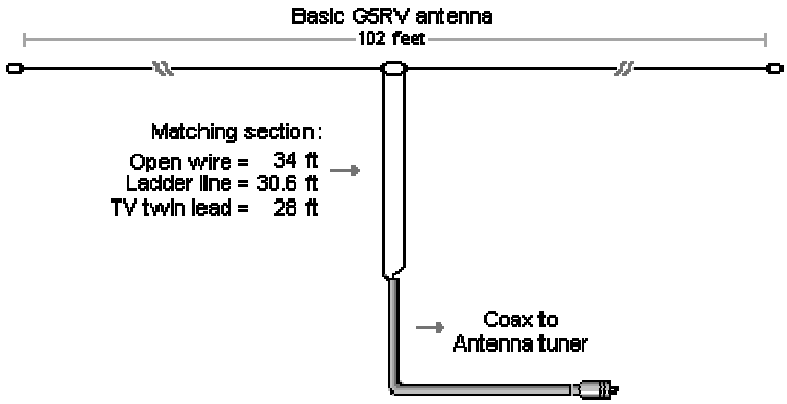
The G5RV
Multiband HF Antenna

Over the last 40 years G5RV dipoles have become the most widely used general purpose multi-band antennas in the world. Good performance, modest size, low cost, simplicity, and versatility are the reasons for this popularity.

Invented in 1946 by Louis Varney, whose call sign is G5RV ("Silent key" on June 28, 2000. He was 89). The basic antenna measures only 102 feet across the top, and is fed at the center through a low loss 34 feet feed-stub.

The interaction between the radiating section and the feed-stub makes the G5RV easy to match on all-bands from 80 through 10 meters with an ordinary low-cost antenna tuner.

In spite of small size, it provides dipole equivalent coverage on 80 and 40 meters. From 20 on it favors DX with four to six low angle lobes reaching out in all directions.



THE ANTENNA LENGTH :
The design center frequency of the full-size version (configured as a 3/2-wave dipole on 20m) is 14.150 MHz, and the dimension of 102 ft is derived from the formula for long-wire antennas which is :

LENGTH (in feet) = (492 (n - 0.05)) / f (MHz)
= (492 (3 - 0.05)) / 14.15
= 102.57 ft (31.26 m)
(n = number of half wavelengths of the wire)

In practice, since the whole system will be brought to resonance by the use of an antenna tuner, the antenna is cut to 102ft (31.1m).

In some cases, this is still too large to fit in one's yard, and not everyone can convince their neighbors to allow one to stretch the wire across property lines. In this case, a half-size version, covering 7 to 28 MHz is useable.
Conversely, some amateurs would like to have 1.8 MHz capability, and have the 204 ft (62.2 m) length necessary for this array.

The antenna does not need to be put up as a flat-top array, but can be installed as an inverted-V.
If the antenna is raised as an inverted-V, the included angle at the apex should not be less than 120 degrees.
The center of the antenna should be as high as possible, of course, and the matching section should descend at a right angle to the array.

THE MATCHING SECTION :
The matching section may use with several ways :

Open Wire :
It is recommended that the matching section be constructed of open-wire feeder for minimum loss, as it always carries a standing wave on it. Due to the standing wave on it, the actual impedance is unimportant.

Ladder Line (Window-type line) :
The next most-desirable matching section would be made from window-type open wire line, either 300-ohm, or 450-ohm. This is basically a ribbon line, like heavy duty TV-type twin lead, with #16 to #20 wire, and "windows" cut in the insulation every 4 to 6 inches. The advantage of

the "window" line is that the conductors won't short together if the line twists in a high wind.

"TV" Twin Lead :
The main disadvantage of the TV-type twin lead is durability. The advantage of it is that it is readily available at electronics outlets. Do not use the "shielded" twin lead. The shield will degrade the matching section, especially on 3.5 or 7 MHz.

MATCHING SECTION LENGTH :
The length of the matching section is an ELECTRICAL half-wave on 14 MHz. The actual physical length is determined by the following formula :

LENGTH (in feet) = (492 x VF) / f (MHz)

(VF = the velocity factor of the matching section)

The velocity factor is determined by the type of line, and the dielectric properties of its insulation. For the three types of line discussed so far, the VF is :

Open wire = 0.97
Ladder line (Window line) = 0.90
"TV" twin lead = 0.82

By substituting the VF in the formula, and calculating for a center frequency of 14.15 MHz, you come up with the following matching section lengths :

- Open wire = 33.7 ft (10.28 m)
- Ladder line (Window line) = 31.3 ft (9.54 m)
- "TV" twin lead = 28.5 ft (8.69 m)

This matching section is connected to the center of the array, and allowed to descend vertically at least 20 ft or more, if possible. It can then be bent and tied off to a suitable post or line, and connected to the coaxial line, and run to the Antenna Tuner.

TABLE OF FULL-SIZE, DOUBLE-SIZE and HALF-SIZE :

Band Coverage	3.5 - 28 MHz	1.8 - 28 MHz	7 - 28 MHz
Length of Antenna	102 ft (31.1 m)	204 ft (62.2 m)	51 ft (15.55 m)

Matching section :

- Open wire	33.7 ft (10.28 m)	67.5 ft (20.56 m)	16.9 ft (5.14 m)
- Ladder line	31.3 ft (9.54 m)	62.6 ft (19.08 m)	15.6 ft (4.77 m)
- "TV" twin lead	28.5 ft (8.69 m)	57 ft (17.38 m)	14.3 ft (4.35 m)

Material pulled together by yb0emj from reference [G5RV Multi-Band Antenna by Louis Varney, G5RV]

$$\text{Length (ft)} = \frac{492\ (n - 0{\cdot}05)}{f\text{MHz}} = \frac{492 \times 2{\cdot}95}{14{\cdot}15} = 102{\cdot}57\text{ft}\ (31{\cdot}27\text{m})$$