BYoffset Software

USER MANUAL

Clarification

This docunment aims to introduce the use of BYoffset software.

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CONTENTS

1 Brief Introduction

With the accurate position provided by GNSS signals, Byoffset provides a simple and easy-to-use way to measure the antenna lever arm in the Vehicle frame and matches perfectly with X1 integrated navigation system.

2 Overview

Software Use

Byoffset is specifically dedicated to calculate lever arm of the Vehicle frame.

System Configuration

The software is required to operate on PC and or other compatible devices with Win7/Win 8/Win10 x64 operating system.

Software Operation

Installation is not required. Extract the file and click on the program to enter the software interface and to run the required operation.

Software Upgrade

The latest version can be downloaded for free from Bynav official website:

https://www.bynav.com/en/resource/support

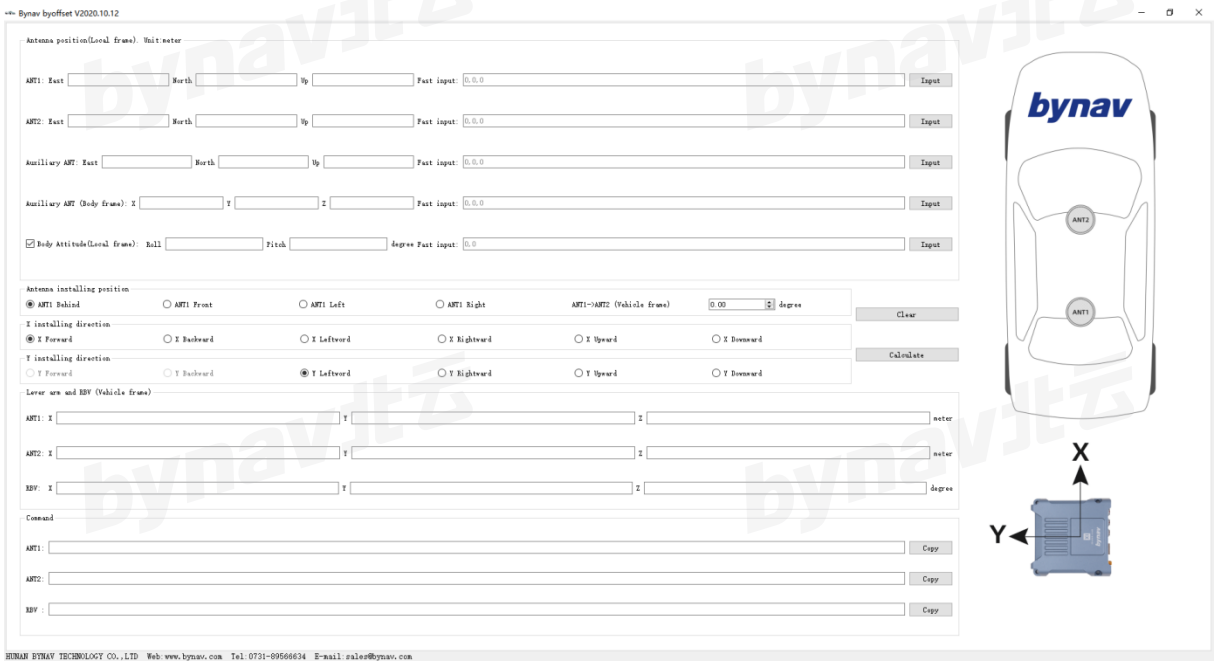

Figure 2-1 Interface of Byoffset

3 Instructions

3.1 Selecting Antenna Installation Method

Taking the positive direction of the Y-axis of the Vehicle frame (the vehicle traveling direction) as the front, the antenna can be installed in two ways: front-to-back and left-to-right. In case of front-to-back installation, ANT1 can be installed on the front or back side of the vehicle, while in case of left-to-right installation, ANT1 can be installed on the left or right side. As illustrated in figure 2, the four installation modes are respectively ANT1 in back, ANT in front, ANT1 at left and ANT1 at right. According to the actual installation mode, select the corresponding option in the software interface as illustrated in figure 3.

If the dual antennas are mounted diagonally, you can adjust the angle between the vehicle head direction and the vector where ANT1 points to ANT2 by inputting a parameter "ANT-> ANT2 (the vehicle frame)", and the rotating counterclockwise direction positive. For example, when the vector where ANT points to ANT2 is 45°toward the front right side of the vehicle, the parameter should be -45.

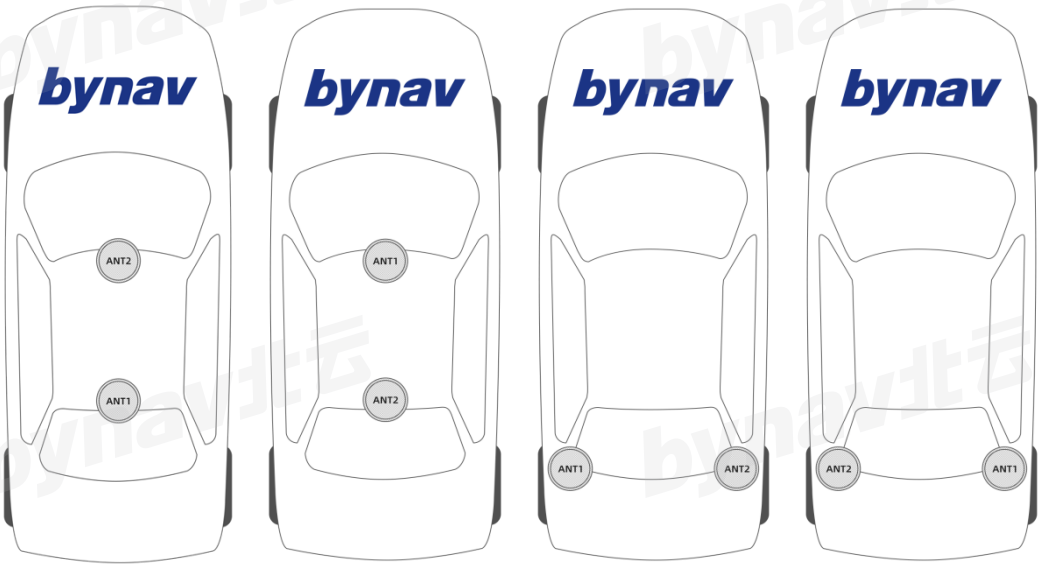

Figure 3-1 Antenna Installation Mode

Figure 3-2 Select Antenna Installation Mode

3.2 Selecting X1 Installation Mode

The X1 enclosure can be installed in 24 ways, determined by selecting the direction of the X-axis and Y-axis of the IMU body. According to the actual installation mode, select the corresponding option in the software interface, as is shown in Figure 3-3.

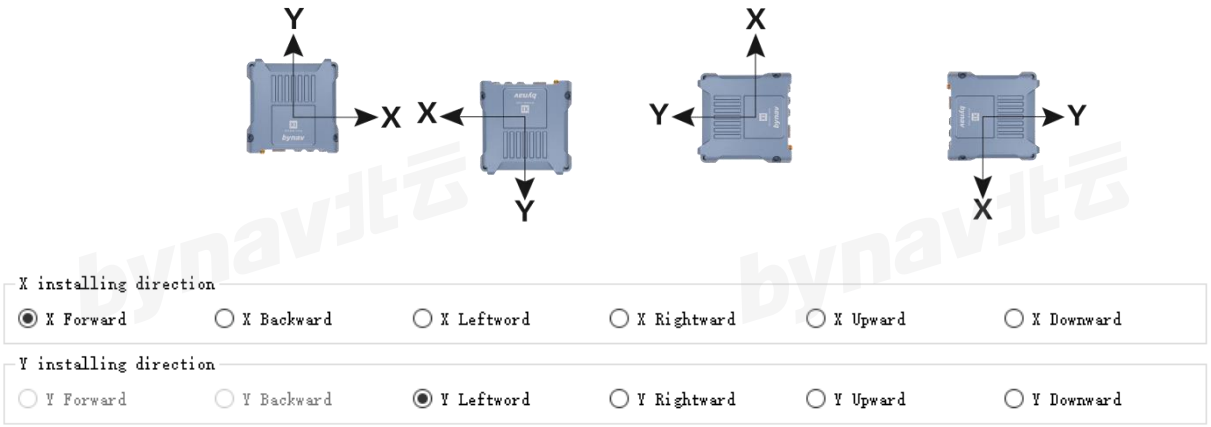

Figure 3-3 Select X1 Enclosure Installation Mode

3.3 Measuring Dual Antenna Position

Keep the vehicle stationary, enter **ENUAVR** (e.g., LOG COM1 ENUAVR ONTIME 1) to get the mean value of dual antennas position relative to a same reference point in ENU coordinates.

Note: It is suggested to record the data when the **ENUAVR** message has been output for more than 60 seconds.

ENUAVR Example:

#ENUAVR,COM1,0,0.0,FINESTEERING,2095,127522.000,00000000,0000,25;-1075.1430,-98.4608,-8.6259,-1075.1430,-98.4610,-8.6258,-3.1407,-0.0016,58*2865555d

ENUAVR Description:

ID	Field	Description	Format	Binary Bytes	Binary Offset
1	ENUAVR header	Log header	-	H	0
2	ANT1 East	ANT1 East position (m)	Double	8	H
3	ANT1 North	ANT1 North position (m)	Double	8	H+8
4	ANT1 Up	ANT1 Up position (m)	Double	8	H+16
5	ANT2 East	ANT2 East position (m)	Double	8	H+24
6	ANT2 North	ANT2 North position (m)	Double	8	H+32
7	ANT2 Up	ANT2 Up position (m)	Double	8	H+40

8	Roll	Roll (°)	Double	8	H+48
9	Pitch	Pitch (°)	Double	8	H+56
10	Count	Count	Int	4	H+64
11	xxx	32-bitCRC checksum	Hex	4	H+68
12	[CR][LF]	Terminator	-	-	-

Suggestion: write down the value after ENUAVR message output more than 60s.

3.4 Measuring Auxiliary Antenna Position

After the positions of the dual-antenna have been measured as shown above, connect the auxiliary antenna to the ANT1 interface of X1 (or directly use the antenna which is connected to ANT1 of X1), place the auxiliary antenna near the receiver where the satellite signal is good, and re-enter **ENUAVR** command to get the position of the auxiliary antenna in ENU coordinates relative to the same reference point. Then directly measure the position of the auxiliary antenna in the IMU Body frame, which means measure the position deviation in three axial directions along the coordinate axis marked on X1.

Note: In case of using the antenna, which was connected to ANT1 interface of X1, it is recommended to complete this step first and put the antenna back to its original position, and then measure the dual antenna position required in section 2.3 to avoid errors caused by antenna movement.

3.5 Calculating Lever Arm Value

Once the above-mentioned steps are completed, fill in the software interface with the antenna position value respectively, and click "Calculate" to get the lever arm and RBV of dual antennas in the Vehicle frame, as well as to generate the commands of configuration.

3.6 Data Checking

After clicking "Calculate", if the program pops up "If X1 is not on the front side of the carrier, the antenna position may be reversed, please check!", it means that you probably reversed the dual antenna position, or probably X1 was installed in front of the vehicle, at that moment the X1 position relative to the vehicle will be estimated and illustrated by the figure on the right side. If the warning "Antenna position error!" pops up, it means that the position of the dual antennas filled in the interface may be abnormal, and you'll need to check if there's error with the measurement or the filled-in value.

3.7 Fine Measurement of Vehicle Attitude (Optional)

The actual X1 installation is permitted to deviate slightly from the mode selected in Byoffset, this error can be corrected later with RBV automatic calibration. But for this method to work, make sure the two antennas are installed at the same height of the vehicle and keep the vehicle stationary on the level ground, as the software takes this as a condition to determine the vehicle attitude.

If the actual X1 installation does not deviate too much from the mode selected in Byoffset (deviation less than 1°), then you can use **ENUAVR** to fill the roll and pitch value of X1 in the ENU coordinates into the software. Using this method, you can measure the vehicle attitude more accurately, and this method only has high requirements on the installation of X1 and does not require the dual antennas to be installed at the same height on the vehicle or the vehicle to be stationary on horizontal level ground.

3.8 Error Control (Optional)

As there is a relatively large elevation error in the RTK positioning results of GNSS, it is suggested to use laser ranging for calibration. A laser range finder with an inclined sensor (e.g., BOSCH GLM 500 professional laser range finder, which can directly measure the horizontal and vertical distances) can accurately measure the height of the dual-antenna and the auxiliary antenna from the same starting plane (e.g., the ground). The measured data are then used to replace the UP coordinates of antennas in the ENU system, which can obviously reduce the lever arm value error in the Z axis.

3.9 Measurement Using Total Station (Optional)

The above methods use the RTK positioning results of each antenna in the ENU system. Similarly, you can use a total station to measure the phase center of the dual antennas and the X1 enclosure original point in the total station coordinate system (or some other coordinate systems with both origin and axes stationary relative to the ground). And then enter the position of ANT1, ANT2 and auxiliary antenna into the software, and set the position of the auxiliary antenna to be 0 in the X1 IMU Body frame. In this way, the lever arm value of the dual-antenna in the Vehicle frame can be measured.

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