God Bless The U.S.A.

The RADIO WORKS

Where Ham Radio is a Contact Sport!™

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Tech Line 1-757-484-0140
FAX 1-757-483-1873
Website www.radioworks.com
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Catalog 261

2005 was a good year for the RADIO WORKS. 2006 will be even better. If all goes well, there will be some significant changes. First, is this catalog. It's our first mini-catalog. Its purpose is to make it practical for us to mail our catalog using "first class" mail instead of the unreliable and slow "Bulk Mail" we are using now. The mini-catalog will include all the products available at the time of printing. The long descriptions will be missing. Those will be featured on our web site where you will find our complete General Catalog in the form you're used to. Second, I'm planning a complete redo of the web site. It's been several years since it was created. I'll be going for a completely new look, but the site will still have all the features of the old site. As usual, I'll be adding more material as it is developed. I want to have even more reference material and a really useful FAQ database. I also plan to publish all of our manuals and other publications from the past. You'll be able to download that product manual that mysteriously disappeared after you got your antenna in the air. All-in-all, we will be able to serve you much better through the new website.

Third, and I've been promising this for some time, I want to open an on-line store. We are simply overloaded at times, and an on-line store will reduce those frustrating times when you have problems getting through on the phone. There are many other advantage, too, like order confirmation, shipping notification, instant shipping cost calculator, and all the other features provided by today's web-store software.

I need to address a real problem that you will experience in the coming months, and it's going to affect more than just your hobby. As you probably know, copper, silver, and gold prices are going up almost daily. I've been advised to expect a large increase in copper prices over the next year. I have already seen copper prices double in the past few months. We'll do our best to hold down price increases, but they will probably prove necessary throughout the year. The increase in petroleum and metal prices will affect just about everything the RADIO WORKS produces. We are not going to compromise quality by trying to purchase cheap substitutes, so we may have to make price adjustments along the way. I know that you've always expected the best from us, and we don't plan to disappoint you.

New! Full Catalog On-line

This is a mini-catalog. The full catalog is available on our web site. You can download or view all or specific parts of the full, General Catalog. The General Catalog is available in Acrobat PDF format to make downloading easy.

Other On-line Features

Sales - Monthly, last minute and clearance sales are featured.

Jim's Notebook - All sorts of useful information about antennas, plus many articles from the "Reference Catalog" and Jim's "Most Asked Questions" books are available here.

Jim's Hamshack - It's a virtual tour of my ever changing hamshack, my latest nostalgia and Classic Rigs collection plus the new station I'm working on. I wonder what I'll do this time? You don't suppose that I'll finally go digital, do you?

There's lots more - It can take a couple of hours to see everything.

A Note About Email

I try to answer your email promptly, but .....
I now receive between 600 and 1000 SPAM messages each day, so I am using aggressive filtering provided by my ISP and an exceptional filter for "Outlook" by Cloudmark.

Please don't send attachments. My SPAM filters will look very closely at attachments and often delete your message or attachment if anything looks suspicions.

Be specific with "Subject Lines." Spam filters are looking for vague and misspelled words. Even if everything looks right, you may still be filtered if you use an ISP that is supporting suspicious or high volume traffic. Further, you might not receive my messages because your ISP rejects my ISP. It's one of the largest in the country and has a huge traffic volume.

I try to respond to all questions and other email correspondence quickly, but there can be delays. If you don't hear from me within a few days, send your message again. Let me hear from you.

Messages asking about our products are answered first. General questions and those unrelated to our products fall father back in the queue.

The RADIO WORKS is Baluns

The **RADIO WORKS** introduced a full line of precision, 'Current-type' baluns several years ago. They were instantly popular because 'Current-type,' baluns avoid the bad habits that conventional 'Voltage-type' baluns exhibit. 'Voltage-type' baluns try to produce equal and opposite voltages at the balun's balanced output port regardless of the load impedance. Since low impedance antennas are current fed, a balun that produces equal and opposite currents at its output over a wide range of load impedances is desirable. There is little to be gained by forcing the voltages of the two antenna halves, whether the antenna is balanced or not, to be equal and opposite relative to the ground side of the balun input. The antenna field is proportional to the currents in the elements, not the voltages at the feed point.

Misconceptions

1. Baluns will not necessarily improve SWR (the exception is when a balun is used as part of a matching network, i.e. 4:1 baluns used in loops)
2. They are not lightning arresters, the winding inductance in most baluns is too low.
3. Built-in spark gaps don't work. The radio equipment is long gone before the 'gap' arcs.
4. Baluns do not allow multiband operation of single band, coax fed antennas. Nor do they make antennas more broadbanded.

These are all generalizations. Of course, there may be specific exceptions to any of them.

A balun really has only two jobs

1. Isolate transmission line from the antenna.
2. Provide balanced output current

Proper Balun Design

A properly engineered balun will include these design points:

1. High winding inductance (reactance)
2. Low stray capacitance
3. Very short internal transmission lines- << 1/4 wave, the shorter the better.
4. High power components- high voltage wire and insulation to withstand high power or a mismatch.
5. Large wire gauge reduces I^2R losses.
6. Large cores - prevents saturation and provides the necessary inductive reactance values on the low bands.
7. Mechanical considerations: Weatherproofing, rustproof hardware and a strong case to withstand high physical loads.

To insure the utmost in reliability, wires from the internal windings of the *B1, B4, Y1,* and *RemoteBaluns* are brought directly outside the case for connection to the antenna. This eliminates any chance of an unreliable connection. The trade-off is that the holes where these wires exit the balun's case must be sealed. Coax Seal® is included with each balun for this purpose and to seal the coaxial connector.

The transmission lines or the balun's windings are carefully designed for optimum impedance. The all-important wire used to make these internal transmission line(s) or other windings are insulated with a material similar to Teflon®.

All 1:1 and some 4:1 models are Current-type designs. Current-type baluns are extraordinarily saturation resistant and provide superior reactance characteristics. Signal distortion and RFI due to core saturation is practically eliminated. Current-type baluns are very forgiving when feeding antennas that do not provide an ideal load.

Retrofit Line Isolators

A very useful application for Line Isolators is to install them in series with a beam antenna's normal feed system. The proper location is between the antenna's balun or matching device/system and the feedline. Doing this will not affect antenna matching unless the feedline is acting as part of the antenna. This is, of course, not a desirable situation, and the installation of the Line Isolator will point out that a major problem exists with the antenna. In beam installations, using a Line Isolator in series with the antenna's feed system can substantially improve the antenna's front-to-back and front-to-side ratios. It does this by providing the antenna with balanced current at the feedpoint and by very effectively preventing the feedline from acting as part of the antenna. It is a seldom appreciated fact that ineffectively decoupled feedlines can act as efficient vertical antennas that can degrade an otherwise excellent radiation pattern. The addition of a Line Isolator or a proper balun can significantly reduce feedline radiation and dramatically decrease RFI and TVI. Beam antennas, especially, benefit from improved balanced drive and superior feedline isolation, but even simple dipoles benefit from properly selected and installed baluns and Line Isolators. Receiver noise also may be reduced by eliminating signal pickup by the feedline.

RFI Applications

Current-type baluns and Line Isolators are especially effective in reducing RF current on the outer surface of a coaxial cable's shield while having no effect on the signal carried within the cable. Current-type devices are singularly well suited to this application, because of several exceptional features that are not present in other balun designs. In the list of desirable characteristics is a very high load isolation over a very wide bandwidth, extremely low loss characteristics and a wide, low SWR bandwidth.

Important - Power Ratings

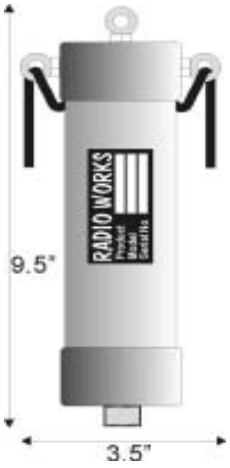
All RADIO WORKS' products power ratings are for standard duty-cycle SSB and CW transmissions. We do not rate any of our products for high duty-cycle modes including AM, RTTY and high duty-cycle digital modes. Essentially, these modes require devices designed for commercial service. It's either that or use low power levels. I have checked on prices for a commercial 2 kW baluns and the price was more than $1500. This is certainly beyond the range of most of our budgets. I know that there are some amateur radio baluns that claim power ratings of very high values. However, they say nothing about a duty-cycle rating, nor the load conditions under which they will survive their rated power. I am being up-front with our ratings.

Beside the problem of duty-cycle is the popularity of the use of older transmitters which run "class-C" output stages. It is common for these transmitters to have a high harmonic and spurious signal content. Some antenna components, among them, high quality current baluns and Line Isolators, absorb much of the harmonic and spurious energy which results in core saturation and excessive heating. You may say that this doesn't happen in other types of devices. The reason is that these devices just pass the harmonics and spurious signals along to the antenna. This isn't to say that current baluns and Line Isolators can be used as "low pass filters." Their functions are different and they should be used together.

PSK-31

I often receive questions about the compatibility of PSK-31 and our products since I warn against high duty-cycle modes. The operating habits and power used by most PSK operators are perfectly compatible with our baluns, Line Isolators and antennas. IMD levels will not be elevated and the typical duty-cycle is not significant when running power below 100 watts on PSK.

B1-2K Plus



Balun Type	Current
Ratio	1:1
Operating Bandwidth	80 - 6 m
Power Loss, dB	Nil
Saturation Resistant?	Yes
Internal Xmsn line Z	50-ohms
Core type	HF/VHF ferrite
SSB/CW Power @ 3.5 MHz*	1.5 kW if SWR <3:1
SSB/CW Power @ 50 MHz	300 watts
Output Balance	Excellent
Load Variation Tolerance	Excellent
Input Connector	SO-239
Output Connector	Wire
Size	2.3" x 8"

Uncompromising Performance

The B1-2K follows the same tradition of the uncompromising performance established by the incomparable C1 and B4 baluns. (The C1-2K balun was produced nearly 20 years ago and is not in current production. It has been replaced with newer models.) The B1-2K is built into a conventional case with eyebolts. It is here that the similarity with other products ends. The B1-2K is a full power balun. The RADIO WORKS' design brings the wires from the balun's windings directly outside the case so you may solder them directly to your antenna wire.

The Best, Low Cost Current Balun

List Price $40 $29.95

	B1-4K Ultra	B1-5K Plus
Balun Type	Current	Current
Ratio	1:1	1:1
Operating Bandwidth	160 - 10 m	160 - 6 m
Power Loss, dB	Nil	Nil
Saturation Resistant?	Yes	Yes
Internal Xmsn line Z	50-ohms	50-ohms
Core type, Ferrite	HF	HF/VHF
SSB/CW Power @ 3.5 MHz*	4 kW	5 kW
SSB/CW Power @ 50 MHz		600 watts
Output Balance	Excellent	Excellent
Load Variation Tolerance	Excellent	Excellent
Input Connector	SO-239	SO-239
Output Connector	Wire	Wire
Size	2.3" x 8"	2.3" x 8"
Price	**$45**	**$48**

B1-4K

By popular request, I've brought back the B1-4K, the ***maximum isolation*** version of the B1-5K. **The power rating is 4 kW PEP and frequency range is 160 - 10 meters.**

The isolation factor of the B1-4K Ultra is about 10 times that of the B1-5K and more than 20 times the isolation provided by other manufacturer's baluns.

B1-5K

The B1-5K's specifications are impeccable. It is as close to a laboratory quality unit as we can get with an economical balun made to handle high power. The B1-5K has a nearly flat reactance curve from 160 meters to 6 meters. I do not know of another balun with this combination of precision, specifications, high power rating, and construction quality.

Y1-5K

Specifications

	Current
Balun Type:	
Ratio:	1:1
Bandwidth:	160 - 6 m
Coupling Coefficient:	100%
Power Loss in dB:	Nil
Internal transmission Line Z:	50 Ohms
Core:	Ferrite
Power rating @ 3.5 MHz*	5 kW if SWR <3:1
Output balance:	Excellent
Load variation tolerance:	Excellent
Size:	2.5" x 9"

*Important: CW/SSB duty-cycle only. Not rated for AM, RTTY or other high duty-cycle modes.

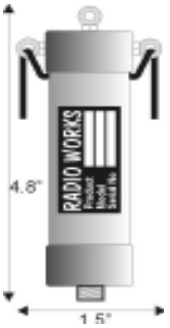
$47.95

IMPROVED PERFORMANCE

If the manufacturer of your beam does not specify a particular balun for your beam, use the Y1-5K, a T-4 or T-4 Plus (see the note in the previous column). Unless a specific balun is part of the antenna's matching system, and this is not usually the case, substituting the Y1-5K will not adversely affect antenna matching.

Adding the Y1-5K or T-4 Line Isolator can improve the front-to-side and front-to-back ratios in many beams by maximally isolating the feed line from the beam.

For beams fed directly with coax and those using coiled-coax choke baluns, consider using the T-4 Line Isolator as an alternative to the Y1-5K. The T-4 is an excellent choice for all unbalanced, directly fed beam antennas.



	B1-200	B4-100
Balun Type	Current	Voltage
Ratio	1:1	4:1
Operating Bandwidth	80 - 10 m	80 - 10 m
Power Loss, dB	Nil	Nil
Saturation Resistant?	Yes	Yes
Internal Xmsn line Z	50-ohms	50-ohms
Core type	Ferrite	Ferrite
SSB/CW Power @ 3.5 MHz*	200 W if SWR <3:1	200 W if SWR <3:1
Output Balance	Excellent	Excellent
Load Variation Tolerance	Excellent	Excellent
Input Connector	SO-239	SO-239
Output Connector	Wire	Wire
Size	1.5" x 4.8"	1.5" x 4.8"
Price	**$35.95**	**$35.95**

*Important: SSB/CW duty-cycles only. Not rated for AM, RTTY or other high duty-cycle modes.

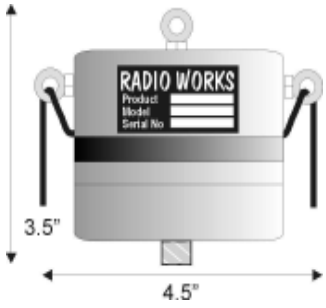
The Same Uncompromising Performance

Our new 200 watt baluns offer the same outstanding performance as the B1-2K and the B4-2K. Only the package and components are smaller to meet the need for a physically small balun for barefoot, QRP, SWL, barefoot rigs, stealth and similar interests.

Special cores and high quality wire rated for high temperature and high dielectric ratings are used in this balun series. Now you have the parts you need to build small, carry-along antennas or those hidden, stealth antennas you've been planning. Finally, you have a precision, high spec. balun in a small size to meet your special needs.

Prices and specifications are subject to change without notice.

RemoteBalun™



	Current
Balun Type	
Ratio	4:1
Operating Bandwidth	160 - 10 m
Power Loss, dB	<0.8 dB nominal
Saturation Resistant?	Very Good
Internal Xmsn line Z	40-ohms equiv
Core type	HF ferrite
SSB/CW Power @ 3.5 MHz*	1.5 kW *
Output Balance	Excellent
Load Variation Tolerance	Excellent
Recommended Coax	Low-loss types
Recommended Coax Length	<16 feet
Input Connector	SO-239
Output Connector	Wire
Size	3.5" x 3.5"

The RemoteBalun - A Proven Solution

Still The Best!

The RADIO WORKS brought you the RemoteBalun many years ago, and it was an immediate success. At the time there was no other balun on the market designed specifically for this purpose. In fact, back then, 'Current Baluns' were nearly unknown in Amateur Radio circles. As is always the case, success breeds copies, and soon there were lots of copies of the RemoteBalun (at least in name, but little more).

$59.95

Prices and specifications are subject to change without notice.

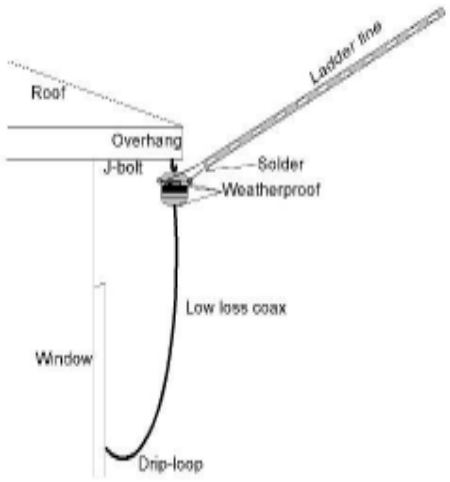
** Power must be derated under some conditions.*
CW/SSB duty-cycle only. Not rated for AM, RTTY, and other high duty-cycle modes.

Applications: Open-wire to coax interface, external to the operating position. ***Use with tuner.***

The RemoteBalun

We increased the RemoteBalun's winding inductance without restricting bandwidth. We improved the output balance and lowered losses. We added 160 meters and increased the power rating safety factor.* We increased the high SWR load tolerance. **We made a better RemoteBalun.**

The ***RemoteBalun*** is based on the B4-2KX, network compensated, Current Balun technology. Special winding techniques insure wide operating bandwidth and high power handling. Massive ferrite cores keep everything under control and the specifications on target. Try the ***RemoteBalun;*** *it's what an "external balun" should be.*



A different kind of balun - The RemoteBalun™

Description

The RemoteBalun™ is the interface between balanced feeders and coaxial cable. The RemoteBalun™ is a rugged 4:1 current-type balun.

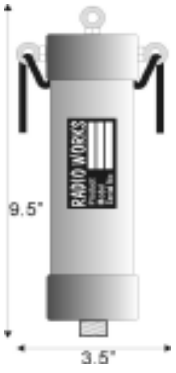
A short length of low loss coaxial cable connects your transmatch to the RemoteBalun™. The inconvenience of routing balanced feeders into the radio room is eliminated.

Baluns work best at low to moderate impedance levels. Often, a RemoteBalun will be used to drive very high impedance loads. Efficiency suffers when any balun operates under highly mismatched conditions. The power rating of the balun must be down-rated as the efficiency falls.

The RemoteBalun™ has more of everything - higher power rating, a wider load operating range, and a high efficiency design. A new, custom-made transmission line is used in the RemoteBalun™ to achieve this improved level of performance. This means that more power is delivered to the antenna, and ***you have a bigger signal!***

Power Rating - *Important*

Putting a specific value on this specification is not possible because the power rating depends on so many factors. The load impedance and reactance presented to the RemoteBalun, combined with the operating frequency and duty cycles are interrelated factors which must be taken into account. The 1500 watt power rating assumes normal duty cycle modes (CW and SSB) with the balun operating into a moderate impedance. Monitor your SWR on your tuner's SWR meter. Any drift in SWR while operating may indicate that the RemoteBalun™ is overloaded. Reduce power or change the length of the ladder line feeding the antenna to lower the lead Z. This may reduce the impedance to tolerable levels.



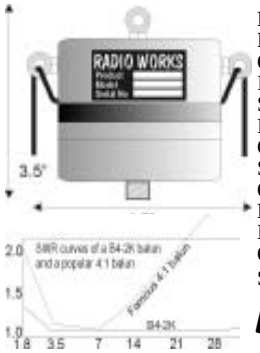
1.5 kW, 4:1 Broadband BALUN B4-1.5K

Balun type	Voltage
Ratio	4:1
Operating Bandwidth	80 - 10 m
Power Loss, dB	<0.8 dB nominal
Saturation Resistant?	Yes
Internal Xmsn line Z	40-ohms equivalent
Core type	HF ferrite
SSB/CW Power @ 3.5 MHz*	1.5 kW* if SWR < 3:1
Output Balance	Good
Load Variation Tolerance	Good
Input Connector	SO-239
Output Connector	Wire
Size	3.5 x 9.5" overall

$37.95

Something Special

- An effective, wideband design
- Laboratory developed & optimized
- Oversize components
- Saturation resistant design
- Special high voltage wire insulation
- L-C Network compensation = wide bandwidth
- Wire from internal windings are brought outside of the case where you solder them directly to your antenna wire. There are no unreliable connectors possible.
- Stainless-steel eyebolts
- Clearly written manual.



	B4-2K	B4-2KX
Balun Type	Voltage	Current
Ratio	4:1	4:1
Operating Bandwidth	80 - 10 m	160 - 10 m
Power Loss, dB	<0.6 dB nominal	<0.8 dB nominal
Saturation Resistant?	Moderate	Moderate
Internal Xmsn line Z	40-ohms, equiv	45-ohms equiv
Core type	Ferrite	2 x Ferrite
SSB/CW Power @ 3.5 MHz*	1.5 kW if SWR <3:1	same as B4-2K
Output Balance	Very Good	Excellent
Load Variation Tolerance	Very Good	Excellent
Input Connector	SO-239	SO-239
Output Connector	Wire	Wire
Size	3.5" x 3.5"	3.5" x 3.5"
Price	**$43.95**	**$59.95**

The B4-2KX is the Only 4:1 Broadband Current Balun

Current-type™ baluns have several major advantages over common Voltage-type baluns. Simply stated, Current-type™ baluns are more tolerant of imperfect loads while providing excellent output balance and feedline isolation. Very wide bandwidth and high power operation are additional characteristics of all RADIO WORKS' Current-type™ baluns. The electrical specifications of each RADIO WORKS' balun far exceed industry standards.

Something Special - The B4-2K is a high quality 4:1 balun. Special ferrite toroids manage reactance and provide the very high inductance values necessary in an effective 4:1 balun. Problems with other 4:1 baluns now on the market include low winding inductance, leakage inductance, high loss, poor balance, and inferior construction. In comparison, we use large, efficient, toroid cores, heavy, high-voltage wire, and special winding techniques. This combined with our exclusive L-C compensation networks achieves wide bandwidth with a high power safety factor. It's an unbeatable combination. It's an unbeatable balun.

T-4, T-4 Plus & T-4G, T-4G Plus

Used at "Voice of America" to solve ground loop problems.

Nothing Else Even Comes Close!

The T-4 Plus

The "Plus" versions of the T-4 add increased isolation at higher frequencies. With most of today's new rigs featuring all bands including 6 meters, we've developed a Line Isolator for these new rigs. You get all of the performance of the T-4, plus the added performance of improved ferrites which work well into the VHF range.

T-4G Plus

The T-4G Plus is the grounded version of the T-4 Plus. Its ground strap provides a direct path to earth so that RF traveling along the outside of the coaxial cable's shield sees a path straight to ground. Any stray RF heading for your shack sees only a very high impedance and seeks the direct ground path. The T-4G Plus should be located directly at a properly installed ground rod or other station ground system. In applications where access to earth ground is not possible, use the T-4 Plus.

T-4, T-4 Plus & T-4G, T-4G Plus Specifications

Type:	Current
Ratio Input/Output:	1:1
Design Impedance:	50 ohms
Internal XMSN line Z:	50 ohms
Bandwidth:	160-10 T-4, T-4G
	160-6 m T-4+, T-4G+, T-4-500, T-5G
Winding Z @ 3.5 MHz:	>33 K (All T-4 & T-4G) 75K (T-5G)
Winding Z @ 14 MHz:	>80 K (All T-4 & T-4G) 50K (T-5G)
Winding Z @ 50 MHz	>4 K (T-4+), 2K (T-4-500), >1K (T-5G)
Coefficient of coupling:	100%
Power loss in dB:	Nil
Power handling: *	> 1500 watts (All T-4 models but T-4-500)
	500 watts (T-4-500)
Input connector:	SO-239
Output connector:	SO-239

** CW/SSB duty-cycle only. Not rated for AM, RTTY or other high duty-cycle modes. Derate power @ 28 MHz.*

Use jumpers and connectors of your choice.

All Line Isolators have SO-239's at their input and output. This permits you to use jumpers of the required length, with the connector of your choice for the application.

T-4 $38.95 **T-4 Plus $42.95**
T-4G $42.95 **T-4G Plus $46.95**

T-4-500 $33.95

New "500 watt" Line Isolator with exceptional performance

A Smaller, better LINE ISOLATOR?

The isolation factor is actually higher than the standard models. They are far smaller in size and weight, too. The rating is 500 watts in SSB and CW service. That makes them perfect for interconnecting a transceiver and a linear amplifier. In low power installations, considerable space can be saved using these new units.

T-5 G $53.95 An Even Better Line Isolator

Added Isolation at VHF frequencies

The T-5G is a T-4G and a T-6G VHF Line Isolator in a single . This extends the T-5G's isolation into the VHF spectrum. This is important with today's solid state transmitters which use broadband output amplifiers. Wideband power amplifiers often produce energy from the low HF frequencies to the VHF region. Modern transceivers have filter in the output stages to reduce this RF energy to tolerable levels, but the filters in the transmitter are only so good and problems are exacerbated when ground loops develop around the communications system. The T-5G solves this problem by helping break up ground loops and keeping RF off the coax's shield well into the VHF spectrum. The result is a cleaner communication system and less interaction between HF and VHF equipment. The T-5G is used with HF equipment. *The T-6G is a VHF Line Isolator and is available only on special order.*

Why two ground straps?

In communications equipment, signals travel in two direction. The receiver can pick up trash collected by a coax cable's shield acting as a random length antenna. The ground strap nearest the antenna provides a direct path to ground for RF impressed on the shield from outside sources.

When transmitting, if the transmitter is not well grounded, unwanted RF can appear on the station's ground system and be conducted and radiated by the coax's shield. Thus, for maximum isolation, two ground straps are used.

What we are doing here is to provide a direct path to ground, eliminating the condition where one end of the Line Isolator is looking at a very high inductive reactance before going to ground.

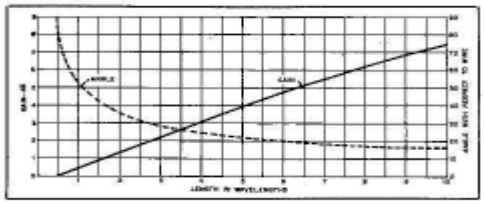
In some cases, you will only want to ground one end of the T-5G. This is best determined experimentally.

Prices and specifications are subject to change without notice.

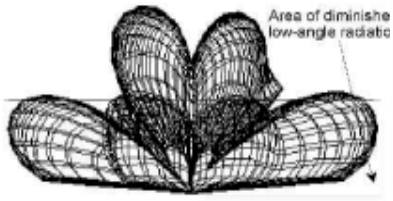
A New World Record

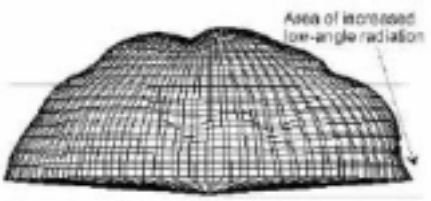
High Performance Wire Antennas

The CAROLINA WINDOM and SuperLoop are in the prestigious class of high performance antennas. Previous catalogs had many pages dedicated to this subject. We didn't have room in this catalog, but the information is available on our web site at www.radioworks.com You'll find all of the useful information from our previous catalogs on our web site. Included below are some graphics from those articles. Drop by radioworks.com and check out all the details.



This is a **treasure map - think GAIN!** Contained within this diagram is one of Mother Nature's important secrets. The mystery of wonderfully loud signals emanating from insignificant looking antennas strung between two cooperative trees is explained in this simple chart. This map to the "Treasure Island" of incredible antenna performance was borrowed with permission from the 14th edition of the ARRL Antenna Book, page 7-1.





Presented here are two radiation patterns. Each is a CAROLINA WINDOM 80 operating on 20 meters. In *pattern to the left*, the vertical radiator has been removed. In the pattern to the right, the vertical radiator is operating. What an amazing difference the Vertical Radiator makes. As you can see, when the vertical radiator is absent, radiation at low takeoff angles diminishes as the radiation pattern approaches the horizon. On the other hand, in the pattern where the Vertical Radiator is operating, radiation from the antenna continuously increases up to a point less than 5 degrees above the horizon. This is the point where "ground-effects" prevent a zero-degree takeoff angle. The incredible performance of the CAROLINA WINDOM is the result of this significant radiation pattern improvement at the all important very low takeoff angles.

Do's and Do Not's of Antenna Installation

Do's

Inspect coaxial cable for flaws in its jacket. Don't be concerned about minor jacket irregularities.

Pay particular attention to station grounding. This is especially critical when your station is not on the ground floor.

In most cases, it is OK to bury standard coax. You can add some protection by running it inside standard garden hose. Bury coax below the frost line.

Carefully seal any coaxial connector exposed to weather. Follow the procedure outlined in this publication.

Check available space before purchasing an antenna. Make sure the antenna will fit. Reasonable bending of the elements will not hurt. Elements must never be bent back on themselves. If space is limited, consider alternatives.

To avoid kinks in antenna wire, roll out the wire using a hand-over-hand technique.

Antennas will work in trees. In most cases, it doesn't hurt if the wire touches leaves, though you might set a leaf or two on fire. If you want, consider using insulated wire.

Definitely use Dacron™ antenna support line. Nylon, Polypropylene, Hemp, Cotton, or other rope types are not suitable in this application. Use Kevlar™ only if you don't want any stretch in support lines, however some stretch is desirable.

Install your antenna as far away as possible from your or your neighbor's house. Antenna installations close to houses are great candidates for RFI and TVI problems.

Don'ts

Do not change the length of manufactured antennas. Antenna lengths are critical.

Do not roll up the ladder line in G5RVs or SuperLoops.

Do not bury Ladder Line or let it get close to the ground or anything metal. Do not run it along side other cables. It must be in the clear.

Do not rely too much on inexpensive antenna analyzers. You can't be sure what parameter you're actually measuring.

Do not support a CAROLINA WINDOM so that its Vertical Radiator is closer than 15' minimum to a tower or other metal object. If less than 15', direct it away from the metal pole or tower at an angle.

Do not tie down the Vertical Radiator of a CAROLINA WINDOM. It must move with the antenna, or the connectors will pull apart. The weight of the coax and Line Isolator is usually enough to keep the Vertical Radiator in place.

Don't lay the CAROLINA WINDOM's Vertical Radiator on your roof.

Don't use heavy weights in combination with pulleys to hold an antenna taut. Free falling weights accelerate the antenna like a bow string. The wire may fail.

Don't worry about coax losses. With a coax length less than a couple of hundred feet, when the SWR is below 5:1 or so, you can't measure the loss in signal strength. Use a tuner to make your rig happy when the SWR is higher than your rig will accept.

CAROLINA WINDOM

Earned its reputation honestly, one QSO at a time™

All Bands, 80 -10 meters + WARC

New, Smaller, Better

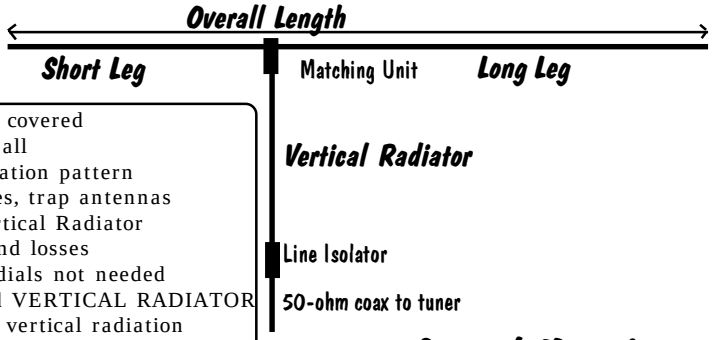
This is the new Low Profile CAROLINA WINDOM 80 LP

Shown is the complete assembly, including the Matching Transformer, Line Isolator and new Vertical Radiator, #16 hard drawn wire and end insulators.

Standard Type - This is the conventional CAROLINA WINDOM made with **full-size components, #14** stranded, hard-drawn stranded antenna wire and a 1.5 kW power rating. Other wire types are available on special order.

LP Models - These are the new 'Low Profile' versions of the standard CAROLINA WINDOMS. The only difference are the smaller sized components, the #16 antenna wire and the ***600-watt power rating***. Performance is the same.

Here are the new Matching Transformer and Line Isolator compared to the standard Matching Transformer.



Features

- Outstanding on all bands covered
- One antenna that does it all
- Unusually low angle radiation pattern
- Easily beats G5RV, dipoles, trap antennas
- Enhanced, low angle, Vertical Radiator
- High efficiency - no ground losses
- Ground independent - radials not needed
- The secret is the inverted VERTICAL RADIATOR
- Matching Unit enhances vertical radiation
- Use Transmatch

Chosen by 'Big Gun' DX'ers and DX'peditions.

Specifications

Model	CW 160	CW80	CW40	CW40+
Coverage	160-10	80-10	40-10	40-10
Overall length	265'	135'	66'	66'
Short leg	83'	50'	25'	25'
Long leg	182'	83'	83'	83'
Vertical Radiator	22'	22'	10'	18'
	LP models have the same dimensions			
Recommended ht.	>40'	>35'	>25'	>30
Gain	As much as 10db*			
Feedline	50-ohm, RG-8X recommended			
Tuner	Manual tuner recommended. Will work with newer rigs with automatic tuners.			
Power rating	All models rated 1500 watts CW/SSB**			
Price, standard	**$160**	**$125**	**$115**	**$135**
Price, LP	**Not made**	**$120**	**$110**	**$120**

** Based on user reports and field evaluations. Gain is the result of the low takeoff angles.*

*** CW/SSB duty-cycles only. Not rated for AM, RTTY or other high duty-cycle modes.*

General Mounting Requirements

- Mounting height at top of vertical section: >30'
- Absolute minimum angle between legs = 126-degrees
- Recommended min. angle between legs = 140-degrees
- Minimum height at ends = 8'

It isn't easy to put out a respectable signal on 160 meters. It may be even harder on 80 meters because everyone has a strong signal. The CAROLINA WINDOM 160 comes to the rescue. The CAROLINA WINDOM is the antenna that has helped put many 160 and 80 meter stations on the map.

The CAROLINA WINDOM was the first antenna to take advantage of 'VERT™' (Vertically Enhanced Radiation Technique). 'VERT™' is a radiating feed line technique that produces a controlled, low angle vertical radiation pattern. The effect is absent from most ordinary antennas. Field tests, user reports and seven product reviews confirm that the CAROLINA WINDOM will give you a remarkable performance advantage.

The off-center fed CAROLINA WINDOM provides unusually good performance on all bands covered, including the WARC bands. It's an ideal antenna for those of you who do not wish to use a tower and beam. The CAROLINA WINDOM is also ideal for those of you who want a high performance antenna to cover the bands not covered by your beam antenna.

The Real Secret

It's the Vertical Radiator. Combined with the Dedicated Matching Unit and special Line Isolator, it is responsible for the low-angle, vertical radiation pattern.

Far more complete details are available on our web site at www.radioworks.com

Automatic tuner Range Extender

MFJ-914 1.8 - 30 MHz, 300 watts. Many auto-tuners do not have the necessary tuning range to match a CAROLINA WINDOM. The MFJ-914 solves the problem for only about $60. **Or, use the fantastic, new LDG or MFJ automatic tuners.**

Coax Length

Use any 50-ohm coax. RG-8X is recommended. Any length may be used in most installations.

Prices and specifications are subject to change without notice.

The "Short" Versions of the CAROLINA WINDOM

Formally known as the CAROLINA BEAM

The "Short" CAROLINA WINDOM™

The Short CAROLINA WINDOM™ is the antenna for everyone - DX, rag chewer, or net operator. You get full CAROLINA WINDOM performance on the lower bands and enhanced performance on the higher bands, and, all that in a shorter version of the antenna. There is no reason everyone shouldn't take advantage of their secret weapon.

The Short "CAROLINA WINDOM" combines the best characteristics of the CAROLINA WINDOM and the 'BOBTAIL CURTAIN' BEAM.

The Short CAROLINA WINDOM™ is part CAROLINA WINDOM and part Bobtail Curtain (sometimes called a "Half-square"). It takes advantage of the best characteristics of both antennas. You have the performance advantages of the Bobtail Curtain, combined with the additional performance and convenience of the CAROLINA WINDOM. The Short CAROLINA WINDOM™ thus takes the lead in simple, high performance antenna systems. It sets the new standard for high performance, all band, wire antenna systems.

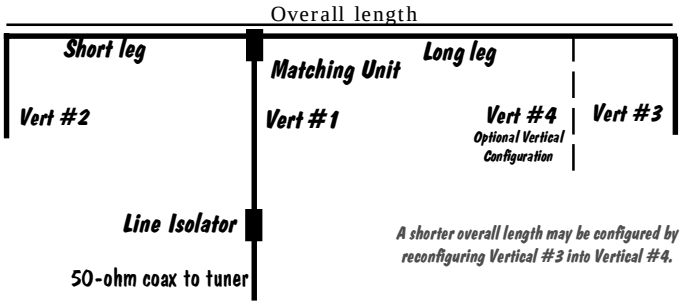
The Short CAROLINA WINDOM™ has three vertical radiators directly interconnected by the single horizontal radiator. It is this unique integration of horizontal and vertical radiation components that accounts for the outstanding performance of this antenna system.

PERFORMANCE

I compared the Short CAROLINA WINDOM 40™ (40-10 meters) and CAROLINA WINDOM 40™ against our G5RV. During daylight operation when incoming signals arrive at high angles, all antennas perform similarly, with the G5RV coming in last. The Short CAROLINA WINDOM 40™ was down a bit from the CAROLINA WINDOM 40™ due to the Short CAROLINA WINDOM's extremely low takeoff radiation angle. However, at night, or anytime the band lengthens for long-haul DX, the Short CAROLINA WINDOM™ outperforms the G5RV by a couple of 'S-units,' sometimes more. Of course, the improvement depends on direction and distance. The CAROLINA WINDOM 40™ outperformed the G5RV nearly as well as the Short CAROLINA WINDOM 40™ until the bands really lengthened out and then the Short CAROLINA WINDOM 40 really moved to the front of the pack.

The Short CAROLINA WINDOM's performance and characteristics are similar to the full-size CAROLINA WINDOM. The shorter length is the result of folding the antenna to provide the two extra Vertical Radiators. The result is higher performance (depending on propagation).

The phased multiple vertical radiator sections are the reason for the outstanding low-angle, long-haul performance of the Short CAROLINA WINDOM™. The three vertical sections generate a very low angle radiation pattern while radiation from the horizontal portions of the antenna provides a medium-to-high angle pattern.



Model	**CW "Short" 80**	**CW "Short" 40**
Coverage	80-10	40-10
Overall length	100'	50'
Minimum overall	84'	42'
	with optional Vertical #4 configuration*	
Vertical #1	16'	8'
Vertical #2	22'	10'
Vertical #3	16'	8'
Vertical #4	32'	16'
Short leg	34'	17'
Long leg, normal	66'	33'
Long leg, w/vert#4	50'	25'
	LP models have the same dimensions	
Recommended ht.	>40'	>30'
Feedline	50-ohm, RG-8X recommended	
Tuner	Manual tuner recommended. Will work with newer rigs with automatic tuners.	
Power rating	All models rated 1500 watts CW/SSB**	
Price, standard	**$145**	**$130**
Price, LP	**$145**	**$125**

Gain is the result of the low takeoff angles.

*Antenna is configured with either Vertical #3 or Vertical #4. Insulators are in place for either configuration.

** *CW/SSB duty-cycles only. Not rated for AM, RTTY or other high duty-cycle modes.*

Short CAROLINA WINDOM

For long-haul operation the *"Short" CAROLINA WINDOM* is in a **class by itself**. When the band gets hot, you get hotter - no more standing in line waiting your turn. And, you don't have to give up casual operating, just because the *"Short" CAROLINA WINDOM* is a **DX antenna**. Non-DX'ers need a big signal, too. Besides, the *"Short" CAROLINA WINDOM 80™* is **field reconfigurable.** You can select just the right combination of medium-angle and low-angle patterns. In fact, you can configure it as a standard CAROLINA WINDOM if you wish. It's the perfect, high performance, antenna choice for the DX'er, traffic-handler, rag-chewer, or dedicated SWL.

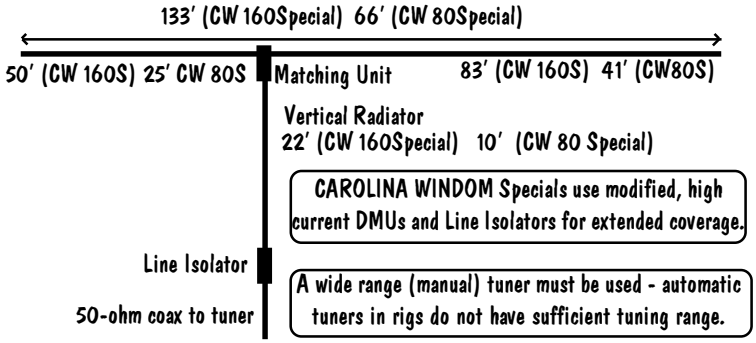
The *"Short" CAROLINA WINDOM* **requires far less space** than other high performance antennas. Just look at the overall length in the specifications. Also, the antenna will work at reasonable heights. When the band opens, you will be ready!

Visit our web site for more detailed information

Prices and specifications are subject to change without notice.

CAROLINA WINDOM 160 Special CAROLINA WINDOM 80 Special

CW 160 Special is used by the club station 4U1WB at the World Bank



Model	CW 160 Special	CW 40 Special
Coverage	160-10	80-10
Overall length	133'	66'
Vertical Radiator	22'	10'
Short leg	50'	25'
Long leg, normal	83'	41'
Recommended ht.	>40'	>30'
Feedline	50-ohm, RG-8X recommended	
Tuner	**Manual tuner required** for lowest frequency band. Some newer rigs will tune the higher bands with their built-in tuners.	
Power rating	500 watts on the lowest frequency band. 1500 watts on all higher bands. CW/SSB**	
Price	**$155**	**$145**

*** CW/SSB duty-cycles only. Not rated for AM, RTTY or other high duty-cycle modes.*

160 meter operation

The characteristics of the CAROLINA WINDOM outlined on the previous pages hold for the CAROLINA WINDOM 160 Special and the CAROLINA WINDOM 80 Special.

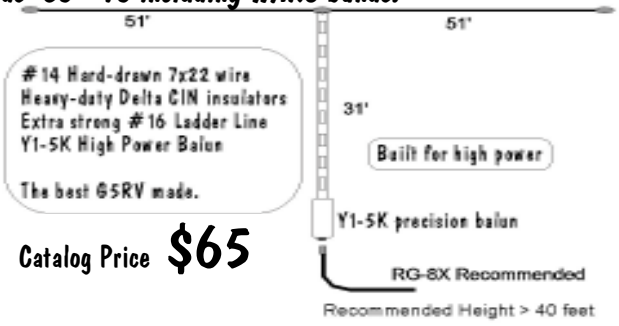
The CAROLINA WINDOM was designed for 80-10 meter operation with optimization on 80, 40, and 20 meters. It has always been a top performer on 80 meters. Now, with its new, improved DMU and Line Isolator, the CAROLINA WINDOM 160 Special may be used on 160 meters, too. If you want to get your feet wet on 160 meters, but can't put up a full-size 160 meter antenna, the CAROLINA WINDOM 160 Special is a good choice. You don't give up any of the CAROLINA WINDOM's superior performance on 80-10 m, and you pick up acceptable 160 meters performance in the bargain. Performance on 160 m will be down one or two S-units from a full-sized CAROLINA 160. **Using the CW 40 on 80 meters is possible for the same reasons.**

Note: Power Reduction on the lowest frequency band.
The CAROLINA WINDOM has been modified to permit operation on the band lower than usual for the length of the antenna. ***You MUST reduce transmitter output power to under 500 watts PEP, CW/SSB***. Excessive power levels will destroy the Dedicated Matching Transformer or Line Isolator.

- IMPORTANT - CAROLINA WINDOM tower mounting technique Keep the Vertical Radiator section well away from conductive objects such as towers, masts, gutters, metal roofing, etc. Detuning the Vertical Radiator will destroy the excellent performance of the CAROLINA WINDOM.

To facilitate tower mounting, an extra end-insulator is included and you can install it on the long leg of the antenna. Use this insulator to support the antenna from a standoff on the tower. This standoff can be any length over 2 feet. The Vertical Radiator and LINE ISOLATOR™ should be held at least 15 feet away from the tower. Full details are given in the instruction manual.

G5RV Plus *All bands 80 - 10 including WARC bands.*



Catalog Price $65

The RADIO WORKS' 'G5RV PLUS' has two outstanding improvements over the many copycat versions of the G5RV on the market. First, I have added a Y1-5K, our precision, Current-type balun at the transition between the balanced stub and unbalanced coaxial cable feed line. The second improvement is the choice and length of matching stub.

After careful analysis, a change in stub resonance and a specific feed line length was necessary to achieve the best match on each band. Still, the match is not perfect on any band. It is lowest on 20 meters where the SWR drops to around 1.8:1 under ideal conditions. On all other bands, the SWR will be higher. Even with a slightly elevated SWR, losses in the system are low. Unless you are using a rig with tube finals that can accept a moderately high SWR, an antenna tuner is necessary. This advice goes for any G5RV. Contrary to what many antenna makers claim, the G5RV requires a transmatch unless your rig can tolerate a moderately high SWR.

Combining these technical improvements with the G5RV's own attributes produces a very good antenna system. The RADIO WORKS' NEW G5RV is an excellent combination of performance modifications, high quality, and **high power** parts. You can't find a G5RV that works better than this one.

Watch out for all the cheaply constructed G5RV antennas now made by just about everyone with a soldering iron. Sure, a G5RV is a "no brainer" when it comes to making an antenna. It's simple, and anyone can make one and put it on the market. Of course, if you want one that will stay in the air more than a few months, take a look at the construction. One major manufacturer uses little pieces of printed circuit board for insulators. Quality parts are the major ingredients in any successful antenna. Don't accept less than the best.

Prices and specifications are subject to change without notice.

New Dimensions - Even Better performance

SuperLoop 80tm

SPECIFICATIONS

Freq. coverage:	80 - 10 meters
Polarization:	Both vertical and horizontal
Matching method:	Combination of reactance + stub & dedicated tuning unit.
Tuner needed:	Yes, all bands
Power Rating:	1500 Watts, CW/SSB**

** CW/SSB duty-cycles only. Not rated for AM, RTTY, and other high duty-cycle modes.

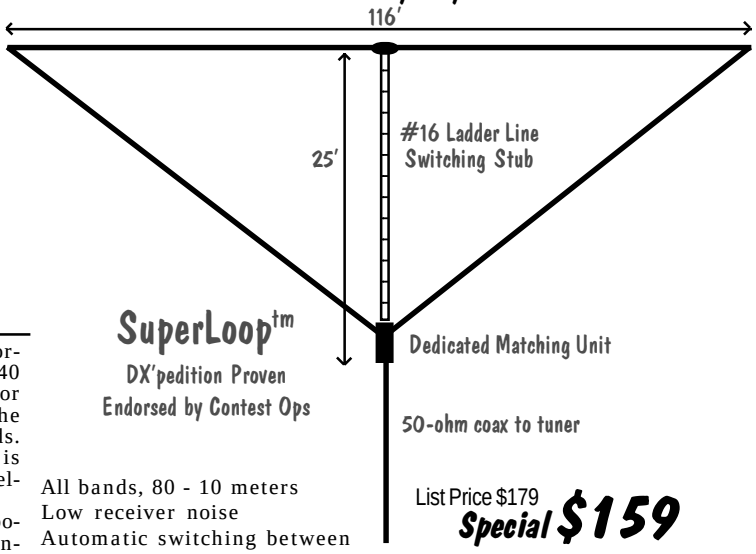
Coax length is not critical. Any length may be used. RG-8X is recommended.

The RADIO WORKS' *SuperLoop 80™* is a high performance, full size, full-wave 80 meter loop antenna. On 40 meters the *SuperLoop 80™* is a 2 wavelength open loop or Bi-Square. The stub in the top leg of the antenna opens the loop when operating on 40 meters and selected other bands. This improves the antenna's radiation pattern. Its gain is around 4 dB, but it will seem much higher due to its excellent, low angle, radiation pattern.

The Dedicated Matching Unit with all the other components in the antenna work together to provide a well managed SWR on all bands. While the SWR is not below 2:1, it is low enough to permit the use of coaxial cable. System losses are low.

The *SuperLoop 80™* is an outstanding performer on all bands, 80 - 10 meters. Combine all band operation, coax feed, with gain on all bands, and the *New SuperLoop 80™* is the obvious choice in a multiband DX loop antenna system.

Simply Terrific
80 - 10 + 30, 17, 12 m WARC



All bands, 80 - 10 meters
Low receiver noise
Automatic switching between multi-wavelength modes
Exceptional Performance on every band!
50 Ohm Feed
Superb receive antenna - SWLs take note
All parts, DMU, ready to go. Solder only two wires
Easy to follow instructions

List Price $179
Special $159

Visit our web site for more information

Many of the newer rigs with automatic antenna tuners will tune the SuperLoop on all bands. If you have an older rig, you can still use your auto-tuner if you add the MFJ-914 tuning range extender. MFJ & LDG automatic tuners will work with the SuperLoop as do all manual tuners.

Custom Modified Antennas

We can build CAROLINA WINDOMS and dipoles with insulated wire. It is not possible to use insulated wire with loop antennas. The wire will not twist back on itself well enough to hold an insulator in place.

Wire types available -

#13 (19-strand) VariFlex copper-clad steel insulated wire. Very tough, slick, black insulation.

#12 (259-strand) PE insulated copper wire A copper wire with a tough black insulation. Not as stiff as #13 and not as strong.

#14 (168-strand) PE insulated copper wire Same as above but with #14 wire.

#12 (259-strand) PVC insulated copper A very flexible insulated copper wire.

#14 (168-strand) PVC insulated copper As above with #14 wire.

#12 (7-strand) Copper-clad steel Uninsulated - This is the standard copper-clad (copperweld-type) wire.

To calculate the price of the antenna, simply multiply the cost, per foot, of the wire times the length of the antenna. Add the building cost ($10) plus the price of the antenna and the cost of the wire.

Example - A CAROLINA WINDOM 80 is 133 feet long. #13 wire is desired. Multiply 133 (wire length) times the current wire price = cost of the antenna. Add to that the building cost of $10.

Nearly all of the antennas we have ever offered are available on special order. All of the antennas listed below are special purpose, high performance antenna systems that are not popular enough to give full details in this catalog and to keep in stock. As a service to our friends and customers, we will custom-build them for you on request. Below is a list of some of these antennas.

Allow two weeks for delivery. Call us at our 800-280-8327 number for further information, estimated date of delivery, and to make any special requests. ***We do not custom design new antenna systems for specific situations.***

SuperLoop 40 Half-size version of the SuperLoop 80 covering 40-10 m. $139.95

BigSig Loop Single band 3/2 wave loops with about 3 dB gain. No tuner needed. From $60 - $100

Vertically Radiating Dipole A special dipole system using the "VERT" system to produce a vertically polarized pattern. From $90 - $120

CAROLINA WINDOM Shortwave Shortwave version of the CW 40. Simply excellent and priced at $125.

Ultima Dipoletm High power conventional dipoles. Available in 2 kW and 3 kW models. Top quality parts. Models for any band. Prices range from $60 to $125.

See our web site for more antennas and complete details.

Prices and specifications are subject to change without notice.

Kits for RFI and Weatherproofing

RFI Kits

To make solving RFI problems easier, we have assembled kits of parts that you will need. Each kit contains a Line Isolator[tm], a 3-foot deluxe jumper cable and six RFI cores. *Caution: In mobile installations, it is not safe to use your radio equipment when your vehicle is in motion. RFI can effect the vehicle's onboard computer.*

RFI Kit #1	T-4, jumper, and 1/4" cores	**$55**
RFI Kit #2	T-4-500, jumper, and 1/4" cores	**$55**
RFI Kit #3	T-4, jumper, and ½" cores.	**$65**

Weatherproofing Kits

All cables used outside in the weather MUST be properly sealed. (The technique detailed on our website is the one I use... Jim) Here is a kit of everything you'll need to seal a couple of dozen RF connectors. Illustrated instructions are included.

Contains -
1 roll of 3/4" x 60' black electrical tape
1 roll of 3/4" x 30' black cold shrink tape
1 roll of ½" x 12' Coax-Seal
1 tube of STUF

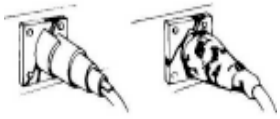
$19.95

Consider purchasing extra RFI cores, jumpers and Line Isolators[tm] and weatherproofing for emergency situations

Coax & Connector Weatherproofing

Sealing coaxial connectors and other antenna components is a multi step operation. Connectors are sealed from the inside and the outside. ***STUF[tm]***, ***Coax-Seal[tm]***, ***Cold-shrink tape***, and quality ***electrical tape*** are all used to ensure lasting and reliable weather-proofing. When all products are applied properly, you should enjoy years of trouble-free service. Such confidence in the long term performance of your antenna system is well worth the slight extra effort.

Coax-Seal[tm]



CoaxSeal® is your first line of defense in your coax cable's war against the ruinous effects of the weather. CoaxSeal® is a hand-moldable, plastic mastic, suitable for sealing a wide variety of materials, metals, plastics, and vinyls to accomplish a tenacious and waterproof, long-lasting seal for coaxial cable. CoaxSeal® is black, tacky, nonconductive, non-contaminating, 100% waterproof, and has low vapor transmission rate. It has self-healing qualities.

#101	**Pack ½" x 10"**	**75¢**
#104	**Roll ½" x 5'**	**$ 3.25**
#105	**Roll ½" x 12'**	**$ 5.95**
#105	**Box = 4 rolls**	**$19.50**
#106	**Roll 1" x 12 '**	**$ 7.50**
#106	**Box = 4 rolls**	**$26.50**

STUF

This a viscous white compound with dielectric properties that exceed those of the connectors to which it is applied. STUF forces air and moisture out of the connector from the inside during assembly, sealing it from the inside. One tube will fill several connectors. Tube contains a volume of 3.2 cubic inches, enough for a couple of dozen PL-259's.

Do not use without Coax Seal or Cold Shrink outer protection.

$6 per tube

Cold Shrink Tape

Ideal moisture barrier
Resists sunlight
Long-term protection
No heat needed, just wrap

Cold Shrink tape is wrapped around the connector with a slight stretch. After a few hours, the tape shrinks and forms a solid weatherproof seal. I like to use Cold Shrink tape over a layer of Coax-Seal as you will see on the next page. Illustrated instructions are included in the product manual.

3/4" x 30' roll $7.50

See W4THU's 5-step, foolproof, sealing process for connectors. It's been used under saltwater for years without failure. Details on our web site.

Prices and specifications are subject to change without notice.