

Unfortunately the entire document was mailed to DLISWN in the form of photocopies (low resolution jpeg files for each page, whole 29 Mbytes). So we've had to transform it into TIF files of higher resolution, readable by the OCR program FineReader (ABBYY, Moscow). FineReader reads fine – didn't it? Nevertheless we beg your pardon for remaining bugs, resulting from our technology. But we are lazy dogs and prefer drinking beer instead of typing the text. Do not search the figure 8, obviously it isn't needed and wasn't mailed!

The Screwdriver antenna
by *Curly K7HRW*

December 30, 2000

Some ideas and observations, after winding two coils, rebuilding one of Don's W6AAQ units, And building one of my own. . . .

I believe the present instructions showed schedule #40 PVC. They are now using schedule #80 for the coil base. As you can see if one has a lathe or access to one, making the coil is rather simple. I did not have access to a lathe to groove the form. I located some plastic pipe, two inches in diameter. I wound the coil on the surface of the tube. First cutting it to the length I wanted. Drilling the starting hole at the top for the coil wire. I have wound two, one with #14 and one with #16. I prefer the #14 for a better "Q". I first sprayed the coil form with some 3M spray on quick drying glue. While the glue was still slightly tacky, I started winding the coil. I spaced the wire with 50 thousandths thick monofilament weed eater material. It takes close to 75 feet of both materials to make the coil. I spliced the monofilament by drilling a very small hole, inserting both ends, epoxying the unit with quick drying epoxy. My method for winding was my battery operated Bar B Que rotisserie turner, modified to rotate clockwise, as that suited me better than counter clockwise. I used two small plastic or rubber balls that I could compress on a quarter inch shaft, inserted into the inside of the coil form. The other end of the form was slipped over a piece of tubing that was held in place by a vise. Fortunately I had an AC adapter that plugged into the AC outlet and provided 6V D.C, that ran the unit very well. I rewired the rotator to accept my radio station (Radio Shack) foot switch, that I use for PTT. One should be able to control the turning and winding of the coil, especially if you are working by yourself.

I used a different method for making the RF path contact at the top of the main 2" tube. You can see that in order to resonate at the different frequencies, a method is needed to short out the top of the tube to the coil. There have been several variations for doing this. I'm sure there are many people out there with many very good various ideas on how to accomplish this. My method was to cut, grind or saw, however you see fit, and put four small slits in the aluminum or copper tubing, one at each corner, opposing each other. North, South, East and West, if you will. These are about 3/8" to 1/2" down from the top and should not be wider than about a quarter or five sixteenths of an inch long. If you can find stainless steel, it's the best. I had to use brass shim stock. Thirteen thousandths, up to 18 thousandths will work. Cut them long enough to slip through the slit from the outside, and bring enough up through the inside of the tube, over the top and back to the outside. Leave some slack on the inside, as the coil slides inside, these units will hold the coil very snug and provide good contact. Over here we have the black ABS plastic plumbing pipe and one of the sizes has an exact 2" ID. Cutting a piece 1" wide, makes an excellent pressure type collar that slips over the four contacts without any glue or other substance to hold them in place.

One of the dictating areas for building one of these antennas, is what are the materials available in your area. Bearing in mind, that those of us are here in the US, and have all the aforementioned materials. The 2" aluminum tubing comes from farmers-ranchers pipe used for irrigation. Some have made these antennas with 2" ID copper pipe. Mine is made of some old

surplus Aluminum tubing 2-3/8", which lends itself nicely to my method of winding a coil on 2" plastic material. I would imagine, the first big challenge is gathering up the necessary material. Probably would be a great Radio Club project. Many more folks would know of available resources. The cordless screwdriver motors are naturally a very important part of this unit. I have converted two different kinds. The Skil that Don talks about in his instructions and the Black and Decker. These were both older units, I found in various flea markets. Some of the older units, they quit making replacement batteries for and you can buy them very reasonable. I'm not sure just how much mailing would cost to send three to six pounds of material to your QTH. I like the Skil unit much better. You can replace the small 2.6v motor with a Radio Shack unit that operates off of 12v D.C. Again, I'm not sure what voltage you folks have to deal with, etc. Some users of the antenna with the dropping resistors, have had a problem with burning up the small motor -- I don't have any details.

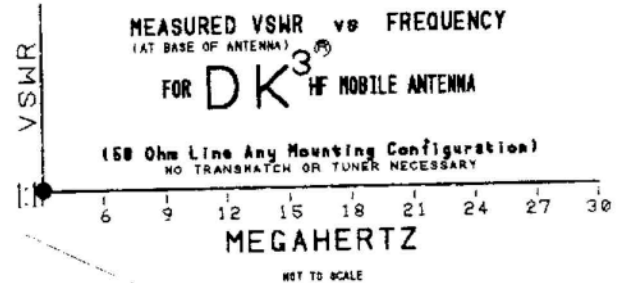
I can only say, that this type mobile antenna has taken ham mobileers by storm. We have many Ham operators that are eighteen wheel truck drivers and is used coast to coast with very good success. Many run small solid state amplifiers, 300 to 500 watts, and produce a very big signal on all the bands. When Don Johnson, W6AAQ first came out with this concept, it was to provide all amateurs with a means and the idea to build their own mobile system. He had developed other antennas over the years, and has always made the construction secrets available for the asking.....If I can think of other short cuts and/or ideas, I will jot them down.

Curly

Big DK³

by W6AAQ DK (Don) Johnson, Box 595, Esparto CA 95627-0595

WOW! Think about this: — *spend about a kilo-buck for an all band transceiver ... with zillions of automatic this-n -that buttons splattered all over the front panel.. then while mobile, to QSY, do you have to send the spouse out on the turtle back to either change antennas or re-resonate the one you're using ?!*



ARE YOU USING A DUMMY LOAD ON A STICK?

It will soon be twenty years that many of my HP mobileering friends have been band-hopping, operating from band-edge to band-edge without even lifting their foot off the accelerator. I started out with a home brew no nonsense multi-band antenna — Bruce Brown, W6TWW^{SK}, designed a companion mobile automatic antenna matcher that could be assembled for less \$ than most dinners for two. Brown's matcher/resonator is mounted either inside an enlarged antenna mount or within very few inches of the mount. Scores of HF Mobileers have been using this new Big DK³ for several years, -some with Brown's matcher and others with their own. They are challenging all coiners to field strength duels —barefooted-- Their motto is: *When you come up with more field strength while hopping from band to band in seconds, we are going to be the first to steal your thunder. See NOTES 1, 2, 2, 4*

ANTENNA DESCRIPTION

This antenna has withstood the rigors of snow and ice in Alaska and furnace like heat in Arizona. Now in use at some Military and Gov't installations, MARS - CAP - RACES. Mobile home and Motor home owners have been operating the antenna mounted horizontally very successfully as well as vertical. Some are strapped to chimneys at fixed stations. We have received pictures where two Big DK³ have been mounted butt-to-butt horizontally as a dipole. The dipole configuration does not require any matching, tuner or otherwise — Absolutely flat on every frequency from 3.5 to 30 MHz .. Does not require grounding or radials. As a dipole, the 75 meter overall length is only 19 feet which installs very nicely on most RV's.

Don't worry about GDOs, SWR or Noise Bridges; neither winding the exact number of turns on the coil or the exact length of top whip is NOT critical. Once assembled, the antenna will be operational within minutes — you don't have to get out and “tweak” the top whip or move jumpers, taps or shorting bars. When the feed point impedance has been properly matched to the feed line, just turn on the rig and start transmitting. Move around from band to band — band edge to band edge — the antenna is always resonant and flat.

The antenna is designed with a motor driven center loading coil; the coil slides up and down inside a thin-wall pipe as you move down and up in frequency. As the lower turns disappear into the lower mast they become an integral part of that mast. NO! - there are NO shorted turns — they are not *turns* anymore ... All you no-code extras, go ahead and argue - If you say that there *are* ... you are wrong! Why did I inject this into this piece? Well, guess who we have had to prove this to! With the coil fully extended, the antenna resonates on the lowest frequency — let's say 3800 kHz (or 3500 if you wish) .. as the coil descends into the pipe, the antenna resonates higher and higher in frequency ..

The antenna will resonate at any frequency from 3.5 right up to 30MHz *without leaving the drivers seat!* An interesting freebie on this motor driven configuration is that no limit switches are necessary when either the upper or lower travel limit is reached, — if, by accident, the drive screw bottoms out, the entire coil will start to rotate until motor is shut off or the direction is reversed.

When the coil is completely submerged into the tube, the top whip length can be adjusted to resonate the antenna for 10 meters. This is truly a full coverage antenna .. particularly to get into MARS or do some SWLing in the short wave bands. If you are an amateur with communications duties on general service frequencies you may be able to slip into the ham bands between other schedules. No attempt was made to design a 160 meter model, however, we have heard reports of some who have done the 160 mod ... I have no details (1 Nov 92).

Endless frills can be added to the installation. Automatic position indicators — (bar magnets work thru aluminum, brass or copper pipe [tubing]) — Position seeking selector switches; automatic positioning when the band switch on the transceiver is changed ... and more. Automatic voice-controlled resonating with the W6TWW Mobile Tennamatic is also being used with many of the Big DK³s. Some of those units were built as far back as 1974 and have followed the procession of Big DK antenna series. NOTES 2, 3, 4, 7. Weather proofing is as simple as picking up a free plastic "beef jerky" tube at your corner convenience market.

PARTS PROCUREMENT see Parts List

Every part for the antenna can be found at the same do-it-yourself home center -- one trip through one checkout counter! However, you may improvise with parts you have on hand; you do not have to duplicate the procedure exactly as shown here ... no doubt with your own ideas, spawned by looking over this assembly, you may make worthwhile improvements.

DRIVE MOTOR **Part H**

After spending a few C-notes trying various drive motors, the solution was laying on our workbench all the time! All the antennas that have been assembled since early 1991 utilize the SKIL Twist Model 2105 or the *True Value* MASTER Mechanic Model 8521 Cordless Screwdrivers. The only modification necessary to operate on 12 volts DC is to remove the 2.4 volt nicad battery stick and switch; a 5 ohm, 10 to 20 watt, WW resistor is installed in the vacated battery cavity. Both screwdriver models are identical and have been found priced all the way from \$8.99 to \$25.00 (1992) — so do a little shopping. Here again some feedback has been received — one group of amateurs had access to some stepping motors ... they are programmed where the antenna moves automatically with the transceiver dial. That is real sophistication and certainly beyond this paper.

LOADING COIL DISCUSSION **Part C**

The loading coil is not too shabby either - Q in the 200s. The coil is wound on Schedule 40 PVC pipe (white). Endless methods of winding this coil has been reported. The OD of the Sked 40 PVC all seem to hold pretty close, so there's no problem there. The ID of the lower mast section varies considerably with the type and material and the manufacturer. Brass Escutcheon Pipe is my favorite — however, brass is quite expensive and how much can you spend is determined by the individual. The next great pipe with perfect fit is decorative brass railing found at most 'home-centers' but it is thick walled and very heavy. Numerous builders have used 2" copper pipe and the price varies with the degree of daylight, (or moonlight?) The ID of the copper pipe is a bit greater than needed but the smarter builders have used correct size plastic spray can lids as bushings. Using the copper pipe and the bushings require no special tools or preparation of the PVC form to wind the coil. In our area 2" aluminum irrigation pipe is plentiful — from nothing to about 0.50¢ a foot. Some .. not all.. irrigation pipe is just a bit too small to accept the PVC coil form. So the entire length of the PVC has to be reduced plus cutting the 10 TPI grooves in the winding area. Oh, don't throw up your hands and say that is beyond the average amateur! The real easy way is of course — line up a lathe. That lathe may

not be as far away as you think. At our monthly breakfasts we have several retired machinists who help out fellow hams. The vocational classes at the city college; Clubs and individuals continue to report great success with vocational shop teachers assigning the project to students. — do a little leg work.

Let me tell you about one really dedicated and ingenious radio amateur:- As a long haul truck driver he has to take forced rest periods. To prepare his PVC coil form he used these rest periods to dress the PVC coil form with sand paper and the grooves for the 10TPI were prepared with a pen knife. Recently I received a *terrible* letter from the **ARRL** (and I am a Life Member). "..... *this project..... appears too complex for most readers. ...* " That statement can be translated into "*most hams are dumb and only want to be entertained*". Insulting! Why, we have had Junior High School shop build this antenna and **none** of the students, nor instructor, were hams.

THE MAIN ANTENNA MAST **Figure 3**

Although being redundant — here it comes again: The lower antenna mast material can be Aluminum Irrigation Pipe, thin-wall Copper Pipe or thin-wall Brass Pipe. The brass pipe can be located as decorative coverings for plumbing fixtures, hand railings etc. We located ours at a pipe supplier that specializes in all types of pipe and tubing. The irrigation pipe and copper pipe are common items.

Although a number of antennas were made using the brass tubing, it was found that the aluminum irrigation pipe was cheaper by a factor of at least ten. Needless to say, the last several score antennas are all made with the aluminum pipe. Salvage lengths may be bummed from sympathetic farmers. A little steel wool and elbow grease makes it look pretty presentable .. We paint some to match the vehicle.

As indicated above, the inside diameter of the aluminum and brass tubing may vary by several thousandths so it is advisable to verify the ID before turning down the internal antenna parts. Some 2" irrigation pipe was found where the ID was enough to permit inserting the 1½" PVC blank form as it came off the pipe rack — for that reason it has been found helpful to take the PVC blank coil form out to the pipe pile and rummage around.

COIL ELECTRICAL CONTACT Finger stock **Figure 6**

Although the coil turns are eliminated as they go into the pipe mast, integrity is assured by installing finger-stock at the top end of the lower mast section. Finger stock is a common item found on much electrical equipment - it comes in various sizes. Several parts catalogs show

finger stock in stock. NOTES 5 & 12 & 13

We have been shown finger stock fabricated from regular 0.005" auto parts brass shim stock. It took no more than a little imagination and a pair of household shears. Manicure the shim stock into shape and secure it to the pipe. A valid part number at NAPA auto parts counter is Victor No. 9014. If your home-brewed finger stock does not seem to have sufficient tension to satisfy you, a small diameter spring can be placed around the outside .. no doubt rubber bands would work after a fashion. However, commercial finger stock is obviously preferable and extra tension is not required.

Of course it is a little difficult to solder copper or brass to an aluminum pipe. The commercial or home-made finger stock can be soldered to a half inch wide strip of brass shim stock — punch holes in the shim stock and attach it to the mast by drilling and tapping for small screws. Oxidation could be a problem in time but as long as you are aware of it, proper preventive maintenance will avoid trouble.

Another advantage of the tension from the finger stock is that no key-way is necessary to keep the coil from rotating as the all-thread drive rod spins; unless, like I say, you goof and let it bottom out - up or down.

Multicore Solders, Westbury NY 11590 (516) 334 7450, have a solder that will solder aluminum. Alu-Sol^R 45 D, Soldering Temp 600-700°F. Available in gauges 14,16,18,20,22. Can be used on Aluminum, brass, copper, tin-plate, nickel, steel. I do not use it.

— NOW GET OUT THE PARTS PICTORIAL ON PAGE 19 AND FOLLOW ALONG —

ANTENNA MAST BOTTOM CONNECTION **K,L,M**

Although simple, this has been an area with a lot of suggestions. Depending on the material and tooling on hand, no doubt many methods may be devised — go for it.

Definitely DO NOT use a spring base mount. DO NOT worry about the apparent hugeness of the antenna — The lower mast is only an eighth of an inch larger than one current commercial unit. The wind loading is less than many of the popular bug catchers. AND - remember, in addition to having outstanding field strength - the absolute advantage of the Big DK³ is ALL the HF bands, *band edge to band edge, can be operated without stepping outside the vehicle*

PREPARING THE COIL FORM **Part C**

Figure 1. A 22 inch piece of 1½" schedule 40 PVC pipe is used for the all band coil form. The PVC pipe will slide up and down freely inside most of the brass tubing we have procured. It is more likely to find the aluminum irrigation pipe slightly undersize. If the ID is too small, The PVC diameter will have to be reduced to allow about 0.050" clearance all around for the entire length. See previous LOADING COIL DISCUSSION.

The coil is wound with $150 \pm$ turns of #16 solid, tinned or silver plated, copper wire (buss wire) spaced 10 turns per inch. Do not use larger sized wire at 10 TPI — the Q will go to pot. Excellent wire source - any quantity: 1-800-727-WIRE . Some coils have been wound with #16 bare copper house grounding wire. A Yuma AZ station is using aluminum welding wire from his heli-arc spool. Also there are various types of phosphor-bronze spooled welding wire. 0.045 is a good size to play around with. Don't be afraid to experiment.

To allow for clearance when the coil is wound; starting about ¾" from the top of the form, an additional 0.030" of material is removed in the 15" winding area. Be sure to study Figure 1. to determine the proper area to size. Next, cut 0.030" deep threaded grooves - ten per inch - to accept the bare #16 buss wire (or whatever you wind up using). The radius of the groove should be about the same radius as the wire.

Use a size #36 drill or smaller and drill holes through the coil form at the beginning and end (top and bottom) of the wire grooves. Drill two more holes below the winding area — used to secure the lower end of the coil wire. See Figure 1 *Do not wind the coil yet.*

PREPPING FOR THE TOP OF COIL

Figure 1, Parts A & B: The top of the coil has to be prepared for a 5 to 6 ft stiff upper whip. Chase the 1/8" NPT threads in the ½" to 1/8" brass pipe bushing, **Part A**, with a regular machine screw 3/8s by 24 tap. Into the side of one of the hex-flats, drill and tap a 6-32 hole ... the top coil wire will be secured there later. Screw the brass bushing into the 1 ¼" slip to ½"NPT PVC bushing. **Part B**

Reduce the slip area (sandpaper-file-lathe) of the PVC bushing so it will fit snugly inside the top of the 1½ PVC coil form. Also slightly reduce the hex-area of the PVC bushing where it will just slide thru the lower mast section. Later the completed coil and drive assembly will be shoved up thru the mast from the bottom. At the top of the PVC bushing, drill a small hole downward for the coil wire in the area of the 6-32 screw hole. This completes the prep for **assembly A/B**

PREPPING FOR THE BOTTOM OF COIL

Figure 1, Part E; 1" slip PVC pipe cap. Drill a 3/8" hole in the center of the cap. Suggest using a Uni-bit or Cobra-bit for clean perfectly round hole.

Part F: 1/4 - 20 KNIFE-THREAD WOOD INSERT for wood, particle board, plastic. A

RENSER PRODUCT item found in most home-center super markets in the cabinet or wood working area. Orchard Hardware in California.

This insert is force-threaded into the 3/8s hole drilled into the PVC pipe cap E. Use a short piece of 1/4 x 20 all-thread with a jam~nut — use as an insertion tool. If a lathe is not available, run the insert into the cap as straight as you can by hand — if it appears to be crooked, carefully heat the cap near the insert, straighten and keep in line until PVC cools. It will be found that the coarse outside threads bind so tightly in the cap there's no danger of it coming out. This completes assembly E\F. During final assembly, the 1/4 x 20 all thread, G will be screwed into the insert.

In the event the Wood Insert cannot be located, pick up a 1/4 brass pipe plug, (auto parts) and drill and tap it for 1/4 x 20, The plug will screw into a 1/2" hole in the pipe cap — strange eh? - but true.

ANTENNA DRIVE MOTOR Part H

Cordless screwdriver preparation. Three screws free the top motor case for removal. Carefully tilt off the top half of the case, starting from the front end — business end. Here's where you have to be careful; snap rubber bands around the motor and gear case so the parts won't fall out while you're working on it. Remove the battery pack and switch by merely picking up the battery from the far end and pull out ... this will not be used with this antenna.

Install three 0.01, or larger, disc caps; one across the motor terminals and one from each motor terminal to the motor frame. The motor frame will tin nicely when a bit of the cad is scraped off. Study Figure 5. for the following paragraph.

From one motor terminal, where there are already 2 capacitor leads inserted, connect a 5 ohm - 10 to 20 watt - resistor. The two 12 volt power leads, from the motor to the control box DPDT switch; connect one to the free end of the resistor and the other to the opposite motor terminal. For starters, make the power leads about 12" long; shielded wire not necessary — solder all the connections on the motor terminals and the dropping resistor. Drill a small hole in the end of the handle and pass the wires thru. The rubber bands can now be removed and the top motor case replaced. Both the SKIL Twist and the MASTER Mechanic screwdriver housings are held together with 3 screws. Do not replace the single screw in the middle of the handle toward the motor; at this screw hole, drill completely through the case/handle with a #28 drill ... later, when the motor assembly is dropped into the 5 1/2" piece

of PVC, Figure 2. A 1-7/8" long pin is pushed through the hole to secure the motor in the PVC pipe. I use a piece of 1/8th" brazing rod. About an 1/8 of an inch in from the open end of the motor bit\chuck, drill a #36 hole to accept a cotter pin. The all-thread drive rod will be pinned in the motor chuck during assembly.

Mid 1992 we received some reports of the motor power leads causing trouble on 17 meters. To correct this, operators recommend that the leads be brought out at the very bottom of the antenna. Install a Molex connector (Radio Shack) close to the antenna. Then near the Molex plug male that comes from the control box, wind about ten turns or more of the power cord thru a toroid to decouple possible RF feedback. Amidon T 94-2 cores are working ok. The drive motor prepping is now complete.

MOTOR SUPPORT

Figure 1, Part J: Select, and if necessary, size the OD of the 5 1/2" piece of PVC. Measure down 5/16" from the top end, and with a #28 drill bit, drill through both sides. Drop the screwdriver assembly into this PVC until it bottoms on the shoulder (don't forget the motor power leads) push the 1-7/8" screw\pin through these holes and the middle hole that was drilled in the screwdriver handle. It is not necessary to put a nut on the screw/pin or insulate it

BASE MOUNT ADAPTER

Figure 1, PARTS K, L, M: Later, assembly K L M will be secured in the bottom end of the antenna mast. Part M drops right over the solid stud mount explained in the next section.

Insert the 2 1/2" piece of Type M copper pipe, M into the 3/4" copper pipe adapter L, secure firmly by sweat soldering.

Screw the L\M assembly into the 1 1/2 PVC bushing, K. Now K L M is one assembly. Assembly K L M is complete and just wait awhile, we have some more sub assemblies to do.

One group thrashed all this nonsense and just dropped the lower mast into a short piece of 2" Sked 40 PVC which was attached to the vehicle with hose or saddle muffler clamps. Pretty smart—huh! I like it.

VEHICLE ANTENNA MOUNT **Figure 7**

For nearly 40 years all our antenna base-mounts sport a 3" long brass stud screwed onto the standard antenna mount. The 3/4" copper base adapter, part M, sets right over the stud when you mount the antenna on the vehicle. This makes for a very quick disconnect, especially trying for a quick dismount in the rain at a motel archway. The stud is machined with a slight taper; when the copper pipe base section slips over the top there is no problem with a poor

connection, either mechanically or electrically. The top and bottom of this stud is drilled and tapped 3/8s x 24 so it will still receive one of the standard “old fashioned” antennas.

WINDING THE COIL

Winding the coil is now a breeze. Use bare solid #16 buss wire .. tinned or silver plated. If your lathe operator is experienced, let that person spin the 150 turns on. If your welcome does not extend that far, here's how to do it by hand: From the outside of the coil form, insert the coil wire through the top hole - then thru the previously prepared top bushing and fasten to the 6-32 screw in the brass bushing. Now, insert the coil top assembly **A/B** into the top of the coil form -- drive it in tight to the shoulder that was left on the bushing when it was sized.

Secure the far end of the 75 foot coil wire in a vise or other sturdy device - walk out to the end of the wire, be sure to remove any kinks or loops, then pull it tight and start winding. Position the form so the wire comes up over the top toward you .. with right-hand threads (grooves) this will place the upper end of the coil form on your right and winding will be from right to left. ...you will feel the wire snap down into the grooves. Don't let the turns get away from you, if necessary, the windings can temporarily be held in place with some electrical tape until you get the bottom end secured. Thread the lower end of the coil wire thru the lower three holes. Where the wire is tied off in the bottom two holes, to maintain clearance inside the mast, it may be necessary to apply a little heat with the soldering iron tip to push the wire into the softening PVC — *careful!* Oh! it is a good idea to turn off the blasted telephone bells and instruct the spouse not to let anyone bother you until the coil is complete!

If you do not have to cut threads or grooves for your coil wire, the correct spacing can be accomplished by winding the wire side by side with nylon fishing line or weed-eater cord. The #16 wire is about 50.8 mils in diameter so spacing the turns one diameter will be close enough to 10 turns per inch ... use spacing line that has the same approximate diameter. The slick trick is to connect the wire and hold the coil form as explained in the above paragraph — the wire fed over the top of the coil. Tie 75 ft of the nylon line to a weight .. I use a 12" crescent wrench .. carry this weight out behind you so the free end of the line will just reach the coil form. Let's review this — The free end of the coil wire is secured in the vise 75' in front of you. The weight tied to the nylon line is laying on the deck 75' behind you — You and the coil form are in the middle of this 150' stretch of property. Bring the free end of the nylon line between your legs and up UNDER the coil form, attach it firmly to the beginning\first winding. Now as the top of the coil form is turned toward you, you and the coil will be heading toward the vise. The weight will keep the nylon line taut as it creeps up behind you. By the

time your coil form is full, you, the coil and the weighted end of the nylon line will all end up pretty close together. Leave the wire-spacing line in place, secure both ends of the wire and line. To keep the nylon line in place, dab two or three narrow bands of fiberglass resin the full length of the winding ... Let it set up. The entire circumference of the winding **must** not be covered due to the fact the finger stock must make electrical contact with the winding at any turn.

FINGER STOCK Figure 6

Position and secure the finger-stock on the 2" mast section. One method is suggested in the section, COIL ELECTRICAL CONTACT PAGE 5

ANTENNA ASSEMBLY

All the sub-assemblies are now complete and they are ready to connect together as shown in Figure 2

Screw a couple of inches of the 20" long all-thread, G, into assembly E/F. Cut off about a 1" piece of someone's small air hose — with a flat washer on each end of the air hose, pop these parts over the upper end of the all thread ... then install the cap nut (or jam-nuts) D firmly onto the top end of the all-thread drive rod. This will prevent the coil from shooting out to the moon if the UP switch is accidentally held on too long. It is advantageous to coat the all thread very lightly with Anti-Seize Compound **NAPA No. 765-1151**. Last step here — spin the cap assembly up the rod until it is stopped by the hose/washer assembly.

Push, or drive, the PVC cap into the bottom of the coil form. It is suggested that PVC glue not be used on these connections ... if there is any doubt about the cap coming out, drill and tap and insert a headless set screw.

Before installing the all-thread into the screwdriver chuck, make another air hose\washer assembly and slide over the lower end of this drive rod. Position the top of this assembly 15" below the lower end of the pipe cap assembly E,F - now install a couple of jam nuts below the hose\washers. When the jam-nuts are secured, run about 6" of the all-thread up into the coil form.

Place the lower end of the all-thread into the cordless screwdriver chuck, drill thru the previously drilled holes in the chuck and thru the all-thread ... secure with a cotter pin.

Lay the lower mast on the work table and from the bottom, shove the entire - Figure 2 - assembly inside until the PVC motor mount part J is about 1/2" inside the lower mast section. The coil should be sticking out of the upper end of the pipe, past the finger stock,

Next, shove in the assembly K L until the shoulder of the PVC bushing is tight up against the lower end of the mast. Now before doing anything else, --- > about 3" inches up from the bottom of the mast, drill and tap a 6-32 hole thru the mast and into the inside PVC J — insert a 1/2 long inch screw. This screw holds the entire inside assembly in place from now on.. Around the bottom of the metal mast, drill and tap 3 holes spaced 120°, -- insert screws thru the mast and into the copper adapter Part L.

Be absolutely sure that there is electrical continuity between the 2" main mast and the piece of 3/4" copper pipe that is going to fit over the antenna mount stud. We have seen some installations that had jumpers installed between the bottom mast and copper pipe ... play it by ear.

This completes the antenna assembly To check out mechanically, apply 12V DC to the motor power leads, alternately reversing polarity, to observe the coil moving up and down.

TOP WHIP

Chart I shows the approximate coil position for the various bands when using a 66" top whip. —(surplus CHP)— If you are a little jumpy about the over all length, do this: Run the coil way up until just the bottom two turns of the coil are contacting the finger stock. Now trim off the top whip a bit at a time until you reach the lowest part of the 75\80 meter band that you plan to operate. A number of the hams that do not use 10 meters are using the longer stainless steel CB whips for the top section. Then instead of cutting off the whip, lower the coil position. position.

ANTENNA MATCHING

Do not, under any circumstances, attempt to operate, this all band antenna without proper impedance matching at the antenna base. HF Mobile antenna matching is covered in the ARRL publications: ARRL Handbook; ARRL Antenna Book; ARRL Antenna Compendium- Vols I & II & III and very explicit in Maxwell's book REFLECTIONS⁸. One of the best explanations is contained in an April 1981 QST article by Andrew Pfeiffer, K1KLO NOTE 10 THIS SHOULD BE REQUIRED READING FOR ALL MOBILEERS!

As with any good HF Mobile antenna, the base impedance is much less than 50 ohms — the lowest on 75M -- higher on the higher bands. Also the better the antenna - the lower the base impedance. Install a switchable/adjustable impedance matching network at the very base of the antenna which can be selected when changing bands. For real convenience, wires can be picked up from the transceiver band switch to do this automatically.

BARE BONES BASE MATCHING DEVICE

A very practical, simple and effective matching device is shown in Figure 10 on the separate supplemental cover sheet titled CONTINUOUS COVERAGE HF MOBILE ANTENNA The matching unit can even be mounted *inside* the antenna; inside the base or in a small box as shown in Figure 10

Repeating — mount the Matching Network as close to the base of the antenna as possible — inches — *and no shielded wire or co-ax between the 'matcher' and the base of the antenna.*

FULLY AUTOMATIC !

However, as long as we are really enjoying all-band mobile, leaving the appliance operators setting there on one band on one frequency, let's really go for it! Once the antenna is moved into the approximate 'band-area' on the all band coil, the antenna re-resonating adjustment can be fully automatic ... the antenna resonates and is flat before you can complete your call sign! If you had absolutely NO junk box parts, it would still be surprisingly cheap. This unit also mounts at the base of the antenna; it is small enough to mount right inside the antenna base mount.

Best system: --> A&A Engineering has a high quality kit (or just boards) for fully automatic control. NOTES1, 2,3 and 4 These systems are controlled from the cockpit as bands are changed. Parts sources are listed in NOTES 5 thru 7 .

If you have already built the unit from the October 1982 QST, or the July 1979 73, you can use it on this antenna -- with one modification; to drive the Cordless Screwdrivers, replace the TIP-32's (Q 1,2,3,4) with the higher current TIP-105's in the same sockets ... no circuit changes. A & A kits now supply the TIP 105^s (or leave the TIP 32s in and use the circuit in fig 4 of my Oct 1 982 QST article)

INITIAL TUNEUP CHART I (using 66" top whip)

This is going to be the easiest HF Mobile antenna that you have ever attempted to tune up. Once the base matching section is installed and adjusted, minimum effort is required to get this antenna on the air. Mount on the vehicle and if you plan to use 10 meters, run the antenna motor to position the loading coil where the finger stock just touches the top coil turn. ... adjust the length of the top whip to resonate the antenna for ten meters. *Do not do this if you are not interested in the ten meter band..* No external matching is necessary on 14 MHz and above. You will find that it will go down to absolutely 1:1.

The following procedure is for a 66" top whip using the matching section, at the base, shown in Figure 10: Select the 75 meter position (K1 energized). Tune the **receiver** to the middle of the 75 meter band — turn up the receiver RF and Audio gain; run the antenna motor to position approximately 12½" of the coil windings above the finger-stock; there will be no question when the coil reaches that area — the receiver noise will increase significantly. Now you can apply a low power carrier and tap the UPADOWN switch gently to achieve minimum SWR ... for this -1st time only- tune up, C1 is adjusted to bring the SWR to 1:1 — The total capacity will be approx 1000 pF or higher .. the coil may require a very slight readjusting with the motor.... yes, it will drop right down to the zero pin. If it don't, you goofed somewhere — start over. 40 meters is adjusted exactly the same way; De-energize K1, energize K2; run the coil down with the motor to approximately turn 41 from the top; the receiver noise will peak, then zero in the same way with the transmitter and adjust C2. C2 WILL BE SOMEWHERE NEAR 500 pF or higher. The capacitors will never have to be adjusted again. For 20 meters and above, both relays are de-energized ... find the coil area with receiver noise and then make fine adjustments by applying carrier then raise or lower the coil for 1:1 on the SWR bridge ... the high frequency bands take very little tweaking ... just tap the switch slightly, *repeating -- DO NOT, under any circumstances, operate this antenna without proper feed point matching (75 & 40)---* **this DOES NOT mean using the auto-tuner built into your transceiver!** The antenna must be resonated to your operating frequency by moving the coil to the proper position.

CLEANUP and TIPS

No details are given relative to making the electrical connections to the motor power leads or the method of firmly securing the PVC parts. An accident may make it necessary to disassemble for repairs, so PVC glue is not a good idea. On units that did not appear secure, we drilled and tapped and inserted 6-32 set screws. These are all basic operations and many of us have our own pet procedures.

A word or two about the escutcheon pipe — this pipe looks similar to the chrome drain pipe that you see under some sinks. The longer lengths are more normally used as decoration to cover plumbing etc that may run thru a living area. Some is used on antique toilet tanks that are placed high on the bulkhead — where you pull the chain. Some is chromed — some is polished brass .. The outside dimensions seem to be the same on the various types altho the wall thickness varies. The larger hardware supply houses in our area carry all types. A number of hams opted for thin wall copper pipe rather than brass or aluminum.

Be absolutely sure that the corona ball is on the antenna tip or there will be fireworks that cause all sorts of mysterious things to happen.

COIL POSITION INDICATORS

You will find that remote coil position indicators are not necessary if you listen for noise on the desired frequency while running the antenna up and down. However, if you want a little gingerbread, let your imagination be your guide. K1KLO QST April 1981, installed a solid-state digital readout to show frequency; really neat. ¹⁰

Or how would you like this ----> We have all seen a drooping loop of water-filled hose to match levels across a foundation or lot. My antenna test vehicle uses that method to indicate the DK³ coil position (band). Quarter inch transparent tubing is used. One end is taped up alongside the windshield post ... the tubing goes down through the floor boards, under the vehicle, up between the inner and outer walls of the pickup box and then the far end is hooked to the bottom of the coil weather shield. (next section) With the coil fully raised in the 75 meter position, water is fed into the tubing until the water level reaches the upper part of the windshield. Place a mark on the windshield or tubing for an index to mark "75". As you move to the higher frequencies, the tubing will droop as the coil shield descends — the water level on the windshield goes down correspondingly — place other indices for your favorite freqs. When everything is in place, inject a half eye-dropper of food coloring. Real high tech! One of the Southern U.S. *Screwdriver Net* members reports using a TV rotor control box as a position indicator — as the antenna goes up and down, the control box clicks accordingly to indicate band/frequency on the dial — memory, too, eh! Another hi-tech method was demonstrated — as simple as looking in the rear view mirror!! Again, GoFerIt.

PROTECTING THE COIL

Good old pure rain water does not seem to hurt the coil at all and we don't even have much of that in our part of California. However, road film (grease!), bugs and particularly ice and snow sure louses up mobile antennas. We were down at the corner convenience store and setting by the cashier was exactly what we needed! There were various lengths of plastic tubes, complete with caps, that dispensed ropes of beef jerky. We made off with the long empties and whacked off 18" long pieces. A 3/8s hole was cut in the center of the top end cap, the cap and tube were placed over the top end of the coil. The plastic tube rides up and down with the coil and extends down over the lower mast. The Tap-Plastics store sells a very light, correct diameter, tube with end caps. Also blueprint supply houses stock these lighter enclosures. Oh, use both end caps — cut the hole in the lower cap so it freely slides over the 2" base section — that sorta keeps the bottom from banging around.

Sure hope this paper gave you some great ideas and it certainly beats running around with

A Dummy Load on a Stick!

During the many months of developing and helping build the first few score of these antennas: my deepest appreciation for the unfailing continued support, suggestions and environmental testing by my friend and neighbor, AA6VK

And — of course — none of this development over the past few years would have been possible without the sincere support of my XYL - Letha, W6HMD. Suggestions, errand running, parts procurement and encouragement - not complaining too much when I'm caught dipping into the "sugar-bowl" for supporting cash — and it's taken a lot of it.

There are still some callers out there that neglect to practice simple telephone etiquette. For those few, we wish they would preface their message with an ID, It is not very pleasant to be called in from the back '40' to be asked if we would like to subscribe to so & so. Please.

The first public disclosure of this antenna design is dated 1 8 March 1991.

- N O T E S -

We have accumulated a couple of boxes of letters and pictures (would you believe over a thousand!) over the last couple of years. Lots of nice things to say about the antenna and convenient worthwhile suggestions have been added to this manuscript.

Here is one that may be of interest and I'll dump it in as received on disk:

15 August 1992 addendum to Big DK³

F E E D B A C K

1) A smaller diameter version of the antenna has been assembled by several amateurs; - - -- -
fundamental changes:

a. Coil form 1 inch schedule 40 PVC pipe -Pipe cut

24" long Winding area 1 5"

Wire - same size - # 16 tinned buss wire (1 -800-727-WIRE)

Turns spacing 13 turns per inch

This spacing easily accomplished by winding the wire and 50 pound mono-filament fishing line side by side.

b. Lower antenna mast is aluminum irrigation pipe that measures 1.5" OD.

c. Same finger stock used,

d. If a satisfactory, smaller diameter, gear-head motor is not available (to fit inside the smaller pipe) --here's the fix:

Use the standard cordless screwdriver - - Mount the screwdriver in a 10" length of the 2" dia aluminum pipe - mount at the bottom of the smaller mast. The two sizes of pipe can be bushed together with standard PVC pipe bushings. Be sure both pipes are connected electrically — screws.

e. Use same length of top whip. Reported field strength is practically equal to the larger DK³.

2) In the event of problems, 20 meters and above. Two cases of trouble have been reported

a. Difficulty with SWR on 18 megs

b. When using the W6AAQ/A&A auto-resonator, antenna motor would overrun

Fix in both cases was to wind about 10 turns of the motor power leads thru a toroid form. The bundle was then taped to the outside of the antenna mast.

3) And here's another surprise! More and more hams are reporting that they are building two DK³s and mounting them butt-to-butt. Operates ALL frequencies without any tuner whatsoever. Feed with plain o | 50 Ω co-ax. I thought most were being used on RV's but we have reports of fixed stations on small lots and apartment balconies. Using the two DK³ requires a 1 to 1 Current Balun at the antenna feed point.

OTHER FEEDBACK

The length of the lower mast: Changing the lower mast section from 5 feet to 3 feet only results in a 1dB loss in field strength.

The length of the top whip: Changing the top whip from 66" to 102" increases the field strength 3dB. The longer whip limits the upper frequency band the antenna will reach. Dumb trouble: In my books and in this paper it is repeated over and over *Put the AAQ assembly impedance matching device within inches of the antenna base.* What do I discover? Troubled rigs roll into my yard with the matching unit mounted almost anywhere — yes, yards of wire or co-ax threaded all round the trunk and under the vehicle. **The matching device must be at the base of the antenna and do not use any co-ax or shielded wire from match to antenna.** Questions received: How about the shorted turns inside of the lower mast. There are none --they are no longer turns — that part of the coil becomes part of the mast. It is *NOT* the same as shorting out turns on a coil with a jumper.

The antenna appears to work OK mounted horizontally on RV's. Just remember one thing — proximity of vehicle metal to the lower mast has minimum effect, however, provide a lot of clearance for the top whip. The more successful RV horizontal installations are arranged so the top whip is slanted up and away from a metal roof — go for the max legal hight. Keeping the top whip clear also means; no metal brackets, wire guys etc. Use nylon cord & PVC pipe. Grounding the transceiver to the firewall with low inductance braid/strap important ... that's why that ground post was put on the rig. The same important type of ground is needed at the matching unit ... don't hang on a long wire and call it a ground just because the other end is grounded. Besides a good connection to the vehicle body, follow thru by shortest possible route, from that point to the main frame.

When mounting any loaded vertical antenna, the active part of the coil must clear the highest part of the vehicle by at least 12 inches. The best rule to follow on mobile installations is to go for every inch of height possible.

PARTS LIST

1 C	22" piece of 1½" Schedule 40 PVC (white) plastic plumbing pipe -
1 J	piece of same PVC, 5½" long
1 E	PVC cap for 1 " sked 40 PVC pipe -slip-
1 B	PVC bushing 1¼" slip to ½ " NPT
1 K	PVC bushing 1½" slip to ¾" NPT
1 F	¼ by 20 (inside threads) KNIFE-THREAD WOOD INSERT -see text
1 G	20" piece ¼" x 20 all-thread - steel or brass
1	7 inch length 0.005" brass shim stock or Finger-stock {see text}
1	36" length of 2" OD Brass escutcheon pipe \or aluminum or copper
1 M	2½" piece of ¾" type M copper pipe
1 L	copper adapter - ¾" male NPT- to ¾" -solder- for ¾" copper pipe
1 A	brass pipe bushing - ½" to 1/8" NPT
75	feet #16 <u>bare</u> tinned solid copper buss wire Note 11
1	5 to 6' or more. stiff upper whip - (see text)
H	SKIL TWIST Model 2105 Cordless Screwdriver or <i>True Value</i> MASTER MECHANIC Model 8521
1	5Ω WW Resistor - 10 to 20 watt

These are all the main parts .. a few screws are needed

Notes

¹ Don Johnson, "Build a Weird 2 Band Mobile Antenna" 73, Oct 1976, p.20

² Bruce Brown, "Tennamatic:An Auto-Tuning Mobile Antenna Tuner." 73, July 1979, p. 132

³ Don Johnson, "Mobile Antenna Matching - Automatically!" O.ST, Oct 19E2, p. 15

⁴ Don Johnson, "40 Years of HF Mobileering: Antennas- Installations -Tuners" \$ 15. -out of print 8/1992 Box 595 Esparto CA, 95627

⁵ Editor's Note: Capacitors Types 302 through 306 from Allied Electronics, 401 E 8th St Forth Worth, TX 76102

or
HSC Electronic Supply
4837 Amber Lane
Sacramento CA 95S41
or
3500 Ryder Street Santa Clara CA 95051
HSC also stocks Finger Stock
1-800-442-5833

⁶ Toroid T-106-2 available from Amidon Associates, Box 956, Torrance CA, 90508. (213) 763-5770 FAX (213) 763-2250

⁷ PCB boards available for Tenna-tuner: A&A Engineering, 2221 W. LaPalma #K, Anaheim CA 92301 (714) 952-2114 FAX (714) 952 3280 Their boards #191 & #192. Kit of parts also available.

⁸ REFLECTIONS by M Waller MAXWELL W2DU an ARRL Publication

⁹ Digi-Key Corporation 701 Brooks Ave South Box 677 Thief River Falls MN 56701-0677 Cat # RLC05-ND Sub Cub D LCD Bi-directional module - 8 digit -(order the PCB & Bezel that goes with it)-

¹⁰ ST April 1981, page 16

¹¹ A wire source:
WireMen 1-800-727-WIRE

¹² Circuit Specialists Inc
PO Box 3047 Scottsdale AZ 85271
3047 1-800-528-1417 FAX 602-464 5824 Authors favorite supplier.

¹³ Finger Stock ~ Bob Denniston 21970 Kern Road South Bend IN 46614 1-219-291-0252

--updated 1 November 1992 de W6AAQ

73

Big DK³

- A 1/8" to 1/2" BRASS BUSHING
- B 1/2" NPT to 1 1/4" SLIP PVC BUSHING
- C 1 1/2" SKED 40 PVC by 22" long
- D 1/4" CAP NUT

- E 1" PVC (slip) PIPE CAP
- F 1/4 x20 Wood Insert-C Text pg 7
- G 20" of 1/4" by 20 ALL-THREAD
- H CORDLESS SCREWDRIVER
- J 1 1/2" SKED 40 PVC 5 1/2" long

- K 3/4" NPT to 1 1/2" SUP PVC BUSHING
- L 3/4" COPPER PIPE ADAPTER
- M 2 1/2" of 3/4" TYPE M COPPER PIPE

--and-- 6 1/2" FINGER STOCK \ commercial or home made. see text.

--also-- 75' #1 6 BUSS WIRE FOR COIL

CORDLESS SCREWDRIVER is either *SKIL TWIST Model 2105* or a *True Value-MASTER MECHANIC Model 8521* To operate from 12V vehicle battery - remove switch & batteries - replace batteries with 5 ohm 10 to 20 watt WW resistor

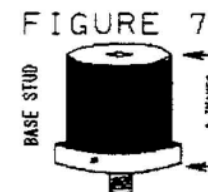
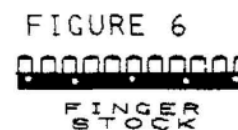
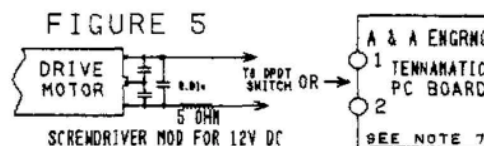
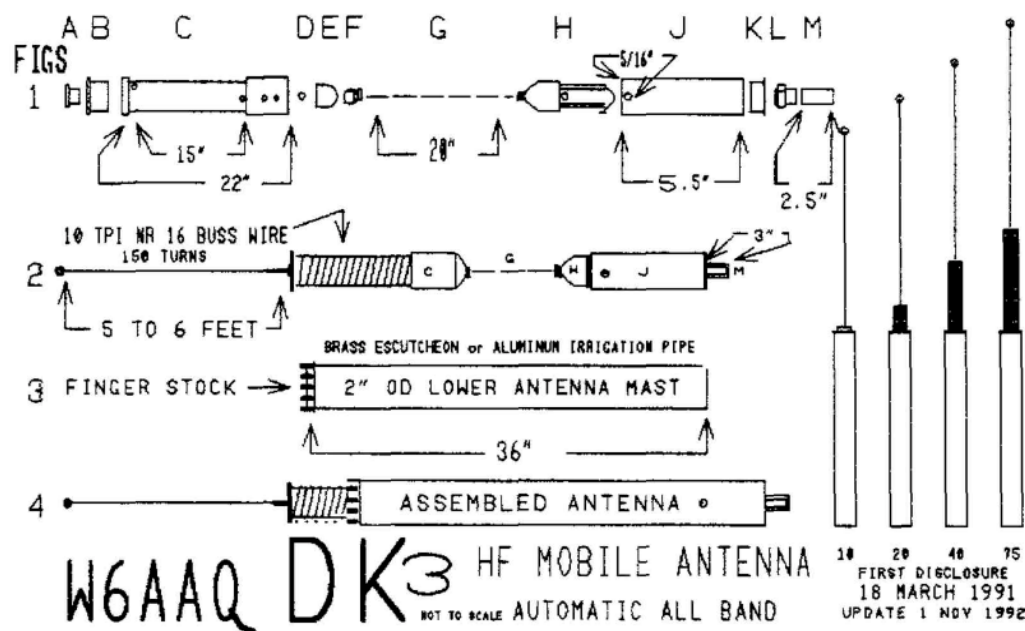
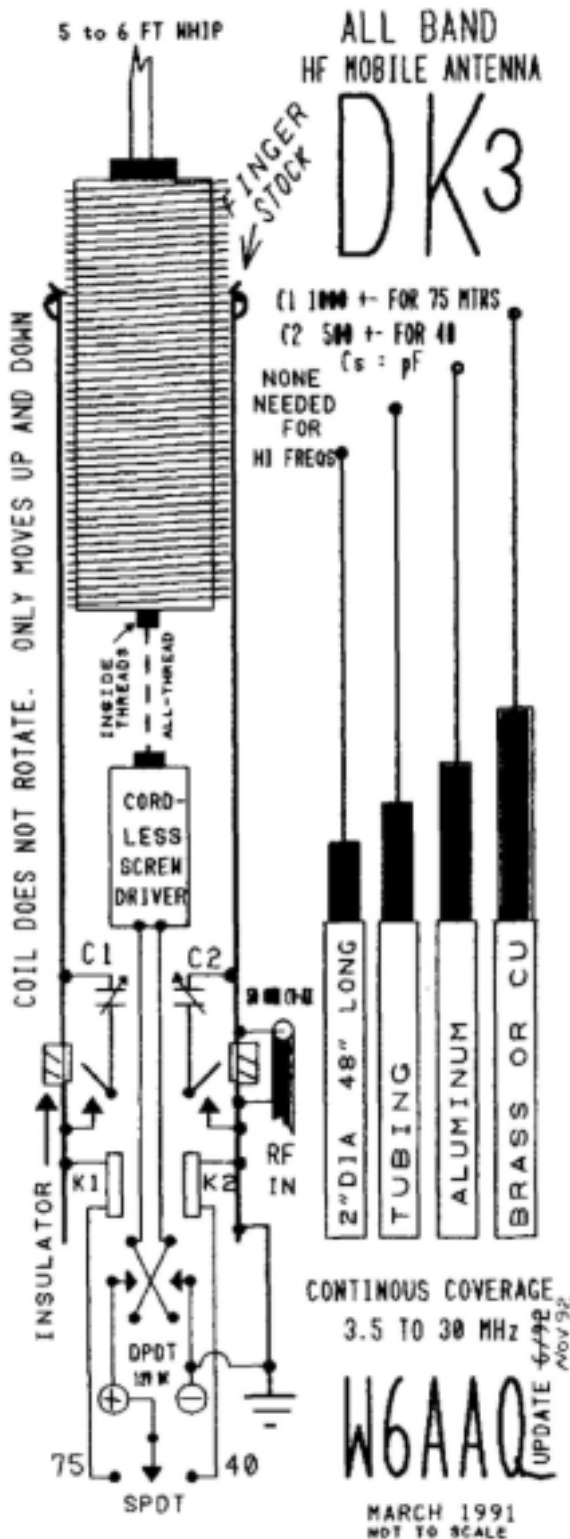


CHART 66" WHIP I	
FREQ	TURNS
10 MTRS	NONE
15 MTRS	7 +-
20 MTRS	10 +-
40 MTRS	40 +-
3.900 MHz	125 +-

CONTINUOUS COVERAGE HF MOBILE ANTENNA

ANTENNA RESONATES **WITHOUT, TAPS, ROLLER COILS OR OTHER DEGRADING GARBAGE**

FIG 9



Mobile - portable - fixed. Vertical. Phased.

Use two as Horizontal dipole.

In use in apartments - mobile home parks - hotels

Continuous coverage ALL frequencies 3.5 to 30. HAM, CB, WARC, MARS, CAP, Commercial, Gov't, Military

QSY to any frequency in any band without stopping or getting out of vehicle.

There is NO other HF mobile antenna that has this capability

Easily assembled, installed and operating in minimum time.

No tuning, tweeking or tip pruning. No jumpers, taps, shorted or open turns.

Absolutely 1 to 1 SWR on all freqs with no fuss .. can be automated (voice controlled) within 100 Kz windows when using the tuning unit described in **QST** October 1982

Lower mast. 3' or more. Top whip, 5' or more.

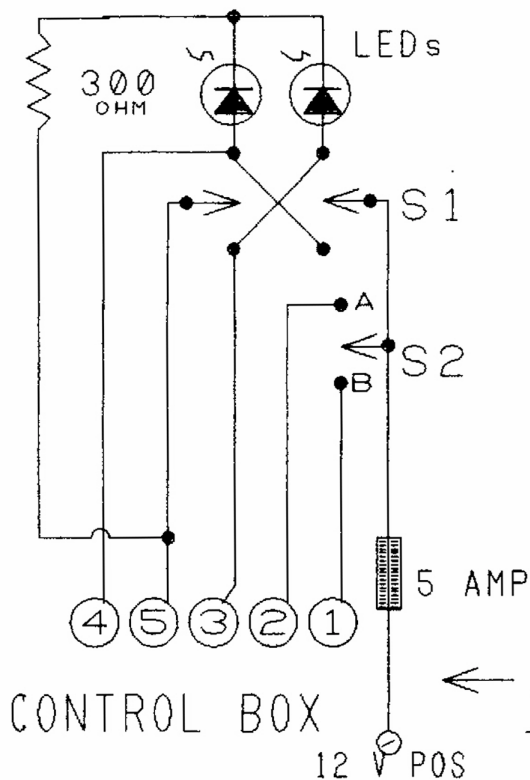
Recommended combination: 3 foot base section; 66" top section for 3.8 to 30 MHz.

All construction parts available at most large discount hardware stores or home improvement centers.

Scores of units in continuous use now into 3rd year in all environments ... completely debugged.

Search for instant band change *all frequency* HF Mobile antenna with more field strength. We can not find one

S1 DPDT CENTER OFF SPRING LOADED
S2 SPDT CENTER OFF



CONTROL BOX

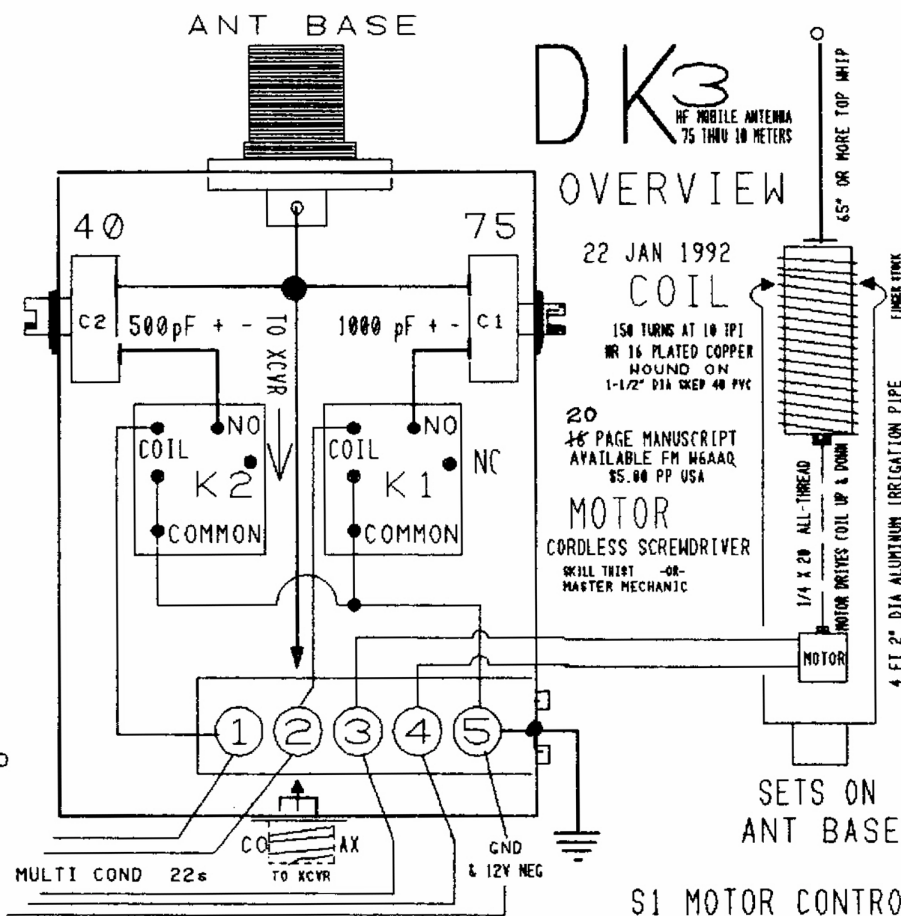
12 V POS

W6AAQ FIG 10

NOTHING IS TO SCALE
A NUMBER IN USE SINCE EARLY 1991
RECOMMEND A&A ENGINEERING

TENNA-TUNER

WEATHERPROOF ELECTRICAL BOX
2-3/4 X 4-1/2 ACTUAL SIZE
BOX IS USED FOR ANTENNA MOUNT
GROUND TO VEHICLE



DK3
HF MOBILE ANTENNA
75 THRU 10 METERS

OVERVIEW

22 JAN 1992

COIL

150 TURNS AT 10 TPI
NR 16 PLATED COPPER
WOUND ON
1-1/2" DIA SKEP 40 PVC

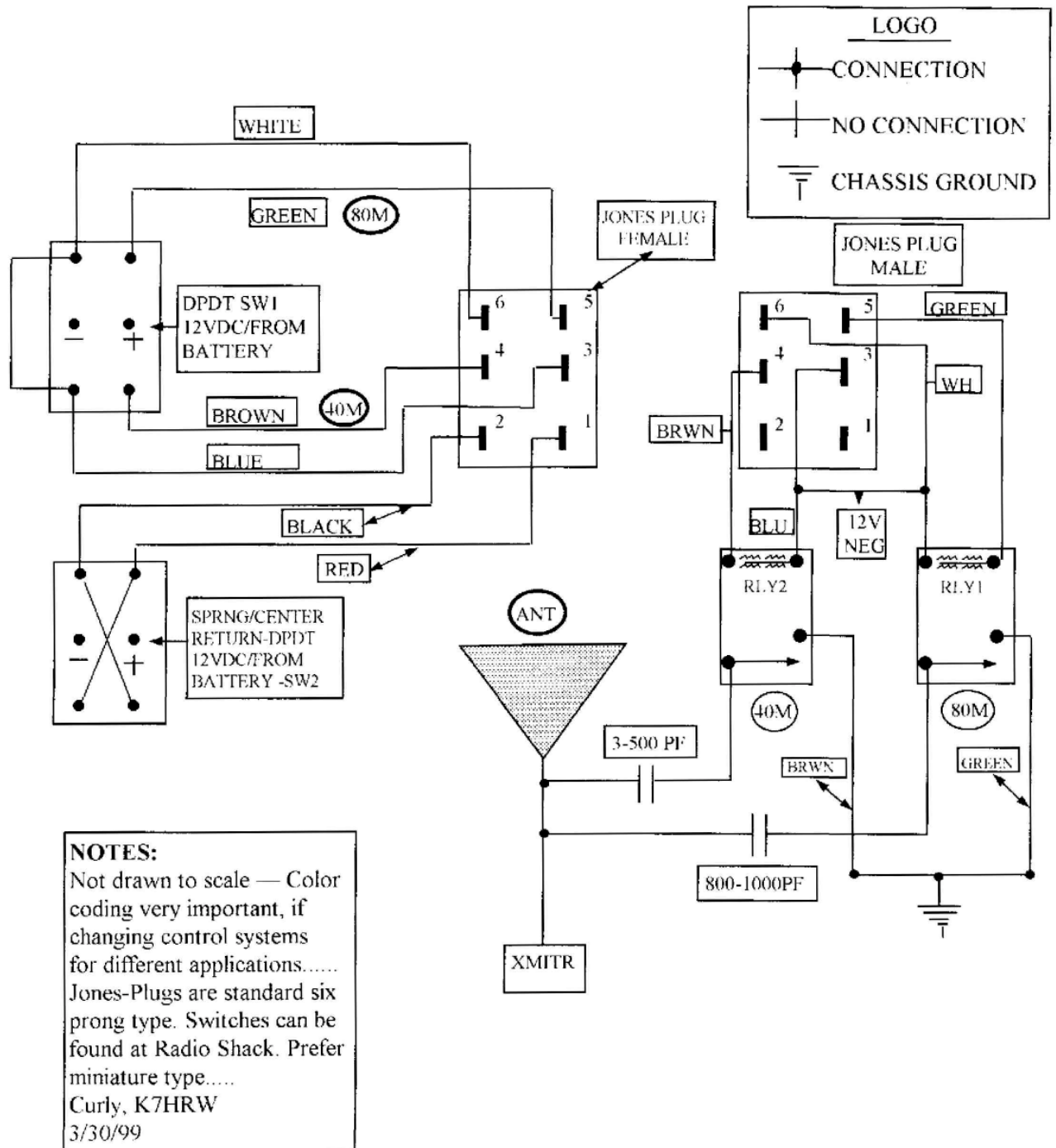
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48 PAGE MANUSCRIPT
AVAILABLE FM W6AAQ
\$5.00 PP USA

MOTOR
CORDLESS SCREWDRIER
SKILL THIST -OR-
MASTER MECHANIC

SETS ON
ANT BASE

S1 MOTOR CONTROL
S2 Z MATCH CONTROL
A 75 METERS
B 40 METERS
CENTER OFF -
- 20 & ABOVE
K1&2 RS 275-248
C1 7 PLATE - C2 5 PLATE ARCOs
SEE MANUSCRIPT NOTE 7

REMOTE CAPACITOR TUNING CONTROL FOR SCREWDRIVER ANTENNAS



Warning! There are no limit switches installed in this antenna. Over the last several years it has been determined that they are not absolutely necessary. If limit switches were added it would add to the initial cost and just a source of more trouble. Starting in aug 92 we install 1/2 lengths of rubber air hose over the all thread which seems to be working out well as 'bumpers' to limit coil movement and minimize chance of jamming.

Just in case the *grandkids* goof you up and jam it and the coil will not start down, do this; grab the coil and give it a quick twist to the right That should un-jam it. I have never had that problem but it is possible and i'll bet it has happened. There are endless ways to determine the position of the coil. Some in the text. If you listen on the receiver it is pretty easy to tell where you are. Go for it.... Give us some ideas.

As i mentioned in the cover letter i don't ship a top whip section; you can get them just as cheap - the length is not critical, however, 66" is a good choice. 108" cb whip gives you about another 3 db on 75. Of course you can see that it may be too long for 15 and 10 meters even when the coil is completely submerged. For 10, entire antenna can't be over 96".

I know you understand that there must be a *matching* unit at the Base ... Do not put it more than a foot away.

Suggest that the unit shown in figure 10 be used. It is only a couple of hour project and now you really have remote control. A convenient box is a weather proof electrical duplex box. A lot of others have picked up on this also because it is so simple .. The holes and everything are right there waiting for you. The stud does not have to be on the box. Now experimenting with putting the matching unit right inside the antenna mast... So far it is working out very well.

12 volt negative to red wire extends coil. Use #20 or #18 wire.

Late bulletin: to prevent rf feedback on 17m from the dc motor power leads, wrap 1.0 or more turns of this power cord thru a toroid core. Amidon t94-2 works ok. — maybe beads?

You may hear a rattle in the antenna sometimes.

The pieces of air hose are sliding up and down.

For weather protection — do as described in the manuscript... And — the cap on the wx cover will prevent the coil from disappearing into the lower mast section. The motor will stall and you'll know you havta go the other way. A couple of those plastic "slurpy" bottles (with a plastic straw out the top) cut the bottoms out and connect them together ..make a whale of bug cover. They even come in *wild* colors!

By the way, some gov't agencies have installed a few of these antennas in various configurations with great success. Also have had requests for a pressurized unit.

Oh! A fellow in paradise ca put the entire antenna inside a 2" piece of pvc and then tapered it on top with a smaller diameter. He sure has a great flag pole in the garden. The tuning device is in the base mount... The co-ax and control lines underground! Plus radials.

Two dk3s mounted butt to butt and fed with 52 ohm co-ax tunes just like a doublet (dipole) it does not require an antenna tuner but a 1 to 1 balun must be used. The antenna is always resonant at the operating frequency ...it will be absolutely flat on all freqs 10 thru 75 meters. For 10, hold over-all length to about 16 ft. Antenna can be mounted horizontal or vertical.

You may see some red-dots on the coil. With 66" top whip — top dot of course is 40, lower dot 3.9. — these antennas are all proto-types ... Continually trying to improve by experimenting. It's easy to see that i know nothing about machining but i just stumble along anyway.

Let's hear some suggestions & tnx. 73 /dk w6aaq\ 1992