EXPERIMENTAL BROADCASTER'S NEWSLETTER

April 1, 1985 Vol. 2, No. 4

This is our one-year anniversary. How time flies when you're having fun. Several of our subscribers have been recognized in the April issue of Popular Communications magazine. A very excellent article about low power broadcasting (AM) was presented by Tom Kneitel, K2 AES. Its worth picking up if you havn't seen it yet.

More pictures. Send more pictures. We havn't seen all our subscriber's stations yet. Also anyone that has helpful information for subscribers should send in a letter. We'll edit it if necessary or present it as is. Let's share experiences and information.

Your editor keeps getting requests for things like: 5 to 8 channel mixer/consoles, 100 watt AM amplifiers, 25 watt AM and 25 watt FM amplifiers, UHF tv transmitters, AM antenna couplers, AM power line (carrier-current) couplers, FM antenna kits or assembled FM antennas, etc. I also have had requests for shortwave transmitters up to 100 watts. What do you think? Will you come to visit me when the FCC hauls me away?

This issue of the EBN contains some mini-lessons and some letters from readers. Enjoy.

MUSIC ON HOLD

If you've ever been on mic and had the phone ring you know how frustrating it can be. The person on the other end expects you to answer, but you've got your hands full of turntable or copy. If you don't have a bell shut-off the darn thing is heard on the air. Your option then is to simply grab it off the hook and set it down somewhere and get to the caller when you can. Of course if the caller knew you were on a live mic he or she probably would wait for you patiently.

I don't like to be put on "hold", A little background music helps, even if its rock & roll (I'm an old fuddy-duddy you see). If you have to put someone on hold then the following circuit might be of interest. If you press button "A" while hanging up the phone it will "hold" the line and put your station's sound on it. If you press the "A" button while the phone is still on the hook it will connect the line, with music, and hold it for you until you can answer it. If the calling party hangs up the "hold" releases. To remove the "hold" and music just push the "B" button. While on "hold" the LED indicator will light up. No external power is required - it uses the phone line voltage.

The schematic diagram and parts list are on page 3. It can be easily built on a "perf" board and most parts are available from Radio Shack. The circuit is polarity sensitive however. The LED end of the circuit must be connected to the + side of the phone line. If it doesn't work when you connect and try it, it is probably backward. Just reverse the connections and try again.

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MINI-LESSON Extending the use of meters with shunts and multipliers

When constructing broadcast equipment, or installing a studio, there is often the need for a meter of some kind. The meter may have to measure voltage from a power supply, or the amount of current drawn from the supply. The meter may be used to monitor audio levels, or be connected as an RF voltmeter to monitor transmitter output power. Sometimes it is difficult to find just the right meter to do the job. This is where a knowledge of shunts and multipliers comes in handy.

As an example, lets suppose you are building a power supply. Let's say it must provide 24 volts at .7 ampere, and, you want a meter or meters to show these measurments. You trot down to the local Radio Shack and find some nicely priced meter movements, but.... they are 50 microamperes, 1 milliampere, and 15 volts. None have the right scale nor electrical characteristics you want.. .but no matter, you can calculate the necessary external resistances that will make them do just what you want.

The scale on the 50 microampere meter reads 0 to 50 so your 24 volts could be read at mid-scale. All that needs to be done is adjust the total resistance so the meter will read full-scale when 50 volts is put to it. In other words when connected to 50 volts it would have the required 50 microamperes passing through it. With 24 volts then it would have only 24 microamperes flowing through it and would read "24" on the scale.

On the back of the meter package it says the meter's resistance is 2150 ohms. The external resistor needed is calculated thus: Rm = Es / I meter - R meter

Or, written out simply: Resistor (multiplier) equals Voltage (supplied) divided by the Current (of the meter) and subtract the resistance (of the meter).

For the above example then:

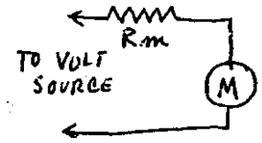
(1) $R_m = \frac{50V}{50\mu A} - 2150\Omega$

(2) $R_m = \frac{50}{.00005} - 2150\Omega$

(3) $R_m = 1,000,000 - 2,150$

(4) $R_m = 997,850\Omega$

Connected thus:



Because the meter resistance is so small compared to the multiplier resistor it turns out that you would only be off by about 2% if you just used a 1 Megohm resistor. You should use a 5% resistor. If you want to be more precise you can try several 1 Meg resistors until you find one off tolerance enough to be about the 997,850 ohms needed.

Now let's look at the problem of measuring our expected power supply current of .7 ampere. For this we can select the 1 milliampere meter. We simply look at the 0 to 1 scale as 0 - 1 ampere. Of course if we put 1 ampere through it the pointer would wrap around the right hand peg, and we can't have that...so we get most of the current to go around the meter. This kind of resistor is called a "shunt".

In this particular case you'll want only 1 milliampere to go through the meter, the rest of the current (999 milliamperes) must go through the shunt. This would give us a full-scale reading of 1 ampere. Your expected .7 ampere would then read at 70% of the scale.

The amount of current flowing through a resistance is greater as the resistance value is lowered. In this case we want 999 times more current flowing through the shunt as we do through the meter. The value of the shunt resistance then must be 999 times SMALLER, than the meter resistance. This boils down to: R(shunt) = I (meter) / I (shunt) x R (meter)

Or said: Resistance (of the shunt) equals the Resistance (of the meter) times the meter current divided by the shunt current. If the meter resistance is 2000 ohms.....

For the above example then:

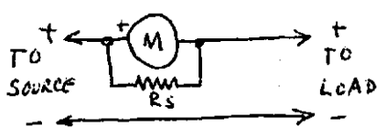
(1) $R_S = \frac{1\,ma}{999\,ma} \times 2000\,\Omega$

(2) $R_S = \frac{1}{999} \times 2006$

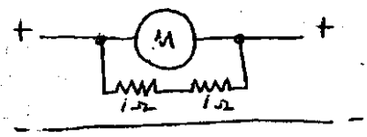
(3) $\frac{2000}{999} = R_S$

(4) $R_S = 2.002\,\Omega$

Connected thus:

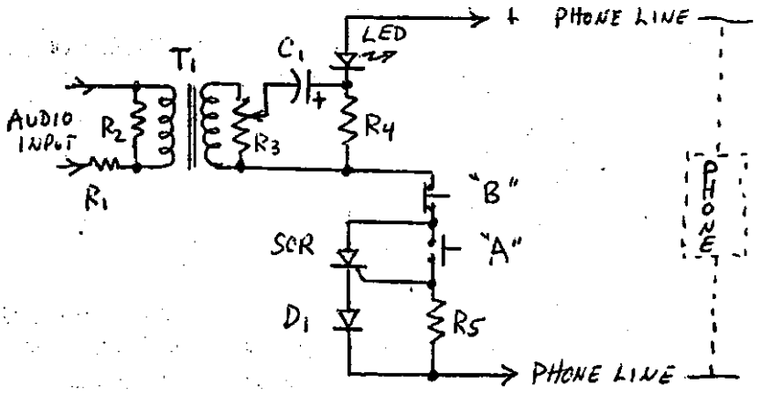


Because the meter resistance is so much larger than the shunt resistance then even with a 5% value you'll probably still be within the 5% accuracy of the meter itself. The only remaining calculation is what wattage rating is required for the shunt. It could have as much 1 ampere flowing through it. The amount of power it would dissipate would be $I^2R = P$. That is, the current times itself times the resistance. When we do that we get 1 x 1 x 2 which is 2 watts. It is good paractice to use a resistor whose wattage rating is 2 to 4 times greater than that calculated. Therefore a 2 ohm, 5 watt wire wound type would do nicely. You could also use two 1 ohm, 2 watt carbon types connected in series which would make a 2 ohm, 4 watt resistor, like so:



Ed. note: If these mini-lessons start to get too technical for the majority of subscribers I can tone them down a bit or cover other topics. YOU have to let me know what type of material you want covered. A few subscribers said they learned something from the impedance matching mini-lesson in the last issue. That's good. Give me feedback so I can present material most beneficial to you.

Music on hold schemo & parts list:
R1 - 1K (or value to match source)
R2 - 620 ohms
R3 - 1 K poteniometer (volume control)
R4 - 1.2 K 1 watt
R5 - 820 ohms
T1 - 600 ohm/600 ohm audio trans.
C1 - 1 uF, 50 volt capacitor
SCR - TO-92 type, 100 volt
D1 - 1N4002
LED - 2 volt type or so, 40 ma max
"A" - normally open push button
"B" - normally closed push button



LETTERS

Dear EBer's,

After receiving the list of radio stations that are members of the LPBN I recognized some of the call letters. I checked with my Van Jones Radio & TV Station Guide and sure enough I found 3 stations with the same call letters and a 4th was just issued to a Denver TV station. It would probably be wise to change conflicting call letters to avoid any problems. The radio stations which have been assigned these call letters by the FCC could get nasty if they wanted to...just as, say, Coca-Cola might sue Dr. Pepper for saying "Dr. Pepper (coke) IS IT!" which is a copyrighted slogan. The stations are: KAMB, 101.5 FM, 50,000 watts, 400 ft HAAT Merced, CA
KUSA, TV ch 9, Denver, CO
KVOM, 800 kHz AM, 250 watts AND
101.7 FM, 3000 watts, 200 ft HAAT, Morrilton, AR
WMAC, 1360 kHz AM, 500 watts, Metter, CA

If in doubt when picking your call letters you should check the Broadcasting Yearbook, Media Spot Sales, and Broadcasting Weekly. These are often available in libraries.

KKTO NEWS

A few changes have taken place since our article in the EBN a few months ago. We sold our AM to another broadcaster so he could expand his hours. He was on 1210 kHz and we were on 1200 kHz. We have added a third FM station, KWLV at 102.3. With 2 watts at 10 feet above ground it fills in a shadow area of KKTO. Its coverage area is 6 miles into the KKTO shadow and 8 miles forward. About 15,000 people are in its coverage area. Its about 40% simulcast with KKTO.

At KKTO itself we have uped the power to 37 watts ERP (gain antenna). This gives us a good signal 34 miles to the North, 6 miles to the South, 28 to the West, and 4 miles to the East....all with the antenna just 65 feet above the ground. High mountains on the South and East sides prevent our signal from going farther in those directions.

KKTO-2 FM has changed its name to KKOR 101.7. It runs News & Information 24 hours a day. We are now the talk of the town schools, stores, shopping centers, resturants, you name it....we hope you know who does not know of us. (Ed. note, don't be too sure they don't know already and are simply ignoring you for the time being!)

Population Coverage: KKTO, 99.3 FM, 37 watts ERP, 300,000 (5 cities, 2 counties plus 900,000 on cable
KKOR, 101.7 FM, 2 watts ERP, 95,000 + cable
KWLV, 102.3 FM, 2 watts ERP, 15,000 no cable

KKTO is interested in running programs from other stations. We prefer programs be on Maxell XL2S or TDK SA-X tape for highest quality of sound. They may be either mono or stereo, the tape will be returned after it is aired.

KKTO

Letters continued

Rebuttal:

Re- March issue: I take exception to remark made concerning Class IV stations doubling range at 1 KW night time.

Theoretically, true! In practice, NO DIFFERENCE in range by operating 1 KW nights. Why? Because everybody else is also running 1 KW and you get nailed by Heterodyne...

At WYGL, Selinsgrove, PA (where I work weekends), I find we're getting out no further at night than when we ran 250 watts. However, we are heard better in the area we do cover at night .... Just my 2 cent's worth.

R.F.H.

Editor's reply: Your 2 cent's worth is appreciated. There is nothing like first-hand experience in the field to get at the truth of the matter. It appears I understated the case when I said "Some new interference may be noted at times."

NOTE: Anyone who wishes to express an opinion or bring up an issue for discussion is invited to do so. This is what the EBN is all about..communications and discussions that are relevant to Experimental (and commercial) Broadcasters.

The following is a letter from an old friend who began his career by starting a licensed 10 watt FM "community" station in San Francisco several years ago. He was also active in a little pirate broadcasting in his earlier years in New York.....

Dear Ernie, Thought you'd like to know I made an all-cash offer of $80,000 for bankrupt KKER (formerly KSPO) Spokane, WA. 1230 kHz, 1 kW 24 hour, Class IV AM. Its been on the air since 1921, the oldest "living" station in the Pacific Northwest. We apparently won the bid in spite the asking price of "$100K min bid acceptable". I'll be 17% owner and CE, we have most of the $80,000 pledged. P.S. still have % of (other station) available, advise! Meyer Gottesman

Editors note: I don't have the bucks but if any subscribers are interested in becoming part owner of a station, Meyer is looking for investors.....

Dear Editor of EBN, April 1, 1985

I have been in and out of pirate radio for about 10 years now. I guess I lost interest in it for awhile when I discovered personal computers. I started off with a simple TRS-80, a cartridge deck (borrowed from my station) and an old tv set for a monitor. Today you wouldn't believe what my bedroom looks like! I have 3 two-inch tape transports I picked up surplus, plus a large console printer, and 5 IBM disk drives. I picked up a Sanyosonic WHIZ 5000 keyboard and mainframe, and a 25" COLOR monitor by Hitchagomi (these imports are great!). I have now automated by little radio station!

The AM transmitter is hidden in the closet. Its only 50 watts but it gets out pretty good with my present antenna. The antenna is a 100 foot tree in the backyard with an antenna tap on it about 2 feet up. I used my computer to calculate the overall characteristics of the tree, including the capacitive hat formed by the limbs and leaves. It worked out perfect, no loading coil was needed, just tapping at the proper point up the trunk. I have an SWR of about 1 .3 but I can live with that I guess.

My computer system has the capability to operate the station, makes sure the transmitter is operating properly, and schedules the music for me.. I converted one of my 2" tape transports to play digitally encoded music----great quality. I use another one of the transports for the actual programming. You see, I just set up a computer program to select certain cuts from the first tape and put them in a specified order on the second tape. After that I just sit back and listen.. .and play with my computer.

My latest acquisition is a MODEM. A simple hook up on the phone line and I'm "on line" with the WORLD! I've communicated with all sorts of computer freaks like myself but none of them have a radio station. I've even managed to "peak" into some other computers by figuring out the right access code...now that's fun! But, I think I may have a problem.. .and that's why I writing to you about all this.

You see, for the last year I have been compiling all the data I could on other pirate and experimental broadcast stations. I have the names and address, call letters, power, hours of operation.. .everything. Of course I kept this hidden in my computer so it could only be found with a special access code. After all we wouldn't want this information to get into the wrong hands. Who knows what might happen?

But now I'm a little worried. The other day I brought the list up on screen and several of the names and address were missing.. .completely erased from the memory. It was quite obvious. There would be a couple of names then several blank spaces, more names then more blank spaces. Its almost like someone managed to "peak" into my computer and take a few names, then erase them from the memory so I couldn't tell (or warn) the persons whose names and address were missing. Do you suppose some Government Agency managed to break into my computer? If so, do you think it could have been... Oh, I hope not.....I <u>AM</u> sorry. Have to go, someone's knocking on my door. Later, maybe.....

KFOOL April 1, 1985

<u>Of special interest</u>: ELECTRONICS BARGAINS CATALOG, ELECTRONICS SUPERMARKET, PO BOX 988, Lynnfield, MA 01940 (617) 532-2323. . .has computer equipment cabinets (holds 19" rack panels) 25 W, 30D, 63 H, weight 150 lbs, only $69.00 shipped freight collect. 5 for just $250.00..looks like a bargain.

MINI-LESSON Horizontal, vertical, and circular polarization

Most AM stations are vertically polarized. This simply means their tower is straight up and down - vertical. The radio frequency currents flow up and down the tower and produce electromagnetic waves that travel outward perpendicular to the "polarization" in other words - the waves are horizontal. When that wave passes through a vertical antenna wire it causes a current to flow in that wire. This produces a voltage along the length of the wire. A radio connected to the wire amplifies these tiny voltages, separates out the modulation, amplifies the audio and feeds it to a speaker.

Most FM stations are horizontally polarized. I'll correct that general statement in just a moment. The antenna is smaller than an AM station, only about 5 feet around, or long, depending on the type of antenna. Several can therefore be mounted on a vertical tower..but the antenna itself is horizontally polarized. Currents flow back and forth through it producing an electromagnetic wave which travels outward in a vertical plane. When that wave passes-through a horizontal wire (receiving antenna) it produces a current and a resultant voltage across the antenna, .into the radio, amplified, demodulated, and on to the speaker.

The point of all this is that a vertically polarized signal requires a vertically polarized receiving antenna. Theoretically a vertical antenna is not affected by a horizontally polarized wave. The opposite is also true. A horizontal receiving antenna only responds to a horizontally polarized wave and not a vertically polarized wave.

In today's modern mobile, portable, and mini-equipment society we find radio antennas in all manners of polarization. Table radios have line cord antennas hanging down to the floor, car radios have vertical antennas, portable radios may be in any position imaginable! If FM stations are mostly horizontal polarization then they can only reach receivers that have horizontal antennas!

Of course we know this is not true in actual practice. Radio waves at FM broadcast frequencies can change polarization as they bounce off of buildings and hills, etc. So a little vertical polarization is produced by interference with obstructions.

To assure maximum coverage for all possible polarization angles, horizontal, vertical, diagonal, etc., circular polarization was devised. NOW most FM stations either have or wished they had circular polarization. A circular polarized transmitting antenna consists of a horizontal and vertical antenna, on the same axis (same position on the tower), which are fed identical signal levels, but are phased 90 degrees apart. The resultant radiated wave rotates through all angles of polarization once each cycle of the transmitting frequency! The signal is essentially "screwed" into space at the rate of 100,000,000 times a second (100 MHz)! No matter what the polarization of the receiving antenna it gets the signal.

There is a slight disadvantage. Half of the power goes into the vertical antenna and half goes into the horizontal. Unless the transmitter power is doubled the coverage distance is only about 70%, Also, it is difficult to arrange for circular polarization on the AM frequencies for obvious and lengthy reasons.

WANTED, FOR SALE, EXCHANGE. SWAP, BARTER

Wanted: Rock programs for my LP station on trade basis. Will produce free rock shows for you if you supply tape and $1.00 for postage. Send for listings and free ROCK promo to: Music Data Base/KAOR-FM, PO Box 1625, Silver Springs, FL, 32688-1625,

For Sale: Five watt FM, Make decent offer. Contact Rich White, Mt Vernon Plaza, 1058 Mt. Vernon Ave. Columbus, OH 43203.

For Sale: 3 kW water cooled dummy load, 50 ohms, 7/8" flange mount. 250 watt communications type FM transmitter, 50 MHz but can be converted up to about 150 MHz by altering tank tuning coil, in cabinet with all metering, tubes and power supply..should have 5 or 10 watt exciter if used for broadcasting, present exciter ok for voice only. Shipping wieght about 200 lbs. Make offer starting at $250,00 + freight. Contact Ernie at 916 534-0417.

Wanted: Seeking correspondence/ideas from other E.B/Pirate types. Formerly a local musician, I now work as a weekend D.J.-announcer at a 1 kW commercial AM station. I also operate a mobile recording studio. Want to start a low-power station for the purpose of promoting local muscial talent. No room within format for such a program where I work. C & W orientation. Mailing address for my recording operation: Underground Sound, PO Box 143, Sunbry, PA 17801-0143.

For Sale: Two AM 5000 units upgraded for more power and frequency control. Both are in one cabinet with two power supplies (5 watt amps) and two exciters. $350.00 or best offer. ALSO, FM transmitting antennas cut to your frequency. QUARTER WAVE type gives effective power gain of 2 on metal mast; $100.00, HALF-WAVE type gives effective power gain of 4 on metal mast; $135.00. ALSO, FM transmitter in deluxe cabinet with latest revised circuitry, upgraded to 1/2 watt, WITH 1/4 wave antenna (covers 7 miles with antenna 15 feet above ground).. .$425.00. Contact: Steve Webb, KKTO inc, 816 Woodlawn Dr. Thousand Oaks, CA 91360 or phone (no collect calls) (805) 495-0262

For Sale: NUMARK DM 1000 mixer. 2 phono, 2 tape, 2 mic, cue, master fader and talk-over switch. $40.00 Contact Paul Kriegler, 423 N 47th ST, Omaha, NE 68132

For Sale: Heathkit IO-4235 "scope", dual trace, time delay, 35 MHz (good to 100MHz) very clean, built it myself. Make a reasonable offer. New kit cost is over $800.00, Contact Ernie Wilson (Panaxis) at PO Box 130, Paradise, CA 95969