

# G5RV Multi-Band Antenna

## Three basic configurations

The G5RV, with its special feeder arrangement (ladder line), is a multi-band center-fed antenna capable of very efficient operation on all HF bands. Specifically designed dimensions allow it to be installed in gardens and other open spaces to accommodate a reasonably-straight run of 31.1m (102 ft) for the "flat-top" standard model.

The most useful radiation from a horizontal or inverted-V resonant antenna takes place from the center two-thirds of its total length. Up to one-sixth of the total length of the antenna may be dropped vertically, semi-vertically, or bent at some convenient angle at each end without significant loss of effective radiation efficiency.

For installation in a very limited space, the dimensions of both the "flat-top" and the matching section can be divided by a factor of two to make the half-size G5RV, which is a very efficient antenna from 40 to 10m.

The full size G5RV antenna was not designed as a half-wave dipole on the lowest frequency of operation, but as a 1/2 centre-fed longwire antenna on the 20m band. The 10.36m (34 ft) matching section (the open-wire or ladder line) functions as a 1:1 impedance transformer. This enables the coaxial cable feeder to "see" a close impedance match on that band with a consequently low VSWR on the feeder.

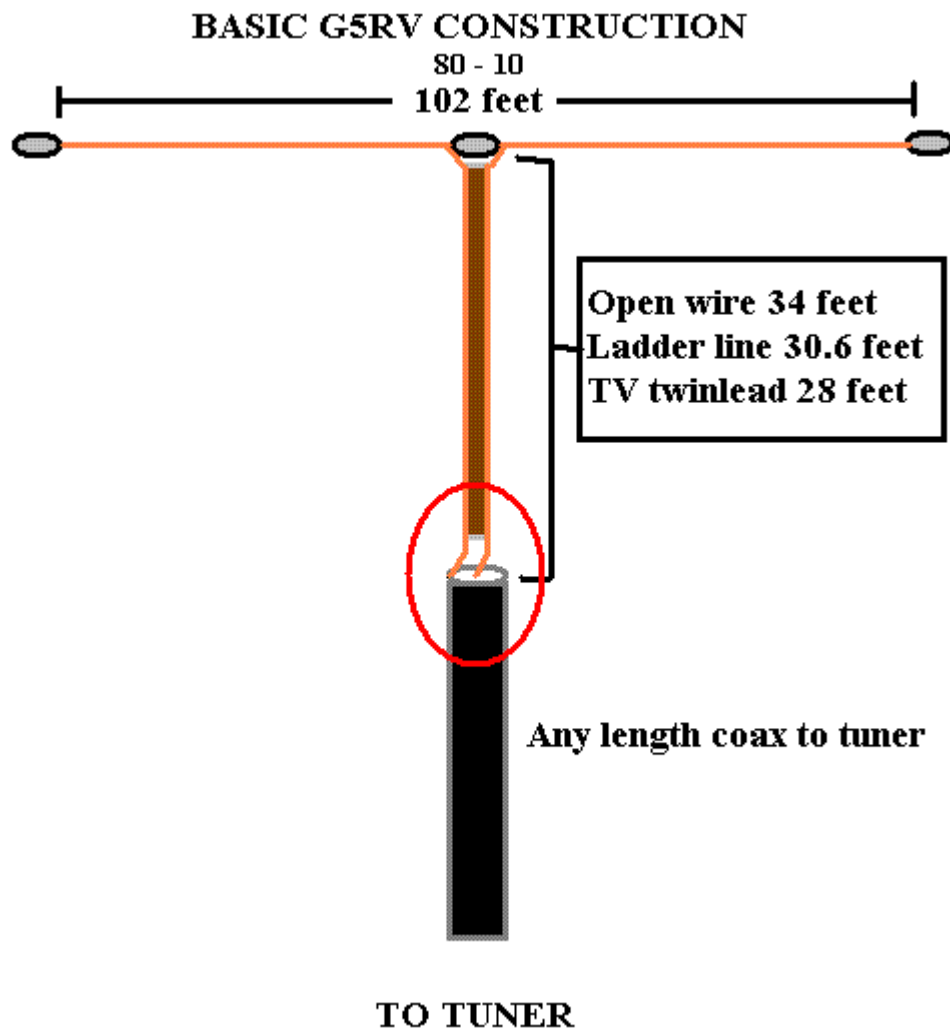
On all the other HF bands, the function of this section is to act as a "make-up" section to accommodate that part of the standing-wave (current and voltage components). Certain operating frequencies, cannot be completely accommodated on the "flat-top" (or inverted-V) radiation portion.

The design center frequency for the full-size version is 14.150 MHz. Dimensions of 31.1m (102 ft) is derived from the formula  $\text{Length (ft)} = 492 (n - 0.015) / f \text{ (MHz)}$  where n is the number of half-wavelengths of the flat-top wire.

## Construction

Antenna dimensions and matching section are shown in the drawing displayed below. The "flat-top" should be horizontal, run in a straight line, and mounted as high as possible above ground.

The optimum radiation efficiency on 160, 80 and 40m bands for any horizontal type antenna is generally an average height of about 10.35m (34 ft). Few amateurs can install masts of the optimum height of half a wavelength on 80 or 40m, and certainly not on 160m.



The antenna may be bent up to about 3m (10 ft) at each end. The bent portion can be allowed to hang vertically at any convenient angle, or be bent in the horizontal plane. Bending the ends has little practical effect upon performance.

Most of the effective radiation takes place from the center two-thirds. The amplitude of the current standing wave falls rapidly to zero at each end. Effective radiation from the end of the antenna is minimal.

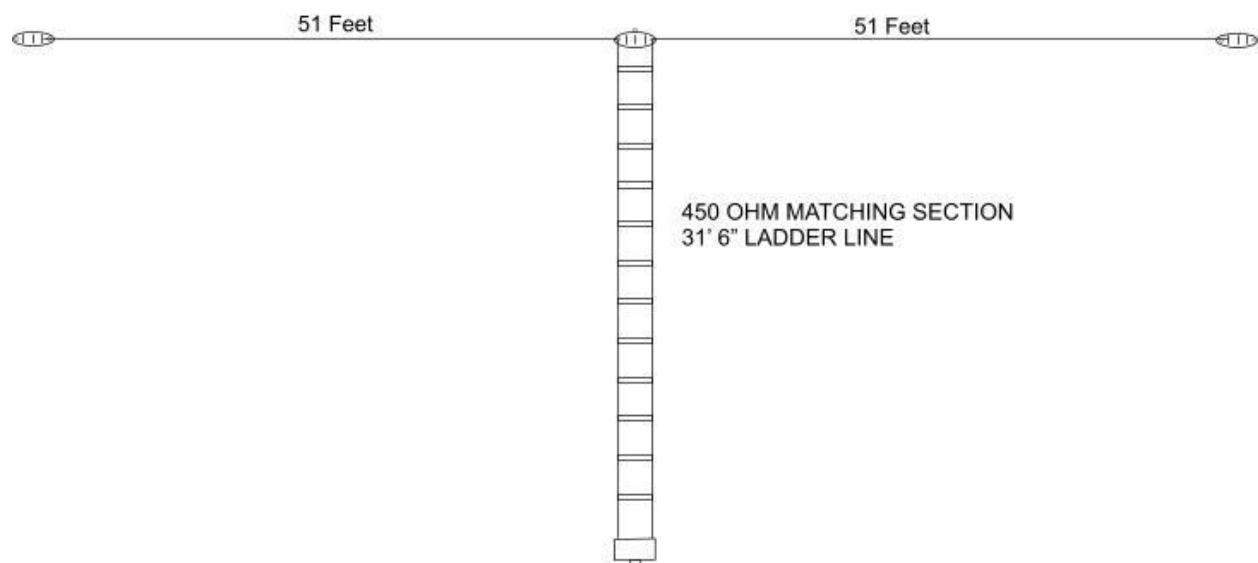
The antenna may also be used in the form of an inverted-V. The included angle at the apex of the V should not be less than about 120 degrees to radiate at maximum efficiency.

### **G5RV Standard Multi-Band Antenna**

Band coverage: 3.5-28 MHz

Length: 102 feet

Matching section: 33.7 ft (open) - 31.3 ft (ladder) - 28.5 (TV twin lead)



The G5RV is an superb all-band (3.5-30 MHz) 102 Ft. dipole. The 31.5 Ft. ladder line feeder of 450 ohms achieves a resonance on all bands from 80 to 10 meters with only one antenna and without any

loss in traps or coils. The impedance at the end of the 450 ohm feed line is 50-60 ohms which makes it perfect for a direct connect to standard 50 ohm coax.

The standard-size G5RV functions as follows:

80m - portion operates as folded dipole beginning approximately 15 ft. down ladder line

40m - two half-waves in phase on 7 MHz with a portion folded in the center

20m - three half-wavelength antenna

15m - two full-wave lengths fed in-phase

10m - two one and a half-wave lengths in line fed in phase

The G5RV is slightly short on 80 meters where the 450 ohm line serves as a form of matching stub and both a stub and/or impedance matching transformer on the other bands.

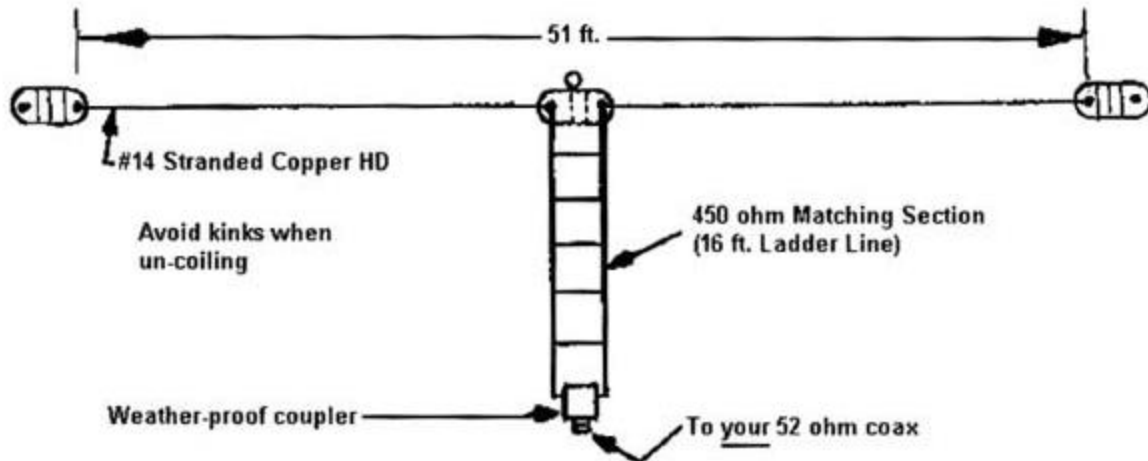
### **G5RV Junior Multi-Band Antenna**

Band coverage: 7-28 MHz

Length: 51 feet

Matching section: 16.9 ft (open) - 15.6 ft (ladder) - 14.3 (TV twin lead)

The antenna is supported with rope or other non-conductor. Ladder line comes away from the flat-top at a right angle for at least 10 feet.



The G5RV Junior can be erected as an inverted veer (120-degree included angle). An antenna tuner will permit operation on bands 40 through 10.

The G5RV junior functions as follows:

- 40m - half-wave dipole folded at center
- 30m - half-wave dipole folded at center
- 20m - collinear array with two half waves fed in-phase
- 17m - center-fed long wire of 3 half-waves fed out-of-phase
- 15m - two full-wave antennas fed in-phase
- 12m - two full-wave antennas fed in-phase
- 10m - 5 half-wave longwire

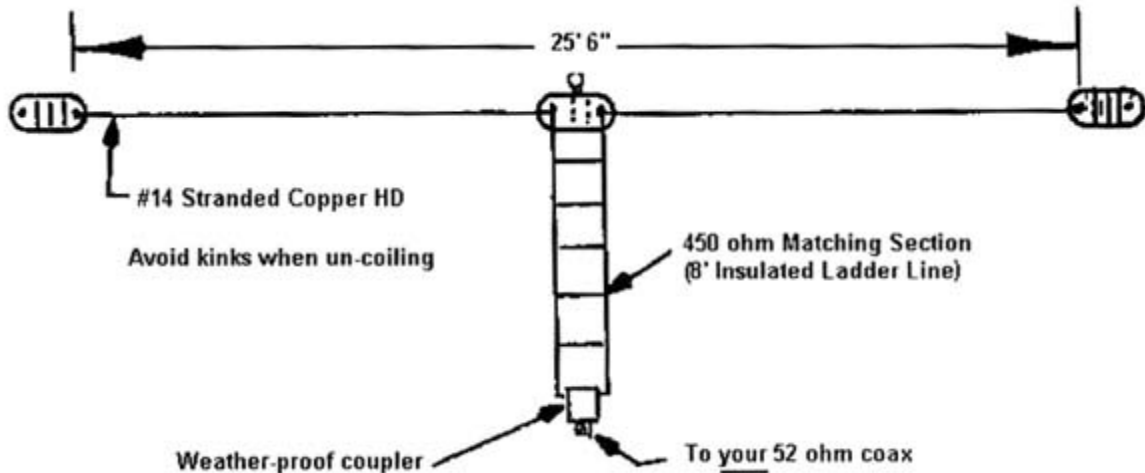
### **G5RV Mini Multi-Band Antenna**

Band coverage: 14-28 MHz

Length: 25 feet 6 inches

Matching section: 8 ft (ladder)

The antenna is supported with rope or other non-conductor. Ladder line comes away from the flat-top at a right angle.



The G5RV Junior can be erected as an inverted veer (120-degree included angle). An antenna tuner will permit operation on bands 40 through 10.

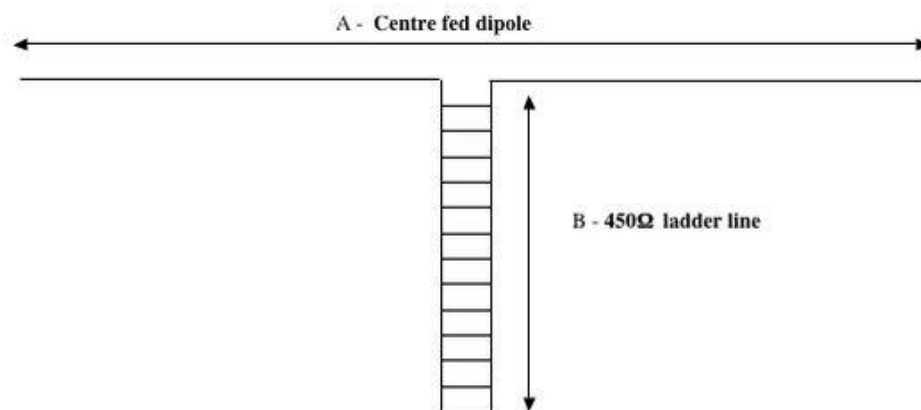
The G5RV mini functions as follows with lowest SWR on 10 meters:

- 20m - half-wave dipole folded at center
- 17m - collinear array with two half waves fed in-phase
- 15m - center-fed long wire of 3 half-waves fed out-of-phase
- 12m - center-fed long wire of 3 half-waves fed out-of-phase
- 10m - two full-wave antennas fed in-phase

## Summary

The antenna was invented by Louis Varney (G5RV) and shares some physical characteristics with a center-fed dipole. It is not a 1/2 wave dipole. Main difference between a dipole and the G5RV configuration is that the G5RV transmission line is part of the matching section which allows multiband operation.

The G5RV can generally be used on 20 meters without an antenna tuner, but a tuner is necessary on all other bands.



Approximate dimensions for G5RV variants

G5RV variant	Bands covered	Dimension A - Dipole	Dimension B - feedline
Standard	10m – 80m	102ft – 31.09m	31ft – 9.45m
M or double	10m – 160m	204ft – 62.18m	64ft – 19.51m
Junior or half	10m – 40m	51ft – 15.54m	17ft – 5.18m

There are several different variations on the G5RV. The most well-known is fed through 450-ohm ladder line 10.6 meters (34.8 feet) long, with one end of the ladder line connected at the centre-feed point of the antenna and the other connected through a balun to 50-ohm Coaxial Cable feedline.

An alternative is to run balanced feedline (such as twin-lead or ladder line) all the way from the antenna feedpoint to the antenna tuner. This arrangement can be very effective but not all feedline lengths tune properly.

Standard G5RV antennas are 31 meters (102 feet) long, excluding feedline and matching section length, and can be used on 80, 40, 20, 15, and 10 meters. A half-length G5RV (51 feet long) can be used on 40, 20, 15, and 10 and is known as the G5RV Junior.

The antenna can be installed as a horizontal dipole or an inverted V. If configured as an inverted V, the included angle at the apex should exceed 120 degrees. This means that the center is elevated approximately 13 feet higher than the ends.

Additional reading: [G5RV Antenna Revisted \(L. B. Cebik - W4RNL\)](#)

