



# EQUIPMENT REVIEW

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## THE BUTTERNUT SUPER-TROMBONE

*Anyone who operates 2 m FM from their home sooner or later discovers the need for an antenna with a respectable amount of gain, particularly if they are using a standard quarterwave above a groundplane. A beam can be used but apart from the added expense of a rotator it can make net operation difficult if one or more of the stations fall in a null. The answer to these problems is an omni-directional vertical antenna with gain. This review describes an excellent candidate for this task.*

The Butternut Electronics Co sell several antennae of interesting construction. One of these is the model 2MCV-5 'Super-Trombone'. This is the largest of their two metre antenna. It is effectively two  $\frac{1}{4}$  wavelengths long and therefore should have a respectable 7 dB gain over a half wave vertical dipole. The patented 'trombone' phasing sections allow the radiator to remain unbroken by insulators and so retain high strength.

### CONSTRUCTION

The base of the antenna is designed to slide over a  $\frac{1}{8}$  inch mast or slide into a  $\frac{1}{4}$  inch OD mast. As the bottom of the antenna is a low impedance four radials are used. Matching is achieved with an adjustable gamma match. The radiator is thus kept at ground potential for DC. A phasing line made out of  $\frac{1}{8}$  inch aluminium rod is fitted half a wavelength up from the base. It is shaped like the slide in a trombone, hence the name. The task of the 'trombone' is to change the phase of the signal by 180 degrees so that maximum gain can be obtained by driving physically adjacent half waves in the appropriate phase. The 'super-trombone' uses two phasing sections. The main radiating element is made from four lengths of tubing ranging in diameter from  $\frac{3}{4}$  inch down to  $\frac{5}{8}$  inch. The overall height is 15 feet 9 inches (4.8 m).

An SO-239 connector is provided for a 50 ohm coaxial feeder. The elements are made of aluminium and the clamps and assorted hardware are made of stainless steel. This should ensure minimal corrosion and long life in most locations.

### PUTTING IT TOGETHER

The antenna is shipped in a box about four feet long and four inches square. The assembly of the antenna is quite rapid and the detailed instructions make the task an easy one. I took less than an hour to complete the assembly and most constructors would take no longer. Although it is probably quite obvious the instructions omit to say that both 'trombone' clamps use  $\frac{3}{8}$  inch screws, the longer ones being reserved for clamping the main element's sections. Two flat nylon spreaders are used on each 'trombone' and these were a very tight fit on the main element. I found that a piece of timber eighteen inches long and three by four inches in cross section was needed to persuade the spreader to move. This was done by drilling a one inch diameter hole in the timber near one end. Once the spreader was fitted to the end of the element it could be drifted into position by placing the hole over the element and tapping the spreader sharply.

The only tools needed to assemble the antenna were a screwdriver and a small wrench.

### TESTING

After the antenna was completed a check was made

of the VSWR. This was found to be quite low across the whole band with the minimum occurring just below 145 MHz. As most FM operation takes between 145 and 148 MHz in VK a small adjustment was made to the gamma match as suggested in the instructions. This reduced the VSWR to 1.2:1 at 146 MHz instead of the initial 1.4:1. Some slight adjustments to the locations of the 'trombones' would have been necessary to improve the VSWR at 147 MHz. The table gives the VSWR after adjusting the matching.

TABLE 1

FREQ MHz	VSWR
144	1.60
145	1.25
146	1.20
147	1.55
148	1.80

On-air tests were made between 145 and 148 MHz using both simplex and repeater channels. A half-wave vertical mounted at thirty two feet was used as the reference. The test antenna was mounted at thirty five feet to reduce interaction. After completing one series of tests the coaxial cables to the two antennas were changed over and the tests repeated.

The perceived signal to noise ratio on signals through the more distant repeaters were compared. Tests were run at nominal 1 and 10 watt levels to check changes for 10 dB level changes. An attenuator was used to check the difference in level between the dipole and the 'super-trombone' by another station some ten miles distant.

Gains ranging from 5 to 6 dB were measured. The variations are attributed to the combined effects of receiver sensitivity variation, attenuator errors and changes in transmitter power with frequency, load and time. It therefore seems that the gain is close to the theoretical maximum of 7 dB.

Under normal conditions the dipole provides access to eight voice repeaters from my home QTH. The 'super-trombone' increased this to ten and improved the usefulness of four of the eight by giving noise-free signals. Further tests at a country location enabled operation through four repeaters instead of two with two more being improved from barely detectable to good copy although 10 watts was insufficient to reliably trigger these two repeaters. For these latter tests the reference antenna was a  $\frac{3}{8}$  vertical above a groundplane.

### CONCLUSIONS

The 'super-trombone' is an excellent omni-directional vertically polarised antenna with a respectable amount of gain. It is well designed, being strong but lightweight and is easy to assemble (or disassemble). If you have a need for a high quality base

antenna but have been put off by the problems of home construction, then this is the antenna for you.

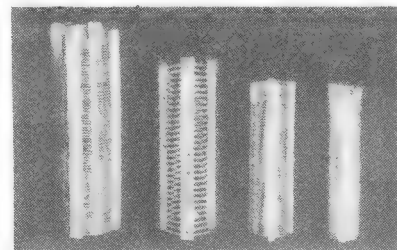
The test antenna was kindly provided by Traeger Distributors NSW Pty Ltd. All enquiries should be directed to them.

### NEW RSGB PRESIDENT

Mrs Joan Heathershaw G4CHH was elected the 51st President of the RSGB on 11th August, 1984.

She will be the first YL president of the Society and will take office on 1st January, 1985.

## AIR-WOUND INDUCTANCES



No	Diam Inch	Turns per Inch	Length Inch	B & W	
				Equiv	Price
1-08	$\frac{1}{2}$ "	8	3"	No 3002	\$1.60
1-16	$\frac{1}{2}$ "	16	3"	No 3003	\$1.60
2-08	$\frac{5}{8}$ "	8	3"	No 3006	\$1.90
2-16	$\frac{5}{8}$ "	16	3"	No 3007	\$1.90
3-08	$\frac{3}{4}$ "	8	3"	No 3010	\$2.30
3-16	$\frac{3}{4}$ "	16	3"	No 3011	\$2.30
4-08	1"	8	3"	No 3014	\$2.60
4-16	1"	16	3"	No 3015	\$2.60
5-08	$1\frac{1}{4}$ "	8	4"	No 3018	\$2.90
5-16	$1\frac{1}{4}$ "	16	4"	No 3019	\$2.90
8-10	2"	10	4"	No 3907	\$4.20
8-10/7	2"	10	7"	No 3907	\$7.20

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