

Use the supplied Heat Shrink tubing and tie wraps to mount the sensor to the bracket. A dab of Cyano can be used to secure the sensor and tie wraps once the position has been set. The sensor is carefully bent over the top of the bracket with the writing on the sensor facing the fan (Note: The most sensitive side of the sensor is the side with the writing, however, if you have one magnet installed from a previous Futaba GV1 setup, the Jockey sensor needs to be oriented with the side without the writing facing the magnet).

The magnet should be mounted on the underside of the fan at a radius of 28mm (60-90 size) or 23mm (30-50 size) from the center of the fan. Drill a 4mm hole 1.5mm deep and epoxy the magnet to the fan. Use a good epoxy with a 20min or greater curing time.

If both magnets are installed to balance the fan in a 2-stroke setup, make sure that the sensor only responds to **one** of the magnets. **Quick tip:** Use a black marker and color the two exposed faces of the magnets while they are stuck together. Install in fan with both black faces out.

The sensor must be mounted as close to the magnet as possible. The sensor must be less than 2mm away from the surface of the magnet.

The sensor is only sensitive to one pole of the magnet. To check the correct orientation of the magnet, connect the Jockey to the receiver and turn on the transmitter then connect the sensor and pass it in front of the magnet. The Red LED will light as the sensor detects the magnet. After installation, this method can be used to periodically check that the sensor and magnet are in range.

Governor Operation

After power-up, the TJPro waits for a calibration event from the AUX channel. Normally the Jockey will enter an idle state monitoring the sensor, throttle and auxiliary channels waiting to be enabled. Once enabled the jockey waits for the engine to reach the target speed set by the auxiliary channel state ATV. After 1 second, the Jockey will slowly and smoothly take over the throttle channel, regulating the engine directly. If the target speed is changed during flight (by changing the aux state setting), the Jockey will acquire the new speed target setting.

Limiter Operation

After power-up, the RevMax waits for a calibration event from the AUX channel. Normally the Jockey will enter an idle state monitoring the sensor, throttle and auxiliary channels waiting to be enabled. Once enabled the RevMax waits for the over speed value set by the auxiliary channel state ATV. In an over speed situation the RevMax will smoothly take over the throttle channel, regulating the engine directly until the over speed condition is controlled and then pass control back to the throttle curves. If the target speed is changed during flight (by changing the aux state setting), the Jockey will acquire the new over speed target setting.

Rules of governor / limiter engagement

The Jockey will only govern the throttle after ALL of the following conditions have been met:

1. The Sensor, Throttle and Aux channel are operating correctly AND
2. The Jockey has been calibrated AND
3. The Throttle stick is above 25% AND
4. The AUX ATV is greater than 5% AND
5. The target speed has been reached.

After governing has been enabled, the Jockey will pass control back to the throttle channel if ANY of the following conditions occur:

1. The Throttle stick is below 25 % (Throttle stick priority) OR
2. The sensor fails OR
3. The AUX ATV is less than (Auxiliary disable) 5%

If the battery voltage dips below 3.56V, the Jockey will enter a 'fail-out' mode where control is passed back to the receiver. The only way to exit the 'fail-out' mode is to cycle the power.

Four-stroke engine setup

Four-stroke engines run at about half the speed of a two-stroke engine. Two magnets can be installed 180 degrees apart on the fan. This will cause the Jockey to limit at half the target rpm (4750 to 10250 rpm).

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TJ PRO / TJ RevMax

Instructions

Safety Warning

- When using the ThrottleMax for the first time or making changes to the throttle servo throw, always perform the calibration operation.
- Always perform a range check after installing the Jockey.
- When starting the model, always keep the throttle below 25%.
- Set the failsafe of the throttle channel to the stop position of the engine.

Model Avionics "ThrottleMax" Instructions

Introduction

The ThrottleMax is either a digital rotor speed governor or limiter depending on the selected mode. It uses an adaptive feed-forward control algorithm to govern rotor speed or prevent over speed. The Throttle Jockey Pro monitors and governs engine speed. It continuously adapts to the response of the engine and the demands of the pilot. Aggressive throttle commands will cause the Jockey to under damp the control loop yielding a fast response to changing loads and slowly changing throttle command cause the Jockey to over damp the control loop yielding a smooth response to changing loads.

The TM employs a pulse filtering system that cleans up any hits or glitches on the auxiliary and throttle channels and is compatible with all 2.4 GHz systems and conversions currently on the market.

The RevMax is the latest evolution of the Throttle Jockey for intermediate, advanced and extreme flyers. This system yields the best performance tradeoff between power and rotor over speed. When the rotor system is at or below the target rpm, the limiter passes throttle control to the radio system. It engages only when an over speed condition is detected. The pilot must setup traditional flight mode throttle curves for 3D flight. In testing, the use of super servos did not yield any performance improvements, so any high-quality servo will suffice

The TJ's are designed to govern/limit the engine speed between 9500 and 20500rpm. The actual head speed can be calculated by dividing the engine speed by the main gear ratio.

$$\text{Rotor rpm} = \text{engine rpm} / \text{gear ratio}$$

For example, a 9:1 gear ratio would yield a governed head speed range of 1055 to 2253 rpm.

The Model Avionics website (<http://www.modelavionics.com>) includes the latest information, setup tips and videos for various radio systems and an on-line ATV calculator.

Key Features

- Selectable between governor and limiter.
- Advanced Digital Control Algorithm – employs an adaptive feed-forward rpm control loop.
- Set the target RPM from your transmitter.
- High Resolution pulse and generation system.
- Low Power
- Small and lightweight.
- Outstanding customer support and service.
- Fail-out feature on low battery conditions – Governing ceases on a low battery condition passing control back to the receiver.

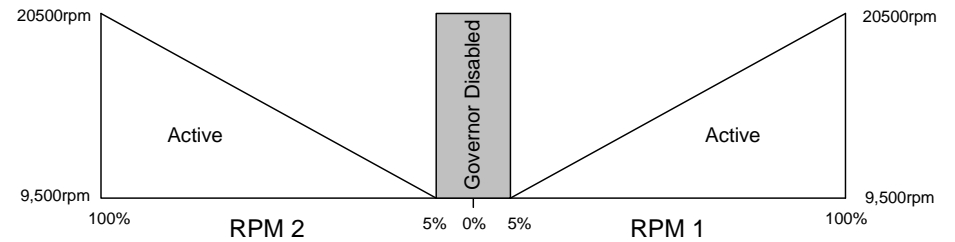
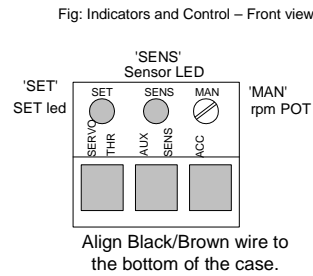
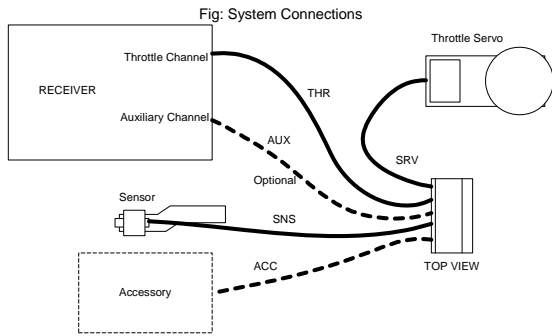
Radio System requirements

The wiring of this Product is compatible with all 72 MHz and 2.4 GHz JR, Futaba, Hi-Tec, Graupner, Robbe and the current style blue plug Sanwa/Airtronics radio systems.

Connections

From left to right, the connections are as follows:

SRV	Throttle Servo Output
THR	Throttle Channel Input
AUX	Auxiliary Channel Input (Optional)
SNS	RPM Sensor input (magnetic OR optical)
ACC	Accessory Output (For future Model Avionics Accessories)



ATV ranges differ slightly between radio manufacturers. The tables below show examples of ATV settings for popular radio systems.

Throttle channel operation

Make the servo operating range as close to +/-100% ATV as possible (**VERY IMPORTANT!!**)
 Use working throttle curves. (Even if they yield a little higher head speed than you are going to govern) (**VERY IMPORTANT!!**)
 Set the flight mode/stunt/idle up minimum throttle settings greater than the 25% so that the Jockey is enabled (SET led on) at all stunt throttle stick positions. (Note that it can still be disabled using the aux channel).
 Make sure that the engine can idle reliably when the throttle stick is below 25%.
 Set the throttle hold below the enabled threshold (25%) so that the Jockey is automatically disabled during auto rotations.
 Set the PCM failsafe to the stop position of the engine.

Calibration / Mode Selection

During calibration, the Jockey measures the limits of the auxiliary and throttle channel and also sets the mode of operation between governor or limiter. Once calibrated, the Jockey stores the measurements in non-volatile memory.

Calibration only needs to be performed when first installing the Jockey, changing throttle servo throws, changing modes or after transferring the Jockey to a new machine.

REMOTE mode Calibration Procedure

- Setup the throttle servo operation so the travel (ATV) is a close to +/-100% as possible. **Also have THR curve at 0,25,50,75,100**
- Set the Aux travel (ATV) to +/-100%, make sure that any mixing to the Aux channel is turned off. **⚠ READ NOTE BELOW**
- Set the throttle and trim to the low (stopped) position **< Important!**
- Turn on the transmitter and then turn on the receiver.
- During the first 3 seconds, toggle the AUX switch twice. **⚠ Read Below**
- The SET led will flash green indicating that the Jockey has entered its calibration phase.
- With the throttle trim all the way down raise and lower the throttle stick over its full range.
- **The mode of operation can now be selected:** Exiting at Low stick (Green LED) will activate TJ Pro governor mode and exiting at high stick (Yellow LED) will activate TJ RevMax limiter mode.
- Exit calibration by toggling the AUX switch twice.
- The SET led will turn off at low stick indicating it has stored the radio parameters

Manual Mode is NOT Supported

To verify correct calibration, verify that the SET led is OFF when the throttle stick is below 25% and ON when the throttle stick is above 25%.
 ⚠ For Futaba systems set the AUX ATV/ENDPOINT to 90/90
 ⚠⚠ Do not use flight mode switch for this.

Setting the Target RPM

The AUX channel input is usually assigned to a slider, pot or two or three position switch. The ATV of this channel controls the active state of the Jockey as well as the target engine rpm. If the ATV in either direction is set to less than 5%, regulation is disabled. An ATV setting between 5% and 100% sets the target speed. The relationship between ATV and rpm above 5% depends on the radio system type. ATVs above 100% are possible, but to use them, the TJ must be calibrated using these higher settings. Settings above the calibrated ATVs are ignored. Always use symmetrical ATVs on the AUX channel, this allows the Jockey to correctly calculate the midpoint.

The highest target rpm is 20500rpm and the lowest rpm setting is 9500rpm. To verify operation, raise the throttle above the 25% threshold (LED On) and lower the active ATV of the auxiliary channel below 5% and verify the LED is off. Alternatively, the ATV at each state of the aux switch can be used to set a different speed target. ATVs greater than 5% set the target rpm. 6% corresponds to 9500 rpm and 100% corresponds to 20500 rpm. On some radio systems, the auxiliary channel can be mixed with the flight mode switch. Different ATVs (or speeds) can be assigned to each flight mode setting using this method. Set the PCM failsafe to 0% for this channel. **Quick Tip: A real easy way of setting the head speed is to start with low AUX values and slowly increase them until the desired head speed has been reached. Have your buddy verify rotor speed with a tach. Also make sure you have good working throttle curves first!!!!**

Fig: Auxiliary Channel ATV to target Speed

Sensor and magnet installation

The Jockey uses a magnetic hall-effect sensor. The magnet is installed on the cooling fan of the engine and the sensor is attached to a bracket which attaches to one side of the engine mount.

Fig: Sensor and bracket - side view

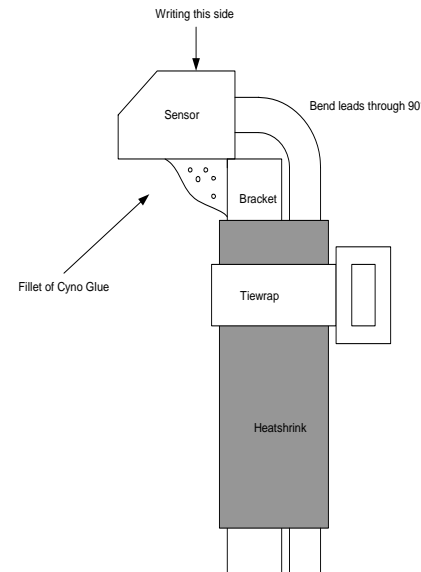
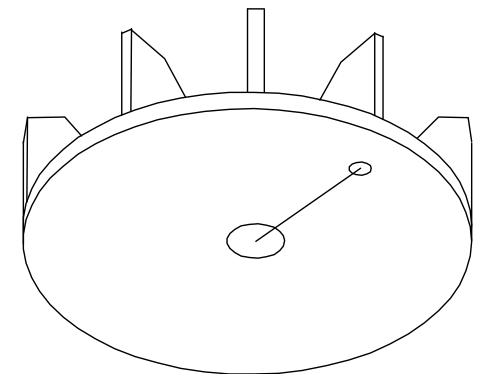


Fig: Engine Fan Magnet – bottom view



28mm (50/60 SIZE)
 23mm (30 SIZE)