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DRAFT

Servo Setup Issues

This following setup problem is serious enough that we are not waiting for the next edition of ***Gas Engines—Giant Planes*** to make the update on this subject. We are including it at no charge with your new copy of ***Gas Engines—Giant Planes***.

I take several calls or visits per week from modelers who have hot running or burned out digital servos, melted wires or extensions and are needlessly crashing planes because of improper setup of digital servos, linkages or radio programming. Additionally receiver reboot issues is not a new problem . 15 years ago we called it battery dropout and its caused by the same things today that it was caused by 15 years ago. If your 6v system(7-8.4V nominal preregulated voltage) is running at 3.4V you've got a problem with the setup of your plane.

Modelers often believe the malfunctions to be the result of faulty components or the "naturally high current flow for digital servos" when it is the improper setup that has caused the high current flow and resulting damage or receivers that shutdown due to lack of power. Also, you may have heard that you shouldn't use a digital servo on throttle because you will burn it up. You will burn it up if you don't set it up correctly but that's a modeler issue not a servo issue. See Below

To handle the higher current rates caused by improper setups modelers often believe they need and use 16 guage wire and powerpoles or Deans connectors power isolation systems and other gadgets. While it is not wrong to use these items, these components often mask the true nature of the problem. Often the "fix is to treat the symptom rather than address and fix the problem. I believe we should fix the problem.

Let me give you the typical symptoms — Modelers who set up their planes, without using a current meter to properly adjust multiple digital servo linkages, that are driving a single control surface will often experience high idling current, high battery drain, hot running or burned out servos or regulators, erratic operating servos receivers and regulators and in worse cases system shutdowns from melted wires, burned out servos, overheated regulators or receiver reboots. In short modelers are needlessly punching planes in the ground from not understanding the cause and effect of their improper setup.

When modelers set up their planes without using a current meter the above symptoms or failures often occur. The root cause of "abnormally high current draw " is the servo preload or linkage binding that occurs when digital servos are not set up properly. It is virtually impossible to accurately set up travel adjustments without a meter because digital servos have ***5 times*** the centering accuracy of analog servos. What does this centering accuracy mean in practical terms relative to your setup?

When a standard servo moves from full left to full right the servo moves 1024 incremental steps from stop to stop. A digital servo uses 5120 steps to travel the same distance from stop to stop hence 5 times the centering accuracy. If you are not in perfect alignment one servo will fight the other servo. (high current flow, hot regulators etc.)

Unlike a standard servo, when a digital servo feels resistance from any source the servos respond virtually immediately with high torque and holding power causing high current flow.

Analog servos by comparison take several degrees of travel before they ramp up to their max torque and holding power. Coupled with the poor centering accuracy of an analog, relative to digital servos, modelers can get away with sloppy setups with analog servos that would crash the same plane if it were set up with digital servos.

Misaligned linkages, Tail wheel binding, hinges or sub trim not adjusted correctly, endpoint and misaligned midrange adjustments always cause high current flow, hot running regs or servos, high battery draw and/or erratic running servos or receivers and with the latest 2.4GHZ receivers a re-ceiver reboot is possible.

Incidentally this receiver reboot problem is not new— or limited to 2.4 gig systems. Years ago we called it battery dropout .

While it is certainly possible to get a new defective component that can cause these same symptoms, the common cause of these problems is due to servos fighting each other due to improper setup. In extreme cases servos can actually melt due to the setup error.

A digital servo's normal idling current is somewhere in the 10-20 mah range – It depends on the brand and the servo size so check your servo specs. My 40% Carden with 13 JR 8611 and JR 8711 digital servos has an idling curent of approximately 200 mah with the plane sitting on the ground. If your servos are drawing more than 10-20 mah you've got a problem.

To test your setup plug the current meter between the servo and the receiver to measure the current flow to the servo. One can immediately see if there is binding because of abnormal meter readings.

With your aileron or elevator surfaces in neutral you should be reading your servos idling current. If your meter is reading more than idling current , there is a problem that will result in increased battery draw, hot or burned out servos melted wires or regulators or systems shutting down .

The 3 setup issues to electronically measure with a current meter is:

- Subtrim
- End point
- Midrange travel

Procedure – (Travel adjust radio programming should be set to max 140-150' to obtain the best servo resolution before connecting and adjusting your setup).

Subtrim (neutral)

With the radio turned on plug in one of your wing servos to the current meter and plug the current meter into the receiver or matchbox. Read the meter– if the reading is not showing the proper idle current for your servo this tells you one servo is fighting the other. Take out your prolink wrench and mechanically adjust the turnbuckle. If the reading gets worse turn it the other way to null out the preload on your servo.

Endpoints -

With the meter still plugged in move your aileron stick to full right deflection. Watch the meter. When your ailerons are fully deflected against the stop you should be reading idle current. If your ailerons bottom out and the servo continues to travel the servo will stall and draw high current. Reduce this travel overdrive by moving the linkage connection out on your control surface or in on your servo. Reducing end point travel either through the matchbox adjustment or through your radio programming is the next step for fine tuning the total travel.

Repeat the process by moving the aileron stick to the full left position and nulling out any preload using the same process described above. On throttle make sure the servo is not overdrive the idle and high speed stop. (burned out servo)

Now for the midrange travel -

Move your stick ½ way – If your full travel is 40 degrees move the stick so your surface travels 20 degrees. Check the current reading. If it jumps in the mid travel this tells you your linkages are not properly adjusted. When using bolt linkages such as 8/32 or 10/32, with linkage fittings screwed onto the bolt, the binding at this point is caused because the fitting, that the pushrod is connected to, is not connected the same distance from the hinge line. In other words, to illustrate this issue let me exaggerate the problem – If you are 20 turns out from the hinge line on one bolt and 10 turns out from the hinges line on the second bolt the mechanical connection may scribe a 1 ½" radius on one servo and a 2" radius on the second servo. Now you can visualize the binding that takes place if these linkages are not set up in perfect parallel symmetry.

Disconnect the linkage and turn the fitting in on the bolt a few turns. Reconnect the linkage and read the meter – If the reading is worse disconnect the linkage and go in the other direction until the preload is nulled out. Note: you can check your servo with the linkage disconnected to see if you have a defective servo. If you are drawing more than idel current with no linkage hooked up the servo may be defective (not likely but not impossible)

Now you can see why so many modelers, who don't perform these checks, burn out regulators and servos, draw high current resulting in batteries that drain after just a few flights. The impression to the uniformed is the battery, servos, switch or receiver is defective when the root cause is improper setup. The fix is not to install heavier wire, big connectors, power isolation systems and a host of other gimmicks to compensate for their problematic setup – The fix is to set the plane up correctly. While its not wrong to use these items, all of these devises are unnecessary if the systems are set up properly.

These setup errors often times cause planes to needlessly crash with the blame being incorrectly placed on components that failed due to modeler induced setup errors.