

# CSM

## ICG540 GYRO/PC

### INTERFACE MANUAL

#### INTRODUCTION

The ICG540 gyro is equipped with a 'computer' port that allows the internal settings of the gyro to be adjusted to the users' requirements. Although for most users the default settings of the ICG540 (with which it is supplied pre-loaded) will be satisfactory, 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. Should you be unsuccessful in finding a better set-up, the PC software includes a facility for returning the gyro back to the factory default settings.

#### INSTALLING THE INTERFACE SOFTWARE ON YOUR PC

The installation program may be run under DOS or windows. The following description is for DOS. To install the gyro interface software onto a hard drive, insert the distribution disk in drive A (or B) and at the DOS prompt type:-

A: (Enter) {or B: if appropriate}

INSTALL(Enter)

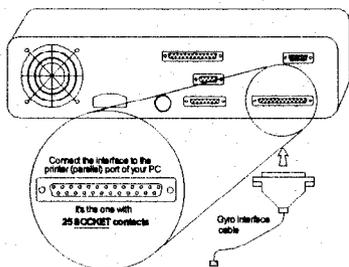
You will be asked which hard drive you want the software installed onto (e.g. "C"), and the floppy drive from which the software will be installed ("A" or "B"). Once the selection of drives has been confirmed, a directory called 'ICG540' will then be created on the appropriate drive, and the required files transferred. If the install program finds a previously installed version it will ask if you wish to overwrite it.

#### 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 install the interface on LPT1, LPT2 or LPT3. You will be able to select the port in use when running the interface program.

#### ! DO NOT CONNECT YOUR PC TO THE GYRO YET !

##### 2. START THE INTERFACE SOFTWARE

Do this by typing at the DOS prompt:-

GYRO (Enter)

##### 3. SELECT THE LPT PORT IN USE

At the first menu screen select the printer (LPT) port to which you have the gyro interface cable connected. If you are unsure of your LPT port's address you will need to try each option in turn until a successful connection to the gyro is achieved. (some PC manufacturers use non-standard port addressing, ie. 278 for LPT1)

##### 4. TURN RECEIVER ON.

This will power up the gyro. Check that the power indicator LED "PWR" is on.

##### 5. CONNECT INTERFACE LEAD TO "COMPUTER" PORT OF GYRO

This lead is easily identified as the only white/red/black ribbon cable emerging from the gyro.

##### 6. PRESS ANY KEY TO INITIATE LINK-UP

**When you have finished making changes to the gyro's internal settings disconnect the interface cable from the gyro and cycle the power in order to let changes take effect.**

#### TROUBLE SHOOTING

During the initial stages of the link up 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. As an aid the software automatically highlights your last port selection on being run.

#### THE MAIN MENU

Once you have successfully connected to the gyro you will be presented with the main menu.

This offers the following options:-

- Set up general gyro parameters
- Set up Flight Mode 0
- Set up Flight Mode 1
- Set up Anti Drift system
- Return gyro to factory settings

If you are familiar with using your ICG540 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. The factory default is 1.5100ms but this value is automatically adjusted to the value for your radio system as part of the Auto-setup routine, so it is not normally necessary to adjust its value via the PC interface.

#### Throw limit 1 and Throw Limit 2

These are the servo throw limits set by the gyro and are expressed as a percentage of the normal full travel of the servo. These values are set a part of the Auto-setup routine and so will not normally need adjustment via the PC interface. However, it is useful to see the actual values as the can help to trace problems with the setup of the tail linkage. If, for example, the limits are both greater than 100% it suggests that a better setup 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 has a very asymmetric linkage, but it may also point to an incorrect tail centre pitch value.

#### Gyro sense reversed

This is also a parameter that is set in the Auto-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 in use

This is also set in the Auto-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 will be damaged by being used with the ICG540 in Super Servo mode. If in doubt leave this parameter OFF

#### Look-ahead time

The look ahead facility of the ICG540 enables it to anticipate the required servo movements and contributes to the gyros clean stop capability. This parameter allows the look-ahead time to be adjusted. The default value is 'SHORT' but in large helicopters (especially scale types) it may be useful to change this to 'LONG'. Changing this parameter will also affect the required values of look-ahead gain used in the two flight modes, with lower values normally being needed when the look-ahead time is set to LONG.

#### Look-ahead on motion/stick

You have the option of letting the gyro anticipate just the motion of the helicopter or to have the gyro attempt to anticipate both the motion and the stick movements. The default state is with the look-ahead on the mo-

tion only. Enabling look-ahead on the stick can crisp stick responses but demands a smooth touch on the rudder. Where look-ahead on stick is used the Glitch Window facility can be used to mask rough stick movements, though if used to excess this will largely defeat the crispening effect of the stick look-ahead feature.

#### Glitch Limiter Window

This facility is used to 'filter' the rudder command data coming into the gyro. It may be used for several reasons. It may simply be used to limit the effect that radio glitches have on the gyro response. Since the ICG540 yaw rate demand feature acts to give the helicopter a very agile tail it follows that unwanted glitches in the rudder command data will be more noticeable than with less agile conventional systems. Alternatively, it can be used to smooth out rough handling of the rudder stick. It may also be used to artificially slow the tail response of the helicopter for example in scale models where slower handling responses may assist your scale flying technique.

#### 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 modes.

#### Look-Ahead gain

This parameter sets the degree to which the look-ahead feature influences servo position. The right amount of look ahead gain helps clean up the gyro 'stop' and will allow an increase in the overall gain to be achieved. Too much look-ahead gain can smear the stop or cause a short-lived 'shudder' as the pirouette stops.

#### Conventional gain

This sets the degree of rate damping provided by the gyro, and is like the gain on an ordinary gyro.

#### Exponential gain

This feature improves the speed of tail response to large yaw rate changes and should be used to help reduce the stop time from fast pirouetting manoeuvres. Excessive values will tend to degrade the clean nature of the stop.

#### Heading Lock gain

This sets the degree of resistance the gyro provides to unrequested heading changes. **If you want a 'standard' (non Heading Lock) mode set the Heading Lock Range to zero.**

#### Direct (stick to servo) coupling

This provides the gain independent servo movement linked directly to the demanded yaw rate from the stick position. The setting of this parameter is discussed later.

#### Heading Lock range

This limit sets 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.**

#### Heading Lock Relaxation Rate

The new 'Heading Lock Relaxation Rate' feature makes it possible for

the ICG540 to have handling characteristics that are adjustable between full Heading Lock and fully conventional. Using Heading Lock without relaxation gives a helicopter no tendency to weathercock round into wind. The higher the Heading Lock relaxation rate 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. Small values (say less than 4%) 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 this is recommended for eliminating any 'swing' on take-off.

#### Stick Linear Sensitivity

The yaw rate demand curve for each flight mode can be fully and independently adjusted to give exactly the stick 'feel' you want. This 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 graphical display at the right of the Flight-mode edit screen allows you to see the shape of the demand curve you are creating.

#### Stick exponential

This has little effect near to mid-stick but has a big effect towards full-stick deflection.

Use this in conjunction with the stick linear sensitivity and the graphical display to the right of the flight mode edit screen to get the stick response you want.

#### Max yaw acceleration of helicopter

This parameter helps the gyro match its operation to the actual agility of the helicopter in yaw. The value relates to the maximum achievable rate of acceleration and deceleration of the helicopter in yaw. Helicopters with large yaw inertia (i.e. those with scale bodies), small diameter tail rotors, or slow tail rotor speeds will generally have lower yaw acceleration than, say pod-and-boom designs set up for aerobatics. Setting a value that is higher than the helicopter can achieve will mis-match the gyro to the helicopter and degrade the quality of the start/stop transients.

#### Set up Anti Drift system

This menu has four options:-

- Optimise for low vibration environment
- Optimise for medium vibration environment
- Optimise for high vibration environment
- Exit without changing optimisation

The Fuzzy Logic anti-drift system is largely self-adjusting and for the majority of cases the default setting (optimised for low vibration environment) is best. However you may wish to select the medium or high vibration environment options if you are fitting the gyro into a petrol (gas) powered helicopter especially if this is to be run at high engine RPM.

#### General remarks

We strongly recommend that before entering into adjustments of 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 setup, tail linkage adjustment, friction or stop, tail blade length, etc. Trying to cure such defects by internal adjustments of the gyro will be a frustrating waste of time.

Once you have your model responding well to the default settings, probably the first parameters you will want to adjust are the Stick Linear sensitivity and Stick Exponential. These determine the shape of the Yaw Rate Demand curves for each flight mode and in so doing determine the 'feel' of the stick. The factory default setup for the ICG540 gives both flight modes the same shape of demand curve. By adjusting these parameters you can build exactly the stick feel you want for each mode separately and have the feel switch with the gyro mode. The Glitch Limiter window (with or without the use of the Look-Ahead on Stick option) may also help tailor the stick response of the model 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 Look-Ahead gain is affected by a change in the Heading Lock gain. So, before attempting this it is vital that you have the model in perfect mechanical condition and performing well with the factory default settings. 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 Look-Ahead 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 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.

Adjustment of the Direct (stick to servo) Coupling can be left until other aspects of your Flight Modes have been set. The other parameters can be adjusted with the Direct Coupling set to the factory default value. Adjustment of the Direct Coupling is done by observing the effect of gyro gain changes on the maximum yaw rate. If you find that reducing the gyro gain causes the maximum yaw rate to decrease then more Direct Coupling is needed. Conversely, an increased maximum yaw rate at reduced gyro gain means that too much Direct Coupling is being used.

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