position for one hour and give you the best position. Once the hour has completed the Novatel will switch to fixed position mode and the **bestpos** log will contain the averaged position.

Example of output with these commands (actual output may vary depending on license installed).

First starts with:

```
[COM2]<BESTPOS COM2 0 94.0 UNKNOWN 0 49.000 804c0000 6145 6988
<    INSUFFICIENT_OBS NONE 0.00000000000 0.00000000000 -6378054.2000 17.2000
WGS84 0.0000 0.0000 0.0000 "" 0.000 0.000 0 0 0 0 0 00 0 00
```

This means it doesn't have a lock.

When the receiver gets a lock the output changes to this:

```
[COM2]<BESTPOS COM2 0 85.0 FINESTEERING 1792 318201.000 80000000 6145 6988
<    SOL_COMPUTED SINGLE 50.06989041322 -97.27409557569 244.2690 -28.2000
WGS84 2.1171 1.5331 3.2899 "" 0.000 0.000 8 8 0 0 0 02 0 01
```

Then after the hour is completed the output changes to:

```
[COM2]<BESTPOS COM2 0 79.5 FINESTEERING 1792 322643.000 00100000 6145 6988
<    SOL_COMPUTED FIXEDPOS 50.06986994614 -97.27414097148 256.8313 -28.2000
WGS84 0.0000 0.0000 0.0000 "" 0.000 0.000 8 7 0 0 0 02 0 01
```

Get the latitude and longitude and height from this (in this example 50.06986994614 -97.27414097148 and 256.8313m) and enter these values into the DGPS plugin base station

position settings.

DGPS Correction Settings

The DGPS /Differential Correction Settings page is for selecting the source of your DGPS data.

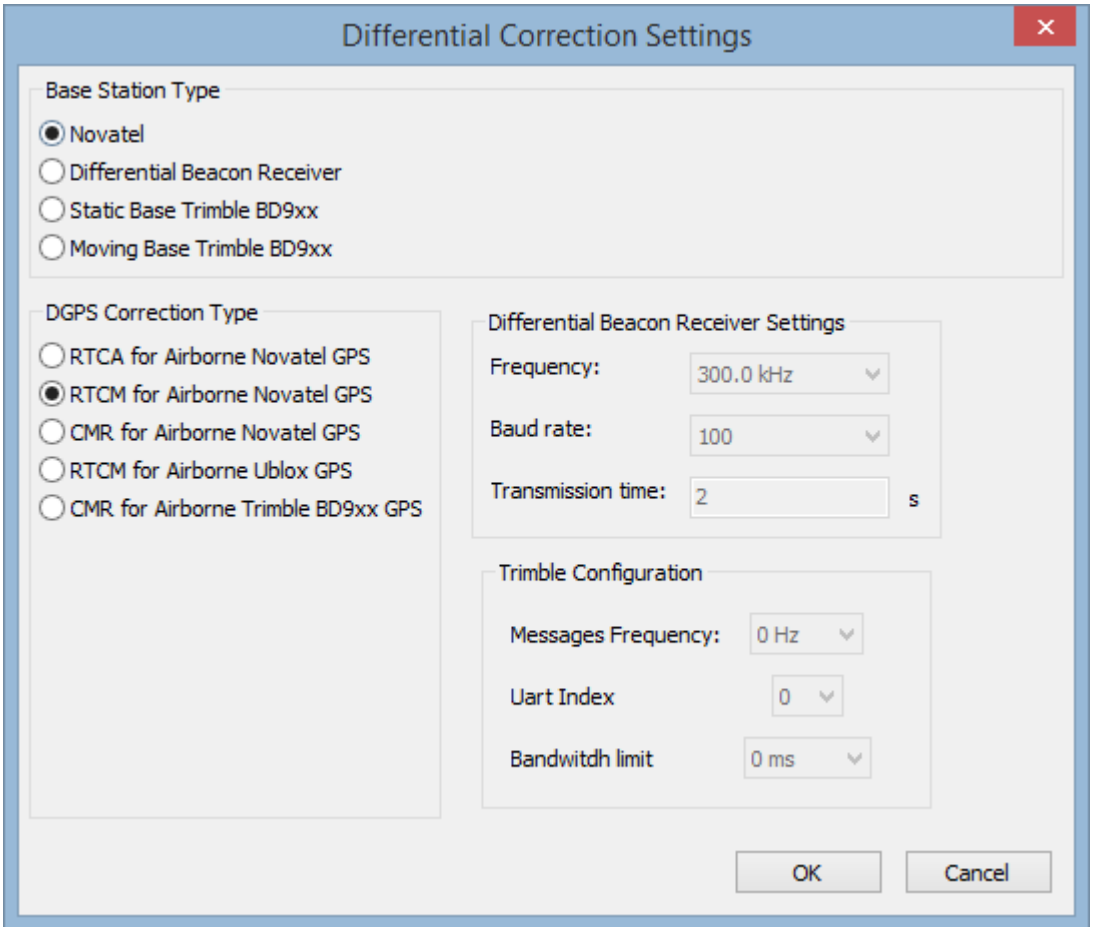


Figure 5 - Differential Correction Settings

Base Station Type

For a Base Station, either a Beacon Receiver or a Novatel Base station may be selected. For the MP Novatel DGPS Base station you should set: *Novatel*

DGPS correction type

If your MicroPilot Autopilot has a Ublox receiver installed, you should select:
RTCM for Ublox receiver.

NOTE: RTCM implies RTCM version 2.1. The Ublox GPS receiver requires RTCM 2.1 correction data.

Ublox AMY5M*: Note the Ublox AMY5M GPS receiver on the first G2 autopilots does not accept RTCM corrections. All new G2 autopilots have the AMY6 receiver and this does accept RTCM corrections.*
The AMY6 is built into MP2128 G2 autopilots from serial number #26-1352.

If your MicroPilot Autopilot has a MicroPilot supplied Novatel OEM –V airborne receiver connected, you should select:
RTCM for Novatel receiver with RTK.

Differential Beacon Receiver Settings

These settings are only used when your base station is a Differential Beacon receiver. You should set the frequency and baud rate from the specifications of the Beacon that you use. The **Transmission time** is the interval between correction data transmissions to the autopilot / GPS receiver. The default 2 seconds is a good choice.

Log Events

This option in the Settings menu enables or disables the logging of any events to a text file in your Horizon3.x\logs folder.

Send Corrections

This must be enabled to send DGPS corrections to your MicroPilot Autopilot.

Operating

When you connect HORIZON^{mp} to your Autopilot, the default settings should start a TCP/IP server which allows plug-ins to connect through HORIZON^{mp}.

Note the Novatel base unit has to be powered for at least 10s BEFORE you open the DGPS plugin. This is because the Novatel GPS receiver takes 6s to initialize and enter a state where it can accept commands from the Autopilot; the autopilot then sends a configuration message to the Novatel receiver.

Once HORIZON^{mp} is connected to your autopilot you can open the Tools menu and start the DGPS plug-in. The round indicator at the lower right of the DGPS plug-in should turn green, indicating a link with the autopilot.

If this indicator is red, the DGPS plug-in is NOT connected; you must then connect the plug-in by opening the File menu and clicking **Connect to UAV**. A connection window will open, allowing you to select the connection and UAV that you want. If HORIZON^{mp} is already connected to your autopilot, you must select the TCPIP link to the UAV number that HORIZON^{mp} is using for your autopilot.

- When the GPS receiver is receiving correction signals and it has activated its DGPS mode, the indicator for DGPS Status will show ON. See Figure 6.
- The left indicator lamp will be green while the DGPS corrections are being sent out of the COM port.
- The right-hand indicator is green if communication to the autopilot is valid.
- The GPS status panel in the status bar of HORIZON^{mp} will also show DGPS when DGPS mode is active.

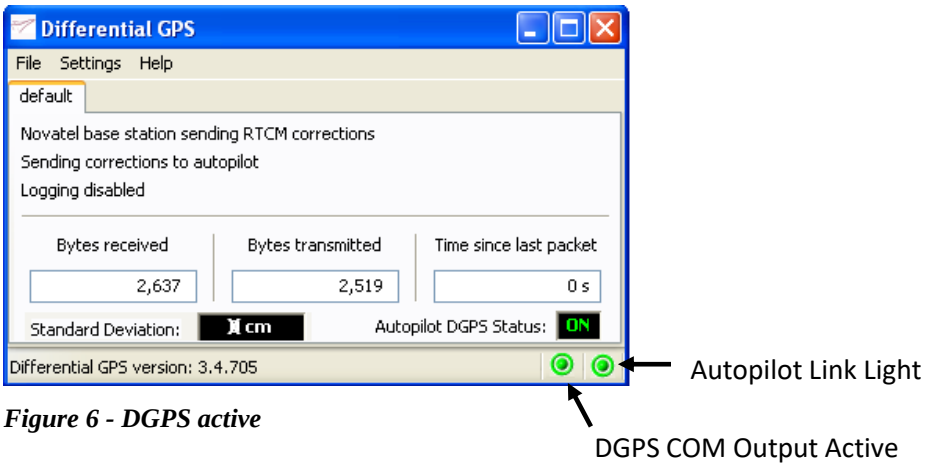


Figure 6 - DGPS active

When DGPS mode is NOT active, the Autopilot DGPS Status indicator will show **OFF,** as in Figure 7 below, and HORIZON^{mp} will show simply GPS in its GPS status panel.

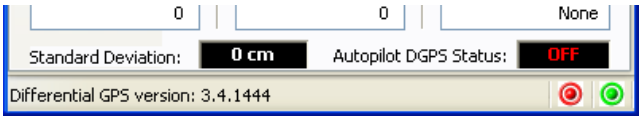


Figure 7 - DGPS OFF

MP Novatel Base

When the DGPS plug-in is used with the MP-Novatel base to send speed and heading to the autopilot, the left-hand status light will indicate if communication is valid from the Novatel base.

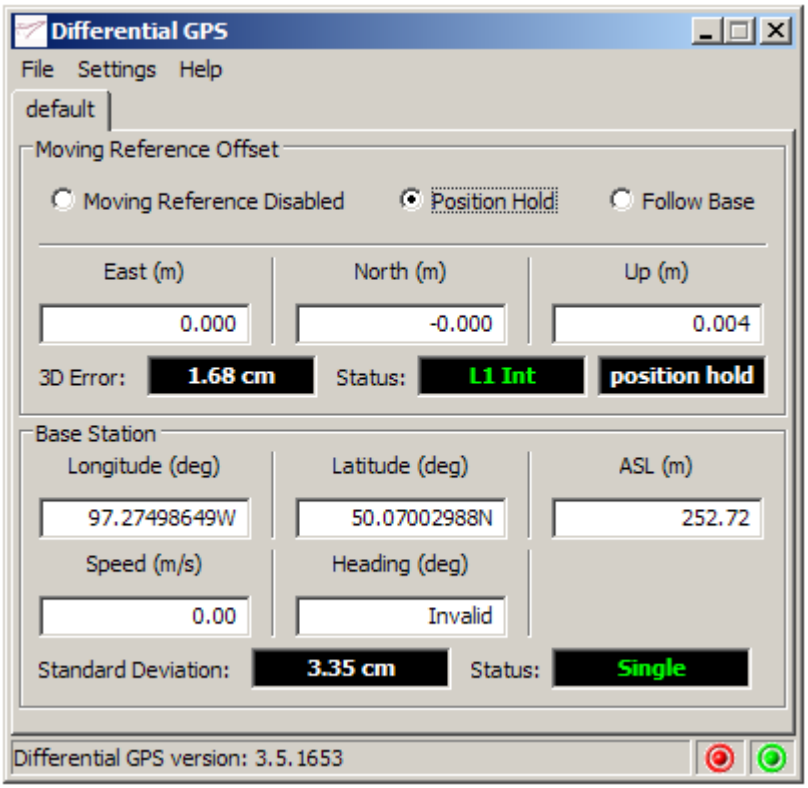
Packet Receive rate

Note that with the GPS antenna connected, the DGPS plugin typically receives a packet every second or so. With antenna disconnected, the plug-in receives a packet approximately every 10s.

Novatel ALIGN Features

When the Novatel Align feature is enabled, the DGPS plug-in will display information about the align status and allow you to select the operation mode and specify the hover offset.

The DGPS plug-in does not need to connect to the base station GPS via a COM cable, as the remote and base are already directly connected. Instead, the DGPS plugin will only connect to the autopilot through Horizon.



Moving Reference Offset

The Moving Reference Offset panel indicates the relative position of the remote from the base, and the position error, status (type of fix), and what mode is active.

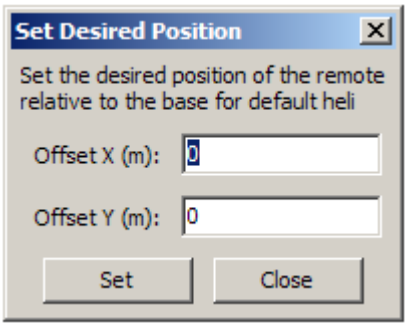
The option buttons at the top allow you to select whether to disable Novatel Align data, hold position with the Novatel Align, or follow the base station.

Base Station

The Base Station panel displays the location of the base station as well as its calculated speed and heading. If the speed is below 9ft/s the heading is not calculated because the velocity is too noisy to calculate heading at low speed; the Heading will display 'Invalid.'

Set Desired Position

Open the settings menu to set the '*desired position relative to base*'…



Troubleshooting

The DGPS plug-in does not receive any packets

The Novatel base unit has to be powered for at least 10s BEFORE you open the DGPS plugin. This is because the Novatel GPS receiver takes 6s to initialize and enter a state where it can accept commands from the Autopilot; the autopilot then sends a configuration message to the Novatel receiver.

RTCM corrections not working on your G2 autopilot

Note the Ublox AMY5M GPS receiver on the first G2 autopilots does not accept RTCM corrections. All new G2 autopilots have the AMY6 receiver and this does accept RTCM corrections.
The AMY6 is built into MP2128 G2 autopilots from serial number #26-1352.

Disconnecting the DGPS plug-in Closes it automatically

When you start the DGPS plug-in from the Horizon Tools menu then disconnect it so that you can change settings, you may find it disappears! This is because the default behavior is to automatically close when disconnected. To change this, open the settings file:

"C:\Program Files (x86)\MicroPilot\Horizon3.6\plugins\dgps.ini" and change the value of the setting AD_ENABLE to 0 (i.e. it should be AD_ENABLE=0) then save the file and close it.

The Plug-in will now remain open after disconnecting.

Novatel GPS – the Novatel can get a GPS lock but DGPS mode does not engage

First check that you are running the DGPS plug-in and that the 'bytes transmitted' field is constantly incrementing every second or two. If not, there is a problem with the communication with the DGPS base. Verify the COM port and settings in the DGPS plug-in are correct. The default settings as shipped from MicroPilot are 57600 baud, 8 bits, 1 stop bit, no parity, no flow control. Also check that the differential correction settings are set to 'Novatel' and 'RTCM for Airborne Novatel GPS'.

If using an MP2128^{3X} autopilot

If bytes are being transmitted, then verify:

- the base station position setting in the DGPS plug-in is correctly set to the location of your DGPS base antenna
- the top board is active and you are connected to the radio A and B connections, or you are directly connected to APCOM_1b
- the COM link status is green
- both GPS units have licenses using the log version command as described in Chapter 21 of the MP2128^{3X} manual: *Using Differential GPS with the Novatel GPS Receiver*

Fields to Check for Novatel

When checking the Novatel receiver operation with your autopilot, you can monitor fields 1699 to 1703 in the Sensor Monitor.

If the Novatel receiver still does not go into DGPS mode, you may have to clear the memory in the Novatel GPS units and/or upgrade the Novatel GPS units' firmware. There is a known bug in Novatel firmware older than 3.803 that can cause this problem.

To upgrade firmware on the Novatel:

1. Connect HyperTerminal to your Novatel receiver.
   For an MP2128^{3X}, connect to APCOM_1b using HyperTerminal.
2. Press 'NNNN' to enter Novatel GPS terminal mode.
3. You may have to type 'unlogall' and press enter in order to stop the GPS from transmitting.
4. Type 'log version' and press enter.
5. Check the version number that appears directly after the string "OEMV1-2.04-TT". If it is less than 3.803 you need to upgrade.
6. Go to www.novatel.com and download their firmware upgrade package (http://www.novatel.com/support/firmware-software-and-manuals/firmware-software-updates/oemv-family/)
7. Follow the instructions in the package to upgrade the firmware.

For an MP2128^{3X} you will have to remove the Novatel OEMV-1 receiver from the 3x and connect using an MP-Novatel adapter board in order to upgrade the firmware.

8. Now connect to the Novatel GPS base using HyperTerminal to check the firmware version, and upgrade the firmware if necessary.

To clear the Novatel memory:

1. Connect to your Novatel GPS receiver using HyperTerminal.
   For the MP2128^{3X}, connect to APCOM_1b using HyperTerminal.
2. Press 'NNNN' to enter Novatel GPS terminal mode.
3. You may have to type 'unlogall' and press enter in order to stop the GPS from transmitting.
4. Enter the following commands:
   FRESET GPSALMANAC
   FRESET GPSEPHEM
   FRESET SBASALMANAC
5. Turn off power.
6. Enter these same commands in HyperTerminal when connected to the DGPS base.
7. Power cycle and try to use DGPS again.

Novatel Connect Software

This software allows you to connect to the MP Novatel DGPS Base station to view the GPS fix data as well as many other things. You can use this to determine the position of your base station then enter the position into the "Base Station Position" dialog of the MP DGPS Plug-in.

Novatel Connect software can be found on this page:
http://www.novatel.com/support/info/documents/809

Additional information

Novatel manuals are available on their web site; please see:
http://www.novatel.ca/support/docupdates.htm#oemv
The relevant files are: OM-20000093, OM-20000094, and maybe OM-AD-0038.

{All links were checked Oct 2014}

If you need any help with your configuration, contact MicroPilot Technical Support at:
Email: support@micropilot.com

Telephone: +1 204 344 5558 Press 2