



# EZ PUSH-TO / EZ GOTO Installation Manual

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**Living Apart,  
Sharing the Sky**

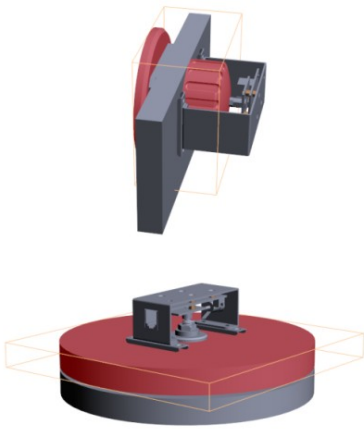


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# 1. EZ PUSH TO Introduction

EZ PUSH TO is the first product to integrate smart phone app and built in high accuracy encoders in the Dobsonian. Through wireless connection, you could browse entire deep sky leisurely, or even search the faint comet when it visits us at early stage.

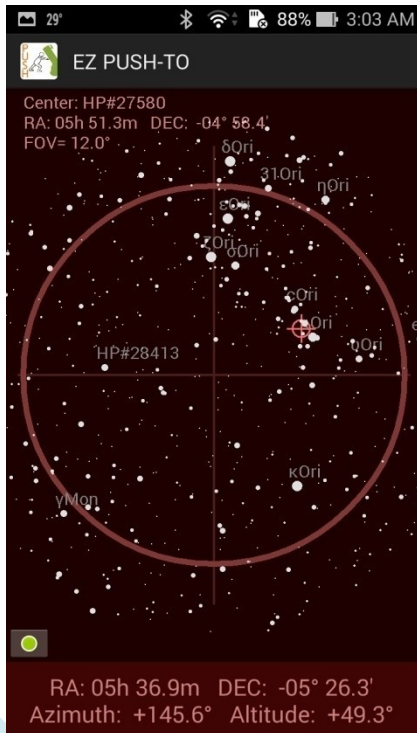


The electronics installed on the Dobsonian is exposed outdoors to enhance the wireless data transferring. All the parts is designed to against humidity, and there is an automatic fuse to protect the power supply. The construction is made of durable metal and removable for convenient storage. It looks very simple, but is precisely manufactured and inspected one by one manually.



The installation is very straightforward, just put on the azimuth and altitude encoder modules on the Dobsonian base in a minute. Connect BT with phone, waiting the GPS location and time. Then put your phone on the base bottom, and turn around to adjust the level. The app would collect the earth magnetic flux data and gravity information in every direction. In seconds, the system is initialized.

When pushing the telescope toward the target, both azimuth and altitude encoder magnets rotate and are sensed. Only when the magnets rotate circularly, the encoders could achieve best accuracy. Therefore, lots of customized parts in EZ PUSH TO kit are designed to improve the base construction stability and telescope pointing accuracy.



This is EZ push to, and certainly designed only for naked eye observing. Don't ask me why it is not kind of encyclopedia. We did not build the star map for research or let you to enjoy all the colorful pictures when you zoom in the map. In contrast, the star map is designed to assist you watching and searching the real sky. The map is concise, but completed with Messier/NGC /Herschel catalogue, double and binary stars, comets and small bodies, and magnitude 9.5 stars (110,000 stars). EZ PUSH TO features lots amazing interfaces, such as roaming in the deep sky. EZ PUSH TO absolutely bring you to reach the real deep sky at your backyard, or in your family camping.

## Specification

1. Azimuth and Altitude Encoders Resolution:  $0.1^\circ$  (The resolution is  $0.08^\circ$ , but displayed as  $0.1^\circ$ )
2. System Accuracy:  $\sim 0.5^\circ$  (single star alignment),  $< 0.2^\circ$  (multi-stars alignment)
3. System: Android 5.0 or later version ( 720P display or above )  
Apple iOS ( iphone 5 or later models)  
Windows 7~10 Stellarium
4. Compatible Brand / Telescope: GSO / Dobsonian Telescope
5. Solar System / more than 1000 small bodies / 110 Messier & 7840 NGC / Hershel 400 catalogue / more than 260,000 Stars(*magnitude* 10.5)/  
More than 100 Double & Binary Stars etc.
6. Connection: Dual Module Bluetooth 2.0/4.0
7. Power: DC 5V ~15V Automatically, Standard DC (DC-USB cable included)
8. GPS Location: Supported by Phone App
9. Level Meter: Supported by Phone App, Custom Designed Algorithm to  
Ensure the Level Bias Less Than  $0.2^\circ$

## 2. Hardware Installation



### Parts Listing

1. Main Column
2. Main Column Cover
3. Bearing for Main Column
4. Bearing Cover
5. Screw Nut of Main Column
6. Azimuth Encoder Magnet
7. Magnetic Pads for Modules
8. Washers for Encoder Magnet
9. Screws
10. Thin Rubber Pad(Single Glue)
11. Thick Rubber Pad(Double Glue)
12. Data wire
13. Power DC- USB Cable
14. Altitude Side Cover

Notice: 3(Bearing for Main Column) & 4(Bearing Cover) are not included in EZ PUSH TO kit. They

belong to original parts of your Donsonian.



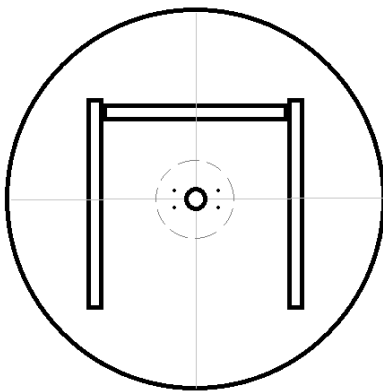
**Azimuth Module (Left)**  
**Altitude Module (Right)**



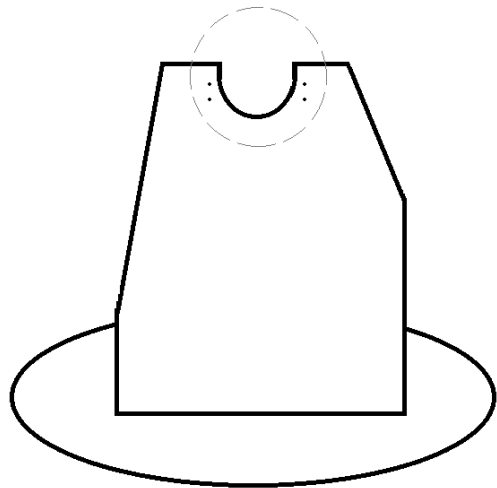
Left: Azimuth and Altitude Encoders (**Encoder Magnet Alignment Plate** Included)

Right: Main board with MCU and Bluetooth

In order to install encoder modules on the Dob, you need to drill holes before screwing the parts. The drilling locations are shown on the under picture. We advise to install the metal pads of the Az/Alt modules helped with the double sided tape temporarily. Remove the tape after drilling the holes to screw the metal pads permanently.

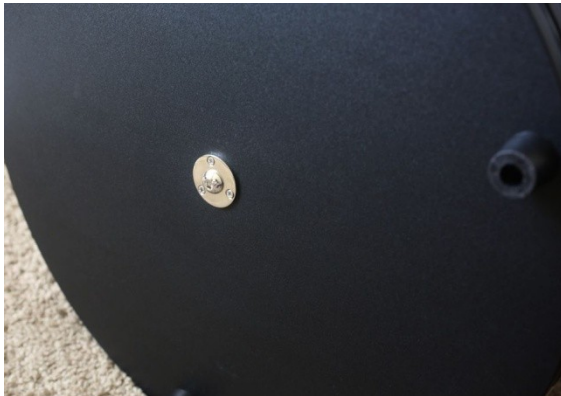


AZIMUTH ENCODER  
DRILLING LOCATION



ALTITUDE ENCODER  
DRILLING LOCATION

## Hardware Installation



1 Turn over to the bottom of Dobsonian base to install the Main Column (part #1).



2 Fix the Main Column with 3 small screws (part #件 9) with proper torque.

3 Turn back to the upper side of Dobsonian base



**To Ez Push To users:**

**Pease shorten the original steel tube slightly (0.5~1mm) with a sander paper.**

Shorter tube causes more stress under the main column cover to increase the friction the AZ clutch requires.



4 Install the original steel tube and Main Column Cover (part #2) into the central hole. Make sure the cover is installed tightly and matched.





5 Put on the Bearing(part #3), then put on Bearing Cover (part #4)



6 Tighten the bearing Gently with Main Column Nut(part #5)

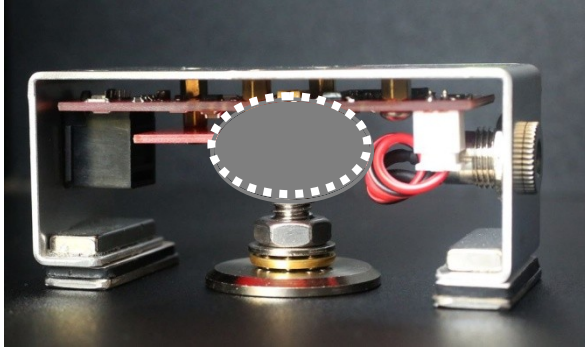


7 Screw the Magnetic pads for azimuth module (part #7 & 9). After finishing, stick the thick rubber pads (part #11). Do not remove the upper tape at this moment.

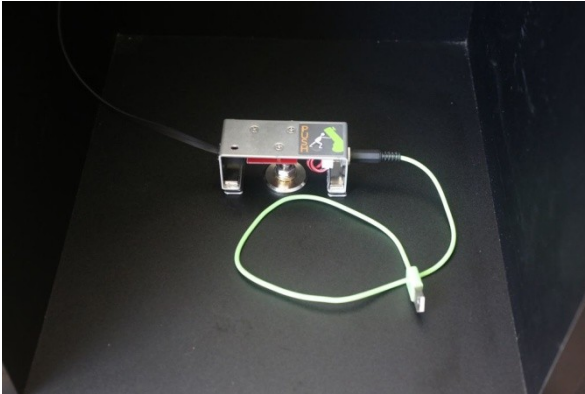


8 Install the azimuth encode magnet (part #6). Insert several washers (part #8) to make the magnet inside the zone where the azimuth encoder could sense.

Tip: The quantity of the encoder washers should be adjusted as following guidance.



**Make sure the head of Encoder Magnet little passing through the Encoder Alignment Plate.** If not, put more or take away the magnet washers to adjust its height.

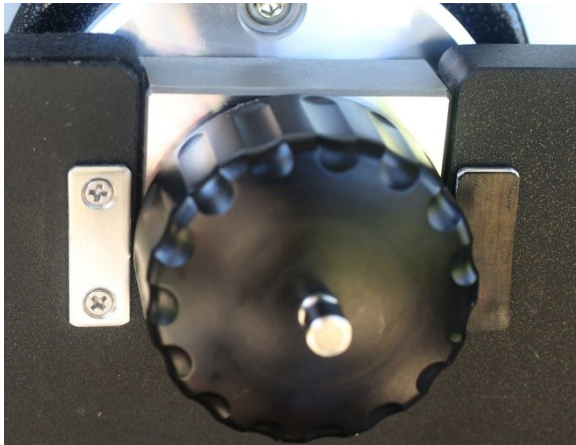


9 After confirmation, remove the upper tape on the thick rubber pad. Then, stick the whole azimuth module to complete the azimuth installation. The power plug is on the right side, and the data plug is on the left side.

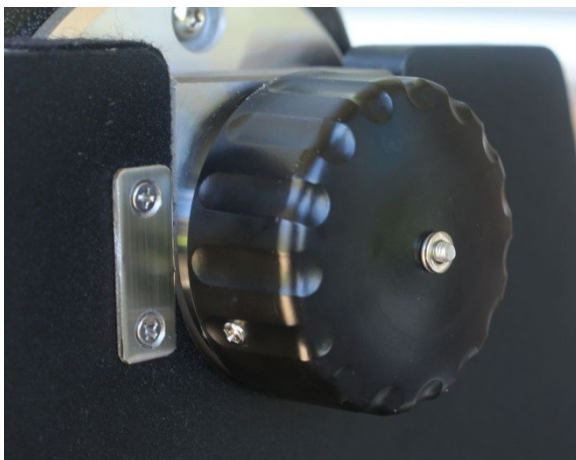


10 Replace the old black bearing cover with new one. Be aware of a small screw on the cover side.

Do not miss the metal washer between bearing and cover. The washer would adhere on the old cover because of sticky lubricant.

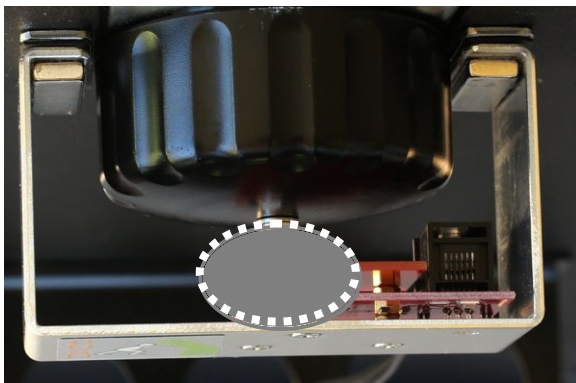


11 Screw the Magnetic pads for altitude module (part #7 & 9). After finishing, stick the thin rubber pads (part #10).



12 Install the altitude encode magnet on the altitude side cover (part #14). Insert several washers (part #8) to make the magnet inside the zone where the altitude encoder could sense.

Tip: The quantity of the encoder washers should be adjusted as following guidance.



**Make sure the head of Encoder Magnet little passing through the Encoder Alignment Plate as well.** If not, put more or take away the magnet washers to adjust its height.



13 After confirmation, connect the data wire (part #12) to complete the altitude module installation.



14 Power Plug: Only DC 5V~15V is allowed.



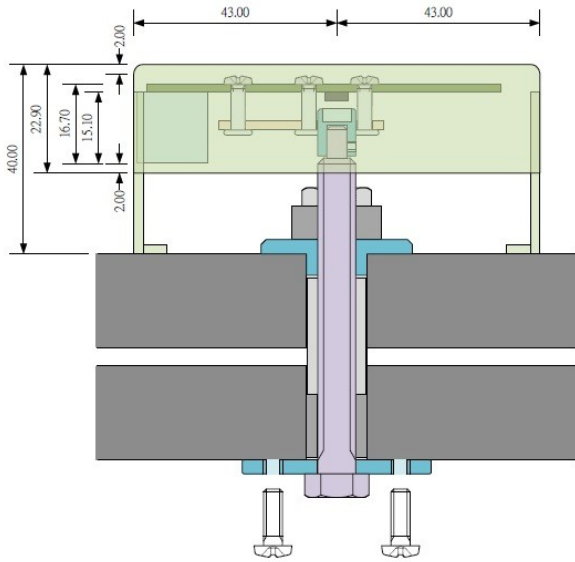
The included DC-USB cable (part #13) is for any 5V~15V USB battery. The 5V USB portable power bank used on handsets is one of the most convenient power suppliers.

The battery case (8 AA batteries) comes with in GSO Dobsonian kit could be the power supplier.

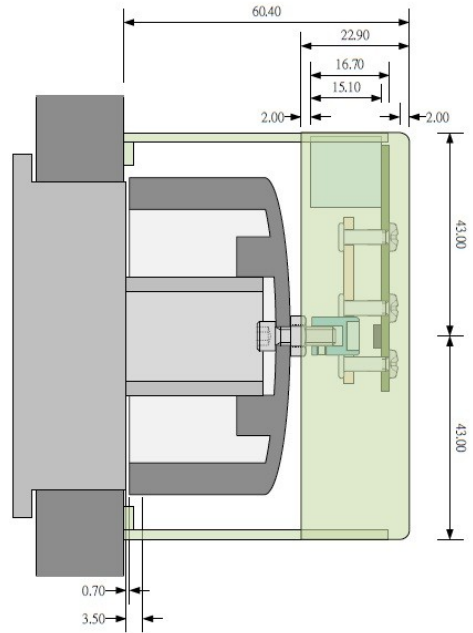


# Layout of AZ / ALT Encoder Modules

unit: mm

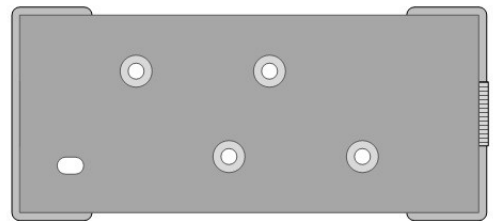
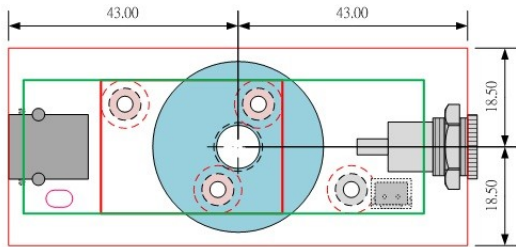


AZIMUTH ENCODER

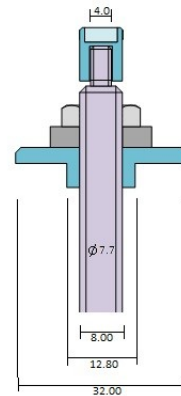
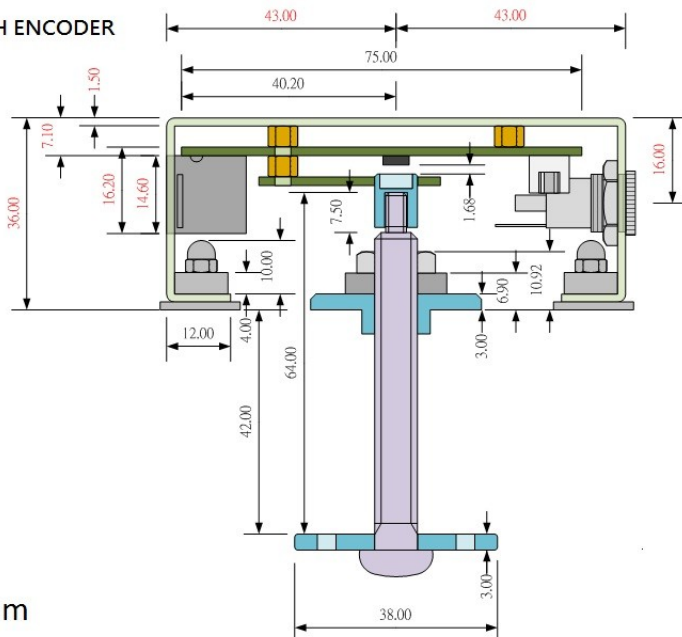


ALTITUDE ENCODER

AZIMUTH ENCODER  
Front View



AZIMUTH ENCODER



Unit: mm

## Q / A and Troubleshooting

1. Is the EZ PUSH TO compatible with my Dob ?

So far, GSO ever ODM many brands Dob. The feature is plastic black covers on both sides to adjust the tension. EZ PUSH TO is directly compatible with them.



2. Why does my Dob performs poor repeatability?

Because of loose parts, the encoder module slightly moves relatively when rotating. Please fasten the encoder magnets (part #6), and **glue the AZ module with thick rubber pad (part #11)**. It is very important to glue the AZ module. Then do the repeatability again to make sure parts on where they should be. If necessary, **lubricate the sensor magnets** for less friction.

**And, make sure the AZ encoder magnet as perfectly centering as possible** when rotating the base. If not, adjust its centering by hitting the top side(4mm part) of the main column with rubber or wooden hammer slightly.



### 3. Why is my Dob inaccurate?

There are two issues, 1st is app setting, 2nd is system alignment

Let us check the 1st issue:

**Time should be correct** (error is less than 1 min), please set the time on your smart phone precisely.

**DST & Time Zone, please run app again without previous default, and confirm the information on app are correct.** DST is only used in few nations during summer. Disable DST when you are not in those regions. **Be aware that Time Zone on the EZ PUSH TO app is shifted by DST** (for example Time Zone in Houston is -6 without DST, and -5 with DST).

Location is automatically setup by GPS. Please double check the input format when inputting the location manually.

Let us check the 2nd issue:

**Perfect Leveling**, please adjust the dob in perfect leveling with the qualified bubble level meter.

Star Alignment, please choose stars (altitude between 20~70 degree) for alignments. Lower altitude is easily disturbed by atmospheric refraction. The higher altitude is easily confused on AZ/ALT coordinate (**imagine the star at altitude 90°, its azimuth is totally confused**), **the best alignment stars is chosen nearby altitude 45°.**

**Avoid to choose all the alignment stars in similar zones.** If 2~3 stars are available for alignments; for example; try to choose their azimuth at 0° / 120° / 240° as wider FOV as possible.

### 4. How to improve pointing accuracy?

Most Dob's base is made of wooden material. The rigidity is a critical issue to the pointing accuracy. Multi-stars alignment is designed to improve the linearization on encoders. The app allows up to 12 stars for alignments in every zone of 30°. We advise you align encoders with at least 3 stars as wide as possible. The tip is **to choose a brighter alignment near the unknown target.**

### 5. Battery problem

Only **5V~15V DC is allowed** in EZ PUSH TO. The battery case comes with GSO manufactured Dob's fan works as well.

Besides, the USB power bank is a good solution. Be aware to choose new model of 5V USB power bank. Most outdated models would power off automatically in minutes because the EZ PUSH TO is an extremely power saving product.

#### 6. Encoders Accuracy

EZ PUSH TO uses a pair of AMS AS5600 magnetic rotary sensors. The resolution of AS5600 is  $0.088^\circ$ . Rarely, the worst bias would be up to  $0.3^\circ$  from issues of installation. However, their repeatability is always as good as  $0.1^\circ$ . **The new released EZ PUSH TO app provides the PEC (periodic error correction) to guarantee the accuracy in the range of  $0.1^\circ$  in minutes.** There is a clip on YouTube to demo how PEC works.

Sure, we have known that the Dob's accuracy is not as good as encodes could be because of its inferior rigidity.