

Northern Great Plains Network

National Park Service



Using the Arrow 100 GPS Receiver with Field Maps

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Summary

This standard operating procedure (SOP) describes the procedures used by the Northern Great Plains Network to collect high-accuracy location data with the Arrow 100 GPS Receiver.

Revision Log

Previous Version	Revision Date	Author	Changes Made	Reason for Change	New Version
---	4/12/2019	M. B. Davis	New document	New hardware acquired in 2018	1.0
	3/14/2024	A.Rosse	New hardware, software	FieldMaps replaced Collector, add groups in AGOL and download offline areas	1.1

Introduction

The Eos Arrow 100 is a GPS/GNSS¹ receiver that collects sub-meter location data when connected to an iPad or other smart device. The Northern Great Plains Network (NGPN) uses Arrow 100s, rather than relying on an iPad's internal GPS, whenever higher accuracy location data is desired. Any Arrow unit: Gold or Gold+ will interact with the iPad and FieldMaps in the same way. Most commonly, this is when establishing and installing new sites for plant community or stream channel monitoring. One needs to do configuring and set-up in the office with a reliable internet connection, before heading to the field. Make sure off-line map areas are downloaded prior to leaving the office for the park of interest. To interact with existing NGPN dataset in Field Maps, you must be added to the appropriate AGOL group.

Setting Up

Check the Hardware

There are three main working components to the Arrow: the receiver, the antenna, and the two-section antenna cable (items 1, 2, and 3 in the figure below). The two-section antenna cable connects the receiver to the antenna. The cable is very delicate; please be careful not to bend or kink it.



Figure 1. Eos Hardware.

Receiver Description

Make sure the receiver is fully charged before heading out to the field. To check for battery life, press the power button on top of the receiver. If fully charged, the battery LED interface will be lit up with green indicator lights all the way to the left (A and B in figure below). If the receiver is not fully charged, plug it into the wall with the 12VDC battery charger (C) via the DC charging jack port (D).

¹ GNSS – Global Navigation Satellite System – while GPS (Global Positioning System) refers to the U.S. government's satellite navigation system, GNSS generically refers to any satellite-based navigation system, including GPS, the Russian GLONASS system, the Chinese Beidou system, the European Galileo system, and the Japanese QZSS system.



Figure 2. Arrow Unit

Install the Eos Tools Pro app onto your iPad

The Eos Tools Pro app allows you to view data as it streamed from the Arrow. It is useful for doing a quick check on data quality parameters such as horizontal accuracy (H RMS), vertical accuracy (V RMS), and the number of satellites in view vs. number of satellites used. At a minimum, you want H RMS to be below 1 meter. The app can also be used to perform NTRIP processing (real-time corrections via the internet over cell/wifi). NGPN can use NTRIP at some parks but it requires an internet connection.

To install the app, go to Comp Portal on your iPad/ smart device, search for the Eos Tools Pro app, and download it onto your iPad. You will be able to see the data that is being collected by the Arrow once you make a Bluetooth connection between it and your iPad.

Install the Field Maps app onto your iPad

Make sure the Field Maps app is installed on your iPad, also using Comp Portal. Make sure you are added to the correct Groups in AGOL. You can view your FieldMaps account on your laptop and select any map you want to download for offline purposes. [Field Maps Designer \(arcgis.com\)](http://Field Maps Designer (arcgis.com)).

Make a Bluetooth Connection

You must make a wireless connection between the Arrow 100 receiver and your iPad via Bluetooth. Go to Settings on your iPad, select Bluetooth, then turn on Bluetooth by sliding the button to the right (it will turn green). Turn on the Arrow 100 GPS receiver if it is not already on (push and hold the power button on top for a few seconds), then wait for your Arrow 100 to show up under the My

Devices heading. Each receiver will be identified by its serial number (check the bottom of a receiver to find its serial number). Tap on the device you wish to pair, and the item description will notify you that it is now connected.

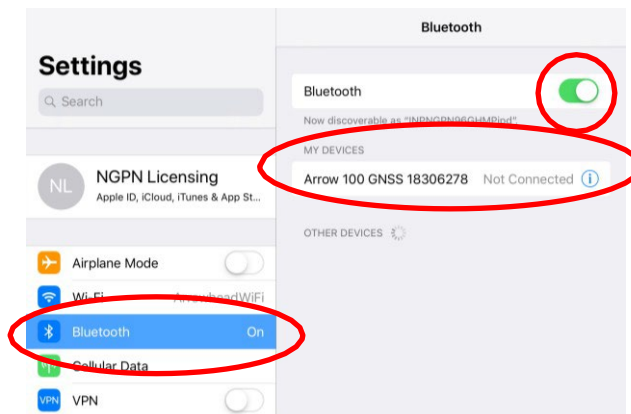


Figure 3. Ipad Settings to set up Bluetooth connection to Arrow Receiver.

The procedure is demonstrated in the video <https://www.youtube.com/watch?v=YFX0JWhP-I> (How to Pair Arrow Series Receivers with iOS Devices via Bluetooth).

Configure Field Maps

The Northern Great Plains Network uses the ESRI FieldMaps app on iPads to perform many field tasks that were previously done with a handheld GPS unit (for instance, navigation in the field, recording location of new monitoring sites, and recording weed treatment polygons). The next two sections will show you how to configure Field Maps to work with the Arrow. The process is also on the NPS Geospatial Team site with complete instructions, <https://doimspp.sharepoint.com/:f:/r/sites/doi-Geospatial-Community/Shared%20Documents/Field%20GIS?csf=1&web=1&e=z8IxLL> (How to Configure Field Maps and Eos Arrow), also available at N:\Admin\DATA_MANAGEMENT\GIS.

It's only necessary to add a location profile for SBAS². If NTRIP and a reliable internet connection are available at a park, you can configure Eos Tools Pro for NPS NTRIP corrections as well. The default setting for Field Maps is to use the iPad's internal GPS receiver. In order for Field Maps to switch to using the Arrow:

Open Field Maps → Tap the profile button from the Maps screen → Tap Provider → Tap the + button in the upper right to add a receiver → Set antenna height at the height above ground you will have the antenna (usually about 1.3 meters if using a backpack pole, 2 meters if using a range pole) → Choose the Arrow receiver you would like to use. The receivers are identified by their serial numbers, which are printed on the Arrow unit.

² SBAS – Satellite-Based Augmentation System – is a way to deliver real-time correction data to receivers via satellite broadcasts. It broadcasts measurements taken at reference stations to account for real-world conditions that affect the GNSS satellite signals. SBAS corrections are what make the Arrow 100 receivers able to have sub-meter accuracy, versus the 3-5 meter accuracy of an iPad GNSS receiver.

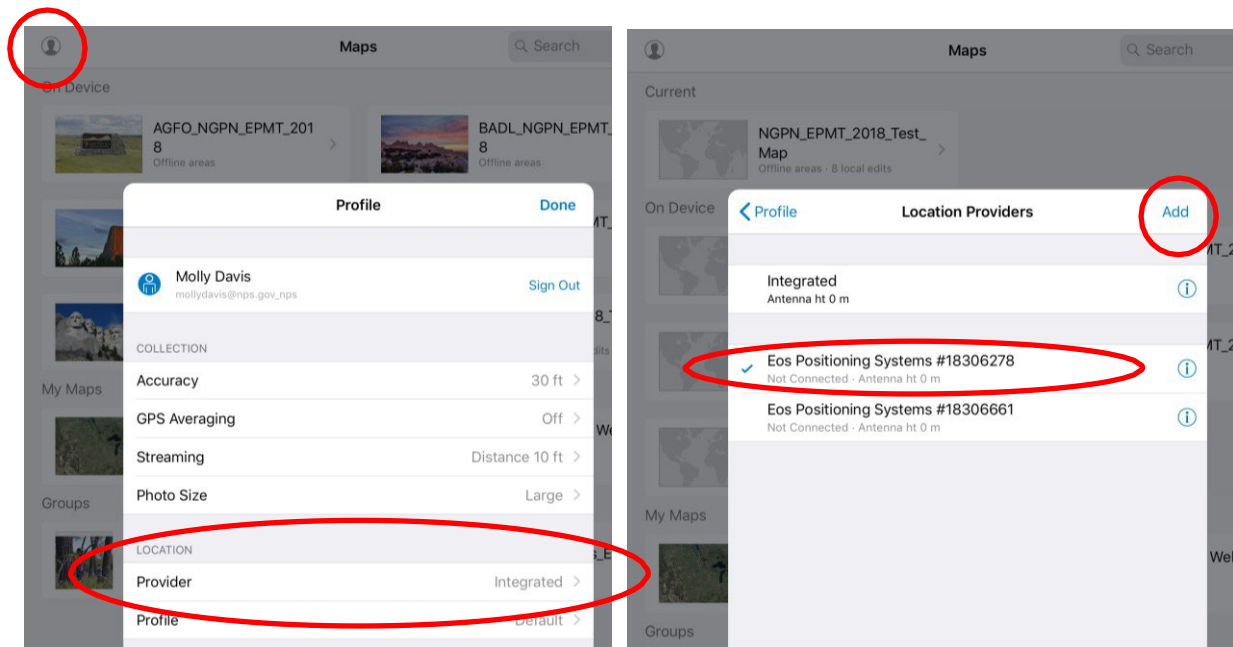


Figure 4. 2024 version of Field Maps

Set Up a Location Profile

Location Profiles are datum transformations performed by Collector. Collector's default Location Profile thinks that incoming locations are in the GCS WGS 1984 datum (this is also the datum used by the iPad's internal receiver). However, the Arrow sends the iPad SBAS-corrected locations in the GCS ITRF 2008 datum. You will need to add a new Location Profile that tells Field Maps that incoming data is in the GCS ITRF 2008 datum, not the GCS WGS 1984 datum.

Add a Location Profile for SBAS-corrected data by following the directions in the video <https://www.youtube.com/watch?v=aRv2M9KwuLU> *Configuring Location Profiles in ArcGIS® Field Maps for iOS® - Eos (eos-gnss.com) Using ArcGIS Field Maps with Eos Positioning Systems (youtube.com)* To start, tap Location Profile in Settings, then tap the Add button (+) in the upper right. In the first search window, search for GCS ITRF 2008. In the second search window, select Projected and search for WGS 1984 Web Mercator Auxiliary Sphere (number 3857). Then zoom into North America and tap the right arrow button. Choose the first transformation listed, ITRF_2008_To_NAD_1983_2011 + WGS_1984_(ITRF08)_To_NAD_1983_2011 and name it SBAS. Your completed profile should look like this:

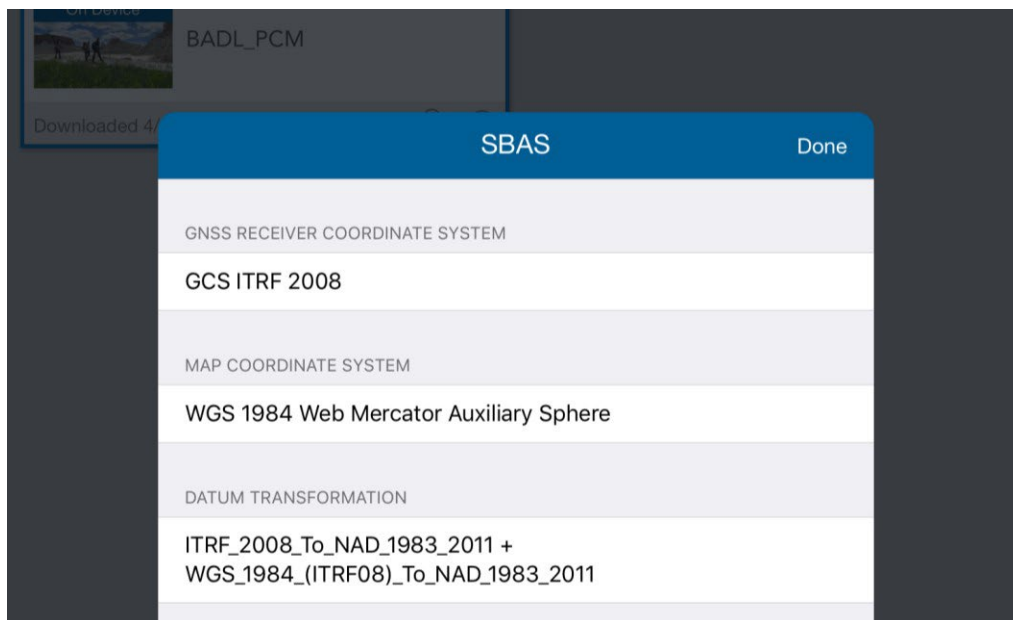


Figure 5. SBAS Location Profile

Use this Location Profile whenever you collect data with the Arrow.

Tips for Using the Arrow in the Field

Turn on the Arrow in advance of when you'll be collecting positions: you may need to wait 10-20 minutes for the satellites to get a good fix. In general, make sure the antenna has a clear view of the sky so it can pick up as many satellites as possible. It's okay if the antenna is covered by a single layer of fabric—for instance, you can place the antenna in the top lid of your backpack, and it will still pick up satellite signals as long as nothing else is covering it.

You can check to make sure everything is functioning correctly and that you're getting a good signal either by opening the Eos Tools Pro app (you want H RMS to be below 1 meter) or by opening Collector and checking the GPS Accuracy display on the map. In the Classic version of Collector, GPS Accuracy is displayed in a box in the lower left hand corner; tapping on the box will open a metadata popup window. In the new version of Collector, GPS Accuracy is displayed in a gray banner across the top of the screen; similarly, tapping on the banner will open a GPS Details window with information about GPS accuracy.

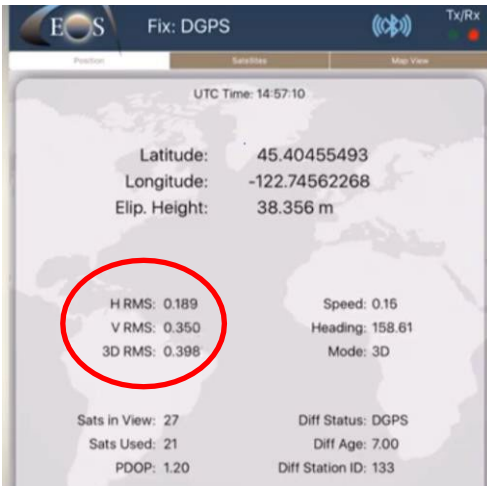


Figure 6. Error rate in Eos Tools Pro app

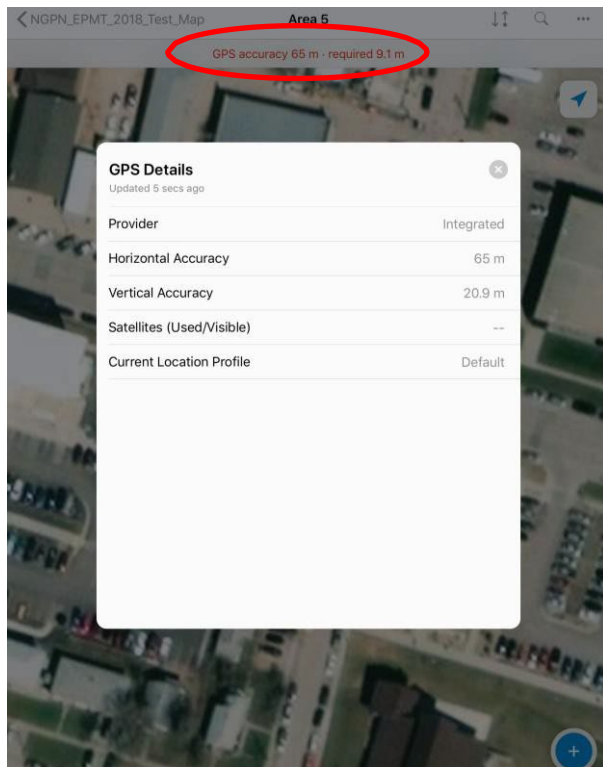


Figure 7. Location Accuracy in Field Maps

If you are simply navigating to a plot, it's unlikely you'll need sub-meter data from the Arrow; you can switch back to using the iPad's internal GPS receiver in order to save battery life on the Arrow. When you re-set your Provider to Integrated Receiver, remember to also re-set your Location Profile to Default so that Collector makes the correct datum transformation.