

A221 Base Station Operation Notes

This document provides the following base station information for the A221 Smart Antenna:

- Things to know about A221 base station operation
- Ensuring you are using ellipsoidal height in your reference coordinates

This document is a supplement to the following:

- Hemisphere GPS A221 User Guide (875-0236-000)
- Outback A221 User Guide (875-0245-000)

All documentation mentioned in this document is available for download:

- For Hemisphere GPS documentation, go to www.hemispheregps.com and navigate to Support > Precision > Technical Documentation
- For Outback documentation go to www.outbackguidance.com and navigate to Support > Precision > Technical Documentation

Things to Know about A221 Base Station Operation

- On powerup, the A221 base station typically establishes its GPS position within 30 seconds and then averages this position for 5 minutes to establish its reference point.
- This reference point is used in the RTK solution. A rover's position is calculated relative to this reference point.
- The A221 base station reference point has a standard deviation of up to 1 m (0.5 m with WAAS).
- On a relative basis a rover's position is typically accurate to within 2 cm of the base station's defined reference point; however, on an absolute basis a rover's position may be offset by 1 m or more. For this reason, it is critical that the A221 base station always uses the same reference point as previous RTK sessions at any particular location.
- The A221 base station ensures this whereby upon determining its position after powerup it compares this position to previously established reference points. The A221 stores a list of up to 32 previous reference points.
 - If the closest of these previous reference points is within 5 m of the newly established position, the A221 base station uses the previously stored reference point.
 - If the closest of these previous reference points is not within 5 m of the newly established position, the A221 base station continues to average the position (converge) for 5 minutes and then sets this as the new reference point.
- You can manually enter the reference point into the A221 via the LCD display on the unit, via Remote Control software (available from Hemisphere GPS), or via serial command. This is useful when you are swapping out the A221 base station or other equipment for a new base station. It is critical to maintain relative RTK continuity by ensuring the same reference point is used in the new equipment.
- Write down and record the base station reference point in case the unit gets damaged or you want to upgrade to new equipment.
- As long as there is continuity in the reference point being used, it does not need to have survey-quality absolute positional accuracy.

Ensuring You are Using Ellipsoidal Height in Your Reference Coordinates

When entering a reference point into the A221, make sure you use ellipsoidal height and not geoidal height. The difference between the two can vary by up to +/-90m depending on your location. Using geoidal height can put stress on the RTK solution, resulting in position jumps.

Some GPS equipment uses geoidal height. If you are swapping this equipment out for an A221, you must first convert the geoidal height to ellipsoidal height before you enter the coordinates into the A221. If you are not sure if the height from your old reference station is geoidal, or ellipsoidal, complete the following:

- Determine your current ellipsoidal height
- Determine if your old equipment reported in ellipsoidal height or geoidal height
- Enter your reference coordinates

Determine Your Current Ellipsoidal Height

1. Connect to the A221 serial port and issue the following command to turn on the GPGGA message at 1 Hz (once per second):

```
$JASC,GPGGA,1
```

2. After several seconds, issue the following command to turn off the GPGGA message:

```
$JASC,GPGGA,0
```

3. Look at one of the GPGGA messages. For example, in the following GPGGA message:

```
$GPGGA,175250.00,3333.42646711,N,11153.35317335,W,2,07,1.3,406.854,M,-26.294,M,10.4,0100*4F
```

406.854 is the reported geoidal height

-26.294 is the offset from ellipsoidal height

4. Calculate the ellipsoidal height as (reported geoidal height) + (offset from ellipsoidal height):

$$406.854 + (-26.294) = 380.56$$

So now we have the following:

Ellipsoidal height = 380.56

Geoidal height = 406.854

Determine if Your Old Equipment Reported in Ellipsoidal Height or Geoidal Height

Your old equipment's reported height should be within +/-3m of either the newly measured ellipsoidal or geoidal height.

- If you determined the old equipment's height is ellipsoidal, you may use its height value when entering the reference coordinates in the new base station.
- If you determined the old equipment's height was geoidal, you must convert to ellipsoidal by adding the offset (-26.294) and the resulting value should be within +/-3m of the newly measured ellipsoidal height.

Enter Your Reference Coordinates

Enter the reference coordinates in the A221 base station using the following command:

```
$JRTK,1,LAT,LON,HEIGHT
```



Additional Information

For more information on using the \$JRTK and \$JASC commands refer to the Hemisphere GPS Technical Reference available at:

www.hemispheregps.com/gpstechinfo

For full documentation of Base Station Coordinate Management and Automatic Reference Point Selection contact Customer Service at outbackcs@outbackguidance.com or 800-247-3808.

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