SL560 PC INTERFACE MANUAL

INTRODUCTION

The SL560 gyro is equipped with a 'PC' port that allows the internal settings of the gyro to be examined and adjusted to the users' requirements. For most users the default settings of the SL560 (with which it is supplied pre-loaded) will be satisfactory. However with careful experimentation, it may be possible to tailor the operation of the gyro to match more closely the particular model, radio equipment, and flying style of the pilot. The gyro is also capable of being used for many non-standard applications (e.g. fixed wing models, camera stabilisation, robotics, etc.) that are generally outside the scope of this manual. However, if you have such an application please contact us via email at: tech@csm-ltd.co.uk. and we will attempt to advise you. As information on these uses becomes available we will post it on our website:- www.rcmodels.org/csm

We strongly recommend that before making adjustments to the internal parameters of the gyro you first get your model performing well with the factory default settings. In our experience this is always possible and if you have major handling problems with your model you should look for the cause in your radio set-up, tail linkage adjustment, friction or slop, tail blade length, servo choice, battery condition, static discharges, etc. Trying to cure such defects by internal adjustments of the gyro will be a frustrating waste of time. The PC interface is a powerful diagnostic tool. By showing you the values of the Mid Stick pulse length, Throw limits, Quick-trim offset, etc. it allows you to accurately check the radio set up and linkage adjustment.

Once you have your model responding well to the default settings, probably the first parameters you will want to adjust are the Linear and Exponential stick sensitivities to get the stick feel to your liking. The remaining parameters determine the detailed dynamics of the gyro system and given the number of these variables as well as the many aspects of the helicopter (tail blade size, engine performance, servo speed, etc.) that influence the characteristics of the helicopter in yaw it is not possible to give a simple recipe for further optimising the gyro for your model. The parameters have complex interactions so that the optimum value of, say, Acceleration gain is affected by a change in the Heading Lock gain and vice versa. So, before attempting adjustments it is vital that you have the model in perfect mechanical condition and performing consistently. You should then try making small adjustments to the default settings and observe their effects.

In arriving at the factory default settings we found it useful to set the two modes to nearly identical settings differing only in, say, the value of the Acceleration gain value. By switching between the two modes we were able to see quite small changes and 'home in' on the optimum. Careful note-taking is vital to prevent confusion in this process! An observer taking notes on a clip board or Dictaphone is very useful. Once you have used this technique to get one good mode you can then apply the same method to optimise your second flight mode.

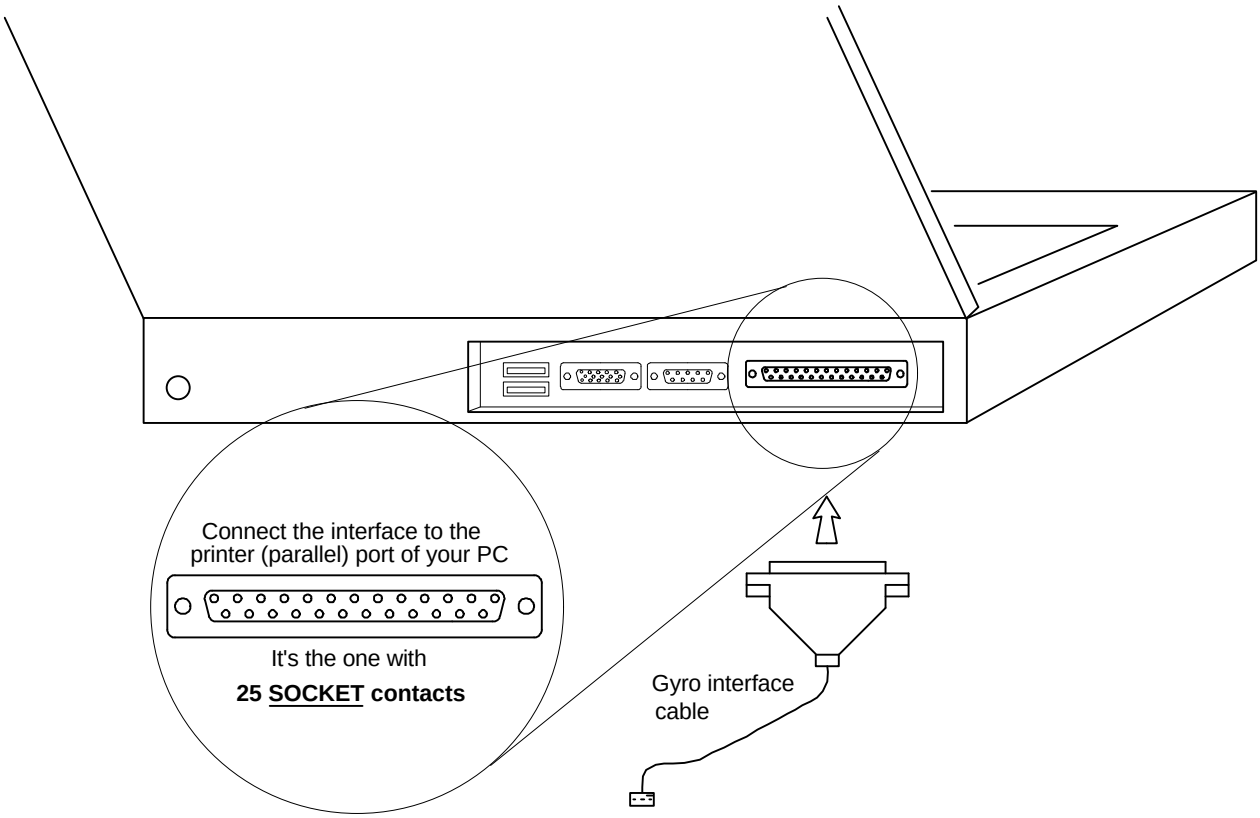
INSTALLING THE INTERFACE SOFTWARE ON YOUR PC

Insert the distribution disk into drive A or B of your PC and use 'Windows Explorer' or 'My Computer' to copy the 'SL560' folder (and its contents) from the distribution disk to the hard disk of your PC. For convenience, create a short cut to the interface program as follows:-
Right click on your desktop.
Select 'New' and ' Shortcut'.
Click on 'Browse' and in the resulting window double click on the 'SL560' folder on your hard disk.
In the window that now appears double click on the 'SL560' application.
Then click 'Next', 'Next', and 'Finish' at successive stages to complete the shortcut.

RUNNING THE INTERFACE SOFTWARE

Once the software has been installed on your PC follow these steps to connect to your gyro.

1. CONNECT THE GYRO INTERFACE CABLE TO YOUR PC



Locate the Parallel (Printer) port of your PC. This is a 25 pin 'D' connector with **socket contacts.** If you have a printer attached to your PC it may already be connected to the desired port. If so, disconnect it and connect the gyro interface cable in its place. If your PC has multiple parallel ports you can use the interface on LPT1, LPT2 or LPT3. You will be able to select the port in use from the interface program's main menu using the 'Change PC-Gyro interface port' option

! DO NOT CONNECT YOUR PC TO THE GYRO YET !

2. START THE INTERFACE SOFTWARE
Do this by double clicking on the 'SL560' shortcut.

3. TURN RECEIVER ON.
This will power up the gyro.

4. CONNECT INTERFACE LEAD TO "PC" PORT OF GYRO
This lead is easily identified as the only white/red/black ribbon cable emerging from the gyro.

5. ACCESS THE GYRO PARAMETER MENUS AS DESIRED
Whenever you access one of the gyro menus the integrity of the PC-gyro communications is checked and any problems will be reported. Failure to establish a link-up is usually due to the selection of the wrong LPT port address. This can be changed using the 'Change PC-Gyro interface port' option on the main menu. If you exit a parameter menu by pressing 'Enter' or clicking on 'OK' any changes will be uploaded to the gyro and the gyro will immediately respond to them. If you want to exit a menu without uploading the changes to the gyro press 'Esc' or click 'Cancel'.

When you have finished making changes to the gyro's internal settings disconnect the interface cable from the gyro before turning off the receiver power. The gyro may not re-initialise if the PC lead is connected at the time of turn on.

When you quit from the interface program the currently selected LPT port number is saved to ensure trouble free connection next time it is used.

Conflicts with other software

Some printer and scanner drivers can conflict with this interface program. If you experience problems:-
Right click on the shortcut to SL560.exe
in the list that appears click on 'properties'
click on the 'program' tab
click the 'advanced' button
check the 'MS-Dos mode' box
click the 'OK' buttons to close and accept changes.

THE MAIN MENU

This offers the following options:-

General gyro parameters
Servo options
Flight Mode 0
Flight Mode 1
Vibration Filter
Stop-Tracking Controls
Return gyro to factory settings
Change PC-Gyro interface port
Quit

If you are familiar with using your SL560 with its factory default settings then Flight Mode 0 is the so called 'Standard' mode while Flight Mode 1 is the 'Heading Lock' mode.
However, with the aid of this PC interface both Flight Modes are fully configurable and you could, if desired, set up both modes to have Heading Lock capability. To do this simply copy the Factory Default values for Flight Mode 1 to Flight Mode 0.

The General gyro parameters menu

The parameters under this menu influence the overall operation of the gyro and are common to both the flight modes.

Mid Stick pulse length

This must correspond to the channel output pulse width of your radio system with a channel set to its centre position. It is used to set the zero yaw rate point and also the switchover point for the Mode 0 to Mode 1 switching. Most RC manufacturers use either 1500ms (e.g. Sanwa, JR) of 1520ms (e.g. Futaba, Hitec). The gyro's factory default is 1520ms but this value is automatically adjusted to the value for your radio system as part of the Quick-setup routine. It is therefore not normally necessary to adjust its value via the PC interface. However its value is useful for diagnostic purposes. If having done the Quick-setup you find the value is not close to either 1500ms or 1520ms then you may have some trim offset or sub trim set on the rudder channel. Alternatively, some unwanted mixing (e.g. revo, or ATS) may be active.

Throw limit 1 and Throw Limit 2

These are the servo throw limits set during the Quick-Setup procedure and are expressed as a percentage of the normal full travel of the servo. These values are set as part of the Quick-setup routine and so will not normally need adjustment via the PC interface. However, it is useful to see the actual values as they can help to trace problems with the set-up of the tail linkage. If, for example, the limits are both greater than 100% it suggests that a better set-up could be obtained if a longer servo arm were fitted and the throw limits reduced correspondingly. If the values for the two directions are very different this could simply indicate that the helicopter tail linkage has a very asymmetric pitch capability but it may also point to an incorrect tail centre pitch value.

Quick-trim offset

This is the servo offset that the gyro has set during the Quick-trim procedure to counter any error in the tail linkage length. It is limited to 630% of the total servo travel. Since it is set by the Quick-trim procedure you will not normally need to adjust it via the PC interface but it is useful to know the value. If the value is 30% or -30% then the linkage error is probably too great to have been fully corrected by the gyro and you should adjust the tail linkage length and repeat the quick-trim.

Stick Slew Limiter and Stick Filter

These parameters are used to condition the rudder signal into the Yaw Rate Demand. If on finishing a pirouette the rudder stick is simply released to fly back to centre it will reach the middle far faster than the helicopter can stop. The stick will also bounce around the centre value causing an oscillating rudder signal. The Stick Slew limiter can be used to artificially limit the speed at which the stick seems to return to the centre and can be used to match the demand to the actual performance of the helicopter. The smaller the value the slower the response will be. The stick filter can be used to remove the stick bounce and smooth out the final part of the stop. Once again the smaller the value the slower the response will be. Scale pilots may wish to use low values for these parameters to help simulate full-size handling characteristics.

The Servo options menu

Gyro sense reversed

This is also a parameter that is set in the Quick-setup routine and should not normally need changing via the PC interface. However, if you do change it please check that the gyro is operating in the correct sense before the gyro is next flown.

Super Servo frame rate

This is also set in the Quick-setup routine, but for convenience is also included in this menu. Care should be exercised in turning this facility ON as standard servos that are not able to handle the high data rates may be damaged by being used with the Super Servo mode. They may also malfunction in flight. **If in doubt leave this parameter OFF**

The Flight Mode menus

The two Flight Mode setting sub-menus are identical and provide control over the following parameters which have independent values for each of the two gyro modes. The three gain terms work in conjunction with the gain value set from your transmitter.

Linear Stick Sensitivity and Exponential Stick Sensitivity

The yaw rate demand curve for each flight mode can be fully and independently adjusted to give exactly the stick 'feel' you want. The linear sensitivity has most influence on the feel near mid-stick. If the model feels too 'dead' around mid-stick then increase this value. Conversely, reduce this value to reduce the sensitivity to small stick deflections. The Exponential sensitivity has little effect near to mid-stick but has an increasing effect towards full-stick deflection. By default gyro modes 0 and 1 have the same values for these parameters. However you can give different values for the two modes so that the stick feel changes as you switch between the two gyro modes. Further tuning of the stick feel can be obtained from the rudder rates, travel adjustments, and exponential on your transmitter.

Acceleration Gain (Auto gain tracking)

This parameter controls how quickly the gyro corrects errors between the actual yaw rate and the demanded yaw rate and acts as an automatic, dynamically varying gain tracking function. It helps to equalise the stop rates in the two directions of pirouette, helps clean up the stop and will generally allow an increase in the overall gain to be achieved. However too much acceleration gain can make the stop quality too soft. When you make changes to this parameter you will need to re-adjust the gyro gain on your transmitter for optimum performance.

The main control of stop quality is provided by the 'Stop-Gain Tracking' controls discussed later. However, if you have difficulty in obtaining equal stop rates in the two directions you may wish to increase this parameter from the factory value but be mindful of the softening effect on the stop.

Conventional gain

This sets the degree of rate damping provided by the gyro, and is like the gain on an ordinary (non-heading lock) gyro. It still provides the primary stabilising effect of the gyro. Except for special applications (e.g. camera stabilisation) you will need some degree of conventional gain. You may wish to experiment with adjusting the relative amounts of Conventional gain and Heading Lock gain. In doing so its worth considering the tail as if its controlled by a spring and damper combination. The Conventional gain acts as the damper and the heading lock gain acts as the spring. With too little conventional gain for the amount of heading lock the tail will tend to oscillate every time it is disturbed (e.g. by turbulence)

Heading Lock gain

This sets the degree of resistance the gyro provides to unrequested heading changes. In the analogy above it is like the strength of the 'spring' holding the tail in the desired direction.
Please note, if you want a 'standard' (non Heading Lock) mode set the Heading Lock Range to zero.

Direct coupling

This provides the gain independent servo movement linked directly to the demanded yaw rate from the stick position. Only small values of this parameter are desirable for a Heading lock mode and the default value will generally be good. With this parameter it is possible to set up a 'straight through' (non-gyro) mode. Such a mode is useful in a fixed wing model where mode 1 is used to assist keeping the model straight on the take-off while the gyro in mode 0 simply transmits the rudder command to the servo for normal flight. The straight through mode would have zero values for Acceleration gain, conventional gain and Heading Lock gain. In the straight through mode set the Direct coupling to give the desired amount of servo movement.

Heading Lock range

This limits the range of headings over which the Heading Lock gain applies. It can, if desired, be used in conjunction with the Heading Lock Gain to limit the maximum power of the Heading Lock. **Important: Set this parameter to zero for a 'standard' (non Heading Lock) mode.** For beginners it may be useful to reduce this value to about 10 degrees for Mode 1 as high levels of heading lock will not be needed and the maximum takeoff swing will be reduced.

HL decay time

This feature makes it possible for the SL560 to have handling characteristics that are adjustable between full Heading Lock and fully conventional. Using Heading Lock without decay gives a helicopter no tendency to weathercock round into wind. The shorter the Heading Lock decay time the more the gyro will respond like a conventional type and allow the helicopter to weathercock. Thus, this feature allows you to create a full range of handling characteristics between full Heading Lock and fully conventional. Long decay times of 60 seconds or more give flying characteristics indistinguishable from full Heading Lock but allow the servo to gradually centre when the model is on the ground for a period and so helps to prevent 'swing' on take-off.

The Vibration Filter menu

Vibration Filter

This parameter controls the primary filter noise/vibration filter in the SL560. The default state is with this filter ON. However in low vibration environments (e.g. electric helicopters) an increased gain (with a corresponding increase in performance) may be achieved by turning it OFF.

Stop-Tracking Controls menu

This menu gives access to two independent gain tracking values; **Left Stop Gain** and **Right Stop Gain.**

These can be used in conjunction with the transmitter gain to optimise the gyro performance separately for fast forward flight, left pirouette stops, and right pirouette stops.

Set up these values as follows:-

Initially leave both stop gain values at the default of 100% and set up the gyro and helicopter as described in the main gyro manual. Having established by flight tests the highest mode 0 and mode 1 gains (set at the transmitter) that do not cause wagging in fast forward flight you can then use the stop tracking to optimise the quality of the stops.

Test the stop from fast left pirouettes and adjust this stop quality using the **Left Stop Gain**.
- Increase the Left Stop Gain to make the stop crisper.
- Decrease the Left Stop Gain to eliminate any bounce in the stop.

Repeat this process for fast right pirouettes to achieve the best value for the **Right Stop Gain.**

If you find that very different values for left and right stop gains are needed or that good stop quality is not obtainable in both directions you should inspect the geometry of your tail linkage and correct as needed.

Check that the Throw Limits (under the 'General Gyro Parameters' menu) are nearly equal. If not, reduce the greater value to that of the lower and turn on your radio system to investigate where the imbalance in the mechanics arises. Flight testing with the two throws equalised should give nearly equal stops both ways. If not check that the Quick-trim offset is within 610%. If not adjust the pushrod length and repeat the Quick-trim procedure until a value within 610% is obtained. If the two stops are still not equal the tail linkage is probably asymmetric and changes pitch more rapidly one side of hover pitch than the other. Such cases will benefit from rotating the servo output arm on the servo shaft and lengthening or shortening the pushrod as required to keep the correct tail pitch centre. If done in the correct direction this will at least partially compensate for the asymmetry of the linkage. (See also 'Acceleration Gain' under 'Flight Mode Menus')