



ENGINE SYNCHRONIZER

Dear friends, our ENGINE SYNCHRONIZER is a control and synchronizing device for speed synchronization of internal combustion engines of twin engine models.

Herewith we would like to explain the mechanical assembly and programming of the unit.

The device renders it possible to separately program each throttle servo as well as the three conditions as mentioned below::

- Engine Stop,
- minimum and maximum rpm
- reversion of the particular servo

Furthermore, mixing of throttle and rudder is possible as well as reversing of the input. The device is equipped with two Hall sensors which control speed and take care of synchronization as well. In case of failure of one engine you may choose one of the two following alternatives:

- immediate cut off of the still running engine
- throttling down of the running engine to full idle by shifting the throttle stick to its lowest position and then again gain full control of the still running engine.

Assembly and checkup of the wiring

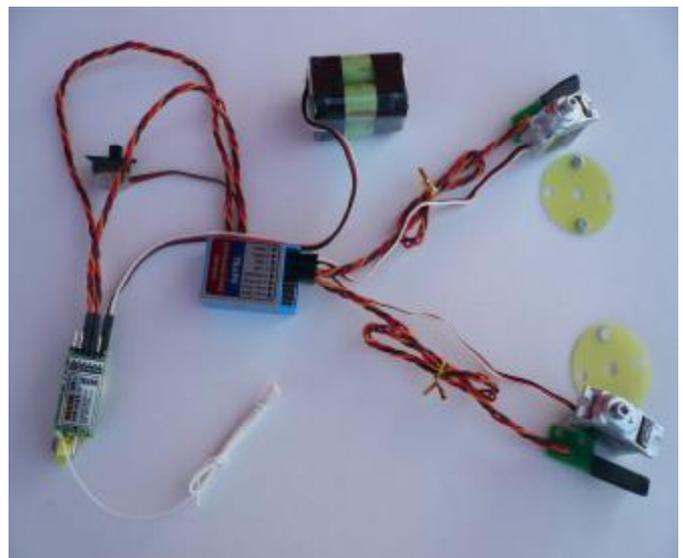
If necessary adapt the hole of the magnet holding disc to the crankshaft diameter. Insert two equally polarized magnets into the holding disc and secure them by thin cyano glue. Slide the disc on the crankshafte and secure it with the propeller nut. The gap between the Hall sensor and magnet should be approximately 2-3 mm and the sensor should be aligned with the magnet axis. After preparation of the mechanical assembly check the cooperation of the magnetic field with the sensors.

Connect the sensor connectors of sensors one and two to the appropriate sockets HALL1 and HALL2 of the ENGINE SYNCHRONIZER. The sensor connectors correspond to servo connectors (orange - signál, red- plus and brown - mínus). Connect a voltage supply of 4,8V (receiver battery) to output Motor1 or Motor2. **By no means should the throttle input (longer cable) be connected, or the receiver and transmitter have to be switched off, otherways is this indication not available!** When turning the prop the LEDs (red or green) should flash when passing the Hall sensor, which detects a correct magnetic field. This way both sensors should be checked, if one of them does not work just turn the holding disc by 180 deg. and check again.

If you don't want to use the glas fiber magnet holding disc you may drill two symmetrical holes into the back side of your propeller hub and glue the magnets in there. Before glueing the magnets in check first their polarity and the reactions of the Hall sensors to the magnetic field.

When using big volume engines you may take advantage of existing magnets on the engine (the unit works even with one magnet), but do not forget to check reactions of the Hall sensors.

Example of fixing the holding disc and the Hall sensor. Wiring of the Engine Synchronizer.



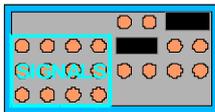
Configuration programming:

Plug into the receiver throttle output channel the **longer** cable from the Engine Synchronizer (usually 1 or 3), the second shorter cable you may plug into the receiver rudder output if you would like to mix rudder to throttle, otherways you can leave it unconnected. Connect to the Engine Synchronizer both sensors HALL1 and HALL2 and to each sensor a throttle servo to MOTOR1 and MOTOR2. Switch on the transmitter and receiver and check whether the green LED is flashing fast.

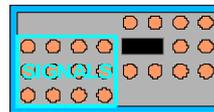
If the **green diode is not flashing, switch over the external switch (pass-thru mode which is only copying the throttle input into outputs MOTOR1, 2; identical with a V-cable function)**. If the green LED is flashing now proceed to programming of particular functions.

Programming is carried out by replacing programming jumpers into positions as shown in the pictures and by switching the external switch forward and backward in order to store this values into the device memory. After selection of the programming modes and plugging jumpers into positions as shown in the pictures the green and red LEDs flash fast and alternately. After adjustment of the desired value at the transmitter throttle stick switch the adjustment switch forward and backward in order to store this value into the device memory. A flash of the green LED confirms successful storage. If you choose a wrong code combination the red LED wil flash several times. After finished programming remove jumpers from the device.

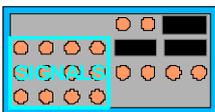
Reverse setup of servo 1 (reverse ON)



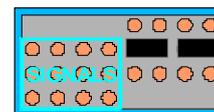
Setup of original servo 1 adj. (reverse OFF)



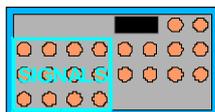
Reverse setup of servo 2 (reverse ON)



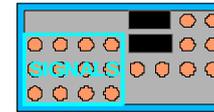
Setup of original servo 2 adj. (reverse OFF)



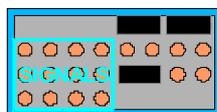
Idle rpm motor 1



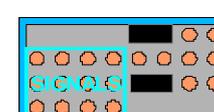
Idle rpm motor 2



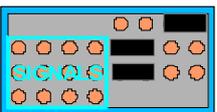
Motor 1 stop



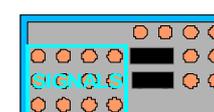
Maximum rpm motor 1



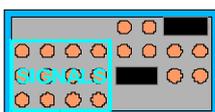
Motor 2 stop



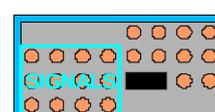
Maximum rpm motor 2



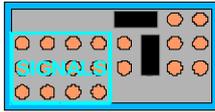
Failure of one motor
immediate shut off of the other motor



Failure of one motor
idle and further full operability



Factory setup of the Synchronizer

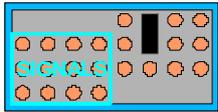


Extended programming

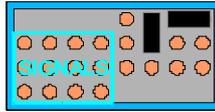
If the factory setup does not suit you, you may here program your own alternatives for optimization of the power system.

1) Adjustment of the „dead“ zone when mixing rudder into throttle

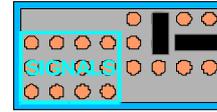
dead zone +/- 30us



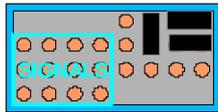
dead zone +/- 70us
(factory setup)



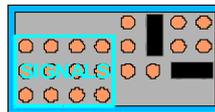
dead zone +/- 110us



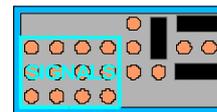
dead zone +/- 150us



dead zone +/- 200us

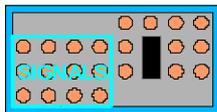


dead zone +/- 280us

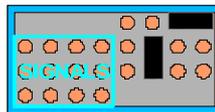


2) Adjustment of increased feedback gain of motor control – for experts only!

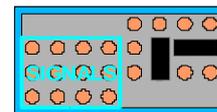
increased feedback gain 1,5



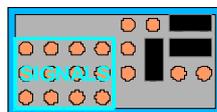
increased feedback gain 3



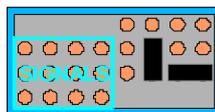
increased feedback gain 4,5



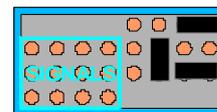
increased feedback gain 6
(factory setup)



increased feedback gain 9



increased feedback gain 14



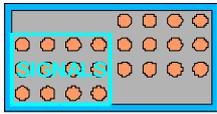
ATTENTION: In some cases can increased feedback gain excite pulsations (sustained oscillations) of the regulator. If so, it is unavoidable to decrease feedback gain. Response will be decelerated.

After programming of your selected items remove the programming jumpers and start checkup on the running engine. After operating the switch the green LED should start flashing. Start the first engine, check the servo end positions, proceed the same way with the second engine. When both engines are running operate the switch. The green LED stops flashing and the red LED may turn on. The red LED signals low rpm, the engines are not synchronized. As soon as the speed is adequate (more than 2700 rpm) the synchronization becomes activated. When synchronization occurs the green LED starts flashing or may turn on steadily.

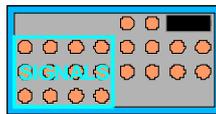
Choice of increased rudder and throttle mixing ratio

The unit offers another choice by increasing the ratio of rudder mix to throttle. In this case the jumper must always stay in the controlling unit as seen in the pictures. Here actually occurs no real programming and nothing is stored in the memory.

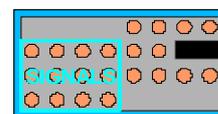
mix increase by 0,25



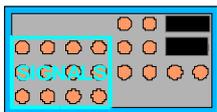
mix increase by 3/8



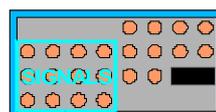
mix increase by 0,5
(factory setup)



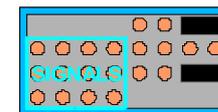
mix increase by 6/8



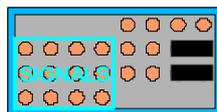
mix increase by 1



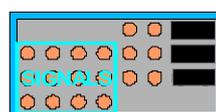
mix increase by 10/8



mix increase by 1,5



mix increase by 2



Before every start it is necessary to:

- check the Hall sensors (transmitter switched off, throttle input without signal, LED indication),
- switch on the transmitter
- start both engines in the pass-thru mode (external switch, fast flashing green LED),
- (option) program the idle engine rpm (in case of change¹)
- (option) adjust mixing ratio by means of jumpers
- switch the external switch over to synchronizing mode

As soon as you have executed all operations as mentioned above check the engine operation. Switch over the external switch. Slowly open the throttle and by turn on of the green LED we obtain information that the speed is synchronized now by an amount better than 1 %. We recommend opening up the throttle very slowly in order to keep the green LED turned on steady or at least flashing . This way the Synchronizer learns the engine deviations in full extent (it is a self teaching predictive regulator). After this phase the synchronization in the air in case of throttle changes occurs immediately . Check synchronization also at full speed.

We are wishing you lucky flying!

MZK servis, Na Korunce 441, 190 11 Praha 9, Czech Republic

„8/2005“

¹ due to engine wear or mechanical changes of the servo-carb connection