SL630 features:-

- **Ultra stable, high bandwidth, wide dynamic range silicon SMM sensor.**
- **Dual internal setup** – for small electric or for IC models
- **Link adjustable output frame rate** – Maximise the performance from your chosen digital servo.
- **Three-stage power supply regulation. –** For the widest choice in operating voltage (3.3 to 8.4v).

Your SL630 is a precision gyro capable of the highest standards of performance with features not found in other gyros. Please read this manual carefully before installing and flying.
We want you to enjoy the full potential of this product. If you are unsure about any aspect of its installation or use please contact us at:- tech@csm-ltd.co.uk, Tel: (+44) 1457 854680

How to use this manual

The main body of this manual covers the essential information for the initial installation and adjustment of the SL630. It assumes that the helicopter is correctly assembled and adjusted ready for the gyro, the servo operating sense is correct and that the user is familiar with model helicopters and is a competent pilot. Beginners who are unsure of the necessary mechanical setup should refer to the appendices (especially B and F).

RC system compatibility

The wiring of this gyro is compatible with JR, Futaba, Hi-Tec, Graupner, Robbe and the current style blue plug Sanwa/Airtronics radio systems. To use this unit with other makes of radio please check with the service centre in your country or e-mail the CSM service centre (tech@csm-ltd.co.uk). Most systems of 7 channels and more have the facilities needed.

Installation

This installation procedure assumes that the mechanics of the helicopter are correctly set up. If you are unsure as to the setup of the tail control linkage please refer to Appendix B

Servo selection

The SL630 is designed to work with digital servos working on standard (1500-1520us) communications pulses . Do not attempt to use with an analogue type servo or with digital servos with short (760us) communications pulses (e.g. FP-S9251 & 9256).

To obtain optimum performance from your servo the SL630 can transmit at two output frame rates – 250 frames/second which all digital servos can accept and 333 frames/second which some digital servos can accept (with an improvement in performance). The default frame rate is 250 frames/second. To activate the 333 frames/second option push the supplied yellow link into the "FR" location between the + and – pins as shown on the quick reference card.

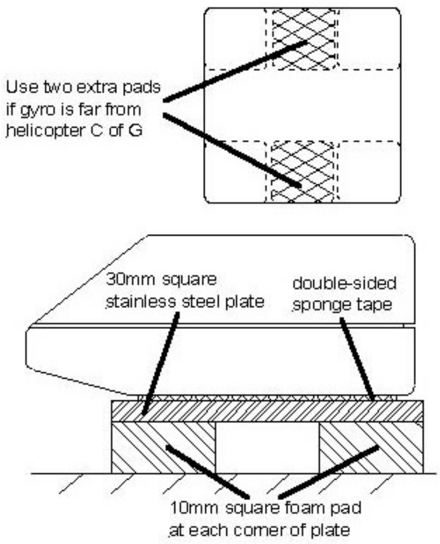
Coreless motor servos with speeds better than 0.1s/60 degrees are recommended. In small electric helicopters this may not be possible as most micro servos use cored motors. However, the "E" mode of the SL630 gyro is designed to accommodate this problem.

For further information on specific servos see Appendix A

Mounting the gyro

This is one of the most important considerations if the full potential of the SL630 is to be realised. The gyro must be mounted on a horizontal surface. This surface **must** be accurately at right angles to the main shaft of the helicopter in both pitch and roll directions. Failure to do this will cause unwanted roll-yaw or pitch-yaw interactions. Although the SMM gyro sensor has a high degree of shock and vibration immunity the SL630 performs best if sited at a point of low vibration in the helicopter airframe. Where possible a location close to the centre of gravity of the helicopter is advantageous. Especially avoid siting the gyro at the extreme front of the radio tray as this area is subject to high levels of main rotor generated vibration and flexing of the tray under servo loads will be transmitted to the gyro. Generally the gyro will more accurately track the motion of the helicopter if mounted at the rear of the frames. Poor location of the sensor can impose a wobbling motion on the sensor from the main rotor or the engine and produce a vibrationally induced precession of the heading (see Appendix J for more information).
Mount the gyro so that the LEDs can easily be seen.

Figure 1. Gyro mounting



For optimum vibration and shock resistance mount as shown in Figure 1. Other types of mounting may reduce performance. If the gyro location is close to the helicopter's centre of gravity use four square foams, one at each corner of the plate. For locations away from the centre of gravity use six of the square foams: three along each side of the plate. In small electric helicopters where weight is critical the plate may be omitted and the gyro mounted directly using four foam pads. All the mounting components are available as CSM spares (see the spares list at the back of this manual). For good adhesion, ensure that all surfaces are clean and free of oil, and the temperature is at least 15 deg C (60 deg F)

Connecting the gyro

Please note that if the supplied 300mm cables are too short or too long for your gyro location alternative cables between 100m and 500mm long are available from your CSM stockist.

- Ensure the radio is off.
- Using one of the supplied cables connect the rudder channel from the receiver to the "RUD" input of the gyro.
- Using the other supplied cable connect the gyro gain channel from the receiver to the "GAIN" input of the gyro.
- Connect the tail servo to the "SERVO" output on the gyro.

To reduce vibration being transmitted to the gyro along the wires leave about 50mm of the wire between the gyro and the first wire anchorage to the helicopter frame. Where possible bring the wires around in an arc and anchor them to the frame alongside the gyro mount. Don't have long unsupported wires leading to the gyro as these will flapand tug the gyro about on its mount, causing small tail disturbances.

Radio Set-up

For this you may find it useful to refer to the additional information on setting up popular radios given in Appendix G, and the operation of the gain/mode channel which is described in Appendix E.

First enter the menus of your transmitter and set up the rudder and gain channels as follows:-

- Centre rudder trims and (if fitted) rudder sub trim.
- Set left and right rudder travel adjustments (ATVs) to 100%.
- Ensure that the rudder rates are set to the default value of 100%.
- Zero the gain channel sub trim (if fitted)
- Set the gain channel travel adjustment to 60% (both ways).
- Ensure that **Automatic Tail Stabilisation (ATS) or 'REVO' mixing is INHIBITED.**
- Ensure that **Pilot Authority Mixing is INHIBITED**.
- Put the throttle hold switch to the OFF position.

The Quick-setup routine.

The unique Quick-setup facility of the SL630 allows the important parameters - Rudder stick centre, Gyro sense, Vibration filter state, E mode and Travel limits to be quickly and simply set up from the transmitter. The set-up is stored in the gyro's non-volatile memory so the routine will only need repeating if one of these parameters needs to be changed.

Entering Quick-setup

To access Quick-setup toggle the gain switch continually during the gyro boot-up time (the first few seconds after the radio system is switched on) until the gyro acknowledges by zipping the servo back and forth twice. The gyro samples the mid-stick pulse width on entering Quick-setup so have the rudder stick and trim centred at this time. If low gain values (less than 35%) are set the gyro may not enter Quick-setup.

Gyro sense reversing (REV)

The first item to be set is the gyro sense reversing. Check that the "REV" LED turns on and off as the rudder stick is moved fully left and right (the servo will also move). Now, **if the servo operating sense has been set correctly**, simply **push the rudder stick to the left and release it back to the middle.** This will set the gyro sense to match your system. The servo will travel over to allow you to check that left tail command is indeed being given (as described in appendix F) and once this has been checked **the gyro sense is 'entered' by toggling the gain switch once** (i.e. into mode 0 and back to mode 1) The gyro will 'zip' the servo back and forth in acknowledgement and again park the servo in the middle.

Vibration filter (VF)

Now set the VF as required. By pushing the stick left and right you will observe the "VF" LED turns on and off. Just select on or off as required (LED ON = FILTER ACTIVE). Having done so, release the stick to the middle and enter the VF condition by toggling the gain switch. This will be acknowledged as before by zipping the servo back and forth. For initial flight trials set VF to OFF.

Electric Mode (E)

The SL630 has two sets of internal settings:-
"E" LED OFF - selects the standard set optimised for use with 30 to 90 size helicopters (rotor diameter greater than 1 metre).
"E" LED ON – selects a set of defaults optimised for use with micro electric helicopters (typical rotor diameter 450mm). Also useful on lerger helicopters where the tail servo is slower than 0.15s/60 deg.

By pushing the stick left and right you will observe that the "E" LED turns on and off. Set the LED on or off as required above. Then toggle the gain switch to confirm this selection. This will be acknowledged as before by zipping the servo back and forth.

Servo travel limits

Following the acknowledgement of the E mode setting the servo travels over to the first travel limit and this can now be adjusted. Hold the stick over in the direction of the servo deflection to increase the limit or hold it over against the deflection to reduce the limit. The servo will move as you change the limit and with its slow movement it is possible to set the limit very accurately. **<u>Make as much pitch range available as is permitted by the mechanical limits of the linkage</u>**). Then enter the limit value by toggling the gain switch. Once again an acknowledging 'zip' is given.
Now the servo travels over to the opposite travel limit. Adjustment and entering is the same as the first limit. Once this limit has been entered the Quick-setup routine is complete. A double acknowledgement is given to show this, the servo will centre, and the gyro will halt with no activity until the power is cycled.

Restart checks
For the set-up changes to take effect the gyro must be turned off for about 5 seconds and turned on again. At turn on the gyro takes approximately 5 seconds to re-boot. Having re-started the system check the operation of the tail servo for rudder inputs and helicopter movements. Do this for both flight modes. It is important to check the gyro operating sense. To do this simply set the gyro in mode 1 (Smart Lock mode) and rotate the helicopter 90 degrees to the right (clockwise as viewed from above) then look at the tail blades. These should have their leading edges pointing to the right.

Quick-trim reset
The Quick-trim value is zeroed when the gyro enters the Quick-setup routine. This allows you to assess the error in the tail linkage adjustment during the Quick-trim procedure.

Flying the gyro

Turn-on sequence
- Turn on your transmitter.
- With the model stationary and level on the ground turn on your receiver.
- Wait while the gyro goes through its self-test/boot up sequence and the Set LED comes on.
- Move the rudder stick fully in both directions and ensure that the tail rotor servo responds to stick movements. (Do not move the gain switch until the boot up is complete unless you wish to enter the Quick-setup routine)
- Your SL630 is now ready for flight.

!! Make sure the model is not moved during the gyro self test period. !!

Before the first flight
Before the first flight, check that you know which of the gyro mode/gain switch positions gives you Heading Lock (Mode 1) and which conventional (Mode 0) operation. The Heading Lock mode moves the servo progressively through its full travel as the heading of the helicopter is slowly swung through an angle of between 20 and 60 degrees (depending on the gain). In contrast the conventional mode always centres the servo when the helicopter is stationary regardless of heading. Check that you have about the correct Mode 1 gain by checking the servo covers its full range of movement for about a 50 degree change of helicopter heading. Also check that the gyro sense is correct by noting that in Heading Lock mode rotating the helicopter to the right causes the gyro to apply left tail rotor pitch and vice versa. Beginners should have this double checked by an experienced pilot.

Initial flight trials

Neutral check
First select Flight Mode 1 (Heading Lock mode) and hover the helicopter. Note the yaw of the helicopter. This should not be more than a few degrees per minute with the stick centred. If the yaw exceeds this please refer to Appendix H.

Mode 1 gain setting
Use short, small 'stabs' of rudder control to disturb the helicopter in yaw and observe. If some tendency to oscillate is seen, slightly reduce the gyro gain. Conversely if no tendency to oscillate is seen try increasing the gain. You are looking at this stage for the highest gain that gives no sign of oscillation when the tail is disturbed by sudden changes in tail command.

Once this has been done you may wish to check for tail wagging in fast forward flight. Should this be observed, you should lower the gyro gain slightly.

Once you have adjusted the Mode 1 gain to your liking set your transmitter to give the same gain value for Flight Mode 0. This value may be refined later but first we need to adjust the Mode 0 trim with the Quick-trim procedure.

Quick-trim
Note: - For optimum performance do the Quick-trim even if you do not wish to fly in mode 0

Quick-trim allows the gyro to accurately fine-tune the tail pitch trim, reducing the amount of push-rod length adjusting required. While in Mode0 the error causes the helicopter to turn its nose out of wind or ‘crab’ in slow forward flight. **Do not try to correct this with the transmitter trim**. Hover nose into a moderate wind or fly in slow forward flight. Activate the quick-trim by switching the gyro gain/mode switch on your transmitter back and forth five times between the two gyro modes. Hold each mode for about 1 second. The right timing for this is easily obtained by counting the clicks of the switch out aloud to yourself as you do it. If the tail push-rod length adjustment is reasonably correct the Quick-trim will now compensate for the remaining error and the model should fly straight in mode 0. If not, repeat the Quick-trim sequence. If, having repeated the Quick-trim, the mode 0 trim is still wrong the push-rod length is outside the range of the Quick-trim system and some mechanical adjustment is required. For details of this see Appendix J.

Mode 0 Gain setting
You may now adjust the mode 0 gain in the same way as described for mode 1 above.

This completes the basic installation of the gyro. Appendices C & D give further information on optimisation.

DOs:
Do mount the gyro with its axis of rotation parallel to the helicopter main shaft.
Do mount the gyro using the supplied anti-vibration system.
Do mount the gyro to a hard, smooth clean surface preferable close to the C of G of the model.
Do anchor the gyro wires, allowing for free movement of the gyro on its mount.
Do remove slop and stiffness from tail control linkage.
Do use Quick Setup to set gyro sense correctly and check it before flight.
Do use Quick-setup to set travel limits to the maximum mechanical tail pitch range without binding the linkage.
Do use Quick-trim to get the Mode 0 trim accurately set for the hover.

Do use the rudder ATV and rates to tailor required stick response.
Do use a battery state monitor and check it before each flight.
Do inspect tail linkages, gears, grip bearing etc. periodically for wear.
Do explore the performance limits of this gyro with care.

DON'Ts:

Don't subject the gyro to mechanical shock.
Don't mount the gyro where it will be subjected to high vibration levels.
Don't allow the gyro wires to be unsupported for more than 50mm from the gyro.
Don't use Pilot Authority Mixing.
Don't use Automatic Tail Stabilisation (ATS) or Throttle-Tail mixing.
Don't use unnecessarily long servo extension leads with the gyro.
Don't move the model during gyro self-test time.

FAQs

Gyro will not go into Quick-setup routine.
Ensure ATS (revo) mixing is off & rudder trim centred. Increase the gyro gain for both mode 0 and mode 1 to 100% and retry. Return the gains to their desired values after completion.

Model pirouettes violently as soon as it starts to lift off.
Gyro sense has been set incorrectly. See Appendix F and the Quick-setup routine.

Model tail wags from side to side in the hover.
Reduce the gyro gain (using the gain channel travel adjustment)

Model flies OK in one gyro mode but wags when switched to the other mode.
You have too much gain in just the one mode. Reduce the gain channel travel adjustment for the mode that wags.

Tail response is not crisp.
Too little gyro gain. Gradually increase travel adjustment of the gain channel until tail shows some tendency to wag and then reduce it back until wag just stops.

Model wags even when the gain is very low.
Possible causes: Slop in pitch linkage. Friction in pitch linkage. Tail hub bearings locking up under load. Servo is very slow. Short servo arm with excessive servo travel.

Model slowly rotates in mode 1.
Carry out the Quick-setup procedure so that the gyro samples an accurate stick centre value.

Model hovers steadily in mode 1 but starts to rotate when switched to mode 0.
Repeat Quick-trim procedure (see **Quick-trim** section of this manual for details).

Even in calm conditions model suffers continuous small movements of the tail. May also appear to drift.
Check that the wires leading to the gyro are properly supported – long unsupported runs of wire can flap, tugging the gyro about on its mount, while too tight an anchorage will prevent the gyro from moving correctly on its mount. Check model for vibration. Then try turning the Vibration Filter on (See Quick-Setup procedure). If the filter fails to improve the condition then probable cause is fluctuating engine torque.

Model flies OK on first few flights of the day but tail starts to wag on later flights.
Servo consumption with fast gyros is high, and falling battery voltage reduces servo performance making the tail system less stable. Cycle receiver battery and check its capacity. Also consider using a fast Delta -peak charger to top up battery between flights.

Model was OK last season but after the winter in store the tail now wags.
Check the tail control linkage for free movement. Pay special attention to the pitch slider and the tail hub bearings. Receiver battery may have developed a high internal resistance. Cycle the battery and check its capacity. It may show a normal capacity at low discharge rates, but a much reduced capacity when measured at say 3 amps discharge rate indicating a high internal resistance.

The left and right hand stops are not equal. Stops from right hand turns are slow but clean while left hand stops are bouncy.
The mechanical tail trim needs setting correctly. Carry out the procedure in the **Quick-trim** section of this manual and reassess. If you still have problems, try reducing one servo travel as follows: - if bouncy when stopping left turns, reduce the right pitch travel limit and vice versa.

Although I am running a high gyro gain the stops from high-speed pirouettes are too slow.
The maximum available tail thrust is too small. If possible increasing the pitch range of the tail as this will give the best overall performance. With some helicopters alternative tail gear ratios are available to allow for higher tail rpm. This is an excellent way to improve tail authority. If neither if these options is available then increase the length of the tail blades while ensuring that this leaves adequate clearance between the main and tail blades. If the blade length limit is reached then increase the chord of the tail blades.

The model suffers violent erratic twitches in yaw.
With belt-driven tails very high voltage static electrical charges can build up on the tail boom, etc and discharge via the tail servo to the RC system. In severe cases damage to RC components can result. We recommend spraying the back of the belt with an anti-static spray such as Graphic 33.

Appendix A – Additional servo information.

The following servos are recommended for use with the SL630 gyro. The optimum frame rates given are based on tests conducted by us on samples of these servos and are believed correct at the time of going to press. Since manufacturers may change specification without notice, users should ensure when selecting the 333fps frame rate that the servo responds correctly to the gyro over the full travel range, both off load and under load, at your chosen operating voltage.

Servo	Frame rate setting
Airtronics 94758	333fps
Airtronics 94761	333fps
Sanwa ERG-WRX	333fps
Hitec 5925MG	333fps
Hitec 6965HB	333fps
HDS577	250fps
JR 8700G	250fps
JR 3400G	250fps
JR 8900G	333fps
Futaba FP-S9253	333fps
Futaba FP-S9254	333fps
Futaba FP-S9650	333fps

Appendix B – Initial mechanical set-up of the helicopter

Because the detailed mechanics differ from machine to machine this is a general guide to obtaining an acceptable initial mechanical setup of the tail linkage. Connect the tail servo directly to the rudder channel of the receiver so that the amount of servo travel in each direction can be assessed quickly from stick deflections and ATV settings. Optimising the linkage can be an iterative process with several adjustments to servo arm length and pushrod length needed to home in on the optimum adjustment.

Servo arm length

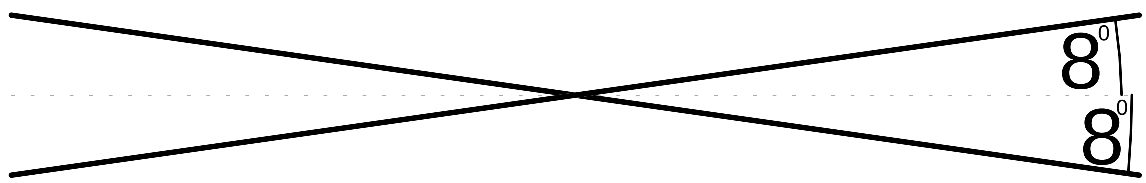
The gyro performs best when it is able to make very quick changes of the tail rotor pitch in response to pilot commands, turbulence, engine power changes etc. In general the longer the servo arm used the smaller the servo movements need to be to achieve a given pitch change. On most IC powered models arms of between 17 and 22mm will provide good results. If you are using a low torque servo of say 2.5kg.cm on a 90-size machine you should limit the arm length to about 18mm. With small electric helicopters much smaller arms are of course appropriate. In all cases the rule of thumb is to ensure that about 90 degrees of servo travel (+/-45 degrees) covers the full available pitch range of the tail.

Servo arm position

Ensure that with the servo centred the arm is at right angles to the pushrod.

Pushrod length

Adjust the length of the pushrod to the tail until, with the servo centred, the tail rotor blades are at about 8 degrees of right pitch (or 8 degrees of left pitch for a machine with an anticlockwise rotor head)
The following diagram will help you to judge 8 degrees of pitch. Note that the angle between the two blades is twice the pitch – 16 degrees and may be easier to judge. This will almost invariably get the linkage very close to the correct trim in mode 0 with any residual trim error small enough to be accommodated by the gyro's Quick-trim facility.



Tail pitch range

In our experience it is almost impossible to have too great a pitch range. It is usually limited by the range of movement available at the tail pitch slider. It is recommended that you have about 40 to 45 degrees of right pitch and 30 to 35 degrees of left pitch available (reverse these figures for anticlockwise rotor head models). Substantially lower ranges will limit stop performance and holding power.

Appendix C – Linkage fine-tuning

Servo arm offsetting

Some helicopter tail linkage geometries give somewhat asymmetric response to tail pushrod movement with much more rapid changes in pitch occurring one way than the other. In these cases the servo throw to cover the full pitch range may be greater one way than the other. The SL630 has independent travel adjustments for the two directions to accommodate these differences. In some machines more symmetrical handling characteristics may be obtained if the servo arm is rotated around one or even two splines on the servo shaft so that it is no longer at right angles to the pushrod when the servo is centred. A change in the pushrod length will be needed to restore the 8 degrees of pitch with the servo centred. With the servo arm offset in the correct direction the servo throws will be more equal. Remember that the travel limits will need re-adjusting after this process to ensure the full tail pitch range is available.

Pitch range and engine governors

Many current helicopters lack sufficient left tail pitch especially when an engine governor is employed. During low G pirouetting manoeuvres (540 stall turns, rippers etc) governors dramatically reduce engine output and the reduced assistance from the main rotor torque places a bigger demand for left tail pitch. In some cases minor modification of the slider and/or the linkage can increase the available range with useful results. In cases where a restricted pitch range is unavoidable, longer tail blades will help.

Appendix D - Basic optimisation

Adjusting the stick response

After initial setting use the rudder ATV, Rates, and Exponential facilities of the transmitter to tailor the control response as required. If an increase in available yaw rate is required increase the rudder travel on your transmitter **gradually** until the desired response is obtained. Remember that increasing the rudder travel adjustment will not increase the overall tail servo throw as this is set by the gyro's own travel limiters.

The SL630 has built-in exponential and mid-stick deadband. These improve controllability around the mid-stick position. Remember that the ATV and rates facilities work together so that setting the rudder ATV to 80% in both directions and also setting a rudder rate of 60% will give a total rudder throw of 0.8 x 0.6 = 0.48 = 48%

Adjusting the Stop quality

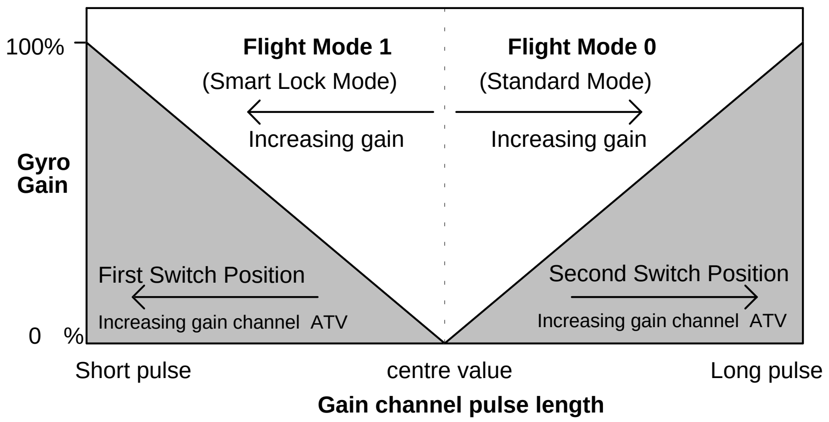
At the initial installation you will have made sure that the servo travel limits are set so the tail pitch each way is limited only by the mechanical limits of the linkage. You will also have carried out the Quick-trim procedure and adjusted the gyro gain to the maximum that gives no wagging. Now assess the quality of the left and right stops from fast pirouettes (i.e. full stick). Note if the stops are sharp enough for your flying style and see if there is a marked difference between the two stops noting which stop is the softer.

If you are trying to obtain fast stops you will find, beyond a certain point, that increasing the gyro gain has only a marginal effect on stop speed. This is because the available tail rotor authority dominates stop times from fast pirouettes. If, having optimised the gain, the stops are softer than you require you will need to increase the power of the tail rotor. Since you will already be using the maximum pitch range available increase in the tail blade length should be made. A small increase in tail blade length can make a large increase in the available thrust of the tail rotor. Longer tail blades increase the mechanical gain of the tail system so an adjustment to the gyro gain may be needed.

In many cases only one of the stops is soft. Check that the mode 0 trim is acceptable and repeat Quick-trim if needed before re-assessing the difference between the stops. A lack of tail-rotor pitch one way (usually in the leftward direction) is quite common. This shows up in slower entry into left pirouettes and slower stops from right pirouettes and can be especially noticeable with governed engine systems in low G manoeuvres (e.g. stall turns). We find that good tail performance is obtained with 45 degrees of right tail pitch and 35 degrees of left tail pitch. In extreme cases it may be necessary to increase the tail blade length until the soft stop becomes acceptable. Prevent the faster stop becoming excessively hard by a small reduction in the travel adjustment for the appropriate pitch direction.

Appendix E – Operation of the Gain/Mode channel

The graph below shows how the gyro gain channel provides both mode switching and independent gain adjustment of the two modes. If the gyro gain channel pulse is longer than the centre value the gyro is in Mode 0 while with the gain channel pulse shorter than the centre value the gyro is in Mode 1. The travel adjustment (or ATV) settings for the two switch positions of the gain channel provide a convenient way of adjusting (from the transmitter) the gain for the two modes. Increasing the ATV of the gyro gain channel increases the gain for that mode. Please note that it is not possible to use the SL630 with basic radio systems that lack a suitable channel for controlling the gyro gain.

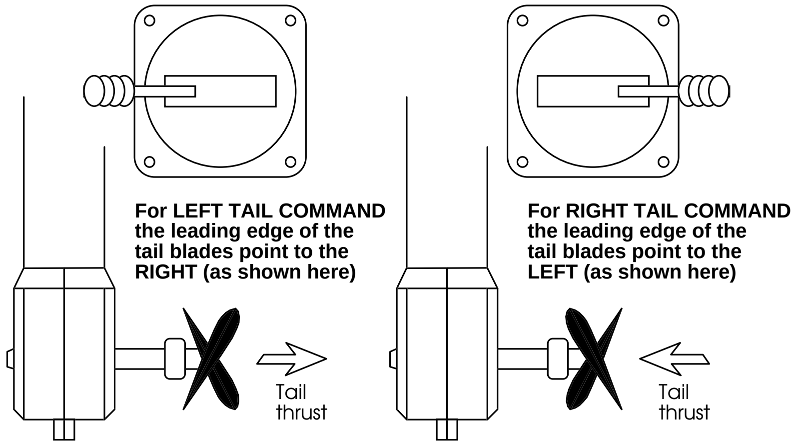


The Gyro gain channel acts as both gyro mode switch and gain control

The centre pulse value is set at the factory at 1.51ms. However the Quick-setup routine will adjust the gyro centre value to accurately match that of your particular radio system. This accommodates the different pulse length standards adopted by different radio system manufacturers.

Appendix F – Getting the servo operating sense correct

The Quick-setup routine simplifies the setting of the gyro sense. However, it is important to set the servo operating sense correctly first. **Failure to do this will cause an uncontrollable pirouette on take-off. Beginners who are in any doubt on this aspect of the set-up should seek advice.** The correct operating sense can be established by looking at the tail rotor blades. With a left tail rotor command held on, the leading edge of the tail blades are pointing to the right (see below)



If the tail blades move in the wrong direction change the servo reversing of the tail rotor channel in your transmitter and recheck the movement of the tail blades.

Appendix G - Information on popular radio types

CSM gyros are designed to accept a wide range of radio system parameters (frame rate, servo pulse timings etc.), however it is not possible to provide information as to channel usage and radio set-up details for all manufacturers' equipment. The information below covers some popular systems. If you wish to use this gyro with other types of radio system please consult your radio manual. In case of difficulty please contact your radio manufacturer or the CSM technical department (Email: tech@csm-ltd.co.uk) for advice.
Connect the gyro to your receiver as indicated in the following table

Radio Type	Gyro "RUD IN" connect to	Gyro "GAIN" connect to
J . R	"Rudd"	"Gear", "Aux2" or "Aux3"
Futaba	Channel 4	Channel 5 or Channel 7

Connect the "SERVO" output to the tail rotor servo.

JR PCM10S/SX

Set-up with 'code 44' disabled
On these radios it is easier to disable the JR 'code 44' (gyro sense adjust) and control the gyro gain by a switch. In this case the gain for the two gyro modes is adjusted by the two travel adjustment values for the gyro channel. Initial values of 60% should be used.
Set-up with 'code 44' enabled
If you wish the gyro to switch automatically between mode 0 and mode 1 as the Flight Mode (Idle Up) switch is operated you will need to enable the JR 'code 44' gyro sensing facility.
When using 'code 44' you should remember that the SL630 gain control works from the centre of the channel outwards. As a consequence a Tx display value of 50% (the channel centre) is in reality zero gain (the switchover point between the two gyro modes). Increasing the value above 50% will increase the gain in one flight mode while the other mode is adjusted by decreasing the value below 50%. Be aware that this value will be reversed so that a Tx display value of 25% will actually be a higher gain value than a Tx display value of 30%. Note: if the gyro is adjusted through the JR gyro software, the gyro channel travel adjustments should be set to equal values each way. Initially set them to 100% and only increase them if you run out of gain adjustment with the code 44 parameters. The starting point should be with the code 44 parameters set to 10% and 90%.

JR X388S/X3810/X8103

On these radios it is easier to control the gyro gain through the gear channel as it is not always possible to have control over other channels on a 2-position switch. Note: if so desired it is possible to set the gyro up using the JR gyro software on the 3810/8103, see the PCM10 instructions above.

Futaba 9ZHP/ZAP

This transmitter gives independent gyro gain values for each of the idle up states (& throttle hold) and for both gyro modes (i.e. eight gain values in all). If you use different head speeds in each idle up state you should optimise the gyro gain separately in each idle up state. However initially all the flight conditions should have the same gyro configuration. To check all the flight conditions you will need to go into the various menus mentioned below and turn throttle hold on and off and then try each of the idle up positions in order to see the status for all the conditions (see your ZAP/ZHP manual for more detail). First ensure that **in all flight modes** the gyro sense mode is set to INHIBIT. To do this go to the "GYR" entry of the "helicopter condition" menu and for each flight condition press the INH key to select the INHIBIT state. Then press END to exit the gyro sense menu. Now check under the "PMX" entry that no throttle to rudder or rudder to gyro mixing is active in any of the flight conditions. Then check in the "P->R" entry that pitch to rudder mixing is inhibited. Now enter the "ATV" menu. Press "RUD" to select the Rudder channel and for all flight modes make RATE A and RATE B equal to 90%. Then press "GYR" to select the Gyro menu and set RATE A and RATE B to 60% for all flight modes. Press END to exit the ATV menu.
Now press "MDL" to enter the "model menu". Use the "FNC" entry to allocate the gyro control to a switch of your choice. Finally use the "SRV" menu to check that the gyro gain behaves as required in all flight modes and both gyro modes.

Sanwa RD6000

This particular radio demands a slightly different set-up than normal although it may be used with the SL630. There are no spare switchable channels on the RD6000 so to change gyro mode you will have to use one of the flight mode switches. There are three flight modes Normal, Flight Mode 1 and Flight Mode 2. There is no switch either for throttle hold and this function is usually achieved by using Flight Mode 2 (see the transmitter instruction manual).
This leaves the flight mode 1 switch available for gyro mode switching. Also the gyro channel will be used. The SL630 gyro is plugged into the rudder channel and the auxiliary lead from the gyro is plugged into the gyro channel in the receiver, (Channel 5). The way in which it will operate will be as follows: the gyro can be set for example to operate in conventional mode when in Normal Flight Mode with a gain of +70%, and then in Smart Lock Mode with a gain of -70% when in Flight mode 1. Depending on whether or not you have a driven tail during autos will determine what value you will need to use in Flight Mode 2 which will be Throttle Hold Mode.
You should experiment with settings until you are satisfied. The rotation or pirouette rate will still be controlled by the use of EPA** on the rudder channel, and should be set to about 60% initially for both left and right throws. This can be increased after flight testing if you require a quicker rotation rate. The SL630 Quick-setup routine can still be utilised by toggling the Flight Mode 1 switch a couple of times to enter this mode.

** EPA =End Point Adjustment. See the RD6000 instructions for details.

Appendix H - Curing neutral errors

If when hovering in Mode 1 (Smart Lock) the helicopter yaws by more than a few degrees/minute with the stick in the middle the following possible causes should be investigated.

- A slight movement of the helicopter during boot up (the time between turn on and the SET LED coming on).

- Quick-setup has not been performed or the rudder stick and trim were not centralised at the entry to Quick-setup.

- Vibration induced precession - an effect that occurs with gyro sensors when vibrated about all three axes. To see how this comes about imagine a helicopter that does the following movements: -

pitch 90 degrees nose down (not seen by gyro)
roll 90 degrees right (not seen by gyro)
pitch 90 degrees nose up (not seen by gyro)
yaw 90 degrees left (seen by gyro)

So- the helicopter is pointing in the direction it started from but the gyro sensor has seen a 90 degree left rotation - and responds accordingly.

This extreme case makes the effect obvious but vibration motions in pitch roll and yaw will cause the sensor to see a rotation that we outside the helicopter don't see. The gyro Heading Lock will yaw the helicopter in response causing the apparent drift. Vibration at engine or main rotor frequencies can cause this effect. The levels present in model helicopters generally cause no problems. If you are experiencing this and have investigated possible sources of excessive vibration you should consider re-siting the gyro. (See the installation section of this manual)

Appendix I – Using the vibration filter

This is a facility that helps reduce the effects of very high levels of vibration on the gyro/tail servo system. Such levels of vibration are only likely to occur on large petrol (gas) powered helicopters or on highly tuned 90-size glow powered helicopters. Even in these cases the use of the filter can usually be avoided by correct siting and mounting of the gyro.
If during flight trials you find that the tail tends to exhibit continual small amplitude movements then you may find that enabling the Vibration Filter will reduce the movements. Generally you will find that introducing the VF will slightly reduce the amount of gain that can be used. Use of the VF should thus be avoided where possible. Sometimes turning the VF on increases the small tail disturbances. Under these circumstances their cause is an inconsistent torque output from the engine. In this case turn the VF off and look to changes in the glowplug, mixture setting, fuel type, etc. for a resolution.

Appendix J- Correcting the pushrod length

If you have repeated the Quick-trim several times without the Mode 0 trim being corrected you will need to adjust the pushrod length to reduce the trim error to within the range of the Quick-trim.

Observe the direction of the yaw in mode 0. If the yaw is to the left then you will need to adjust the pushrod length to increase the right tail pitch. Conversely, if the yaw is to the right adjust the pushrod for more left pitch. As a rule of thumb lengthen or shorten the pushrod by about $1/6^{th}$ of the servo arm length (e.g. with an 18mm servo arm lengthen or shorten the pushrod by about 3mm) then repeat Quick-setup to establish the new travel limits and fly the model to repeat the Quick-trim. Usually Quick-trim will now perfect the trim and only in exceptional cases where the initial trim was wildly inaccurate will this process need to be repeated.

Ratings

Weight:	16g
Dimensions:	27mm x 38mm x 16mm high
Supply voltage range:	3.3v to 8.4v**

** Warning: Check your RC system voltage limits as these will be more restrictive.

Spares, repairs and servicing

CSM0032	Pair 100mm leads
CSM0033	Pair 200mm leads
CSM0034	Pair 300mm leads
CSM0035	Pair 400mm leads
CSM0036	Pair 500mm leads
CSM0064	Frame rate link (2)
CSM0070	Vibration isolating mounting system
CSM0071	Gyro foam for mounting system

Manufactured in the UK by CSM Design Consultancy Ltd

For repairs and servicing please contact:-
CSM Service Department, PO Box 101, Glossop, SK13 5ZW.
Tel: +44 1457 854680, email tech@csm-ltd.co.uk
Website: www.rcmodels.org/csm
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