PACK RATS'

CHEESE BITS

CLUB CALL: W3CCX

MT. AIRY VHF RADIO CLUB, INC.

MT. AIRY VHF RADIO CLUB., "THE PACK RATS", PHILADELPHIA, PA. W3CCX
NET FREQUENCIES: 50.125, 144.150, 222.125, 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 18966

VOLUME XXXIV DECEMBER 1992 NUMBER 12

THE PREZ SEZ

As this year is fast growing to a close, can the Holiday Season be far away? I want to take the opportunity to wish all of you the very best for the Holidays. The spirit that makes the Holidays so merry, that of giving, is particularly strong in the Amateur community and indeed in our club. We all band together to help each other by spending time at tower parties or locating that special part or rig for a club member. The result is a stronger club and a better amateur. I do not know if 6 Meters will again provide the seasonal F2 that has been so prevalent this cycle. But it may just do that. I have just received a pack of QSL cards from the bureau and can now savor how rare some of the DX really was.

The important thing is that you must be on the air to work the DX or the TROPO. Now that the weather is colder, lets all get back on the air. And by all means call CQ and spread that Holiday spirit. But save a little for the January VHF contest.

73's

William T. Murphy
W$\emptyset$RSJ FN2$\emptyset$JR

NOTE: DATE CHANGE FOR the JANUARY CONTEST: JANUARY 23-25, 1992.

New Club Member: Len Martin, N3NGE
321 Linden Street, PO Box 268
Terre Hill, PA 17581

Pack Rats CHEESE BITS is a publication of the Mt. AIRY VHF RADIO CLUB, INC. Philadelphia, PA. and is published monthly.

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DEADLINE FOR ARTICLES AND SWAP SHOP IS THE MONTHLY MEETING DATE. NON-COMMERCIAL SWAP SHOP ITEMS-FREE OF CHARGE.

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(215) 355-5730

PACKRAT 222 MHz REPEATER - W3CCX/RPTR
222.98/224.58 MHz, Churchville, PA

MONDAY NIGHT NETS

TIME	FREQ.	NET CONTROL
7:30 PM	50.125 MHz	K3EOD
8:00 PM	144.150 MHz	W2EIF
8:30 PM	222.125 MHz	WB2YEH
8:30 PM	224.58R MHz	K3ACR
9:00 PM	432.110 MHz	WA3AXV
9:30 PM	1296.100 MHz	WA3NUF
10:00 PM	903.100 MHz	N3AOG

COMMITTEE CHAIRMEN

LADIES' NIGHT: WA3YUE 215-666-1558
JUNE CONTEST: N3CX 215-679-7293
HAMARAMA: K3EOD 215-742-3312
VHF CONFERENCE: KB3XG 215-270-3158

Calendar of Coming Events -December 1992

Jan. NOTE CHANGE IN DATE OF THE JANUARY VHF S/S CONTEST

6 Goddard ARC and Tri-County ARC Hamfest at the Prince George's County Community College Campus in Largo, MD, exit 17A or 15A Capitol Beltway. TI 147.78/.18 and .52. VE Exams.

7-14 Chris, WA3HMK is planning a DXpedition to Turks and Caicos Islands and will be on 6M and 2M and possible 2M EME. Laison on 3.818, 7.163, 14.345, and 28.885 MHz.

7 Check into the 6 Meter Net on 50.125 MHz at 7:30 PM EST.

7 Check into the 903 MHz Net on 903.100 MHz at 10:00 PM EST.

4-6 ARRL 160 Meter Contest. 0000 UTC Saturday until 2400 UTC Sunday. See page 132 of the Nov. issue of QST for the rules.

7 Check into the 2 Meter Net on 144.150 MHz at 8:00 PM EST.

7 Check into the 1296 MHz Net on 1296.100 MHz at 10:00 PM EST.

10 Packrat board of directors meeting at the QTH of Dick, N3AOG. Call 215-443-9965 for directions. All interested parties invited. Meeting starts at 8:00 P.M.

13 Predicted peak of the Geminids meteor shower at 1232 UTC.

12-13 ARRL 10 Meter Contest. 0000 UTC Saturday until 2400 UTC Sunday. See page 129 of the Nov. issue of QST for the rules.

14 Check into the 220 MHz Net on 222.125 MHz or 224.58/R at 8:30 PM EST.

17 Regular meeting of the Mt. Airy VHF Radio Club at the Southampton Free Library on Street Rd. in Southampton, Pa. Have you qualified to submit a contest log for the January contest for the club by attending the minimum of 2 meetings? Contest packages will be handed out and both the "JUF VHF" and "CT" logging programs will be demonstrated.

20 Chanukah

21 Check into the 432 MHz Net on 432.110 MHz at 9:00 PM EST.

22 Predicted peak of the Ursids meteor shower at 0458 UTC.

25 Merry Christmas to all.

Jan. 1993

3 Quadrantides meteor shower peak at 1234 UTC.

23-25 THE CONTEST. Everyone's help in getting at least 51 logs submitted this year is necessary to qualify the club for the Unlimited Class in the club competition. See Dec QST page 124 or consult your contest package for the rules.

TID BITS:

Congratulations to Dave, N3CX, for his 3rd place overall in the ARRL UHF Contest.

John, KB3XG will be operating portable in FN21 during the contest.

John Kedziora, WU3C's address while away at school is Box 670, 100 Institute Road, Worcester, MA 01609

TID BITS: Continued

Walt, N3EVV will be roving throughout many grids in E. PA during the contest.

Tom, WA8WZG, EN81 in Sandusky Ohio, is looking for skeds on 6M, 2M, 432 MHz and 1296 MHz.

Congratulations to Emil, W3EP, on taking over the as editor of "The World Above 50 MHz" in QST. I guess we'll have to change his subscription from paid to complementary.

For those of you that don't read all of the ham magazines, 73 magazine has an excellent column "Above and Beyond" by C. L. Houghton, WB6IGP and CQ has "VHF Plus" by Joe Lynch, N6CL, Both include technical and operating information and run around 2 pages of small type.

SWAP SHOP

Send non commercial swap shop items to the editor.

Wanted: Approximately 2 ft. dia. dish for 3.3 and 5.7 GHz. Harry, W3IIT, 215-584-4846.

Wanted: Kenwood MC 42S or MC 43S microphone. Al, K3EOD, 215-742-3312.

COMMERCIAL AD

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 "Sooper Looper" $99 kit, $124 assembled and tested. 2304 MHz 45 element $75 kit, $89 assembled and tested. Also available: element and hardware kits for the 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: 903 MHz .8dB NF $90, 1296 MHz .8 dB, 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. For information and orders telephone (207) 948-3741.

Visitors at the November Meeting

Robert Nail, N3HWN, Palmertown, Pa.
John Miller, N3NIA, Kintnersville, PA.
David Kaufman, no call, Glenside, Pa.
Glen Codeick, WA3TUL, Glenside, PA.

Health and Welfare

Johnny Allen, W3CXU, will be in the Abbington Hospital during the January Contest getting another hip replacement.

Mike Andrayo, N2DEQ, is recovering after a hernia operation and then another trip back into the hospital with an unknown virus.

Ex Packrat Greg Adams,KD6KD, is undergoing chemotherapy.

CHEESEBITS SUBSCRIPTIONS

Cheesebits subscriptions are available to everyone interested in activities and information from the VHF thorough the microwave frequencies. Subscriptions are for 1 year of 12 issues. For a subscription, send the following information:

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Dec. 92

Send to: SUBSCRIPTION/ADVERTISING MANAGER:
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7258 Walnut Avenue
Pennsauken, NJ 08110

LOCAL OSCILLATOR FOR THE 144 MHZ TRANSVERTER

By Paul Drexler, WB3JYO

It has often been said that a clean, stable LO is the heart of any transverter design. With these objectives in mind a companion 116 MHz LO chain is presented for the 144 MHz transverter. The circuit provides a spectrally pure LO signal having greater than 150mW power output - enough to easily feed two high level mixers using a power splitter.

The oscillator chain consists of a 2N5179 common base oscillator, a Mini-Circuits MAR-03 MMIC buffer amplifier, followed by a Thomson TRF559 stage and a lowpass filter. Crystal X1 is a fundamental mode 116.000 MHz, series resonant crystal having 0.001% tolerance. An HC-18/U type crystal was used for small size. An 8 volt, 100 mA voltage regulator is used to supply a "stiff" voltage to the oscillator. Capacitors may be ceramic or silvered mica types. All component values are fairly forgiving with the exception of the inductors and capacitors used in the oscillator.

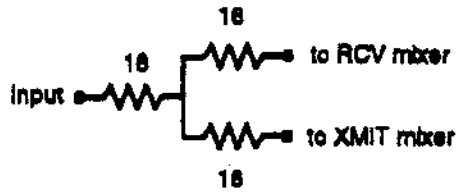
The LO output needs to be split and supplied to both the receive and transmit mixers. Two types of power splitters will work with this LO. Although resistive power splitters are very lossy, they can be used with this LO since there's plenty of reserve power. The transformer type splitter may also be used.

Although construction is straightforward, care must be taken to keep all lead lengths to a reasonable minimum. I built the LO using the "dead bug" technique on a PC board serving as a common ground point. It is recommended that the LO be housed in its own enclosure, perhaps with the receive mixer. Only one variable capacitor is used in the LO - simply tune for oscillator start-up. A power meter or spectrum analyzer may be used to measure the LO's power output.

RESISTIVE 116 MHZ POWER SPLITTER

Insertion loss = 6 dB

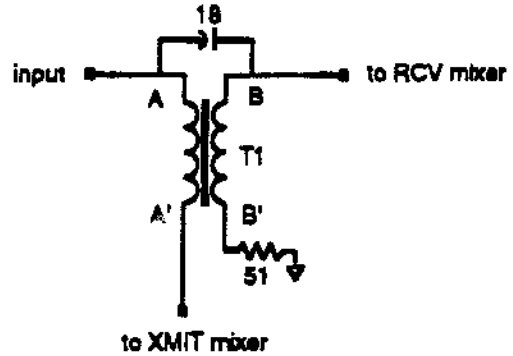
All resistors 18 ohm, 1/4 W



LOW LOSS 116 MHZ POWER SPLITTER

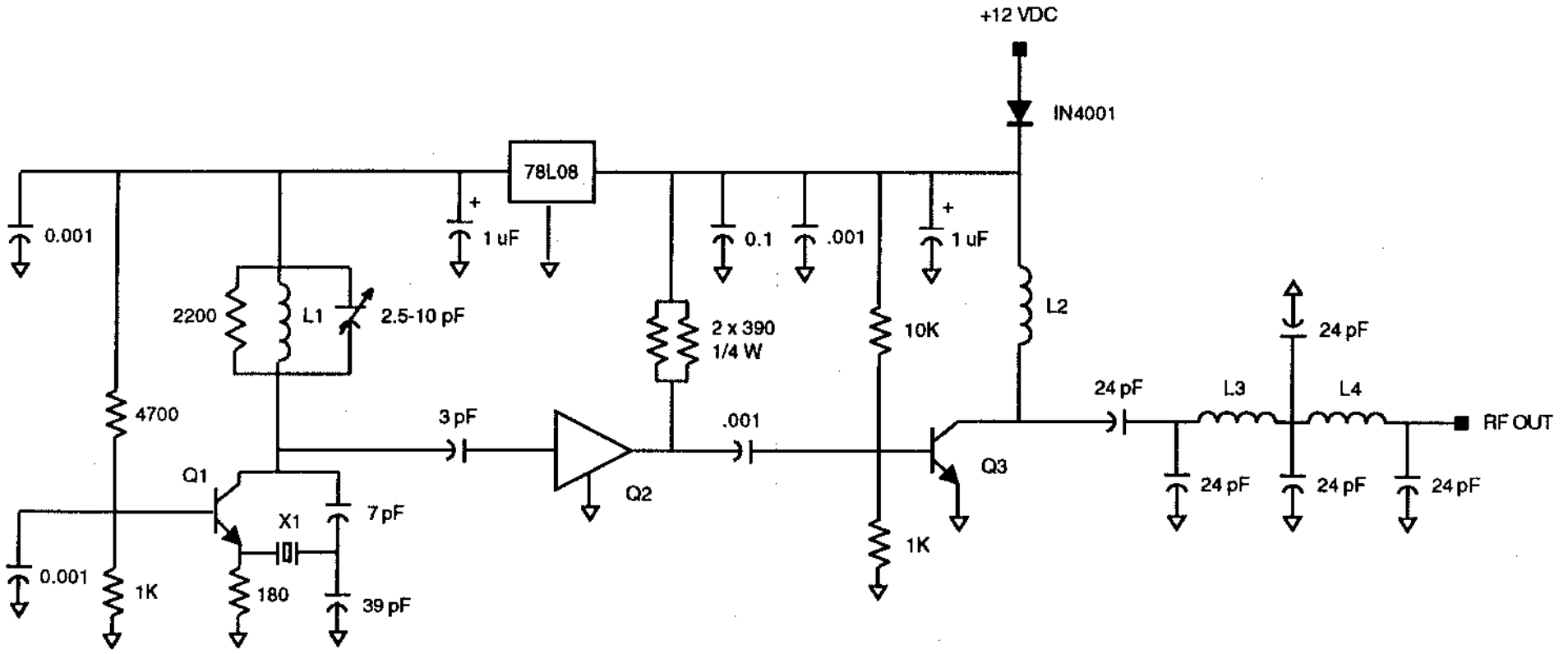
Insertion loss = 3.5 dB

T1 6t #28 BIFILAR on T25-0 toroid.
Connect XFMR as shown



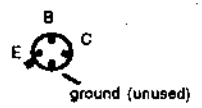
WB3JYO 11-92

116 MHz "HIGH LEVEL" LOCAL OSCILLATOR



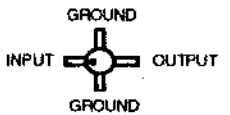
Q1	2N5179
Q2	MAR-03 Mini Circuits MMIC
Q3	Thomson TRF559
X1	116 MHz series resonant, HC/18U, 0.001 % tol.
L1-L4	8 t #24 enameled wire, .1" I.D.

2N5179



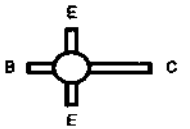
78L08 REGULATOR

MAR-03 MMIC



Note color "dot" marks input lead

THOMSON TRF559



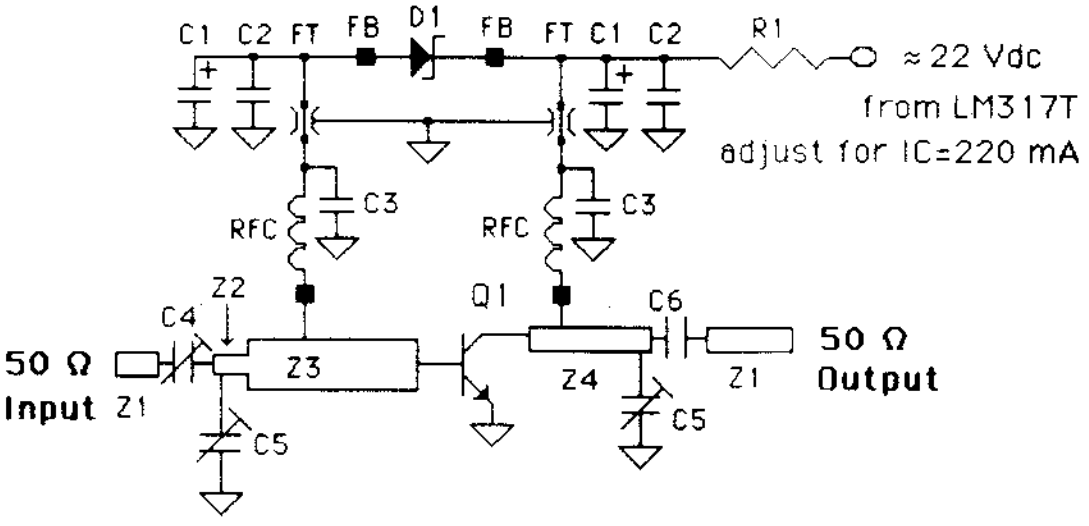
116 MHZ HIGH LEVEL LO

Pout > 200 mW
Harmonics > 40 dB down

WB3JYO 10-92

2304 MHz Class A Linear Amplifier

by Dave Mascaro, WA3JUF



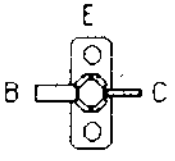
Board material is 1/32" Teflon Er=2.5

Z1 0.080" wide 50 Ω lines

Z2 0.080" X .275"

Z3 0.28" X 1.0"

Z4 0.14" X 0.55"



MSC80196

Q1 SGS-Thomson Microelectronics MSC80196

C1 1 ufd electrolytic	R1 1-2 ohm 2 watt
C2 0.1 ufd disc cap	RFC 4t, #24, 0.1" ID
C3 100 pf chip cap	FB Ferrite bead FB43
C4 .3-3.0 pf Johanson	D1 20V zener diode
C5 10 pf Johanson	FT .001 ufd Feedthru cap
C6 10 pf chip cap	

7.5 dB Gain @ 30 dBm output Psat ≈ 31 dBm

This amplifier re-drawn from my 1986 design

HYBRID SPLITERS COMBINERS

One of the simplest and least expensive methods of making a power divider is by direct couled or branch line. Originally, branch couplers and hybrids were characterized as narrow band. Broader band devices are possible by using multi-sections. Below are two of the most fundamental dividers.

The first of these is the 90 hybrid. THis is, perhaps, the most useful of all types. This is shown in Figure 1 below. In the configuration shown, it consists of cross-over constructed with co-linear output arms. An input signal is split equally to the two output arms with a phase quadrature relationship between the outputs. Both the quality of the hybrid, and the mismatches on the two output arms determine the amount of power which is shunted into the terminated arm. In the perfect spliter, there is little or no power in the terminated arm; however, under practical conditions, power at this port is typically somewhere between 10 and 20 dB down from the input power.

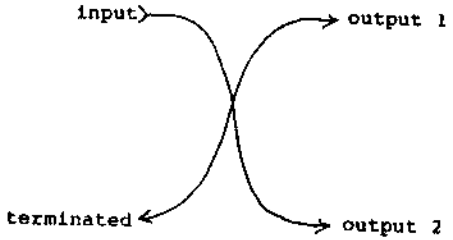


FIGURE 1

Sage Laboratories Inc., makes wireline that works well for this. A pair of wires are insulated from one another, encased in a teflon insulator inside a metallic outer conductor. This type of wireline can be used as a quadrature hybrid or diectional coupler; with power specifications from 100 Watts to 500 Watts.

The length of a 3 dB hybrid to cover a specific frequency range is:

$$l = lr/fq \text{ inches}$$

where lr = 1850 MHz/inch for HC type line
and fq = (f min + f max) / 2
where f min = lowest frequency in MHz.
f max = highest frequency in MHz.

As an example, a 3dB coupler for 1296 MHz. would have a 1.45 inch length. A wireline length for a 3dB coupler that could cover 900 MHz. to 1300 MHz. is 1.68 inches.

A second hybrid, the Wilkinson, is an in-phase, in-line three-port type of hybrid, shown in Figure 2. In this type, the input signal splits equally between the two output ports with an equal phase and amplitude relationship between the outputs. The reverse isolation between the two output ports is typically 20 dB, but may be between 15 and 30 dB due to design and frequency. The resistory is 100 Ohms at 1/2 or 1 watt, and each line is 70.7 Ohm, 1/4 wave long at the opperating frequency. At frequencys above 1 GHz., this type of line can be stripline. Below 500 MHz., lumped element work well.

The above divider has excellent performance, but can be improved by adding a quarter-wave transformer in front of the power division step and a shift in the impedance levels as shown in Figure 3. The bandwidth of this circuit is approximately one octave.

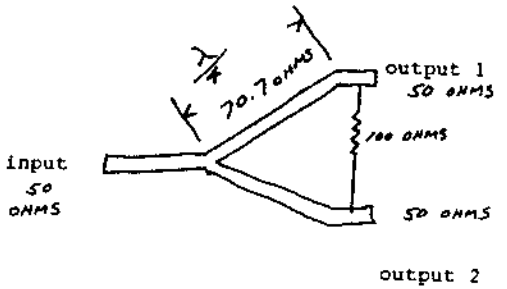


FIGURE 2

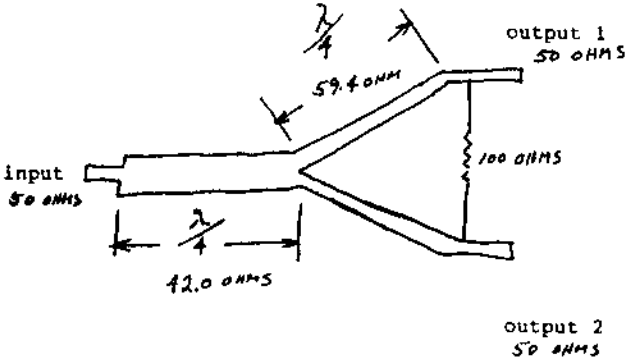


FIGURE 3

The power division accuracy is not frequency sensitive and is, therefore, strictly a function of the construction of the device. The isolation of this divider is slightly better then the compensated divider, with a better input VSWR. On the other hand, the output VSWR is better with the uncompensated divider.

de

WA3IAC

6/92

Plumbing Parts as 7/8 Inch Hardline Connectors

Kevin Kaufhold, WB9GKA

Recently, I scrounged up some 7/8 inch Andrews Hardline, enough for two very nice runs up my tower. A call to a electronics supply store specializing in connectors produced quite a shock - the commercial, retail price for 7/8 inch connectors terminating into N type females or males was well over $100 per connector. And I would need 4 of them!!

Further telephone calls produced scary results, as well - surplus connectors (i.e., really scrounged) were running anywhere from $40 to $75 for each connector, if you could locate them.

Not happy about the price of connectors, I let the hardline sit in the basement while I put up several runs of equally scrounged 1/2 inch CATV line. I used UG-21 D/U N type connectors, and modified these connectors as suggested in an earlier K0IFL newsletter. These fat, little D/U's worked great on 1/2 inch line.

Not content at letting very good Andrews hardline just rot in my basement, I returned to the connector problem for the Heliax. I went to the Hardware store, and fooled around in the electrical department for a while, with no results. I then wandered into the plumbing area, and noticed that the threads on some of the plumbing parts looked very similar to the threads of UHF type connectors. A closer inspection proved to be a bonanza - a UHF type barrel connector fit very nicely into a 3/8 inch plumbing reducer!

After fiddling around several more hours at home, I had some very nice looking terminations from the Heliax that would fit either N type or UHF type fittings. And all using plumbing and hardware parts, and all for a price of $10 to $15 per termination - even cheaper if brass fittings were not used.

Use of plumbing parts proved to be cheap and easy. Further, while I was working on 7/8 inch hardline, plumbing reducers are available that would fit almost any size Hardline. And, if the right type of plumbing reducers are used, most of the parts could be interchanged for either N type or UHF type connections.

I have not checked the resistance value of this Plumber's special. I would hazard to guess that the impedence value is anything but 50 ohms. If you want perfect impedence, break down and buy commercial grade connections.

FOR UHF TYPE CONNECTIONS:

1. Obtain a reducing union that goes from 3/4 inch inside thread to 1/2 inch inside thread (a reducer down to 3/8 inch could also be used, but then it would have to be comletely changed if the termination would someday change to a N type connection).

2. Place an 1/2 inch (outside thread) to 3/8 inch (inside thread) insert into the 1/2 inch side of the union. Use an anti oxidizing compound if dissimilar metals are being used.

3. Cut off some of the plastic jacket of the Heliax. Screw the 3/4 inch side of the union onto the end of the Heliax. Use an anti-oxidizing compound for dissimilar metals. The 3/4 inch union may have to be coaxed onto the Heliax with some small amount of force. It is going to be a tight fit, but the union can be screwed onto the end of the Heliax.

4. Take a piece of 5/16 inch all-thread (it normally comes in 3 foot lengths), and cut it to around 3 inchs (the exact dimension is not critical). Gradually taper the last one inch of the all thread down to 3/16". This can be easily accomplished with just an old fashioned file. File down the end of the all thread so that the last 1/4 inch or so of the rod is 3/16" in diameter. The all-thread piece is going to be the center conductor of the coax, so it would be a good idea to make sure a UHF type barrel connector fits it's center connection onto the filed-down end of the all-thread.

5. Gently screw the thread end of the all-thread piece into the copper tubing of the Heliax. The all-thread makes a perfect fit into the center tubing of the Hardline, and gently pushing the all-thread into the tubing in a rotating manner will produce some furrows in the copper tubing that will grab the all-thread and keep it in place. A 5/16 inch rod can be used instead of all-thread, but then it must be soldered into place somehow.

6. Keep screwing the all thread into the tubing until it is flush with the end of the 1/2 inch to 3/8 inch insert.

7. Screw in a UHF type barrel connector into the 3/8 inch opening. It should fit very tightly, and resistance should be felt as the connector starts to grab the filed down end of the all-thread. Gently tighten until a good connection is established. As always, be sure to use some type of compound that keeps down oxidation, rust and corrosion in the metal connections.

8. Use an Ohm meter to make sure the center and outside connections are electrically solid.

FOR N TYPE CONNECTIONS:

1. Obtain a reducing union to go from 3/4 inch inside thread to 1/2 inch inside thread. Also obtain a 1/2 inch threaded nipple (1 to 2 inch long should work).

2. Screw the nipple into the 1/2 inch side of the reducing union. A 3/4 inch reducer to 1/2 inch copper pipe fitting could be used instead of the union and the nipple, as suggested in # 1, above, but then could not be interchanged if you vere need to go from N type to UHF Type.

3. Cut off some of the Heliax's plastic jacket. Screw the 3/4 inch side of the union onto the Heliax. It will be a tight fit, so don't push it too hard. I would suggest to slowly rotate the union around the Heliax as small amounts of pressure is being applied to the union - The union should then thread itself onto the outside copper conductor of the Heliax.

4. The 1/2 inch nipple then fits into a UG-21 D/U N type connector, as modified and described in the earlier K0IFL newsletter. Instead of the D/U connector fitting onto a 1/2 inch CATV hardline, it is connecting into a 1/2 inch nipple that is fitted onto the reducing union as noted above in # 1 through 4.

5. Use 5/16 inch all-thread for the center conductor of the Heliax. Again, a solid rod could be used, but then it may slip without some type of soldering onto the copper tubing of the Heliax.

6. Some experimenting will have to be done to make the end of the all-thread fit onto an N type center pin. Many center pins have very small inside diameters, something on the order of 2/16 inch or less. Some center pins designed for 9913 will have slightly larger openings that will accept a bigger center conductor. If you have a 9913 type of center pin, you may be successful in just filing down the end of the all-thread until it fits into the center pin. If you have a small diameter N type pin. however, I would suggest that you throw away it away and obtain some 9913 pins.

8. The all-thread is then threaded into the copper tubing far enough to allow the center pin to stick past the end of the 1/2 inch nipple. The D/U connector is then attached onto the nipple, and the center pin fits into the hole provided (the N Type center pin hole may have to be drilled out a bit, as suggested in the earlier article on 1/2 inch hardline).

TO INTERCHANGE BETWEEN N TYPE and UHF TYPE:

1. Many times, equipment manufacturers will have N type treminations for some antennas and radios, and also will have UHF type connections for other equipment. Other Manufacturers will also have different connections, as well. I wish everything would be N Type for 6 meters and above. But unless you are ready and able to change fittings on the radios and antennas, you probably will be faced, someday, with a coax termination that does not fit the radio or antenna.

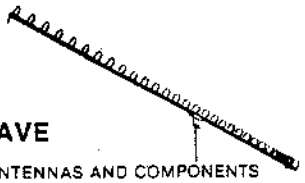
2. Instead of using an adapter to go from N to UHF, thereby producing some line loss inefficiency in the adapter, you can easily change the above referenced Plumbing connections on the Heliax. Keep the 3/4 inch to 1/2 inch reducing union, and then change from a 1/2 inch nipple to a 3/8 inch insert, if you are going from N to UHF (or visa versa for UHF to N type). The tapered piece of the all-thread may make a direct fit from N type fittings converted to a UHF termination, at least if you have used a large diameter 9913 center pin on the N connnector. The UG-21 D/U would then be replaced by a UHF barrel connector.

3. Presto ! The Heliax termination has been quickly changed from N type to UHF type (or visa versa). You will end up with different sexes, though - instead of an N type Male, you will have a UHF type female.

FINAL COMMENTS:

This article should be used as a guideline. It is meant to be improved upon, and experimented with. It at least shows that simple, cheap and easily available plumbing parts can be made to work as terminations for Heliax, and other large diameter hardlines. If brass and copper fittings are used, the end product will be pleasing to the eye, as well as functional.

DOWN EAST MICROWAVE



MICROWAVE ANTENNAS AND COMPONENTS

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W3HQT

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