Central Oklahoma Radio Amateurs

COLLECTOR AND EMITTER

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AN INFORMATIVE MAGAZINE PUBLISHED MONTHLY BY AND FOR OKLAHOMA RADIO AMATEURS AND ANYONE INTERESTED IN LEARNING ABOUT IT

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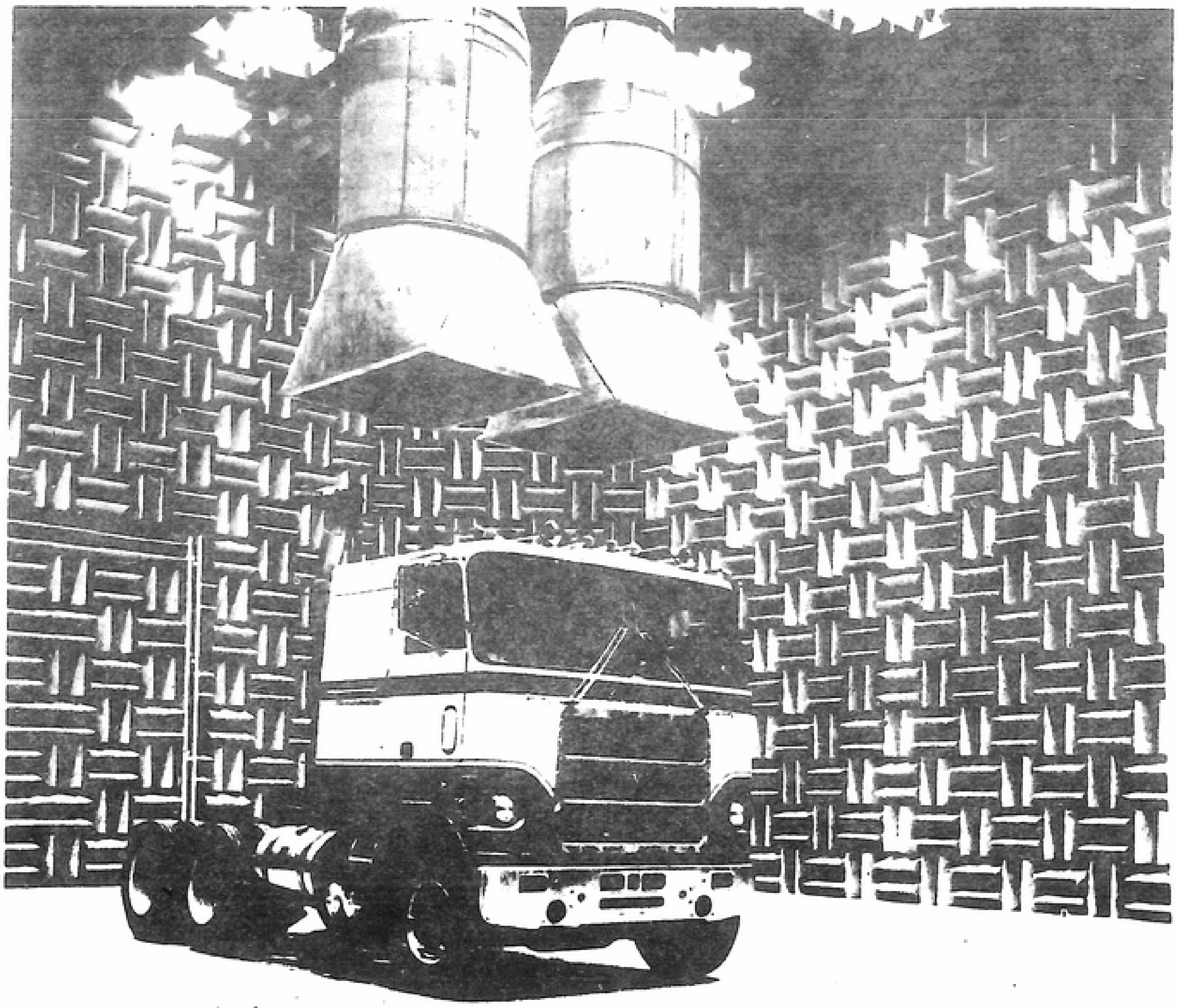

10.5 GHz - USE IT OR LOSE IT!

LARGE SCALE ATTACK ON ANOTHER AMATEUR BAND!

Having learned lessons from unsuccessful attempt to grab 220, evil doers organize to do it right this time. Truck in photo is undergoing RF testing in anechoic chamber. Read all the horrible details about this trickery on page 8.

Central Oklahoma Radio Amateurs

COLLECTOR AND EMITTER

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Central Oklahoma Radio Amateurs, Inc. (CORA) is a not-for profit association of radio amateurs, founded for the promotion of interest in amateur radio communication and experimentation, for the advancement of the radio art and of the public welfare and operates to enhance the cooperation of member clubs in sponsoring activities of mutual interest to the clubs and all radio amateurs.

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ARNS
Amateur Radio News Service

MORI Mid - Oklahoma Repeator, Inc.

THE ATOM

The March, 1978 National Geographic contains an interesting and informative article about taking photographs in the realm of science. It is called EYES OF SCIENCE by Rick Gore. Small portions of this article are quoted below.

Physicists at Fermilab in Batavia, Illinois are examining the atom. Once believed to be composed of a nucleus having neutrons and protons orbited by a certain number of electrons, the "physicists are finding all sorts of strange things within the atom, things such as 'kaons,' 'pions,' and 'muons.' What they would really like to see is a 'quark,' particularly one with 'charm.' " They have counted hundreds of other particles in the atom.

"Quarks and charm, along with 'color' and 'flavor' and 'truth' and 'beauty,' are names applied in whimsy to important new subatomic particles and their properties."

The reason scientists would like to take pictures of quarks is that they are now generally considered to be the "fundamental building block of the nucleus."

"A quark, if found by itself instead of bound to other quarks (an impossibility, in the view of some scientists), could help physicists better understand the forces that hold the universe together. Today we can list four basic forces: gravity, electromagnetism, and two nuclear forces, one strong (color) and one weak (flavor). Could these all be expressions of the same universal force? Scientists believe they are on the track of the ultimate truth."

Some of these particles exist for "only a fraction of a billionth of a second before decaying." Special photographic techniques allow scientists to see the tracks left by these particles. "If one particle collides with another, sprays of tracks fly off in a chaos of lines, curves, and curlicues from the point of impact."

"The proton, we believe, is built from tightly bound quarks. When a neutrino collides with a proton, we can learn a lot about charm indirectly in the debris created."

Elsewhere in the same article: "The electron microscope is giving us a new view - - of the atom. Nearly eight years ago Dr. Albert V. Crewe of the University of Chicago made the first electron micrograph of a single atom. He has recently taken movies of the same atoms, uranium. To his surprise he found that they 'move about like bees in a swarm.' "

" 'Conventional theory says that atoms in solid state are rigid and only vibrate,' explained Dr. Crewe. 'Well, it ain't so - at least in one case. What that means for the theory we can't say. It's like Galileo. You build a better telescope, and you start to see things.' "

A HOLE in transistor theory may turn out to be a quark with strawberry flavor!

- - - Bill, WA5RAQ + + +

= =

IT'S MAGIC

PERRY, W5MGZ, will give a MAGIC SHOW for the program at the MORI meeting, April 4. Bring the family.

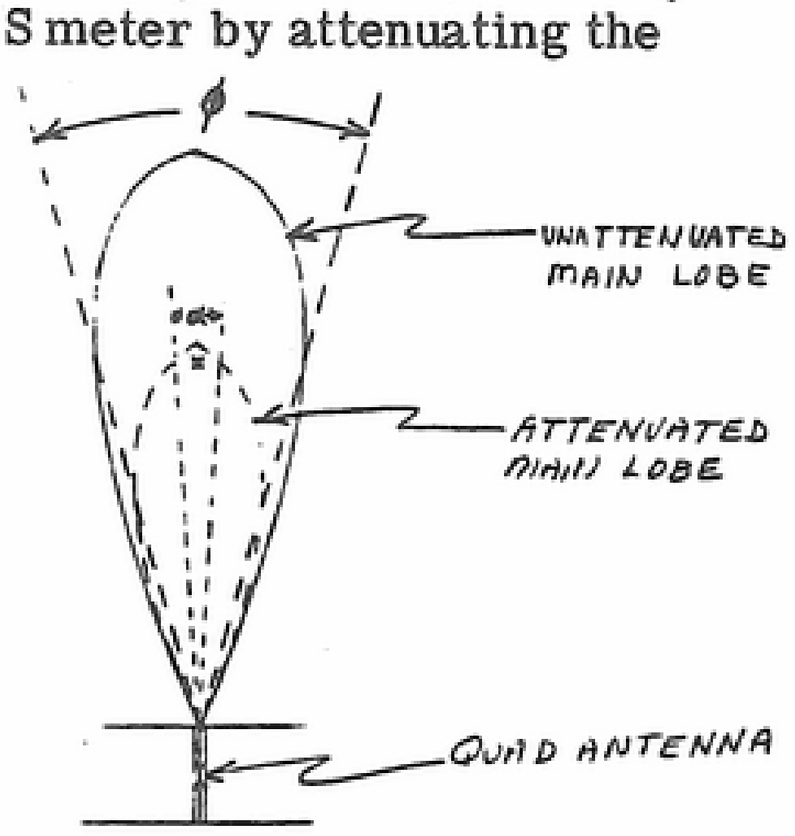
= =

Mid-Oklahoma Repeater Inc.
A NON PROFIT ORGANIZATION
OF RADIO AMATEURS DEDICATED TO PUBLIC SERVICE

D C D F
(DIRT CHEAP DIRECTION FINDING)

Say "DIRECTION FINDING" to most people and they immediately envision vans full of sophisticated electronic equipment with neat continuously rotating antennas and other "beep-beep" or "ding-ding" systems. Even we highly trained and well-educated amateur radio operators tend to slide off into such day-dreams. But direction finding does not have to be terribly sophisticated to be very effective. Remember, all the DF system is supposed to do is give the operator a fairly accurate indication of which direction a received signal is coming from. How accurate that indication must be is determined more by how versatile the operator is than by the circumstances in most cases. And, of course, cost is inversely proportional to sophistication. So let's get inverse and see how to do the job at lowest possible cost!

First, lets consider the elements of direction finding. The most common approach is to turn a directional antenna until the incoming signal gives the strongest indication of signal strength on some form of signal strength meter. This will give good definition of direction as long as the signal source is far enough away that the signal strength (S) meter is not pegged. For closer signals, the direction definition in terms of beam width gets too wide to be useful. (See FIG 1) Rather than move farther from the signal to reduce the signal level (we're trying to find it, remember?), lets fool the receiver S meter by attenuating the signal electronically. This results in the apparent lobe shown by dotted lines in FIG 1. So we can now move even closer to the signal by just continuing to attenuate the signal until we are right on top of it! (Note: Some exaggeration exists in the last statement.) But the problem is...how to do all this inexpensively!



DF LOBE-SHARPENING BY ATTENUATION

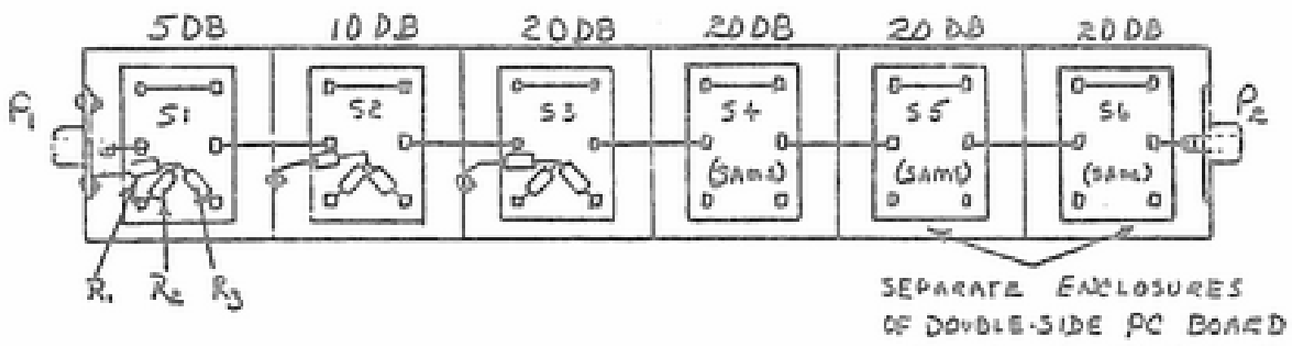
FIG 1

Let's start by figuring out how to attenuate the signal. FIG 2 shows an inexpensive home-built attenuator which will provide a rather wide range of reduction capability. It has the advantage of not requiring any modification of the receiver being used for the DF system. It has the disadvantage of precluding use of the transmitter portion of a transceiver without disconnecting the antenna and attenuator each time. It also means another piece of equipment to carry along. However cost should not be a problem!

Another approach to the attenuation requirement is to attenuate the signal within the receiver itself. Before you faint, read on cause it "ain't that bad"! The addition of a small 5000 ohm linear taper potentiometer in the RF section of your receiver will allow you to directly adjust the gain of the RF amplifier, and consequently the apparent signal strength of the incoming signal. This is most simply done by reducing the "B+" voltage applied to the RF stage(s). Specific connection points for several popular transceivers are given in FIG 3. A quick look at the schematic diagram for your receiver should let you find the equivalent points in your receiver. By using some of those cute tiny new potentiometers, with the sexy little knobs, you can actually make the modification improve the looks of your rig, too! And that would be a real change for me!!!

Continued on page 5

0 - 95 DB ATTENUATOR



5 DB — $R_1 = 62\Omega$, $R_2 = 15\Omega$, $R_3 = 15\Omega$ ¼W 10%

10 DB — $R_1 = 36\Omega$, $R_2 = 24\Omega$, $R_3 = 24\Omega$

20 DB — $R_1 = 10\Omega$, $R_2 = 39\Omega$, $R_3 = 39\Omega$

$S_1 - S_6$ — DPDT

P_1, P_2 — PHONO JACKS, BNC, ETC.

CONCEPT AND VALUES FROM ARRL RADIO AMATEUR HAND BOOK.

FIG 2

RF GAIN CONTROL

EQUIPMENT MODIFICATIONS

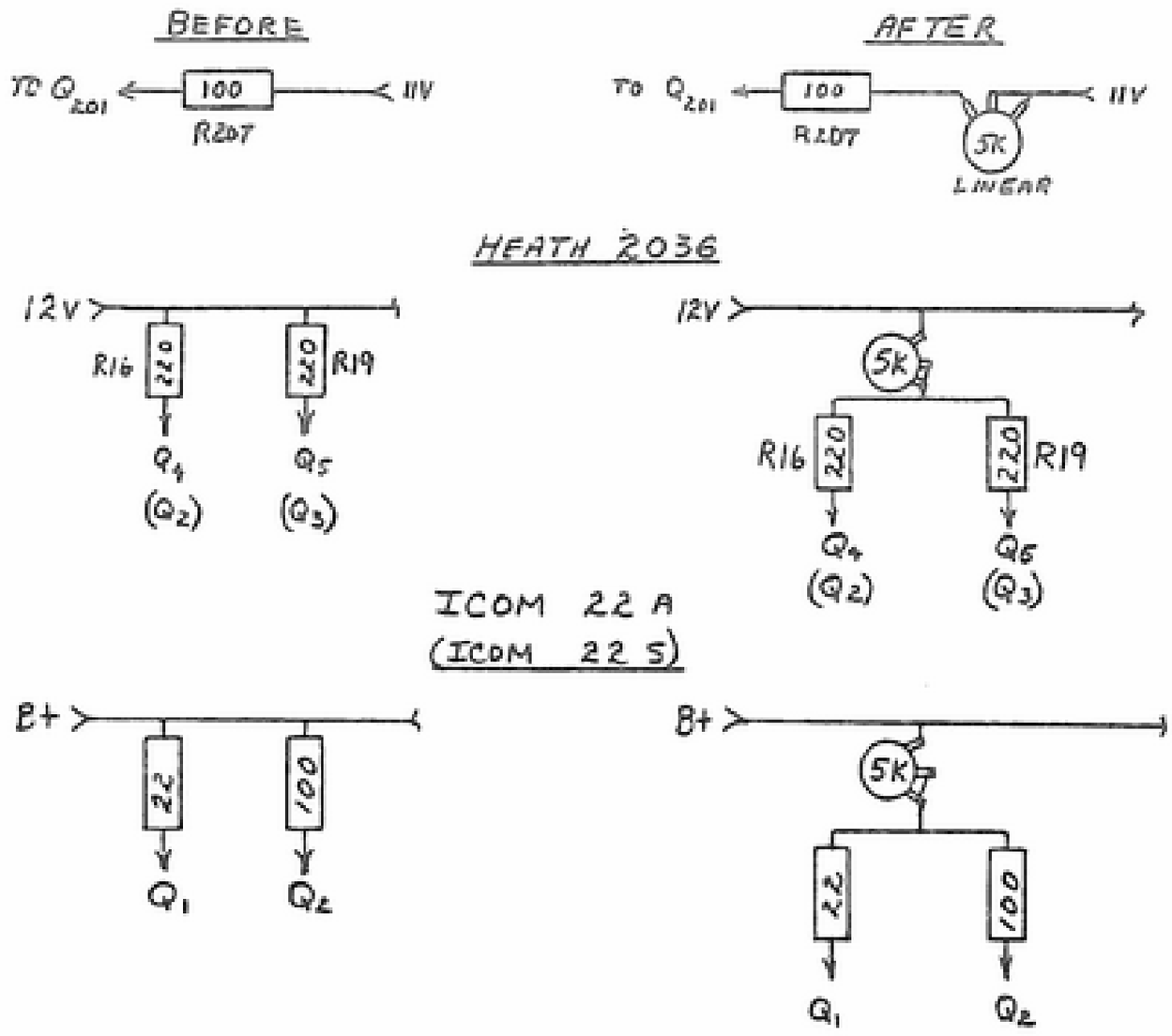


FIG 3

In anticipation of the comment now made by one of our highly technical members, I will provide appropriate answer. Yes, it will tend to distort the incoming signal to drop the "B+" on the RF stage in an amplitude sense. But isn't FM wonderful!

Continued on page 6

Cecil E. Pegors, Manager 787-0560

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All this time we have assumed that we had a perfectly good directional antenna giving us all those beautiful directional signals. Now we have to figure out how to build one of those for less than a fortune.

The simplest directional antenna is the legendary DF LOOP. That is a fine directional antenna except that is bi-directional! So it gives only a line on which the signal source will lie, not the final direction. Why did you think the DF vans continuously rotate their DF loops?

So let's try to find another antenna with good directional characteristics and without the ambiguity of the DF loop. The cubical quad comes to mind almost instantly since it is nothing more than our DF loop with a reflector added to eliminate the other side of the world. And it works very well! Front-to-back ratios of 20 to 25 dB are not at all unusual. It also has a very well defined main lobe so the attenuation technique previously suggested works like a champ! The quad also lends itself very well to minimum cost construction as FIG 4 demonstrates. Anyone who spends more than $15 for the materials should find another lumber yard and hardware store!

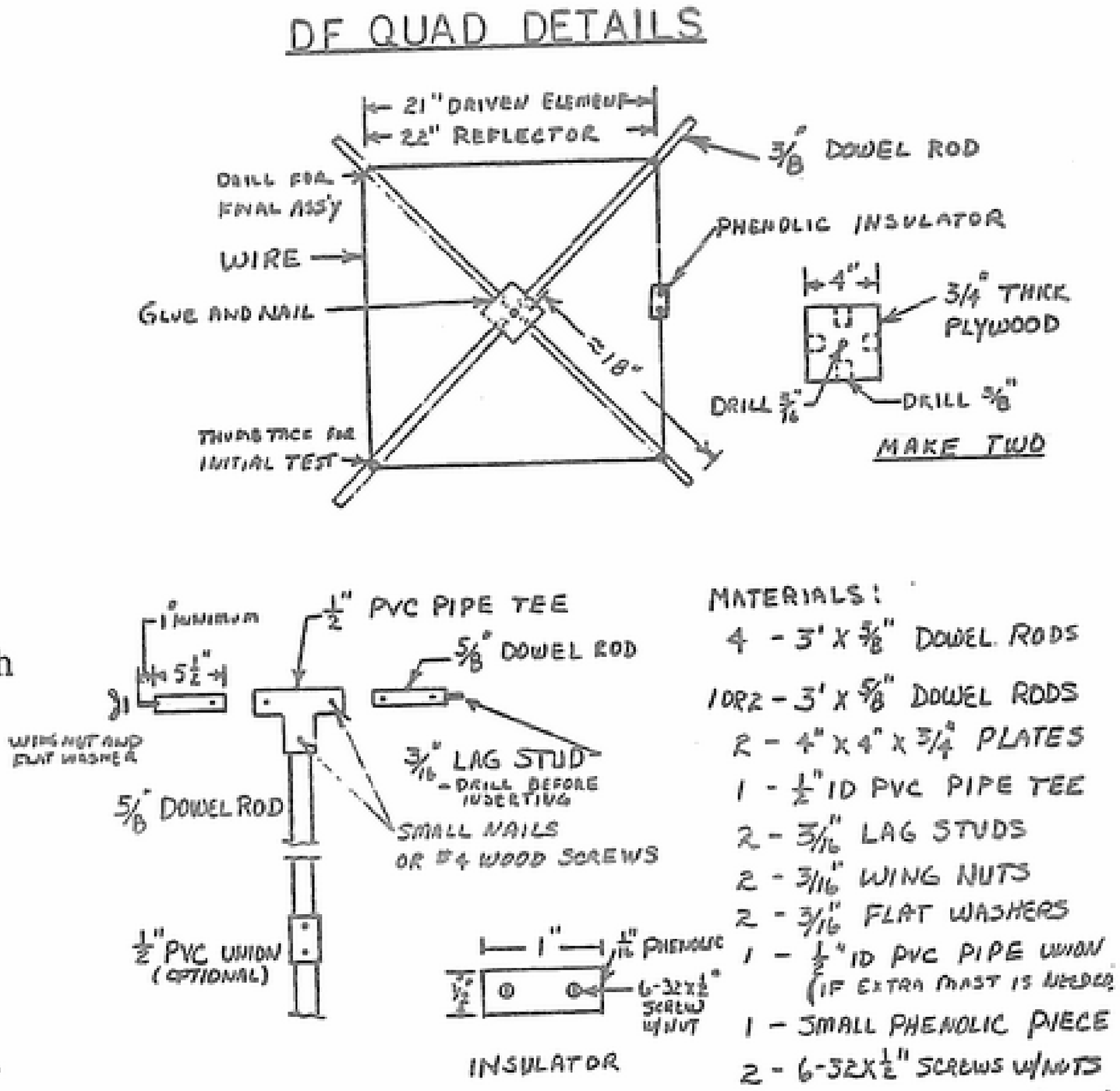

FIG 4

Mounting the antenna on your means of transportation is left to the ingenuity of the builder. One simple method used a single roof-top carrier section. A 2X4 length was clamped/tied/nailed to the cross-member and a 5/8" hole drilled to accept the 5/8" mast of the quad. This turned out to be force-fit and quite adequately damped the rotation of the antenna while moving from position to position. The support was also adequate to keep the antenna from departing the vehicle for all reasonable speeds (legal).

One more technical note - a phenolic block is not required in the reflector loop and tuning of the loops is unnecessary if the dimensions are met reasonably close.

Lest I be given more credit than is my due, I would like to identify the real sources of the information contained in this article. The development of the antenna and the attenuation scheme was done in San Antonio, TX by K5GJN and WB5SXG (now of Oklahoma City). Good luck and good hunting.

Don Graham WA5TAW

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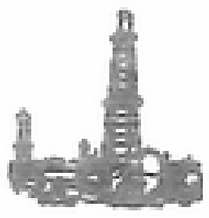

MID-OKLAHOMA REPEATOR INC.

USERS OF THE PHONE PATCH ! ! !

HERE IS THE RECOMMENDED WAY TRY IT !!

1. Call the repeater as you would any other station. WR5ADF this is _____(your call sign). Press the STAR(*) for ONE FULL SECOND, then release your transmit button.

2. Listen for the dial tone - dial your number. If you disconnect you may be holding your tones too long or they are too hot.

3. Phone will ring approximately six times (35 seconds). If you do not transmit for 35 seconds the patch will disconnect.

4. To end the call. Identify as in #1 above, press the pound(#) for ONE FULL SECOND.

DO'S AND DON'TS FOR THE PHONE PATCH

DO Let the phone ring at least 5 times.
DO Tell the party that they are on the radio.
DO Rember at least 200 people may be listening (Including the FCC).
DO Make each transmission short.
DO Make a list of emergency numbers and keep it handy.

DON't Do not call ANY business number unless you are calling a specific person about something NOT RELATED to that business.
DON'T Do not ask someone to dial a number for you for an unnecessary call.
DON'T Do not ramble on and on and on, etc. Someone may be waiting to use the patch.

Ken, Trustee, WR5ADF

THE REGULAR MONTHLY MEETING WAS CALLED TO ORDER AT 8:00 PM BY PRES. JOHN,K5QDR. THERE WERE 43 QUEST AND MEMBERS PRESENT.

NEW BUSINESS

KEN,K5VVZ,BROUGHT UP THE IDEA OF THE CLUB PURCHASING SEVERAL DIRECTION FINDING UNITS SIMILLIAR TO THE HAPPY FLYERS TYPE.THEY WOULD BE USED TO TRACK DOWN INTENTIONAL INTERFERENCE ON THE REPEATERS.AFTER MUCH DISCUSSION ABOUT THE SUBJECT A COMMITTEE WAS APPOINTED TO STUDY THE MATTER.THE COMMITTEE CONSIST OF THE FOLLOWING MEMBERS, SID,W5KOZ,CHAIRMAN;KEN,K5VVZ;RON,WA5WYQ;JOE,K5JB AND DON,WB5UAP.

IT WAS ALSO MOVED BY DON,WA5TAW AND SECONDED BY SID,W5KOZ TO PURCHASE UP TO THREE HAPPY FLYERS OR SIMILLIAR DIRECTION FINDING UNITS,AS DEEMED NECCESSARY BY THE COMMITTEE.THE MOTION PASSED.

CHARLIE,WA5JGU BROUGHT TO OUR ATTENTION THAT OPERATORS WOULD BE NEEDED AT THE EMERGENCY OPERATING CENTER DURING THE SEVERE STORM CONDITIONS.LARRY,WB5POW AND RICH,WB6FYL VOLUNTEERED TO BE OF SERVICE.

JOHN,K5QDR REMINDED ALL PRESENT OF THE UPCOMING LAWTON HAMFEST AND THAT PREREGISTRATION FORMS WOULD BE AVAILABLE AFTER THE MEETING.

LARRY,WB5POW REMINDED US OF THE DAYTON HAMFEST,THE WORLD'S LARGEST.IT WILL BE HELD MARCH 28,29&30 AT DAYTON,OHIO.

DOOR PRIZES ?

IT WAS ANNOUNCED THATTHERE WILL BE GIVEN AWAY EVERY EVEN NUMBERED MONTH A MINIMUM OF FIVE AND A MAXIMUM OF TEN.THE COST WILL NOT EXCEED 50 DOLLARS.ONE TICKET WILL BE GIVEN FREE AT THE DOOR AND ADDITIONAL ONES CAN BE PURCHASED FOR 25¢ EACH.THIS WILL BE FOR A SIX MONTH TRIAL PERIOD STARTING WITH THE APRIL MEETING.

THERE WAS NO OLD BUSINESS BROUGHT UP.

AFTER THE BUSINESS MEETING OUR QUEST SPEAKER DEAN FRALEY WITH THE OKLAHOMA INSULATION ADVISORY COUNCIL GAVE BOTH AN INFORMATIVE AND EDUCATIONAL PROGRAM ON USE OF INSULATION IN THE HOME,THE DIFFERENT KINDS AVAILABLE AND SOME VERY USEFUL TIPS ON HOW TO FIND THE BEST BUY.

MEETING ADJOURNED AT 9:45 PM. RICH,WB6FYL SEC/TRES.

COVER STORY: 10.5 GHZ -- USE IT OR LOSE IT

The first rumors started in California about six months ago. Initial reports appeared in a few confidential government reports. And a recent ad in a nation-wide CB publication has confirmed the latest invasion of the amateur bands by CBers. CB bootlegging has moved up to (or down if that is your perspective) to the Amateur Microwave frequencies!

No one is quite sure where the original idea came from, but the best indication is that several long haul truckers approached a small microwave products company a year or so ago about the possibility of producing small quantities of of active devices capable of transmitting on the same frequencies used by police radar in the 10.5 Ghz band. The amateur band extends from 10.0 Ghz to 10.5 Ghz. The company was MicroCon Inc. and its president, Moe T. Rucker, became intrigued with the possibility of communications on the microwave band between between vehicles. He sat down and sketched out a simple microwave transceiver based on the now common Fuzz Buster radar avoidance device as the receiver. He calls his new device, Fuzz Comm Model C (now in its third generation). By using Pulse Duration Modulation, it is possible to use circuitry present in the Fuzz Buster as a receiver. The transmitter, however, is completely outboard, but the entire unit fits in front of the Fuzz Buster. A functional block diagram is shown below:

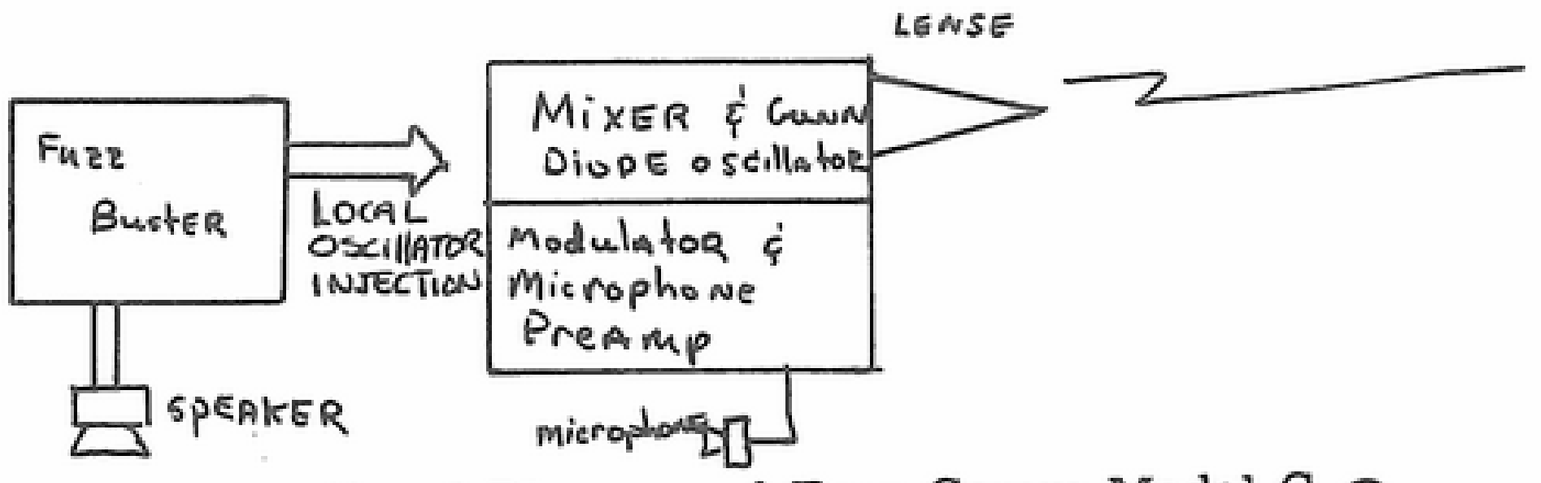

FIGURE 1: Functional Diagram of Fuzz Comm Model C ®

The transmitter uses a simple Gunn Diode oscillator. The modulator contains a microphone preamp, analog to digital converter and the necessary logic to produce the pulse duration modulation. The output of the Gunn oscillator is in the 10.45 to 10.5 Ghz band and is factory preset. This also corresponds to the lowest frequency that can be reasonably detected by the Fuzz Buster before it reaches its waveguide below cutoff frequency. To prevent interference with normal Fuzz Buster operation, the modulator is equipped with a 43 Khz sub-carrier before adding the pulse duration modulation.

As I indicated, the Fuzz Comm Model C is a complete black box active device that mounts in front of the Fuzz Buster. It provides all local injection, mixing and audio processing and modulation. The kit version comes with a small lense antenna that mounts on the front of the Fuzz Comm. However, an advanced model provides the necessary parts for mounting the Fuzz Comm outside the truck on the air horn and features the trucker's favorite cophased type antennas.

Details of the device and its use are still sketchy, and MicroCon is rather tight lipped about it, but Rucker indicated that they would be available in Oklahoma City during the next month. What the nationwide market is remains to be seen. Preliminary reports are that about 500 units are in service.

Fuzz Comms will provide as much sport with the local smokeys as communications capability. It is absolute in jamming local police radars. Since the radar measures the speed of passing vehicle by using the Doppler effect, the interception of a Fuzz Comm signal many megahertz away may give the indication that

the truck is traveling several thousand miles an hour to the ultimate confusion of the local troopers. Although it is clearly illegal to operate such devices without the proper license, Rucker declares that it is perfectly legal to sell them. He said, "It's my constitutional right to make a buck by selling these things. CBer's need more channels. What they do with them after they get them is not my business. The Fuzz Comm offers the perfect alternative to the trucker who wants to enjoy a nice quiet conversation with a fellow trucker and not have to put up with the normal drivel present in the CB bands.

Our cover photo shows the complete Microwave testing facility used at MicroCon for setting Fuzz Comms on frequency. The test area is completely anechoic and is surrounded by microwave absorbing materials so that the Fuzz Busters see only the two microwave point sources located above the truck. The Fuzz Comm can be tested for both output power and and receiver sensitivity. The cophased horns can be mounted on either side of the air horn. Otherwise, the complete system can sit on the dash in front of the Fuzz Buster.

Reaction from the FCC is guarded. Publically, they are stonewalling in expressing confidence that they can successfully patrol the microwave frequencies looking for Fuzz Comms. Privately, members of the Personal Communications Division are lamenting the lack of manpower and equipment necessary for locating the microwave devices. What is worse is that the Commission realizes the initial cost of the Fuzz Comm of $250.00 will come down to the point where they will be quite competitive with regular CB sets and could make enforcement a "throw up your hands and give up" situation. Rucker has already petitioned the Commission in a recent proposal (RM-4178) to legalize these devices for CB use and is proposing a new Class F CB License for their operation. Rucker is asking that the Commission set aside the band from 10.4 to 10.5 Ghz for Fuzz Comm use. A joint Department of Transportation--Federal Communication Commission is considering the large scale purchase of Fuzz Busters for use as detection devices for FCC Field Engineers. The Law Enforcement Assistance Administration has already set a special category for federal matching funds for the purchase of Fuzz Busters for local Highway Patrol units.

The effect on amateur frequencies could be severe. The loss of 100 Mhz could prove significant as amateur population continues to expand. The problem is the lack of usuage of the band by amateurs. Several clubs are banding together (more notably clubs in California) to fight the frequency grab. Petitions have just started circulating and one group of club members are featuring buttons that say "10.5 GHZ, Use it or Lose." There is an odvious advantage to amateurs. As the cost of Fuzz Comms drops, amateurs will be able to pick them up at reasonable prices for use on amateur frequencies. Inexpensive microwave transceivers will make amateur population on microwaves increase. Conversion to other amateur microwave frequencies should be easily accomplished. Any reader who purchases one of these devices when they start appearing in OKC CB shops and truck stops later this month are asked to contact either K5JB or myself for conversion details. A regular net is planning on meeting on a weekly schedule on 10.39 Ghz, just outside the proposed new band. We must act to populate the band and head off another proposed frequency grab.

Micheal Salem N5MS and Joe Buswell K5JB

THE LET IT ALL HANG OUT "I MADE A MISTAKE DEPARTMENT"

What with deadlines and all, I have a perfectly good excuse. However, I draw your attention to the article that appeared in last months C & E on capacitance meters. My confused mind said that the construction article in QST used a a NE555 as an oscillator and counted the number of pulses that occurred in a

standard time period. What really happens is that the NE555 gates the timebase output into the counters. A small capacitance at the test point allows only a few cycles to be counted. The larger the capacitor, the more cycles of the time base that get counted. The circuit is simplicity itself and interfaces to you frequently counter with just a few solder points. Please mark your copy of C & E accordingly.

Micheal Salem N5MS

A TOUCHTONE IN THE HAND IS WORTH TWO IN THE BOX DEPARTMENT

I have been looking at those neat Drake 1525EM Microphone and Touch Tone ® encoders for quite some time. WA5JXX and WD5FVI also shared my interest in finding some way to prevent carrying a separate touch tone pad around with the old mobile radio. Well, we all collapsed at the same time and ordered three of them from Ham Center (the demand was so high that the only delivery we could get locally was months away. Glenn started making inquiries back in August of 1977). The package arrived by UPS in just a few days and I found that the connector had to be modified slightly to accommodate my IC-230. The first plan of action was to convert the IC-22S radios owned by Roger and Glenn. I'll get to the IC-230 later.

The radio were duly disassembled and a 1K resistor was installed for power to the microphone to the extra connector on the microphone jack. The connector for the microphone was opened and changed to accommodate an IC-22S microphone. Thus if the 1525EM ever crapped out, all you had to do is reinstall the mike that came with the radio. The circuit worked first time for both Roger's and Glenn's radio.

Next was the IC-230. Icom apparently lacked the foresight to include a 4 conductor mike jack on this radio. No problem, I thought. I'll just run down to the local parts store and get one and put it on the radio. Getting the connector was easy, even here in Norman. I disassembled the radio and took the front panel completely off. Ugh. Icom had epoxied the connector to the front panel. No amount of grunting and panting with all the pliers and hammers at my disposal could budge it. About an hour later, I decided that the only way to remove it was drill through the connector, remove the center pins and then collapse the connector in with a pair of pliers. I finally installed the 4 conductor jack.

I wired the jack identical to the IC-22S mike cord and then modified my IC-230 microphone. This way, I would have complete intechangeability with either Glenn or Roger. If I was going to change the connector, I might as well standardize it.

The mike works perfectly.An examination of the schematic reveals a straight forward circuit using the Motorola MC-14410 encoder. A deviation pot is enclosed for setting levels. The first thing I did after completing the installation was to remove that ungodly looking mike holder that Drake installed.

The mike has worked quite well on a variety of autopatch systems. The Digitran keyboard has tactile feedback and ease of operation. The only problem that has occurred has been a loss of audio for the touch tone pad. I opened the microphone and found that some dirt or other gunk had gotten under the center wiper of the deviation control. The only other complaint is the lack of the fourth column (1633) on the pad. I recently remedied this by opening up the microphone and drilling a small hole on the left side and mounting a SPDT microswitch.

DRAKE 1525EM Touch Tone Encoder-Microphone -- A Review

I then cut the land between pin 12 of the 14410 and the key pad. Wires from Pin 12 and Pin 11 were installed to the microswitch and another wire to the center wiper of the switch went to the switching matrix. With just a push of the button, I can now convert the 3, 6, 9, # column to accommodate the fourth column. Ordinarily, the microphone can be used as an endoder with just one hand if you have enough dexterity in your fingers. By adding the microswitch on the left side of the mike (as the touch tone pad faces you), you can still accommodate one handed dialing with the fourth column with just a little practice.

The Drake mike is neat and convenient. It could be a little smaller, but I am sure that the size of the encoder portion was dictated by the size of the Digitran pad. I have always wished that Digitran would make their pads a little smaller and then we would be able to fit them onto HT-220's with a little more symmetry than the four by four pad provided. The 14410 chip uses a 1 meg crystal and is fairly reliable. I have not had one fail in several years of operation in handie talkie service. The Mostek Chip that uses the color burst crystal in my 450 HT has crashed once, but I have had no problems since then. All in all, the Drake mike is a good buy. I understand that Larry Dillard WB5CWB now has them locally.

Micheal Salem N5MS

NORMAN MICROPROCESSOR SLUSH FUND DEPARTMENT - AN UPDATE

Response to my article last month concerning a request for donations for the purchase of an 8085 microprocessor for WR5AFW at the University of Oklahoma has been modest, but gratifying. Several amateurs have already stepped forward with dollars for their repeater system and others have promised to help. W5UZD is talking the project up with various others at the regular "coffee" held each Tuesday morning at the Commons restaurant.

Meanwhile WA5JXX is continuing working on the software. I don't quite understand how he can work all day writing software and designing and then come home and write software for the autopatch and repeater controller, but that is one of the many quirks of nature. In any case, we will order the chips as soon as financially possible.

Micheal Salem N5MS

FOR SALE: Collins station, KWM2A, winged emblem, 516F2 AC power supply 312B5 outboard VFO console, round emblem. $1300.00. Firm. Also Collins mobile mount, $30.00, Mosley extender kit for TA33 & TA36, $80.00. Hobe Burgan, WB5MLN, phone 751-1646.

FOR SALE: SB-101 Transceiver, with power supply, speaker, CW filter and SB-200 Linear. $490.00. Call Howard, W5CG, 685-4805.

ALTUS AREA AMATEUR RADIO ASSOCIATION

President - Bob Bratton, WD5BBW

Sec/Tres - Janice Simms, WB5WMN

The Altus Ham Club met Thursday, March 9, 7:30 p.m. at the North Main Fire Station. Nineteen were in attendance.

President Bob Bratton, WD5BBW, called the meeting to order. Introductions and the treasurer's report followed.

The business session was opened with discussion on changing the club name. It was decided that the "HAM CLUB" would be changed and known as the "ALTUS AREA AMATEUR RADIO ASSOCIATION" effectice 9 March.

A report on the Amateur Radio classes which begin March 21, indicated some 20 persons pre-registering. Classes will be held at the North Main Fire Station at 7:00 p.m.

Emergency co-ordinator, Dwight Dennis, WB5KRH, informed the group that our local weather watch program will operate in a co-ordinated system. Maps and details will be distributed at a later date. Dwight reminded the group that Gary England from channel 9 weather station would be making a presentation Thursday, March 16, at 7:00 p.m. at an open meeting on severe weather in Southwest Oklahoma - All are urged to attend.

Loren Simms, WA5CBF, assistant emergency co-ordinator gave a brief report on the meeting which Dwight and himself had with Jim Edder, reporter for the Daily Oklahoman. They also reported on their trip to Oklahoma City to the State Emergency Operations Center with Bob Mayotte, Civil Defense Director for Jackson County.

Dwight reported that the repeater has been brought from the mountain for maintenance and to install the controller.

Loren explained the need for an 04/64 repeater pair crystal for the Metrum II which is used in the weather watch. H.C. Ford, W5CHE, has offered his repeater to provide a link between the Granite machine and the 19/79 repeater. The club voted to purchase the needed crystal.

Information on the Lawton Hamfest, April 8-9, was distributed and discussed. FCC examinations will be given Saturday.

After a short break, Bob introduced Jerry Howard and Jerry McCauley from Jackson County Composite Squadron of the Civil Air Patrol. They presented an interesting program on their part in communications. Anyone interseted in joining CAP, contact Jerry Howard.

WELCOME to Clyde Smith, W5ZOI. Dues were paid by Clyde Smith, Betty Gilliam, Joe Carlton and George Earp.

DUES DUE - Frank Martin, Owen Richards, Larry Jones, Cal Hunter, Gary Stevenson, Brent Haught, Danny Watson, Richard Spencer and Mary Longberry.

ON THE ROAD AGAIN ! ! !

A group of Civil Defense and Weather Watch personnel from the Altus Emergency Operations Center were invited to Oklahoma City. Bob Myotte, Civil Defense Director, headed the group. Others making the trip were: Dwight Dennis, WB5KRH, Bobby Henry, WB5VUM, Loren Simms, WA5CBF, SGT Shorty Baker and A/1 William Fulkrod (Altus AFB Radar Sec)

The group left Altus at 0700 and arrived at Oklahoma City at 1000 outside the Sequoyah building of the State Capital Complex. The State Emergency Operations Center is located underground in a tunnel between two office buildings in the complex area. The Operations Center has massive steel blast doors to seal the area off. It is completelyself-contained and is able to accomodate 100 people for four weeks. Mr. Cody Grider, the Southwest Area Coordinator for Civil Defense, was our gide for a tour of the facility. The communications section was the most interesting. It is composed of a single room filled with RTTY machines, telefax, and other communications gear. In this section all of the public services are tied in - Police, Highway Patrol, Forestry, Highway Department and Amateur Radio.

Our group also visited the Channel 9 TV station and talked with Gary England. He led a tour of the facilities. Mr England was very informative on the Starcom-9 request-line satellite picture receiver. He demonstrated the Colorscan-9 computerized color radar.

The objectives of the trip was to acquaint ourselves with the central Oklahoma Severe Weather Reporting System. We wish to make our severe weather net compatible to the central part of the state.

SOUTHWESTERN OKLAHOMA SEVERE WEATHER NET

In order to coordinate intra-state flow of information we would like do describe our Southwestern Oklahoma Severe Weather Net.The net operates on WR5ANX (146.190/196.790 MHz) which incompasses a large portion of Southwestern Oklahoma and North Central Texas. The Net Control operates out of the Altus-Jacksob County Civil Defense Emergency Operations Center. This center operates a direct telephone line to Altus Air Force Base Weather Radar. This net serves the following communities: Altus, Mangum, Eldorado, Hollis, Olustee, Duke, Tipton, Snyder, Frederick, Mountain Park, Gotebo, Hobart, Granite, Blair, Martha, Lone Wolf, Burns Flat, Vernon, Electra, Childress, Crowel, Quanaha, and Memphis.

Weather data is gathered from the Weather Net, processed and passed on to groups in Wichita Falls, Lawton, Elk City and Oklahoma City. Approximately 30-5- operators participate in the Southwestern Oklahoma Severe Weather Net. The net goes on standby basis whenever a hunderstorm or tornado watch is issued for the area. The net is fully activated when we are notified by Altus Civil Defense or any participating station reports any severe activity.

With the modifications and improvements performed in the equipment at Channel 9 TV, we hope to exchange information with the central Oklahoma Severe Weather Reporting System. We will strive to improve our methods and operations with the coming years.

Janice, WB5WMN

(Ed.: I retyped this report, so all misteaks are mine, Joe, WA5ZNF)

CORA / H A M H O L I D A Y

Plans are rolling towards HAM HOLIDAY on July 29-30,1978. Lincoln Plaza Forum has room you wouldnt believe, acres of parking, a banquet room that will seat 1500, technical meeting room for 450, Ladies programs in a room seating 225 and a Super Flea Market (Saturday only)with 10,000 square feet of air-conditioned comfort. We did it all for you so you can enjoy HAM HOLIDAY even more than last year.

At the CORA meetings to date we have voted to stay with the same low Pre-registration fee of $3.00 ($4.00 at the door), established a budget based on 500 Pre-registrations and 100 at the door, and plan to make the July issue of Collector & Emitter the HAM HOLIDAY special. This will be mailed to all who registered last year and all ARRL members in Oklahoma. In addition we plan to bulk mail Pre-registration forms to as many Radio Clubs as we can identify. Pre-registration forms will be included in each issue of Collector & Emitter starting next month.

Help make this the best HAM HOLIDAY ever, tell your friends about it, bring your goodies for a super big Flea Market and bring money in case you see something you cant get along without. If you know a Commercial exhibitor who would like to display there, have him contact Marshall Williams, K5MB. There are ideal display rooms available at reasonable cost. If you need information, have some suggestions, or would like to help, contact the appropriate committee chairman. At present we need some help on Registration, Ladies Programs, an entertainment program for Saturday night, and a talk-in station for 34/94.

73, Bob, W5HXL

REGISTRATION	(MORI)	Mark Northcutt	WD5YDI	842-1086
FACILITIES	(OKCAP)	Marshall Williams	K5MB	787-9292
			office	787-9545
PROGRAM	(OCARC)	Joe Buswell	K5JB	732-0676
PRIZE	(ACARC)	Bob James	K5FW	787-5793
LADIES	(76'ers)	Ken Burdick	K5UAB	681-0281

ALTUS
HAM
CLUB

THE DAILY OKLAHOMAN Monday, March 20, 1978

Sooners Standing Weather Watch

By Jim Etter
Staff Writer

ALTUS — People in this often-stormy part of Oklahoma have made an institution out of watching — and listening — for ominous signs in the skies.

A small, unorganized group of ham and citizens band radio buffs who began helping Altus and Jackson County Civil Defense workers about 13 years ago has grown into a southwestern Oklahoma project involving almost 200 volunteers.

Their range of radio communication now spans most of about eight Oklahoma counties and four counties in neighboring Texas. And with some new equipment now being installed, they'll soon — maybe by this tornado season — be able to swap weather information with someone as far away as Okinawa.

Their equipment collectively amounts to about $20,000.

The operation is known in this area simply as "the weather watch."

"We're quite proud of it because it involves a bunch of people — it's a community thing," says Bob Mayotte, the fulltime Altus Civil Defense director.

"Everything weatherwise seems to start down here in the southwest," he said in citing the need for the volunteers. "We have about 28 weather watches (alerts) a year. And we don't wait until we see a tornado on the ground tearing up houses before we blow the siren and go into action."

Word of a "tail" or other cloud "signatures" that may mean severe weather spreads out from Mayotte's communications room to the volunteers as soon as he gets it from the Altus Air Force Base radar.

The volunteers, including the county civil defense director, Altus attorney Tal Oden and the scores of amateur radio operators, then start moving — which often means driving into the storm areas in order to detail the movement of a twister.

Many of the volunteers have been in the storm areas when tornados left heavy damage and even death — scenes that make them aware of their dangerous roles. Several have had close brushes with tornadoes. They were on the job tracking down twisters in 1973 at Frederick, in 1975 at Altus and last year at both Altus and Tipton.

"We just do whatever we can do — you do what needs to be done. And our group, every year we get a little better, and we think we'll keep growing," says Betty Gilliam, a part-time sheriff's office dispatcher of Altus and a member of the Southwestern Oklahoma Repeater Association (SWORA), a group of about 60 licensed amateur radio operators chartered last year.

The group's president, Dwight Dennis, an Altus electronics technician, says his group, along with the Altus Ham Club, the Altus REACT group of citizens band operators and general civil defense workers "can all operate individually — but together we're super strong."

The repeater association members just last year put up a new $8,000 "repeater tower" on nearby Wilson's Mountain which boosts their broadcast diameter to about 130 miles.

Their first repeater tower, built in town in 1974, was lost the next year when, ironically, it was blown down by a tornado.

Just newly acquired and still being installed by the SWORA group is a $2,800 "high frequency rig" in a room in the Civil Defense headquarters. The equipment, donated to the group by a Mangum feed mill operator, Joe McDonald, will give the volunteers radio contact "with the outside world, way, way out there," says Dennis, "in case things really get bad."

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WD5FKG

Manager

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TUNERS
ROTORS

Illustrated at right is Model 1402SM 2.5 watt 144-148 MHz

The standard of Amateur Hand-Helds is Wilson's line of VHF and UHF radios as follows:

Three models in the 144-148 range include the 1402SM - 2.5 watt, 1405SM - switchable 1 and 5 watt, and 1407SM - 7 watt units, one unit in the 220 band: Model 2202SM - 2.5 watt, and Model 4502SM — switchable 1 and 1.8 watt unit is in the 450 range.

Illustrated above is 1405SM with optional Touch Tone Pad (Models 4502 and 2202 have similar appearance.

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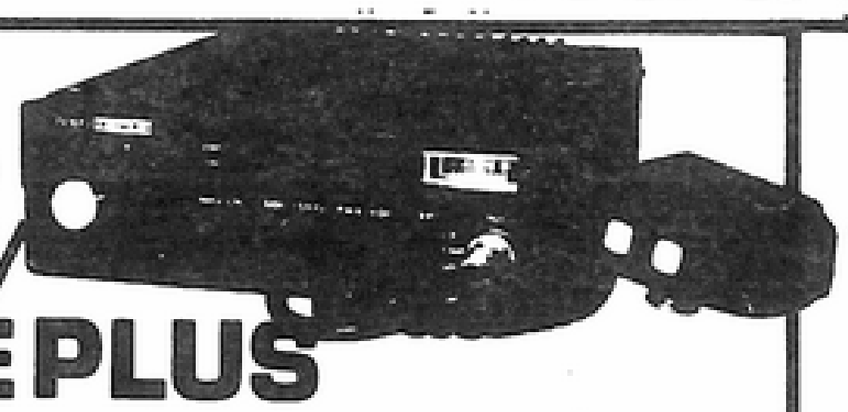
ANTENNAS

MICROWAVE MODULES

HIGH PERFORMANCE UNITS FOR 144, 432 and 1296 MHz

LINEAR TRANSVERTERS



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The Tempo/ONE PLUS offers full 25 watt output or a selectable 3 to 15 watt low power output, remote tuning on the microphone, sideband operation with the SSB/ONE adapter, MARS operation capability, 5 KHz numerical LED, and all at a lower price than its time tested predecessor... the Tempo VHF ONE.

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THE BIG SIGNAL NEWS
OKLAHOMA CITY AUTOPATCH ASSOCIATION, INC.

FEBRUARY MEETING HIGHLIGHTS

The "clan" gathered at KWTV, Channel 9, as scheduled on February 21. We were happy to see such a fine turnout which included amateurs from other clubs, interested citizens, and civil defense coordinators. In spite of poor weather and bad road conditions, spirits and enthusiasm ran high.

Hobe Burgan - WB5MLN outlined the control aspects of the Severe Weather Net. He and/or Lloyd Wright - WB5ZOI will man the net facilities. Bob May - N5RC and Henry Israel - WB7NPN/5 will co-serve as net control.

As soon as the weather net is activated, a summary of what is in store will be transmitted and net control identified. Check-ins will be invited in "quadrant sequence." The metropolitan area will be divided by using I-35 and I-40 as the boundaries. Operators in other cities will be invited to check in with the quadrant nearest their city. Please listen for your sector call before contacting net-control. Incidentally, a "beeper" will be used to signify that the net is in operation.

Gary England and his plucky band (Tom Mahoney and Dennis Smith) discussed facilities such as their computerized radar and "Starcom 9" and briefed their interfacing with the weather net. Films and slides were shown depicting examples of severe weather conditions, all of which made those of us present "expert spotters."

It was stressed that reporting to net control should be timely, clear and concise. Accuracy is important. There is always the fear that false warnings may encourage complacency on the part of the general public and such could become disastrous.

In general, it was felt that the program as a whole, which included well-fielded questions, was educational and inspirational. Hopefully, it will result in a more effective Severe Weather Reporting Net.

* * * * * *

NEW ENTRY INTO AMATEUR RADIO

We welcome a new Novice into amateur radio. The little lady is Glenda Irick - WD5IVX. She, along with dad (Dolph - WD5HVC) had worked through the program master-minded by Frank - N5FM and Bob - N5RC (Ex-WB5NYR).

Guess "pappy" will have to keep his eyes open for good equipment buys for daughter!

Make Glenda feel welcome when she shows up at our meetings.

* * * * * *

NOTE OF INTEREST

FCC's special phone number for legal or technical questions is Area 202, 632-7510. Requests for FCC participation at gatherings such as Ham Holiday should go to Area 202, 632-7520. Inquiries regarding amateur licensing processing should go to Gettysburg: Area 717, 334-7631. We understand that Wx2 callsigns are used up for the 5 call area.

* * * * * *

It is said women have cleaner minds than men. Is it because the gals change them so often?

THE BIG SIGNAL NEWS

OKLAHOMA CITY AUTOPATCH ASSOCIATION, INC.

EXCERPTS FROM HR REPORT

OSCAR 8 IS UP AFTER A flawless launch that lifted off the launch pad right on schedule last Sunday morning (March 5, 1978). Listeners to the AMSAT 20-meter net heard the actual countdown and blastoff relayed by WA3NAN, and the later ejection of OSCAR 8 from the launch vehicle was so perfect that the 435.095-MHz beacon signal showed the satellite was tumbling far less than had been expected. This permitted extension of the 10-meter antenna Sunday evening on the fifth orbit instead of waiting several days as had originally been planned, and on the following orbit Mode A was turned on as OSCAR 8 came over the southern horizon and its 29.402 MHz beacon laid a strong signal across the entire U.S.

Preliminary Tests Show the new bird to be a fine performer, with good Mode J signals and Mode A performance apparently even better than OSCAR 6 was. The telemetry system is also working very well - watch Channel 1 (solar array current, immediately following "HI") change abruptly as the satellite loses the sun in the earth's shadow. Checkout testing will continue through the end of next week, after which the OK should be given for general use of OSCAR 8.

OSCAR 8's Orbit came very close to predictions, with preliminary calculations showing it nearly circular with a 909.583 km mean altitude, a period of 103.193 minutes, and an inclination of 99.146 degrees resulting in a 25.7983 degree progression at the equator each orbit. These numbers are being further refined, and by next week's HR Report reference orbits for the next week or two should be available.

Anyone Copying OSCAR 8's telemetry during the first 100 orbits can receive a special OSCAR 8 QSL by sending the copy to Bernie Glassmer at ARRL, and those who checked into the launch-day 20-meter net are eligible for a "First Day In Orbit" QSL from NCS WA3NAN, Box 86, Greenbelt, Maryland 20770.

RICHARD COOPER HAS THREATENED in his SSB News column, "Keydown" to ask the Justice Department to investigate the FCC-ARRL "conspiracy" against CB and through his Communications Attorney Service to "seek an injunction against the use by the FCC...of funds for the Personal Communications branch (sic) of the FCC for either salaries or function, until it is determined that the money is being lawfully used." It's also being rumored on the West Coast that his petitions to give Amateur privileges to CBers have over 9 million names, which are currently being key punched.

He's Also Reported to have been conferring with California Governor Brown and former Governor Reagan about his plans.

(OKCAP Ed's Note: The very existence of our fraternity is being threatened daily by individuals and groups such as these. Can you imagine: "Catfish calling CQ," or "Strawberry Buddy calling YV5--?" Think about it.)

FCC HAS BIGGER TEETH NOW as a result of legislation recently signed into law by President Carter. The new law gives the FCC jurisdiction over unlicensed as well as licensed operators and can levy to $2000. The new law shouldn't change things much for licensed Amateurs, but should make a lot of difference in FCC's efforts to go after HFers and other scofflaws.

LIGHTNING SEASON APPROACHES despite the extensive snow cover that remains and it's time to check out antenna grounds and antenna grounding practices. Logic alone isn't sufficient protection, WB2TBC found, when his antennas on the roof of a four-story building attracted enough energy to light up his shack despite a 40-story building only 100 feet away. Thanks News Fuse.

THE BIG SIGNAL NEWS
OKLAHOMA CITY AUTOPATCH ASSOCIATION, INC.

A WORD FROM SEVERE WEATHER NET CONTROL

HOW ABOUT THAT PRESENTATION?

On behalf of the amateurs who work the Severe Storm Warning Net I would like to thank Gary England, Tom Mahoney and Dennis Smith for the fine presentation on severe weather. Very informative fellows, thanks.

O.K. amateurs, the channel 9 weather staff has given us the information we need to make intelligent reports, so keep up the good work that past experience shows we can do.

I am going to go through the check-in procedure in as much detail as possible.

There will be a beeper on the 146.22-82 repeater when the net is in session. This means no personal calls during that time. If the 146.82 repeater goes off the air for any reason, we will use 146.07-67 to run the net. This is as it has been in the past.

When the net is called, you will get a briefing from Radar Control as to the location, movement and severity of the situation. Net Control will then ask for emergency situations in any area (condition 3 or worse).

You will be asked to check-in by guadrants. NW SW SE NE, the dividing line being Interstates 35 and 40. Areas outside Okla. City will be called first, and as the storm progresses we will ask for check-ins as needed.

The speed of movement and severity of storm will determine check-in procedure. i.e. we may just want your last 2 or 3 letters (CDP) or (KZ). If we feel there is plenty of time we will want your entire call and location at time of check-in. We may ask for certain towns or your entire quadrant. Please listen to instructions at time net is called.

After you have checked in if you move or have to go off the air, please check out or recheck for location change. We need to know where you are. As soon as an area is clear we will secure that quadrant so everyone won't have to be up all night. Hi:

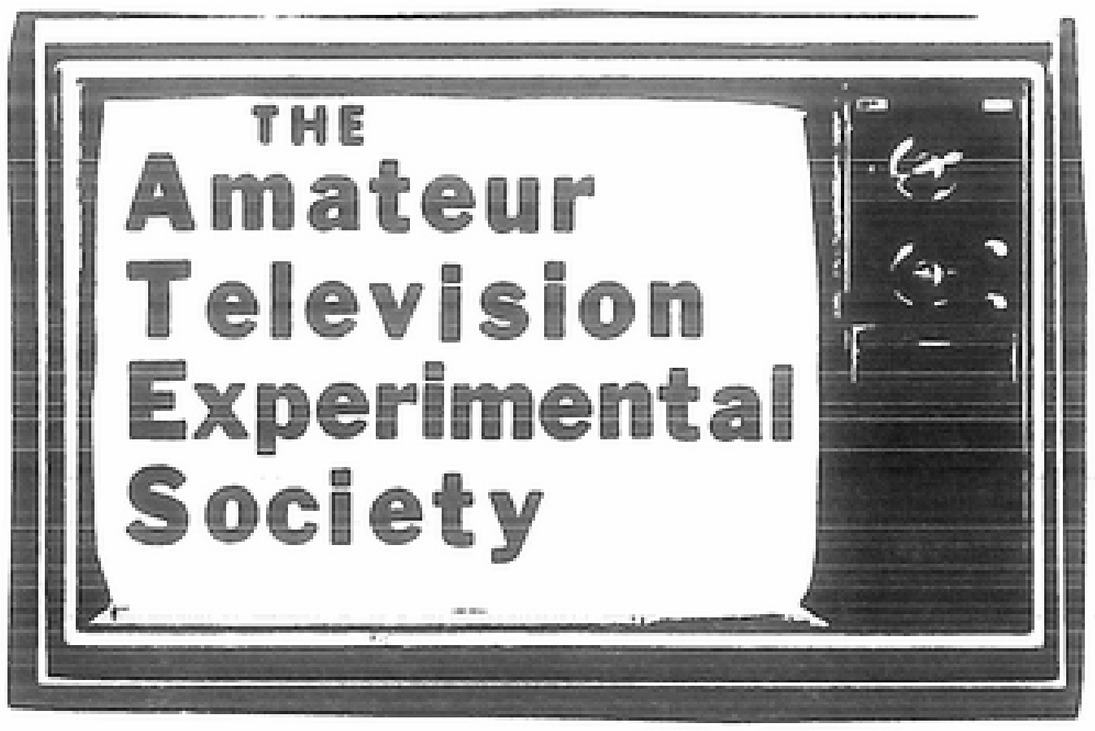
We have some towns or the quadrant lines such as Moore, Norman, Yukon, El Reno, etc. These places will be asked to check-in with a certain quadrant when net is called in your area.

Alot of you have been spotting for a few years, but I am new at Net Control so bear with me and we will get the job done.

You showed fine support at the meeting and I would like to say tnx.

Talk to you this spring,

Bob May
N5RC



The Amateur Television Experimental Society cordially invites you to an event unprecendented in the Oklahoma City area-----

The organizational meeting of the Amateur Television Experimental Society! You have the opportunity to get in on the ground floor as a charter member. All you need are the following qualifications:

1. A sincere interest in amateur television.
2. An amateur radio license or firm intent to obtain one.

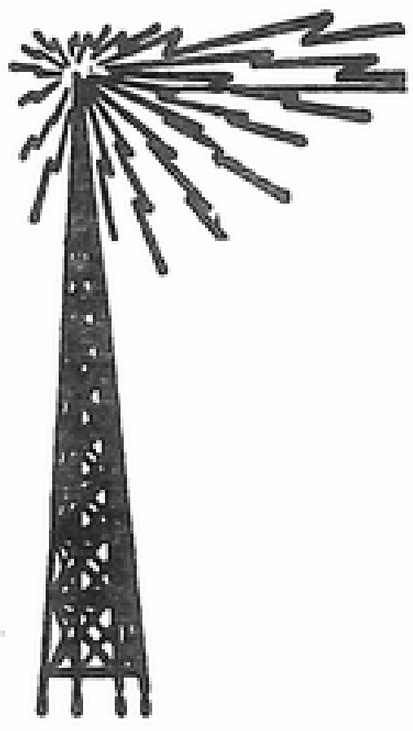
The meeting will be held at Continental Federal Savings and Loan Company in the Edmond Plaza Shopping Center---15th and Broadway in Edmond.

The date is Tuesday May 2,1978 at 7:30 pm.

Included in the meeting will be a live on-the-air demonstration of Amateur Television and all the information needed to get you on the air. When you leave the meeting you will know what Amateur Television is all about!

HOPE TO SEE YOU THERE

WA5CZN--DOC WB5EVO--PAUL



Lawton - Ft. Sill Amateur Radio Club, Inc.

FCC will conduct Technician thru Extra Class examinations on Saturday April 8,1978. FCC Form 610's will be available. Good Luck.

ANNOUNCEMENT

LAWTON-FT. SILL AMATEUR RADIO CLUB 32nd ANNUAL HAMFEST
MONTEGO BAY MOTEL COMPLEX - April 8th and 9th 1978
Mars Meetings, Demonstrations, QLF and Novice Contests
Eye Ball QSO's- Ladies Activities, Sat Night Activities
COME AND PLAN FOR A WEEKEND OF FUN
Lawton Hamfest, Box 892, Lawton, Ok 73502

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* Base matching and phasing coils sealed and impervious to weather
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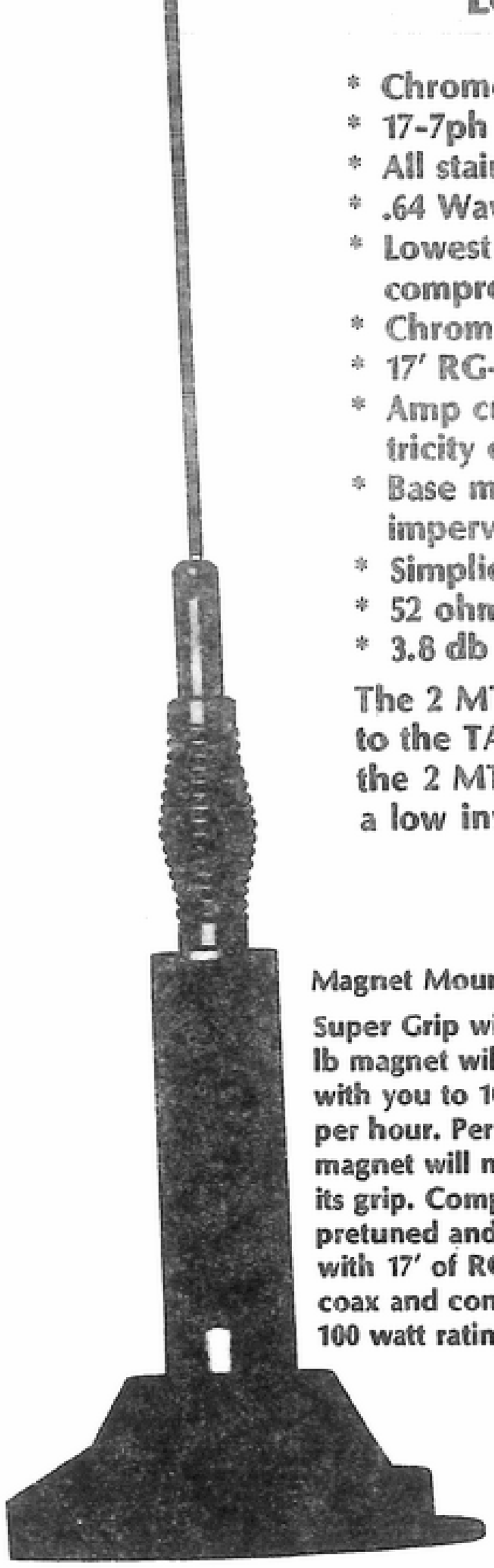
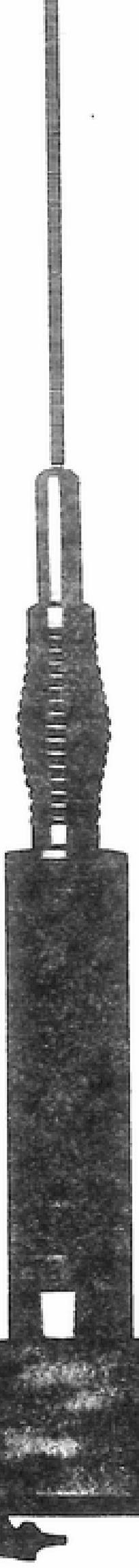
The 2 MTR antennas are the latest addition to the TAYLOR line of antennas. Designed for the 2 MTR Amateur who wants the best at a low investment.



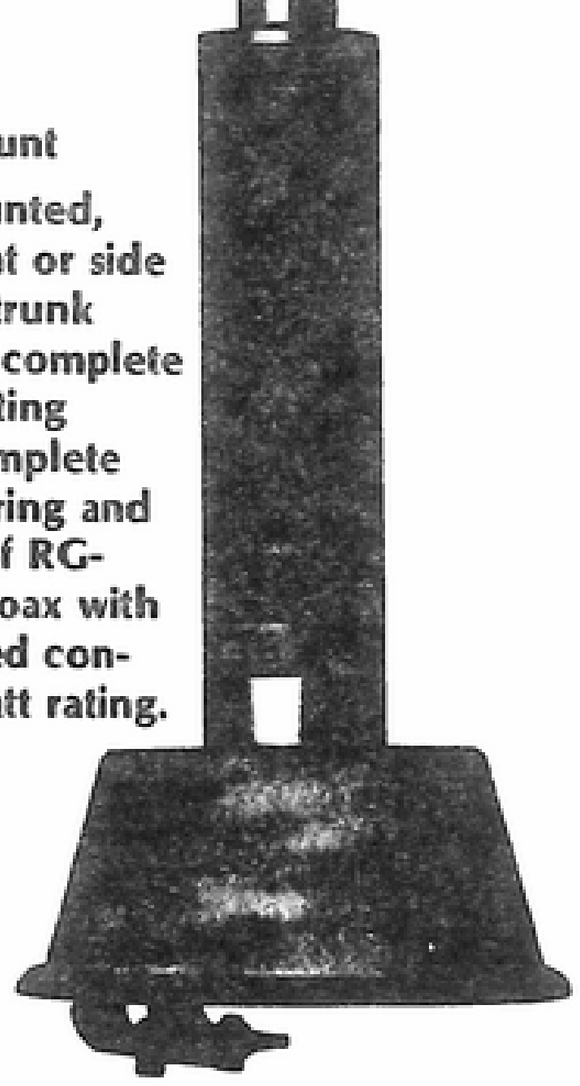
Magnet Mounted

Super Grip with a 80 lb magnet will stay with you to 100 miles per hour. Permanent magnet will never loose its grip. Completely pretuned and assembled with 17' of RG 58A/U coax and connector. 100 watt rating.



Trunk Lip Mount

Trunk lip mounted, clamps to front or side edge of your trunk lid. Furnished complete with all mounting hardware. Complete with shock spring and wrenchs, 17' of RG-58A/U foam coax with factory installed connector. 100 watt rating.



B & J Two Way

+ + + AMATEURS DEPARTMENT + + +

1516 S.E. 44 PHONE 672-1381 OKLAHOMA CITY

ONE BLOCK EAST OF I-35

Club
NEWS

WSLOW
The Elmer Geddes Memorial
Station

MINUTES OF MARCH MEETING

MEETING WAS CALLED TO ORDER 8 PM BY PRESIDENT KEN, WB5KHU, WITH 26 MEMBERS AND GUESTS PRESENT. AL, WB5KCU, VICE PRESIDENT, PRESENTED PAST PRESIDENT WOODY, W5FMX, WITH A PLAQUE THANKING HIM FOR HIS ABLE SERVICE.

KEN, PRESENTED THE FOLLOWING LIST OF ITEMS TO BE AUCTIONED OFF AT NEXT MONTH'S MEETING (SEALED BIDS WILL BE ACCEPTED PRIOR TO MEETING FROM THOSE WHO CAN'T ATTEND)

CLUB EQUIPMENT (SURPLUS)

GLOBE SCOUT (NOVICE TX) - AS IS.

HEAVY DUTY SOLDERING UNIT LESS ELECTRODES - AS IS.

"VINTAGE TRICKLE CHARGER" - OPERATING.

DUMONT ELECTRONIC SWITCH AND SQUARE WAVE GENERATOR - OPERATING.

RF SIGNAL GENERATOR (ADVANCE SCHOOLS, INC. - PROBABLY BY HEATHKIT)

5" OSCILLOSCOPE MODEL 10B-18 ADVANCE SCHOOLS, INC. (BY HEATHKIT) SAME MODEL NO. GOOD AS OR CONVERT TO SSTV MONITOR USING INSTRUCTIONS IN ARRL SPECIALIZED COMMUNICATIONS TECHNIQUES HANDBOOK.

FILM STRIP PROJECTOR - OPERATING.

JUNQUE BOX - COMPONENT PARTS, ANY OR ALL.

BOB, W5HXL, REPORTED ON ACTIVITIES OF HAM HOLIDAY COMMITTEES.

STEVE, W5WCJ, REPORTED THAT ON APRIL 10, 1978 7:30 PM AT THE FAIRGROUNDS IN ENID, THE CHANNEL NINE TV STAFF WILL PRESENT A WEATHER PROGRAM SIMILAR TO THE ONE PRESENTED IN OKLAHOMA CITY.

CARL, W5JJI, REPORTED ON SOME LEAGUE ITEMS AND DESCRIBED AN ANTENNA DESIGN BY W4ATE WHICH HAS CONTROLLED CURRENT DISTRIBUTION RESULTING IN GAIN.

KEN, AUCTIONED THE OLD (1976) CALL BOOK FOR $3.00 TO PAUL, W5TQG.

JOE, WA5ZNF, MANAGING EDITOR OF CORA C & E, PASSED OUT EXAMPLES OF BUSINESS CARDS ADS BEING RUN IN C & E AND ASKED THAT THE MEMBERS CONTACT MERCHANTS AND GET SOME ADVERTISING SOLD. THREE PAGES OF BUSINESS CARDS WOULD PAY EXPENSES FOR A YEAR. HE ASKED IF ANYONE MAD ANY IDEAS FOR BARGAIN PRINTING. JACK, WB5ZKZ, SUGGESTED CONTACTING VOTECH SCHOOLS.

BOB, W5HXL, PRESENTED THE PROGRAM ON SETTING UP AN AMATEUR STATION. HE PRESENTED MANY IDEAS AND TECHNIQUES LEARNED FROM SEVERAL YEARS OF EXPERIENCE THAT MAKE OPERATING COMFORTABLE AND SAFE.

PAUL, WA5HTL, CONDUCTED A PRIZE DRAWING AND MADE A BUNCH OF PEOPLE EVEN HAPPIER THEY CAME.

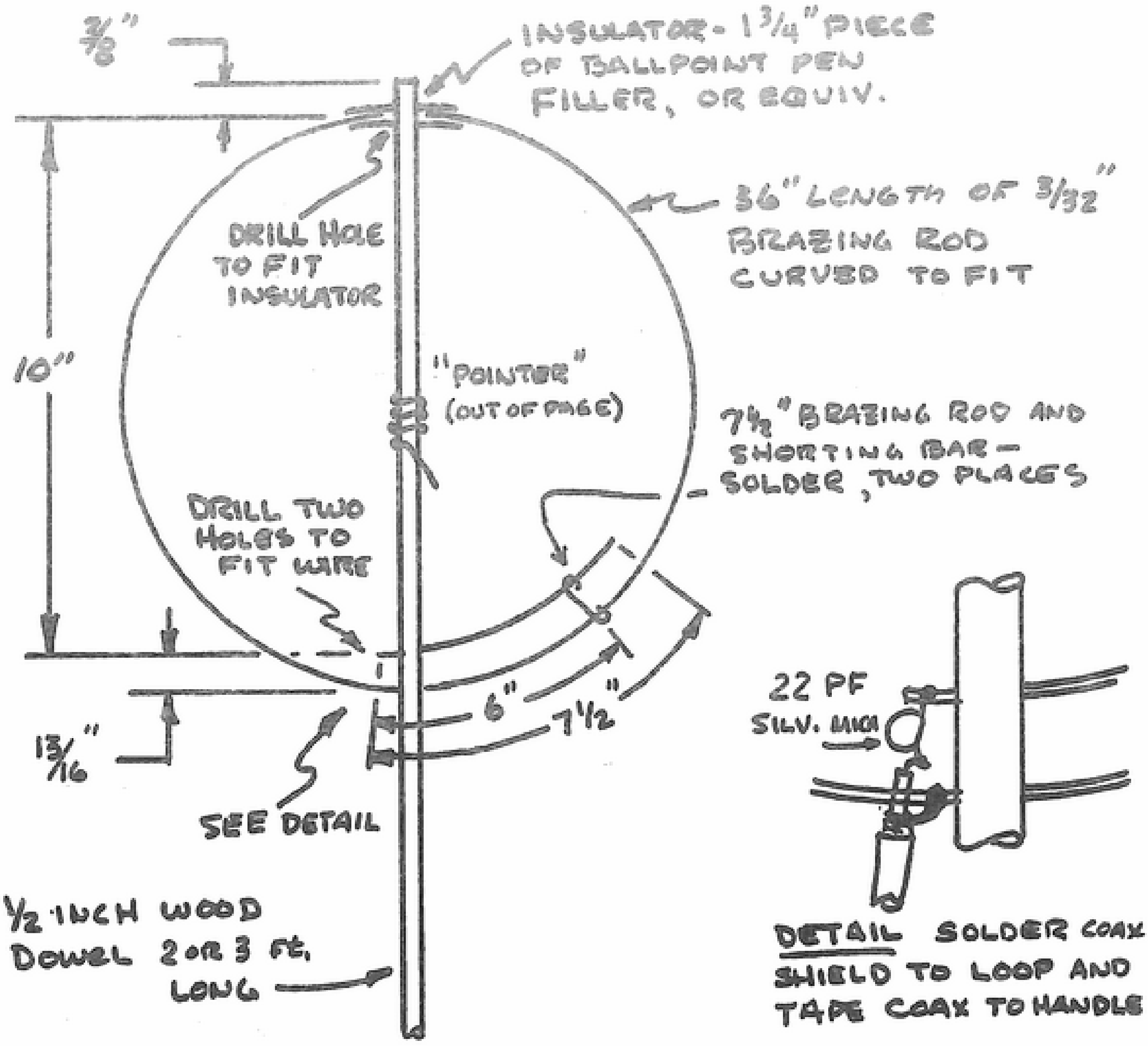
MEETING WAS ADJOURNED AT 9:30PM.

JOE, K5JB, SEC'Y

TRANSMITTER HUNTING

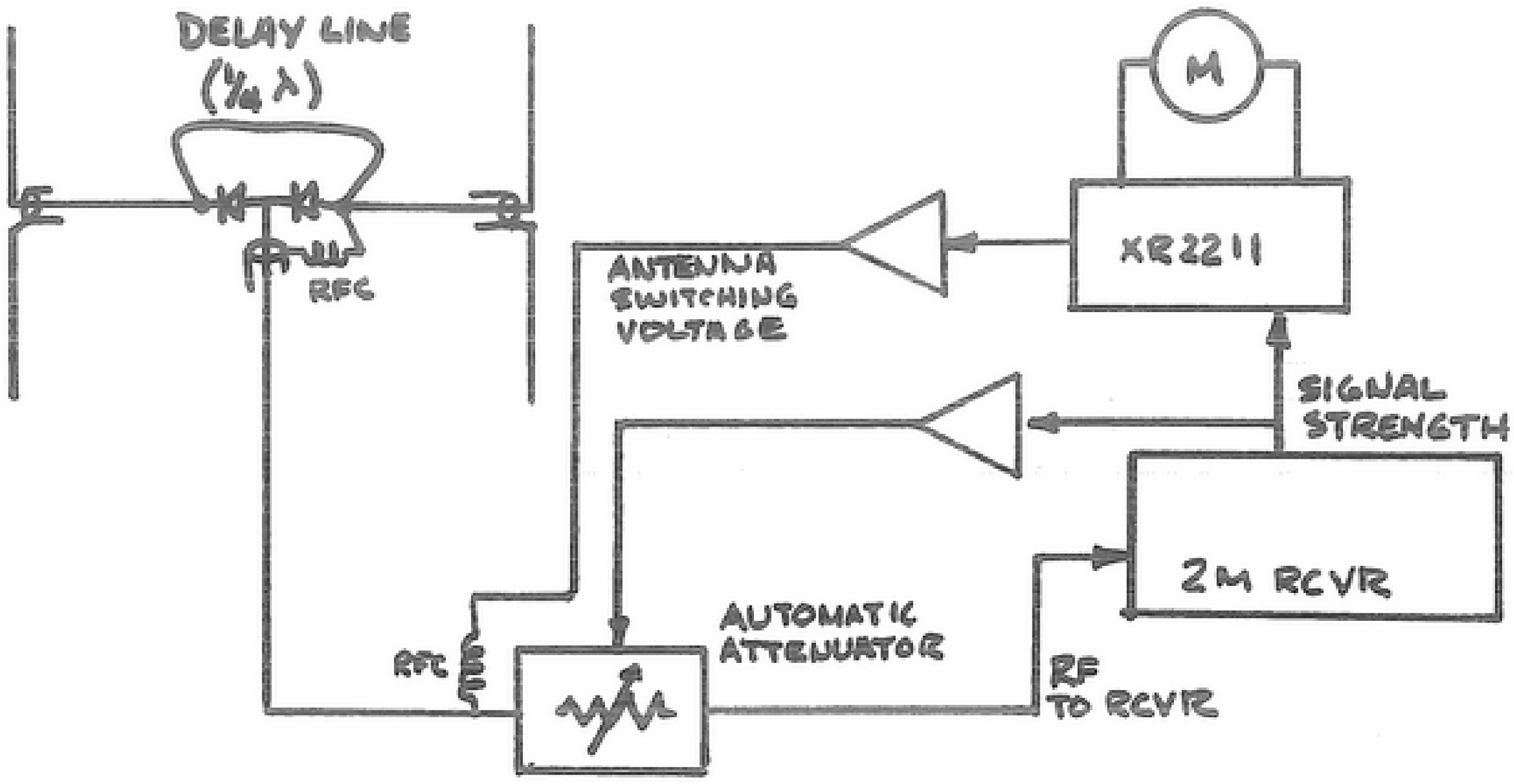
LATELY THERE APPEARS TO BE RENEWED INTEREST IN LOCATING HIDDEN TRANSMITTERS, PARTICULARLY THOSE OPERATED BY PERSONS UNKNOWN ON THE 2 METER FM REPEATERS. I DON'T KNOW IF INTEREST IS SUFFICIENT FOR ANYONE TO DO ANY MORE THAN TALK ABOUT IT BUT IN CASE IT IS, I RESEARCHED BACK ISSUES OF C & E AND FROM THE AUGUST, SEPTEMBER AND OCTOBER 1976 ISSUES, CONDENSED THE FOLLOWING.

SID, W5KOZ, DEVELOPED THE SIMPLEST AND THEREFORE, PROBABLY MOST PRACTICAL TOOL FOR TRANSMITTER HUNTING. HIS LOOP ANTENNA IS NOT A TRUE MAGNETIC LOOP SINCE IT IS NOT SHIELDED BUT EITHER BY DESIGN OR LUCK, SID'S LOOP HAS A SINGLE NULL IF IT IS USED IN A CLEAR AREA, RELATIVELY FREE OF REFLECTIONS. I DUPLICATED HIS ANTENNA USING THE SKETCH AND IT WORKED EXACTLY LIKE SID'S. ONE MIGHT FEED A LITTLE POWER TO IT WITH A TRANSMITTER AND DIRECTIONAL WATTMETER AND VARY PLACEMENT OF THE GAMMA SHORTING BAR AND VALUE OF THE 22PF CAPACITOR FOR MINIMUM REFLECTED POWER AND SEE IF THE ANTENNA WORKS BETTER. ON THE OTHER HAND, IT MIGHT NOT WORK AS WELL, SPOILING THE SINGLE NULL WHICH IS PECULIAR TO THIS DESIGN. THE SHIELD OF THE COAX TRAILING DOWN FROM THE ANTENNA MIGHT BE ACTING AS A "SENSE" ANTENNA SO I COILED THREE OR FOUR TURNS AROUND THE HANDLE ABOUT 18 INCHES BELOW THE ANTENNA TO ACT AS A CHOKE. THE ANTENNA SEEMED TO ACT A LITTLE MORE CONSISTENTLY.



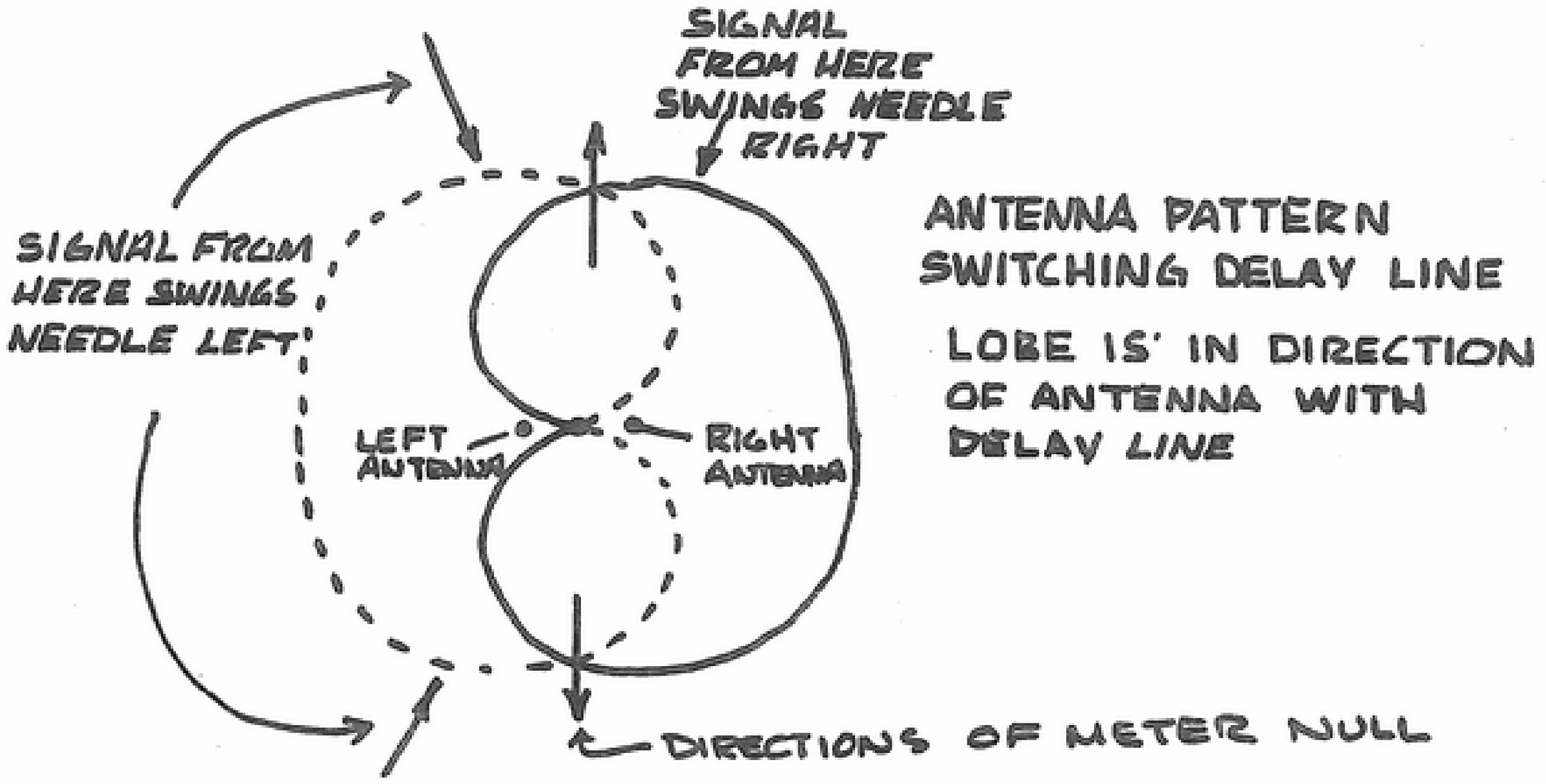
W5KOZ DF ANTENNA

THE HAPPY FLYERS RADIO DIRECTION FINDING UNIT IS SHOWN IN BLOCK DIAGRAM. THE HEART OF THE THING IS THE XR2211 FSK DEMODULATOR MADE BY EXAR INTEGRATED SYSTEMS, INC. IT IS BEING USED TO GENERATE A SQUARE WAVE SWITCHING VOLTAGE WHICH ALTERNATELY PUTS THE TWO ANTENNA DIODES INTO CONDUCTION CAUSING THE DELAY LINE TO SWITCH FROM SIDE TO SIDE IN THE ANTENNA SYSTEM. THE CHANGE IN SIGNAL STRENGTH THAT RESULTS, CAUSES THE RECEIVER "S" METER (OR LIMITER CURRENT) TO HAVE A FLUCTUATION AT THE SAME FREQUENCY AS THE SWITCHING. THE PHASE OF THIS FLUCTUATION IS COMPARED, IN THE XR CHIP, WITH ITS INTERNAL OSCILLATOR PHASE. IF THERE IS A DIFFERENCE, IT CAUSES THE METER MOVEMENT TO DEFLECT ONE WAY, IF THERE IS NO DIFFERENCE, IT WILL DEFLECT THE OTHER WAY. IF THERE IS NO VARIATION IN SIGNAL STRENGTH, THE METER WILL SET IN THE CENTER.



BLOCK DIAGRAM HAPPY FLIERS DF UNIT

SEE THE ANTENNA PATTERNS CAUSED BY THE SWITCHED DELAY LINE. THE METER WILL NULL AT TWO POINTS WHERE SIGNALS ARE EQUAL BUT ROTATING THE ANTENNA SLIGHTLY WILL CAUSE THE METER TO DEFLECT EITHER TO RIGHT OR LEFT DEPENDING ON WHETHER THE OPERATOR IS LOOKING AT, OR AWAY FROM, THE SIGNAL SOURCE. THE DIRECTION INDICATION IS THEREFORE UNIQUE.

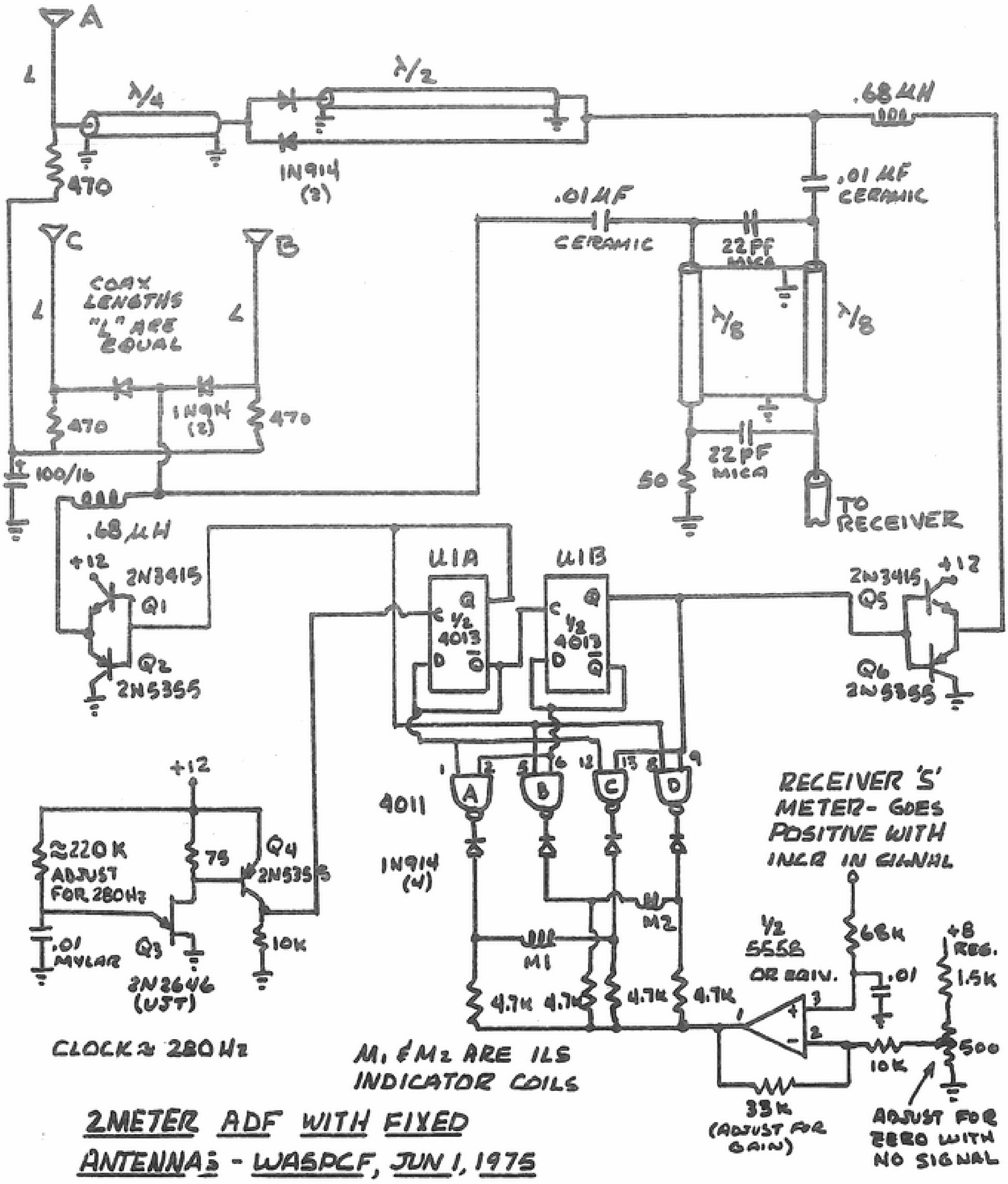


THE ANTENNAS I USE ARE OF TWO DESIGNS. ONE IS A PAIR OF QUARTER WAVE VERTICALS ON A MAGNETIC MOUNT. THE OTHER IS A PAIR OF HALFWAVELENGTH VERTICALS ON A BOOM MOUNTED ON MY MAST WITH THE OTHER ANTENNAS.

THE RESOLUTION OF THIS SYSTEM IS CLOSER THAN THE AVERAGE INDICATOR SYSTEM CAN MEASURE. FOR REALLY ACCURATE AZMUTH READINGS, THE CAR CAN BE PARKED AND ALIGNED WITH A KNOWN SIGNAL SOURCE AND THE ANTENNA SCOOTED AROUND FOR A NULL IN THE METER. THE AZMUTH TO THE UNKNOWN SIGNAL SOURCE IS READ USING A LENSATIC COMPASS RESULTING IN A RESOLUTION OF PERHAPS ONE DEGREE.

THE KEY TO ACCURATE PIN POINTING OF SIGNAL SOURCES IS OBTAINING TWO VALID AZMUTH READINGS AND TRANSFERRING THEM TO A MAP. WHEN TAKING COMPASS READINGS, IT IS NECESSARY TO CORRECT FOR MAGNETIC DECLINATION (VARIATION). THIS IS THE ERROR BETWEEN MAGNETIC NORTH AND GRID (TRUE) NORTH. IN OKLAHOMA COUNTY, THIS VARIES BETWEEN 8 AND 9 DEGREES EAST OF NORTH. THIS MEANS THE COMPASS NEEDLE (OR DISC) WILL BE A LITTLE BIT EAST AND ABOUT 8 DEGREES MUST BE SUBTRACTED FROM A COMPASS READING TO GET TRUE DIRECTION.

HAPPY FLYERS DF CIRCUIT BOARDS AND ADDITIONAL INFORMATION IS AVAILABLE FROM HAPPY FLYERS, 1811 HILLMAN AVE., BELMONT, CA 94002. CIRCUIT BOARDS AND DATA PACKAGE COSTS $10.00. PROFITS FROM SALE OF BOARDS GO TO FINANCE EMERGENCY LOCATOR TRANSMITTER HUNTS AND OTHER WORTHWHILE RDF ACTIVITIES.

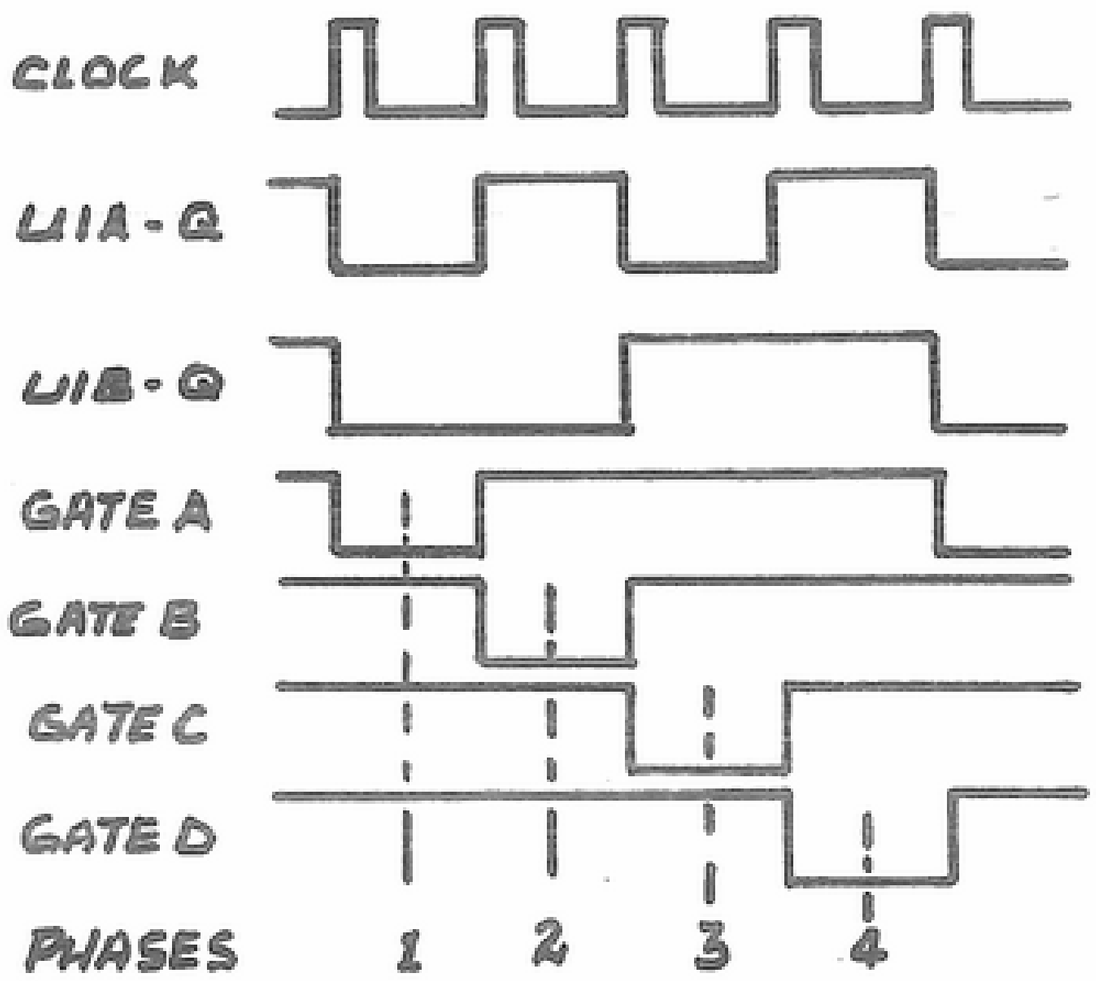


2METER ADF WITH FIXED ANTENNAS - WA5PCF, JUN 1, 1975

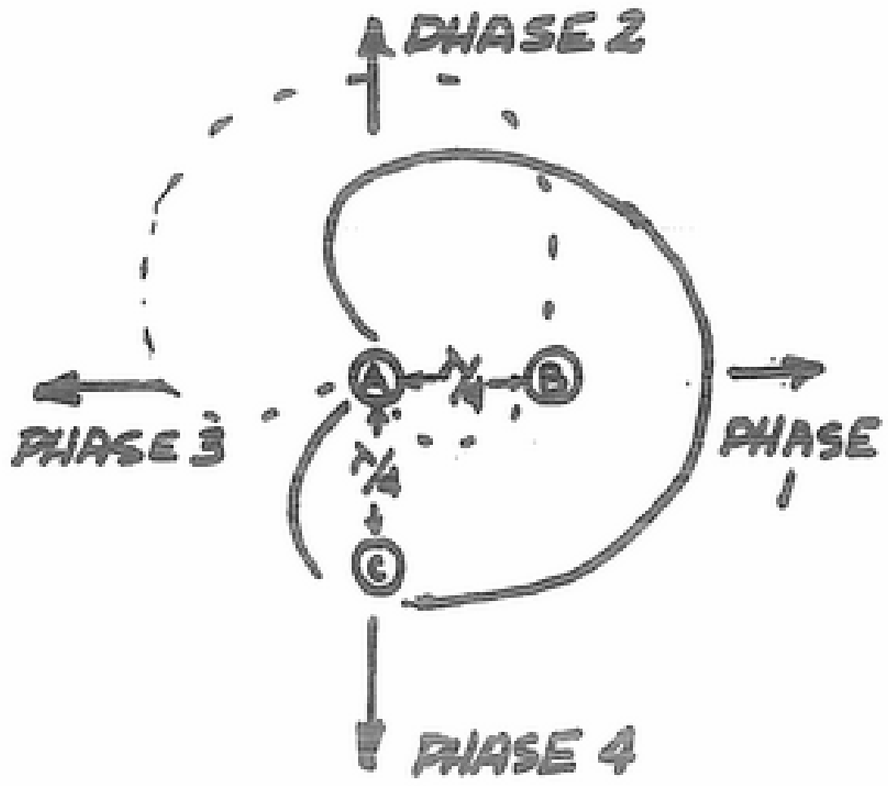
IN AUGUST 1976 C & E, BILL, WA5RAQ, REDREW AND PUBLISHED A SCHEMATIC OF A SYSTEM DEVELOPED BY WA5PCF. IN OCTOBER, I DESCRIBED HOW IT IS SUPPOSED TO WORK. TO DATE, I DON'T KNOW OF ANYBODY LOCALLY WHO TRIED IT. IT IS A LITTLE MORE COMPLICATED TO UNDERSTAND THAN THE HAPPY FLYERS UNIT AND THERE AREN'T STEP BY STEP INSTRUCTIONS AND CIRCUIT BOARD AVAILABLE, TO MY KNOWLEDGE. INSTRUMENT LANDING SYSTEM (ILS) INDICATORS MAY NOT BE READILY AVAILABLE BUT ANY CROSSED POINTER METER MOVEMENT SHOULD WORK. PERHAPS ARRANGING SOME LIGHT EMITTING DIODES IN A CROSS AND ARRANGING BIAS SO THEY WILL ILLUMINATE PROGRESSIVELY WOULD SERVE AS A SUBSTITUTE.

THE WA5PCF CIRCUIT SHOULD RESOLVE DIRECTION TO FOUR COMPASS POINTS OR MORE AND HAS ADVANTAGE THAT IT IS UNNECESSARY TO ROTATE THE ANTENNAS.

THE CIRCUIT LOOKS COMPLICATED BUT IT ACTUALLY IS NOT IF IT IS CAREFULLY STUDIED. THE CMOS 4013 IC CONTAINS TWO FLIP-FLOPS. THE CLOCK IS GENERATING PULSES WHICH TOGGLE THE FIRST FLIP-FLOP. ONE OUTPUT OF THAT FLIP-FLOP IS TOGGLING THE SECOND FLIP-FLOP. THE OUTPUTS OF THE TWO FLIP-FLOPS ARE DOING TWO THINGS: SWITCHING ANTENNA PATTERNS AND SUPERVISING OPERATION OF THE ELECTRO-MECHANICAL INDICATOR THROUGH FOUR GATES CONTAINED IN A 4011 IC.



TIMING DIAGRAM



(ONLY PHASES 1 & 2 SHOWN)

ROTATING PATTERN

LOOK AT THE TIMING DIAGRAM. THE FLIP-FLOPS MAKE TRANSITION ON POSITIVE GOING EDGE OF CLOCK PULSES. OUTPUT Q FROM U1A IS SWITCHING ANTENNAS C AND B ON ALTERNATELY BY USING Q1 AND Q2 AS EMITTER FOLLOWERS. OUTPUT Q FROM U1B IS SWITCHING A ½ WAVE DELAY LINE (180°) IN AND OUT OF THE CIRCUIT WITH ANTENNA A. NOTICE THE 100 UF CAPACITOR NEAR ANTENNA C. IT WILL CHARGE TO ½ OF SUPPLY VOLTAGE AND PROVIDE SOURCE OF CURRENT WHEN EITHER Q2 AND Q6 IS CONDUCTING.

THE OP AMP IN THE LOWER RIGHT CORNER OF THE SCHEMATIC PROVIDES SIGNAL DRIVE TO THE ILS INDICATOR COILS THAT IS A FUNCTION OF RECEIVED SIGNAL STRENGTH. THIS SIGNAL STRENGTH WILL VARY AS ANTENNA PATTERN IS ELECTRONICALLY ROTATED. THE GROUNDING OF POINTS A, B, C & D ON THE INDICATOR COILS IS DONE BY THE GATES AND DIODES (SEE TIMING DIAGRAM) AND IS IN SYNC WITH THE ANTENNA PATTERN ROTATION.

THE PLACEMENT OF THE THREE ANTENNAS AND DIRECTION OF PATTERN DURING THE FOUR TIME INTERVALS SHOWN ON THE TIMING DIAGRAM IS SHOWN IN THE FIGURE.

SIGNALS FROM ANTENNAS A AND B OR C ARE COMBINED IN THE LITTLE FOUR PORT COMBINER MADE UP OF 1/8 WAVELENGTH PIECES OF COAX AND 22 PF CAPACITORS. THIS IS A NICE FRILL BUT MAY NOT BE NECESSARY. THE DISADVANTAGE OF THIS COMBINER IS A 3dB LOSS IN SIGNAL THROUGH THE CIRCUIT. THE ADVANTAGE IS BETTER CHANCE OF MIXING SIGNALS WITHOUT STRANGE TRANSMISSION LINE PROBLEMS SHOWING UP.

WELL, THERE YOU HAVE IT. FOR ADDITIONAL INFORMATION, SEE DON WA5TAW WHO HAS DOPE ON BILL, WB5SXG's QUAD AND IS WRITING IT UP FOR C & E. I WOULD PARTICULARLY LIKE TO SEE SOMEONE BUILD THE WA5PCF SYSTEM AND GIVE US A REPORT ON HOW IT WORKS. FOR THOSE WHO ARE THOROUGH RESEARCHERS AND NOTICE I LEFT A BUNCH OF STUFF OUT WHEN I COPIED THE SCHEMATIC FROM AUGUST 1976 C & E, I'LL EXPLAIN. I DIDN'T KNOW WHAT THE AUTOMATIC GAIN CONTROL CIRCUIT WAS FOR SO I LEFT IT OUT AND SUBSTITUTED A 5558 OP AMP FOR THE LM 324 QUAD OP AMP. PIN 8 IS +12V AND PIN 4 IS GROUND. THE AUTOMATIC GAIN CONTROL COULD BE USED TO CONTROL AN AUTOMATIC ATTENUATOR IN THE SIGNAL LINE BUT WE CAN GET INTO THAT IF SOMEONE GETS THIS FAR.

JOE, K5JB

AERONAUTICAL CENTER AMATEUR RADIO CLUB, INC.

W5PAA

AERONAUTICAL CENTER AMATEUR RADIO CLUB MEETING MINUTES
March 3, 1978

The meeting was opened promptly at 8:30 p.m. by President Bob Graham with 40 members present. Ellard Foster handed out the Oklahoma picture post cards that may be used for making your own QSL cards.

Station Manager, George Lagaly reported no problems with the Station, Master Instructor, Charlie Green requested help for the licensing class beginning in September. There will be no classes during the summer.

Cora President Bob Ashly gave a brief status report on Ham Holiday.

The ACARC repeater W5PAA/rpt. will be placed in service within 30 days. This will be an open repeater with autopatch. It will operate on 146.25/85 mc.

March is the month for ACARC members to fold, staple and mail C & E volunteers to meet at the usual place at 7:00 p.m., March 27, 1978.

Mr. Mike Carpenter, an electrical engineer, from OG&E presented a very interesting and informative program on power generation and alternative methods of fueling power generators.

Respectfully submitted, Bob K5FW

RANDOM WORDS FROM THE PRESIDENT

We had an excellent turnout for the March meeting at the ACARC. I think that everyone enjoyed the feature program, "Energy Realities," and Mike Carpenter, O.G.&E. representative, did a fine job fielding some very tough questions. Who knows, maybe Mike will pass some of them along (Hi).

In April, we will have another outstanding program that will be of much interest to all. Frank Jerome, instructor at Oscar Rose Junior College, will present a video-tape, and slide presentation on communication satellites. Frank, himself an amateur, teaches Amateur Radio at OSCAR Rose and should present an excellent program.

At the March meeting, I announced that we are finally on the way to a working repeater. Our order is in, and by the time you read this our new Motorola B73mpb-1000 repeater, with 120 watts output power. We have also purchased a 6 cavity duplexer, and a DB-224 antenna, so we should be on the air right away. I would like to thank John Waldvogel, W5UNA, and Bob Pace, WA5CJG, for their generous contributions of both materials and time in finally getting this project moving. With their help it looks like we may soon be on the air.

Field Day is closer than most of us realize. Robby Runyon, W5JES, and Charlie Green, WA5JGU, are planning to have a lot of fun this year, so get in touch with Robby, or Charlie if you are interested.

I have received several suggestions for program topics, and will do my best to cover these topics. If you have any suggestions or ideas for programs, please let me know, so I can best serve your interests.

73, Bob Graham, WB5NSV

Johnson Viking Valiant, 200 W. AM, 275 CW, 300 PEP SSB W/Xternal Xciter
(3-6446's) VFO - 160 - 10.
HQ110C Hammarlund 160 - 6 W/Q Multiplier.
HC-10 -- SSB Adapter.
SB-10A T-21 (BC 450) VFO All manuals on all equipment.
Robbie 373-1818 W5JES

MEMORY UNLIMITED

An amazing new integrated circuit has been developed which may revolutionize the electronics memory industry. The following is an excerpt from the specification sheet.

FULLY ENCODED, 9046xN, RANDOM ACCESS, WRITE-ONLY-MEMORY

DESCRIPTION
The 25000 Series 9046xN Random Access Write-Only-Memory employs both enhancement and depletion mode P-Channel, N-Channel, and neu-Channel (see note 1) MOS devices. Although a static device, a single TTL level clock phase is required to drive the on-board multiport clock generator. Data refresh is accomplished during CB and LH periods (Note 2). Quadristate outputs (when applicable) allow expansion in many directions, depending on organization.

The static memory cells are operated dynamically to yield extremely low power dissipation. All inputs and outputs are directly TTL compatible when proper interfacing circuitry is employed.

FEATURES
- FULLY ENCODED MULTI-PORT ADDRESSING
- POWER DISSIPATION 10uW/BIT TYPICAL
- AVAILABLE OUTPUTS "n"
- CLOCK LINE CAPACITANCE 2pF MAX. (Note 3)
- Vcc= +10V
- Vdd= 0V ± 2%
- Vff= 6.3Vac (Note 4)

APPLICATIONS
DON'T CARE BUFFER STORES
LEAST SIGNIFICANT CONTROL MEMORIES
POST MORTEM MEMORIES (WEAPON SYSTEMS)
ARTIFICIAL MEMORY SYSTEMS
NON-INTELLIGENT MICRO CONTROLLERS
FIRST-IN NEVER-OUT (FINO) ASYNCHRONOUS BUFFERS
OVERFLOW REGISTER (BIT BUCKET)

BIPOLAR COMPATIBILITY
All data and clock inputs plus applicable outputs will interface directly or nearly directly with bipolar circuits of suitable characteristics. In any event use 1 amp fuses in all power supply and data lines.

INPUT PROTECTION
All terminals are provided with slip-on latex protectors for the prevention of Voltage Destruction. (PILL packaged devices do not require protection.)

SILICON PACKAGING
Low cost silicon DIP packaging is implemented and reliability is assured by the use of a non-hermetic sealing technique which prevents the entrapment of harmful ions, but which allows the free exchange of friendly ions.

SPECIAL FEATURES
Because of the employment of the proprietary Sanderson-Rabbet Channel the 9046xN will provide 50% higher speed than you will obtain.

COOLING
The 9046xN is easily cooled by employment of a six-foot fan, ½" from the package. If the device fails, you have exceeded the ratings. In such cases, more air is recommended.

NOTES on following Page.

NOTES

1. "Neu" channel devices enhance or deplete regardless of gate polarity, either simultaneously or randomly. Sometimes not at all.
2. Coffee Breaks and lunch hours.
3. Measure at 1 MHz, 25mVac, 1.9pF in series.
4. For the filiments, what else!

For a copy of the Block Diagram and Characteristic Curves, please contact me as soon as possible (only a limited quantity are available, first come, first serve.)

Bob Graham, WB5NSV

Edison and Wireless Communication

Most of us are acquainted with Edison's contributions to the art of wire telegraphy, but not much has been said about what he did for radio communication. The December issue of "Amateur Radio" carries an interesting article on Edison.

The same issue also carried articles on modifying the Yaesu FRG-7 for a slower tuning rate, building a two-tone oscillator for testing SSB transmitters, plus a whole flock of items about the general scope of amateur radio.

New Communications Systems

Not only the new narrow-band system mentioned in QST is popping up in the news, but an entirely different system is mentioned in the January issue of IEEE Spectrum. It's totally different. It's called "a spread-spectrum communications system" and, unlike all others, does not involve a sinusoidal carrier. Instead, it transmits periodic waves directly (no carrier), and these are spread over a very considerable frequency spectrum. So much so, in fact, that the dispersed signal fragments disappear into the general background noise. Because of this characteristic, the new type of signal can be superimposed upon an occupied frequency spectrum without interference to (of from) services already using that band of frequencies. Just how the desired signal is fished out and made detectable to the receiving station is not mentioned, as the system is highly classified. Anyway the concept is exciting!

Will we ever hear of it again? Or will it disappear into limbo . . . . like the antenna systems that worked upon the principle of extracting information from the electromagnetic portion (instead of the electrostatic) of a radio wave; such systems were hinted at in the literature a few decades ago . . . . then disappeared from the ken of ordinary man!

W5JJ

TRADE: G-43 All band Rcvr (Gonset) manual typewriter and electric calculator (Olivetti), for scope and signal generator. Bob K5FW 787-5793

FOR SALE: INSTANT NOVICE STATION (Just add antenna) HEATH HW-16 XCVR 90 watts, HEATH HG-10B VFO, MFJ CW Filter, Telex headphones, Key, 75ft Coax, $175 Don Sullivan, WB5RAX 787-0092 All equipment in like-new condition.

AERONAUTICAL CENTER AMATEUR RADIO CLUB, INC.

W5 PAA

OKLAHOMA's SEC, WA5MLT

Rapidly becoming one of Oklahoma's best-known radio amateurs, WA5MLT, Norman, will be on the road again this spring meeting with amateurs in many areas of the state to build up emergency operations and organization.

H. O. Townsend, known variously as Mike Lima Tango, Mayonnaise Lettuce and Tomatoes (his preference), or simply "Ho," can also be found Sunday mornings on the Oklahoma Phone Emergency Net, many evenings on the SW Traffic Net, and at many other hours (including lunch time) on the higher bands in pursuit of illusive DX. He is, considering the fact that he holds a full time job with a postal facility in Norman, amazingly active on all the bands.

A native of Texas, H. O. now lives on the near east side of Norman with his wife, Anita, and three small harmonics. He's the guy who dragged said YL to a hamfest in Texas last year and came back stunned after SHE won the grand price, a TS820-S.

At that point, H. O.'s beautiful Drake twins sort of went to the corner of the desk and Kenwood RF began radiating from the tribander and inverted vees. Lately, the strength of the RF has increased because H. O. has been field testing a prototype linear for Dentron. It's a 1200-watt unit that differs from the MLA 1200 in that its power supply is built in.

Organizational ability and dedication to ham radio mark H. O.'s part in his volunteer emergency work. A year ago he was EC of Cleveland County and was instrumental in carrying on and expanding the weather work and other activities of the Cleveland County ARES. A computerized roster, telephone calling tree for emergency call ups and operating procedure manual were among his innovations. More recently, his term as SEC has been marked by development of a state emergency plan and the naming of several new ECs.

With the higher bands improving radically for DX, H. O.'s recent hamming has concentrated mostly on chasing the rarer countries. He hopes to have DXCC quite soon, the only question being when some of those tardy QSL cards show up. He is also in pursuit of 5BWAS.

Interest in radio and electronics came early for him. Among his memories of early childhood is the hassle that developed after he experimentally stuck a toy in a fuse box to see the pretty sparks. He doesn't do that sort of thing any more . . . very often, anyway . . . but there are signs that his own harmonics may be following in line.

Just recently, for example, H. O. found the kids playing with some toy CB units they received (from someone else!) for Christmas. The experiment - key the milliwatt transmitter close to the TV set and watch the picture turn green. And even more recently he heard one of them calling "CQ good buddy." It's a start. If they follow dad's example, they'll go a lot farther.

Jack, WB5TZZ

AERONAUTICAL CENTER AMATEUR RADIO CLUB, INC.

W5PAA

DX QSLING K5LIL

Having been asked to write a few lines regarding DX QSLing, let me pass on a few facts and some ideas.

FIRST - The ARRL maintains 12 QSL bureaus, one in each stateside call are, one in Alaska, one in Hawaii. The bureaus are manned by volunteers who spend many, many hours sorting and mailing cards to those who have envelopes on file. The local bureaus handle incoming cards only. They receive some cards direct from the DX countries and some from the League in Newington. This is where the expense appears - postage from Newington, Conn. to the local bureaus. I had hoped to receive some facts and figures from our local bureaus but will have to give them to the C and E at a later date. To those DXers who do not have self-addressed, stamped envelopes on file at the Bureau, we say, "May your coax stay shorted!!" Of course if you really do not care to receive your cards from those DX stations whom you have worked let the Bureau know so they will not have pounds and pounds of cards stacked up. They have no idea whether you ever will send SASES or not. They have no set rule on how long to keep cards for you, but they will not hesitate to dispose of them after so long a time. If you have any particular instructions regarding your cards the Bureau will clip your note to your envelopes and abide by your wishes. "Save for 10 cards" and "Send every month" are examples of personal instructions on SASES.

SECOND - If you want your cards from the DX station(s) quicker than via the Bureau there are several ways to go at this. First of course you have to know the DX station's address or at least his Bureau address. His personal address probably will be listed in the DX edition of the Call Book. If you work the DX station on CW and he says QSL via CBA, he's telling you to QSL him via the address in the Call Book. One service of belonging to W5PAA Club is that the latest edition of both the DX and stateside Call Books are available at the club station. If your DX station says QSL via the Bureau, then look up the Bureau's address in the Call Book or get it from QST. QST prints the addresses of nearly all the DX QSL Bureaus periodically. The third method is if the DX station has a manager. When it does, that manager has cards and logs (when sent by the DX station and will mail the card to you when your QSO is verified in the log. Now, for goodness sake don't be known as a cheapjack. Send that manager an SASE or at least postage for the return of your card. Several managers have told me they have spent many dollars on postage just because they are "good old boys" and "good old girls" too. One of the most respected QSL managers is Maryann, WA3HUP. She's known all over the world as QSL manager for CEØAE, Father Dave, JY1, King Hussein, and many others. Some of us in times passed have taken advantage of W2SAWs stamp service. We purchased stamps of the country, sent it to that DX station on an addressed envelope and the results were delightfully quick. If anyone is interested I will check around and see if this service is still available. Another method of supplying the DX station with postage for your card is the International Reply Coupon, the old IRC is good for postage at nearly any post office in the world. Most DX stations appreciate getting these.

THIRD - The ARRL operates an outgoing - QSL Bureau. Send your cards to League Headquarters in Newington and they will forward them to the foreign bureaus. If you are not in too big of a hurry for cards this is an excellent service of the League. The contesters really take advantage of this service. Mark your envelopes QSL Bureau.

AERONAUTICAL CENTER AMATEUR RADIO CLUB, INC.

W5PAA

I sincerely hope that the foregoing will aid some of you newer DXers in receiving and sending QSL cards. If I have missed any important points or methods of QSLing I hope someone will call it to my attention and I will certainly mention it in a later C and E.

Gud luck, Gud DX and by all means - happy QSLing. K5LIL

ARRL 5th District Bureau
P. O. Box 1690
Sherman, Texas 75090

QUARTER CENTURY WIRELESS ASSOCIATION

The Central Oklahoma Chapter of QCWA will hold its quarterly meeting at Val Gene's restaurant (Penn Square) in Oklahoma City, Sunday, April 23, 1978, at 1:00 p.m. Elmo Black W5JCB will present a program on "Time and Frequency Measurements." It is suggested you go through the cafeteria line between 11:30 a.m. and 12 noon leaving plenty of time for lunch and fellowship before the program and to avoid a long line. The meeting will be held in one of the meeting rooms immediately to the right of the cafeteria line. All members and their wives and visitors are welcome.

W5AA

The ACARC antenna party is tentatively scheduled for Saturday, April 15, 1978, weather permitting. Work will begin about 9:00 a.m.

FOR SALE: HyGain TH-3, 3 El. 10-15-20 Meters, Good Condition, ASKING $90.00, Call Bill K3TGY/5, 794-0406.

POSTMASTER: Send Form 3579 to:
CORA C&E Box 15013
Oklahoma City OK 73115

APRIL HAM HAPPENINGS

SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
PLAN AHEAD HAM HOLIDAY JULY 29 & 30						APRIL FOOL! 1
2	3	MORI MEETS 4	Q MEETS 5	6	ACARC MEETS 7	LAWTON HAMFEST 8
LAWTON HAMFEST 9	10	11	12	ALTUS AREA ARA 13	14	15
16	17	AUTOPATCH MEETS / TGRS MEET 18	Q MEETS 19	20	OKLA CENTRAL ARC 21	22
23 / 30	24 EDIT C&E / MORI MAILS C&E MAY 1	25	CORA MEETS 26	27	28	29

See page 2 and/or individual club sections for details

rsi rsi rsi rsi rsi rsi rsi rsi rsi rsi rsi rsi rsi rsi rsi rsi rsi rs

COMPLETE AMATEUR RADIO STATION PACKAGE

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BRASS TELEGRAPH KEY

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