Gyro Up-date

Up-grade your RCM&E helicopter gyro for the larger and more powerful models with this pre-amplifier by J. Davey and G. Booker.

SINCE THE ORIGINAL GYRO appeared in the January 1982 edition of RCM&E, many hundreds have been built with great success. The original design was developed for use with the smaller helicopters, in which it made a dramatic difference to the ease of control. Since then it has been found that gyros are of benefit in the large machines and give very much smoother flying characteristics, especially when circuit flying. Because these large machines are inherently more stable, their yaw rate is much lower hence more gain is required from the gyro. We have now developed an additional board that can be fitted into the existing case without modification. This allows the maximum gain of the system to be pre-set over a range from approximately one third up to three and a half times that originally available. This allows matching to a wide range of machines. The variable features via the radio link remain available and work as before.

Over the past year the original mechanics have been modified to provide improved stops and a better gimbal assembly (see photograph). A few builders have had problems correctly orientating the pot and wiper assembly. The following notes should clear up any problems in this area.

Mechanical Improvements

To ensure the correct fitting of the pot wiper, orientate it so that the fingers are adjacent to the pot fixing screw and are closer to the —VE than +VE end of pot (see Fig. 1). Voltage measured from pot wiper to input —VE should be 1 to 2 volts.

To clamp the pot ceramic firmly without the risk of cracking it, fit a 6BA washer under the screw head. This washer must have its outer edge cut back to miss the cover. See **Fig. 1**.

Increased gain can be obtained by altering two resistor values — R3 to 27K, R4 to 56K. NB. If using *Futaba* 'M' (old type) or MacGregor 'A' leave as per original circuit.

To provide more room between the end of the motor and the case, fit the motor capacitor alongside the motor body and bend the leads around the end of the motor. Solder the leads to the tags, ensuring that the leads do not short against the motor case. Secure the capacitor with a small drop of contact glue. See **Fig. 2**.

Pre-Amplifier

Preparation of mixer (Existing electronic module) Unplug the mechanics module and remove the electronics from the case.

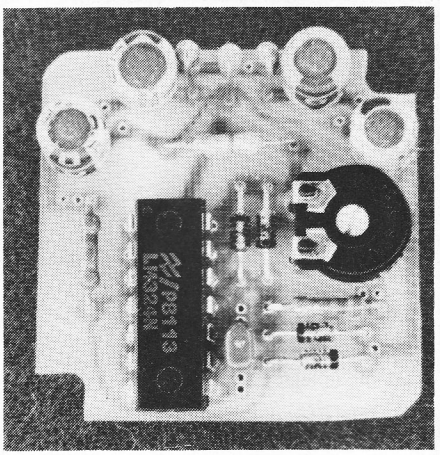
1. Carefully remove the connecting cable to the gyro mechanics.
2. Remove C4, R7, R8 and R9.
3. If R3 and R4 have not been changed to 27K and 56K respectively do so now.

NB. If using *Futaba* 'M' (old type) or *MacGregor* 'A' omit this step.

4. Fit 220K resistor for R7, R8 and R9.
5. Add five 2in. lengths of wire as follows:
   Red to motor +V
   Black to motor —VE
   Green to pot wiper
   Orange to pot +VE
   Brown to pot —VE
   As defined on mixer module layout.

Preparation of Pre-amp

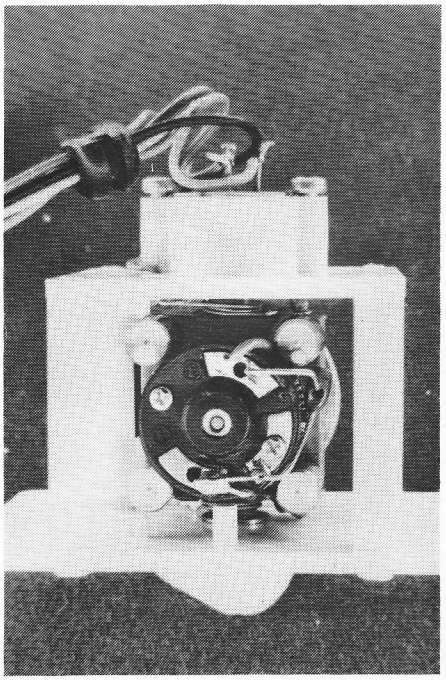
1. Check and if necessary file the PCB to fit the case. See **Fig. 3** for foil pattern.
2. Assemble components in the following order:
   IC1, Capacitors C1, C2, C3, C4, VR3 pot, Capacitor C5. Resistors. Diodes. See **Fig. 4**, component layout.
3. Connect the wires from the mechanics module as shown in the layout of the pre-amp. **Fig. 4.**
4. Connect the five links from the mixer as shown.



Above, right: completed circuit board, ready for wiring. Right: new type mechanics with improved counterbalancing and end stops. Note suppressor capacitor on motor.

Setting Up

1. Do not plug in gyro mechanics — set gain control to maximum at Transmitter or unplug the control channel. Set VR3 to minimum (anti clockwise). Centre rudder control on transmitter. Plug rudder servo into mixer, and mixer into receiver.
2. Switch on, and check servo operates and set servo to correct neutral, using VR1. Switch off.
3. Loosen the screws holding the pot into the mechanics and rotate the pot so that the wiper is approximately at the centre of the carbon track. Plug in the mechanics.
4. Switch on and adjust the position of the Pot in the mechanics to achieve servo neutral.
5. Check that swinging the gyro will cause servo movement, the servo will behave as before but with less sensitivity.
6. Rotate VR3 fully clockwise and repeat. You will notice greatly increased sensitivity. Switch off.



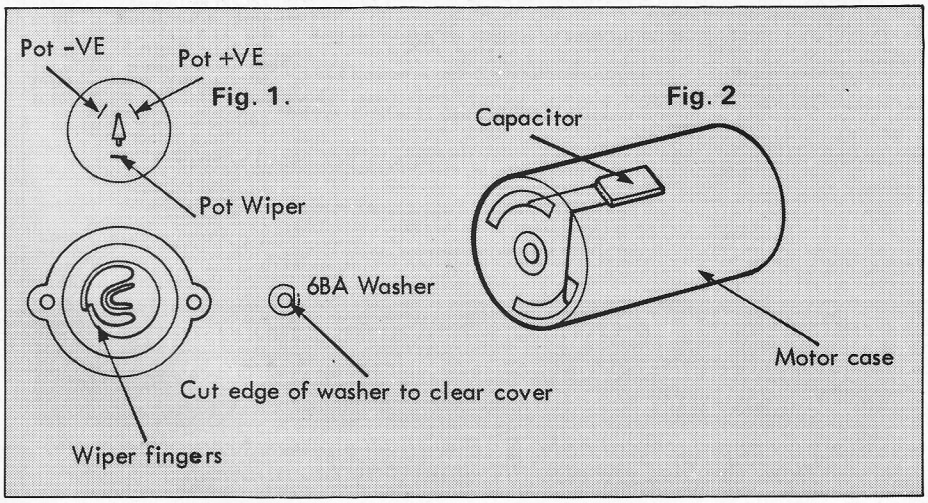


Fig. 4. Component placement.

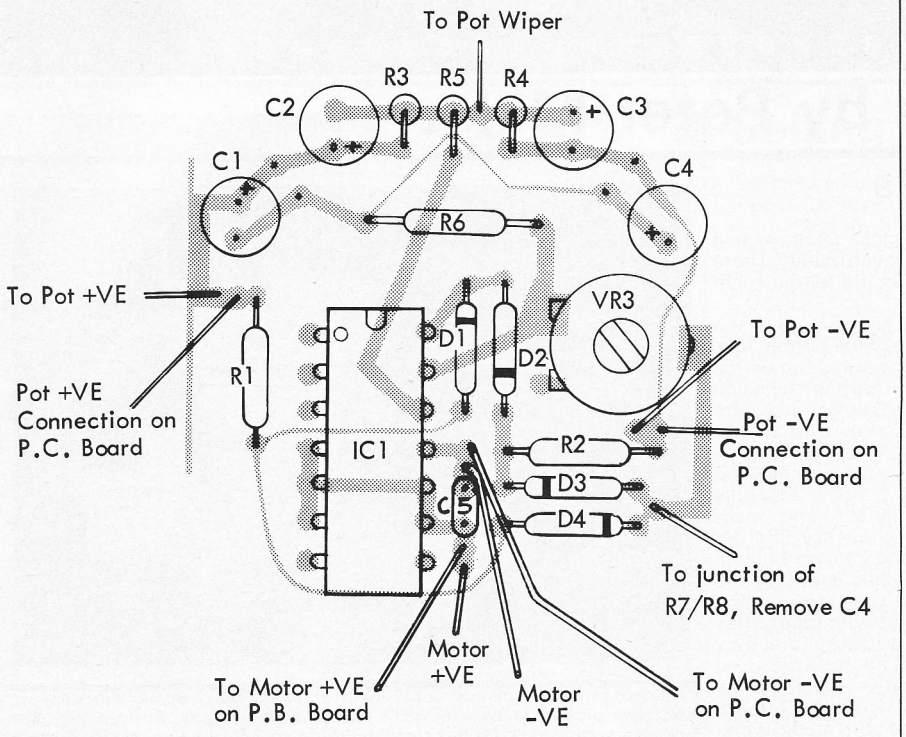
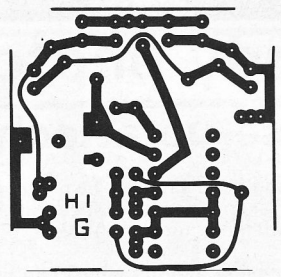


Fig. 3. Printed circuit board — full size.



Component list

R1, R2 82K GREY RED ORANGE
R3, R4 1M BROWN BLACK GREEN
R5, R6 47K YELLOW MAUVE ORANGE
C1, C2, C3, C4 47µF Mini Alum (note polarity + or —.—VE may be shown by stripe).
C5 0.01 µF (10nF) Ceramic
D1, D2, D3, D4 IN4148 Diode
VR3 470K Pot
ICI LM324 OP-AMP

7. Refit into the box with a piece of foam between the boards. You may wish to drill a hole in the case to facilitate adjustment of VR3 from outside.

In the Helicopter

With VR3 set at about ⅓ travel, the system will perform just as it did before modification. We suggest you use this setting as a start point. As VR3 is increased in value (anti-clockwise from outside) the gain increases. Too much gain can cause the helicopter (particularly small ones) to swing steadily from side to side. So don't overdo this adjustment.

Points of interest

A lot of flying experience has taught us one very important point: that is that the helicopter must be in good order itself to benefit from the gyro. For example a sticky tail rotor pitch control, that gives a different neutral from both directions, will almost guarantee problems and a lot of slop is pretty bad news too.

If possible, the tail rotor trim should be set up without the gyro operating, since the correct trim is difficult for the inexperienced flyer to establish when the gyro is operating.

For the experimentally minded

The PC board allows the introduction of a yaw acceleration term by replacing the two 47µF capacitors C1 and C4 by 4.7µF adding two 470K resistors as indicated and adjusting VR3 to taste.