Product Review & Short Takes Columns from *QST* Magazine

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Product Reviews

Elecraft K-1 QRP CW Transceiver Kit

Idiom Press Rotor-EZ with RS-232

Short Takes

DX4WIN/32

Idiom Press Rotor-EZ with RS-232

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Of all of the operations in the average ham shack that have been interfaced to a PC over the last few years, one of the last holdouts has been antenna rotation control. While computer-controlled rotator systems and substitute control boxes have been readily available for quite some time, they have historically been rather pricey. Enter Idiom Press's Rotor-EZ with RS-232 controller kit for the Ham-II, III and IV, and Tailtwister control boxes.

A second nearly identical version of this kit—lacking the components required for computer interface capabilities but providing all of the other enhanced system control features—is also offered. The parts needed to add computer control can also be ordered separately and installed on the circuit board of the more basic version at a later time.

Hidden inside this ordinary-looking rotator control box is a new product that enhances its operation and expands its capabilities.

What Does It Do?

The Rotor-EZ (pronounced "Rotor-Easy") is a small circuit board kit that can be installed inside the control boxes of any of the Ham-M or Tailtwister rotators that use analog meters and the three-lever control arrangement. The device employs a microprocessor that works with the existing control box's electronics, switches and meter to add both hands-off point-and-go operation and more "intelligent" rotator motor control.

Rotor-EZ smartens up the controller command operations with an automatic five second brake delay, electronic end points (to avoid the mechanical lock up that sometimes occurs when the motor runs into its end stops), an "Unstick" routine for Tailtwisters and jam protection. In other words, it takes care of all of the things an operator is supposed to do to reduce wear and tear on a rotator and tower, only automatically.

There is also a ninety-degree offset indication feature available—perfect for those who have additional directional antennas installed at right-angles to the main antenna. (This is a common configuration that's used to reduce interaction between closely spaced antennas.) Rotor-EZ is even smart enough to put up with—to some extent—the "dead spots" that sometimes develop in worn indicator potentiometers.

How Does It Work?

The brain of the Rotor-EZ is a Microchip Technologies PIC16C73 microprocessor. It responds to your manual or computer commands and drives separate relays that control the brake solenoid and the motor in the rotator. The processor uses an analog-to-digital converter to read the position of the rotator motor's direction potentiometer and that of the control box's calibration control.

Once Rotor-EZ has been installed, the control box's existing front panel-mounted **CALIBRATE** knob becomes a go-to bearing set point control—Idiom Press refers to this as "Auto-Point." The meter is driven by the processor's outputs and serves double duty—it indicates the targeted direction when using the **CALIBRATE** knob to set the desired antenna bearing, and the actual direction as the antenna turns towards and reaches its new heading. The processor also controls four LED indicators and uses them to show what the system is doing, the progress of rotation and any error conditions.

Building the Kit

I received my Rotor-EZ kit and immediately got down to business. The patient? My Tailtwister control box. This is the rotator control located farthest from my operating position and the one that takes the longest stretch to operate.

My Tailtwister frequently "sticks" when the brake wedge doesn't fully disengage as rotation begins (this is a common idiosyncracy with the Tailtwisters). The usual cure is a short manual pulse in the opposite direction before beginning a rotation. Rotor-EZ performs this automatically, so I was definitely anxious to take advantage of that feature. I disconnected the rotator control box, pulled it out of the shack and dragged it—kicking and screaming—off to my "laboratory."

The Rotor-EZ kit comes with a fair number of parts (see Figure 4). They're all packed onto a small circuit board that's designed to be mounted right on the studs of the meter in the control box (see Figure 5).

I am an experienced builder, so it only took about a half-hour to stuff and solder the board, even though I took the time to check off every step and double-check the resistor values. I recommend that you take your time during the assembly phase and be careful to do the job right—it would likely be very difficult to troubleshoot the board after it's been installed.

I had to drill a hole for one of the LED indicators in the front panel of my box—my unit originally had only three LEDs. Depending on your particular model and version of the control box, it may be necessary to drill additional holes for the other LEDs, and possibly a hole in the back panel to pass the computer control cable through as well. When drilling, it's a good idea to use masking tape on the inside of the box to catch any stray chips.

Once you've completed the circuit board, secured it to the meter, wired up the four LEDs and rewired the **CALIBRATE** control pot, you can run a "Pretest." If everything checks out, you can continue integrating the unit into the control box.

As I removed wires in the existing control circuitry, I took pains to record

Bottom Line

Rotor-EZ adds set and go convenience, "intelligent" motor control, added features and optional computer controllability to the popular Ham-M and Tailtwister rotator systems.

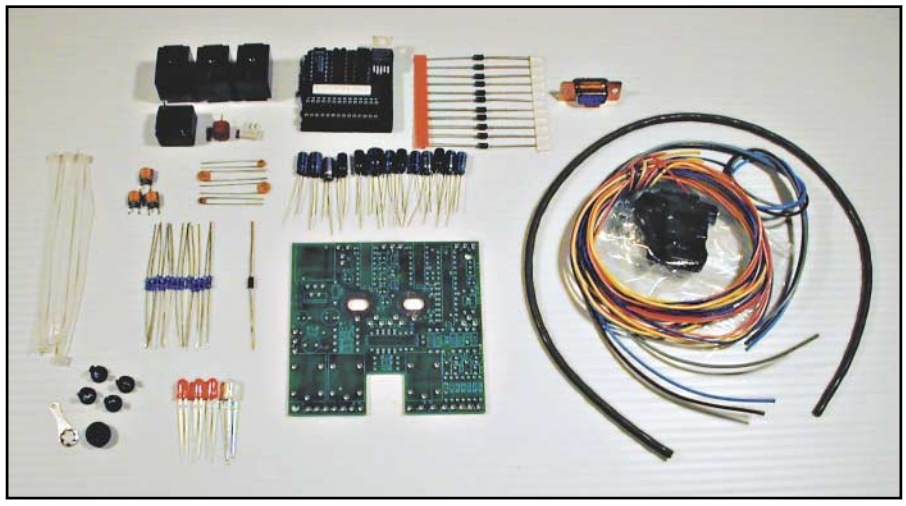

Figure 4—The Rotor-EZ with RS-232 kit as delivered. The $3^3/_8 \times 3^3/_{16}$-inch double-sided circuit board is solder masked and silk screened with component outlines and parts numbers. Everything you'll need—including hookup wire and wire ties—is included.

the color of each wire and where it went in the original configuration. This is especially important should you decide to assemble and install the kit over several sessions—don't rely on memory alone!

A couple of warnings are in order here. The wires originally used within these control boxes are typically solid conductor and the insulation on them has a low melting point. If you linger too long with the soldering iron you'll melt the insulation off the wires. Most of the wires in my control box were long enough to snip them off at their connection points and strip off a little more insulation for reattachment.

There is a common modification that has been made to many of these control boxes over the years that keeps the brake off for a few seconds after you let go of the **BRAKE RELEASE** lever (see Figure 7). Rotor-EZ takes care of all brake delay operations, so if your box has had this change made, you'll want to begin by reversing this—and any other—user-installed modifications. The instructions naturally assume that you are installing Rotor-EZ in an unmodified unit.

I proceeded carefully through the process of interfacing the new brain to the remaining control box circuitry. There are quite a few wires involved. Take your time and pay close attention to properly dressing the leads. The completed installation is shown in Figure 8.

I then double-checked all my connections and applied power. Success! All of the smoke stayed *in* the components and the rotary **CALIBRATE** control and switches all appeared to behave properly. I followed the calibration instructions and had the rotator system back in operation within four hours of initially opening the case.

The Instructions and User Manual

I found the instructions to be clear and straightforward, but there are no drawings—text only. When I asked Idiom Press about this, they told me that they have identified (among unmodified controllers) five different meter movements and at least three significantly different component layouts. There are also minor variations among these. Early boxes employed separate components where later boxes used printed circuit boards. Even then, there are at least two different versions of PC board models.

Since it would take a significant number of drawings or photographs to cover all of the possible variations, the instructions rely completely on text descriptions—and they do a very good job. I was able to complete the installation phase successfully by carefully following each step. Providing a table for the builder to jot down notes detailing where the original wires are routed would be a helpful addition, but scrap paper will suffice. On a scale of 0 (totally confounding) to 10 (Heathkit-like), I would rate these instructions a 7.

Opportunities for Improvement

The component labeling on Rotor-EZ's PC board could have been clearer—some of the silk-screened text designators are obscured or overlay a solder pad. Also, the

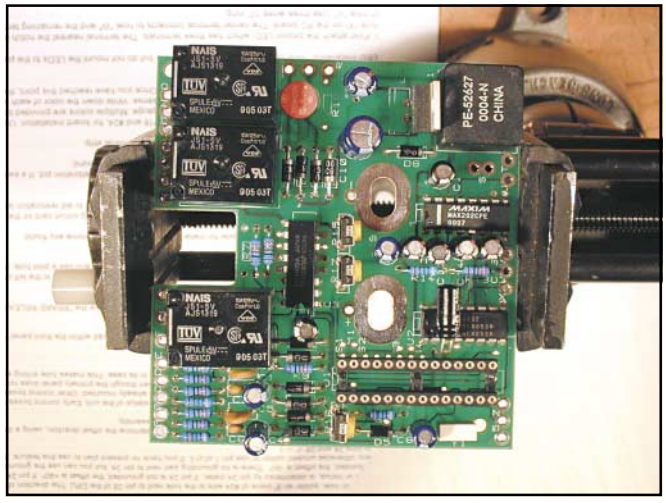

Figure 5—The assembled Rotor-EZ circuit board ready for installation in the rotator control box. The vacant 28-pin socket in the lower right hand corner of the board is for the PIC16C73 microprocessor.

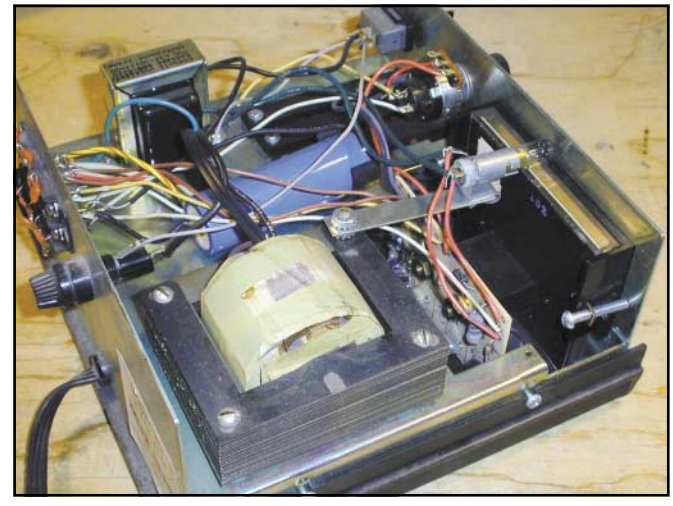

Figure 6—My Tailtwister control box awaits "brain surgery." The Rotor-EZ circuit board will be replacing the original one that's mounted on the meter studs (located just to the right of the large transformer in this photograph).

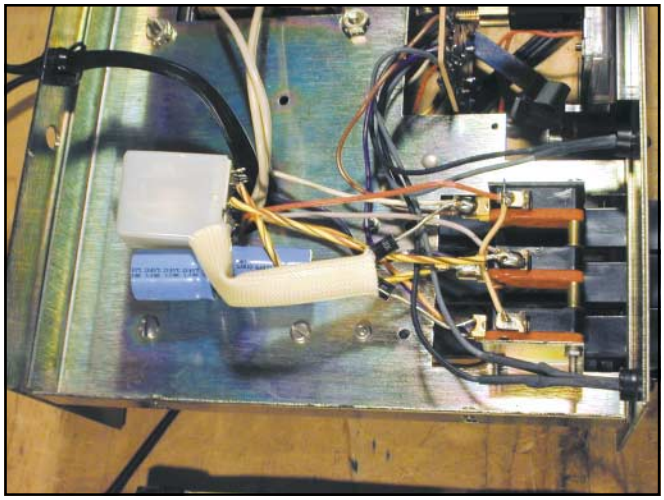

Figure 7—The electrolytic capacitors, the relay (the white plastic cube) and the diodes in this photo are a modification that I added a few years back to provide a brake delay. This—and any other circuit changes that have been made—must be eliminated before Rotor-EZ installation begins.

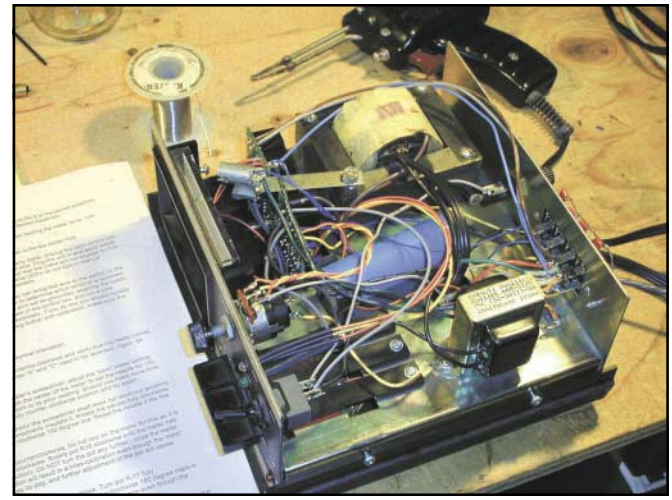

Figure 8—The Tailtwister control box with the Rotor-EZ system installed. Close comparisons with Figure 6 will reveal a significant number of new connections between the original components and their new master.

solder pads themselves are rather small. Since I received my kit, the silk screening has been improved and Idiom Press has indicated that they intend to increase the size of the pads at some point.

Functional Review

My Rotor-EZ equipped control box has been trouble-free. Although I live quite close to a number of 50 kW AM Broadcast stations, I haven't encountered any RF interference problems either to or from the unit. Calibration was straightforward and it didn't require multiple trips outside to verify which direction the antenna was actually pointing.

To operate the modified controller, what was previously the **CALIBRATE** knob is now used to set the meter pointer to the desired bearing. A short press of what was once the **BRAKE RELEASE** lever then initiates antenna rotation. If you prefer, you can still use the **CW** and **CCW** (clockwise and counterclockwise) levers—in combination with the **BRAKE RELEASE** lever—in the "original" manual mode. Either way, the brake will automatically reengage 5 seconds after rotation stops.

The direction LEDs show what the unit is doing. In case of trouble, the status LED will blink or the meter will wiggle to alert the operator.

A really neat feature is the gradual change of color of the multicolored status LED. When a turn command is executed, the LED first appears red. As the rotator gradually turns toward the set point, the color changes from orange to green. I found myself turning the antenna just to watch the cool light show put on by the LED!

I connected the RS-232 cable to my PC and exercised the unit's computer control functions through a terminal program. The command protocol is listed in the user manual. I will eventually command the rotator through my logging software. The software protocol for Rotor-EZ is the same as that of Hy-Gain's DCU-1.

I have not tried the Overshoot option (which allows big antenna systems to coast through the last three degrees into position) or the 90-degree offset feature (for antennas mounted at right angles).

Have I found Rotor-EZ to be useful? You bet! I can set, start and forget—just like on the more expensive rotator control boxes. I never find myself accidentally holding the control levers down while brake wedge is stuck. I now even occasionally catch myself trying to use the Auto-Point mode on my currently (but not for long) stock Ham-IV control box.

Summary

Rotor-EZ is a simple, useful product that fills a common need in ham shacks at a reasonable price. You sacrifice none of the functionality of the old control unit by installing it. The consistent and reliable method by which the rotator motor will be operated should prolong its life and save wear and tear on the tower and antennas. I—for one—am for *any* station improvements that will help keep Murphy at bay. Rotor-EZ is a product I can heartily recommend.

Price: Rotor-EZ kit including RS-232, $129.95; Rotor-EZ basic kit, $99.95 (plus shipping and handling).

Manufacturer: Idiom Press, Box 1985, Grants Pass, OR 97528; 541-474-0293; **sales@idiompress.com**; **www.idiompress.com**.

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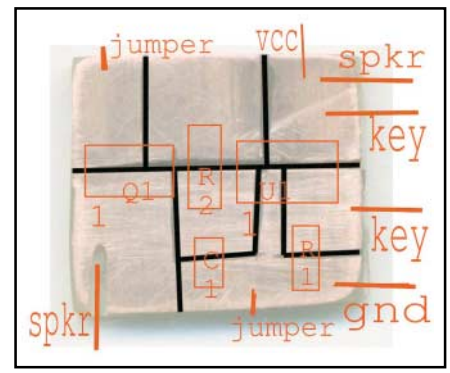
FEEDBACK

◊ Sam Ulbing, N4UAU, author of "The World's Smallest Code-Practice Oscillator," *QST*, Feb 2001, pp 39-41, has provided a part-placement diagram for his homemade PC board. You can download a picture of the diagram from Sam's Web page **http://n4uautoo.home.sprynet.com** and as ULBPIC.ZIP from the ARRL site **www.arrl.org/files/qst-binaries/**.—*tnx Sam Ulbing, N4UAU*



◊ Please refer to Ron Stone, KA3J, "The UniCounter—A Multipurpose Frequency Counter/Electronic Dial," *QST*, Dec 2000, p 34, Figure 1. Ron advises he incorrectly showed U1 pins 12 and 13 connected to DS1 pins 1 and 2, respectively. Correct the schematic to show U1 pin 12 connected to DS1 pin2 and U1 pin 13 connected to DS1 pin1.— *tnx Ron Stone, KA3J* QST