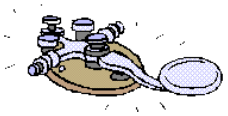
SOUTHEAST MICHIGAN DX ASSOCIATION
SEMDXA

# Long Path



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## March Minutes

Called to order by President, **K8NA** at 8:20 p.m., twenty-three members and guests present. Tim, **K8NWD**, is recovering from his heart attack...**K8SIX** reports he "looks good, is up and down stairs...he has a ten pound weight lifting restriction. He is keeping a low profile and working lots of DX!"

Stan, **AC8W**, passed around one of the new IRC's he received from a Swiss station recently...much larger format than the old ones and, most importantly, it has an expiration date.

A short discussion of e-QSL's and Ted, **K8NA**, read the **DXCC** rule which would prohibit their use for ARRL awards. At present, because they are too easy to forge, they are not accepted for league awards.

The Treasurer's report was passed on from Buck, **N8CQA** by Hank, **K8DD**... March 8 balance $486.89.

At meeting time, most were eagerly awaiting the **P5/YT1AD** operation… paperwork in hand, a full time operation for two weeks...work first, worry later!

This month's program featured two views on the ARRL DX CW Contest... one from the multi-op effort at **K8CC** near Ypsilanti, the other from **KL7Y** in Alaska.

**KL7Y** was put on by Gary, **KR8V**, and Ken, **W8LU**, and their host Dan, **KL7Y**. Dan's QTH at Wassilla is a four hour drive from Anchorage. His impressive antenna array includes 5/5/5/5 on 10M and 15M and other equally impressive hardware on ten acres in the Alaskan wilderness (the nearest neighbor is 1,000 yards away). He has four towers, the tallest at 160' and the smallest at 140'. A 204BA for 20M and a full size 40M beam, slopers for 80M and a vee for 160M. Both of our intrepid DXers had tales to tell of the trek, the unique house, his amp collection and lots of wildlife (including a moose outside the window. The ARRL test is not a favorite in KL7 land because you can only works W/VE, but the crew managed to work 4,200 Q's for 2M points. They set a KL7 record for the ARRL DX CW contest.

Dave, **K8CC**, has hosted many multi-multi efforts and his program recently gave us all a glimpse of his station and antennas. Some of the op's for the ARRL DX CW included **W8MJ**, **KT8X**, **NU8J**, **K8NA**, **K8DD** and **AC8W**. Ted, **K8NA**, really liked operating 20M, especially with the two radio option...one operator can search for mults while the other is running...when the multi op finds a new one he waits until the run station pauses, dumps his call and (hopefully) works the DX with very little time lost for the run frequency. Hank, **K8DD**, operated mostly 15M and commented on his operating this world class station. Stan, **AC8W**, was one of the 40M crew and really enjoyed busting pileups with the full-size 40M beam.

George, **W8AP** asked if anyone had renewed their C6A license recently... seems the fees have gone up to $25 per year and you have to catch up for years you didn't renew.

Future programs: April will feature George Race, **WB8BGY**, who will tell us about the Logbook of the World, and May will feature Al Fisher, **8CW**, well known DXpeditioner.

Stan, **AC8W**, Secretary

## P5/4L4FN OK'ed See the full story inside this issue of the *Long Path*!

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## Flying Horse Callbook

The 2002 Summer Edition of the Radio Amateur Callbook CD ROM will be available in May. The publisher offers a special 40% discount for club orders. Normally priced at $50.00 each plus shipping, quantities of six to twenty-four are priced at $30.00 each plus a $5.00 lot shipping charge. In behalf of club members, **W8LU** will place an order providing at least six club members sign up. Details during the April ***SEMDXA*** meeting.

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**SEMDXA CLUB OFFICERS**
***President*: Ted Pauck, K8NA**
***Vice-President*: Hank Kohl, K8DD**
***Treasurer*: Buck Switzer, N8CQA**
***Secretary*: Stan Arnett, AC8W**
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*DXCC Checker*: **Stan Arnett, AC8W**
***Program Chairman*: Open**
***LP Publisher*: Gerry Fasse, W8GF**

## Automatic Antenna Tuner

**General:**

The January, 1996 issue of QST contained an article describing a microcomputer controlled antenna tuner. Aside from mixing microseconds with milliseconds, the article was interesting and informative. I recently purchased a kit-form version from LDG Electronics Model bearing the model number AT-11MP. There are some changes in circuitry but otherwise is identical in function. It is representative of a number of similar products appearing on the amateur radio scene. What is especially interesting is that this device has no variable capacitors but utilizes an array of fixed capacitors instead. But I am getting ahead of myself.....

Studying the circuit diagram reveals that this unit consists of a group of eight toroidial inductors and eight fixed capacitor banks. Sixteen relays are used to select these components. A seventeenth unit selects high or low "Z" impedance matching. Maximum inductance is approximately 20 microhenries while maximum capacitance is 3900 pF. The capacitor bank can be switched between tuner input or tuner output to match either high or low Z antenna loads. This switched "L" configuration has a potential of over 100,000 tuning settings in binary combination. The manual states that tuning time varies between 0.1 seconds and 6 seconds with an average of about 2.5.

Note that a maximum capacitance value of 3900 pF is nearly tens times greater than what could be expected of a typical tuner using conventional variable capacitors! No figures are published regarding the range of load impedances that can be matched. A number of typical antenna matching conditions are noted however. See my test results later.

A cross needle meter provides an visual indication of not only voltage-standing-wave-ratio (VSWR) but power output in watts too. The meter however, functions only with power on unlike some other units. The manual states that the processor actually calculates power output as indicated on the meter.

The kit contains two printed circuit boards - one mounting most of the major components and the other all front panel controls. These controls consists of: Power on/Standby, Auto/Semi Auto, Capacitor Increase/Decrease, Inductor Increase/Decrease and a pushbutton called Tune. A red LED depicts a power on condition. The rear apron has two standard SO239 jacks for connection to the station transceiver and antenna. Also located at the rear are a power jack requiring an external source of +12 VDC @ 500 mA, a jack for interfacing to the host transceiver's tune control (Icom AH-4 and Alinco EDX-2 protocol only). A DB9 connector allows connection to an optional control head to enable remote mounting of the tuner in mobile installations.

Another interesting feature incorporates an optional audio feedback system which annunciates VSWR conditions via a series of tones (beeps). The tuner is rated for power levels between 5 and 150 watts and covers all bands between 160 and 10 meters. Last band settings are retained as long as 12 VDC is present. Mechanical size is 9-5/8 W, 7-1/2" D and 2-3/4" high overall.

**Operation:**

Three modes of operation are available. In Auto mode the tuner will seek a match of 1.5:1 (or better) anytime the VSWR exceeds 3:1. In Semi Automatic mode the tuner will attempt to match only when the Tune pushbutton is depressed. Also, capacitor and inductance values can be varied in either mode to achieve a more optimum match by operating the spring-return, center off, toggle switches noted as Cap and Ind while observing the cross-needle meter.

With transceiver and antenna connections in place and in Auto mode, the operator applies ten watts or so to the tuner and depresses the Tune pushbutton. The microprocessor steps through inductance and capacitance values while monitoring VSWR. When a match of 1.5:1 or better is noted the tuning process ceases and the operator may apply full power (up to 150 Watts) and operate as desired. If the frequency or band is changed and the VSWR exceeds 3:1, the tuning process is again initiated but now automatically.

In Semi Auto mode, tuning is accomplished only when the Tune pushbutton is depressed. If the Tune button is depressed at the same time as the Cap Up switch is operated, the High/Low Z relay will move the capacitor bank to the input side of the inductor bank (High Z). Conversely, if the Tune button is depressed at the same time as the Cap Down switch is operated, the High/Low Z relay will move the capacitor bank to the output side of the inductor bank (Low Z). Operating both the Ind and Cap to the down position simultaneously will reset the microprocessor and place all inductor and capacitor select relays in the bypass position.

The third mode is transparent and entirely manual. With the Auto/Semi switch in Semi position, the operator may seek an antenna match by observing the cross-needle meter and operating the inductance and capacitance switches and if need be, switch the High/Low "Z" relay control as noted earlier.

**Commentary:**

After assembling the kit from the detailed and easily-followed instructions included, the unit did not operate as specified. The immediate suspect which later proved to be correct, was a small toroidal transformer used in the rf coupling circuit. More detail on this later.

The eight toroidal inductors noted above must be hand wound before actual assembly of the circuit board begins. This proved to be simple enough as the directions were more than ade-

quate. Aside from the inductors, capacitors and front panel components, the major items on the main circuit board are a 52-pin Motorola microprocessor, 8 mHz crystal oscillator unit and a 28-pin IC that drives the relays noted earlier. Sockets are provided for both ICs. The optional tone/beep generator circuit was not installed. Pull-down resistors and bypass capacitors are mainly of the single-inline-pack (SIP) style which helps quite a bit in assembly because the printed circuit board population is quite dense in most areas.

The toroidal transformer noted earlier is hand wound in bi-filar fashion with color coded wire. The assembly instructions are very explicit about the direction of winding and phasing of the leads. Still, I managed to connect the transformer improperly which resulted in improper operation of the coupler as noted earlier. When this condition was corrected, the unit operated as specified. One other problem was noted; the cross-needle panel meter is fastened to the front panel with an "L" bracket but only from the bottom of the rear of the meter case. At best, the meter seemed loose so a small bead of fast-curing epoxy on the inside of the front panel fixed the problem.

The manual urges the builder to use a blob of hot-glue on each of the eight toroids to hold them in place. Total time to construct the unit was about five hours. I make haste slowly and someone else probably could cut at least an hour off this time.

Components appear to be of high quality. The capacitor banks are 5% tolerance, 500 WVDC, silvered mica types. The toroids are wound on large 1" diameter ferrite cores with #18 AWG wire. The housing and cover is constructed of heavy-gage aluminum finished in black enamel.
The printed circuit board is of good quality. Included are a solder mask to minimize assembly problems and silk screening to identify component location.

**The Firing Line:**
A variety of antennas were tried on all frequencies within the range specified. Overall, results were quite pleasing. Just about any antenna available here could be matched on just about any of the nine HF bands. How well they radiate is another matter, however.

The 160 meter band was the first one tested and the results were quite interesting. With a 10 ohm dummy load, the tuner, under semi-automatic mode, was able to match with a 1.3:1 VSWR and was even improved using manual mode to a near perfect match of 1:1! A 200 ohm dummy load was substituted under semi automatic mode and a VSWR of 1.4:1 was noted which was improved to 1.2:1 using manual mode. Almost giddy with success, a 330 ohm dummy load was substituted and a 1.2:1 VSWR was noted under both semi and manual modes. Finally, 1000 ohm load was in place and a 1.8:1 match was noted in semi-automatic mode with no improvement when manual mode was tried. It is doubtful whether a typical pi-network type tuner could achieve these results!

Other bands tried gave similar results. However, on ten and twelve meters a VSWR 1.3:1 was present looking through the tuner with power off. Likely, this is a result of the N/C relay contacts and printed circuit board traces being in the signal path. PC board layout, component selection and location changes would be necessary to use this tuner on bands higher than ten meters.

This tuners unique ability to match very low impedance loads is not without flaws however. Circuit losses are much higher under these conditions and eight relay contacts -each contributing a few milliohms of series resistance- add to the problem. Inductor and printed circuit trace DC resistances also are significant factors.

**Caveats:**
After assembly, the instruction manual states that the integrated circuits including the microprocessor be installed and power applied. Further, it suggests that if a suitable meter is available, the voltage at the output of the +5 VDC regulator can be measured. A less risky approach would be to first measure this voltage and then insert the integrated circuits if everything appears ok. These chips have little tolerance for supply voltages much above their ratings!

A simple calibration procedure is included in the manual. It does require an external instrument to check and adjust for minimum coupler output voltage in the reverse direction while adjusting a miniature trim capacitor located on the main pc board. Output power calibration is performed by adjusting a potentiometer located on the printed circuit board and observing the cross-needle meter and comparing it against a calibrated watt meter connected at the output connector. An adjacent second potentiometer is then set at the same relative position as the power adjustment potentiometer - a seemingly crude method for adjusting the second device! Of course, the question arises "if power output is calculated in the microprocessor, why is it necessary to use a potentiometer to calibrate the output?"

Two troubling problems were noted during use. When the unit is attempting to match a load that is out of range, the tuner continues to cycle non-stop. Another problem noted was that with power in the 100 watt range, the match achieved was greater than 1.5:1 - sometimes as much as 3.0:1. This only occurred when making large frequency changes on a non-resonant antenna. If power is reduced to 20 watts or so this condition was not present. Power rating is 150 watts as stated earlier and if power much beyond this level is present the cross-needle meter power reading falls to near zero even though calibration marks are present to 300 watts.

Summarizing, this is a very useful addition to ones shack if the station transceiver does not have an antenna tuner built-in. All in all it does a very good job and the price is well within reason.

The kit sells for about $200.00 while the finished unit is about 20% higher. Check out the LDG Electronics website at LDG@LDGELECTRONICS.COM

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## ARRL Bulletin

The ARRL has announced it will accept SSB contacts with **P5/4L4FN** in North Korea (Democratic Peoples' Republic of Korea) for DXCC credit. Operator Ed Giorgadze of the Republic of Georgia has been active from the capital city of Pyongyang since early last November. Valid SSB contacts from the onset of the **P5/4L4FN** operation last fall many be sumbitted for DXCC credit, effective immediatley.

ARRL Membership Services Manager Wayne Mills, **N7NG**, said the ARRL now has received adequate evidence that the **P5/4L4FN** operation was being conducted with the knowledge and approval of North Korean telecommunictionns officials. Giorgadze has been operating with oral permission from North Korean authorities, but Mills said that ARRL is satisfied on the basis of written information submitted that the **P5/4L4FN** operation conforms with DXCC rules and should be accepted for credit.

Mills cited DXCC Rule 7, which states "Any Amateur Radio operation should take place only with the complete approval and understanding of appropriate administration officials. "The rule continues, "in any case, credit will be given for contacts where adequate evidence of authorization by appropriate authorities exists."

Mills said the ARRL Awards Committe met and concured that the operation should be accredited.

The **P5/4L4FN** operation is not a DXpedition. Giorgadze is employed by the United Nations World Food Program and often spends as much as twelve hours a day on the job, operating in his off hours. It's expected that he will be in North Korea at least until July and possibly longer. A favorite hangout has been 21.225 mHz (he works split and listens up). He's also been a frequent visitor to 10 meters.

While **P5/4L4FN** has been doing some RTTY operation in addition to SSB, those contacts are not yet acceptable for DXCC credit.

Bruce Paige, **KK5DO**, has been acting as QSL manager and liaison for **P5/4L4FN**. Additional news and information about the operation is on his AMSAT Net Web site, http://www/amsatnet.com. Click on the "P5 North Korea" link.

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