# ds760

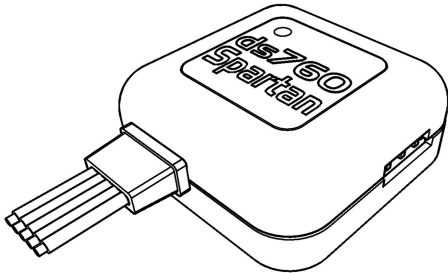## 3D Gyro Evolution

## Installation Guide

SMM AVCS GYRO

**SpartanRC**

www.spartan-rc.com

## About this user guide

This user guide provides detailed information for the installation and configuration of your ds760. It assumes that the model aircraft is correctly assembled and that the user is familiar with model helicopters and is a competent pilot. Please read this user guide entirely even if some sections may not appear applicable to your requirements. Some of the configuration options described in this user guide may only be applicable to a specific firmware version. It is recommended to always use the latest version of firmware and user guide which are published on our website.

## Safety notes

Model helicopter are not toys and they have the potential to be very dangerous. Beginners are advised to seek advice from a competent adult pilot.

## CONTENTS

## Overview

The ds760 is a high specification model helicopter gyro capable of delivering the highest standards of performance. At its heart a premium quality Silicon Micro Machined (SMM) sensor and powerful Digital Signal Controller together with Spartan RC's adaptive angular velocity control algorithms offer exceptionally consistent yaw rates that remain unaffected by outside variables like the helicopter's rotor head speed, rotor disc loading, flight speed, wind, etc. This is a significant feature that not many gyros are capable of and is a necessity for doing complex pirouetting 3D manoeuvres. The holding ability of the gyro is excellent and precise giving a very solid feel.

The ds760 offers two operating modes    Mode 2 is based on an Angular Velocity Control System (AVCS)

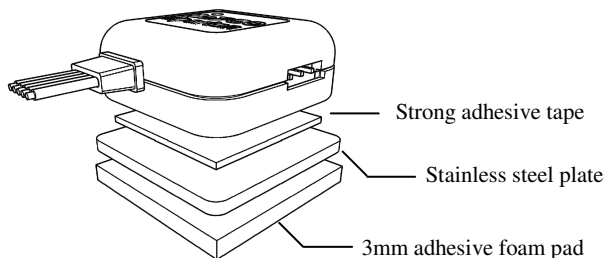## Setting up the ds760 for the first time

Follow the steps bellow in the specified order to successfully deploy your new ds760.

- Spektrum users, refer to Troubleshooting section later in this guide.
- Connect the ds760 to the receiver. Do not connect the servo to ds760 at this time.
- Ensure that the transmitter trims and sub-trims are set to zero and that collective pitch to tail pitch mixing is disabled. Power on the ds760 and check that the LED responds when toggling the gain switch and make a mental note of which side if the switch activates AVCS mode (LED on) and which side activates Rate mode (LED off).
- Perform servo type configuration as described in detail later in this guide.
- Connect the servo to the ds760.
- Adjust rudder direction reversing at your transmitter.
- With the gain switch in Rate mode perform mechanical adjustment of the servo horn and control linkages to achieve approximately 8deg tail pitch.
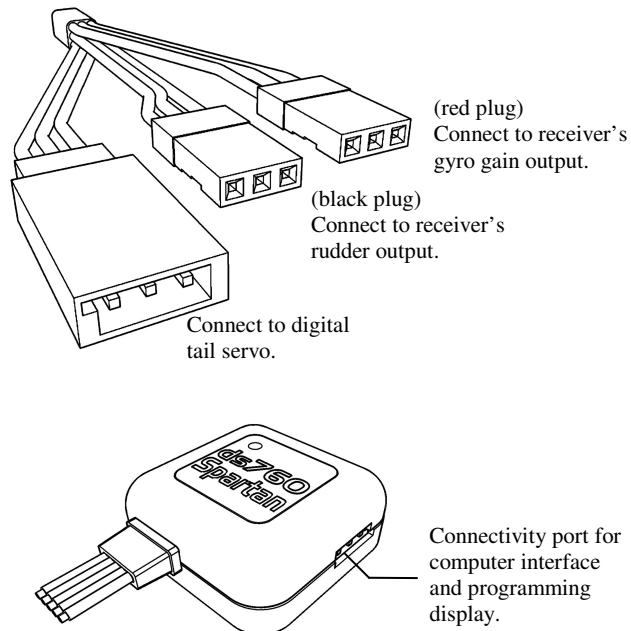
- Perform the ds760 configuration (gyro reversing and servo endpoint) as described in detail later in this guide.
- Adjust gyro gain for both Normal and AVCS modes via your transmitter.
- Perform final checks. Confirm correct relationship of rudder stick and gyro response to tail rotor pitch. Confirm that there is no mechanical binding.

**Mounting the ds760**

The correct operation, performance and stability of the ds760 can be greatly affected by the way it is fixed on the aircraft. It is essential that the ds760 is mounted on a flat surface accurately perpendicular to the main shaft. When possible choose a rigid mounting location close to the centre of gravity (CoG) of the aircraft. Avoid mounting the gyro on weak structures far away from the CoG such as the electronics tray at the front of the helicopter; these locations are often subject to substantially more vibration. The supplied mounting kit contains a stainless steel plate and adhesive foam pads which have been selected by Spartan RC to give the correct mass and shore hardness for effective vibration damping. Using other types of adhesive tape will affect the balance and the performance of the ds760. Small electric helicopters often have much lower vibration levels and it may be possible to mount the ds760 only using a single 3mm foam pad without the steel plate. In high vibration environments the strong adhesive tape can be substituted with a second 3mm foam pad.

Strong adhesive tape

Stainless steel plate

3mm adhesive foam pad

**ds760 interconnections**

(red plug)
Connect to receiver's gyro gain output.

(black plug)
Connect to receiver's rudder output.

Connect to digital tail servo.

Connectivity port for computer interface and programming display.

## Linkage setup

The optimal mechanical setup is essential for getting the best performance from your ds760. Ensure that any slop in the system is kept to a minimum and that the tail pitch linkages can move freely without excessive friction through any guides, stiff ball links or other joints.

With the ds760 set to Rate Mode and the rudder stick positioned at the centre the servo arm should be at a 90 degree angle with the pushrod as illustrated. Adjust the linkage lengths to achieve approximately 8 degrees tail pitch in the direction that compensates the main rotor torque.
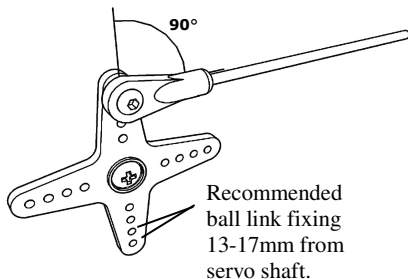


Recommended ball link fixing 13-17mm from servo shaft.

We recommend that the ball link is mounted 13-17mm from the servo shaft unless a different distance is deemed essential for a particular helicopter. Ultimately, the most important adjustment is the servo travel which ideally should have the ds760 endpoints close to 90-110%. If the endpoints are significantly over this range it is advisable to move the ball link further away from the servo shaft and readjust the endpoints. Similarly, if the endpoints are significantly lower you should move the ball link closer to the shaft. Without the configuration card or computer software you will not be able to see the exact endpoint value. However, you may set the gyro to Normal mode and use the transmitter endpoints as a guide.

Always set the ds760 endpoints for the maximum available pitch. This defines how much pitch the gyro can demand and has not effect on how responsive the gyro feels in flight. If you find the ds760 very responsive or very slow for your preference you may adjust this via the transmitter's endpoints or Dual Rate setting for the rudder channel.

## Servo type selection

The ds760 is designed to work with all modern digital tail servos. It can drive servos using the standard (1520uSec) or narrow (760uSec) control pulses and supports both 333Hz and 250Hz modes. The factory default setting is the most frequently used type 1520uSec / 333Hz. If you wish to use a narrow pulse or 250Hz servo you must change the servo type before connecting the servo to the ds760.

The lists below show the required setting for a selection of the most popular tail servos. This list is not exhaustive. If in doubt, please contact our support team to check compatibility with other makes and models of servos.

1520uSec /333Hz servos
Futaba S9253 / S9254 / S9257 / S9650 / S3153 / S3154, JR 8900G / 3400G, Sanwa ERG-WRX, Airtronics 94758 / 94761, Hitec 5925MG / 6965HB, Robbe FS61BB, LogicTech 2100G

760uSec / 333Hz servos
Futaba S9251 / S9256, LogicTech 6100G

1520uSec / 250Hz Servos
JR 2700G / 8700G / 810G, Sky HDS-577 / HDS-877

Attention: Do not attempt to use analogue servos with the ds760. Severe damage may be caused to your servo or loss of tail control.

To access the servo configuration mode hold the rudder stick to full left and toggle the gain switch continuously immediately after powering on the ds760. Once the configuration mode is active the LED on the ds760 will start flashing indicating the currently selected servo type.

| 1 flash | 2 flashes | 3 flashes |
|---|---|---|
| 1520uSec, 333Hz | 760uSec, 333 Hz | 1520uSec, 250Hz |

Move the rudder stick left or right to change to the desired servo type. When satisfied, toggle the gain switch to Normal and back to AVCS mode to store your selection. The ds760 will acknowledge that the servo type is successfully changed by switching the LED continuously on. You may now power off the ds760 and connect your tail servo.

**Configuring the ds760**

Attention: Before configuring the ds760 ensure that the rudder reversing has been correctly set at the transmitter. The ds760 relies on this configuration to adjust its internal gyro direction reversing as required. Before proceeding confirm the correct operation of the rudder stick by observing the tail rotor blades as explained later in this guide. If in doubt, seek expert advice.

To access the configuration mode leave the rudder stick to neutral and toggle the gain switch continuously immediately after powering on the ds760. Once the configuration mode is active the tail servo will chatter twice then rest in its centre position.

Step 1: Gyro direction reversing
The first parameter to be configured is gyro direction reversing. Simply push the rudder stick to the left and the ds760 will automatically match your radio system. The tail blades will move to allow visual confirmation of the correct rudder behaviour. The LED will also switch on/off to indicate if reversing is active. When satisfied, toggle the gain switch to Normal and back to AVCS mode. The servo will chatter once to confirm completion of this step.

Step 2: Adjust low servo endpoint
The servo will now be resting at the low endpoint position and the LED will be flashing twice followed by as short pause. Using the rudder stick adjust the servo position until you achieve maximum tail rotor pitch without binding on the mechanical limits. When satisfied, toggle the gain switch to Normal and back to AVCS mode. The servo will chatter once to confirm completion of this step.
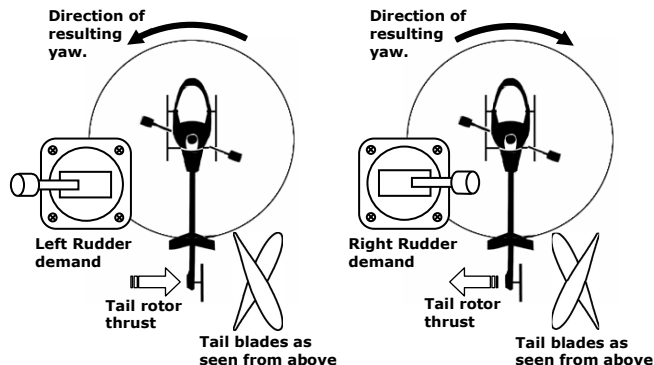
Step 3: Adjust high servo endpoint
The servo will now be resting at the high endpoint position and the LED will be flashing three times followed by as short pause. Similarly to setting the low endpoint use the rudder stick to adjust the servo position for maximum tail rotor pitch without binding. When satisfied, toggle the gain switch to Normal and back to AVCS mode. The servo will chatter twice to confirm completion of the configuration mode.

Upon completion the ds760 will store the new configuration to its internal memory and switch the LED continuously on. You may now power off.

**Gyro direction reversing**

The diagrams below illustrate the pitch of the tail blades for left and right rudder demand. It is absolutely vital to correctly configure rudder reversing on your transmitter before proceeding with configuring the ds760. The ds760 relies on this configuration to adjust its internal gyro direction reversing as required. Failure to follow this step correctly could result in violent pirouetting on take off and loss of tail control.



Direction of resulting yaw.

Direction of resulting yaw.

Left Rudder demand

Right Rudder demand

Tail rotor thrust

Tail rotor thrust

Tail blades as seen from above

Tail blades as seen from above

When performing the final checks of the ds760 installation, you should also check the correct operation of the gyro direction. To do this set the

ds760 in AVCS mode (LED on) and rotate the helicopter at least 90 degrees counter-clockwise. In an attempt to oppose the rotation and maintain the aircrafts heading the ds760 should have now moved the tail blades in the same manner as if right rudder was applied. If this test fails you should check the reversing of your radio and reconfigure the ds760.

## Setting the gyro gain

The diagram below illustrates the relationship between the gain input and the resulting gyro gain and mode (Normal or AVCS). This adjustment requires assigning the gain channel to a two position switch on your transmitter. The gain channel endpoint may be then used to adjust the resulting gyro gain for each side of the switch. Your radio may also offer more advanced configuration options for the gyro gain setting.
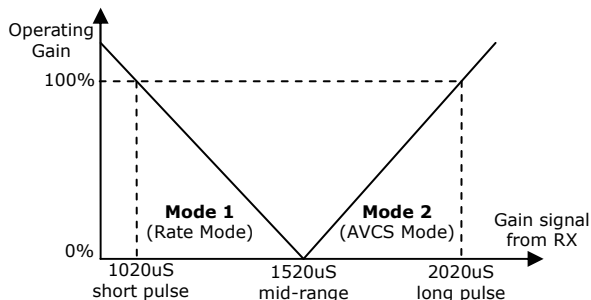


## Operation

Immediately after power on the ds760 performs automatic calibration of the rudder stick and gyro sensor natural points. During this time the helicopter must remain undisturbed and the rudder stick must be left at the neutral point. The calibration lasts approximately 4 seconds and upon completion the tail servo will move to the middle.

The calibration will not start if the gyro is not receiving a valid rudder signal from the receiver or if the rudder stick is not centred. In both cases the LED will emit the Error flashing sequence (see Status LED section later in this guide).

## Status LED

During normal operation the LED provides simple status information to the user.

| | |
|---|---|
| On: | AVCS mode. Stick at neutral. |
| Short double blink: | AVCS mode. Rudder input detected. |
| Off: | Rate mode. |
| Slow repeating flash: | Error. Gyro not receiving valid signal from the receiver or unable to calibrate because the rudder stick is not centred. |

## Advanced configuration

The ds760 offers a set of advanced configuration parameters. These can be modified via a personal computer using our Flash-Link USB interface or detachable LCD screen. The advanced configuration parameters include yaw acceleration, deceleration, stop gains, digital vibration filter, stick dead band and many more.

## Firmware Update

Like all microcomputer systems the ds760 operation is based on factory preinstalled software, known as firmware. Spartan RC is committed to the continuous improvement of our products and from time to time we produce new firmware versions offering optimisations and/or new functionality. These new firmware releases are published on our website. To support such firmware updates the ds760 has a robust built in firmware update utility (firmware loader). It is designed so that the ds760 can always be brought back to operating state even if the update process fails to complete. However, for a smooth update always ensure that the

receiver battery is sufficiently charged.

In order to install a new firmware you will need:
• A Flash-Link USB cable (can be purchased form Spartan RC and our distributors)
• The Windows firmware loader application (available on our website).
• The new firmware file (available on our website).

**Troubleshooting**

Difficulties entering setup mode when using Spektrum radios

Spektrum receivers produce servo signals on power on and before the link with the transmitter is established. This initiates the ds760 calibration process which is sometimes completed before the link is established. At this point it is no longer possible to enter the ds760 setup modes as this must be done during the calibration period.

Starting from firmware version v1.02 the ds760 will not start calibration until the rudder stick is seen at the centre. Spektrum users should bind their radios while holding the rudder stick full left. This becomes the default rudder output when the receiver is powered on which will now hold the ds760 from starting calibration until the link with the transmitter is established.

Can't enter configuration mode

• Check that the rudder and gain inputs of the ds760 are plugged to the correct receiver outputs.
• Check that the LED responds when toggling the gain switch. On one side the LED should be lit (AVCS mode) and on the other side the LED should be off (Normal rate mode).
• The gain value may be too low resulting to the switch toggling not being detected. Temporarily increase the gyro gain to 100% in both AVCS and Normal modes.
• When using a Spektrum DX6/DX7 radio place the mode selection switch to Normal Rate Mode during pairing.

• Ensure the correct servo type has been set.

Can't enter servo selection mode

• Check that the rudder and gain inputs of the ds760 are plugged to the correct receiver outputs.
• Check that the LED responds when toggling the gain switch. On one side the LED should be lit (AVCS mode) and on the other side the LED should be off (Normal rate mode).
• The gain value may be too low resulting to the switch toggling not being detected. Temporarily increase the gyro gain to 100% in both AVCS and Normal modes.

The servo is not moving

• Check that the rudder and gain inputs of the ds760 are plugged to the correct receiver outputs.
• Make sure that the correct servo type has been selected.

**Spare parts and accessories**

SRC03458    Adhesive foam pad set.

SRC03468    Vibration attenuation kit. Includes pads and metal plate.

SRC03478    Flash-Link offers a convenient way to access the advanced configuration parameters and load the latest firmware updates using your computer's USB port.

SRC03488    Detachable display with keypad enables easy access to advanced configuration parameters at home or at the field.

For enquiries of any nature including repairs, servicing, technical support or distribution of this product contact Spartan RC customer support at: http://www.spartan-rc.com/support.htm

## Warranty

This product is warranted to be free from defects in materials or workmanship for twelve months from the date of original purchase. Within this period, Spartan RC will, at its sole option, repair or replace any components which fail in normal use. Such repairs or replacement will be made at no charge to the customer for parts or labour, provided that the customer shall be responsible for any transportation costs. This warranty does not cover failures due to abuse, misuse, accident or unauthorized alterations or repairs. All warranty is return to base; we will not replace items in advance. Spartan RC retains the exclusive right to repair or replace the product or offer a full refund of the purchase price at its sole discretion. In no event shall Spartan RC be liable for any incidental, special, indirect or consequential damages resulting from the use, misuse or inability to use the product or from defects in the product.

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## Liability Disclaimer

Because Spartan RC and their distributors have no control over the installation and use of this product, no liability may be assumed nor will any liability be accepted for any damages resulting from the use of this product. Under no circumstances will the buyer be entitled to consequential or incidental damages. By act of installing this product, the buyer accepts all resulting liability.

## Specification

- Radio compatibility: All PCM, PPM and 2.4GHz radios supporting the standard servo connector pinout (signal, power, ground)
- Servo compatibility: 1520uSec and 760uSec digital servos at 333Hz
- Servo pulse resolution: 250nSec
- Operating voltage: 4 – 8.4 Volts, current draw <75mA
- Compact design measures: 28.4mm x 28.4mm x 12mm
- Weight: 16 grams with cables. Metal plate 14 grams.
- Operating conditions: -10 to 50 deg C, 14 to 122 deg F, 20 to 85 % humidity not condensing.
- Storage: 10 to 70 deg C, -50 to 158 deg F, 20 to 90 % humidity not condensing.



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