OFFICIAL NEWSLETTER FOR THE WEST AUSTRALIAN VHF GROUP(INC)
P.O. BOX 189, APPLECROSS WA 6153.

MEETINGS ON THE FOURTH MONDAY OF EACH MONTH AT WIRELESS HILL
TELECOMMUNICATIONS MUSEUM, ALMONDBURY RD, ARDROSS

VK6WH VK6WH

PATRON MR. F.W. DAWSON

PRESIDENT	BOB BLINCO	VK6KRC H277 7049	SECRETARY	BOB PINE	VK6ZFY H 339 3273
VICE PRES	PETER TAIT	VK6ZPT	TREASURER	BERT MEUWISSEN	VK6ME H 457 3892
COUNCILLOR	TERRY LEITCH	VK6ZLT H332 7008	BULLETIN ED.	JACK BORTHEN	VK6KDX H 447 5933
COUNCILLOR	BRUCE DOUGLAS	VK6BMD	MUSEUM REP.	BOB PINE	VK6ZFY
COUNCILLOR	FRITZ BERRER	VK6UZ	MUSEUM REP.	TOM BERG	VK6ZAF
ACTIVITIES	TERRY LEITCH	VK6ZLT	PUBLICITY	JACK BORTHEN	VK6KDX
MATERIALS	COLIN MURRAY	VK6ZCR	LIBRARIAN	ILMAR BELTS	VK6AIB

CALENDAR

Mar	15	COMMITTEE MEETING	Apr	19	COMMITTEE MEETING
	20	FOXHUNT		24	FOXHUNT
	22	GENERAL MEETING		26	GENERAL MEETING
May	17	COMMITTEE MEETING	Jun	21	COMMITTEE MEETING
	22	FOXHUNT		26	FOXHUNT
	24	GENERAL MEETING		28	GENERAL MEETING

MARCH 93

March	Two Way Radio Testing
April	Gigahertz Focus on Equipment and Operation
May	Annual Junk Sale
June	Antennas for All Reasons
July	Construction Techniques
August	Printed Circuits in Microwave Design
September	To be announced
October	Annual General Meeting
November	The Hunt for the Elusive VHF and SHF DX
December	XMAS Function

V.H.F. GROUP CRYSTAL BANK

FREQUENCY IN KHz — ALL $0.20 EA

1361.000	3463.000	4918.000	6370.000	6999.000	8938.000
1655.000	3478.500	4960.500	6390.000	7010.000	8939.000
1670.000	3520.000	4980.000	6390.000	7029.500	8952.000
1955.000	3575.000	4990.000	6420.000	7065.000	8965.000
2020.000	3590.000	5020.000	6426.000	7067.000	9215.800
2065.000	3708.000	5070.000	6470.000	7107.000	9275.000
2112.000	3715.000	5110.000	6480.000	7138.000	9393.000
2118.888	3720.000	5145.000	6490.000	7164.000	9394.000
2158.888	3740.000	5270.000	6505.000	7230.000	9665.000
2165.555	3776.000	5300.000	6515.550	7265.000	9743.900
2182.000	3859.500	5440.000	6520.000	7270.000	10012.500
2182.000	3865.000	5440.000	6533.000	7280.000	10245.000
2220.000	3868.000	5498.000	6540.000	7320.000	10371.000
2251.666	3873.000	5499.000	6540.000	7345.000	10396.500
2337.000	3890.000	5505.000	6574.500	7362.500	10413.500
2475.000	3915.500	5506.500	6575.000	7400.000	10438.000
2638.000	4045.000	5554.000	6589.500	7414.000	10439.000
2656.000	4055.550	5603.000	6590.000	7465.000	10497.000
2701.850	4061.110	5604.000	6610.000	7685.000	10530.000
2760.000	4095.000	5630.000	6612.000	8033.000	11228.000
2792.000	4117.200	5638.000	6645.000	8040.000	11294.285
2816.000	4129.900	5641.500	6679.500	8074.500	11299.500
2836.000	4142.777	5660.000	6693.000	8075.000	11467.000
2861.000	4142.777	5664.000	6794.166	8110.000	11796.000
2868.000	4267.777	5666.000	6800.000	8116.666	12700.000
2940.000	4275.000	5671.500	6812.000	8152.000	12768.660
2945.000	4318.000	5673.000	6815.000	8165.000	13058.300
2979.000	4350.000	5680.500	6825.000	8166.670	13116.660
2987.000	4397.770	5682.000	6845.000	8210.800	13288.000
3008.000	4508.000	5825.000	6860.000	8305.800	13296.000
3023.500	4525.000	5828.000	6865.000	8345.000	13304.000
3046.000	4535.000	5865.000	6880.000	8446.000	13304.500
3158.000	4558.000	5945.000	6889.166	8460.000	13336.000
3176.000	4572.770	5950.000	6890.000	8465.000	13344.500
3196.500	4584.900	5954.000	6895.417	8773.600	13522.220
3215.000	4596.111	6120.000	6905.000	8820.000	14788.000
3239.000	4620.000	6130.000	6925.000	8845.500	23570.000
3245.830	4626.111	6238.000	6930.000	8847.000	42133.330
3260.000	4634.444	6245.000	6939.166	8862.500	
3265.000	4642.777	6280.000	6945.000	8871.000	
3382.500	4645.000	6280.000	6945.000	8879.500	
3404.500	4652.000	6280.200	6948.888	8896.000	
3418.000	4665.000	6311.660	6960.000	8896.500	
3435.000	4706.111	6320.000	6965.000	8913.500	
3455.000	4719.440	6335.000	6973.541	8917.000	
3460.000	4845.000	6350.000	6995.000	8922.000	
3460.500	4889.900	6360.000	6998.000	8930.500	

NEW WESTERN AUSTRALIAN 10 GHZ RECORD

On 28 February 1993 at 00:28 UTC a new record distance of 85 kilometres was worked on 10 Ghz by Ross Tolchard VK6KAT and Walter Howse VK6KZ. Both stations were portable - Ross being on the Roelands/Collie Road and Wal being at Cape Naturaliste. Respective heights were approximately 220 metres and 120 metres AHD. Signals were 5/6 to VK6KAT and 5/7 to VK6KZ.

The equipment comprised ex-military Tellurometers Model MRA301 which use an EIMAC klystron type EM1070 providing 30 milliwatts and tunable between 10.050 and 10.450 Ghz. The antenna is a 317 mm diameter parabolic dish with stated gain of 27 db above an isotropic radiator. Modulation was FM phone.

As is usual with these frequencies and with high gain antennas, pointing accuracy was critical. This was made easier by Ross who examined the site in daylight and then in darkness and took a bearing on the flashes from the Cape Naturaliste. Wal used a compass bearing initially which when combined with the accuracy of Ross's signal was sufficient to obtain a weak signal which was then peaked by gently moving the dish. Two-way phone continued for about 30 minutes with some fading evident. Bob Blinco arrived from Perth at about 00:45 UTC to observe the activities at Ross's location and he also exchanged reports with VK6KZ.

This contact follows other contacts over 50 Km by stations such as VK6ZSB/p and VK6XH/p (using home constructed gear); by VK6KZ/p and VK6KRC/P and a 71 Km contact between VK6KRC/p and VK6ZFY/p (using Tellurometers) in the December/January period.

When will the 100 Km path be broken - by whom ? Is the Australian record of 200 Km under threat ? Watch this space!!!

Wal VK6KZ.

JOHN MOYLE FIELD DAY 20/21 MARCH

Wal Howse, operator of Amateur Radio Station VK6KZ, will be operating south of Perth on SSB and FM on the VHF/UHF bands during the John Moyle Field day (providing it doesn't rain/hail/lightning/gale).

He welcomes activity on Saturday 20 March at about 1400, 1700 and 2000 WAST and on Sunday at about 0700, 1000 and 1300 WASt. (Contacts can be repeated after a three hour gap.)

He will be operating from a high spot and hopes that activity rather than propagation enhancement will decide his score.

Please point your beams South and give him a call!

TELL US ABOUT YOUR PROJECT OR DX ACHIEVEMENT

I'll bet you found Wal's article on the 10 Ghz record breaking contacts one of the more interesting things you have read in recent times. Why ?. My theory is that it was about an achievement by a couple of ordinary blokes (I include YLs in the blokes category) like you and me with fairly ordinary gear. Not that I am putting down their achievements. The biggest part of which is getting of their bottoms and doing something. However the point I am trying to make is that we are interested in what you are doing, even if it is not Nobel Prize stuff.

So how about it! Drop me a line, disk or paket and tell me about it. You blokes in the bush must be doing something exciting. I heard the blokes in Mandurah are really active (They probably meant fishing). Is there anyone in Albany ?

Meanwhile I will continue with the re-prints.

MEETING PROGRAM

Terry has done a great job organising an interesting meeting program for this year. How about supporting him by coming along to the meetings.

It has been pleasing to note a good improvement in meeting attendance. So please keep it up.

Coaxial Connectors

There are many different types of connectors in use today for amateur applications, plus various military and space applications. Hams use different frequency spectrums, so they need several types of connectors. Choosing the correct connector can be confusing.

PL-259 (UHF)

The most common type of connector used today is the UHF or PL-259 connector, intended for larger cables such as RG-8. You will find it on high frequency transceivers, and on a lot of the VHF/UHF commercial transceivers in production. This connector was used in a lot of military equipment until it was dropped during the early 1960s. It's still used in amateur radio equipment, mainly because it's relatively inexpensive: about $1 each for the chassis or cable connector.

The UHF connector is not weatherproof and does not exhibit a normalized impedance through the connector. By "normalized impedance," I mean that the ratio of the inner pin to the outer shell size is constant and conforms to a standard design impedance, producing a low SWR through the connector. At frequencies up to about 200 MHz this is of little concern, if you're not fussy. You can use it at slightly higher frequencies, but I don't recommend this. The maximum peak voltage rating for the UHF connector is 500 volts.

You can use the UHF connector with RG-58 and RG-59 cables if you screw an adapter for the smaller coaxial cables into the rear of the PL-259. Without this adapter, the PL-259 (UHF) connector must be used with RG-8 cables directly. The UHF connector is a versatile connector, but keep in mind that it is not a good performer at VHF/UHF frequencies. It's ironic that it's called a UHF connector but really can't be used there! The UHF connector goes in the same category as the RCA phono and similar connectors: They connect cable ends together but give attention to little else. At high frequencies (30 MHz) this is just a small problem, but at 300 to 500 MHz the UHF connector's performance is marginal.

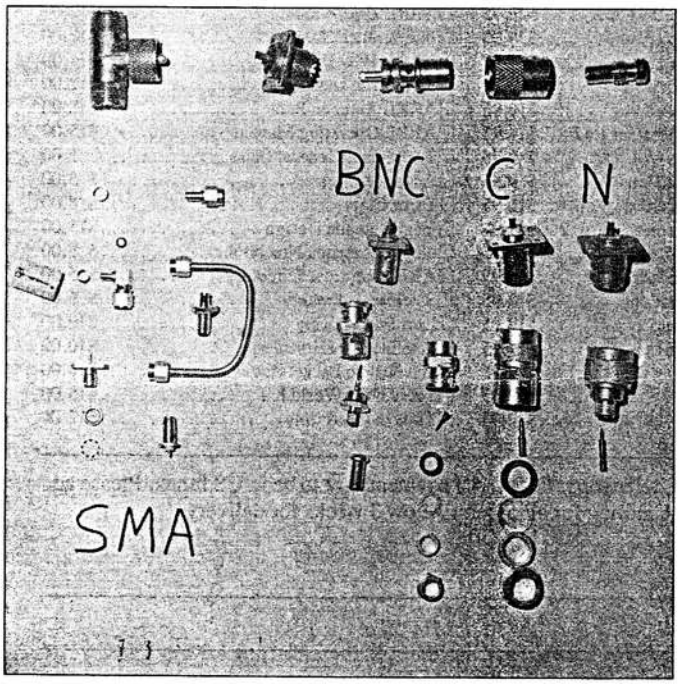


Photo A. Connectors. Across the top are the UHF PL-259 connectors. The small cable adapter is at the far right top. The N connector is a crimp on type, while the C connector is an older style, manually-assembled connector. The right BNC connector is a manual assembly, while the left BNC is a crimp type.

The SMA connectors are on the left. They are shown with the other connectors to compare size. The table gives additional information on some of the most used connectors.

BNC/TNC

The next most widely used connector in amateur applications is the BNC connector, most familiar on 2 meter HTs. This connector is one of the early designs that's good to 10,000 MHz. Currently, it's not really used above 3 GHz in most applications, but this is due to operator preference rather than to connector limitations. The BNC connector shields the inner conductor well, using beryllium copper fingers that make good contact between the mating connector shields. This advantage, combined with its quick-disconnect snap-on twist operation, makes the BNC a very good connector.

The BNC is rated for a standard impedance of 50Ω and 500 RMS volts peak.

There is also a screw-in type that is very similar to the BNC, called TNC for "threaded type of connector," that is useful where there's high vibration. The BNC and its cousin the TNC are identical in almost all respects, keeping in mind that the BNC is twist-on and the TNC is threaded on. (The BNC and the TNC will not mate with each other). Most of the military surplus equipment available has BNC, rather than TNC, fittings.

The BNC type of connectors make up the bulk of medium coaxial cable connectors in amateur use. BNC connectors are used on RG-58 (50Ω), RG-59 (75Ω), and similar size cables. Loss factors on either of the two cables aren't very good on frequencies above 50 MHz. I use the BNC connectors at 10 GHz but adapt them to use 0.141" hardline or semi-rigid coax to keep loss very low. Most applications with RG-58 or 59 is restricted to short lengths of cable where cable loss is not too important. Short runs in mobile applications are where these cables shine as they can be routed in small channels to hide the cable run.

Type N/Type C

A very popular connector favored by the UHF operator is the type "N" connector. The type N connector is truly a weatherproof connector and may be used outside. (Weatherproof or not, it's a good idea to wrap outside connections with a layer of rubber tape, and cover them with a layer of good electrical tape.) The N connector features a high peak voltage rating of 1500 volts and provides a true constant impedance through the connector.

The N connector is a threaded connector and is intended for use with larger cables like RG-8. There is a type "C" connector which is identical in all respects to the N connector, except that it is a twist snap-on. The C connector is made for the larger coax cables like RG-8. Both the N and C versions are weatherproof and are specified to 12.4 GHz. The two types are equal in performance, but the type N has found its way into more equipment and is far more popular than the type C. The type N is found on a lot of commercial test equipment, attesting to its excellent use at microwave frequencies. N and C connectors cost new about $4–7 each; the chassis mating connector is $2.75. The N connector is easily available in the surplus market and at swap meets.

Please note that with these connectors you can specify a type N connector in either 50Ω or 75Ω. (There is no such specification with the PL-259 connector; one size fits all types.) This can cause a problem if you're buying surplus parts: The 50Ω N connectors will not mate with the 75Ω N connectors. You won't see the difference at first glance, but look closer. The 50Ω connectors have a slightly larger center pin diameter than the 75Ω N connector. Look carefully and be sure of what you have!

I have more equipment in my ham shack that uses the N connector than I can count. Almost all test equipment has the 50Ω connector (unless it's intended for the TV industry, which specifies 75Ω).

Almost all of the projects in recent publications using larger connectors have selected the type N connector. This popularity stems from the constant impedance and applications with larger low loss coaxial cables in use at frequencies from 450 MHz and up. The N connector really shines in use with preamplifiers and such. Most of the newer GaAsFET designs have been shown using the N type connector in frequencies below 5 GHz.

N connectors cost more, but they're worth it. When you are

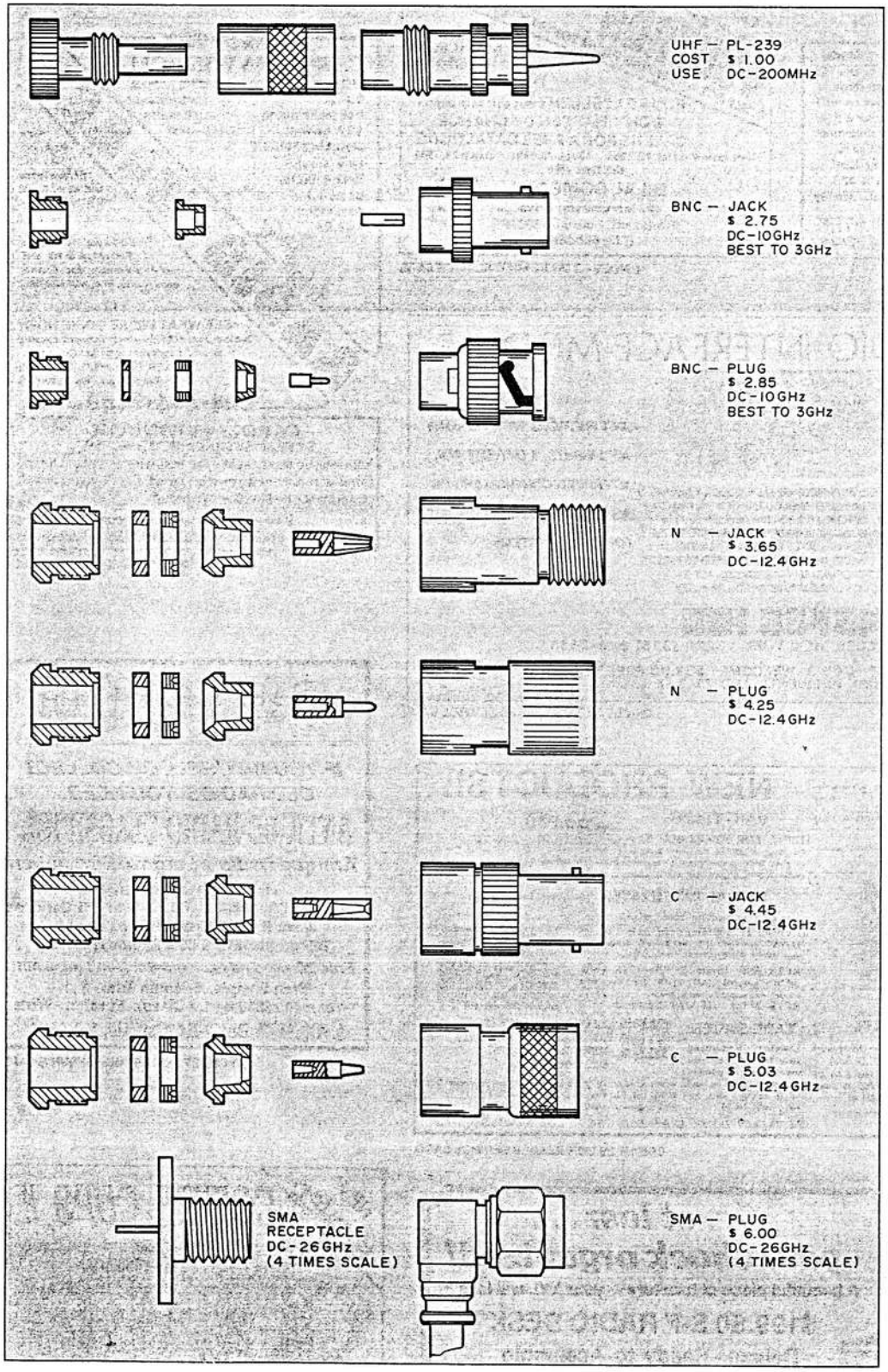


Figure 1. Comparison of popular cable connectors.

setting up equipment to do weak signal work on frequencies of 220 MHz and up, you will appreciate using a connector that gives constant impedance and low loss, with minimum SWR through each connection.

SMA Type

Fourth in popularity is the small miniature SMA connector. By "miniature," I mean a connector that is smaller than the BNC, which is classified as medium. The SMA connectors are coming of age in amateur circles. Industry-wide, the switch to miniature connectors took place quite some time ago. The SMA connector is rated from DC to 26 GHz, making it quite versatile in its application. Additionally, this connector provides a constant impedance through the coaxial connection. I favor the SMA connector and use it in most of the projects on my workbench. Since it's miniature, the SMA can't be used for very high power applications. Limit its use to 50 Watts at the higher microwave frequencies.

This connector shines in small receiving preamplifier and filter applications. Without a connector that will give constant impedance through its connection, you would get an impedance bump causing SWR discontinuity. This discontinuity is very pronounced at microwave frequencies because the size of the connector begins to become a sizable fraction of a wavelength. The SMC connector is quite small, less than ¼ inch in diameter, and is intended for use with miniature coaxial cables as well as with miniature rigid-type cables.

"Consider that most amateurs keep a feedline and antenna system ten years or more . . . Spend a little extra and your connectors and feedline won't let you down."

Most microwave applications specify use with rigid coaxial cables because loss is minimal when using short lengths: You are not concerned with 10 inches or 10 feet of cable at 30 MHz as loss is relatively unimportant in such a short length. As you increase frequency, the length and distributed capacitance and other factors also increase the loss of the cable. For instance, at 10,000 MHz (10 GHz) a 10-inch piece of braided Teflon™ cable showed a loss of 10 dB.

Replacing the braided Teflon cable (using SMA connectors) with a 10-inch piece of semi-rigid (hardline) cable 0.141 inches in diameter reduced the loss to something under 0.3 dB. You wouldn't use this type of cable to make long runs at microwave frequencies, but it's ideal for tying all parts of our microwave projects together. The heavy use of the SMA connector in both industry and with the microwave amateur make this SMA connector very versatile indeed.

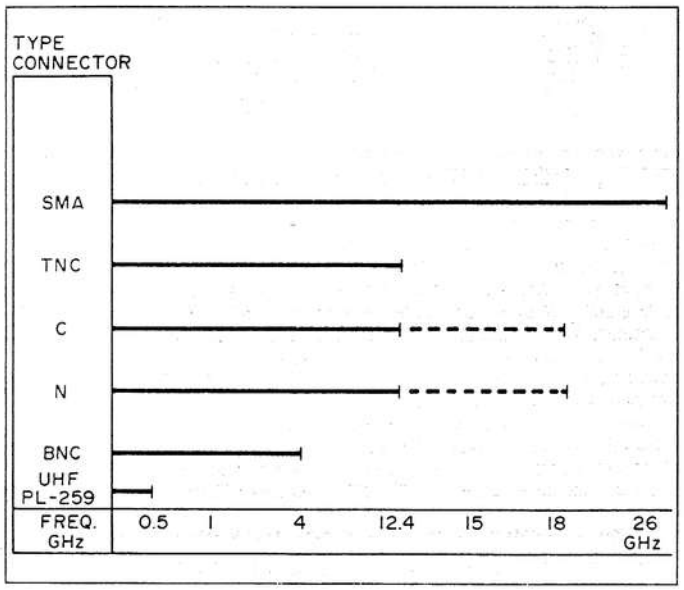


Figure 2. Bargraph of effective frequency limits for popular connectors.

Coaxial Cables

The "Coaxial Cable Loss: Quality Comparisons" table shows the commonly used coaxial cables and provides some loss figures comparing the various types. These coaxial cables are what is normally stocked at amateur retailer stores. For the microwave frequencies, the cables used are mostly a variety of the RG-8U types. I have used several pieces of RG-9BU, which is very similar to RG-8, except that it is a double-shielded braid. This makes it more difficult to assemble the connectors, but the effort is worth it. The double shield allows less leakage than its single-braided counterparts. I did not find RG-9 available from retailers so I did not list it. RG-213 is useful at frequencies up to 10 GHz in short lengths to connect test equipment together. I think most of us have obtained similar cables in microwave test sets from surplus deals.

At frequencies above 1 GHz you should try to minimize feedline loss. One method to lower feedline loss is to mount the equipment near the antenna so that the IF signals at a lower frequency will be cabled to the operating position, allowing you to locate the microwave transmitter and receiver at the antenna.

This is by no means a complete list of cables and connectors—the list was prepared to give you some idea of what is available. As you can see, the loss factors in comparison to the #318 Heliax™ cable look dismal at best. The cost is high, but it's well worth it. That's why most commercial installations use Heliax for the very low loss. Remember that three dB of loss means that one-half of your power into the cable is absorbed by the cable. That means that if you select RG-174 and use a 100-foot length at 30 MHz, you will have a 6 dB loss with a transmitter that has 50 Watts output. The antenna will receive 12.5 Watts on the other end of the coax.

That's just one reason why 9913 costs 50¢ more a foot than RG-174. The 9913 is a poor man's Heliax cable, and cost versus performance is very good. The 9913 is a very good cable. It will never be equal to a true Heliax cable like 318, but the price difference makes up for that.

Beware of bargain priced cables and connectors. Many of these "No Name" connectors are junk! They don't solder well, and the center insulation of the PL-259 melts when you solder the braid. You can recognize them by the very shiny, almost plastic, finish and by the "No Name" printed on them. The good ones are all stamped with identifying companies' names and types.

Even if price is your only objective, consider that most amateurs keep a feedline and antenna system ten years or more, Spend a little extra and your connectors and feedline won't let you down!

Hodgepodge

The Ventura Amateur Radio Club was presented with a 50-year affiliation certificate from ARRL section manager Tom Geiger. Congratulations for 50 years of club activity! The club is presently putting together plans for a group 10 GHz construction project.

The *QST* "New Frontier" column in March 1989 described two 10 GHz Gunn oscillators connected through a "Magic T" to lock the two oscillators to each other, providing more output than the two oscillators combined normally do. I tried it, and my spectrum analyzer display went nuts. I tried this after Kent WA5VJB stated that he'd had the same result. The oscillators locked over a very narrow adjustment, but did not obtain the higher power output. On a spectrum analyzer, the output looked very dirty. Is there anyone that has made this work? Possibly Kent and I have done something wrong. All this in the pursuit of 10 GHz power!

The North Texas Microwave Society is hosting the 1989 Microwave conference. Ever since its conception in 1985 by Don Hilliard W0PW, it has been held in the Estes Park, Colorado area. Don is taking a break and has allowed the North Texas Microwave Group to move the conference south for a year. This year the conference will be held at the Flagship Inn in Arlington, Texas, October 5, 6, 7 and 8th. October 9th is Columbus Day and may be a holiday for some of you. The location is very near the site where the 1987 Central States VHF Society Conference was held. The ARRL has again agreed to publish the proceedings.

The Flagship Inn is located half way between Dallas and Ft. Worth, minutes away from the DFW airport, and very near "Six Flags Over Texas." Room rates are $50 per night, and a block of rooms has been reserved. Technical sessions will take place both Friday and Saturday. There will be swapfests, noise figure contests, and a surplus tour of the area. These are only part of the events planned in addition to the series of technical sessions. Contact Al Ward WB5LUA at (214) 542-6817, or Wes Atchison WA5TKU at (817) 482-3914 for information. 73

Coaxial Cable Loss: Quality Comparisons

TYPE RG#	8U	8X	58A	59B	174	213	214	9913	318	½	½
OHMS	52	C52	52	75	50	50	50	52	50	50	75
DIA IN.	0.405	0.305	0.405	0.242	0.100	0.405	0.405		1.25	0.6	0.63
MAX KV.	4	4	5	2.3	1.5	5	5	3	10	5	5
LOSS dB/100 FT.											
30MHz	0.9	1.3	2.6	2.5	6.0	1.2	1.2	0.5	0.1	0.3	0.4
150 MHz	2.0	3.2	7.0	4.5	NR	3.0	3.0	1.5	0.35	1.0	1.3
450 MHz	3.5	8.0	NR	7.0	NR	5.8	5.8	2.9	0.80	2.0	2.5
1 GHz	6.0		NR	NR	NR	10	10	4.8	1.2	2.5	3.4
5 GHz	NR		NR	NR	NR	NR	NR	NR	3.2		
COST/FT.			0.35	0.14	0.10		1.55				
HRO	0.59	0.39				0.69		0.69			
TEXAS T.		0.22				0.36			4.95	0.79	
AES	0.47					0.69		0.64			

NR = Not Recommended

Suppliers:

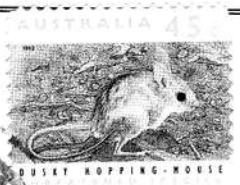
Ham Radio Outlet
5375 Kearny Villa Rd.
San Diego CA 92123

Texas Towers
1108 Summit Ave. Ste.#4
Plano TX 75074
(214) 442-7306

Amateur Electronic Supply
4828 W. Fond du Lac
Milwaukee WI 53216
(414) 442-4200

THE WEST AUSTRALIAN V.H.F. GROUP BULLETIN

MARCH 1993



The West Australian V.H.F Group (INC)
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