INSTRUCTION MANUAL

Star Discovery 2i

202007-V1

CONTENT

Part I: Introduction

A simple mount, yet efficient

When designing the Star Discovery 2i mount, Sky-Watcher engineers kept these words in mind. A simple mount that can really do astronomy, helps beginners to discover the night sky effciently and will become a tool that can fulfill your passion. The Star Discovery 2i mount is not only designed to drive a telescope, but is also a multi-role platform for cameras and video recorders. Perfect for lightweight astrophotography, time lapse photography, wide view and panorama photography, video panning and so many more activities.

With motors on both axes the Star Discovery 2i mount can be driven from one point to another accurately in no time and can pinpoint any object. Any night sky object will be in the center of the field of view in no time, or your camera will frame that scene exactly as you like it.

The Star Discovery 2i mount even includes digital encoders and the patented “Freedom Find™” technology like the biggest Sky-Watcher mounts. After moving to a new object the telescope will automatically begin to track the new object accurately. No resetup is required in one observing session.

The Star Discovery 2i mount is designed to be connected by WiFi to your smartphone, tablet or laptop computer, using the free downloadable software SynScan or SynScan Pro and / or SynScan Photo.

There is no need for an external WiFi signal as the mount produces its own WiFi signal to connect with your smart device. So operation is possible anywhere, even in remote areas far away from any other signal source. All you need is charged batteries in your mount and your smart device, and to have the SynScan software already installed on your smart device.
The Sky Discovery 2i mount will then be able to aim your telescope or camera to any astronomical object selected from its huge 42000+ object database, including objects from Messier, IC, NGC and Caldwell catalogs, the planets, named stars, double stars, variable stars and even user-defined objects like new comets (SynScan) or positions on the landscape (SynScan Photo).

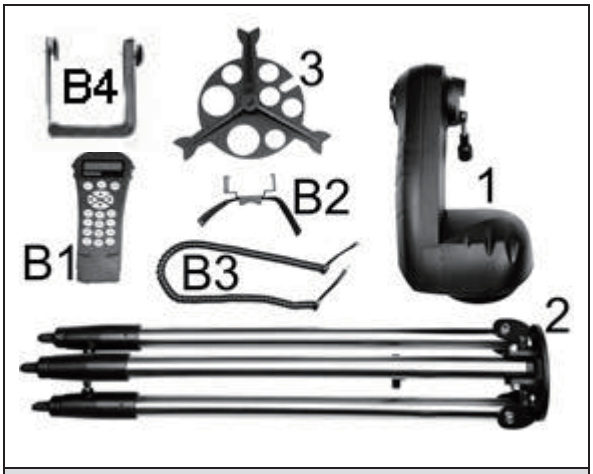
As an option, it is also possible to buy the SynScan handcontroller, which can replace your WiFi connected smart device for astronomy application.

- NEVER USE YOUR TELESCOPE TO LOOK DIRECTLY AT THE SUN. PERMANENT EYE DAMAGE WILL RESULT.
- NEVER USE AN EYEPIECE-TYPE SOLAR FILTER.
- NEVER USE YOUR TELESCOPE TO PROJECT SUNLIGHT ONTO ANOTHER SURFACE; THE INTERNAL HEAT BUILD-UP WILL DAMAGE THE TELESCOPE OPTICAL ELEMENTS.
- USE A CERTIFIED SOLAR FILTER FIRMLY MOUNTED ON THE FRONT OF THE TELESCOPE FOR VIEWING THE SUN.
- WHEN OBSERVING THE SUN, PLACE A DUST CAP OVER YOUR FINDERSCOPE OR REMOVE IT TO PROTECT YOU FROM ACCIDENTAL EXPOSURE.
- NEVER LET A TELESCOPE POINTING THE SUN UNATTENDED.

Part II: Getting Started

Parts description

When unpacking the mount box, you will find the following parts enclosed:



Star Discovery 2i SD - GoTo bundle

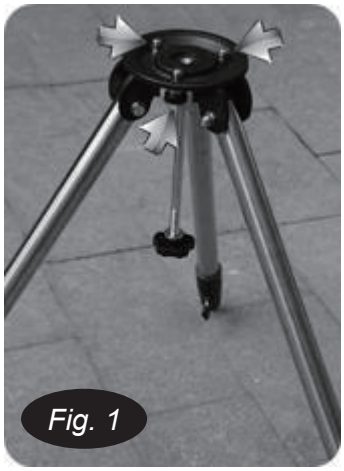
Standard parts:

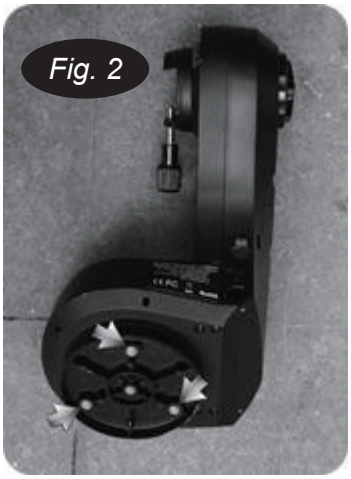
1. The Star Discovery 2i mount
2. The tripod with adjustable legs
3. The accessory tray

Optional parts:

B1. SynScan hand controller
B2. Leg support for SynScan hand controller
B3. RJ12 connection cable for SynScan hand controller
B4. L bracket and secondary accessory plate

Installing the Star Discovery 2i mount for an observation





Install the base on the observation point. Extend the legs at desired height and level the base **(**Fig. 1**)**. You don't have to align a leg to a specific direction. Please note the three screws position on the base.

Part II: Getting Started

Install the mount's head on the base so the three threads [shown by arrows in **(**Fig. 2**)**] are aligned with the three screws on the base [shown by arrows in **(**Fig. 1**)**].

Tight the three screws from the base onto the head threads [shown by an arrow in **(**Fig. 3**)**]. Be sure the head is secure onto the base.

Fig. 4

Fig. 5

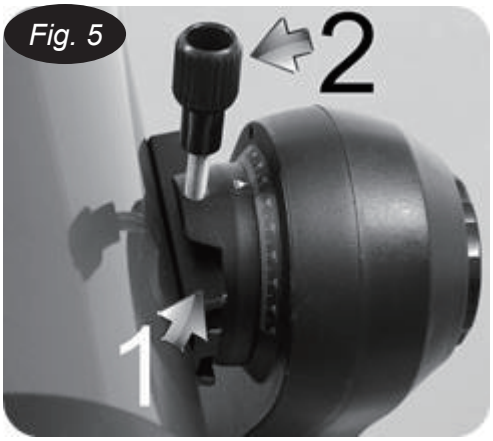


Fig. 6

If not done yet, please install 8xAA cells inside the box located on the external side of the mount's arm. To open the box, gently lift the panel with one finger. Please note the cell holder gets place for 4xAA cells on one side, and 4xAA more on the other side. Please insert the cells with right polarity. When done close the panel **(**Fig. 4**)**.

To install a telescope, loosen the handle screw **(**Fig. 5.2**)** until you can slide the telescope dovetail bar **(**Fig. 5.1**)** inside the bracket. Once inserted, tighten the handle screw **(**Fig. 5.2**)** until the dovetail bar on the telescope tube is securely fastened on the mount. Adjust the clutch knob **(**Fig. 6**)** to obtain a locking force enabling the main tube to be pushed manually while staying steady once released.

Fig. 7

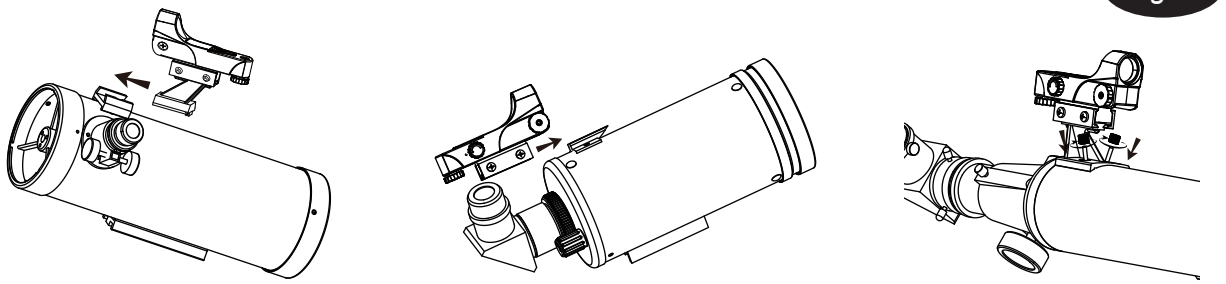
To install the camera instead of the telescope, please refer to chapter "Terrestrial Photography".
Connectors description:

1: ON / OFF switch
2: Snap connector for camera shutter release
3: external power 12V DC input
4: RJ12 hand controller connection port

Attaching the red dot finder

Slide the red dot finder bracket into the rectangular slot and tighten the screw to hold the red dot finder in place **(**Fig. 7**)**.

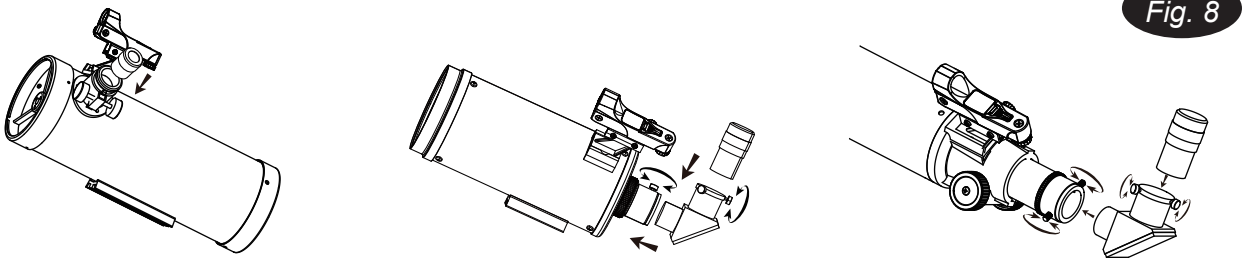
Fig. 7



Mounting the telescope accessories

1. Unscrew the thumbscrews on the end of the focus tube to remove the black plastic end-cap.
2. Insert the desired eyepiece then re-tighten thumbscrews to hold the eyepiece in place **(**Fig. 8**)**.

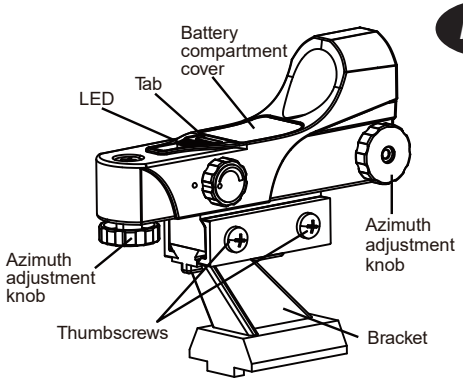
Fig. 8



Using the Red Dot Finder

The Red Dot Finder is a zero magnication pointing tool that uses a coated glass window to superimpose the image of a small red dot onto the night sky. The Red Dot Finder is equipped with a variable brightness control, azimuth adjustment control, and altitude adjustment control **(**Fig. 9**)**. The Red Dot Finder is powered by a 3-volt lithium battery located underneath at the front. To use the Finder, simply look through the sight tube and move your telescope until the red dot merges with the object. Make sure to keep both eyes open when sighting.

Fig. 9

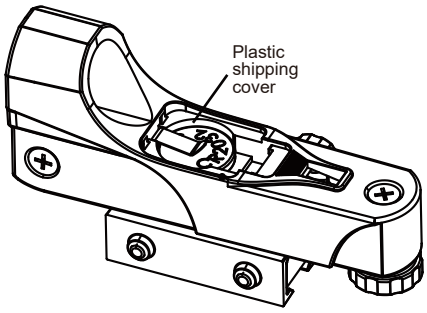


Aligning the Red Dot Finder

Like all finderscopes, the Red Dot Finder must be properly aligned with the main telescope before use. This is a simple process using the azimuth and altitude control knobs.

1. Open the battery cover by pulling it down (you can gently pry at the 2 small slots) and remove the plastic shipping cover over the battery **(**Fig. 10**)**.
2. Turn on the Red Dot Finder by rotating the variable brightness control clockwise until you hear a “click”. Continue rotating the control knob to increase the brightness level. Insert a low power eyepiece into the telescope’s focuser.
3. Locate a bright object and position the telescope so that the object is in the centre of the field of view.
4. With both eyes open, look through the sight tube at the object. If the red dot overlaps the object, your Red Dot Finder is perfectly aligned. If not, turn its azimuth and altitude adjustment controls until the red dot is merged with the object.

Fig.10



Download SynScan or SynScan Pro APP

http://www.skywatcher.com/download/software/synscan-app/

Download SynScan App User’s Manual

http://www.skywatcher.com/download/manual/synscan-hand-control-and-synscan-app/

Wireless telescope control

The Star discovery 2i mount will be equipped with a telescope optical tube for astronomy observation purpose. Please refer to the telescope optical tube manual for use of the telescope and its accessories.

Aiming the telescope automatically with the Star Discovery 2i mount, connected to your smart device equipped with WiFi (smartphone, tablet, laptop):

- Make sure the freely available software (SynScan or SynScan Pro) app is installed on your smart device. You can find them in your App Store, Google Play or on our webpage
- Switch on the Star Discovery 2i mount.
- Connect your smart device with the WiFi signal with identification “SynScan …..”
- Refer to SynScan App User’s Manual.

The Wi-Fi will be turned off automatically to conserve energy if no connection is established within 15 minutes after being turned on.

By default, the SSID of the built-in Wi-Fi is “SynScan_xxxx” with no password.

Reset Wi-Fi configuration to factory default by turning on the power without the SynScan hand control connected and no app operations via the Wi-Fi connection for 1 hour.

Entry-level users are recommended to start with SynScan app, the SynScan Pro app is for experienced users.

Wireless terrestrial photography control:

The Star discovery 2i mount can be equipped with a camera for terrestrial panorama photography, timelapse photography etc.
The connection procedure is identical. The app to be installed is different: SynScan Photo.

Terrestrial photography

The Star Discovery 2i mount is also perfectly suited to shoot amazing panoramic images or do video cruising automatically. But not only… It is also perfect for lightweight astrophotography, time lapse photography, wide view and panorama photography, video panning and so many more activities.

The Star Discovery 2i mount is capable of automatically moving to various preprogrammed positions and controls the camera shutter to take a picture at each position automatically, taking the complexity out of producing panoramic video or photographs.

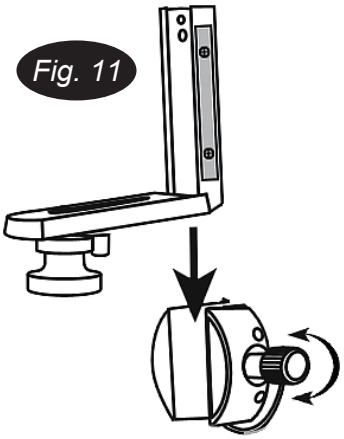
The Star Discovery 2i mount also supports Sky-Watcher latest patented Freedom Find (dual-encoder) technology. With two encoders the mount will keep track of stored position even if the mount has been manually rotated. A feature many nature photographers awaited for so long.

Installing the Mounting Bracket

Before installing the mounting bracket please note the bracket has a metal plate reinforcement on one side, as shown in **(**Fig.11**)**. This metal plate should face the blocking screw on the vertical axe.

Gently slide the mounting bracket inside the dovetail clamp, roughly to the middle or the height of the mounting bracket.
Secure the mounting brackets in place by tighten the blocking screw.

Fig. 11



IMPORTANT NOTE:

PLEASE CHECK CAREFULLY THAT YOU HAVE INSERTED THE MOUNTING BRACKET WITH THE METAL PLATE FACING THE BLOCKING SCREW.

INSERTING THE MOUNTING BRACKET ON THE WRONG SIDE MAY BREAK THE MOUNTING BRACKET WHILE TIGHTENING THE BLOCKING SCREW OR MAY SUDDENLY FALL OFF WITH ACCESSORIES LOADED DURING OPERATIONS.

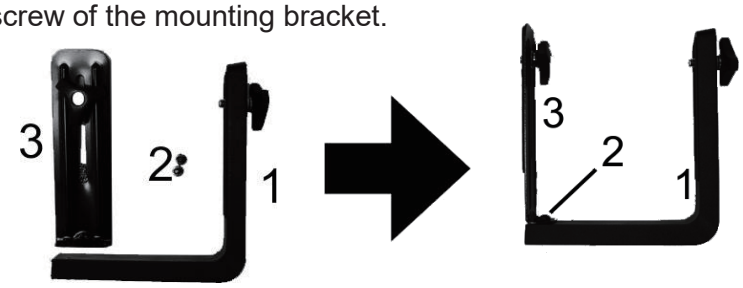
You can assemble on the mounting bracket any device having a standard photo thread (¼ "), like a camera, a camcorder or a spotting scope.

To assemble and secure a camera body on the mounting bracket you need to align the thread inside the camera body with the screw **(**step 1**),** then tighten the screw until the camera is tight **(**step 2**)**.

Don't over tight the screw; you may damage the camera body's thread and/or the mounting bracket screw.

It is also possible to attach two devices on the mounting bracket by using the secondary accessory plate. You will find the secondary accessory plate and two screws inside the box.

To mount the secondary accessory plate: locate two threads on the internal side of the mounting bracket **(**part 1**)** and use the two screws **(**part 2**)** to assemble the secondary accessory plate **(**part 3**)** on the mounting bracket **(**part 1**)**. Take care to mount the secondary accessory plate with it screw on the same side as the screw of the mounting bracket.



The secondary plate is designed to support light accessories (< 400g).

Please do not install a digital single lens reflex camera (DSLR) or a spotting scope on the secondary accessory plate. The mounting bracket may break, or the secondary accessory plate may bend over the accessory installed below.

Choosing the Appropriate Eyepiece

Calculating the magnication (power)

The magnification produced by a telescope is determined by the focal length of the eyepiece that is used with it. To determine a magnification for your telescope, divide its focal length by the focal length of the eyepieces you are going to use. For example, a 10mm focal length eyepiece will give 80X magnification with an 800mm focal length telescope.

$$\text{Magnification} = \frac{\text{Focal length of the telescope}}{\text{Focal length of the eyepiece}} = \frac{800\text{mm}}{10\text{mm}} = 80\text{X}$$

When you are looking at astronomical objects, you are looking through a column of air that reaches to the edge of space and that column seldom stays still. Similarly, when viewing over land you are often looking through heat waves radiating from the ground, house, buildings, etc. Your telescope may be able to give very high magnification but what you end up magnifying is all the turbulence between the telescope and the subject. A good rule of thumb is that the usable magnification of a telescope is about 2X per mm of aperture under good conditions.
Too much magnification and too small a field of view can make it very hard to find things. It is usually best to start at a lower magnification with its wider field of view and then increase the magnification when you have found what you are looking for. First find the moon then look at the shadows in the craters!

Calculating the field of view

The size of the view that you see through your telescope is called the true (or actual) field of view and it is which is supplied by the manufacturer. Field of view is usually measured in degrees and/or arc-minutes (there are 60 arc-minutes in a degree). The true field of view produced by your telescope is calculated by dividing the eyepiece's apparent field of view by the magnification that you previously calculated for the combination. Using the figures in the previous magnification example, if your 10mm eyepiece has an apparent field of view of 52 degrees, then the true field of view is 0.65 degrees or 39 arc-minutes.

$$\text{True Field of View} = \frac{\text{Apparent Field of View}}{\text{Magnification}} = \frac{52^\circ}{80\text{x}} = 0.65^\circ$$

To put this in perspective, the moon is about 0. 5° or 3 arc-minutes in diameter, so this combination would be fine for viewing the whole moon with a little room to spare. Remember, too much magnification and too small a field of view can make it very hard to find things. It is usually best to start at a lower magnification with its wider field and then increase the magnification when you have found what you are looking for. First find the moon then look at the shadows in the craters!

Calculating the exit pupil

The Exit Pupil is the diameter (in mm) of the narrowest point of the cone of light leaving your telescope. Knowing this value for a telescope-eyepiece combination tells you whether your eye is receiving all of the light that your primary lens or mirror is providing. The average person has a fully dilated pupil diameter of about 7mm. This value varies a bit from person to person, is less until your eyes become fully dark adapted and decreases as you get older. To determine an exit pupil, you divide the diameter of the primary of your telescope (in mm) by the magnification.

$$\text{Exit Pupil} = \frac{\text{Diameter of Primary mirror in mm}}{\text{Magnification}}$$

For example, a 200mm f/5 telescope with a 40mm eyepiece produces a magnification of 25x and an exit pupil of 8mm. This combination can probably be used by a young person but would not be of much value to a senior citizen. The same telescope used with a 32mm eyepiece gives a magnification of about 31x and an exit pupil of 6. 4mm which should be fine for most dark adapted eyes. In contrast, a 200mm f/10 telescope with the 40mm eyepiece gives a magnification of 50x and an exit pupil of 4mm, which is fine for everyone.

Appendix: Tips for observing the sky

Sky conditions

Sky conditions are usually defined by two atmospheric characteristics, seeing, or the steadiness of the air, and transparency, light scattering due to the amount of water vapor and particulate material in the air. When you observe the Moon and the planets, and they appear as though water is running over them, you probably have bad "seeing" because you are observing through turbulent air. In conditions of good "seeing", the stars appear steady, without twinkling, when you look at them with unassisted eyes (without a telescope). Ideal "transparency" is when the sky is inky black and the air is unpolluted.

Selecting an observing site

Travel to the best site that is reasonably accessible. It should be away from city lights, and upwind from any source of air pollution. Always choose as high an elevation as possible; this will get you above some of the lights and pollution and will ensure that you aren't in any ground fog. Sometimes low fog banks help to block light pollution if you get above them. Try to have a dark, unobstructed view of the horizon, especially the southern horizon if you are in the Northern Hemisphere and vice versa. However, remember that the darkest sky is usually at the "Zenith", directly above your head. It is the shortest path through the atmosphere. Do not try to observe any object when the light path passes near any protrusion on the ground. Even extremely light winds can cause major air turbulence as they flow over the top of a building or wall.

Observing through a window is not recommended because the window glass will distort images considerably. And an open window can be even worse, because warmer indoor air will escape out the window, causing turbulence which also affects images. Astronomy is an outdoor activity.

Choosing the best time to observe

The best conditions will have still air, and obviously, a clear view of the sky. It is not necessary that the sky be cloud-free. Often broken cloud conditions provide excellent seeing. Do not view immediately after sunset. After the sun goes down, the Earth is still cooling, causing air turbulence. As the night goes on, not only will seeing improve, but air pollution and ground lights will often diminish. Some of the best observing time is often in the early morning hours. Objects are best observed as they cross the meridian, which is an imaginary line that runs through the Zenith, due North-South. This is the point at which objects reach their highest points in the sky. Observing at this time reduces bad atmospheric effects. When observing near the horizon, you look through lots of atmosphere, complete with turbulence, dust particles and increased light pollution.

Cooling the telescope

Telescopes require time to cool down to outside air temperature. This may take longer if there is a big difference between the temperature of the telescope and the outside air. This minimizes heat wave distortion inside telescope tube (tube currents). A rule of thumb is to allow 5 minutes per inch of aperture. For example, your telescope would require at least 30 minutes cooling off to outside conditions. Tip: use this time for polar alignment.

Adapting your eyes

Do not expose your eyes to anything except red light for 30 minutes prior to observing. This allows your pupils to expand to their maximum diameter and build up the levels of optical pigments, which are rapidly lost if exposed to bright light. It is important to observe with both eyes open. This avoids fatigue at the eyepiece. If you find this too distracting, cover the non-used eye with your hand or an eye patch. Use averted vision on faint objects: The center of your eye is the least sensitive to low light levels. When viewing a faint object, don't look directly at it. Instead, look slightly to the side, and the object will appear brighter.

CAUTION!

NEVER USE YOUR TELESCOPE TO LOOK DIRECTLY AT THE SUN. PERMANENT EYE DAMAGE WILL RESULT. USE A PROPER SOLAR FILTER FIRMLY MOUNTED ON THE FRONT OF THE TELESCOPE FOR VIEWING THE SUN. WHEN OBSERVING THE SUN, PLACE A DUST CAP OVER YOUR FINDERSCOPE OR REMOVE IT TO PROTECT YOU FROM ACCIDENTAL EXPOSURE. NEVER USE AN EYEPIECE-TYPE SOLAR FILTER AND NEVER USE YOUR TELESCOPE TO PROJECT SUNLIGHT ONTO ANOTHER SURFACE, THE INTERNAL HEAT BUILD-UP WILL DAMAGE THE TELESCOPE OPTICAL ELEMENTS.