RADIO SPECTRUM Cal Orr

Mid-October each year is one of my favorite events, the QSAA (Quarter Scale Association of America) Fly-In, held in Las Vegas, Nevada. The 2003 Fly-In was October 9-12, where October 9th was the static display held at Arizona Charlies with flying the remaining days taking place at the Eldorado Dry Lakebed, just south of Boulder City. I have attended the QSAA Fly-In since the early 1980's and haven't missed one yet. The QSAA Fly-In provides a good opportunity to meet others with similar interests, a static display, a large, well-controlled place to fly, vendors, and maybe a spec or two of dust.

Over the last couple of years, overall membership of QSAA and the number of pilots at the October Fly-In has been declining. This tends to lead to rumors, "Does QSAA still exist?" YES! QSAA does exist with the help of a few dedicated members who do most of the work. Those of us who attended the 2003 Fly-In had a great time! Mark your calendars for mid-October 2004, you may also go to the QSAA website:

www.qsaa.org

While at the QSAA Fly-In, I had a chance to talk to one of the vendors, EMS (Electronic Model Systems) who have a catalog of several products. The item that really caught my attention was the EMS Linear Servo Conversion Kit. You may contact them at: EMS, 22605 East La Palma Avenue, Suite 516, Yorba Linda, CA 92887. Orders: (800) 845-8978, Phone: (714) 692-1393, Fax: (714) 692-1330 or via their website at:

www.emsjomar.com

In the late 1960's, my first proportional radio system was from Micro-Avionics. The servos that were supplied with that radio system were "linear servos." The linear servos did not have an output wheel to attach your pushrod to, instead, there were two horns on the top of the servo case (one on each side) that slid back and forth as the servo was operated, a true push/pull output. The two servo output horns traveled opposite of each other. We did not have servo reversing switches in the late 1960's, we simply attached our pushrod to the other horn if a given control surface moved the wrong direction relative to transmitter stick motion.

Most servos today have an output wheel that rotates. By attaching a pushrod to the wheel, we convert a rotational motion into push/pull. One of the drawbacks is the non-linearity of the push/pull action. Our control surface moves farther or is more sensitive around neutral. Many computer radios try to offset this non-linearity with a feature called "expo" that allows you to program an exponential curve into a channel. Expo will reduce the amount of servo rotation around neutral while increasing the amount of rotation as the servo approaches its extremes. Therefore, overall servo throw remains the same, however, the push/pull action has become more linear.

If you have ever installed a servo in a tight space or used a short pushrod, you may have noticed that as the servo rotates, the pushrod moves from side to side as well as the desired back and forth (push/pull) action. Or, if you have used the innermost hole in the output wheel, you may have noticed that as the servo rotates, it also tries to bend the pushrod around the servo's output shaft. Or, if instead of pushrods, you use such items as cable sliding back and forth inside a tube, the outer tube cannot extend all the way to the servo's output wheel. As the servo rotates, the cable also moves from side to side. Therefore the outer tube must stop short of the servo's output wheel to allow for this side to side action. With a linear output, a true push/pull, you will not have the side to side action.

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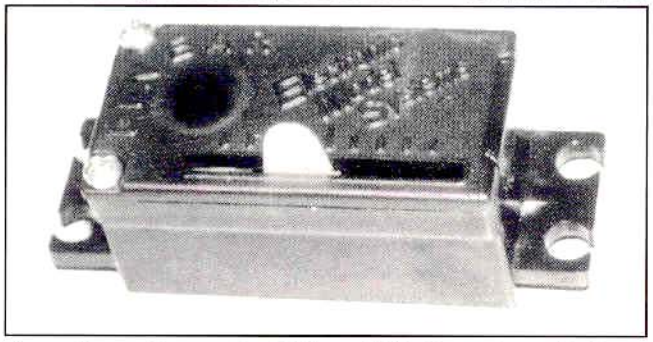
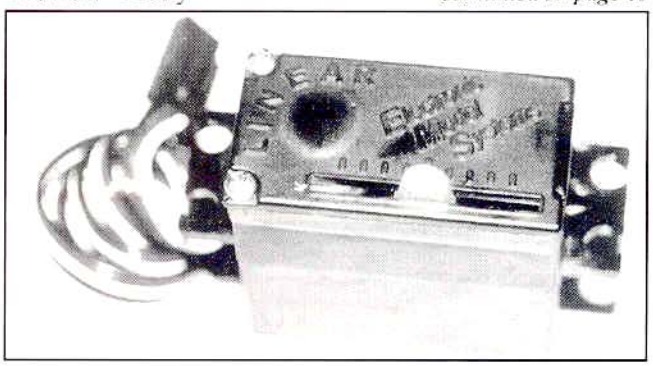
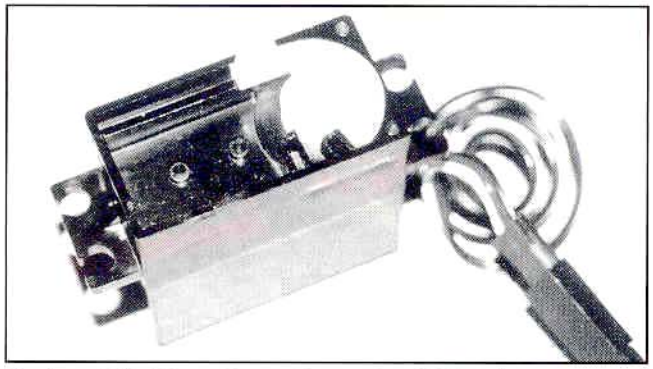


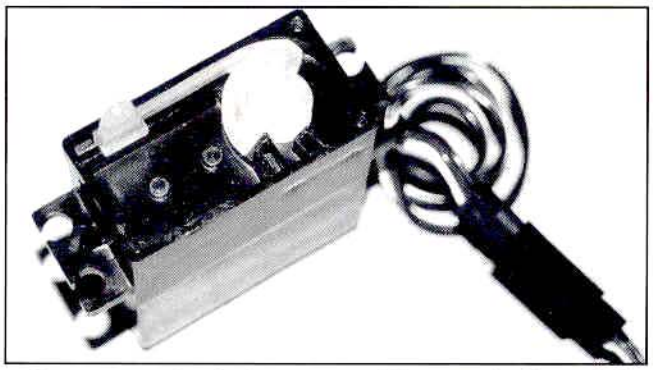
Linear Servo Conversion Kit from EMS. Servo top with linear output that replaces standard servo top.



Linear Servo Conversion Kit installed on top of Futaba S148 servo.



The top of the Linear Servo Conversion Kit has been removed. Here we see the servo at one extreme, the drum has rotated clockwise and the output horn is coiled in...



... Same as previously shown, except the servo is shown in the opposite extreme. The drum is counter-clockwise and the output horn is uncoiled.

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EMS's Linear Servo Conversion Kit contains a servo top with a ball bearing and a unique drum (inside) that slide over the splines of the servo's output shaft. As the servo's output shaft rotates in each direction the drum coils and uncoils the output horn. The drum and output horn is injection molded from high performance co-polymeric plastic with good tensile strength and is resistant to fatigue. The EMS Linear Servo Conversion Kit converts the rotational output of your servo into true push/pull action with a maximum travel of 3/4".

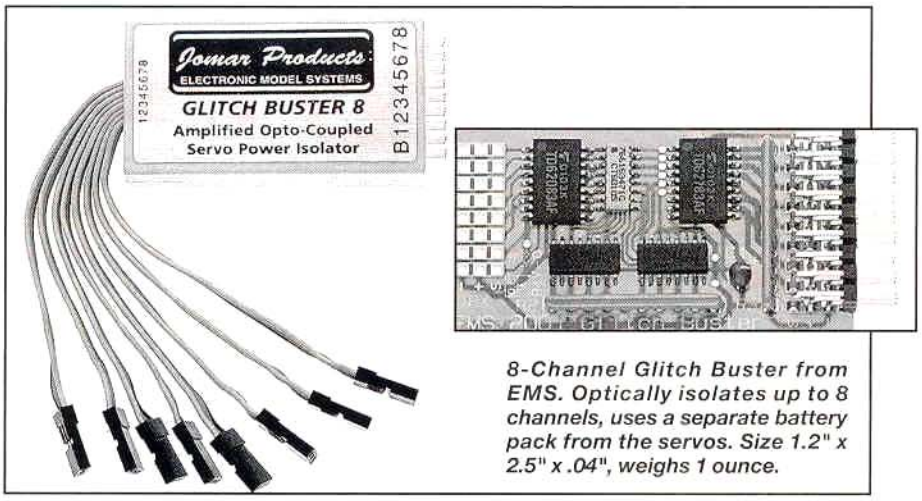
To install the EMS Linear Servo Conversion Kit, you must first center your servo. Use your radio system to help with this — make sure the transmitter trims are also centered.

Next, turn off your radio system, and remove the four screws from the bottom of the servo. Remove the servo's output wheel and then remove the servo's top. While removing the servo's top you may also want to push on the output shaft, this should make it easier to separate the top and bottom case.

Now look inside the servo top, make sure the gears and pins remained in the lower main body of the servo.

Next, physically center the horn on the EMS Linear Servo Conversion Kit and place the new top on your servo. The servo splined output shaft will slide inside the drum. Re-install the four case screws and check the servo's operation. Does the output horn bind up and stall at one of the extremes with full transmitter stick deflection and trim? If there is no binding, you are done.

If you would like to readjust the output horn — simply remove the two small screws on the top of the EMS Linear Servo Conversion Kit and take its top off. You can then pull up on the drum to remove it from the servo's output shaft. Rotate the drum one spline and slide the drum back on the servo's output shaft and check operation again. When you are happy with the operation, re-attach the top with its two screws.



8-Channel Glitch Buster from EMS. Optically isolates up to 8 channels, uses a separate battery pack from the servos. Size 1.2" x 2.5" x .04", weighs 1 ounce.

The Linear Servo Conversion Kit increases the height of the servo by approximately .30". The servo's width and length remain the same, except the very top of the servo is approximately .050" wider.

I was curious as to how hard the servo worked rotating the drum coiling and uncoiling the output horn. I took a stock Futaba S148 servo and let a servo exerciser slowly operate it from extreme to extreme at about a 2 second transient time with no load. The current draw was just over .1 amp or 100 mA (milliamps). Then I installed the EMS Linear Servo Conversion Kit on the same servo. With nothing attached to the output horn I turned on the servo exerciser. The servo exerciser guaranteed that the servo was operated in the same manner in both tests. The current draw with the EMS Linear Servo Conversion Kit averaged approximately 140 mA. The S148 servo stalled draws almost 1 amp or 1000 mA.

The S148 is rated with an output torque of 42 oz./in. This means if you have an output wheel with an arm of one inch (radius), that one inch arm can lift (so to speak) 42 oz. of weight. With a shorter arm, the servo can lift more weight. The arm or radius of the drum is approximately .36". This means that the output horn can lift quite a bit more than the 42 oz. minus its own friction and coil/uncoil losses. Bottom line, you will end up with a servo whose output horn can deliver considerably more than 42 oz. of push/pull.

The EMS Linear Servo Conversion Kit with ball bearing is a clever device with an introductory price under $13.00 per servo. At the time of this writing the EMS Linear Servo Conversion Kits are only available for the Futaba S148 servo. I believe some Hitec servos my be next as they only require minor changes in the drum-spline count.

I would also like to mention another product from EMS, their "8-Channel Glitch Buster." There has been a lot written in the modeling press lately about multiple servos and power buss systems. The 8-Channel Glitch Buster provides good isolation between the receiver and the servos and provides a separate power buss for the servos. The 8-Channel Glitch Buster plugs in-between your receiver and servos and also provides an opto-coupled, amplified 8 channel servo output. Opto-coupled means the servo's signals are electronically isolated, there is no electrical connection common to both the receiver and the servos not even circuit ground. The servos are then powered from a separate battery pack. Thus, we have total isolation between the receiver and servos keeping servo electrical noise from the receiver. The amplified output of the Glitch Buster drives servo signals through long servo leads and can handle up to four servos per channel (with your own "Y" harnesses).

The 8-Channel Glitch Buster is compatible with PCM radios, measures 1.2" x 2.5" x .4", it weighs about one ounce, and is wired and ready to go for under $80.00. ✈