40-10 Meter Portable dipole
Phil Salas – AD5X (ad5x@arrl.net)

This 40-10 meter portable antenna uses switches to disconnect sections of the antenna for 20-10 meter operation, and clip-on inductors to extend operation to 30- and 40-meters. An in-line balun takes care of potential feedline unbalance and radiation problems. The balun consists of an FT114-43 ferrite core wrapped with 10-turns of RG-174 coax as shown in Figure 1, and mounted with an input RCA-style phono jack and #6 stainless steel hardware into a 2.36" x 1.38" x 0.8" mini-plastic box as shown in Figures 2. A crossover winding puts the input and output ends of the coax on opposite sides of the ferrite core so the balun easily fits into the plastic box. A ¼-watt 10K metal film resistor is placed across the RCA connector to keep any static off the feedline. Holes are drilled in the bottom of the box for a nylon cord loop to support the assembly as shown in Figures 3 and 4.

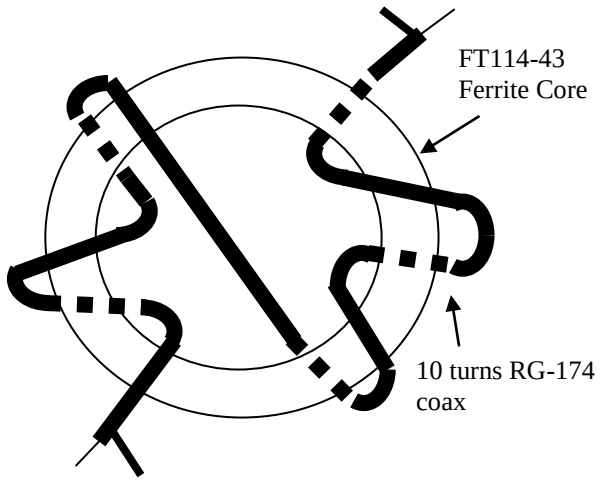

Figure 1: Balun Winding Details
5 Turns/Side (Not all turns shown)

Figure 2: Balun mounted in plastic box

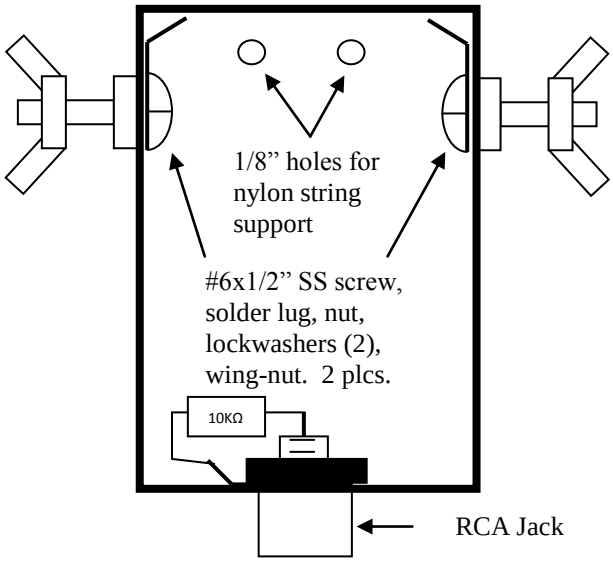

Figure 3: Balun/Center Support Box Details

Figure 4: Nylon support string

The multi-band antenna is a full-sized 20-meter dipole using 22 gauge stranded insulated wire. It is subdivided into switched sections to support the 20-, 17-, 15-, 12-, and 10-meter bands. Starting dipole lengths were based on the standard dipole formula:

L (feet) = 468/Freq (MHz)

This formula ensures the wires are a little long when using insulated wire. For the outer end-insulators, overlap one end of a 12-inch piece of nylon cord with the outside end of the 20-meter wire section and slide a 1-inch nylon spacer over the joint. Then fill the nylon spacer with hot glue or epoxy (see Figure 5).

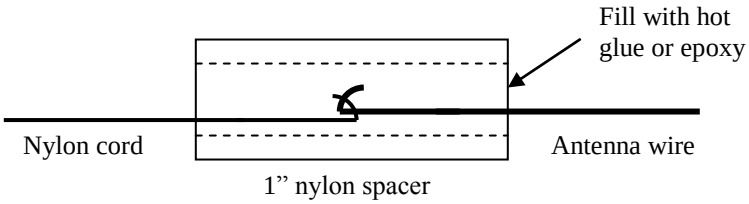

Figure 5: End insulator assembly details

The nylon cord can be used to tie off the ends of the dipole for supporting the antenna. Use a match to cut the nylon cord and fuse the ends of the cord so there is no unraveling. Spade lugs (#6) are soldered onto the inner ends of the 10-meter sections. These spade lugs attach to the feedpoint/balun using #6 wing-nuts. Tack-solder all the wire sections to the switches and hang the dipole where you can easily get to it for tuning purposes.

To tune the antenna, open all switches and adjust the two inner wire sections for lowest SWR on 10 meters using an antenna analyzer. Unsolder the wires on the switch ends and shorten them as necessary. Use the following equation to determine the correct length:

Correct Length = Current Length x (Frequency of low SWR/Desired Frequency)

Next switch in the 12-meter sections and adjust these sections for resonance. Continue this procedure for the 15, 17, and 20-meter bands. Once the final lengths are determined, thread the wires through the switch mounting holes as shown in Figure 6 to give strain relief to the switch terminals.

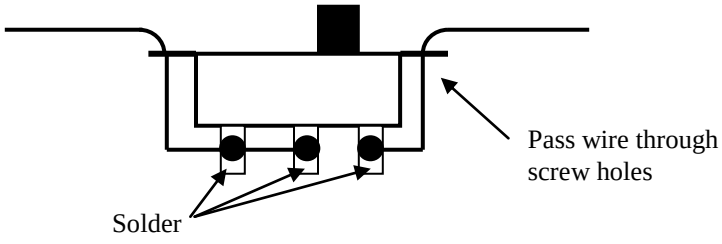

Figure 6: Switch Wiring

The CW-favored end-to-end wire lengths I wound up with are shown in Figure 7. A dab of epoxy on the holes will fix the wires in place and keep the insulation from wearing over time.

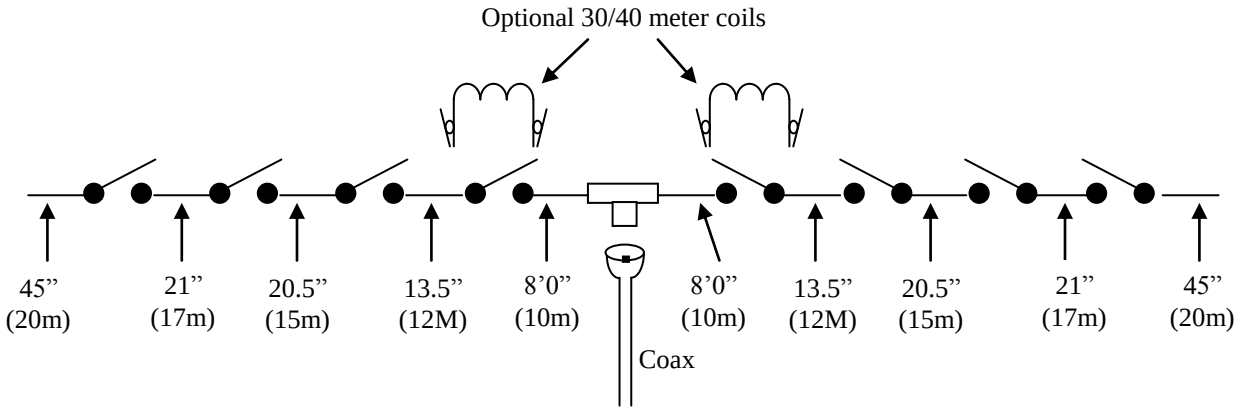

Figure 7: 40-10 meter Switched Dipole

While the SWR will move around due to your portable locations, most of today’s rigs can put out full power into a 2:1 SWR. The important thing is that the antenna is close to resonance. This ensures you won’t suffer noticeable inefficiencies do to coax losses. The internal tuner in my KX3 easily handles any SWR variations.

My next goal was to add 30- and 40-meter capability, yet not exceed the length of the 20-meter dipole. This keeps the antenna compact, and is also a good length for a condo balcony installation. I achieved this by adding loading coils across the 10-meter switches. The 30-meter coils consist of 6.5-uHy inductors (20T #20 enamel wire on T106-2 torroid cores), and the 40-meter coils consists of 18.5-uHy inductors (36 T #20 enamel wire on T106-2 cores). A small dab of epoxy or hot glue keeps the turns in place. Alligator clips on the torroid wire leads clip the inductors across the 10-meter switch contacts (the 10-meter switches are open and all other switches are closed). A 12” strand of nylon cord is wrapped through each torroid to support the torroid on the antenna should the clip leads come loose in the wind. Figure 8 shows one 30 meter coil in place.

Figure 8: One 30 meter coil clipped across one 10 meter open switch

Unless you are lucky, the SWR won’t be perfectly centered, so adjust the turns spacing a little to center the SWR. The SWR on 30- and 40-meters will probably exceed 2:1 at

resonance since the antenna is physically short on these bands. But again, my KX3 tuner takes care of any problems.

For the portable feedline, I used 15- and 25-foot sections of RG-174 coax terminated in male phono connectors. A female-to-female phono coupler joins them for a 40-foot feedline if necessary. RG-174 coax is OK for 100 watt rigs if the SWR isn't too high, which is the case since this antenna is close-to-resonant on all bands. And phono connectors work just fine at HF. Figures 9 and 10 show some details of the antenna and feed mounted and in-use on the 15th floor balcony of our condo during our vacation on Mustang Island, Texas (IOTA NA092). The antenna is set-up in an "M" configuration – i.e. the feed mounts on the balcony at the center. The antenna wires go up to the balcony corners and then drop straight down. Man – what a great portable location this is!! Figure 11 shows my KX3 station in the condo.

Figure 9: One side of dipole

Figure 10: Dipole feed assembly

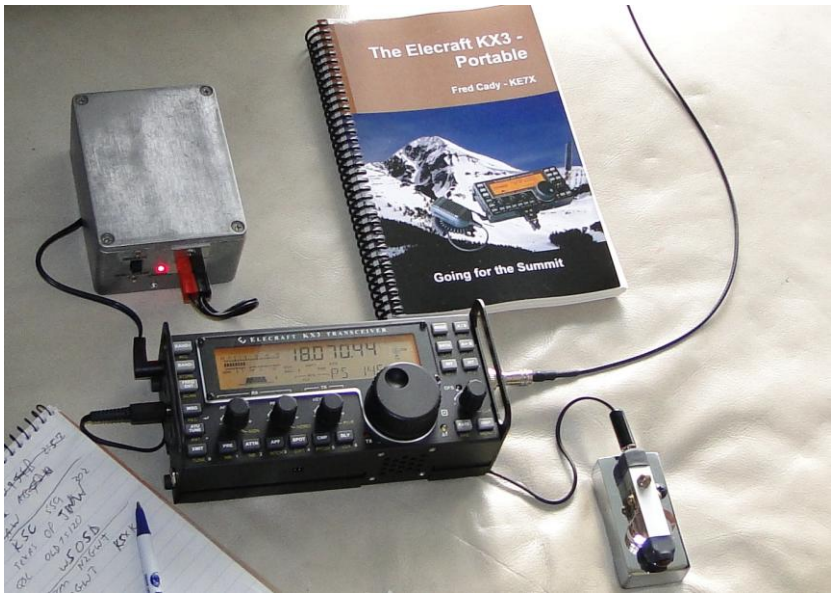

Figure 11: KX3 portable set-up on chair in condo

Dipole/balun Parts List (www.mouser.com, www.cwsbytemark.com, www.allelectronics.com)

QTY	Description	Source/Part Number
8	DPDT slide switches	Mouser 10SM002
1	Phono jack	Mouser 161-1053
1	2.35”x1.38”x0.8” ABS case	Mouser 546-1551HBK
2 or 4	Shielded phono plug	Mouser 172-RPA1005-E
1	phono plug coupler	Mouser 601-19-1702
2	#6 lockwasher solder lugs	Mouser 534-914
8	7/8” alligator clips	Mouser 835-501793
1	10K ¼-watt resistor	Mouser 271-10K-RC
1	FT114-43 ferrite core	CWS Bytemark F-114-43
4	T106-2 powdered Iron core	CWS Bytemark T106-2
35 ft	#22 insulated stranded wire	AllElectronics 22GY-100
2	1” nylon spacer	AllElectronics SP-213
3 ft	#20 enameled wire	AllElectronics MW-20-4
40 ft	RG-174 coax	AllElectronics RG-174
2	#6 spade lug	AllElectronics SL-218
2	SS #6 x ½” screw	Local hardware store
4	SS #6 split lockwasher	Local hardware store
2	SS #6 nut	Local hardware store
2	SS #6 wing-nut	Local hardware store
	Nylon cord	Local hardware store

Conclusion

This article describes a simple and effective 40-10 meter portable dipole. It is compact and inexpensive as well. So get out of the house and have fun operating HF portable!