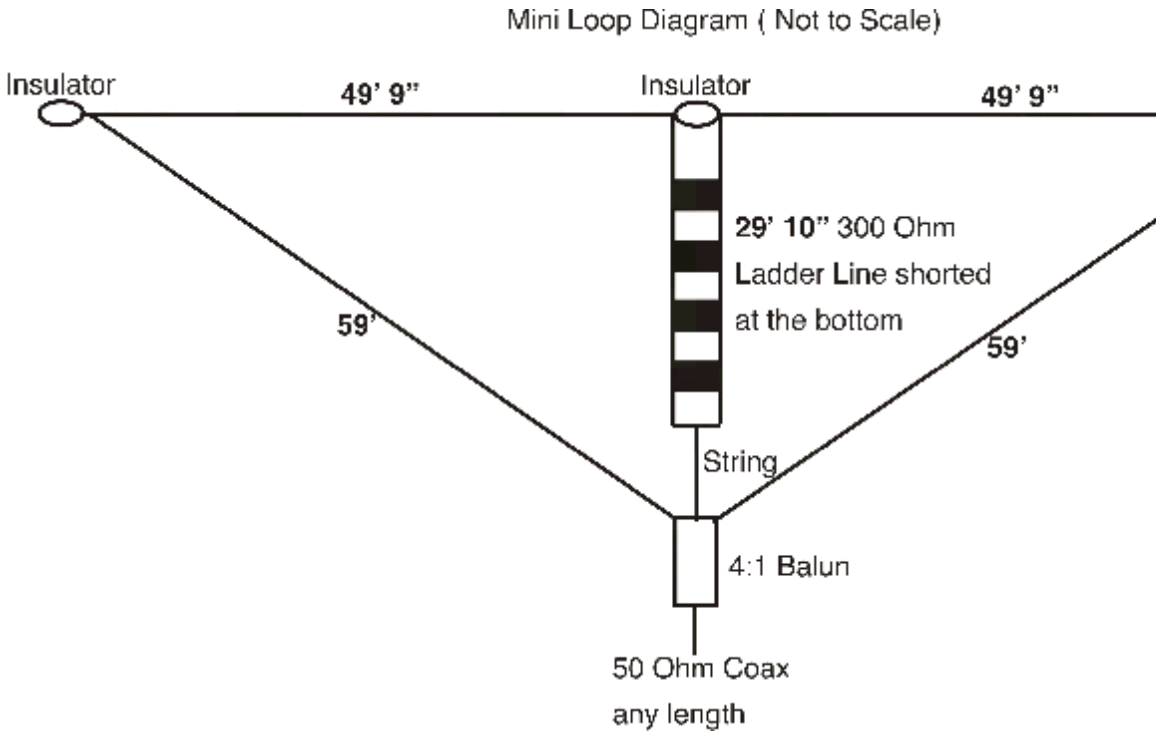
Mini Super Loop 2 Vertical Loops in Phase on 40M
Antenna design by WH2T Dr. Ace

This antenna is a high performance, full size, full wave, 80m loop antenna. On 40m it is a 2 wavelength open loop or Bi-Square. On 40 meters the ladder line stub automatically acts as a switch and opens the connection across the insulator so the antenna works as 2 one wavelength loops fed in phase. The stub in the top leg of the antenna opens the loop when operating on 40m and other selected bands. This improves the antennas radiation pattern. Its gain is around 4dB, but it will seem a lot higher due to its excellent, low angle, radiation pattern and low noise level.



Calculations for the loop.

One wavelength at 7.25 MHz = 1005/7.25 = 138.62 or 138 feet 7.5 inches.

If this length (138.62) is doubled and used on 80 meters as a loop then freq for 80 meters is 3.625. Frequency 1005/(2 x 138.62) = 3.625 MHz.

The 1/4 wave stub = 246 multiplied by (Velocity Factor of your type of ladder line) /frequency. (246 x .95VF)/7.25Mhz 234/7.25 = about 32 feet.

Ladder line or twin lead velocity factors vary by brand, type, insulation, etc. The best method to ensure the correct length is to use a grid dip oscillator or antenna analyzer and measure the resonant frequency of the 1/4 wave-matching stub during construction, rather than by just using the mathematical formula to determine the length.

The perimeter of the 80 meter loop for 3.625 MHz = 277.24. The 29’ 10” length of the ladder line needs to be included as part of the overall antenna length. Include both sides of the ladder line when calculating the ladder line length: ie. 29' 10" = 29.86’ 29.86’ x 2 = 59.7’. Subtracting 59.7’, the total ladder line length, from the overall antenna length of 277.2 gives the length of wire needed for the outside of the antenna: 277.2’ – 59.7’= 217.5’. Here I used 14ga stranded insulated house wire. It is more than capable of handling 1500W of RF power and is far more flexible than either 14ga. or 12ga. Solid wire.

The distance from the top of the horizontal span to where the balun will hang needs to be greater than 30. If each leg of the horizontal span is 49.75’ (49’ 9”) top horizontal span will be 99.5’ long (49.74 x 2 = 99.5’. Subtracting 99.5’ for the horizontal span from the overall antenna length minus the ladder line, 217.5’ results in 118’ of additional wire for the bottom legs. Dividing 118’ in half equals 59’ for each bottom leg. Using these dimensions the balun will hang about 31’ below the top center insulator.

The bottom of the 29' 10" ladder line needs to be shorted and tied to the top of the balun using a piece of fish line, weed eater line. The 50 Ohm coax from the balun to transmatch is not critical. See construction notes below for additional information on build this antenna.

Construction Notes from WH2T

This antenna could also be configured as a 54' 4.5" square on a horizontal plane. The 217.5 ft loop can be pulled into almost any shape but the bigger the "aperture" enclosed area the better it will work.

I have NOT tried this experimental design yet. I believe my calculations are correct and should work.

The antenna has been built and tested by Don / K8THU. Here are excerpts from emails I got from Don in Nov, 2005 Hi Ace, The stub needed to be longer than you quoted. {Page info has been updated to longer stub} The other measurements are exactly as you stated. The antenna is resonant at 7.21 so I could shorten it slightly but have not done so. I just was on 20 and worked N. Ireland and France again both with 5/8 reports. I am using just 100 watts with my Kenwood 570 and the internal tuner. Locally on ground wave on 75 meters I am

getting 20 over 9 reports on distances about 300+ miles. Don,K8THU Hi Ace, Ok, on Saturday we removed the 1/4 wave stub and found it was too short so we changed it and then pruned it until the stub was resonant at 7.25. I did not alter the loop size other than the stub length. Then we reassembled the whole antenna and found with the extra stub length the overall antenna resonant frequency was 7.21 Mhz. so I left it there for now and began SWR testing. The SWR readings are after the stub lengthening. Ladder line is 14 ga. stranded and the other line is also 14 ga. stranded and insulated (thnn?).

VSWR Measurement Results follow:

3.995 Mhz - SWR 1.1. to 1
3.751 Mhz - SWR 2 to 1
7.164 Mhz - SWR 1.1 to 1
7.290 Mhz - SWR 1.2 to 1
14.151 Mhz - SWR 1.3 to 1
14.348 Mhz - SWR 1.7 to 1
21.250 Mhz - SWR 2 to 1
21.441 Mhz - SWR 2.5 to 1
24.932 Mhz - SWR 3.5 to 1
24.987 Mhz - can't load
28.331 Mhz - SWR 3 to 1
29.650 Mhz - can't load

Usually I can't load on 10 meters. 40 and 20 are really quite good. Even 15 isn't too bad. Don,K8THU

Comments from N4MLC
My results were similar to Don’s K8THU. I used 14ga stranded wire and 14ga ladder line and tuned the antenna tuned to 7.190 Mhz. using a MFJ Antenna Analyzer. I would recommend to anyone building this antenna to use a grid dip meter or antenna analyzer for fine tuning the stub length. I found that my ladder was shorter than 29’. I had better loading characteristics using an electrical ½ wavelength of coax RG8X about 57’. RG8X is sufficient for operating SSB or CW I would not recommend continuous operation using more than 300W. I was also able to load this antenna on 10M using a tuner. Performance is excellent, whether running 100W or 1500W I consistently receive signal reports of 10 to as high as 40 db over 9.