Dennys Stuff:

This month we will cover the use of different brand of servos with different receiver types.

Several RRCC club members have indicated they have concerns about mixing different brands of servos with different brands of receivers. The issue is potential

compatibility between the various manufacturers of our radio equipment.

nical, so here goes.

The basic issue all comes down to the signal levels that derive from the receiver's Also note the small black squares on the servo output, and are in turn delivered to scope's screen. The vertical direction inthe servos.

This servo signal consists of a pulse volt- tings on my scope, each vertical line is 0.5 age that varies in pulse width from 0.001 volts, each horizontal line is 0.005 seseconds to 0.002 seconds from "full up" to conds. And, counting from left to right, we "full down". This pulse width has become get 4.5 squares or 0.0225 seconds. a standard in our various radio control equipment, so it is not a concern with Now, counting up from the bottom we get compatibility.

(A pulse signal is one that varies from one Nih battery that measures 6.29 Volts DC. voltage to another at a rapid rate. You could do the same thing with a toggle So, what happened to the other three switch, but it would be difficult to throw volts? Turns out these receivers don't opthat switch back and forth 50 times per erate at the voltage of the receiver battery. second.)

that pulse. scope makes looking at this signal fairly thing. easy.



Take a look at the photo of the servo signal from my Spektrum AR8000 receiver. Where do we start? This can get tech- Note the green signal that is normally at the bottom of the, but jumps up to the top of the screen three times in this photo.

> dicates voltage level, the horizontal direction indicates time. With the present set-

> 6.5 squares, or 3.25 Volts DC. That's interesting, the receiver battery is a five cell

They have an internal voltage regulator that drops the voltage down to the stand-What IS a concern is the voltage level of ard 3.7 volts DC internally. Nothing odd My Tektronix 2236 Oscillo- about that, your cell phones do the same

Also note the bottom of the green trace on the screen. This shows that the output voltage of that pulse is zero volts when the pulse is off.

Take a look at the photo on the right. It's the same signal, but the horizontal sweep has been speeded up to allow a better look at that vertical pulse. Now, each horizontal square is 0.0005 seconds. Since the pulse covers three squares, that pulse width is 0.0015 seconds. (That's 1.5 milliseconds)



The results were interesting.

This output voltage is fairly typical of the First things first. A quick check of the type of semiconductors used in the past pulse RATE, of 0.022 seconds showed 10 years or so. The type of semiconduc- that none of the servos I have on hand tor is defined as CMOS. It's the type of were affected by varying the pulse rate material used in virtually all electronic from 0.022 to 0.060 seconds. (Some of equipment from your cellphones, comput- the older receivers had a pulse rate of ers, IPods, you name it. The signal out- about 0.045 seconds.) put voltage of these types of devices goes from very close to zero volts to very The second, and much more critical issue close to the voltage supplied to run the is the voltage LEVEL of that pulse signal. chip, in the case of the various Spektrum This voltage level can vary from zero Receivers such as my AR7000's and volts to about 3.3 volts DC on the Spek-AR8000 receivers, 3.7 Volts DC.

(As a side note here, many readers may DC on one of my old Futaba receivers. be aware of the Spektrum "Brownout" issue on their receivers. Brownout occurs So, I put together a receiver simulator when the receiver battery voltage drops with one of those MicroChip PicChip mibelow that 3.7 Volts DC, even for an in- crocontrollers that allowed varying the stant. That is why battery supply is very voltage level of that pulse signal. important for these 2.4 Ghz receivers.)

Now, how does all this stuff affect our ser- Futaba servos I had on hand, along with vos? Well, I've got an assortment of several Hitec servos. them, and did actual undervoltage tests on the servos I've got on hand.

trum receivers I've got. That same voltage varied from zero volts to about 6 volts

This signal was applied to a range of

The results? The Futaba servos required a minimum pulse voltage of 0.7 Volts DC for normal operation. The Futaba 3101

| servo required 1.7 Volts DC pulse volts for operation. And, the Hitec servos required about 1.0 volts DC for operation. | requirements of some of these reversing cables don't follow the standards required for operation of the various servos. |
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| So, what does all this mean? The test re- sults suggest that you can safely mix ser- vo brands on your equipment, at least with the Spektrum and at least one old Futaba receiver. | Spektrum specifies that if your model re- quires reversed servo directions that should be done by using a different aux channel on your receiver, and using a transmitter mix command to make it work correctly. |
| That said, the Spektrum website specifi- cally indicates that those "Servo Reverser" cable harnesses are NOT to be used with the Spektrum receivers. I'm not certain as to why not, but suspect that either the input or output voltage level | If any RRCC members has a question on compatibility of some of their old 72 Mhz receivers, or Futaba or other brand 2.4 Ghz receivers, let me know. I can easily check them out on my oscilloscope in my workshop. |