

Laser Offset Mapping Guide for Collector

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Intro

This guide is intended to help you to learn how to configure ArcGIS, Collector for ArcGIS[®] and <u>Eos Tools</u> <u>Pro</u> so you can begin to use two location-capture solutions from Eos Positioning Systems: laser offsets and orthometric heights. Before beginning, make sure you have the required firmware and software versions.

Required Minimum Firmware and App Versions

Arrow Bluetooth[®] Firmware: 2.2.889 and above Eos Tools Pro: 1.78 (build 255) and above Collector for ArcGIS* and ArcGIS Pro[®] (latest versions) *Although this article refers to Collector for ArcGIS on iOS, this workflow is also supported on Collector Classic for ArcGIS.

Creating Your Feature Attributes in ArcGIS Pro

To help our customers who use Esri's ArcGIS Pro, we have created an app note on how to add GNSS metadata and orthometric height into Esri Collector for use in ArcGIS Pro:

How to Add GNSS metadata and Ortho Height in Esri Collector

You will be able to access the toolbox here:

GNSS Metadata Toolbox



Configuring Collector for ArcGIS to Interact with Eos Tools Pro

In this section, we will show you how to designate Eos Tools Pro as the app that will be performing the laser-offset measurements for Collector for ArcGIS[®].

Before you begin, you will need to install Eos Tools Pro on your device. (Eos Tools Pro must be installed on your iPad or iPhone* for Collector to be able to request and read measurements from it. <u>Eos Tools</u> <u>Pro is available for free for iOS on the Apple iTunes store</u>, but you must have an Arrow receiver paired and connected to the iOS device in order to use it.)

*Please note that the laser-offset solution currently works only on iOS. To be alerted when an Android laser-offset solution is released, <u>sign up for our newsletter</u>.

First, let's set up Eos Tools Pro to compute your laser offsets.

Step 1: Configure Eos Tools Pro for Orthometric Heights

In this section, we will show you how to configure Eos Tools Pro and the Arrow receiver to output orthometric height measurements to Collector. This is possible thanks to built-in geoid models within Eos Tools Pro.

1. First, open Eos Tools Pro, and tap on the "Config" tab at the bottom of the app.





2. Select "Altitude" in the upper menu bar. From the "Altitude Reference" pull-down, select "Orthometric".

	Altitude Reference	
Dessiver MSI		
Orthometric		~
Elipsoidal		

3. You will be presented with a list of supported (downloadable) geoid models. Scroll down to your country and select the geoid model you wish to download. Once downloaded, select the model by simply tapping on it (a selection checkmark will appear on the right). Then tap on "Done".

Geoid Models	Done
Swipe Geoid Model to the Left to Remove from device	
AUSTRALIA	
X AUSGeoid09 / AHD71 (GDA94)	
X AUSGeoid2020 / AHD71 (GDA2020)	
BRAZIL	
X MAPGEO2015 / DVB-I (SIRGAS 2000)	
CANADA	
X CGG2013a / CGVD2013 (ITRF 2008)	
X CGG2013a / CGVD2013 (NAD83 CSRS)	
HTv2.0 / CGVD28 (NAD83 CSRS)	 Image: A second s
SWEDEN	
X SWEN17 / RH 2000 (SWEREF 99)	
USA	
K GEOID12B / NAVD88 (NAD83 2011/PA11/MA11)	





Note: The Geoid model that is in use will be displayed on the main Eos Tools Pro Position page, along with the current computed geoid height (undulation), right below the receiver's coordinates.



Now that your geoid model is set in Eos Tools Pro to collect real-time orthometric heights, we will configure the laser offset settings.



Step 2: Configure Eos Tools Pro as the Laser Offset Measurement Source in Collector

1. Open Collector. In the "Settings" menu, under "Collection", select Eos Tools Pro for Offset.

COLLECTION	
Accuracy	40 cm >
GPS Averaging	Off >
Streaming	Time 1 sec >
Photo Size	Large >
Related Types	Filtered >
Offset	Eos Tools Pro 🗦

Step 3: Setting the TruPulse 200X

You can refer to the Laser Technologies Inc.'s TruPulse 200X user manual for all the details about this product: <u>https://www.lasertech.com/FileDownloads/LTI-TruPulse-200X-User-Manual-3.pdf</u>

For Workflows #1 and #2, please ensure the TruPulse 200X Bluetooth[®] Setting is set as follows:

On: Turns the Bluetooth[®] communications on. Serial string is output through the Bluetooth[®] port.



For Workflow 3, please ensure the TruPulse 200X Bluetooth[®] Setting is set as follows:

EnC: Bluetooth Copy Mode. This mode is reserved for future use with the MapStar TruAngle.





Step 4: Setting the MapStar TruAngle

You can refer to the MapStar TruAngle User Manual for all the details about this product.

In addition to the MapStar TruAngle unit, you will need the following accessory: 20" LTI 4-pin (Straight) To LTI 4-pin (Right Angle); This cable is used to interconnect the TruAngle to the TruPulse 200X together for Range-Back sight measurement. Please refer to Workflow #3 in the section below.



IMPORTANT: Please refer to section #3 of the TruAngle User Manual, called "Using the TruAngle", in order to perform the TruAngle's installation, Indexing the Encoder and Zeroing the unit, etc.



Step 5: Configure Laser Offset Settings in Eos Tools Pro

The last configuration required is done in the Laser Offset page inside Eos Tools Pro. This page is visible only when called by Collector for a measurement. It is not displayed in Eos Tools Pro.

Before proceeding: Make sure your iOS device is paired with both your Eos Arrow GNSS receiver and the LTI TruPulse 200X. (Note: During the pairing process, the TruPulse 200X will prompt you with a password. By default, the password is 1234.)

Bluetooth	
Bluetooth	
Now discoverable as "Admin's iPad". MY DEVICES	
Arrow Gold GNSS 19091073	Connected ()
TP200X-TP204478	Connected (1)



1. With Eos Tools Pro running in the background, open Collector. Select a point, line or polygon feature to be recorded.



Note: You will be able to record line and polygon features using the laser offset solution and the geometry will be sent to Collector for each vertex (X, Y, Z values) but the attributes will not be populated. The examples in this guide use point features (including feature attributes) but the principle is the same for adding vertices in lines and polygons.

 Next, select the three dots [...] icon that appears on the top right of the New Feature Tab and select *Offset from Location*. This will call the Eos Tools Pro Laser Offset Page.





3. On the Eos Tools Pro Laser Offset page, tap on the "Settings" tab.



Setting the GNSS Antenna Height (m) and the Laser Device Height (m) is critical for precise measurements as slope distance is being used from the TruPulse. Please make sure you enter the correct information.

The antenna height must include the antenna phase center (if using an Arrow Gold or Arrow 200 for RTK accuracy). Refer to the label underneath the antenna mounting plate for phase center and mounting plate height dimensions.

Refer to the TruPulse 200X manual for the location from which to measure the height to the ground.



When manually entering azimuth information for Method #1 (and since the TruPulse 200X only features distance and inclination information), you have the choice to enter a magnetic declination for your area, by manual entry or automatically from the Arrow receiver.

Done	Settings	
Units of Measurement		Metric >
GNSS Antenna Height		1.450 >
Laser Device Height		1.100 >
Magnetic Declination		From GNSS Receiver : -14.20 >

Congratulations! You are now ready to collect laser-offset measurements directly inside your web maps in Collector. The next steps will walk you through the three different measurement methods, or workflows, for the Laser Offset.



Laser Offset Workflows: Three Options

Workflow 1: Standard Laser Offset

Best for:

- a) Mapping a small number of assets (1-3) per measurement session
- b) Portability and mobility

Things to Consider:

- a) For centimeter accuracy, we recommend using an Arrow 200 or Arrow Gold mounted on a survey rangepole.
- b) For submeter accuracy, we recommend the Arrow 100, and you have the option of using the TruPulse in your hand.

Standard Components:

- a) Eos Arrow Series[™] Receiver (any model)
- b) Eos Tools Pro
- c) Esri Collector for ArcGIS
- d) LTI TruPulse 200x Laser Rangefinder (or TruPulse 360 with built-in compass, for submeter applications; since the 360 is not iOS compatible, values read through the interface must be entered manually)
- e) iOS device (iPad, iPhone) with version 11 or later

Workflow 1 Summary:

- a) Occupy Control Point 1 and log GNSS point
- b) Aim and shoot at target
- c) Enter azimuth information manually



Standard Laser Offset Setup:





Laser Mapping (How-To):

Refer to Step #5 above to select a feature layer in Collector and call the Laser Offset page of Eos Tools Pro.

a) Step #1 – Log GNSS Control Point #1: Click on "Start". Then when done, click on "Next".





b) Step #2 – Fire at Target

Look in the TruPulse 200X lens and aim at your target. When it's done, click on the "FIRE" button on the TruPulse 200X and you will see the target info displayed in Eos Tools Pro (Slope Distance and Inclination). You will have to set the Azimuth manually. The True North azimuth will be computed based on the magnetic inclination value in the settings. Finally press on "Send >", and this will call back Collector and transfer all measurements and attributes to your point layer:

			0	
ES Fix: D	GPS	(N/A	(((\$0))	Tx/
	UTC Time	: 19:43:59		-
Latitude: 45.71542214 Longitude: -73.62069773 Ortho. Height: 28.191 m HTv2.0 in use: -31.272	H RMS: Sats: Mag Dec:	0.238 12 -14.20	Diff Status: DGPS Diff Age: 4.00 Diff ID: 138	
			TP200X-TP2	204478
	Measurem	ent Method	6.5-	*
	Standard L	aser Offset 🛛 👻		
s	tep #2 - Fi	re at Target	ALL.	
Slope	Distance:	4.81		
	Azimuth:	94		
True North	h Azimuth:	108.20		
	nclination:	7.01		
Control Point			Target	
45.71542246	Lati	tude	45.71540904	
-73.62069825	Long	itude	-73.62064000	
-3.448 m	Ellip, H	Height	-2.861 m	
< Back	Car	ncel	Send >	



c) Back in Collector, click on "Submit" to record the Offset on the map. (You don't have to press on "Update Point".)





d) Your meta-data is now available in Collector and ArcGIS Online.





Workflow 2: Range-Range/Intersect

Best for:

- a) Mapping a small number of assets (1-3) per measurement session
- b) Portability and mobility

Things to Consider:

- a) For centimeter accuracy, we recommend using an Arrow 200 or Arrow Gold mounted on a survey rangepole.
- b) For submeter accuracy, we recommend the Arrow 100, and you have the option of using the TruPulse in your hand.

Standard Components:

- a) Eos Arrow Series[™] Receiver (any model)
- b) Eos Tools Pro
- c) Esri Collector for ArcGIS
- d) LTI TruPulse 200x Laser Rangefinder
- e) iOS device (iPad, iPhone) with version 11 or later
- f) Survey rangepole for RTK measurements

Workflow 2 Summary:

- a) Occupy Control Point 1 and log a GNSS point
- b) Aim and shoot at Target
- c) Occupy Control Point 2 and log a GNSS point
- d) Aim at same Target
- e) Select 1 of the 2 possible solutions from the displayed map. (Ex. if target was on the right of the trajectory from Control Point 1 to Control Point 2, then select the solution on the right of CP1-CP2.)



Range-Range/Intersect Setup:





- e) Select the Measurement Method to *Range-Range/Intersect*.
- f) Step #1 Log GNSS Control Point #1: Click on "Start". When done click on "Next".

			0	Ô
E S Fiz	x: DGPS	¶N/A	(((\$1))	Tx/Rx
Latitude: 45.71487168 Longitude: -73.62053117 Ortho. Height: 20.446 m HTv2.0 in use: -31.272	UTC Time: H RMS: Sats: Mag Dec:	20:50:14 0.922 11 -14.20	Diff Status: DGPS Diff Age: 7.00 Diff ID: 138	
	Measureme	ent Method	TP200X-TP2	×
	Range-Rang	e / Intersect		~
Step	9 #1 - Log GNS	S Control Point	5 +	1
	Sta	art		
Control	Point Coordinates	at Laser Device I	Height:	
	Latitude: Longitude: Ellip. Height:	45.71487171 -73.62053017 -10.828 m		1
	Can	cel	Next	



g) Step #2 – Set the Number of Targets to Map (this feature will be available in a future release).

			0	Â
EOS Fix	k: DGPS	¶N/A	((<\$>))	Tx/Rx
Latitude: 45.71487212 Longitude: -73.62053132 Ortho. Height: 20.404 m <i>HTv2.0 in use</i> : -31.272	UTC Time H RMS: Sats: Mag Dec:	: 20:50:23 0.966 11 -14.20	Diff Status: DGPS Diff Age: 4.00 Diff ID: 138	04479
	Measurem	ent Method	122002-122	*
	Range-Rang	ge / Intersect 👻	and a second	~
Set	Step #2 - Num	iber of Targets	1	
< Back	Car	ncel	Next>	



h) Step #3 – Fire at Target; Look in the TruPulse 200X lens and aim at your target. When it's done, click on the "FIRE" button on the TruPulse 200X and you will see the target info displayed in Eos Tools Pro (Slope Distance, Inclination). Note that azimuth information is not needed in this method. If known more or less, entering a value will help the app to auto-suggest the result between the two possible solutions. When done click on "Next".

			0	Ê
EOS	Fix: DGPS	¶N/A	(((\$)))	Tx/Rx
	UTC Time:	20:51:09		
Latitude: 45.7148719 Longitude: -73.6205314 Ortho. Height: 20.598 m HTv2.0 in vse: -31.272	9 H RMS: 12 Sats: Mag Dec:	1.028 11 -14.20	Diff Status: DGPS Diff Age: 7.00 Diff ID: 138	
			TP200X-TP2	04478
	Measureme	nt Method	E. St.	×
	Range-Range	e / Intersect		
	~		10 A.	
	Step #3 - Fir	e at Target		
	From Control Point #1	- Fire at Target #1 :		
	Slope Distance:	30.56		
	Azimuth:	295		
	Inclination:	-1.72		
< Back	Cap	cel	Nexts	
- Doon				



i) Step #4 – Log GNSS Control Point #2: Click on "Start". When done click on "Next".

			0	Ô
EOS Fix	: DGPS	¶N/A	((\$))	Tx/Rx
Latitude: 45.71482585 Longitude: -73.62093632 Ortho. Height: 20.019 m HTv2.0 in use: -31.272	UTC Time: 2 H RMS: 0 Sats: 9 Mag Dec: -1	0:51:54 881 4.20	Diff Status: DGPS Diff Age: 5.00 Diff ID: 138 TP200X-TP2	04478
	Measuremen	t Method	5.5-	*
	Range-Range	/ Intersect 👻		
Step #	#4 - Log GNSS	Control Point Average:	#2 5 +	
	Star			
Control P	oint Coordinates a Latitude: Longitude: - Ellip. Height: -	at Laser Device H 45.71482622 73.62093584 11.581 m	leight:	Ż
Back	Cance	el	Next	



j) Step #5 – Fire at target; Look in the TruPulse 200X lens and aim at your target. When it's done, click on the "FIRE" button on the TruPulse 200X and you will see the target info displayed in Eos Tools Pro (Slope Distance, Inclination). Note that azimuth information is not needed in this method. If known more or less, entering a value will help the app to auto-suggest the result between the two possible solutions. When done click on "Next".

	0	()
ES Fix: DGPS INA	((c\$0))	Tx/Rx
UTC Time: 20:52:36 Latitude: 45.71482456 H RMS: 1.029 Longitude: -73.62094153 Sats: 9 Ortho. Height: 22.125 m Mag Dec: -14.20 HTv2.0 in use: -31.272	Diff Status: DGPS Diff Age: 5.00 Diff ID: 138	
	TP200X-TP2	04478
Measurement Method		*
Range-Range / Intersect 👻		
Stop #5 - Eiro at Target	13155	
Step#5 - File at larget		
From Control Point #2 - Fire at Target #1:		
Slope Distance: 32.42		
Azimuth: 303		
Inclination: -1.60		- 21
< Back Cancel	Next>	



k) Step #6 – Select Range-Range Intersection Point. Click on the Point that corresponds to your target. When done, click on "Send >".





 Back in Collector, click on "Submit" to record the Offset on the map. (You don't have to press on "Update Point".)





m) Your meta-data is now available in Collector and ArcGIS Online!





Workflow 3: Range-Backsight

Best for:

- a) Taking multiple measurements from one location
- b) Obtaining a GNSS + total station-like workflow with precise angular measurements

Things to Consider:

a) This workflow requires capturing a backsight point, to calibrate the TruAngle angular encoder for true azimuth

Standard Components:

- a) Eos Arrow Series[™] Receiver (any model)
- b) Eos Tools Pro v1.72 (104) or above (free for iOS)
- c) Esri Collector for ArcGIS
- d) LTI TruPulse 200x Laser Rangefinder
- e) LTI Mapstar TruAngle Angle Encoder
- f) iOS device (iPad, iPhone) with version 11 or later
- g) Laser Technologies TruAngle and Arrow Mounting Brackets
- h) Tripod

Workflow 3 Summary:

- a) Occupy your Backsight Point and log GNSS point
- b) Occupy Control Point and log GNSS point
- c) Aim and shoot at Backsight Point to calibrate TruAngle
- d) Aim and shoot at target



Range-Backsight Setup:





Laser Backsight Mapping (How-To):

- a) Select the Measurement Method to "Range-Backsight Offset".
- b) Step #1 Log GNSS Backsight Point: Click on Start, when done click on Next".

			0	(Ô)
EOS Fix	: DGPS	(N/A	(((\$1))	Tx/Rx
Latitude: 45.71482582 Longitude: -73.62093999 Ortho. Height: 20.647 m HTv2.0 in use: -31.272	UTC Time: 20:55 H RMS: 0.430 Sats: 9 Mag Dec: -14.20	5:11	Diff Status: DGPS Diff Age: 4.00 Diff ID: 138 TP200X-TP2	04478
	Measurement N	lethod	11200x 112	*
	Range-Backsight	Offset 🚽		
Step	#1 - Log GNSS Ba	cksight Poi	nt	
	Log New Backsigh	t Point 👻		
Num	ber of Positions to Ave	rage: – t	5 +	
	Start			
	Coordinates at Grou	ind Level:		
	Latitude: 45.7 Longitude: -73.6 Ellip. Height: -12.1	1482605 52093953 08 m		2
	Cancel		Next	



c) Step #2 – Log GNSS Control Point: Click on "Start". When done click on "Next".

			0	Ô
EOS	Fix: DGPS	¶N/A	(((\$)))	Tx/R>
Latitude: 45.7150 Longitude: -73.6211	UTC Time: 2 12809 H RMS: 0 15824 Sats: 9	0:55:56 307	Diff Status: DGPS Diff Age: 7.00	
Ortho. Height: 20.546 HTv2.0 in use: -31.272	m Mag Dec: -1	14.20	Diff ID: 138 TP200X-TP2	04478
	Measuremen	t Method	5.A.	∗
	Range-Backsi	ght Offset 👻		
	Step #2 - Log GNS	S Control Poir	nt	
C.L.	Number of Positions to	Average:	5 +	
2.				
	Star	t		
C	ontrol Point Coordinates	at Laser Device F	leight:	
	1			
	Latitude: Longitude: - Ellip. Height: -	45.71502809 73.62115815 11.026 m		
	Latitude: Longitude: - Ellip. Height: -	45.71502809 -73.62115815 -11.026 m		1



d) Step #3 – From Control Point, fire at Backsight Point. The computed true azimuth between the control and Backsight point will be displayed along with the azimuth correction that will be applied to the target measurements. When done click on "Next".

			0	6
EOS	Fix: DGPS	¶N/A	((***))	Tx/R:
Latitude: 45.71502 Longitude: -73.62115 Ortho. Height: 20.828 m HTv2.0 in use: -31.272	UTC Time 776 H RMS: 936 Sats: Mag Dec:	: 20:56:48 0.962 11 -14.20	Diff Status: DGPS Diff Age: 5.00 Diff ID: 138	04479
	Measurem	ent Method	122007-122	04478 ★
	Range-Back	ksight Offset 👻		
	Step #3 - Ang Computed True	Jle Calibration		
No los	From Control Point, F	ire at Backsight Point:		
1	Azimuth:	205.5		
	Inclination:	-1.11		
	Azimuth Corre	action: 297.34		1
< Back	Car	ncel	Next	



e) Step #4 – Fire at Target. Look in the TruPulse 200X lens and aim at your target. When it's done, click on the "FIRE" button on the TruPulse 200X. You will see the target info displayed in Eos Tools Pro (Slope Distance, Inclination and corrected true azimuth). When done, click on "Send >".

ES Fix: DO	GPS	IN/A	(((***)))	Tx
	UTC Time	: 20:57:45	_	
Latitude: 45.71502808 Longitude: -73.62116144 Ortho. Height: 21.815 m HTv2.0 in use: -31.272	H RMS: Sats: Mag Dec:	1.109 11 -14.20	Diff Status: DGPS Diff Age: 7.00 Diff ID: 138	
1953		1. 20	TP200X-TP2	0447
M	easurem	ent Method		*
R	ange-Back	sight Offset 👻		
			and the second second	
Ste	ep #4 - Fi	re at Target		
A	zimuth Corre	ection: 297.34		
Slope E)istance:	16.92		
Observed a	Azimuth:	354		
Corrected	Azimuth:	291.34		
Inc	clination:	-2.48		
Control Point			Target	_
45.71502809	Latitude		45.71508343	
-73.62115815	Longitude		-73.62136038	
-11.026 m	Ellip. I	Height	-11.758 m	



f) Back in Collector, click on "Submit" to record the Offset on the map. (You don't have to press on "Update Point".)





g) Your meta-data is now available in Collector and ArcGIS Online!





Eos Positioning Systems support@eos-gnss.com