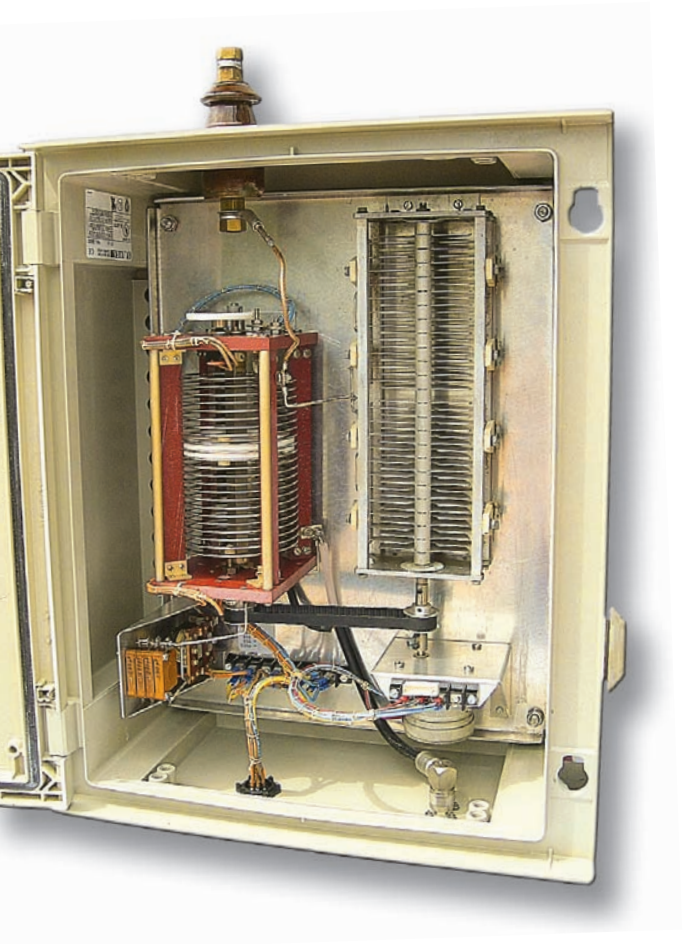


A Single Control Remote Antenna Tuner

This antenna tuner uses a single motor drive to make remote operation easier.

Peter Langenegger, HB9PL

Wire antennas, particularly end-fed ones, are still some of the most popular antennas in use at amateur stations. They are easy to build and almost invisible if thin wires are used. For multi-band operation, they work best with antenna couplers close by the antenna end, a natural for remote tuning.

Remote controlled antenna tuners for matching end-fed wire or monopole antennas are usually quite complicated devices. They require a number of electromechanical components used to tune or select capacitors and inductors from the shack. For the ham with homebrew ambitions, simplification is a significant attribute. The solution described in this article reduces the technical requirements considerably.

Make it Easy on Yourself

With the selection of a favorable antenna length, in my case 120 feet, the requirements can be significantly reduced. Instead of three variable elements (C-L-C), only a single L and C will be necessary to construct a motor driven L network that will provide a match on all bands.

In the proposed solution we carry the simplification a step further by devising a scheme that requires but a single motor. The way this is done is to mechanically couple the roller inductor to the variable capacitor. The gearing is such that the coil and the variable capacitor each revolve together. Since the capacitor covers all its values twice in each revolution, each half turn of the coil can occur with any value of capacitance. This provides a sufficient resolution to provide a proper match to any impedance encountered. The matching resolution could be further increased by changing the coupling ratio between the variable capacitor and the roller coil. For example, by using a sprocket wheel at the roller coil twice as large in diameter as that of the variable capacitor, each quarter turn of the roller inductor can be associated with any value of the variable capacitor. This provides additional matching precision at a cost of the tuning cycle taking longer.

The roller inductor I selected, an (IRV) L32017 from Surplus Sales of Nebraska, came with an integral 10-turn 10 kΩ potentiometer and end-limit switches. The potentiometer allows a remote position indicator to determine the amount of rotation. This inductor was fairly expensive and others could be used if suitable controls were incorporated. The schematic of the tuner is shown in Figure 1.

Drive Mechanism

To control this circuit a reversible motor with a suitable gear-reduction is required. We selected an available reversible ac motor with a drive axle turning at 10 r/min. You may find a suitable motor used for window opening and closing, or designed for any other application with a small reversible low-speed drive. Sprockets on inductor and capacitor and a rubber belt drive are used to turn the capacitor with the inductor. A relay

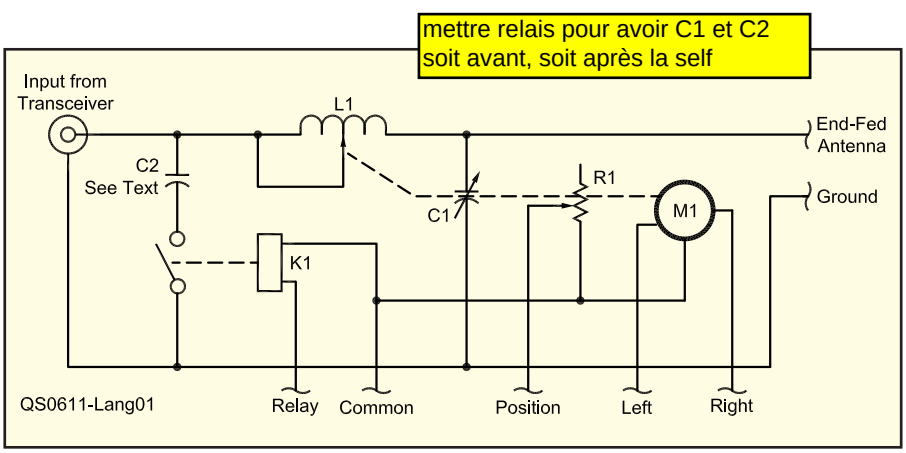


Figure 1 — Schematic diagram and parts list for the remote controlled antenna tuner.

C1 — Variable capacitor, 360°, 380 pf, 8 kV.
C2 — Fixed capacitors at 4 kV, in combination as needed to resonate antenna tuner at low frequencies.
K1 — Relay, 48 V dc, contact rating 250 V ac at 10 A. Contacts as needed to switch required capacitors.
L1 — Roller inductor 0.1 to 24 µH at 20 A, with end contacts and gear driven 10 kΩ, 10 turn potentiometer (R1).
M1 — Synchronous motor, 48 V ac, reversible, with gear box attached, 10 r/min.
Parts except motor were obtained from Surplus Sales of Nebraska (www.surplussales.com); other sources may be available.

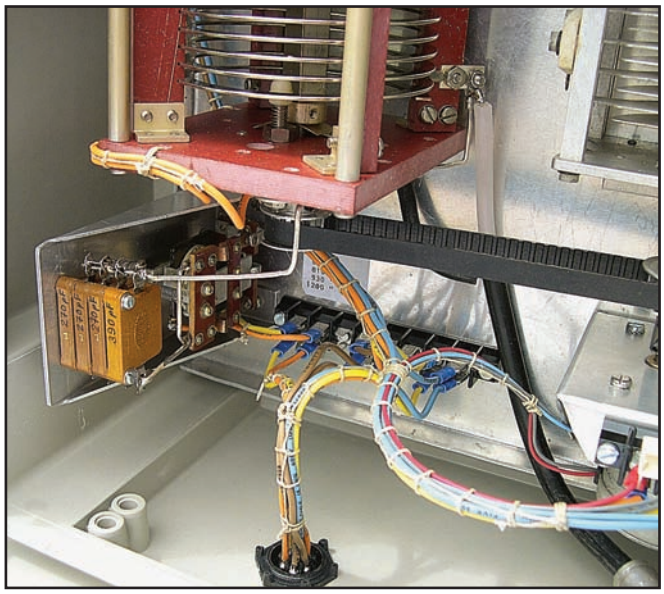


Figure 2 — Detailed view of the drive belt and capacitor switching relay.

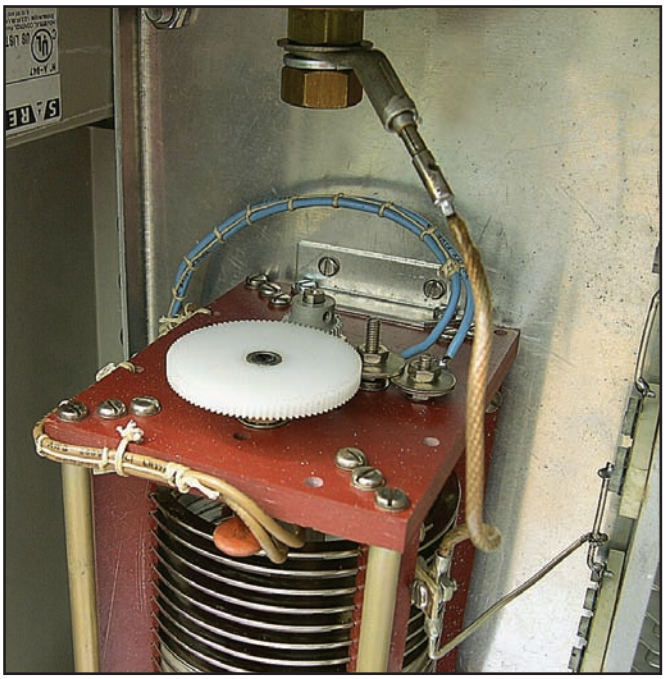


Figure 3 — Detailed view of the integral potentiometer drive on end of inductor assembly.

is shown to select a suitable input capacitance if certain wire lengths require that. The five wire remote control cable leads to a control box in the shack. Figure 2 shows the details of the arrangement in my configuration. The use of different parts may require a somewhat different layout. Figure 3 shows the details of the integral potentiometer. Figure 4 shows a front view of the outside of the weatherproof container while Figure 5 shows the rear with mounting arrangement to fit on a fence post.

Remote Controller

The control box consists of (1) a "Kellogg-switch" (single pole, double-throw with spring-action center off positioning) selecting the direction of the motor, (2) an ohmmeter device that measures the resistance of the potentiometer attached through a gear train to the roller coil's axle for position indicating purposes and finally (3) a switch to control the relay that adds a fixed input capacitance, if needed.

Operation

Tuning the coupler is easy. If the station transmitter or transceiver has an internal tuner, it should be switched off to avoid conflicts. A small amount of RF, just enough to produce a solid reading on the SWR meter, is then applied to the coupler input. A flick of the Kellogg switch to either side starts the motor and turns the combined roller-coil and variable capacitor until the point of lowest SWR is achieved. Eventually, the direction of the motor has to be changed briefly for a final correction of the SWR. If the indication on the ohmmeter is noted, the settings for each band can be quickly approximated before applying RF. The SWR can thus be minimized quite quickly with short flicks of the Kellogg switch.

Grounding

An end-fed antenna system of this sort only works well with a reasonably good ground. This could be several radials of around 60 to 100 feet in length. At the author's installation, a metal fence of approximately 330 feet around the garden does a great job.

Peter Langenegger, HB9PL, was first licensed in 1954. He was a field engineer for Collins Radio Co including an assignment with responsibility for communications during the shooting of Lawrence of Arabia *in Jordan in 1962. He is now Rockwell-Collins' Swiss Sales Representative and an honorary member of the Collins Amateur Radio Club, WØCXX. He has been a DXCC Honor Roll Member #1 since 1982. Peter has held the calls TG9HB, JY2NZK and VP9/HB9PL. He can be reached at Binzstrasse 62, PO Box 321, CH-8712 Staefa, Switzerland, or at* **peter.langenegger@active.ch**.

Figure 4 — Front view of completed unit in weatherproof enclosure.

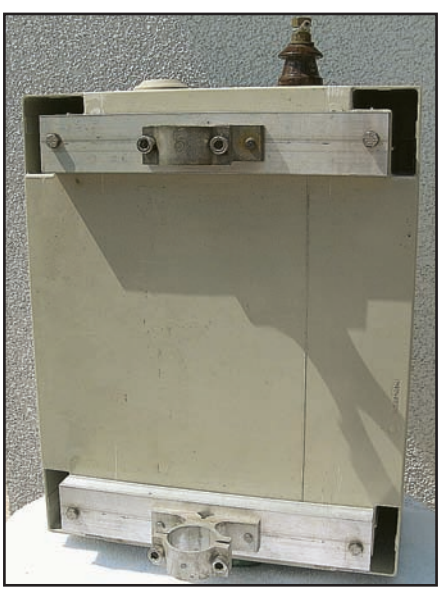


Figure 5 — Rear view of completed tuner showing mounting arrangement.

http://www.conrad.com/Toothed-Belts-168-X-420-Mm-Z-6.htm?websale7=conrad-int&pi=209525&ireusocl=1

http://stores.ebay.fr/iawoo/Shaft-Coupling-/_i.html?rt=nc&_fsub=2224125012&_sid=1019068832&_trksid=p4634.c0.m14&_sop=15&_sc=1

http://stores.ebay.fr/FitPrice/_i.html?_nkw=timing+belt+pulley&LH_TitleDesc=1&submit=Rechercher&_sop=15&_sid=799700493&_sc=1

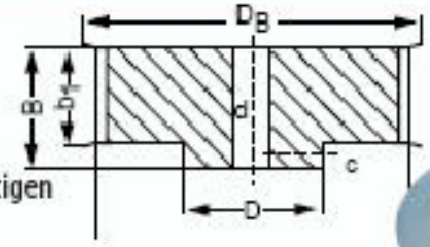
http://stores.ebay.fr/FitPrice/_i.html?_nkw=timing+belt&LH_TitleDesc=1&_sop=15&_sc=1&_sid=799700493

of **Modelcraft**

(0 Reviews)

In stock

Zahnriemenscheiben und Zahnriemen



Zahnriemenscheiben

Material: Aluminium mit beidseitigen Deckscheiben. Zahnteilung 5,08 mm/0,2" (1/5). Abm. in mm. Die Zahnriemenscheiben mit den Größen 40 Z, 52 Z und 60 Z werden ohne Boardscheiben geliefert !

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Best.-Nr.	Zähne	DB	d	D	B	b1	St.€	ab 5 à
22 61 06-WX	10	24	6	9,5	20	14	7.95	6.95
22 60 17-WX	15	28	6	16,0	20	14	8.95	7.95
22 60 33-WX	20	38	8	24,0	22	14	9.95	8.95
22 60 25-WX	25	45	8	27,0	22	14	10.95	9.95
22 60 41-WX	30	54	8	35,0	22	14	12.95	11.95
22 60 42-WX	35	57	8	38,0	25	14	13.95	12.95
22 60 43-WX	40	65	8	45,0	25	14	15.95	14.95
22 60 44-WX	52	84	10	45,0	25	14	16.95	15.95
22 60 45-WX	60	97	10	45,0	25	14	18.95	17.95

Passende Zahnflachriemen nach ISO 5296

Sehr hohe Zugfestigkeit und Biegefähigkeit.

Technische Eigenschaften:

Ölbeständig · Hitzebeständig bis 85 °C und kältebeständig bis -30 °C · Maximal zulässige Drehzahlen 5000 - 10 000 UpM (abhängig von Zahnscheibengröße) · Übertragungsleistungen bis 0,3 kW · Riemenbreite 9,5 mm.

Best.-Nr.	Zähnezahl	Äußerer Umfang mm	St.€	ab 5 à
22 60 50-WX	40	203,0	2.45	1.95
22 60 68-WX	50	254,0	2.75	2.25
22 60 76-WX	65	330,0	2.95	2.45
22 60 84-WX	75	381,0	3.25	2.75
22 60 92-WX	85	431,8	3.45	2.95
22 60 93-WX	95	482,6	3.75	3.25
22 60 94-WX	105	533,4	3.95	3.45
22 60 95-WX	115	584,2	4.25	3.75
22 60 96-WX	130	660,4	4.45	3.95
22 60 97-WX	140	711,2	4.95	4.45
22 60 98-WX	150	762,0	5.25	4.75