



CHEESE BITS

W3CCX
CLUB MEMORIAL CALL

ARRL
Affiliated
Club



Volume LVIII

November 2017

Number 11

PREZ SEZ:

Well, Fall is in full swing and the days are cooler. So what's my excuse for putting off my antenna projects now! It's the perfect time to change out or upgrade those old coax cables. I also need to re-grease the rotor ball bearing. The moisture and dust has turned the lithium grease into molasses.

If you need some help with tower work now is the time to let your fellow Packrats know. Time to schedule that antenna party before the cold weather breaks. Need to borrow some equipment for the upcoming January contest? Let Bob, W2SJ or Bill, K3EGE know now.

The 2017 Packrat Mid Atlantic VHF Conference was a great success! We had close to 85 attending. There was a special bonus seminar Friday afternoon on Station Automation led by Roger W3SZ. Roger included multiple examples of the code and microprocessors to fit many different station configurations. If you missed the seminar you can find much of it on Rogers website. Saturday was a full day of seminars followed by a Buffet Banquet in the evening. Early Sunday morning usually is an outdoor mini-fest but we had a heavy downpour instead.

Last General Meeting's presentation was by Michael KB1JEY. Need to check out your SWR? Michael showed an antenna analyzer that works well to 2304 and beyond. It's portable enough to take up the tower and cheap enough to drop off

the tower without breaking the HAM equipment budget for the next few years. Need an inexpensive signal generator or spectrum analyzer? Michael found these too. The specs aren't the same as a used HP unit, but in many cases will do the job quite nicely. If you find a new piece of inexpensive test equipment, let your fellow Packrats know about it. Not all presentations need to be long, 5 or 10 minutes may be enough. Tell us about the practical applications you found and the limitations too.

December's meeting is our annual Packrat Holiday Social. Come and enjoy a relaxing time of food and fellowship. We will start serving food from Giuseppe's at the Senior Center at 6:15. Be there at the usual 6PM time, but we will have plenty of food throughout the evening. Don't forget to call that Packrat friend you haven't seen at the meetings for some time and bring them along. We will have a special Mario Table like last year. Now's the time (yes, right now before you forget) to dig through your special items you bought at those HAM fests for the last 10 years. Some were for a project that got shelved or you never found time to complete. Bring them to the meeting, put them on the Mario table.

What's new at the KA3WXV ham shack? Well Michael, KB1JEY talked me into buying a TYT 2017 DMR HT radio along with RF Shark Openspot that allows us to get on a Fusion or a DSTAR repeater via the internet from the HT. I can't really blame Michael. I've been watching the digital radio offerings and have been very

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PACKRAT 222 MHz REPEATER - W3CCX/R

222.98/224.58 MHz (PL 136.5) Hilltown, PA

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PACKRAT BEACONS - W3CCX/B

FM29jw Philadelphia, PA
50.080 144.300 222.062 432.290 903.072 1296.264 **2304.043**
3456.200 **5760.195** 10,368.034 MHz (as of 1/17, red = off the air)

MONDAY / TUESDAY NIGHT NETS

VHF/UHF Monday:

TIME	FREQUENCY	NET CONTROL
7:30 PM	50.145 MHz	N3RG FM29ki Ray
8:00 PM	144.150 MHz	K3GNC FN20ja Jerome
8:30 PM	222.125 MHz	KB1JEY FN20je Michael
8:30 PM	224.588 MHz	W3GXB FN20jm Bob
9:00 PM	432.110 MHz	WB2RVX FM29mt Mike

Microwave Tuesday:

7:30 Coordinate QSO's on 144.260 for all Microwave bands you'd like to work. Also setup Q's at w4dex.com/uhfqso or **Packrat Chat Page W3SZ.COM**
Visit the Mt Airy VHF Radio Club at: www.packratvhf.com or www.w3ccx.com

disappointed with the incompatible proprietary offerings. Michael simply provided the temptation I needed! I understand that the DMR standard started in Europe and spread to police and other governmental organizations in this country with the help of Motorola. As you know Fusion and DSTAR are "ham" standards. This combo at least is a start towards interoperability. How well does it work? I don't know yet. A friend of Michael's and a member of the Philadelphia Digital Radio Association has offered to get us started. If this turns out good it might make for an interesting presentation for one of our meetings.



Bottom line, have some fun, learn more.

Build something

73, George KA3WXV



Your editor W2BVH & Family (and friend John) just got back from W4DISNEY. We also met the famous Raterr Mouse!

The 2017 Mid-Atlantic States VHF Conference

Started with a Sizzle and ended with a Drizzle

We had over 80 conference attendees this year with a super set of speakers who were on the cutting edge of station automation, antenna secrets and stealth arrays, LASER communication, SDRs, EME, FM contesting, propagation prediction and VHF multi-op contesting. The Packrat projects of 10.0 MHz oscillators and GPS units were also featured and many units were sold to attendees. The ARRL Atlantic Division Director W3TOM Tom Abernethy was an attendee and offered his greetings. The Vice-Director Bob Famiglio K3RF also visited with us.

As a unique addition to the usual Saturday slate of speakers, Roger W3SZ gave a three hour seminar on Friday afternoon on Station Automation. He explained the basics of why we would want to do this—efficiency, error and glitch free logging, rig operation and reducing operator fatigue during contesting. Roger used examples with the Arduino Uno, the Beaglebone and other processor boards. He explained their value and programming to accomplish simple or more complex station activity such as band selection, microphone and key assignment and the interface with various logging programs to make logging and band changes seamless and coordinated.

Our hospitality hosts George KA3WXV and Michael KB1JEY kept all attendees well hydrated and supplied with snacks throughout the weekend. Elliott K3JJZ was our auctioneer and sold every item we had with very vigorous bidding. The AV crew with Phil K3TUF on the video and Paul WA3GFZ on the audio kept everything running smoothly.

Table top selling in the hospitality suite was rewarding for both sellers and buyers as lots of parts and equipment changed hands. The hotel was very accommodating and the buffet banquet was well received by the attendees. We were in close quarters with everyone dining back in the reset conference room, but it made for a cozy evening. Our dinner speakers Bob W2SJ and Ken K2WB served up interesting and entertaining presentations. Each dinner attendee received a Hammond aluminum construction box, thanks to their company donation. The grand finale was the door prize drawing with enough large and small door prizes to accommodate everyone.

We went to sleep Saturday night anticipating the possibility of Sunday AM rain that would preempt the outdoor tailgating mini-flea market, and rain it did. Apologies to all that this part of the weekend dampened and cancelled that activity.



... Conference cont'd

We are looking at a Mid-Atlantic States conference date for next year on the last weekend in September of 2018. Stay tuned. Thanks to all who attended, participated as speakers and so many helpers behind the scenes who lent a helping hand for making the conference run smoothly and successfully. Please patronize our conference sponsors, donors and supporters listed below.

TNX es 73, Rick, K1DS & Guy WA3JZN Conference co-chairmen

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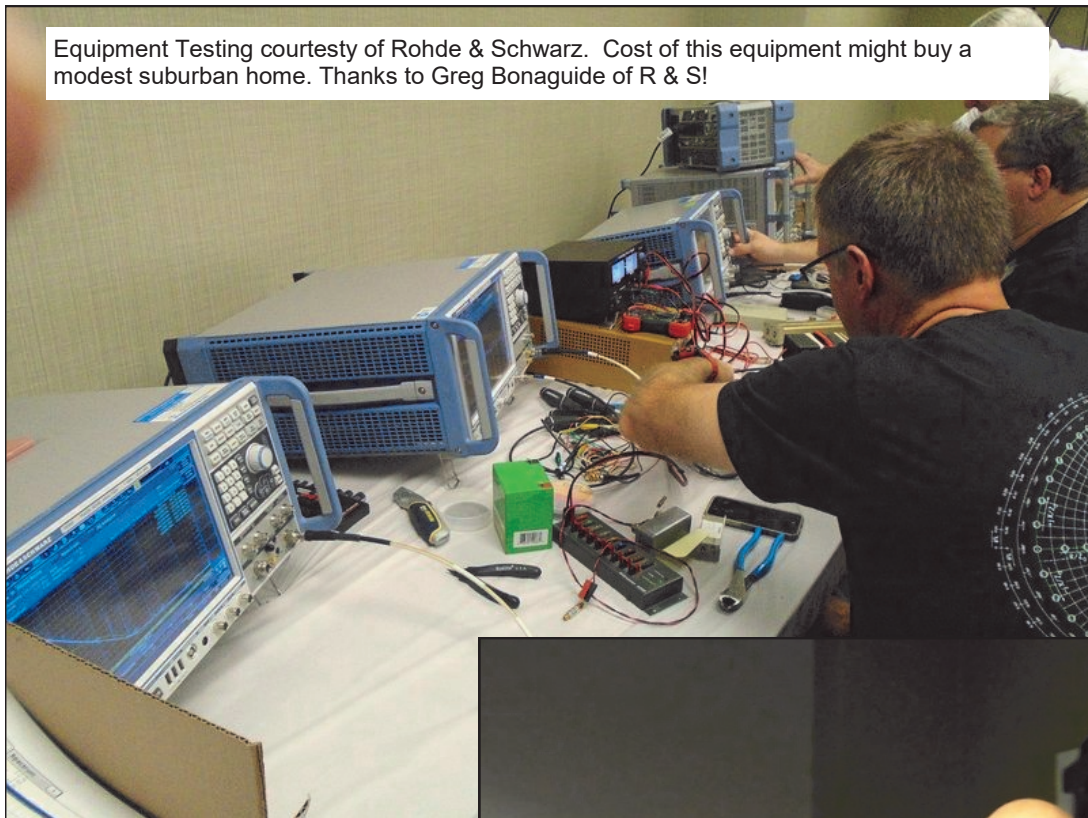
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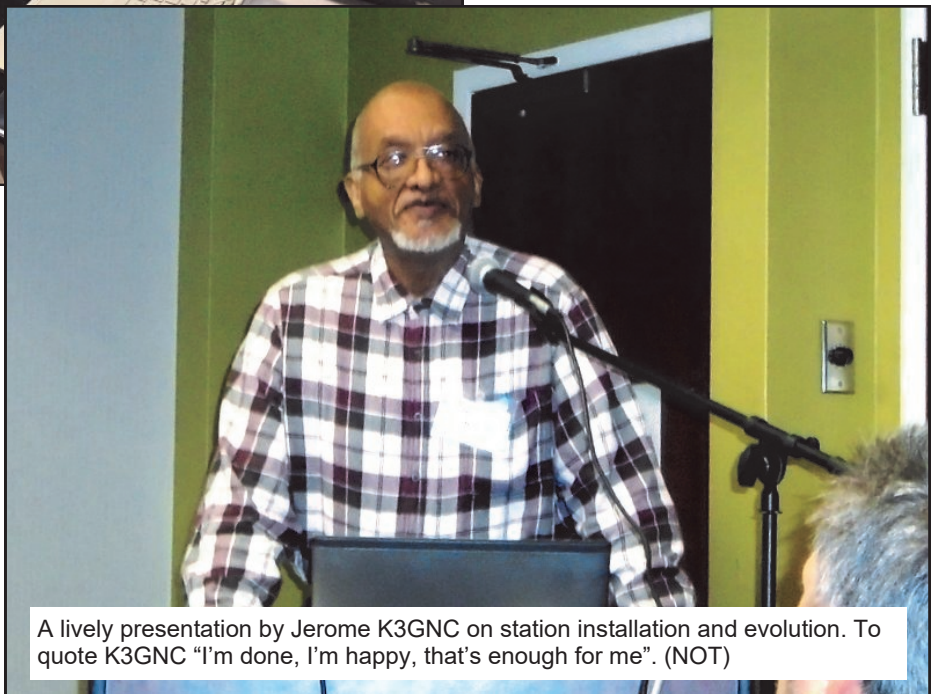


Station Automation Presentation



Equipment Testing courtesy of Rohde & Schwarz. Cost of this equipment might buy a modest suburban home. Thanks to Greg Bonaguide of R & S!





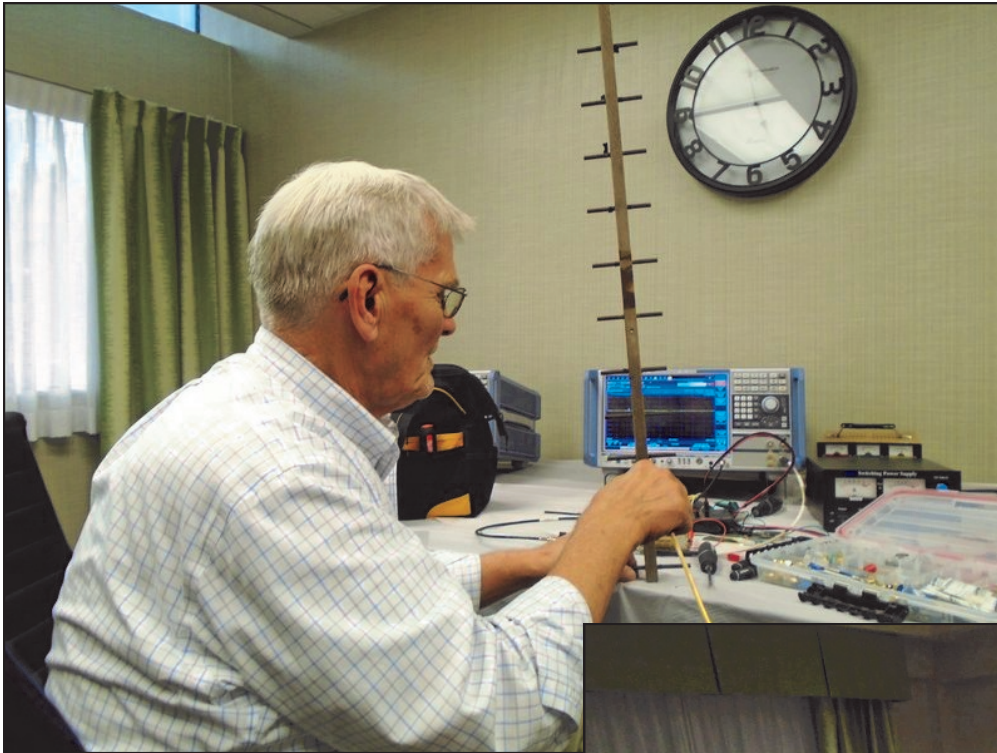
A lively presentation by Jerome K3GNC on station installation and evolution. To quote K3GNC "I'm done, I'm happy, that's enough for me". (NOT)

Joe did a presentation (with AI, AC2CL) on Laser Phone transceiver development.



FM mobile contesting setup of John KM4KMU





October Meeting Pictures



Newest Packrat
Peter WW2Y.
WELCOME!



A well attended meeting



Michael's
presentation on
Cheap and
Good RF
Instruments

432 Sprint Comments and Results

From Pete K0BAK/R

Felt like less activity than 222, but turned out almost the same # of Qs. Logged a good mix of grids contacted in each of the grids I activated, which generated a higher score than I thought I'd get. Disappointed that I didn't hit some of the local stations in all grids. Couldn't hear to the north (FN11,12), but got a good number of CT & NLI stations (FN30,31). WZ1V longest at ~300km. W8ZN reliably worked from FM09. Activated 4 grids: FN20, FN10, FM19, FM29; contacted 8 unique grids. Thanks to stations K1RZ, K1TEO, N3BBI, W8ZN for contacts in all 4 of my activated grids.

Q's 48, Mults 26, Score = 1,248

From Bill K1DY

What a difference a day makes I guess.. I wasn't around the night the "band was open" sorry to say BUT the band was really poor last night. I was on at the beginning and ran 'til about 9. Worked 11 QSO's in 7 grids. Best DX was N2GHR at 533km and then N2SLN at 506km. Both had strong signals on SSB but couldn't hear a peep from stations I ran with beyond that distance. Also, I worked my OWN GRID this time - twice.. wahoo! Anyway, thanks to all who got on and to the sponsors!

From Lenny W2BVH

I had 24 Q's, 8 Grids, 192 points. Conditions seemed flat with no hint of any enhancement. I'm shooting through the trees here and only running 12 watts, both of which made things even more difficult. I'm sure you'll agree that "The tropo giveth and the tropo taketh away". If the contest had been on Tue or Mon results would have been much better (I hear there were W1 to W4 qso's on 1296!). Easily worked K0BAK/R in 3 of the 4 grids he was in (ironically not in my own grid of FN20, where I didn't hear a peep from him). I also got numerous kind remarks on my signal strength for the 12 watts I'm running. All in all well worth the effort! Fishermen say "That's why it's called fishing, not catching". Same can be said for weak signal ham radio.

Comment from Bert K3IUV

There was a time (a long, long time ago) that we thought we were working DX ON 432 if the other station was 50 miles away!.. How times have changed. Now we complain if we can't get past 330 miles!

From Steve W1SMS

Fired up some new hardware - only made a few Qs and the preamp died. Transverter worked but needs some more IF drive. New 1500 watt solid state amp performed well at 600 watts out.

From Bill AA2UK

I thought there could have been more activity and many local workable grids were never heard. The unusual happened, more stations showed up in the last hour. If one was to look at the APRS Map you'd have thought the band(s) would be open from EM92 to FN95. I had fun. I'm still trying to adjust from contesting from a great location & station to the exact opposite. Lots of local grids were missing. I got 36 Q's and 17 grids. Some highlights: working Mike N1JEZ in FN44, VE3ZV in EN92, and K3TPL in EN91. Looking South I can't work much, I'm totally blocked by terra firma within 300 yards.

From Phil K3TUF

I really enjoyed the Sprint on 432, it's such a fun band. Some times there were so many on a single frequency that it sounded like 20 meters. I worked half of my contacts in the first 30 minutes; there just weren't enough stations to keep busy the whole night, but that makes for better use of the chat pages to make arrangements to get far away contacts.

Q's, 64 Grids, 27 for the night

From John W3HMS

Just on for 1.5 hrs in FN10. Small station. with 21 el at 45 ft and 90 w. 6 Q's and 5 Grids

From Walt K3BPP

Only on for an hour. Probably my first 432 sprint though I have been on and off the band for 50 years. I heard you [W2BVH] but could not make it. Heard a few others that we did not work but it was fun. I only have 20 watts. I have a K2RIW amp that I have not used in 30 years but have hopes of getting it on. Ant is a K1FO about 65 feet up 7 Q's and 6 grids.

432 cont'd

From Dave W2KV

Worked a number of 350+ mile contacts including FM06, FN44 and EN93. Conditions I thought were pretty flat in contrast to the huge "opening" shown on the propagation map. Quit at 10 PM but I hear some more stations showed up later. I guess I need more perseverance. Total of 42 Q's in 16 grids.

From Dave K1RZ

432 is a good Sprint and tonight was no exception. Activity seemed strong. Conditions were about average, although I gage that generally by the DX I work, and tonight I did not work so much DX to the northeast. I did get EM95 W4DEX and W4NUS, plus EM94 NT4RT to the south. West was capped by K8TQK. North best DX was FN14 VE3DEW. Rovers were well represented by K2EZ, K0BAK, VE3CRU and AB4CR. Thanks for going out folks. Thanks to the sponsors for these good events. So fun to just concentrate on one band. 73 all. See you in January.

From Bob W2SJ

Enjoyed the 432 Sprint after a strange start. Had a family dinner to attend and did not start until 8:15. I sat down, put the headset on, tuned the band and heard nothing! Absolutely Nothing! Checked the antenna, power, preamp, etc. I was putting out 200 watts so I called CQ multiple times...Still Nothing! Then I heard K1RZ, worked him, called CQ and worked N3BBI. This continued really slow working someone every 5 to 6 minutes, so I fired up ON4KST and found many to work. Guess I missed the rush from 7 to 8:15 PM. Oddly, the activity really picked up the last hour with multiple CW signals on the same frequency proving "it's not over until it's over" !

Worked 34 Q's and 13 grids. Score 442. Best DX this time was VE3ZV in EN92 at 575 KM!

40 TB Hard Disk Drives on the Horizon?

This may be of interest to the group:

<https://www.bbc.com/news/amp/technology-41611802>

73, Brad AA1IP

(From the "Glowbugs" internet reflector)

Mid-Atlantic Conf :Thanks

It takes a village, or a club in this case. There are so many who contributed to the success of the conference, a big round of thanks to each and every one. Lest I forget a name, I want you all to know that there are many moving parts to this event and so many of you contribute in so many ways.

First and foremost, you are Packrats that support the club's programs and activities. You are attendees. You are speakers. You are registrars. You are door prize and raffle item donors, solicitors, auctioneers, suppliers of tools and power supplies for Greg, ambassadors of the club at hospitality, sellers of goodies, providers of the munchies and liquid refreshment, contributors to the proceedings, sound system and AV technicians. The web-site and on-line registration designers too, along with the HTML guru and disc design and printing. Our Friday Station Automation thanks go to Roger W3SZ; it was a huge success.

If you have thoughts about being a speaker for next year, contributor to the proceedings, or taking a role in one of the many moving parts of the conference, or have any corrective or useful feedback, let us know.

For the team, Rick, K1DS

MORE 2m DX for WA3QPX

Paul reports 3 new DX entities for his 2 meter log this month via EME:

BX4AP -Taiwan

T8EM - Palau

3DA0MB - Swaziland

Congrats Paul, keep it up!!

An Arduino Based Transverter Sequencer

by Lenny W2BVH

Here's info on how I built a quick and simple 4 stage sequencer for my 902/3 MHz transverter. It should take no more than half a day (4-6 hours) to build and cost around \$10 - 20 (not counting the box and power supply). At these prices you can have a separate sequencer for each band, and customize it for the specific needs of each band's equipment.

The sequencer uses a microprocessor based "Arduino" board as its core hardware. The Arduino is a simple microprocessor board that's well suited to implementing control functions that hams find themselves faced with fairly often. It would be good for fan control, front panel display on an amplifier or transverter, a SWR alarm, or rig temperature read-out (all of which I've done, quickly and uneventfully). And of course the sequencer described in this article.

The software in the Arduino looks for closure of a "transmit" footswitch and then drives 4 outputs one after the other ("in sequence") with a settable delay between each. Similarly it drops the outputs (in reverse order) when the footswitch is released.

The main purpose of a sequencer is to make sure transmit RF doesn't show up until all the devices (mainly relays) in the transmit path are ready to see RF. Hot switching (switching with rf present) will wear out relays very quickly. Examples: a) The antenna relay contacts will burn up quickly if RF is present when the antenna is being switched onto the power amplifier's output, b) A LNA will be destroyed if it is not switched out of the transmission line before transmit RF shows up, c) The I.F. power attenuator relay contacts will be burnt up in short order if RF is there while the relays are switching it in line. You can find more information on this subject (and many others) in ARRL's terrific book "Experimental Methods in RF Design".

My particular sequencer's job is fairly typical. It has to switch the antenna relay from receive to transmit, enable transmit/receive in the transverter, enable the transmit driver amplifier ("IPA") and power amplifier, switch in a power attenuator at the output of the I.F rig and enable transmit ("PTT") on the I.F rig. Each of the switched devices have their own electrical requirements, and you'll see I've designed drive circuits to handle each of them. You can mix and match these drivers to suit your particular needs.

The nice thing about using software to do the timing, is it's very easy to make changes without doing re-wiring once the hardware is built. There are also no worries about timing caps drying up and changing value (and with it the timing of the sequencer).

Circuit description

LED's

I've included 4 LED's in the design. They light up as each of the 4 "SEQn" outputs are driven high (for transmit). I put them there for debugging during development. They don't affect the functioning of the sequencer, and if you have confidence in your wiring ability (or have another way you'd prefer to test the circuit) you can leave them out. I found they were well worth the extra half hour or so it took to wire them in to see that the sequencer is indeed functioning.

DIP Switches

I connected a 4-position dip switch to 4 input pins of the Arduino board to allow you to set different delay times. I wrote the software so the time between activation of each of the SEQn lines is at least 10 mS. Additional delay is specified by the values set on the DIP switches. If 3 of the switches are closed (0) then the delay is 10 mS between each step (zero additional delay). When 3 of the switches are open (1) the

delay $4+2+1 \times 10 + 10$ mS or 80 mS between each step in the sequence. You just set whatever value is needed by the hardware you're sequencing, using 3 of the switches. The 4th dip switch is for testing. If it is open (1) the time between sequence steps is 2 seconds. This is useful for testing the sequencer when it is first built. You can watch the LED's turn on and off in turn and no instruments (other than your eyes) are needed to verify the functioning.

SEQn Driver Circuits

There are 3 different line driver designs connected on the four sequencing port pins of the Arduino board. In my case for the 902 MHz rig they work as follows:

1. The "SEQ2" and "SEQ4" line drivers use 2N7000 transistors which are off (open circuit) during receive and on (switched to ground) during transmit. They'll hold off up to 60V when off and are good for up to a 75 mA (worst case) or 600mA (typical) load when their gates are driven with a 5V logic level (which is what I'm doing here, with the Arduino output ports). If your loads (relay coils, or whatever it is you're driving) are greater than 75 mA you're taking a chance that the 2N7000 won't saturate and drive "full on". Looking at the 2N7000 datasheet, my opinion is you should be good for up to 200 mA with this circuit. If you decide to overload past 75 mA, just measure the transistor's on voltage when its connected to its load, and if it's 0.5 V or less you should be fine ($0.5V \times 200 \text{ mA} = 100 \text{ mW}$ dissipation). If you find the drain is over $\sim 0.5V$ when on, you can always use a more capable transistor or swap in another 2N7000 (it may be good for more current). As a practical matter, I've had no problem with 200+ mA loads in a half dozen or so Arduino projects that I've done. The nice thing about making just one of something is it's easy to bend the rules a little and get away with it. If I were putting this in to production I'd rate the SEQ2/SEQ4 outputs at 60V / 75mA, to avoid (justifiably) rude calls from customers.

In my particular implementation, these transistors are a) (SEQ2) switching the transverter to transmit which is a relay with a low power coil and b) (SEQ4) switching the IF rig's transmit enable line (don't know what's inside the IF rig, but it's a light load too).

2. The SEQ1 driver is the same circuit as the SEQ2 and SEQ4 design, but it uses a BSP318 transistor which can drive more powerful loads. As with the SEQ2/SEQ4 drivers it is off (open circuit) during receive and on (switched to ground) during transmit. The BSP318 is rated at 60V max, like the 2N7000 but it can handle an astounding 2.6A (at 25 degC). I wouldn't load it at more than 1.5A without doing a thermal analysis. At 1.5A load ($.15 \text{ ohm saturation resistance} \times 1.5A^2 = 338 \text{ mW}$), you're probably in the territory where soldering a small piece of copper foil on the back of the transistor as a heatsink would be a good idea. I picked this transistor, because it has very nice specs and I got a bunch of them at one of the Mario raffles for a buck! If you need some for your sequencer, let me know.

In my particular implementation the SEQ1 driver transistor is switching 1) the antenna relay coil, 2) the coil on the relay that switches in the IF rig power attenuator, and 3) the coil on the relay that enables the 902 MHz driver amplifier ("IPA"). This adds up to $\sim 500 - 600\text{mA}$.

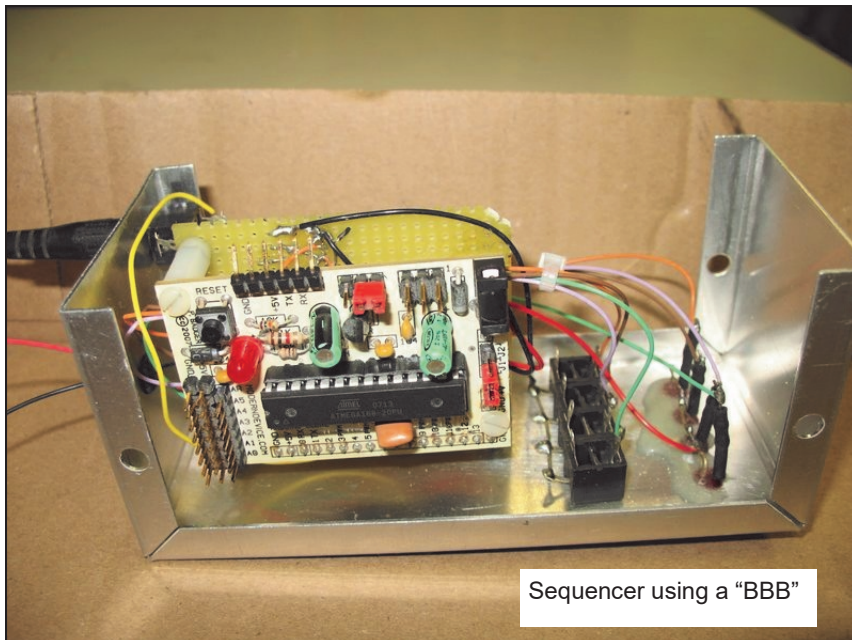
3. The SEQ3 driver has the task of sourcing 12V (it supplies 12V on transmit and is high resistance during receive). I just tagged a 2N4403 on to the circuit used for SEQ2/SEQ4. It's good for up to 40V (just put the voltage to be switched on to its emitter). As designed it will supply up to 40 mA but you can push it way further by making the series base resistor smaller. For instance, when switching 12V you should be able to source up to 500 mA by making the base resistor 240 ohms.

Note: If you're switching more than one load at a particular sequence step and each of the loads has a different voltage, just use a separate transistor for each load. The drains wired separately to each load. The gates are tied together and the sources are both wired to ground.

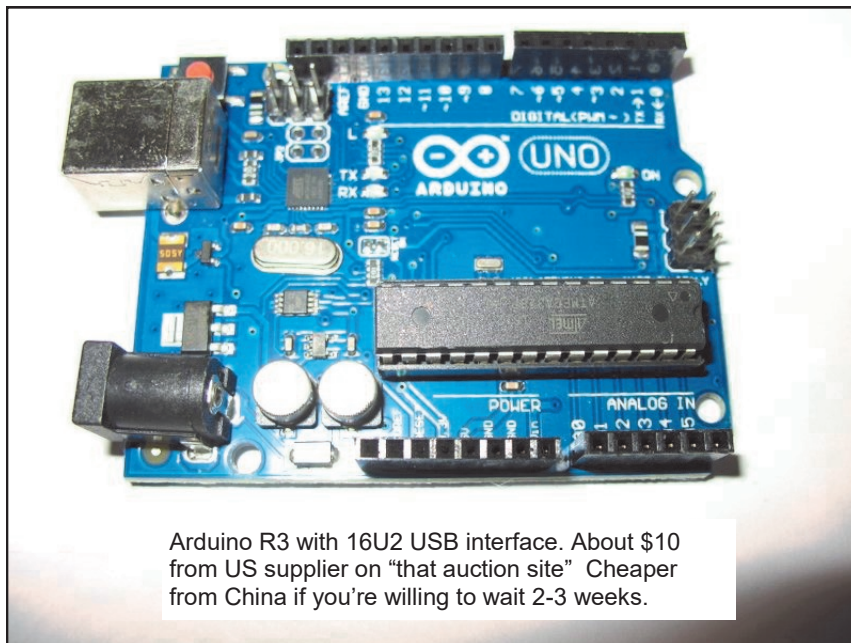
Construction Hints

I built the driver board with glass epoxy "perfboard". There is nothing critical at all about the layout and construction of the driver board. If you want, instead of perfboard, there's a "proto board" with a decent size grid of plated through holes which is available pretty inexpensively and it will mate directly with the Arduino I/O pins. If you use this board, it will save some time and make the job look neater.

There are many flavors of Arduino board available and just about any of them will work for this application. My board is the Arduino "BBB" (Bare Bones Board). I had one of these already so it was well worth using. It is sold by Brian Riley (N1BQ) at <http://www.wulfden.org/TheShoppe/freduino/bbb.shtml>. At the time I got these (a few years ago) I was out of work and was crying the blues to Brian that I'd like to do some Arduino development, but funds were low. Well he paid it forward by sending me some Arduino hardware for FREE. And now I'm paying it back by mentioning his web site here. There are other boards that fit this application well (actually, even better) such as "Arduino Uno R3", Arduino Nano and Arduino "2650". You can get them from many suppliers on the internet such as Sparkfun, Adafruit, Digi-Key, Mouser and of course "that auction site". Some of the boards at "that auction site" that come from China



work fine and go for as little as \$3.75 but they have a different USB chip. When you look for them, you'll see them designated as having a CH340G USB interface or a 16U2 USB interface. If you want to save a little work, look for boards with a 16U2 USB interface. The boards with a 16U2 USB interface will accept the Sequencer program from the program loader ("IDE") directly. Those with the CH340G (the really cheap ones) require you to load an additional driver in Windows before you can upload the Sequencer program from your computer to the Arduino board. Not hard, but one more step. The driver is easily found by Googling "CH340G driver, English".



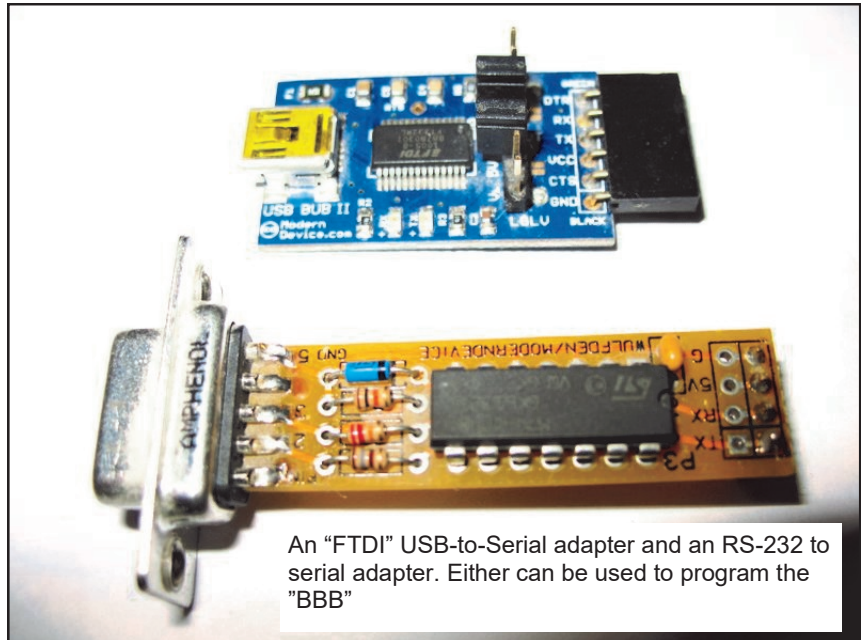
2N7000's were around 40 cents each or \$10 for 100 at Mouser (last time I looked), so you may want to splurge. They're good parts and you can find many uses for them.

The Arduino boards are all designed to accept power from a large variety of sources. You can feed them with regulated 5V or unregulated voltage up to 16V or so (using their on-board regulator). You can even power them from the USB port while programming them. On some boards the power source is selected using on-board jumpers, on others the power source is selected automatically, so you'll have to look at the documentation for the board you've bought to see how to get the power you've got on to your board. If

you use USB to power the boards while programming, and your board is one that has power manually switched, just remember to switch the jumpers for your main power source after you're done with the USB port.

For the "BBB" you'll need a programming board too, to load the software onto the Arduino, since it doesn't have a USB port of its own. The programming board is called "USB to Serial Adapter" or "FTDI Adapter" and is fairly inexpensive. It plugs right onto the BBB. You can take it off the board once you're finished programming and save it for your next project. If you're a little shaky about programming a board, bring it to a meeting. I'll program it and return it at the next meeting.

One final and very important construction note: if you're driving an inductive load, like a relay (which you almost surely will), make sure to put a "catch diode" on the relay coil to keep from burning out the driver transistors in the sequencer (and possibly even the microprocessor). Don't ask me how I know.



An "FTDI" USB-to-Serial adapter and an RS-232 to serial adapter. Either can be used to program the "BBB"

Loading Software

To load the software onto the Arduino board, you need to download the Arduino development program ("IDE") from <http://arduino.cc/en/Main/Software>. You connect the Arduino board to your computer using a USB cable (and if necessary, the USB-to-Serial Adapter). The actual download is a 5 step process: a) Select your board type from the IDE menu "Tools ->Board", b) Load the program using IDE menu "File->Open", c) Build the program from the IDE menu "Sketch->Verify/Compile" d) Reset the Arduino Board using the board's reset pushbutton, e) Upload the program to the Arduino board from the menu "File->Upload".

Don't bother typing the program into the IDE. Email me and I'll send it to you, ready to build and load. As mentioned above, I can program the board for you too.

Hardware additions

As you can see by how tiny the program is for this Sequencer, the microprocessor is barely coasting. If you like and you have an interest, you could make use of the remaining I/O port pins to do other things. (Though come to think of it, the Arduino boards have gotten so cheap, it's reasonable to consider using separate boards for separate functions.)

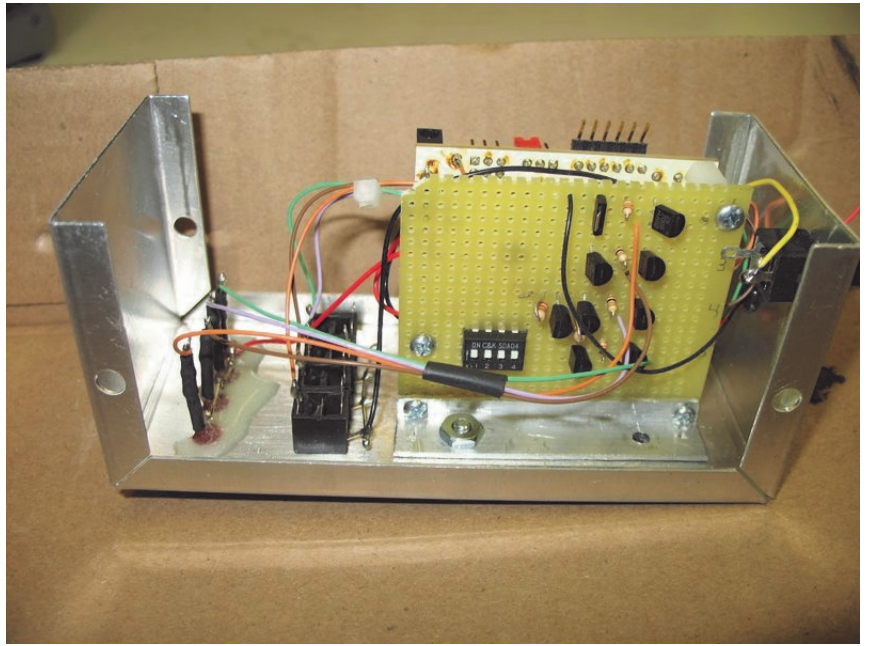
If the driver circuits I've used don't seem to suit your situation, let me know, maybe I can whip up something special to meet your needs.

Software Additions / Changes

As I mentioned at the start of this article, having a sequencer that's driven by software allows you to do what you need to do without making hardware changes; just load a new program and you're in business.

The language used to program the Arduino is a variant of C++. The "variant" part consists of some special key words and macro's that conveniently shield you from having to dig in to the dirty details of the central processor... a great advantage! There are also a ton of very useful library programs available for

free that will keep you from having to do work someone else has done for you! As for the C++ part of it (something that tends to scare some people off), remember underneath C++ is C, a much simpler language. You can do almost all your programming in C and no one will be the wiser. If you have never used C and you're at all interested in programming, my opinion is that it's worth the modest amount of work it takes to pick up this language. Especially for microprocessor programming, where even some parts of this small language are not needed.



Here are some ideas on what changes might be made to the sequencer software.

1. If you need the port pins used by the DIP switch for other purposes, you can get rid of the DIP switch and "hard code" a single delay value into the program, freeing the port pins for other use.
2. You could have different delay values for each sequence step. For instance 50 mS for the antenna relay, 15 Ms for the IF rig enable, etc. These values could be hard coded quickly and easily. Alternatively, the delay values could also be stored in a "look-up table" in the microprocessor's built in non-volatile "EEPROM" memory. Using EEPROM allows changes to the delay values without changing the program; just the delay values themselves are changed. If you wanted to do it with a look up table, you'd need a way of getting the delay values into the EEPROM. A command line parser would be just the ticket for this. Writing a parser routine is several hours of work, but worth it. But you may not even have to do this extra work! There are parser library programs already written for you to use. Whether they would be appropriate for this sequencer, is left as an exercise!
3. Etc, etc. Use your imagination.

Conclusion

I hope you've had as much fun reading about this sequencer as I've had writing about it. Again, if the sequencer seems almost right for you but doesn't have quite the features you need, and you're hesitant about doing changes, let me know, maybe we can figure something out together.

Sequencer Source Code "Sequence.ino"

```
// DIP switch requests added delay
// dip switch IO port nrs
const int DIP_SW_1_PORT = 9;
const int DIP_SW_2_PORT = 10;
const int DIP_SW_3_PORT = 11;
```



```

const int DIP_SW_4_PORT = 12; //Reserved for hardware testing

// Foot switch input port
const int FOOT_SW_PORT = 7;

//Footswitch values
#define UP HIGH
#define DOWN LOW

//Added delay
#define MINDELAY 10
#define ADDEDDELAY 10

//Relay drive output ports. Go from RLY1 (1st) to RLY4(last) when footswitch is 0
const int RLY1 = 2;
const int RLY2 = 3;
const int RLY3 = 4;
const int RLY4 = 5;

// Variables:
int extraDelay; //extra delay time added to the base value depending on the dip switch settings

void setup() {
  // Init dip switch ports to input with internal pullup
  pinMode(DIP_SW_1_PORT, INPUT_PULLUP);
  pinMode(DIP_SW_2_PORT, INPUT_PULLUP);
  pinMode(DIP_SW_3_PORT, INPUT_PULLUP);
  pinMode(DIP_SW_4_PORT, INPUT_PULLUP);

  // Init footsw port
  pinMode(FOOT_SW_PORT, INPUT_PULLUP);

  // Init Relay Drive ports
  pinMode(RLY1, OUTPUT);
  pinMode(RLY2, OUTPUT);
  pinMode(RLY3, OUTPUT);
  pinMode(RLY4, OUTPUT);

  //Calculate the number of extra millieconds to add to the base delay, based on the DIP switch settings:
  0 to 70 extra milliseconds
  //extraDelay = digitalRead(DIP_SW_4_PORT) * 8 + digitalRead(DIP_SW_3_PORT) * 4 + digitalRead
  (DIP_SW_2_PORT) * 2 + digitalRead(DIP_SW_1_PORT) * 1;
  extraDelay = digitalRead(DIP_SW_3_PORT) * 4 + digitalRead(DIP_SW_2_PORT) * 2 + digitalRead
  (DIP_SW_1_PORT) * 1;
  extraDelay *= ADDEDDELAY;

```

```

//Dip sw port 4 high forces a 2 second delay per step for hardware system testing
if(digitalRead(DIP_SW_4_PORT)) extraDelay = 2000;

//Debug
Serial.begin(115200);
Serial.print("Initial extra delay ");
Serial.println(extraDelay);
} //end of onetime setup

boolean footswReadVal;
boolean lastFootswVal = UP;

void loop() {
//Has the footswitch moved?
footswReadVal = digitalRead(FOOT_SW_PORT);
if (footswReadVal != lastFootswVal)
{
Serial.println("Debouncing foot switch"); // for debug
footswReadVal = debounce(FOOT_SW_PORT, 20); //debounce for 20ms
}

//if footswitch state changed sequence or unsequence
if (footswReadVal != lastFootswVal)
{
if (footswReadVal == DOWN) // was up, now its down
sequence();
else //was down, now its up
unsequence();
lastFootswVal = footswReadVal; //remember new state of the footswitch
} //fi
} //end of Loop

//Service functions
boolean debounce(int PORT, unsigned int dt)
{
delay(dt); // debounce for dt ms
return digitalRead(PORT);
}

// Activate relay drivers from 1 to 4 with a wait before driving each
void sequence()
{
Serial.println("Sequence start");
digitalWrite(RLY1, HIGH);
delay(MINDELAY+extraDelay);
Serial.println(MINDELAY+extraDelay); // for debug
digitalWrite(RLY2, HIGH);
delay(MINDELAY+extraDelay);
}

```

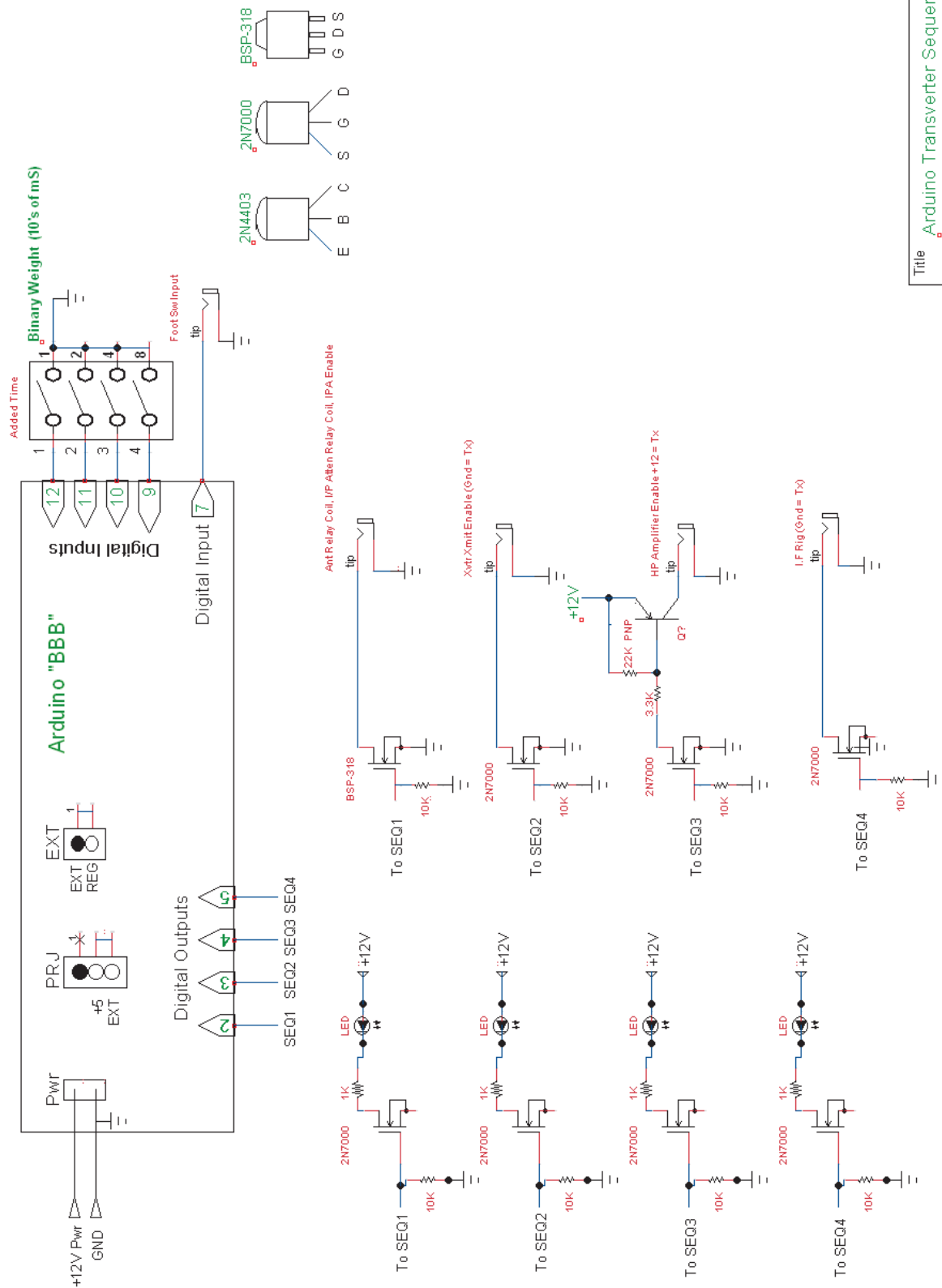

Sequencer source code cont'd

```
digitalWrite(RLY3, HIGH);  
delay(MINDELAY+extraDelay);  
digitalWrite(RLY4, HIGH);  
}
```

//Deactivate relays starting at 4, with a delay before each deactivation

```
void unsequence()
```

```
{  
  Serial.println("Unsequence start");  
  digitalWrite(RLY4, LOW);  
  delay(MINDELAY+extraDelay);  
  digitalWrite(RLY3, LOW);  
  delay(MINDELAY+extraDelay);  
  digitalWrite(RLY2, LOW);  
  delay(MINDELAY+extraDelay);  
  digitalWrite(RLY1, LOW);  
}
```



LED Drivers (optional)

Select driver ckt that's best for your load

Title		Arduino Transverter Sequencer - W2BVH	
Author		Lenny Winfield	
File	.Users\Lenny\Desktop\Sequencer Schematic.dsn		Document
Revision	Date	4-17-2015	Sheets
1.0			1 of 1

WA3QPX

Crabfest

Paul WA3QPX sends Cheese Bits a photo album of his annual Crabfest. You can see (and download if you like) all the pictures from the Crabfest at www.tommills.zenfolio.com. Here is a teaser pic for your enjoyment:



Tracking Hurricanes

We're out of the woods for this season as far as new hurricanes go. But keep this URL for the next time weather systems with names show up next fall: <http://www.nhc.noaa.gov/>

10 GHz EME Record

For those of you who remember seeing Jim and his dish at Camelback. I know he has been trying terrestrial 10GHz with his dish too and was impressed with the results. Paul N2EME.

See <http://forums.qrz.com/index.php?threads/new-10ghz-eme-record.581530/>



KOBAK Wins Rover Category in 3 Sprints

It appears I "won" top rover in 3 of the 4 fall sprints (all but 6m), in an admittedly small pool.

I want to thank all of you who participated in the sprints, especially those who were active till the end since my last two grids are generally 10pm-11pm. It's a significant effort to go out roving even for 4 hours, since (for now) I still have to build and tear-down the minivan each time ... it's only worth the effort when you in Packrats territory get on the air.

Special thanks to operators listed below who managed to contact me in all 4 grids during one or more sprints.

-- Pete KOBAK

K1RZ (2 sprints), K1TEO (2 sprints), K3TUF, KB1JEY, N2NT, N2SLO, N3BBI, N3NGE, N3RG, W2KV, W2SJ, W2TAG, W8ZN

On The Bands

By Jerome Byrd – K3GNC

Tropo Scatterings: What little time I have for ham radio, given my work schedule and personal household restriction, is spent working the “backbone of weak signal stations” in the NE corridor. These stations can be relied upon to be there day after day. One of our favorite sayings, which originated with Connie NG4C is “Thanks for being there”. The nickname for this core of dedicated weak signal op’s is “The 205 Gang”. The list that follows contains the calls of many (but not all) of the gang: KA1ZE, N1JEZ, WA1EAZ, W1ZC, K1TEO, K1BXC, WICOT, AA2TT, N2SLO, WA1RKS, K2ARN, W3ERH, W2QEG, WZ1V, K1PXE, W1VD, WB2SIH, N2GHR, N1TKS, KB1WY, KA3QWO, AA2UK, KO4YC, KD8UD, KD4AA, N4ASF, KJ4MCZ, W8ANS, K8TQK, K3TLP, NG4C, N1GC, VA3HD, VA3WV, VE3EU, VA3ELE, W3BFC myself, and many more. Some of the above are on mornings and evenings. Many of the above medium to well-equipped stations work 400+ mile contact everyday they are on, regardless of conditions. The 2 meter band is alive and well join the fun!

Nets and Scheds: The following is a rundown of the nets and group meetings in the ‘local area’ (<= 250 miles, only nets that don’t conflict with the Packrats nets are shown). Mondays: 2130 local – 1296.110 (group sched with WA2LTM, K1PXE, WZ1V, N2SLO, WA2ONK, WB2SIH, K3GNC and others. All are welcomed. Tuesday: 2000 local – “Mud-toads Net”, KD8UD fm17uv net control. 144.175. All are welcomed. Wednesday: 2030 local - 432,150 – group sched, WA2LTM, K1PXE, WZ1V, N2SLO, WA2ONK, WB2SIH, K3GNC and others. All are welcomed. Thursday: 2030 local - 144.250 – N.E.W.S club net, WICOT fn31st net control. All are welcomed. Saturday: 144.205 2130 local – Chesapeake Net, W3BFC net control. All are welcomed. Sunday: 1030 local – 144.250, Sunday Morning Memorial Net, Bill AA2TT fn30br net control. All are welcomed; 2030 - - 432,150 – group sched, WA2LTM, K1PXE, WZ1V, N2SLO, WA2ONK, WB2SIH, K3GNC and others. All are welcomed.

The Luna-tic Fringe: The second leg of the EME 144 – 1296 contest is in session as I write this article. I am in transition building a new station at a remote location, so my activity and results will be minimum. I will report my observations next time.

EME Tidbits – For the first 6 hours of a moon-pass Europeans stations are available. The next 3 hours are limited to NA and SA. The final 3 hours feature the Pacific islands, AU, ZL, Japan and the far-east at the very tail end of moonset. Until next time please stay/get radioactive!

7 3, K3GNC

K0BAK/R Op Report from PAQP

Another fun PA QSO Party. This is my fourth in a row, all as a rover. Thank you to all the organizers, volunteers, sponsors, and bonus station operations; and of course especially to Mike Coslo. I was able to follow my plan pretty closely, and got a nice pileup almost every time I was able to find a band spot to call CQ. Didn’t start too well with an intermittent RF problem, but replaced the cable from radio to amp and all was good again; was an anxious feeling having a major glitch at the first location. My first stop was CMB; had I known how rare it turned out to be, I would have stayed longer. Only heard one county line station, usually get several. I didn’t discover my computer time was horribly wrong for a few hours, took a lot of log massaging afterwards to correct it. Activated FUL, HUN, and FRA on Saturday night using different locations from last year that took a lot less time to get to. My score went up hugely compared to last year, mostly due to being more aggressive about calling CQ more and S&P less. Didn’t even try the CW bands since I can only S&P CW. Got a call from KG4WV in Guantanamo Bay, but it’s not a section multiplier! I activated 3 parks in the World Wide Flora and Fauna program while in BED, PER, DAU; some of my WWFF friends helped me out throughout the contest. Looking forward to having a better and permanent mobile ham station for the *next PAQP*.

Equipment Testing at MASVHF Conference

Greg & Rick:

Before this week gets away, I wanted to extend a personal 'thank you' on several fronts.

1. As a Western PA guy 325 miles from Bensalem, I wasn't asked to show my passport...It's great that one doesn't have to be a Packrats member to attend!
2. The equipment measurement setup that Greg brought was very helpful to me as someone who has no access to such powerful tools. I learned that my 10GHz and 5760 LNAs were working as designed and that another potential 3cm LNA worked but had an oscillation at 15GHz or so. (Tnx K1RZ for the -18v).
3. The conference itself was first class; I met a bunch of knowledgeable folks and learned a lot, particularly on how I might simplify my rover setup with some automation/standardization. It's good to meet folks that one works in the contests from afar.

I don't know who all participated in making the event a success; please extend my thanks to them as well.

73

Bill W2RMA EN90xh

K2TXB EME Array Construction

I just finished setting up a web page to detail the construction on my new EME array. I thought it might be interesting to see. You can view the page here:

http://www.k2txb.net/NewEMEArray/New_eme_array.htm

The page there just details the tower and gin pole construction and installation. I have started a second page to show the rotators, control boxes, position sensors and wiring. Once I finish that I will devote another page to the antennas and RF parts.

Here is just 1 of the many pictures at the web site:



73, Russ K2TXB

LimeSDR Extended to 10 GHz

AI, K2UYH reports that a crowdsourced project is under way to extend the frequency of the popular LimeSDR transceiver to 10 GHz. Details on this project / product can be found at <https://www.crowdsupply.com/lime-micro/limesdr-mini/updates/lms8001-companion-extends-coverage-to-10-ghz>

The Wayback Machine In CHEESE BITS, 50 Years Ago

Nibbles from November 1967. Vol. X Nr. 9
de Bert, K3IUV
(*author's comments in italics*)

- **“Our Prez Sez”.** Dave, W3LHF (later W3ZD) “talked up” the upcoming January contest. The committee, chaired by Charlie, K3HSS has distributed the questionnaires, group coordinators have been chosen, and Charlie asked that everyone consider what they can do to better their score. (*Our contest preparation was organized with military precision, with check-lists, operating aids and follow-up.*) Dave noted that the recent advent of “incentive licensing” with added band allocations for advanced licensees has resulted in a large increase in Extra Class applications.
- **Membership.** New member, W3PST, Elwood Haldeman. (*Immediately assigned to WA3ERQ’s contest group!*)
- **ARRL Bulletin. Nr 136, 9/28/67.** Following up the FCC report and order, the Commission has begun to issue Novice licenses with a 2-year term. The FCC also clarified the rules for receiving a 2-letter call (based on a league request).
- **Packrat Certificate Rules.** (*The club offered certificates for working a certain number of members, based on the stations distance from center city, Philadelphia*). A special certificate was announced for working 50 Packrats during the January contest. (*Our way of*

encouraging operation, and contacts for Packrats).

- **Humor.** WA3BIV, Carl, contributed another of his frequent articles. “People Modulation” described something similar to the Star Trek “transporter.” (*Beam me up, Carl.*) He managed to work EI, K3JJZ, EI’s wife and harmonic into the hilarity. (*Read it all in the issue archived at W3CCX.com.*)
- **Two Meter Activity Report.** W3LHF, Dave (later W3ZD) commented on “typical” conditions on 2-meters, and reminded us that CW would be useful in working the rarer ones at the low end of the band. He reported that VE3ASO and VE2LI are on nightly from seven to nine pm, and are workable almost every evening. W1HDQ (Ed, Mr. VHF) has joined in on several QSOs. Dave worked Mario, K3UJD (*of our raffle table fame*) who was using his newly revamped SSB rig. A potent signal!
- **Technical Article.** “Transistors for Hams” was the first of several articles by W3QZO, Bob Thomas (*a member of the Philmont Club*), planned to explain the design, construction and use of transistors in Amateur equipment (*remember, this was 50-years ago and transistors were just coming into use.*) This initial article discussed the basics of p-n junctions, current control and gain in a stage.
- **Meeting Notice.** The November meeting was designated as “Home Brew” night. (*The idea is now our March meetings.*) Bring your item, large or small, to the meeting. Construction

details and circuit ideas could assist other members with items for their shacks.

- **Swap Shoppe.** For sale by K3HWZ, "Grandpop" Bill. \$135. A Black Widow mobile rig with mike, all cables and a whip (*this may have been the rig I used in my early days as a mobile (rover) in the Jan contest.*) K3IPM, Stan, offered a 75W 2-meter xmtr using a 5894 final for "the first \$50." And K3GAS, Doc, offered a Utica-650 6-meter transceiver with a "good Astatic mike" for \$98.

Miscellany. Postage 5c this month (4 sheets 8-1/2" x 14). As in previous editions, many "folksy" comments about members, their families, and activities were included in this edition of Cheese Bits. If interested, or for more detail on the above items, visit www.W3CCX.COM and read the full issue scanned by K3IUUV, and posted there by our Webmaster, Ron, W3RJW).



thirty, de K3IUUV

A Bit of Packrat Nostalgia

While looking for something else, I found some early copies of the Packrat Inventory. The earliest one I located was dated January, 1974. I thought it might be an interesting bit of nostalgia for the paper, if you are looking for filler.

As a point of interest, it is printed on yellow Teletype paper. My "printer" in those days was a model 15 Teletype machine (also used for RTTY on two meters). To preserve the file, I would have my perforater connected and make a (chadless) punch tape. The tape could then be used for making more copies. How times have changed. K3IUUV.

EQUIPMENT INVENTORY MT AIRY VHF RC INC JAN 1974		CUSTODIAN
ITEM	DESCRIPTION	
1	ANTENNA 2MMS II 8 EL HYGAIN	W3CJU
W	"	K3GAS
E3	ANTENNA 2M HALO	K3GAS
4	ANTENNA 6M HALO	K3IUUV
5	ANTENNA 1296 DISH	W3CJU
6	CODE MACHINE	PREV.; CHMN.
7	JAN CONTEST INFO PACKAGE	
8	GAVELS (TWO CASES)	W3SAO/W3KKN
9	FREQUENCY METER (RANGE ??)	W3KKN
10	GONSET COMM 6 M	K3ACR
11	GONSET COMM 2M	K3ACR
12	TONE BOX FOR XMITTER HUNTS	K3ACR
13	12/110 V POWER SUPPLY	K3UJD
14	OLD INTERCOM SYSTEM	W3ZD
15	PUSHBUTTON PHONE SYSTEM	W3ZD
16	HAM M ROTATOR AND 100' CABLE	W3ZD
17	TOWER (35') CRANKUP	W3ZD
18	TOWER (40') CRANKUP (QTY 2)	K3DEV
19	TOWER (40') ALUMINUM	K3UJD
20	POLE (20') QTY TWO	W3KKN
21	POLE (40') QTY ONE	K3ME
22	RG8/U (100')	K3 GAS
23	GUY ROPES	W3SAO
24	STAKES	W3SAO
25	POWER OUTLETS	W3SAO
W3EX		
26	WIRE (???)	W3SAO
27	WIRE NO.12(250')	W3CJU
28	PICNIC TAGS	K3MXM
29	PICNIC SIGNS	W3SAO
30	W3CCX QSL'S	W3SAO
31	AMPLIVOX PA SYSTEM	K3JJZ
32	PRINTING PRESS	K3ZKO
	ADDRESSOGRAPH ??????	????

Events

For inclusion, please direct event notices to the editor.

Winter Hamfest - Hamfest - February 24, 2018. Big Flats NY. Sponsored by LIM Contest Group. See <http://www.ka2lim.com/7.html> for details

HRAC Firecracker Hamfest - Hamfest - June 30, 2018. Harrisburg Area Community College, Harrisburg PA. See <http://www.w3uu.org/> for details.

Murgas ARC Hamfest & Computerfest - Hamfest - July 1, 2018. Polish American Veterans Club, Plains PA. See <http://hamfest.murgasarc.org/> for details.

Sussex (NJ) Hamfest - Hamfest - July 15, 2018. Sussex County Fairgrounds, Augusta NJ. See <http://scarcnj.org/> for details.

K0BAK/M Op Report from NYQP

I did another HF contest operating mobile in state parks in the NY QSO Party.

Band	Ph Qs
80:	22
40:	223
20:	104

Total: 349 Pts Mults = 74 Total Score = 25,826

Club: Pottstown Area ARC

Operated from NY state parks rover style to support the WWFF program. Activated 7 parks in Putnam,(2), Westchester, Rockland(3), Orange counties. "High" power was 400w. Only SSB to maximize rate since I didn't operate in motion. Thanks to the organizers and sponsors.

Material from MUD 2017 Still Available

OK, folks, the response to the post MUD book offering was quick and the books all went within two hours... but we still have CDs available for immediate delivery.

If you can't deal with CDs and must have paper, you'll have to wait for ARRL/Lulu. Here are the details...

The conference proceedings are published in book and CD form. The CD contains all of the material from the (monochrome) book plus color versions of the papers in the book and bonus material, such as source code and schematics.

We have sold out all of our books . We still have CDs available. Prices for CDs are:

\$10 for CD shipped to an address within the US
\$22 for CD shipped to an address outside the US

To order copies, please send email to mud2017.info@gmail.com .

Requests will be processed in the order received. Please do NOT send any payment until we reply to your request with payment instructions.

A full list of papers is on the www.microwaveupdate.org website under the Proceedings tab.

Thanks, Mike Lavelle, K6ML

KRACK Attacks: Keep Your Computer Up to Date

(From Warren WB2ONA)

It appears a brute force injection can be made against just about ANY wifi device; smart phones, cable routers, consumer/commercial routers, hamwan/hamlan routers, etc... anything using 802.11 and wpa2. The PoC may be found here: <https://www.krackattacks.com/>

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Schrödinger's smiley

Mid-Atlantic VHF Conference Discs Available

MASVHF 2017 Proceedings Discs are available for \$5 per disc + \$2.50 shipping (for 1-3 discs) and handling Send PayPal payment to W3KM@verizon.net.

Special offer: Get a VHF SuperConference 2016 disc ****AND**** a MASVHF 2017 disc for \$10 (includes shipping).

TNX es 73, Rick, K1DS

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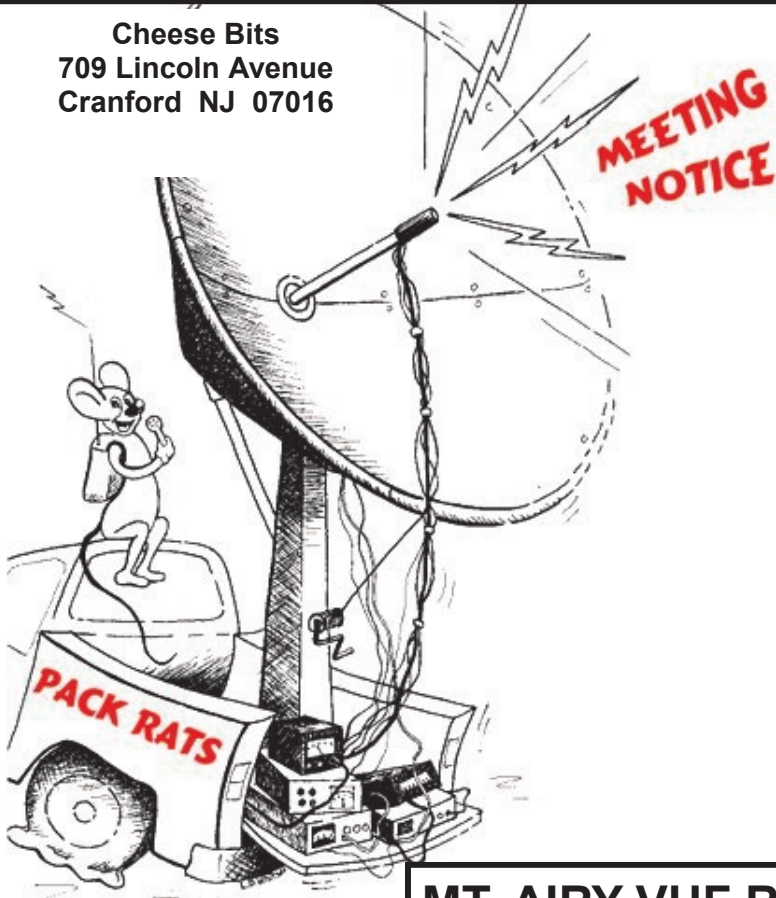
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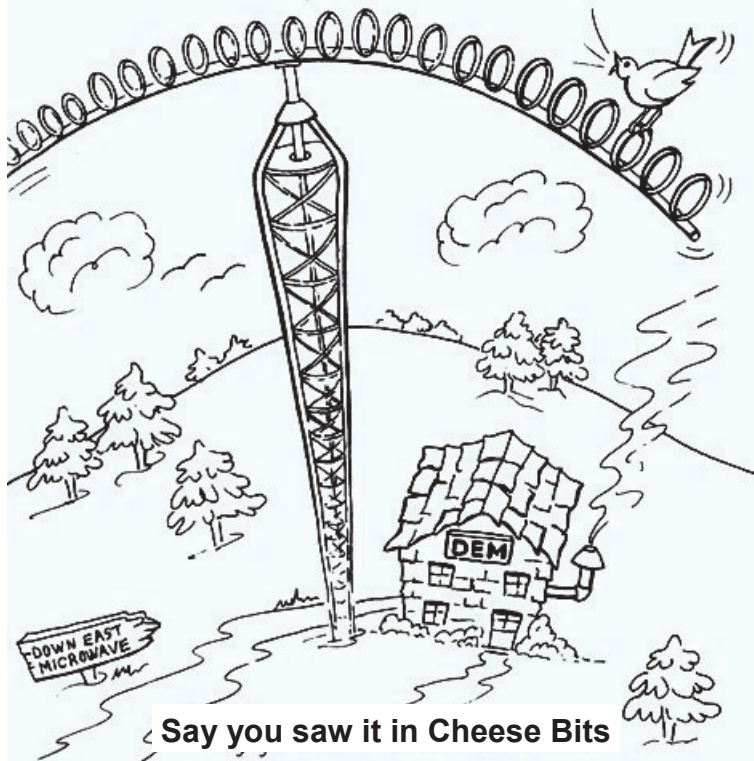
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