Star Adventurer Advanced Version Firmware

OPERATION MANUAL
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I. ABOUT THIS MANUAL
The Advanced Version firmware is developed to provide greater flexibility, as users can now customize various parameters (Section IV) for different purposes. Due to such, new modes become available while the original modes, enhanced (Section V). Therefore, this manual serves solely to provide explanations and guides to the newly acquired features and modes. For general operation, polar alignment, parts name and specifications, please refer to the Standard manual that comes with the product. If you are new to Star Adventurer(SA), we recommend you to become familiar with the Standard Version firmware first, before switching to the Advanced Version. Users may switch between firmwares freely.

II.OVERVIEW OF THE ADVANCED VERSION FIRMWARE (v03.130.07)
Here is a list of the configurable parameters,newly added modes, and their symbols:

5 Configurable Parameters:

- Exposure Time **EXP**
- Shutter Interval **INT**
- Rotation Speed **V**
- Total Picture Count ☼/N
- Range of Rotation ☾/A

2 New Modes:

- Astro-Time-lapse 《☆
- Long-Exposure Time-Lapse **V**
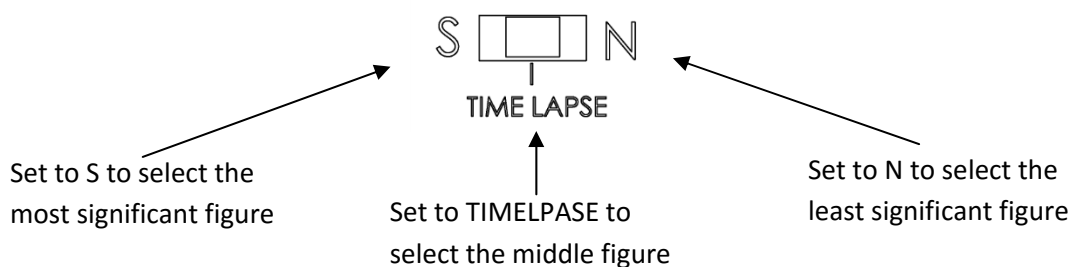
III.NEW MODE DIAL
The new Mode Dial pattern to the right is designed specifically for the Advanced Version firmware. Users can print and cut it out to replace the original Mode Dial pattern on SA. Manufactured piece may be available. Please consult your local dealers for detail.

IV. PARAMETER CONFIGURATION
As mentioned in section 2, there are 5 parameters that allow adjustments. Below is the outline for parameter configuration:

1. **Select a Parameter**: Turn the Mode Dial to the parameter that needs to be configured
   - When configuring Exposure Time and Shutter Interval, simply turn to the corresponding symbol and proceed to step 2. For Rotation Speed, Total Picture Count and Range of Rotation, turn to the corresponding symbol, then press and hold the Arrow Keys; "◄" & "►", simultaneously for 5 seconds, to activate the configuration mode
2. **SelectFigure Place**: 3 significant figuresare given for configuringeach parameter. For example, users can set exposure time (unit = second) to the hundred's place. Use the slide Switch to select which significant figure to be adjusted
   - To select the most significant figure, set to "S", To select the middle figure, set to "TIMELAPSE", to select the least significant figure, set to "N"

S ☐ N
TIME LAPSE

Set to S to select the most significant figure

Set to TIMELPASE to select the middle figure

Set to N to select the least significant figure

- **CAUTION**: For a particular parameter, each significant figure may have a different unit, and may not be in decimals of ten. Please refer to the table below for the specific units
3. **Adjust The Value of The Selected Figure Place**: Press the "◄" key to decrease the value, press the "►" key to increase
    - To verify if the correct value has been entered for a specific figure, observe how many times the "◄" & "►" keys blink in short pulses. E.g. If the Arrow Keys display the following repeating pattern, while the Slide Switch is set to "S":
        ~~Blink.Blink.Blink~~pause~~Blink.Blink.Blink~~pause~~
      then the value "3" has been entered as the most significant figure (I.e. hundred's place)
4. **Complete The Value Adjustment**: Use the Slide-Switch and the "◄" & "►" keys to finish configuring the remaining figures
5. **Registerthe Value**:Complete the procedure simply by turning the Mode Dial to any different position. The values have now been registered. The stored information will not be erased even when power off, unless users restore the manufacturer default values (page 3) or reconfigure the parameter

Parameter	Definition	Press both Arrow Keys for 5 sec.	Unit represented by Slide Switch Position		
			S	TIMELAPSE	N
EXP **Exposure Time**	The duration between shutter open and shutter close signals	No	100 sec.	10 sec.	1sec.
INT **Shutter Interval**	Exposure Time + Panning Interval* + Stabilizing time*	No	100 sec.	10 sec.	1sec.
V **Rotation Speed**	Amount of time required for a 360° revolution	Yes	10 hours	1 hour	10 minutes accepted value: 0~5
☼/N **Total Picture Count**	Number of picture the camera takes	Yes	1000 pictures	100 pictures	10 pictures
☾/A **Range ofRotation**	The rotation limit for the SA. SA will pan back and forth within this angle	Yes	100°	10°	1°

* Explanation of the Panning Interval and Stabilizing Time can be found in page 6

Special Cases:

☼/N
- To take picture continuously, enter "0" for all 3 figures
- Total picture count will restart whenever any switch or button on SA is used

☾/A
- To keep SA rotating in one direction without stop, enter "0" for all 3 figures

V. RESTORE TO MANUFACTURE DEFAULT VALUES

- Use the following procedure to restore ALL parameters back to manufacturer default (See Appendix 1 in page 8 for the default value for each parameter)
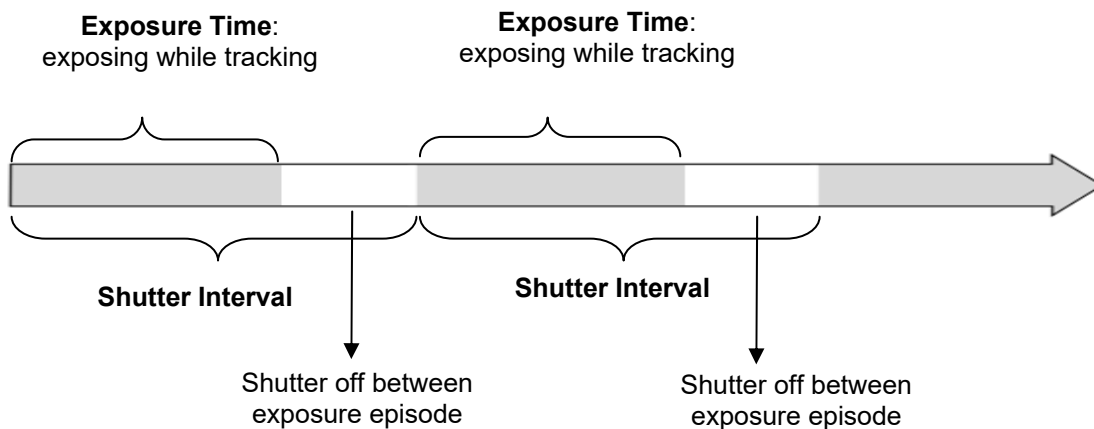
1. Set Mode Dial to: ★/D
2. **Important!** Press and hold both "◄" & "►" keys for 5 seconds
3. The backlight will blink continuously; this indicates the manufactured values have now been restored

V. IMAGING MODES

This section provides explanations and instructions on the various modes available with the Advanced Version firmware.

A. Astrophotography

Users are able to capture series of long exposure images of the night sky, while the mount tracks celestial objects (Sun, Moon, or stars) continuously without interruption. The figure below shows the behavior of the SA under this mode.

Exposure Time: exposing while tracking

Exposure Time: exposing while tracking

Shutter Interval

Shutter Interval

Shutter off between exposure episode

Shutter off between exposure episode

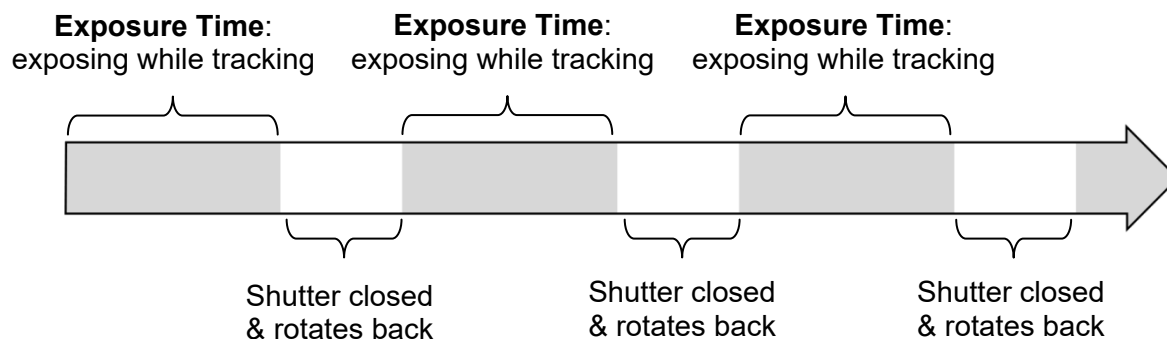**Parameters to Be Configured:**

EXP , ☼/N (optional)

Procedure:
1. Configure or verify the aboveparameters (refer to IV. PARAMETER CONFIGURATION)
2. Set Rotation Direction:
    - For Northern Hemisphere: Turn the Slide Switch to N
    - For Southern Hemisphere: Turn the Slide Switch to S
3. Turn Mode Dial to "OFF"
4. Polar align (please refer to the Standard Instruction Manual, page 20)
5. Setup camera and point to your targeted area
6. Set camera to Bulb, install the shutter release cable
7. Turn the camera on
8. Turn the Mode Dial to ★/D if you are shooting the stars, turn to ☾/A for the Moon, or turn to ☼/N for the Sun

Note:
- The shutter-off time between each exposure is for the camera to save and process the previous picture. The value is equal to "Shutter Interval" minus "Exposure Time"
- If exposure time is set to 0, the manufacture default exposure time is in effect (See appendix 1)

B. Astro-Time-Lapse

Users can use this mode to take series of long exposure pictures of a specific area of the night sky. Under this mode, SAnot only tracks the star during exposure, it always reverts back to the starting point before taking the next picture. This design allows time-lapse video of pinpoint stars moving over the sky. The figure below shows the behavior of the Star Adventurer under this mode.

Exposure Time: **Exposure Time**: **Exposure Time**:
exposing while tracking   exposing while tracking   exposing while tracking

Shutter closed   Shutter closed   Shutter closed
& rotates back   & rotates back   & rotates back

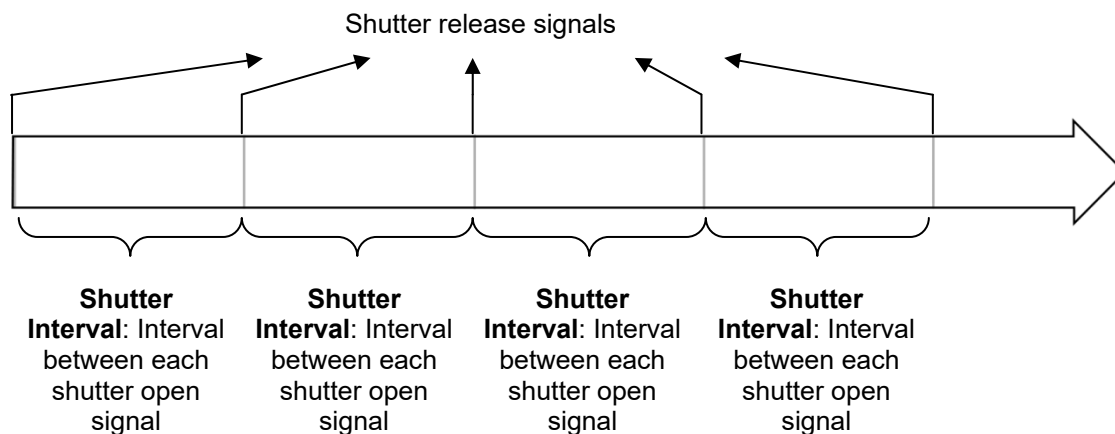**Parameters to Be Configured:**

EXP , ☼/N (optional)

Procedure:
1. Configure or verify the aboveparameters (IV. PARAMETER CONFIGURATION)
2. Set Rotation Direction:
   - For Northern Hemisphere: Turn the Slide Switch to N
   - For Southern Hemisphere: Turn the Slide Switch to S
3. Turn Mode Dial to "OFF"
4. Polar align (please refer to the Standard Instruction Manual, page 20)
5. Setup camera and point to your targeted area
6. Set camera to Bulb, install the shutter release cable
7. Turn the camera on
8. Turn the Mode Dial to ⟪☆ to begin the operation

Tip:
If you require a clear image of the foreground, turn the Slide Switch to "TIMELAPSE" after step 7. SA will take pictures at the configured exposure time while staying stationary. After the picture is taken, switch the Slide Switch to "N" or "S", depending on the hemisphere you are at, and proceed to step 8.

C. Regular Time-Lapse

*This mode is for capturing images for time-lapse purposes under **well-lit conditions**, where long exposure is not necessary. SA will pan continuously, while firing shutter signal at regular intervals set by the users.The figure below shows the behavior of the SA under this mode.*

Shutter release signals

Shutter Interval: Interval between each shutter open signal	**Shutter Interval**: Interval between each shutter open signal	**Shutter Interval**: Interval between each shutter open signal	**Shutter Interval**: Interval between each shutter open signal

Parameters to Be Configured:

EXP (must be set to 0), INT, V, ☼/N (optional), ☾/A (optional)
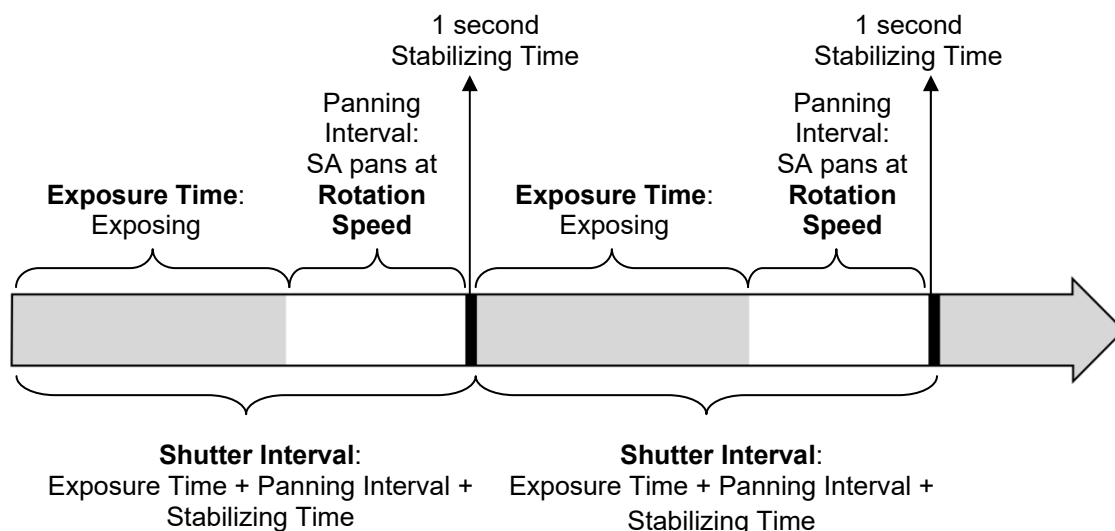
Procedure:
1. Configure or verify the above parameters (IV. PARAMETER CONFIGURATION)
   - **Important:** EXP must be set to 0
2. Set panning direction:
   - For panning left→right: Set Slide Switch to "N"
   - For panning right→ left: Set Slide Switch to "S"
   - For stationary time-lapse: Set Slide Switch to "TIMELAPSE"
3. Turn the Mode Dial to "OFF"
4. Setup camera and find the initial frame
5. Set camera to manual (the exposure time must be set in the camera). Install the shutter release cable
6. Turn the camera on
7. Turn the Mode Dial to V to begin the operation

Note:
- See appendix II for useful formulas and tips

*This mode is designed for time-lapse purposes under**low lightconditions**, where prolonged exposure is necessary. During the operation, the unit repeats the following pattern 1) panning at Rotation Speed, as defined by users 2) stabilizing, 3) stayingstationary while taking long exposure picture. This mode is particularly useful for night city scene and aurora time-lapse imaging. The figure below shows the behavior of the SA under this mode.*

Parameters to Be Configured:

EXP, **INT**, **V**, ☼**/N** (optional), ☾**/A** (optional)

Procedure:
1. Configure or verify the aboveparameters (IV. PARAMETER CONFIGURATION)
2. Set panning direction:
   - For panning left→right: Set Slide Switch to "N"
   - For panning right→ left: Set Slide Switch to "S"
   - For stationary time-lapse: Set Slide Switch to "TIMELAPSE"
3. Turn the Mode Dial to "OFF"
4. Setup camera and find the initial frame
5. Set camera to manual (the exposure time must be set in the camera). Install the shutter release cable
6. Turn the camera on
7. Turn the Mode Dial to **V** to begin the operation

Note:
- The 1 second stabilizing time is to ensure that the whole setup becomes completely still, before the next picture is taken. The value is unalterable
- The Panning Interval is not directly configurable, but can be done indirectly through configuring Exposure Time and Shutter Interval
- See appendix II for useful formulas and tips

APPENDIXI

TABLES

Table 1: Manufacturer Default Values for each parameter

Parameter	value in "S-Timelapse-N" term	Actual value
exposure time	"000"	0 second
Shutter interval	"001"	1 second
Rotation speed in "V"	"020"	2 hrs0min/Rev.
Photo required	"000"	Unlimited
Range of Rotation	"360"	360°

Table 2: The corresponding behavior according to the manufacture setting

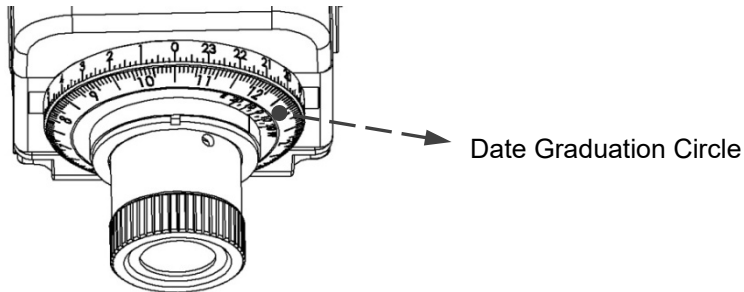| Mode	Rotation Speed	Exposure Time (sec)	Shutter Interval (sec)	Range of Rotation (°)
★	Sidereal	180	180.5	360
☀	Solar	0.5	1	360
☾	Lunar	4	4.5	360
V	2 hrs/Rev.	controlled by camera	1	360
⟪☆	Sidereal	35	~40	N/A

Useful Equation for Long-Exposure Time-Lapse Photography:

Equation 1: Shutter Interval = Exposure Time + Panning Interval+ Stabilizing Time(1sec)
Equation 2: Rotation Speed(time/rev) =3 x Panning Interval (sec) x Desired Video Length(sec) / Panning angle
Equation 3: Number of required pictures = Desired Video Length(sec) x 30(for 30 fps)

Tips for Long-Exposure Time-Lapse Photography:
- Determine the camera focal length
- Simulating the finished time lapse video:
    1. First, set up the camera on the SA. Find your initial frame
    2. Look through the view finder or live view
    3. Hold your camera and slowly pans it across the view you wish to include in the time lapse video, at a speed you find reasonable for your final product. Record the time it took (this will be an estimate of the video length), as well as the spanned angle
    4. A quick way to find the angle is to use the Date Graduation circle; simply record how many degrees it has rotated as you finished the panning process in step 3. For reference, the major division represents 30°, the secondary division represents 2°

Date Graduation Circle

- Take test shot to find out all camera parameters. Write down exposure time
- Use Equation 1 to find out Shutter Interval and Panning Interval. The Panning Interval is by default no less than1 second
- Use equation 2 to find out the Rotation Speed
- Set all SAparameters. To set number of pictures taken, use equation 3, otherwise, set it to 0 for unlimited pictures
- Setup all equipment. Set camera to bulb using the ISO and F-value obtained from the test shot. Turn the Mode Dial to "V" to begin the operation

Example for speed calculation:

Panning Interval(sec.)	Desired Video Length(sec.)	Panning Angle(°)	Rotation Speed(hr/rev.)
3	20	90	2.0
2	20	90	1.3
3	10	20	4.5
2	10	20	3.0
2	20	10	12.0