Introduction

Thank you for purchasing FrSky R9 STAB OTA telemetry receiver.It is a 900MHz/868MHz long-range and stabilization receiver with a built-in 3-axis gyroscope and 3-axis accelerometer. In order to fully enjoy the benefits of this system, please read the instruction manual carefully and set up the device as described below.

Overview

Button
Conventional Channel Outputs (CH1~CH8)
Smart Port →
SBUS out →

R9 STAB
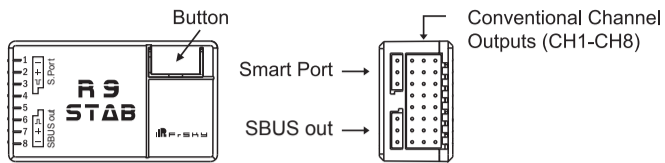
Working State

Green LED	Red LED	Status	Yellow LED	State (Calibration of Accelerometer)	Blue LED	State (Self-check)
On	On	Register	ON	exceeding limits [0.9G, 1.1G]	ON	in process
Flash	Flash	Register successfully	OFF	within limits [0.9G, 1.1G]	OFF	completing
On	Off	Bind	Flashing	completing		
Flash	Off	Work Normally				
Off	Flash	Failsafe				

Specifications

- Dimension: 45.7*26.3*16.2mm (L x W x H)
- Weight: 18.6g
- Number of channels: 8/16CH (CH16 outputs RSSI)
- Operating Current: 140mA@7.4V
- Operating Voltage Range: 3.5V~10V
- Operating Range: Full Range

- Measuring Range of Gyroscope: ±2000dps
- Measuring Range of Accelerometer: ±4g
- Firmware Upgradeable
- Compatibility: ACCESS/*ACCST firmware
  * Need to upgrade to the corresponding ACCST firmware

Features

- ACCESS Protocol and supports OTA function
- 900MHz/868MHz long-range with low latency
- Built-in 3-axis gyroscope and 3-axis accelerometer
- Support S.Port (Configurable in OpenTX / FrOS)

- Low Battery voltage detection supported
- Detachable Ipex1 connector antenna
- Multiple configuration methods (Lua script and FreeLink)

Channels

Number of channel	Corresponding parts on the model	Full name
CH1	AIL 1	Aileron
CH2	ELE 1	Elevator
CH3	THR	Throttle
CH4	RUD	Rudder
CH5	AIL 2	Aileron
CH6	ELE 2	Elevator

Number of channel	Corresponding parts on the model	Full name
CH7	User-defined	
CH8	User-defined	
CH9	No mark	Gyro gain adjustment
CH10&CH11	No mark	Flight modes
CH12		Self-check activation switch

Gyro gain adjustment of CH9: When the the value of CH9 is in the center, the gain is zero. The gain increases as the value gets bigger. Until the value is ±100%, the gain reaches maximum.

Note: CH9~CH12 are not marked on the diagram.
CH9 Edit — Setting CH9 at Weight 50 and offsetting 50, the assigned pot/slider will work normally.

Attentions

CH1~CH8 should be connected to the corresponding servos.
S.Port could be used to update, edit parameter settings via FrSky STK PC tool and connect with telemetry sensors.

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Registration & Automatic binding (Smart Match™)

With the FrSky ACCESS protocol, the transmitter/transmitter module can bind receiver without using the button.
Follow the step below to finish the Registration & binding procedure:
1. Put the transmitter/transmitter module into [Reg] status.
1.1 For Taranis X-Lite Pro and R9M Lite Pro as an example, turn on the transmitter, go to the MENU-MODEL SETUP-PAGE 2, choose External RF-Mode R9MLP ACCESS, then select [Reg].
2. Connect the battery to the receiver while holding the button on the receiver. The RED LED and GREEN LED on the receiver will be on, indicating into the [Reg] status. Select [ENTER] on the transmitter, The RED LED and GREEN LED on the receiver will flash, and the transmitter displays [Registration ok].
3. Turn off the receiver.
4. Move the cursor to select the receiver 1 [Bind].
5. Connect the battery to the receiver, the GREEN LED on the receiver will be on, indicating into the [Bind] status. Select the RX, and the transmitter displays [Bind successful].
6. The transmitter exit [Bind], GREEN LED will flash, RED LED will be off, indicating working normally.

Set up your model and receiver step by step

You need complete calibration of Accelerometer about the six positions via the R9 STAB OTA.Lua/FreeLink APP/FreeLink.exe firstly.
Step1: Connect your servos follow the channel list according to your model.
Step2: Set you radio follow the channel list.
Step3: Choose the Wing Type via the configuration tool (R9 STAB OTA.Lua/FreeLink APP/FreeLink.exe).
Step4: Choose the AUTO LEVEL mode, check the model servo feedback.
Step5: Choose the manual mode, check servo feedback via transmitter.
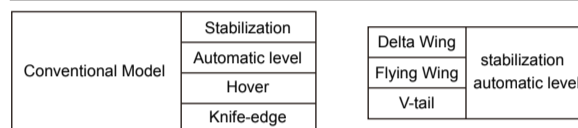
Quick Mode

It supports stabilization mode and manual (six-axis off) mode and configured through CH10. What's more, an urgent mode is added to configure automatic level mode default through CH12. The precise configuration is written below.

| Channel	Position	Flight Mode
CH10	SW Down	None
	SW Mid	Stabilization Mode
	SW Up	Automatical Level Mode
CH12	SW Down	Urgent Mode (Automatic Level Mode)

Note: The default mode of R9 STAB OTA is Quick Mode.When re-flashing firmware of R9 STAB OTA or replacing with a new one, the preset mode will be cleared out.
- If Quick mode is applied, there is no Knife Edge or (3D) Hover mode.
- CH11 is not used when using Quick Mode.

Modes

Conventional Model	Stabilization	
	Automatic level	
	Hover	
	Knife-edge	

Delta Wing	stabilization automatic level
Flying Wing	
V-tail	

The model types could be enabled via R9 STAB OTA.Config or R9 STAB OTA.Lua. If required, R9 STAB OTA could be used as a standard 8 channel R9 series receiver.

Conventional model
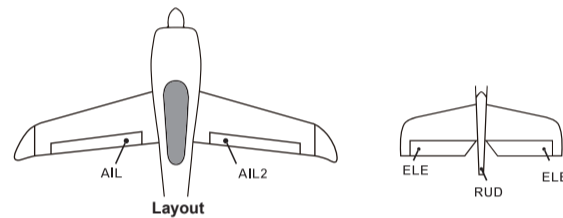
AIL   AIL2   ELE   ELE2   RUD

Layout

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The available flight modes can be assigned to CH10 and CH11 with three-position switches.

Flight mode	Stabilization	Automatic level	Hover	Knife-Edge	Off
CH10 (3 pos SW)	CH10>M+H (CH10 SW Down)	CH10>M+H (CH10 SW Down)	CH10>M+H (CH10 SW Down)	CH10<M-H (CH10 SW Up)	CH10 SW-mid
CH11(3 pos SW)	M-H<CH11<M+H (CH11 SW Mid)	CH11>M+H (CH11 SW Down)	CH11<M-H (CH11 SW Up)	M-H<CH11<M+H (CH11 SW Mid)	

Delta wing & Flying wing & V-tail

AIL
ELE
ELE
RUD
AIL   AIL2

Layout of Delta wing / Flying wing   **Layout of V-tail**
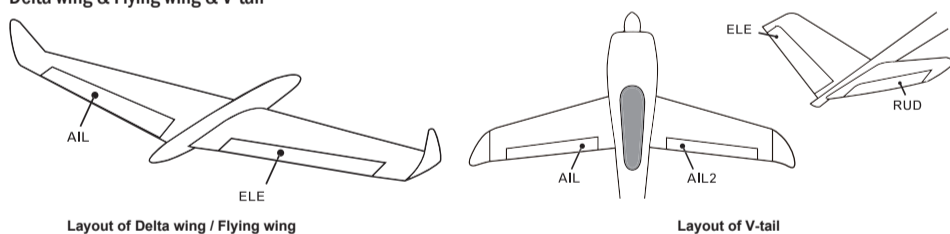
The available flight modes can be assigned to CH10 with a three-position switch.

Flight mode	Stabilization	Auto Level	Off
CH10	CH10>M+H (CH10 SW Down)	CH10<M-H (CH10 SW Up)	CH10 SW-mid

When Delta wing/Flying wing/V-tail is selected, the signal produced by the transmitter should be without active mixes on the channels related to AIL and ELE. R9 STAB OTA will mix the AIL(CH1) and ELE(CH2) input signal with a fixed mix percentage automatically. Signals on CH4~CH8 will behave as required by the user.

M: represents a neutral signal period (1500μs)
H: represents the time of required signal change to activate the mode (50μs). When the factory settings are selected, the switch position shown above represents the required modes.

Flight mode:

Off: When the mode is activated, R9 STAB OTA will transmit the received commands produced by the transmitter to the model without compensating.

Stabilization: When the model is activated, R9 STAB OTA will compensate with external forces (wind) as soon as receiving commands from the transmitter. This function is used to enhance the stability of the model on three axes (Pitch, Roll, Roll). CH9 could be used to adjust gyro gain by assigning a knob or a slider, changing the sensitivity of the counteracting signal produced by the internal three-asis gyroscope.

Automatic level: When the mode is activated, R9 STAB OTA will make the model return to level orientation with internal three-axis accelerometer and three-axis gyroscope on AIL and ELE channels after the sticks being released to neutral. RUD channel works in stabilization mode only.

Hover: When the mode is activated, R9 STAB OTA will make the nose of the model straight up with internal three-axis accelerometer and three-axis gyroscope on RUD and ELE channels (ELE and RUD inputs are not required). Under this mode, AIL is used to control the rotation of the model and THR adjust the altitude. AIL channel works in stabilization mode only.

Knife-egde mode: When the mode is activated, R9 STAB OTA will roll the plane on a certain side (wing points up) with internal three-axis accelerometer and three-axis gyroscope on RUD and AIL channels.Thus, AIL inputs are not required. While the mode steering is done with ELE, altitude will be maintained with THR/RUD. ELE channel operates in stabilization mode only.
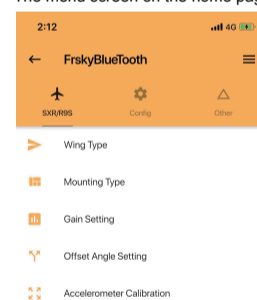
Configuration

Methods: APP configuration
        FrSky radio configuration
        PC configuration software (FrSky STK usb updater)
Configuration parameters: Wing type, mounting type, gain setting, offset angle setting, accelerometer calibration.

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APP(IOS/Android) configuration:
- Connect the R9 STAB OTA to the App with AirLink S.
The menu screen on the home page is displayed below:

You can download the APP.

2:12   FrskyBlueTooth
SXR/R9S   Config   Other
Wing Type
Mounting Type
Gain Setting
Offset Angle Setting
Accelerometer Calibration

IOS FreeLink APP   Android FreeLink APP

FrSky radio configuration:
- Copy the R9 STAB OTA.Lua files on the SD card of the transmitter
- Bind the R9 STAB OTA to the transmitter and run the files.

PC configuration software:
- Connect R9 STAB OTA as shown below to the FrSky STK usb adapter, and plug it into PC
- Run the R9 STAB OTA Freelink.exe and access the home page.
- Press open to connect with R9 STAB OTA.

RED LED   DIP
STK
S.PORT TOOL KIT
GREEN LED
R9 STAB

The menu screen on the home page is displayed below:

ELE   ELE2
RUD
AIL   AIL2
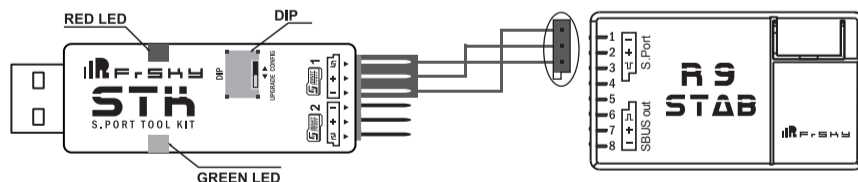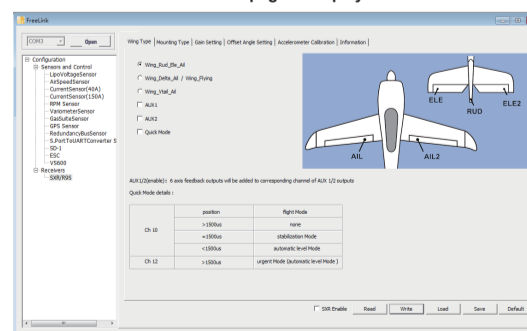
1. Open: Gives the PC software access to R9 STAB OTA configuration data.
2. Read: Retrieves the stored R9 STAB OTA data to be edited in the PC software.
3. Write: Stores the setted data on R9 STAB OTA.
4. Load: restore the settings into the file you saved before.
5. Save: save all settings to one file.
6. Default: Returns all PC software settings to the factory defaults.

Configuration parameters
The configuration parameters are listed on the top of the interface: Wing type, Mounting Type, Gain Setting, Offset Angle Setting, Accelerometer Calibration

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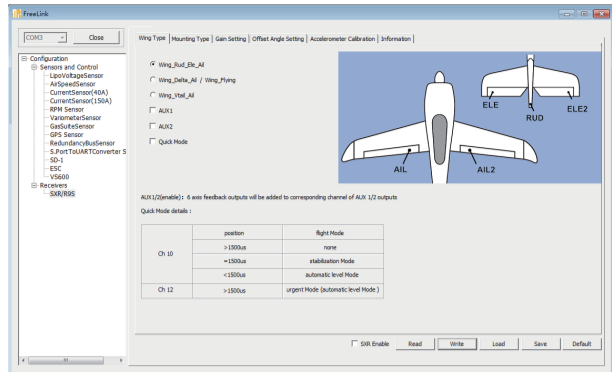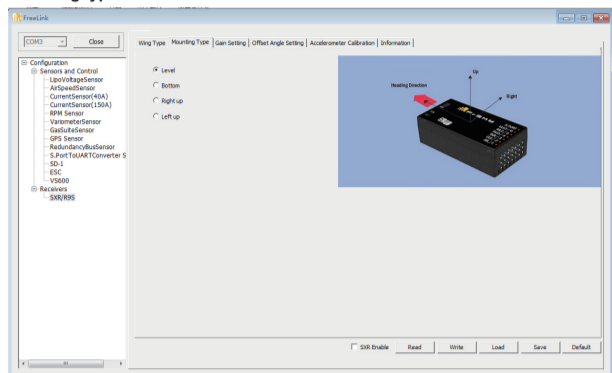
Wing Type

Options of wing types: Wing_Rud_Ele_Ail——conventional model
Wing_Delta_Ail/Wing_Flying—— Delta/Flying wing
Wing_Vtail_Ail——V-Tail

AUX1: If selected, AIL2 function will be disabled on CH5   AUX2: If selected, ELE2 function will be disabled on CH6

Mounting type

Level, Buttom, Right and Left up options are available.

Gain Setting

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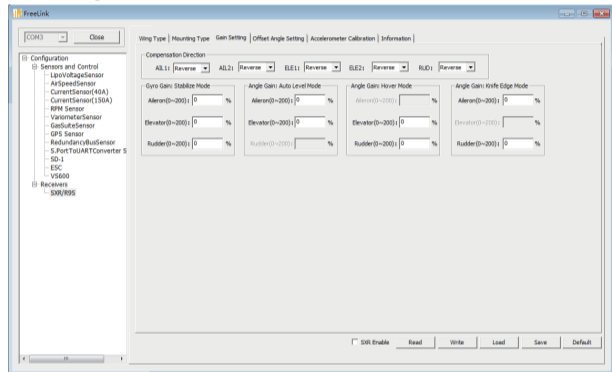
The first part
Compensation direction: selecting the travel direction of AIL, AIL2, ELE, ELE2 and RUD. "+" means positive and "−" means negative.
The second part
Gyro gain: Stabilization Mode
The gain setting under stabilization mode chould be set on the channels related to aileron, elevator and rudder.
Angle Gain: Auto Level Mode
The gain setting under automatic level mode could be set on the channels related to aileron and elevator.
Angle Gain: Hover Mode
The gain setting under hover mode could be set on the channels related to elevator and rudder.
Angle Gain: Knife Edge Mode
The gain setting under knife edge mode could be set on the channels related to aileron and rudder.

> Note: Optional range is from 0 to 200%. 0, 1, 2 refers to 0%, 100% and 200% respectively.

Offset Angle Setting

Due to the possible errors in minor installation and calibration, the function is designed to adjust the attitude of the model. Thus, the user could achieve the best orientation when Auto Level, Hover mode and Knife-edge mode is activated.
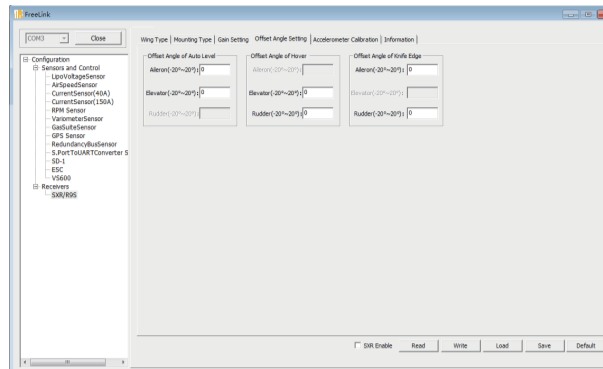
Offset Angle of Auto Level
The angle of roll and pitch could be adjusted on the channels related to aileron and elevator. Straight and Level flight could be realized.
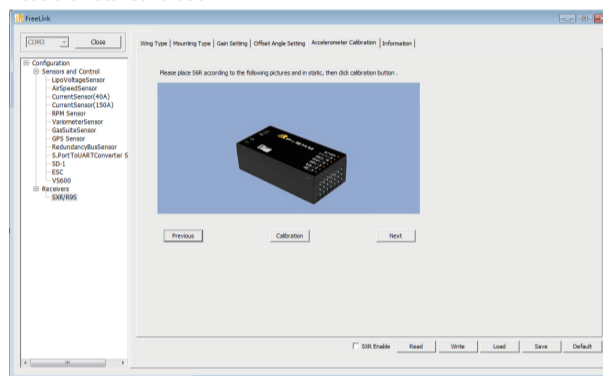**Offset Angle of Hover**
The nose-up angle could be adjusted on the channels related to aileron and elevator. Stationary hover could be realized in calm weather.
Offset Angle of Knife Edge
The angle of aileron and rudder could be adjusted on the related channels. Straight and level knif-edge flight could be realized.

> Note: Optional range is from -20° to 20°.

Accelerometer Calibration

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The positive and negative values related to three-axis gyroscope and accelerometer make a total of six values that need to be acquired. Please follow the on-screen instructions.
• Click the "Calibration" button and wait until the YELLOW LED flashing, indicating the calibration on this orientation has been completed.
• Repeat the above step five times (remaining 5 dimensions). Placing R9 STAB OTA in the required orientation, ensure all values (X, Y, Z, Mod) are displaying 1.000 with the deviation of ±0.1.
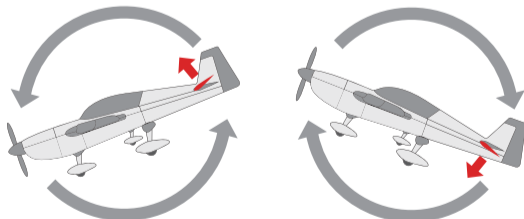• Press "Write" to save the data on R9 STAB OTA when done.

Inspection of flight attitude

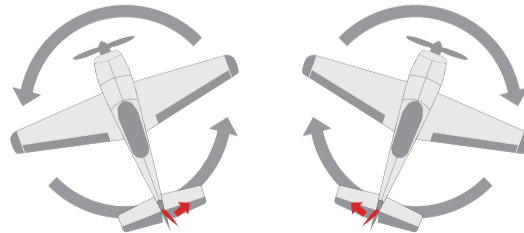**To ensure flight safety, checking the compensation direction of the model is strongly recommended.**
Activating auto level mode will produce a strong deflection on AIL and ELE, which is used to check the response of aileron and elevator. Also, activating Knife-edge and Hover mode will have the same reaction on the rudder.

When the plane is rotated left or right (Roll), ailerons should have the correcting actions as illustrated above.
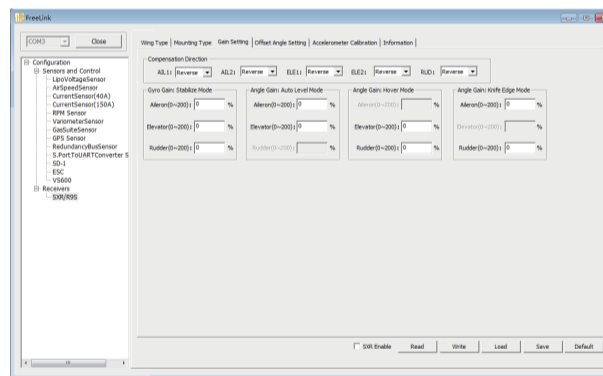
When the plane is rotated up or down (Pitch), elevators should have the correcting actions as illustrated above.

When the plane is rotated to left or right (Yaw), rudders should have the correcting actions as illustrated above.

⚠ After changing the compensation direction, make sure to check it again on the actual model.

> Note: If the compensation direction is incorrect, please reverse the corresponding channel as illustrated below.

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Self-check

Attentions
• Before self-check, please place the model on the groud (level surface).
• When the model is flying, aerodynamic balance is more important than level attitude, which results in that the model flys at a constant altitude with the nose slightly pointing up at low speed. To avoid the nose-diving of the model at high air speed, the user must insure that the model is placed at a level or slightly-nose-up attitude during self-check.
• Always install R9 STAB OTA straight and level in the model. If required, PC software could be used to adjust the angle of attack with the purpose of realizing the required setting. If the values set by the user is bigger than average ones, we advise to recheck the installation orientation of R9 STAB OTA.

Steps
• Turn on the transmitter and ensure that Ail (CH1), ELE (CH2), RUD (CH4), AIL 2(CH5) and ELE (CH6) are in the neutral position.
• Power on the model and start R9 STAB OTA self-check. Ensure the auto level angle of the gyro and the neutral position of gimbal. Please don't touch/move the model until self-check finishes, or it may corrupt the calibration settings created during the procedure.
• Press the button on R9 STAB OTA or move the three-position sticks bound to CH12 three times in 3 seconds (up, mid, down). Then the BLUE LED will turn on, indicating self-check procedure is initiated. After that, the corresponding parts on the model will move. At last, the BLUE LED will turn off, indicating self-check has completed.
• Move the sticks bound to CH1~CH6 (except the stick related to Thr) and check the channel output limits, ensuring that the signal outputs of R9 STAB OTA will not damage the corresponding parts on the model. In the end, R9 STAB OTA will save the zero points of the gyro, auto level angle, gimbal neutral position and servo channel limits.

> ⊘ • Never operate the stick bound to CH12 during flight session. If so, it will trigger self-check and may cause the crash of the model.
> • Cut off the power supply of R9 STAB OTA, or self-check will fail.

Setup
• Calibrate R9 STAB OTA with the PC software and install it into the model. Insure the settings of wing type and mounting type are identical to the intended model installation.
• Turn on the transmitter and reduce the value of servo endpoint setting. Ensure self-check mode will not damage the corresponding parts on the model.
• Assign a knob/slider to CH9, then real-time gain adjustment capabilities of R9 STAB OTA will be activated.
• Assign three-position switches to CH10 and CH11 with the purpose of switching available flight modes.
• Power on the model and check the deflection direction of each related parts on the model. Make sure the switch assigned to flight modes is correct and the compensation direction of the gyro is set as intended on AIL, RUD and ELE.
• Make a self-check for R9 STAB OTA if necessary. Disconnecting the power on R9 STAB OTA will not lose the set parameters.

> ⊘ Under identical operating conditions, the value of each channel produced by the assigned switch in FrOS are opposite to that in OpenTX. For exmaple, SW Up in FrOS is equal to SW Down in OpenTX.

> FrSky is continuously adding features and improvements to our products. To get the most from your product, please check the download section of the FrSky website www.frsky-rc.com for the latest update firmware and manuals

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