

# PACK RATS'



**PACK RATS**

CLUB CALL: W3CCX

MT. AIRY VHF RADIO CLUB, INC.

# CHEESE BITS



MT. AIRY VHF RADIO CLUB., "THE PACK RATS", PHILADELPHIA, PENNSYLVANIA W3CCX  
 NET FREQUENCIES: 50.125, 144.150, 220.125, 224.58/222.98, 432.110, 903.100, 1296.100 MHz  
 AFFILIATED CLUB: AMERICAN RADIO RELAY LEAGUE ARNS  
 Meetings: Third Thursday of each month at 8:00 PM  
 Southampton Free Library, 947 E. Street Road  
 Southampton, Pennsylvania 19866

VOLUME XXXII

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## THE PREZ SEZ

The June VHF Contest is over for another year and all had an interesting time in FN01. The Red gods were not shining on the mountain and rain and lightning put on a show. It seems like every time the Pack Rats go out, the rain follows. We had fair conditions on all bands including the microwaves. I want to thank everyone who went along for there effort: WA3AXV, WA3JUF, WA3NUF, K3EOD, WA3YUE, K3ESJ, N2SB, WB2YEH, N3EVV, WC2K, W0RSJ, W4LYHO, WB3JYO, WB3DNI/rover, N3AOG/rover, WA2OMY/rover, KB3XG/rover, WA3FFC, WA3BUX, and N3CX. I don't know at this writing what the final score is, but it's over 400K. Maybe it's time to change to another rare grid... any ideas?

Elections went smoothly at the June meeting and results are: Prez - N3CX, Vice Prez - WB2YEH, Recording Secretary - WA3AQA, Treasurer - WA3YUE, Corresponding Secretary - WB3JYO. We have a new Director - K3EOD, and WA3AXV was reelected to the Board. Let's all do a good job.

Don't forget the outdoor meeting at the QTH of K3GAS (SK) this month for the annual White Elephant Sale - a lot of good deals.

W3CL, Harry, is out of the hospital and on the recovery trail. He'd like to hear from you about ideas for club projects.

The Pack Rat family picnic will be held here at my QTH on Sunday, August 12. Rain date will be the 19th. Details will be in the August "Cheesebits".

Let's get the gear ready for the UHF contest and if you need any help, let me know! Please contact me if you know of any prospective members. We welcome N3EVV to the ranks of the club and Walt is operational from 50 through 1296 MHz.

73, and listen for the weak ones,  
 Dave Hackford, N3CX

### VOTED TO MEMBERSHIP:

WALT RAUSCHER, N3EVV  
 908 NOBLE ST.  
 NORRISTOWN, PA 19401

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DEADLINE FOR ARTICLES AND SWAP SHOP IS THE 20TH DAY OF THE MONTH. NON-COMMERCIAL SWAP SHOP ITEMS - FREE OF CHARGE.

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PACK RAT 220 FM REPEATER - W3CCX/RPTR  
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WA3AXV RON WHITSEL (2 YRS)  
K3EOD AL BOBLITT (2 YRS)


| <u>MONDAY NIGHT NETS</u> | <u>NET CONTROL</u> |
|--------------------------|--------------------|
| 7:30 PM - 50.125         | W3CL               |
| 8:00 PM - 144.150        | W2EIF              |
| 8:30 PM - 220.125        | WC2K               |
| 8:30 PM - 224.58/R       | K3ACR              |
| 9:00 PM - 432.110        | WA3AXV             |
| 9:30 PM - 1296.100       | WA3NUF             |
| 10:00 PM - 903.100       | N3CX               |

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CALENDAR OF COMING EVENTS  
By Harry Brown, W3IIT

JULY

- 1 Wilkes-Barre, Pa. Hamfest at the Ice-A-Rama Sports Complex, Coal Street, Talk-in: 146.52 and 146.01/61
- 4 Independence Day
- 4 Harrisburg Hamfest at the Bressler Picnic Grounds. Take Exit 1 off of I-283 and follow Pa 441 and signs. Admission: \$3. Talk-in: 147.30/.90 and 146.52
- 14 Pack Rat Board of Directors meeting will be held at the QTH of Jay, KS2T, Toms River, NJ at **10:00 AM**. Lunch served. Call 201-244-7623 for directions
- 14-15 CQ Worldwide VHF WPX Contest. See July CQ Magazine page 90 for rules or check June QST page 83. Contest runs from 0000z 7/14 to 2400z 7/15 (48 hrs) Includes operation on all bands 50 - 1296 MHz.
- 15 Sussex County ARC Hamfest at the Sussex County Fairgrounds, Plains Road, off Route 206 in Augusta, NJ. Talk-in: 147.90/.30, 146.52, 222.90/224.50
- 19 Pack Rat general membership meeting... first of two summer meetings. Famous annual White Elephant Sale is featured. Location will be at the QTH of former member K3GAS, Doc, now a silent key. Please note that this event will not be held at W3ZD's "Zimmerman's Glen", where it usually takes place. Meeting will start promptly at 8:00 PM. Bring your elephants and \$\$\$
- 26-29 The 24th annual Central States VHF Conference will be held in Wichita, Kansas at the Marriott Hotel located near the intersection on I-35 and Highway 54 on the east side of Wichita. For further information, contact Lonnie Roberts, WD0L, 628 Elaine, Clearwater, Kansas, 67026. Tel: (316)-584-6465.
- 28-29 The Colorado Six Meter Invitational Net is sponsoring an Activity Day Contest during the period 1400z 7/28 - 0300z 7/29. Exchange callsigns, name, grid, and SIN number on 50 MHz. SIN number QSO's count 3 points, non-members 2 points. Send logs to KA0MKE, 1034 S. Ventura Way, Aurora, Colorado, 80017. Deadline is 8/31. Please include SASE
- 29 BRATS Hamfest, Timonium, Md. at the Maryland State Fairgrounds, located at the Maryland State Fairgrounds, York Road, adjacent to I-83 near I-695. Talk-in: 147.63/.03, 146.16/.76, and 146.52

AUG

- 4-5 ARRL UHF CONTEST

PACK RAT HAMARAMA 1990

The 1990 Pack Rat VHF Conference and Hamarama are scheduled for October 6 and 7, 1990. Locations of the events will be the same as recent years -- the Warrington Motor Lodge for Conference, and Bucks County Drive-in for Hamarama.

PROPAGATION REPORT!

By Paul Drexler, WB3JYO

On May 30, 6-meters opened to W4 land at 2330z and then briefly to Southern California, DM13, at 0030. On the 31st, the band was open to Florida and the Midwest during most of the afternoon. The MUF continued to rise during the next 24 hours and 2-meters opened with E-skip from 0100 to 0200 into TX, OK, AR, and NM. A 2-meter FM repeater from Little Rock, Arkansas was copied locally, and WA3HMK, near Lancaster, Pa, reportedly worked DM84, New Mexico for the best DX of the opening! On June 2, many were awaiting a repeat opening on 144 but the MUF didn't quite make it high enough. 6-meters had a good opening, however, with stations from W4, W5, W9, and W0 in for almost 2 hours. On the 3rd, the band opened again on 50 MHz, with W4, W5, and W0 stations worked and several double-hop contacts to W6 land. At 2236z, CO2JA was worked before the band died at 2400z

The weekend of June 9 and 10 apparently brought several periods of coastal enhanced tropo conditions for the higher bands. Stations up and down the coast reported as many as 10 separate brief frontal openings during the weekend. The W3CCX/FN01 gang experienced the fronts as they moved across our mountain top. While stations along the coast put the conditions to use working long-haul, the Rats became wet rats with each passing system and unfortunately received little improvement in propagation. Overall, conditions at the Western Pa Pack Rat site were just average, with very little enhancement on the higher bands. 6-meters was decent though, thanks to the thundersom activity to the west.

On June 17, there was some tropo enhancement - K1PXE reports working N2CJP FM16 and W4DO FM08 with good signals on 432. Other than that, not too much to report. Keep looking for that tropo!

W3CCX/FN01 EXPEDITION PRELIMINARY DATA

| <u>BAND</u> | <u>QSO'S</u> | <u>GRIDS</u> | <u>BAND</u> | <u>QSO'S</u> | <u>GRIDS</u> | <u>BAND</u> | <u>QSO'S</u> | <u>GRIDS</u> |
|-------------|--------------|--------------|-------------|--------------|--------------|-------------|--------------|--------------|
| 50          | 364          | 135          | 903         | 28           | 19           | 5760        | 2            | 2            |
| 144         | 239          | 58           | 1296        | 43           | 21           | 10 GHZ      | 3            | 2            |
| 220         | 92           | 39           | 2304        | 14           | 11           | 24 GHZ      | 1            | 1            |
| 432         | 107          | 41           | 3456        | 5            | 5            | LIGHT       | 1            | 1            |

FINAL SCORE:     899 QSO'S                             335 GRIDS                             438,180 POINTS

TID BITS

- Condolence to Gary Hitchner, WA2OMY, and family on the passing of Gary's brother.
- Harry, W3CL, is home and recovering from surgery. Those who checked into the club nets on Monday, July 2 heard Harry check into most of the nets. Sounds like you're doing well, Harry! CU soon.
- Tom Richmond, WB2IEY, formerly active from FN13, has relocated to Pleasantville, NY, FN31 and has a 220 MHz beacon running on 220.052 from his place of work in Bronx, NY. The new beacon transmits 15 watts output to a 1/4 wave antenna mounted top-dead-center of the dome atop the Haupt Conservatory, at the New York Botanical Garden, FN30.

## SWAP SHOP

**FOR SALE:** DSI 5612 frequency counter, 50 hz to 1.3 GHz, 10 MHz time base w/oven, like new, \$130. CushCraft 3219 2-meter boomer yagi, excellent condx, \$65. Have 2 Siemens TWTA's, model RW21 w/magnet assbly's, pulled from 2100 MHz service, 20 watt RF output, less power supplies. Trade ???

**CONTACT:** David Hackford, N3CX  
(215) 483-2030 (w)  
(215) 679-7293 (h)

**FOR SALE:** (Moving out of area): US Tower HDX MDPS 572, 72 ft motorized crank-up/fold-over heavy duty tower, includes 30 ft sked 80 mast, bearing, limit switches, all hardware, mint condx, \$3500. CushCraft 220B boomer, \$65. 19 el RIW 432 yagi, \$30. Pair of Cush Craft 3219 boomers pwr dvdr, phasing lines, \$125 or BO. SSB Elect. 432 remote GaAs preamp w/sequencer, \$150. Mot HT-220/2-meters, HT-220/440, \$100ea. RS color computer \$50

**CONTACT:** Barry Cohen, N2BJ  
(201) 712-1809 (w)  
(914) 362-1955

## COMMERCIAL ADS

LOOP YAGIS: 902 MHz 33 element \$89 kit, \$109 assembled and tested. 1296 MHz 45 element \$89 kit, \$109 assembled and tested. 1296 MHz 55 element "Super Looper" \$99 kit, \$124 assembled and tested. 2304 MHz 45 element \$75 kit, \$89 assembled and tested. Also available: element and hardware kits for above. 2 and 4-way power dividers. Discount on complete arrays. Solid state linear power amps, 13 VDC: 1296 - 8W in 35W out \$315, 1W in 20W out \$265, 4W in 70W out \$695. GaAs FET preamps: 902 MHz .8dB NF \$90, 1296 MHz .8dB \$90, 2304 MHz 1 dB max NF \$140. SHF SYSTEMS no-tune transverter kits, w/144 MHz IF now available for 903 through 3456 MHz. Write or call for complete catalog. DOWN EAST MICROWAVE, Bill Olson, W3HQT, Box 2301 RR-1, Troy, Maine 04907. For information and orders telephone (207) 948-3741.

**JOB'S AVAILABLE/HELP WANTED:** Engineers, Technicians and Technical Support. Several openings in the following areas: UHF Circuit Design, Digital Signal Processing, Data Communications Systems (like packet radio), and Change Control. If you would like to put your ham skills to work for you full time in a professional atmosphere, call Woody Peitzer, AK2F, at HEPCO, Inc., (201) 992-8660 between 7:30 AM and 5:30 PM Monday through Friday.

## 220 MHz FIGHT CONTINUES

Recent FCC proposals have given the ARRL two more opportunities to remind the Commission that action to implement the band in the Part 90 [commercial] rules is premature and subject to reversal by the courts. Writing in the May 19th issue of the ARRL Letter, editor Jim Cain, K1TN, notes that "bait and switch" is how ARRL General Counsel Chris Imlay, N3AKD, referred to the land mobile industry's comments in FCC PR Docket 89-552, in which it is suggested the Commission group the proposed 5 KHz voice channels into contiguous blocks of five or ten channels, and to permit time division multiple access (TDMA) schemes for data transmission. In his reply comments, Imlay pointed out that the 25 or 50 KHz channels proposed by the industry for 220-222 MHz in the name of "spectrum efficiency" already are available in existing land mobile bands. "...the entire rationale for the reallocation of the 220-222 MHz band...is now gone....It is time that the Commission re-evaluated the premises which led to the reallocation of the 220-222 MHz band", the Leagues comments contend. "The conclusions in Docket 87-14 were never correct, and have been shown...to be untimely. TNX "WESTLINK"

# PRESENTATION ON ANTENNAS

delivered by  
Joe Reisert W1JR

## PART 4 (Conclusion) - VHF and UHF Antennas

The spectrum above 50 MHz has special significance to the development of antennas and antenna arrays. This is the frequency range where you can build a really high gain antenna without owning a large piece of real estate. It is also the region where antennas can be tested easily in preparation for scaling them to the HF region. At the upper end of our frequency spectrum the antennas are more akin to optics. I'll divide this segment of the spectrum into two parts, the VHF and UHF regions. The two major types of antennas used in the VHF spectrum (50 to 225 MHz) are the collinear array and the Yagi structure. The collinear array usually consists of a group of 1/2 wavelength dipoles in front of a screen or set of half wave reflectors. In the later case, it technically could be called an array of two element Yagis. The unique thing about the collinear is the simplicity of the feed system which usually is an open wire line. The collinear is usually quite broadband, unlike most high gain antennas, and efficiency and gain can be quite high. The extended expanded collinear is a stretched out version that has less elements and was described in an article I wrote in Dec. '74 QST. Both the conventional and the extended expanded collinears were widely used in the days before good Yagi designs were available and are still in use by some 144 and 432 EME operators. This type of antenna has two main drawbacks: 1. It is large and hence it can be large enough, an expression the late Sam Harris, ex W1FZJ, used to use for antenna that couldn't stay up under adverse weather and 2. Its size usually prevents mounting other antennas on the same mast.

The workhorse in the VHF spectrum is truly the Yagi antenna. The first high gain VHF Yagi designs were published by Carl Greenblum (QST, Aug/Sept. '56), J. Kmosko, W2NLY and H. Johnson, W6QKI (QST, Jan. '56) and Dr. Hermann Ehrenspeck and H. Poehler (IEEE, PGAP, Oct. '59, pp 379-386). Unfortunately, these Yagis weren't always as good as claimed and had only fair cleanliness in the side lobe and front-to-back ratio. In Jan. '72 (QST pg 96 and March pg 101 corrections), Don Hilliard, W0EYE, now W0PW, published his 4.2 wavelength 15 element Yagi based on the unpublished works of Peter Biezicke at NBS. Don and I urged Pete to publish his work and he finally did so in Dec. '77 in NBS Technical Note #688, now out of print. This publication was the result of extensive studies done by the NBS in the 1950's to develop high gain arrays for ionospheric scatter and included models with boomlengths of 0.4 to 4.2 wavelengths plus new

information on scaling and boom corrections. In August 1977 "Ham Radio" I published a full length article on the NBS report including all the necessary details to build your own Yagis and sketched several models for 50 thru 432 MHz. There are some errors in the NBS publication which are corrected in my article. Not correct was the gain of the 2 element Yagi which should be approximately 5.0 dBd, not 2.6 as reported by NBS (they must have had some measurement errors). The NBS Yagis are not the only Yagi designs available but they are easily duplicated and near the maximum gain attainable for the appropriate boom lengths. They have excellent patterns and are easily stacked for additional gain. One more point in passing. The trigonal reflector system in NBS 688 definitely is no good on the 3.2 wavelength and shorter booms. It actually reduces gain by up to 1.5 dB! By lengthening all three elements in this reflector system, I have been able to recover all the gain but no real gain improvement over a single reflector. I have not tested the trigonal reflector on the 4.2 wavelength designs. In Feb. 1978 QST, Wayne Overbeck, N6NB, published an antenna he named the Quagi. It is basically a Yagi using a quad driven element and reflector. It is low in cost using a wooden boom and fed directly with coax cable. DL9KR and others have done further optimization on the Quagi and have used arrays of 16 to do 432 MHz EME. This design could still use some optimization in gain and only a limited number of designs are available. Other versions of the Yagi have also been used including the log-periodic fed Yagi developed by the late Oliver Swan and now manufactured by KLM (See Ham Radio, Jan '76, pg 46). The log periodic antenna discussed earlier in this talk has never found much favor with amateurs since there is no need for the bandwidth and it has less gain than a well designed Yagi. Along these lines, we can now make high gain Yagis with clean patterns using the NBS designs. These antennas seem to stack well in larger arrays yielding the 20 plus dBs required for 144 and 220 MHz EME. One EMEer, Dave Olean, K1WHS, is using an array of 24 of the 2.2 wavelength NBS type Yagis stacked 8 feet apart for EME and he has worked stations all over the world who are only using single Yagis and moderate power.

Most recently, with the help of a large computer, a special program and a local person interested in the design of VHF antennas, we were able to develop a very unique Yagi, an 8 element one on a 12 foot boom for 144 MHz that had extremely high gain (greater than 11.5 dBd true gain) with excellent pattern (all lobes down 20 dB). It worked so well that I made 8 copies and first tested them on a 144 MHz EME DXpedition to Rhose Island where 25 stations were worked off the Moon in two nights of operation. Computers will undoubtedly be useful in the future as this work continues. UHF: The 420 MHz and up area is in a

transition region. Long Yagi antennas can be made with high gain such as the NBS and Guenter Hoch, DL6WU, types. The later designs are an extension of the Greenblum designs mentioned earlier and can be designed up to 20 wavelengths (see VHF Communications, #3 and #4, 1977, and #3, 1982). These designs show an increasing gain of approximately 2.2 dB for every doubling of the boom length which is about the maximum so far reported. Indeed I built a 9.25 wavelength (21 foot) 432 MHz Yagi using this design material and achieved a verified gain of almost 17 dBd at the 1981 Central States VHF Conference in Sioux Falls, SD.

Long backfire ("A New Method For Obtaining Maximum Gain from Yagi Antennas", IEEE, PGAP, Vol 7, Oct. '59) antennas have been tried by the EMEers but gains have failed to live up to claims. The short backfire ("The Short- Backfire Antenna", H. W. Ehrenspeck, Proc IEEE, Vol 53, Aug '65) has been duplicated by myself and others and gains of approximately 15 dBi have been achieved. Perhaps more work should be done in this area as an array of short backfire antennas has the potential of higher gain without the problems of the surface tolerances on the parabolic reflector. Loop Yagi: Another popular UHF antenna is the loop Yagi developed in 1974 by Mike Walters, G3JVL (Radio Communications, RSGB, Jan '75 and Sept '78). Although it looks like a quad, it is distinctly different in that it uses wide but thin metal scraps for elements. Mike started out with wires but could never achieve high gains (like discussed earlier on quads). He recons that the wide but thin strap improves bandwidth and hence gain. The loops are bolted directly to a metallic boom thus solving the mechanical problems of mounting elements at UHF. It is a very practical antenna for 902 MHz and above and has worked well for me on 902, 1296 and 2304 MHz. G3JVL has even designed and tested to specifications a 10 GHz model. The principle designs use 26, 38 and 45 elements. The gain on the 45 element model (which is 16 wavelengths long) is 21 dBi! G3JVL has also published correction factors so that the loop width thickness and boom size can be scaled. Dishes: There is something esoteric about the parabolic dish antenna. It just has to work but the typical dish only has a 55% efficiency at best. Furthermore, it has a large wind surface. Therefore, it is not too popular except at frequencies where loop Yagis are no longer economical and for EME where it can often be mounted close to the ground. More on this subject later.

High Performance Arrays: I'd now like to turn to the subject of high performance arrays and more specifically EME (Earth-Moon-Earth) antennas. EME affords a unique property, viz. that due to the approximately 2-1/2 seconds it takes a radio wave to

traverse the 450,000 mile path to the Moon and back, the EMEer can make improvements to his antenna system and actually hear the difference by listening for his own echos. Furthermore, EME antennas have such high gain (typically greater than 20 dBi) that you can listen to the noise generated by the sun to measure beamwidth, patterns and hence determine actual antenna gain (see "Requirements and Recommendations for 70-cm EME", J. Reisert, W1JR, Ham Radio, June '82) as well as system noise figure. Large Yagi arrays are becoming increasingly popular especially for EME. WB0TEM has 24 5.75 wavelength 19 element Yagis on 432 while K1WHS has 24 14 element 2.2 wavelength Yagis on 144 MHz. Both stations have big signals and are able to work small (1 or 2 Yagi) stations off the Moon. However, the really big EME stations use parabolic dishes up to 40 feet in diameter! The advantages of a dish for EME operation are numerous despite the low (55%) efficiency (some commercial antenna manufacturers have claimed up to 80% efficiency but use cassegranian feed systems that are quite complex). First off, the feed system can be changed to permit multiband EME. Circular polarization is also possible by using dual dipole feeds or the W2IMU multimode horn. Dish type antennas are usually much quieter on reception because of low side lobes and hence are very desirable with the low sky temperatures experienced on 432 MHz and above. On 432 MHz where linear polarization is still predominant, the most efficient dishes are using the EIA symmetrical "E" and "H" plans and works well with a dish with a 0.45 to 0.5 F/D ratio. VE7BBG has such a feed with a W2IMU horn built into the center and has made cross band (23 to 70 cm) EME QSO's. A single dipole in front of a splasher plate is definitely not recommended due to its unequal "E" and "H" beamwidths! We still have a long way to go to improve efficiency and the offset parabola recently introduced to EMEers by W2IMU from Bell Labs has considerable advantages if the construction can become feasible for amateurs. Summary: The VHF/UHF frequency region is a good test bed for developing and improving antennas. Recent developments in the Yagi and loop Yagi have greatly advanced the state of the art in VHF/UHF communications. Antenna patterns have improved and hence the noise temperature of the antennas used is now more compatible with the state of the art preamplifiers. The NBS Yagi data now gives everyone interested a recipe for a suitable antenna without guesswork. EME antennas have taken a big leap forward in performance and made EME operation almost commonplace. We still need to do more work in the area of low loss feed systems especially for Yagi arrays.

(End)

TNX "ERC NEWSLETTER"

# BIPOLAR TRANSISTOR BASE BIAS SUPPLY WITH THERMAL COMPENSATION

By: WA3IWT Richard Prim 215-355-1192

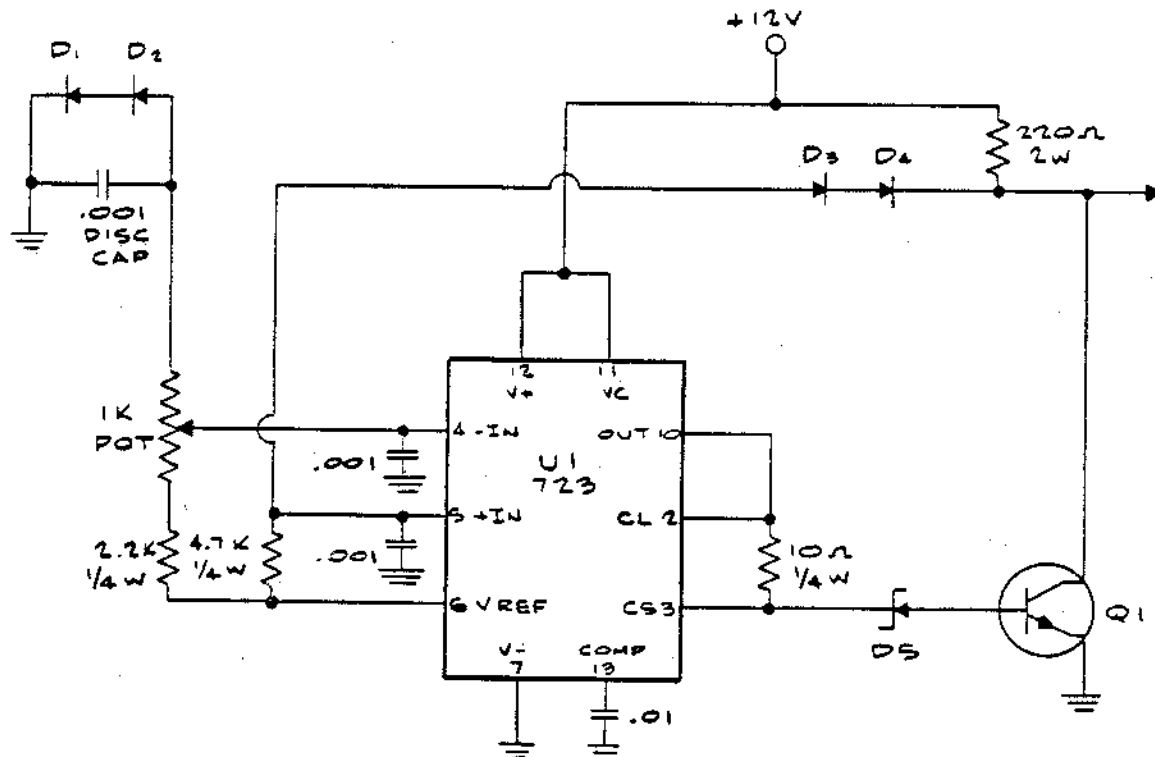
While working on a D.C. dummy load for a power supply at work, I found a way to make the 723 regulator chip work down to .3 volts.

I use the voltage drop of D3 and D4 to make the amplifier in the chip function, it requires at least .7 volts above its V- terminal to function. D1 and D2 are used to compensate for Collector current drift as the transistor heats up. D5 is used to allow the chip to function about 1/2 power supply voltage.

If thermal compensation is too great, i.e. collector current falls as it heats up, remove D2, if it is not enough, add a third diode to D1/D2 combination. If you add a third diode to D1/D2 add an additional diode to D3/D4.

The 723 is sensitive to R.F. so try to keep it away from the R.F. ckt.s.

MOUNT D<sub>1</sub>, D<sub>2</sub> ON AMP HEAT SINK



- D<sub>1</sub> - D<sub>4</sub> = IN4005
- D<sub>5</sub> = 5.1V 1W ZENER
- U1 = 723 VOLTAGE REG CHIP (14 PIN DIP PACKAGE)
- Q1 RS 276-2020 (TO220 - 2N3055)

BIPOLAR BASE BIAS SUPPLY WITH THERMAL COMPENSATION  
WA3IWT 8/23/88



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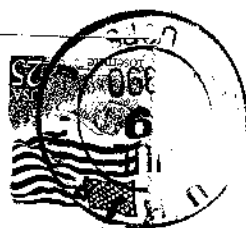
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