W9INN ANTENNAS
P.O. Box 393
Mt. Prospect, IL. 60056
(312-394-3414)

847

2-6-85

Dear Jim:

Thanks very much for your order! We know you will have good results when you get your antenna up and operating.

Since all towers are different, your antenna may require some element length adjustments to get it on frequency. We have supplied it with starting lengths that should be reasonably close to your frequencies on the majority of towers, but due to the unique nature of each tower system, it may not be close enough.

If adjustments are needed, follow the instructions and you should be able to get it right on frequency.

If the lowest frequency, 160 or 80M, is way off frequency, it is a good idea to bring it in close to the desired frequency first! Often, the rest of the frequencies will drop in very close to the desired value.

The lowest frequency resonance may be adjusted by simply unwiding the wrapped back part of the end wire, moving the insulator a couple of inches, and re-wrapping the excess wire back on itself. It is a good idea to leave it uncut, as cutting will change the resonant frequency.

If you find the SWR too high on any band, it can be brought down to an acceptable value with one of the methods outlined in the instructions, or a wide-range T-network tuner, such as our 100W JSR-300A, or MFJ-962, can be used to bring it down. At these frequencies, the losses resulting from using a tuner to bring down the SWR with conjugate matching, are insignificant, even when overcoming quite a high SWR. Or, the SWR can be brought down with one of the counterpoise mentods outlined in the instructions.

The feed can be converted to RTS at any time by ordering a suitable length of transmission line (Saxton #1562). We will supply this with a PL-259 attached. ($ 2.50 for the PL-259 soldered to the end of the line). (#1562 Line @ .11 ft.)

Ground feed usually works right off the bat, as the ground functions as a fine Image Antenna.

In most installations, the system works right off the bat on all bands without any supplementary effort.

Be sure to follow the instructions, which give quite a bit of detail in solving any problem you might run into.

Should you run into a problem you can't solve, please let us know, with details, as we want to be sure your system works properly.

Should you later decide to try RTS, don't forget, you must have a suitable tuner to use RTS. The antenna can be also tuned with coax feed using a suitable tuner. While this is a bit less efficient than using Ladder Line, it still works quite well.

Good hunting!

Vy 73

Wm. E. Fanckboner, W9INN

SLOPER INSTRUCTIONS

You have purchased an antenna capable of outstanding performance! Considering its size, it is difficult to imagine a system that can do a more effective job in the same space. Our Slopers perform best when used with a ground-mounted tower with at least a tri-band beam on top, for "Top-Loading."

W9INN Slopers may also be ground fed. Performance almost equal to tower-fed systems can be enjoyed if a ground system with a minimum of 16 radials is connected to the ground stake at the feed point with the antenna located in-the-clear. (Will work with just a ground stake, no radials)

This type of Sloper is called a ½-Sloper. That is because it is actually a ¼-wave antenna. But, a ¼-wave antenna will not radiate unless "something else" acts as a substitute for the "missing" half of the antenna. We call this: The Image Function. The Image function may be provided by ground, the tower- as an extension of ground, the tower and beam above the feed point, the conductors connected to the tower- acting as a counterpoise, or an actual counterpoise attached to the tower to intentionally provide the Image Function. But, something must function as the missing ¼-wave in order for the system to radiate.

With a tower-fed Sloper system, the tower and beam on top, as well as all other conductors connected to it, are part of the radiating system. The Sloper element functions with the tower et. al. to provide a semi-directional system with a very low vertical-angle lobe, particularly effective for very long distance communication.

W9INN antennas are normally supplied completely assembled, cut to your specified parts of the bands, as developed on our test-site towers. In most cases, they will be reasonably close to requested frequencies. However, due to the great variation in towers and beams on top, every tower is quite different from every other, so adjustment of resonant frequencies is usually required. In some cases the resonant frequency on one or more bands may be quite widely removed from the requested frequency. Extra wire is supplied to permit splicing, should lengthening of an element be required.

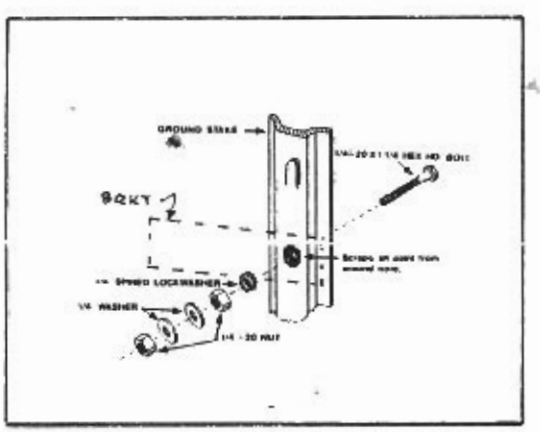
If you tower feed, you must obtain a "U" bolt to fit your tower leg.

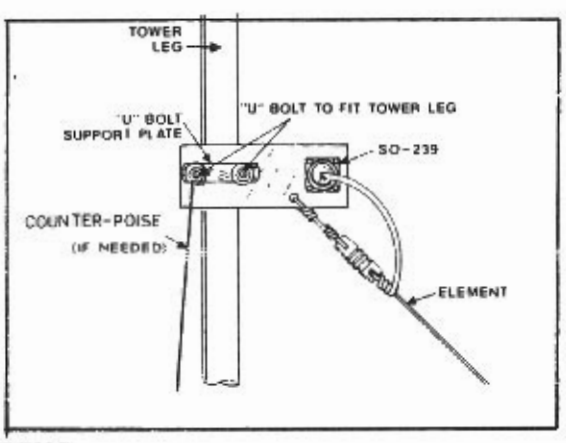
If you ground feed, you must obtain a 5' "fence post" (Steel). These may be purchased at most hardware or garden stores for a couple of dollars.

QUICKIE INSTRUCTIONS:

Since most people don't read instructions unless they have a problem, we will assume you do the same as we! In most cases, you can get on the air by simply doing the following:

1. Hang the antenna at a 45 degree angle.
2. Keep the far end (end away from the feed point) away from everything at least 4 ft.
3. Connect the transmission line.
4. Check the SWR carefully across each band. You should find a frequency where the SWR drops to a low value. This is the natural resonant frequency.
5. Adjust lengths, as necessary, to get each resonant frequency where you want it. Be sure you have found the natural resonant frequency on <u>all</u> bands before making <u>any</u> length changes. Make length adjustments in steps of a couple of inches at a time. Check the resonant frequency of each band after every change. Don't make too much change in one element without bringing the others along. Juggle lengths. ADJUST LOWEST FREQ. BAND FIRST! (160 or 80M)
6. Now, if that doesn't do it, read on. We should cover most of the problems you are likely to encounter.





BRACKET MOUNTING

INSTALLATION - GROUND FEED:

1. Drill a clearance hole for a ¼-inch bolt about 4" from the top of the ground stake.
2. Drive it into the ground so about 8" remains between the hole and ground. (If the end becomes too distorted, it may be cut off with a hack-saw.) Then continue hammering.
3. Attach the mounting bracket as shown, and run the Sloper element to a suitable support. (The more vertically it is hung, the less the directivity. If hung more horizontally than 45 degrees, the pattern will become more broadside and have a higher vertical angle of radiation.)
4. If the upper support does not have sufficient height to hang the element in a straight line, the end may be run through a loop of Nylon line and bent back toward the ground. Just be sure to keep the end (the end 10 to 15 ft.) away from everything at least 4 ft.- farther if possible.
5. At the center, if hung from a metal tower or other support, keep the element at least 2 ft. from tower.

INSTALLATION - TOWER FEED:

1. Attach the bracket to the tower leg at the elected height. Initially, use whatever height you want to use. Should you have a problem obtaining resonance on one band or another, you can try another height later. Usually 25 to 50 ft. will work just fine.

2. Connect the coax to the SO-239 and run down the tower taping to a leg. Run all the way to the bottom of the tower, if possible, as proximity to the tower will strip most of the RF from the coax shield. Otherwise, run down as far as possible.

3. Hang the Sloper element at about 45 degrees to the tower. If the angle is greater, (more horizontal to the ground), the vertical angle of radiation will be increased and the directivity will will be skewed to a more broadside pattern.

   If the angle is less than 45 degrees (more vertical), increased cancellation will occur between the element and the tower. The loss will not become significant until the angle to the tower is about 30 degrees. With this configuration, less directivity will be noticed.

4. The element may be run in a straight line, or, if you don't have sufficient height, it may be tied back to the tower, to establish the 45 degree angle, and the end run more or less parallel to the ground for whatever distance is necessary. The end should be run about 7 to 9 ft. above ground to keep it above people and minimize capacity to ground.

   What you do with the end will not effect the radiation efficiency appreciably, as current is low in that part of the antenna and little radiation occurs. But, the location of the end will have considerable effect on the resonant frequency and feed-point impedance. "Things" around the end will raise the feed-point impedance, making it difficult to get a low SWR. So the end MUST BE KEPT IN THE CLEAR AS FAR AS POSSIBLE, AWAY FROM EVERYTHING. (4 ft. minimum. Farther if possible)

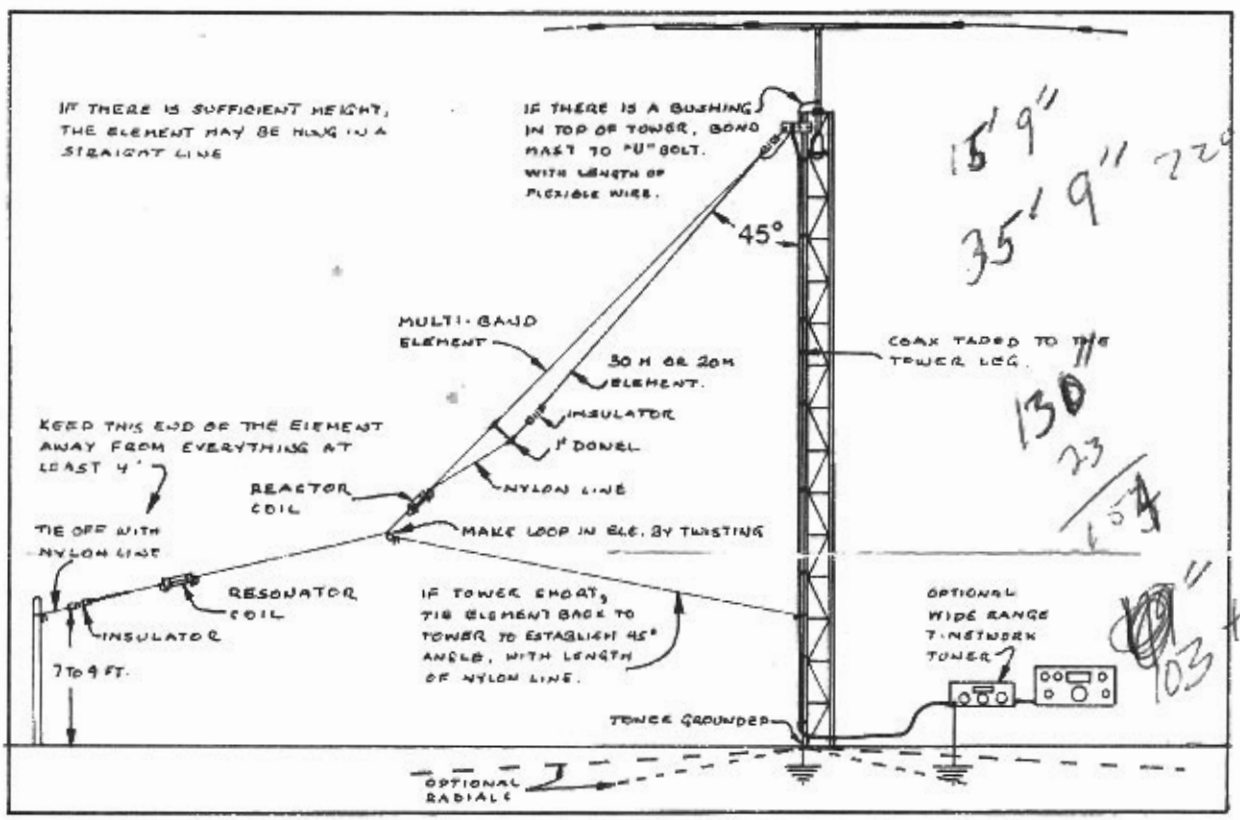
5. Ground the tower to a ground rod. It is also a good idea to run a #14 wire down the tower from the "U"-bolt to the ground rod.

6. While excellent operation may be had without radials, "Ultimate" installations will be helped with at least a few.

7. Good electrical connections between tower sections should be made. Usually, slightly loosening and retightening bolts will do the job on at least a short-term basis. Bonding will make a more permanent connection.

8. If the mast supporting the beam, goes through a collar at the top of the mast, it is a good idea to bond the mast to the tower or, better, to the feed point, with a length of flexible wire (#14)

You are now ready to tune the system.

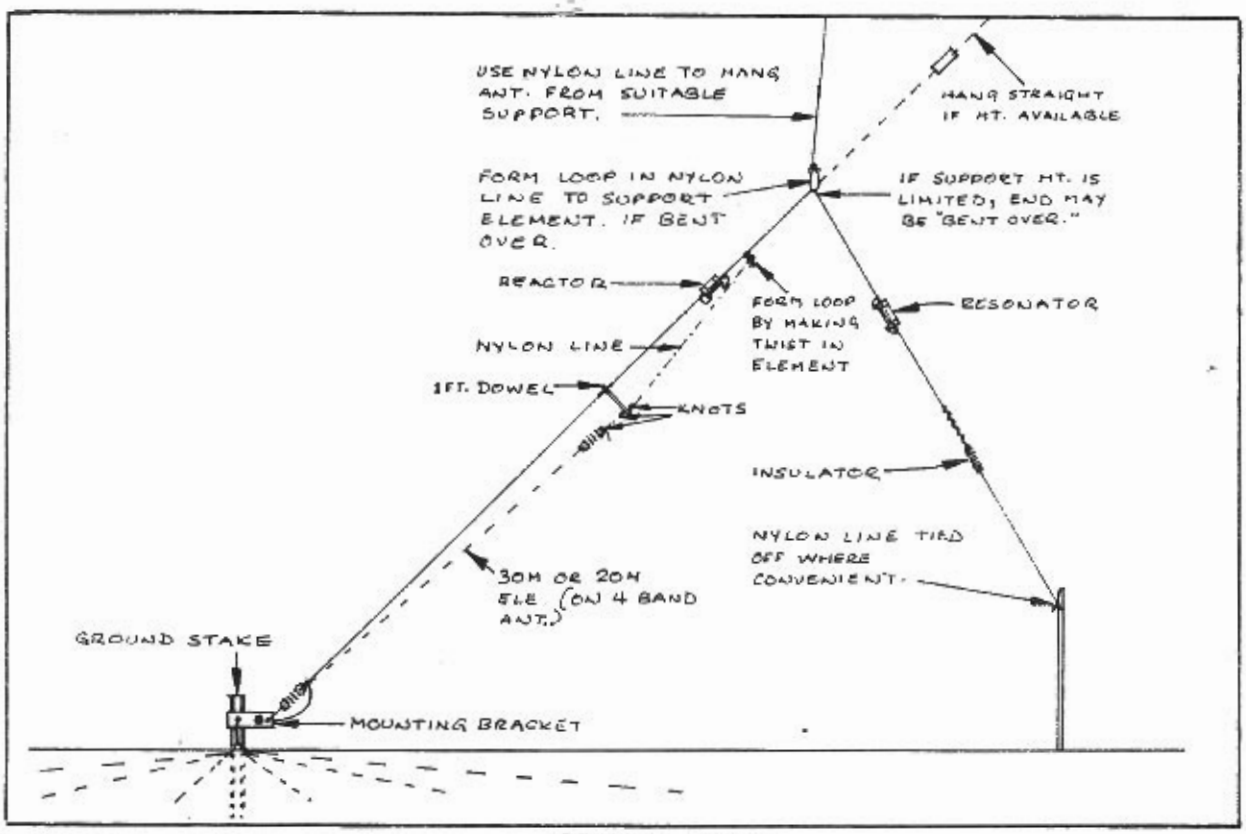


TOWER FEED

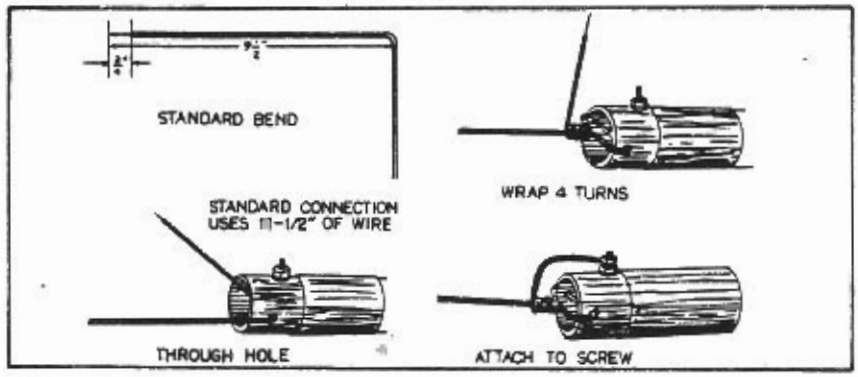
TUNING - GENERAL:

1. Tuning is accomplished by changing the lengths of the various elements by cutting or splicing. LENGTHENING an element will LOWER its resonant frequency. SHORTENING an element will RAISE its resonant frequency.

2. The capacitive end section (the wire farthest from the feed point, attached to the end insulator), may be lengthened or shortened by unwinding the wire, repositioning the end insulator, and re-winding the excess wire back on itself. Don't cut this off, unless it becomes too unwieldy by becoming too long, as it is part of the antenna element. Even though largely neutralized by capacitive coupling to the main element, there will be an element resonant frequency change if it is cut off. This amounts to about 10 KHz per one ft. cut off the excess wire, on 160M.



GROUND FEED



STANDARD CONNECTION

3. Make inner element changes at a coil by disconnecting the wire from the terminal, unwinding it, cutting or splicing, and remaking a Standard Connection after each adjustment. This provides a way of accurately duplicating the connection, so you can measure the amount of frequency change resulting from a measured change in length. (We call this KPI - KHz Per Inch) By keeping track of the KPI, you can reduce the number of adjustments, by knowing how many inches to change for a required number of KHz.

4. The element between the SO-239 and the first coil is the highest frequency element. It is rather completely isolated from the balance of the antenna by the Reactor coil. Bandwidth of this band is very broad. Changes in the length of this element will have only a limited effect on the resonant frequency of the lower frequency elements.

5. On 3-band Slopers, there is considerable interaction between the two lowest frequency bands, as the complete element is active on both of these bands. The element functions as a 3/4-wave element on the intermediate band and a ¼-wave element on the lowest frequency band. So, when the length of the intermediate element is changed, the frequency of the lowest band also changes, and visa versa.

6. For this reason, YOU MUST CHECK THE MIN. SWR FREQUENCY OF ALL BANDS AND WRITE DOWN THEIR RESONANT FREQUENCIES EVERY TIME YOU CHANGE ANY ELEMENT LENGTH, to keep track of what is happening to the frequency of each. While this may seem complicated, a little practice makes it easy.

7. Don't make too much of a length change in a single element at a time! Bring the other elements along as you go. A few inches has quite an effect when made on one of the elements: For example: on the 3-band sloper, approx. KPI = 18 KHz (18 KHz per inch of change). 80M, KPI = approx. 7.5 KHz 160M, approx KPI = 5.5 KHz.

8. The bandwidth of the lower frequency bands is quite narrow, compared to the higher frequency band. So, don't expect the same broad-band effect.

TUNING - GROUND FEED:

The Earth Ground provides an excellent Image Function. If properly hung, a ground fed Sloper usually requires little or no adjustment.

Should you wish to adjust frequencies, simply change element lengths as outlined for tower fed Slopers.

Difficulty in obtaining a low SWR on 160M is usually a result of having the 160M capacitive end section located near foliage or other absorptive "things."

With ground fed Slopers, the quality of the ground is very important. While the antenna can be used with no more than the ground stake with very good results, in some locations where the ground conductivity is high, a really good ground system can make the antenna perform as well as a tower fed Sloper.

TUNING-TOWER FEED:

1. With the transmitter on "tune," determine the resonant frequency for each band. The natural resonant frequency is indicated by a dip in SWR! The frequency at which minimum SWR occurs, is the natural resonant frequency.

2. Make a full SWR measurement every time. Write down the SWR next to the frequency. Make a chart.

3. First check the highest frequency band. Measure every 25 KHz across the band. Then check the intermediate band every 10 KHz. Then check the lowest freq. band every 10 KHz.

   Of course, there will be just 2 sets of readings on 2-band antennas. The lower frequency band on 2-band antennas will be considerably broader in bandwidth than on 3-band antennas.

4. Normally, you will find a frequency on each band where the SWR is very low. Sometimes, due to the characteristis of the particular tower system the antenna is attached to, one or more bands will have a higher than desireable SWR. (Methods of reducing SWR will be explained later.)

5. It may be felt NO resonance exists on one or more bands. It is possible the resonance is out of the band. Some tower systems, or the way the antenna is hung, will cause resonance to occur above or below the band. On the intermediate band, sometimes the SWR will be quite high, but, if measurements are carefully made, a slight drop in SWR should be found and will indicate where the natural resonance is.

6. On 160M (80M with the 80-40 2-band Sloper.), you will normally find a very low SWR at resonance. If you don't find it, and the antenna is hung very high it may be out of the band on the high frequency end. If hung low, with the end close to the ground, resonance may be below the low frequency end of the band. Whether the resonant frequency is low or high may usually be determined, if you have made your SWR chart carefully, by a slightly lower SWR at one end of the band than the other.

   A noise bridge in conjunction with a General Coverage receiver, will locate it for you. Or, you should be able to hear the noise peak up on a General Coverage receiver. A grid-dip meter must be used at the feed point, so you really need to be a "tower person" to use it with Tower Feed. A grid-dip meter is virtually useless at the transmitter end of the transmission line, as it sees too many resonances.

7. Once you have found the 160M resonant frequency, it is simply a matter of adjusting the end wire length to bring the frequency to the desired point.

   The 160M resonant frequency should be brought into the band before making other element length adjustments. (80M on the 80-40M 2-band Sloper.)

8. 80M resonance (on the 160-80-40M Sloper), is sometimes difficult to find, as some towers do not provide an effective Image Function. However, at least a slight drop in SWR should be detected to indicate where resonance occurs. It may be several hundred KHz away from the expected point, in rare cases.

9. 40M resonance is almost always present, very broad in bandwidth, and produces a very low SWR.

10. 30M (or 20M) on the 4-band antenna, is provided by use of a parallel element which is full size. It has very broad-band characteristics and can be adjusted with little or no effect on the freq. of the other elements, or they on it. Adjustments are made by repositioning the end insulator to change the frequency of this element.

11. Final pruning to frequency may be made by "juggling" lengths until all elements frequencies are where you want them. If the SWR on any band is too high, go on to the SWR REDUCTION section.

SWR REDUCTION:

A wide-range T-network tuner will bring down the SWR on any band, to a point where it will satisfy the transmitter. RTS feed will provide the greatest flexibility, by allowing full coverage of the bands with maximum efficiency. We can provide "approved tuners" for this type of operation. Many tuners have insufficient range to match the wide variety of loads encountered with this effective type of feed. They are advertised as "All-band tuners" and are, but have quite limited matching range. If you are going to put out money for a tuner, be sure you get one that will do what you buy it to do! We have tested a number and finally found the ones we know will work properly.

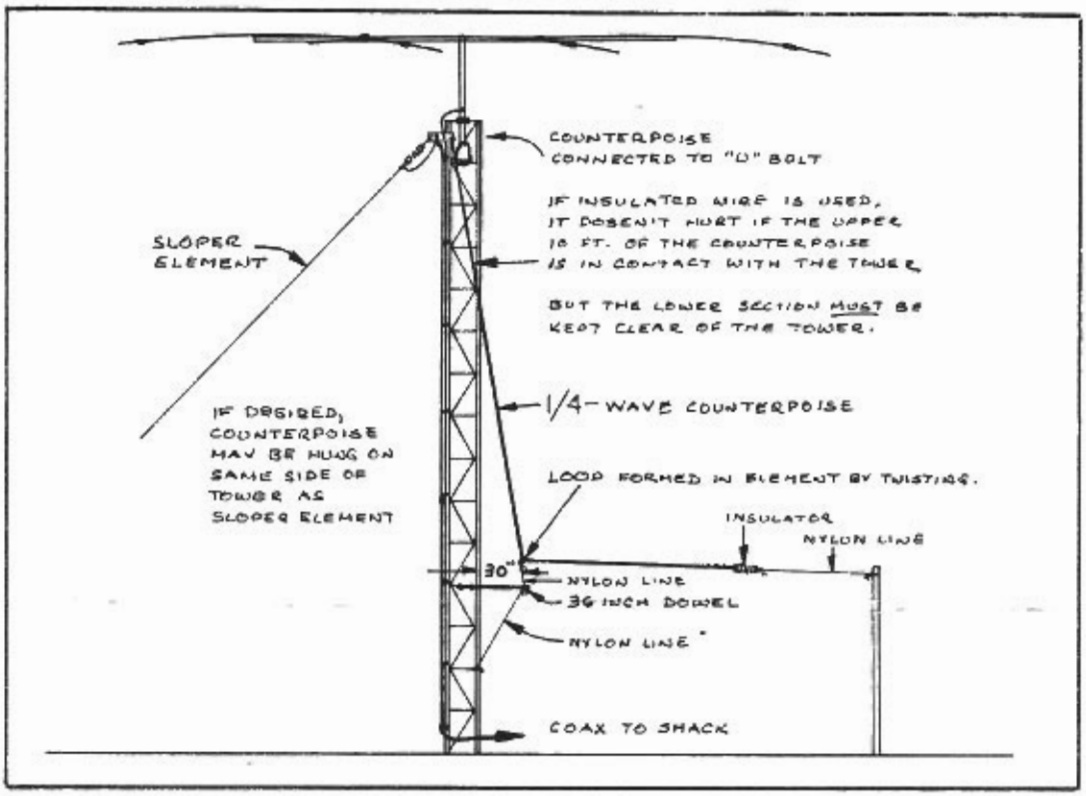
1. 160M usually resonates without a problem. Normal tower heights are such a small fraction of a wavelength on 160M, the tower acts as an extension of ground. If very high towers are used, and resonance does not occur, the Tuned-Loop Counterpoise will solve the problem.

2. 80M may have a high SWR or no resonance if the tower is not ground mounted, or there is not substantial beam on top to help provide the Image Function. A full-size counterpoise may be run down the tower and out to a tie point, to provide resonance. (Connect to the "U" bolt at the feed point.) Or, or the Tuned-Loop Counterpoise may be used effectively, since it only requires a short length of wire. (Full size C.P. L in ft. = approx. 260 divided by Freq. in MHz)

3. 40M can easily be resonated with a full-length counterpoise. Start with a 38'0" length of wire, wrap back 15" at the insulator, and connect the other end to the "U"-bolt at the feed point. Run down and away from the tower as shown. Usually all length adjustments may be made to the counterpoise by moving the end insulator as previously described. If adjusting the counterpoise alone does not result in a low enough minimum SWR, some element adjustments may be required. Juggle the Sloper 40M element length and counterpoise length until a satisfactory SWR is developed.

   The Tuned-Loop Counterpoise may also be used on 40M very effectively.

4. 30M or 20M: Since this element is separated from the multi-band element, it is almost always possible to move it around and/or adjust the length to produce a very low SWR.



QUARTER-WAVE COUNTERPOISE

A ¼-wave counterpoise may be connected to the "U" bolt and run down the tower to a point at least 20" from the tower. Resonance can be produced by adjusting the length of the counterpoise. By juggling the lengths of the counterpoise and element, a 1:1 SWR should be obtained.

When either the Tuned-Loop Counterpoise, or full-size counterpoise is used, if necessary, several may be attached to the tower at the feed point with no interaction. Mixed types may be attached to the same tower with no interaction.

TROUBLE SHOOTING:

If nothing seems to be working right, be sure to check everything carefully!

1. Is the coax ok? There should be no continuity between the center conductor and the coax shield. With the coax disconnected from the antenna at the feed point, short with a jumper. There should be very low resistance continuity between the shield and the center conductor at the transmitter end of the coax. There have been several problems caused by cold-solder connections to coax connectors! There have been several others caused by a short between the shield and center conductor.
2. Check the Sloper element. There should be (Low Ohms) continuity between the center pin of the SO-239 on the mounting bracket, and the end of the antenna. There should be continuity between the screw terminals of each coil.
3. Is the far end of the antenna close to foliage? This can throw it off frequency by hundreds of KHz and raise the SWR.
4. Guy wires should be broken with strain insulators at least every 30 ft. Guys should normally be insulated from the tower.
5. However, in one case, where two sets of guys were used, one set being connected 10 ft. below the feed point were not broken up, but insulated from the tower. The Sloper wouldn't tune properly until the guys were connected to the tower across the insulators. Then everything tuned beauti-fully, as the guys provided a fine counterpoise and Image Function. The upper set were broken every 10 ft. and had no effect on the system.
6. An Inverted "V" hanging from the same tower, may cause problems. The Sloper is particularly sensitive to another antenna tuned to the same frequency (band), hanging on the same tower. The Inverted "V" tends to "shadow" the Sloper.
7. Should you encounter a problem you can't solve, please let us help you, as we want to be sure your antenna operates properly.

REVERSIBLE SYSTEMS:

By hanging two Sloper in opposite directions (or three in three directions), switched on the tower with an INLINE relay, a selective directional system may be established. A front-to-back ratio of one to three S-Units can be enjoyed. 160M directivity is not great enough to require two antennas for that band, so, only one MS-684 antenna is required. The other(s) may be MS-084(s). We can supply all components and instructions for a fully reversible system including INLINE relays.

A WORD ABOUT GROUNDS: (Primarily related to ground feed, though a good gnd. helps Tower feed.)

If you are a serious DXer, particularly on 160M, you do need as good a ground as you can develope. After putting in a few radials (8), of varying lengths from 25 to 120 ft., there was a definite improvement, particularly on 160 and 80M.

1. The object is to produce as perfect a reflective surface and conductive area in the high-intensity field of the antenna, as possible.
2. The region nearest the bottom of the antenna is the most important to cover with metal, as this is the area of high-current density.
3. The longer the radials the better, up to a $\frac{1}{4}$-wave on the lowest frequency band. But, if there is a choice between more and longer, install more. They do not have to be straight.
4. Radials may be made of almost any guage wire, even #28 or #30, if there are more than two or three of them.
5. If buried, or in direct contact with the surface of the ground, radials may be shorter than a $\frac{1}{4}$-wave. A mixture of long and short radials is completely acceptable. 1/10th wave to 1/8th wave will help provide a return path for field-induced ground currents, if there are enough of them. (8+)
6. If insulated from ground, functioning as a "counterpoise," fewer radials are required, but they must be close to resonating with the radiating element at the operating frequency. To resonate they must be an electrical quarter-wave long.
7. Tie any conducting metal into the system at the ground stake, such as a metal fence, sprinkler piping, cold water pipes, etc.
8. Radials should be as close to the surface as possible, or on the surface.
9. Arrange metal around the antenna radially, in as symmetrical a pattern as possible. If not possible, locate the antenna and ground system so the greatest amount of ground system lies away from the feed point (if ground fed), or the tower if tower fed, in the primary direction you want to transmit and receive.
10. Radials used with tower fed systems should be connected to the bottom of the tower or the ground stake, if ground fed.

CAUTION: If you have another low frequency antenna on the same tower as the sloper, or near it, if ground feeding, there is likely to be interaction. The tuning (resonant freq.) of both antennas may change and the performance of the sloper degraded as much as two S-Units. An Inverted "V," for example, can cause considerable "shadowing" of the Sloper, acting like a shield. So, for maximum results, keep the sloper in the clear, away from other low-frequency antennas.

SAFETY:

Be sure to keep your antenna away from power lines. While the insulated wire supplied with all our wire antennas provides some protection against electrocution from 110 to 220 volt lines, it provides none against the voltages commonly found on outside power lines. The insulation does provide an additional benefit by minimizing noise pickup generated by an antenna touching another object.

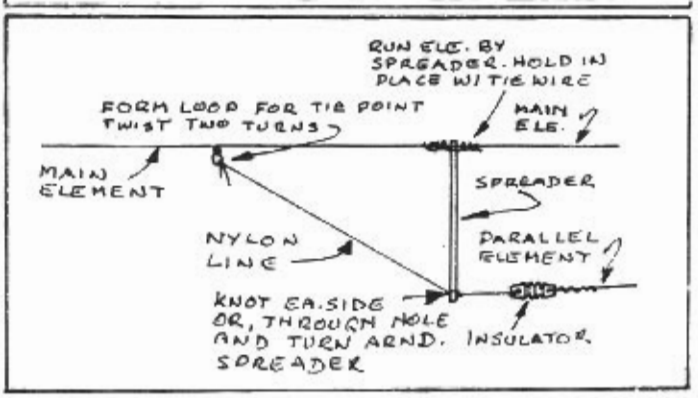
Remember that the outer portions and particularly the ends of antennas are "hot" with RF voltage when the transmitter is operating. With full legal limit transmitters this voltage will be many thousands of volts. Keep the outer sections and, in particular, the ends well clear of people, pets, the residence, and other objects where a fire could be started, or an RF burn could occur. Maintain at least a two-foot distance between the ends and flammable material. The antenna system should be provided with a means of lightning protection. It should be disconnected from your equipment and grounded when not in use. Do not use during electrical storms. Refer to the Radio Amateur's Handbook for more information on this important subject. Failure to provide adequate lightning protection could result in serious property damage, personal injury, or even death.

While we attempt to use strong materials and designs in our antennas, unusual ice or wind conditions, falling objects, tower blowdown, etc., could cause breakage. It is the responsibility of the user to insure that he places his antenna so that failure will not cause it to fall on a power line or endanger people. Keep in mind that power lines sometimes fail also, and keep your antenna away from underneath them. Antennas by necessity are electrical conductors, a fact you should always remember. In testing our various wire antennas and designs for strength, we have suspended them slightly above ground, and they have all withstood the weight of a 200 pound man. As we have no control over the user's assembly methods, and as exposure to the elements could cause material deterioration, do NOT expect them to support your weight, either directly or be leaning a ladder against them. We haven't, and have no intention of, testing our antennas by swinging from them 45 feet in the air.

TELEPHONE POLICY:

We do not accept collect calls. But, should you wish to call, we have arranged for no one else to answer, unless I am here personally. That way, you will not waste a call. I am really the only one who can answer all of your questions. Please call between 9AM and 5:30PM Central time. If you don't get an answer, just call again a little later.

Thanks *Bill*



SPREADER DETAIL

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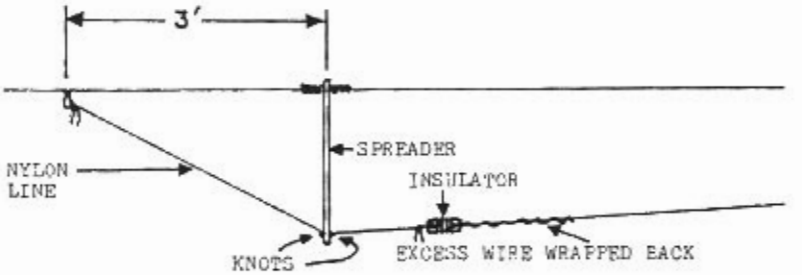
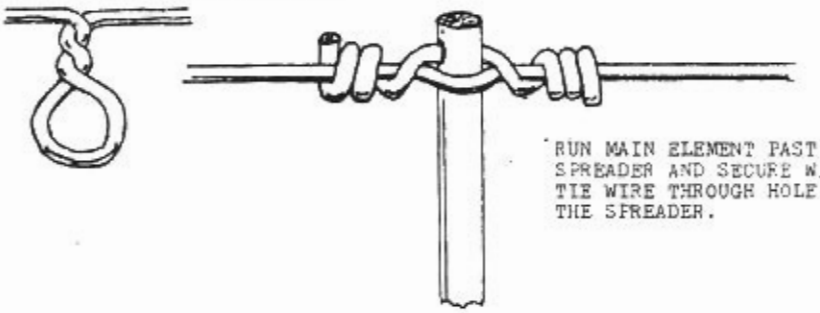
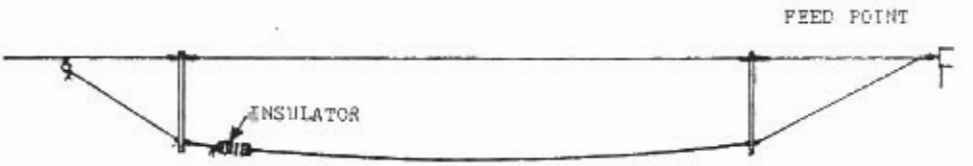


FORM LOOP IN MAIN ELEMENT AND TWIST TO FORM TIE POINT



RUN MAIN ELEMENT PAST SPREADER AND SECURE WITH TIE WIRE THROUGH HOLE IN THE SPREADER.



LEAVE SLIGHT SAG IN PARALLEL ELEMENT

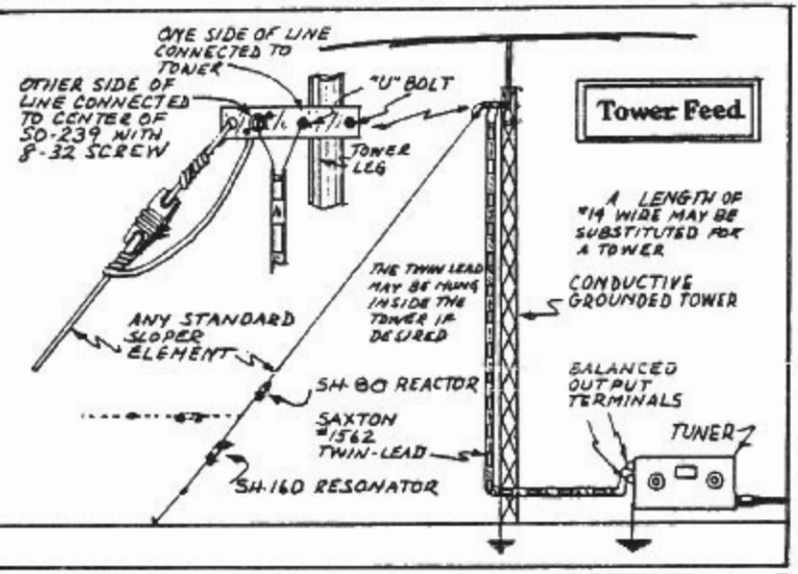
FOR LONGER ELEMENTS, USE TWO SPREADERS TO HELP KEEP FROM TWISTING AT THE FEED POINT.

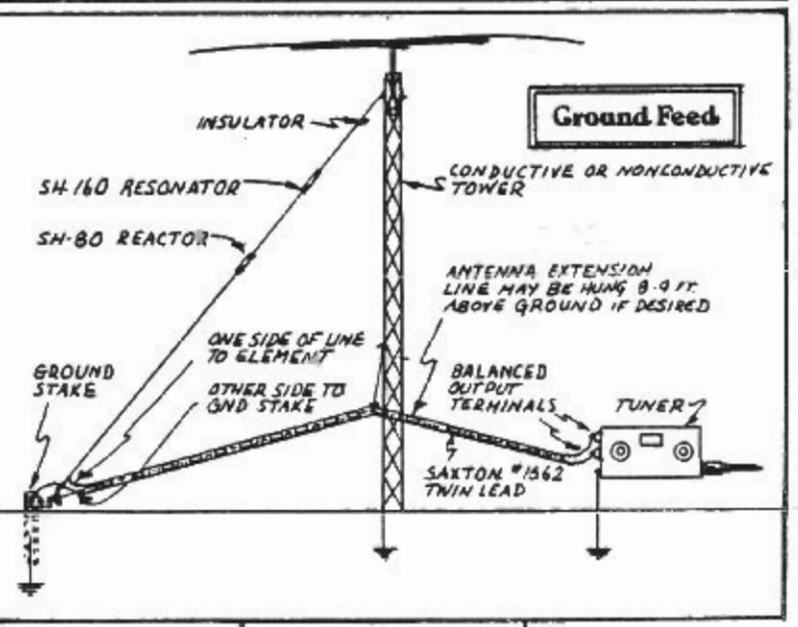
TWISTS CAN USUALLY BE REMOVED BY SHAKING ELEMENT VIGOROUSLY.

SPREADER DETAIL
W9INN 12-84

TS" Remote Tuning System

S CAN ALSO BE USED WITH ANY OF OUR DIPOLES





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