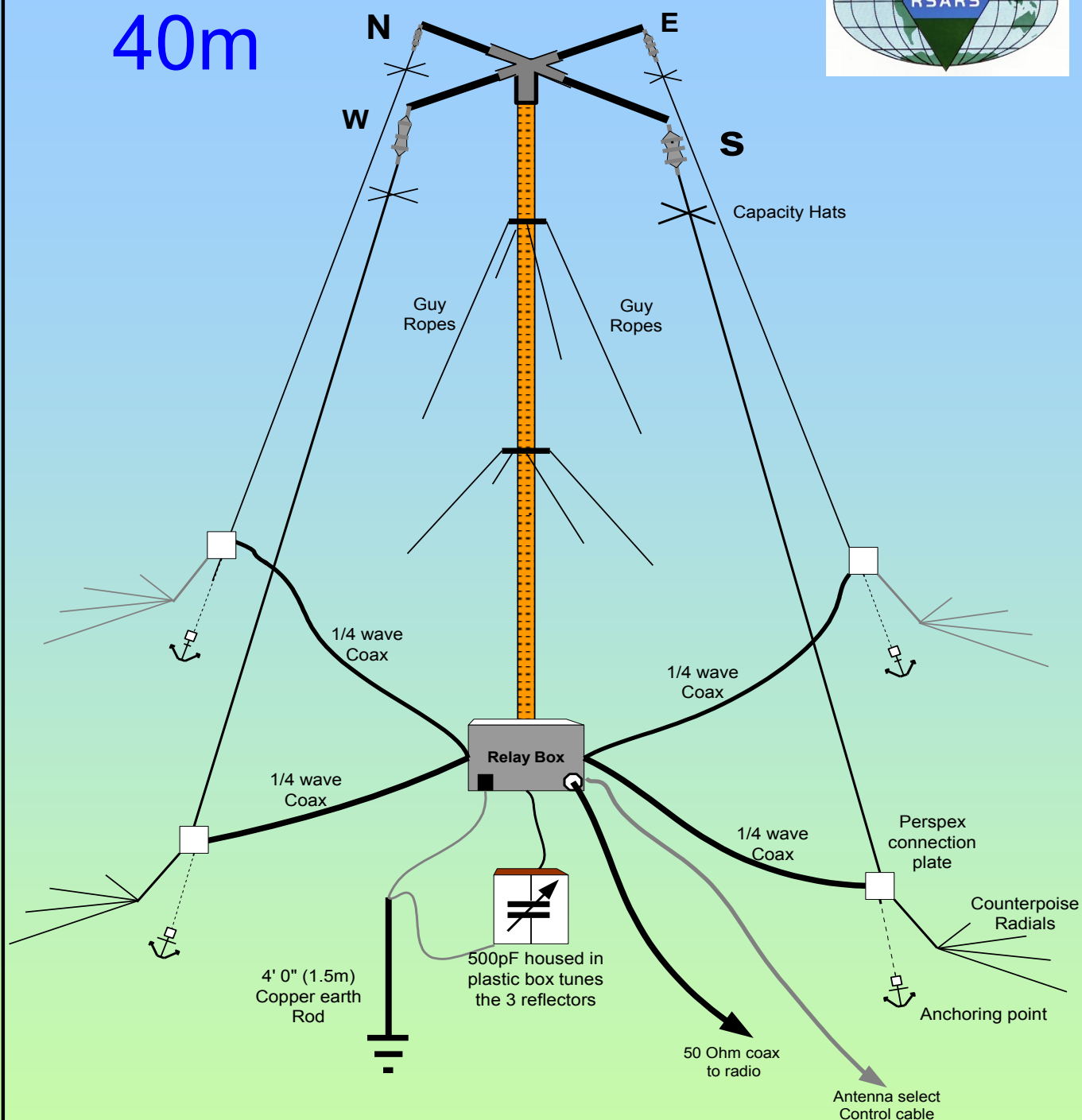


EA5AVL 40m



NOTES

1. The four 1/4 wavelength coax feeds are approx 21' 11" tip to tip of the PL259 connectors.
2. The four spoke stiff wire Capacity Hats are fitted 12" below the insulators using electrician's terminal blocks.
3. The Relay Box & Capacitor Box are earthed using a 4' 0" copper earth rod close to the mast base.
4. Four 1/4 wave coaxes from relay box to Perspex bottom plates.
5. Four Anchoring points to just stretch out antenna wire e.g. heavy brick or long tent peg., (little tension in these wires)
6. The guy ropes are tensioned to support the whole mast.
7. The cross arms can be oriented to any compass bearing to suit personal needs.

EA5AVL Compact 4-Square 40m Antenna - Overview

Drawn by MC - 27 Feb 08

COMPACT 4-SQUARE 40 METRE ANTENNA TECHNICAL INFORMATION

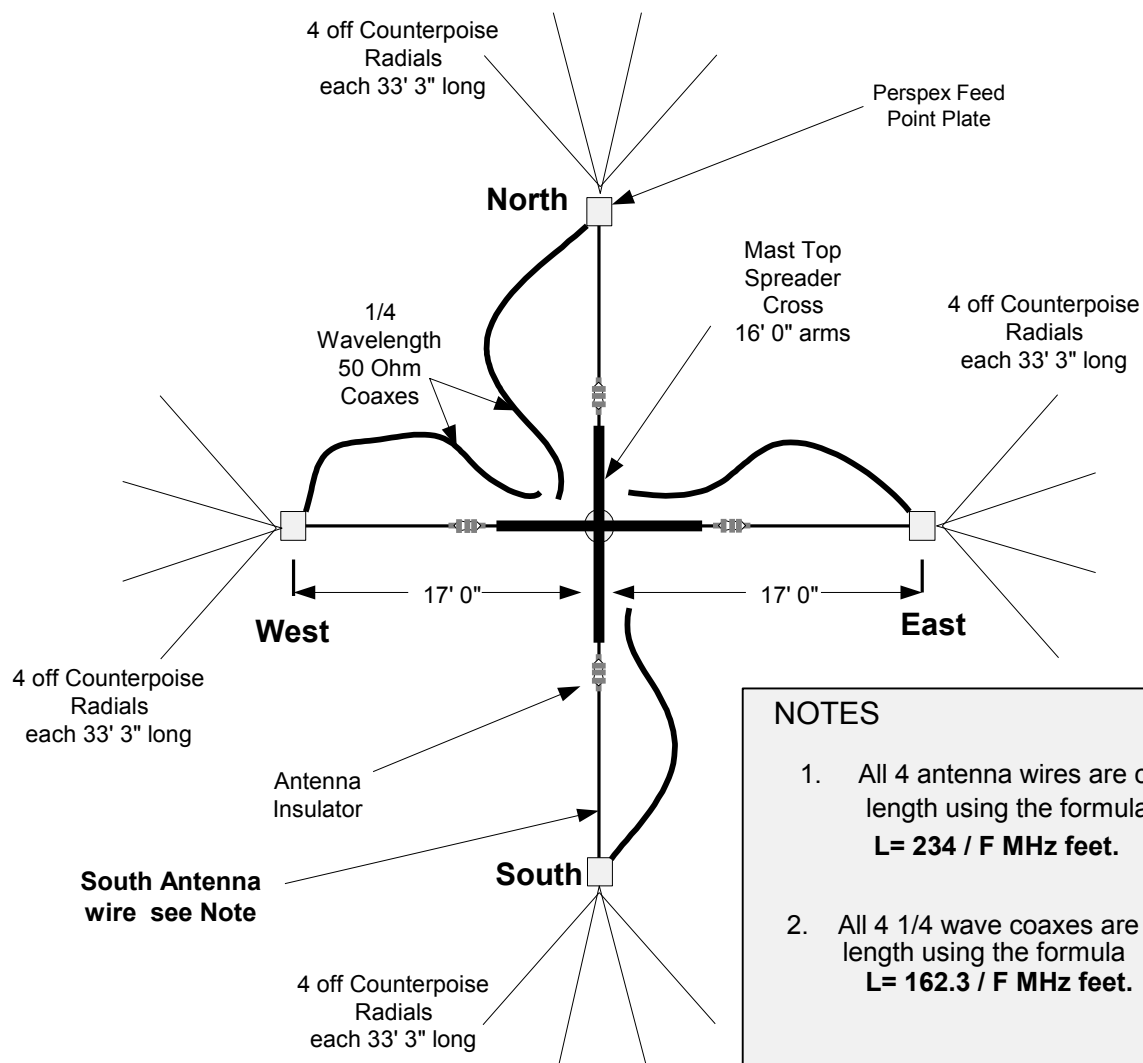
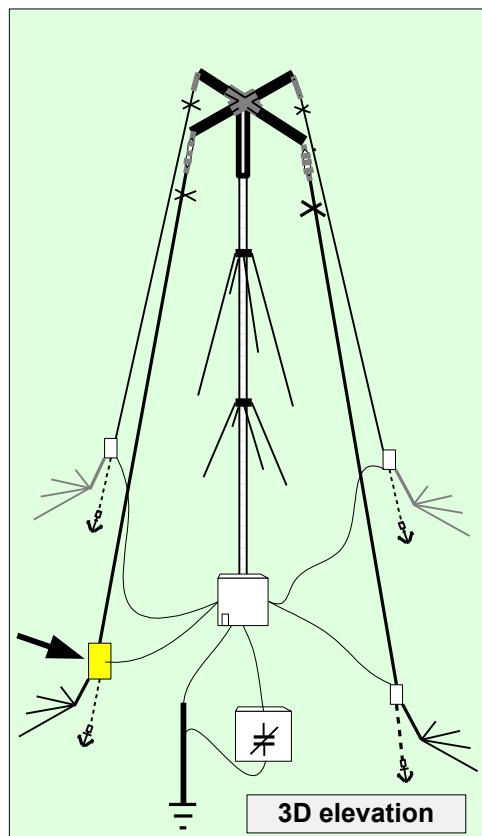
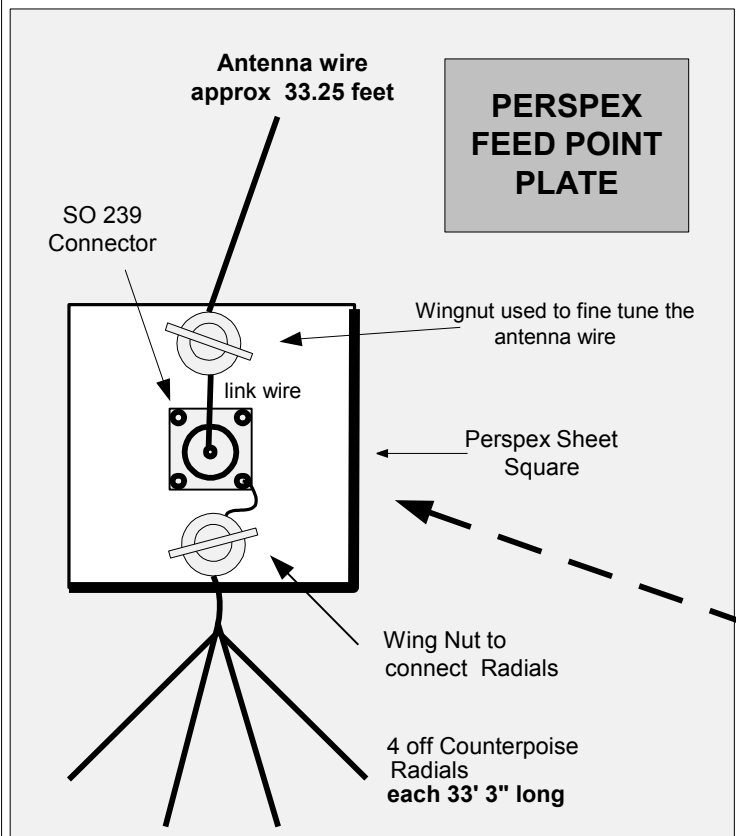
The antenna has been in use for a number of years, and regularly works amateur radio stations in Japan over the North Pole, Nova Scotia, Alberta, Mexico, Cuba, Uruguay, Columbia, Nigeria, Chad, Perth, and other VK & ZL stations on the short path. It produces excellent 5/9 Reports even during the Sun spot minimum. Furthermore the antenna has stood up well to high winds.

Front to Back Gain = 25/30dB Forward Gain = 5dB	1/4 Wave Length (Feet) = 234 / F MHz
Vertical Polarised Mono-Band	6.900 MHz = 33 ft - 11 ins
Power handling = 1Kw + SWR & Bandwidth 1.5:1 & 700 KHz SWR 1:1 at centre frequency	6.950 MHz = 33ft - 7.0 ins
No Antenna Matching Unit Required No rotator required Direction change immediate	7.000 MHz = 33 ft - 5.5 ins
Low wind resistance	7.050 MHz = 33 ft - 2.5 ins
Scalable for any HF-Band limited only by the space you have	7.100 MHz = 32 ft - 11.5 ins
	7.150 MHz = 32 ft - 9.0 ins
	7.200 MHz = 32 ft - 6.0 ins
	7.250 MHz = 32 ft - 3.0 ins

FINAL VSWR READINGS AFTER TUNING ALL THE ANTENNA ELEMENTS

	SWR	SWR	SWR	SWR	
Frequency	NORTH	EAST	SOUTH	WEST	Adjustment Reqd.
6.900	1.2 :1	1.15 :1	1.1:1	1.15:1	
6.905	1.15 :1	1 .1 :1	1:1	1.1:1	
7.000	1.1 :1	1:1	1:1	1.1 :1	
7.050	1.25 :1	1:1	1.1:1	1.1:1	
7.100	1.2 :1	1.17:1	1.2:1	1.1:1	
7.150	1.25 :1	1.2 :1	1.2:1	1.15:1	
7.200	1.3 :1	1.25:1	1.25:1	1.17:1	
7.250	1.3 :1	1.3:1	1.3:1	1.2:1	
7.300	1.3 :1	1.3:1	1.3:1	1.27:1	
	F-Res 7.000	F-Res 7.000	F-Res 6.975	F-Res 7.000	

EA5AVL 4-Square 40m Antenna - Plan View



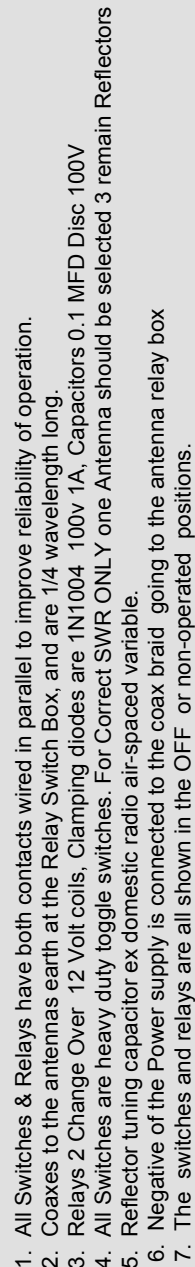
NOTES

1. All 4 antenna wires are cut to length using the formula
 $L = 234 / F \text{ MHz feet.}$
2. All 4 1/4 wave coaxes are cut to length using the formula
 $L = 162.3 / F \text{ MHz feet.}$

Total wire = 665 Ft or 202 metres

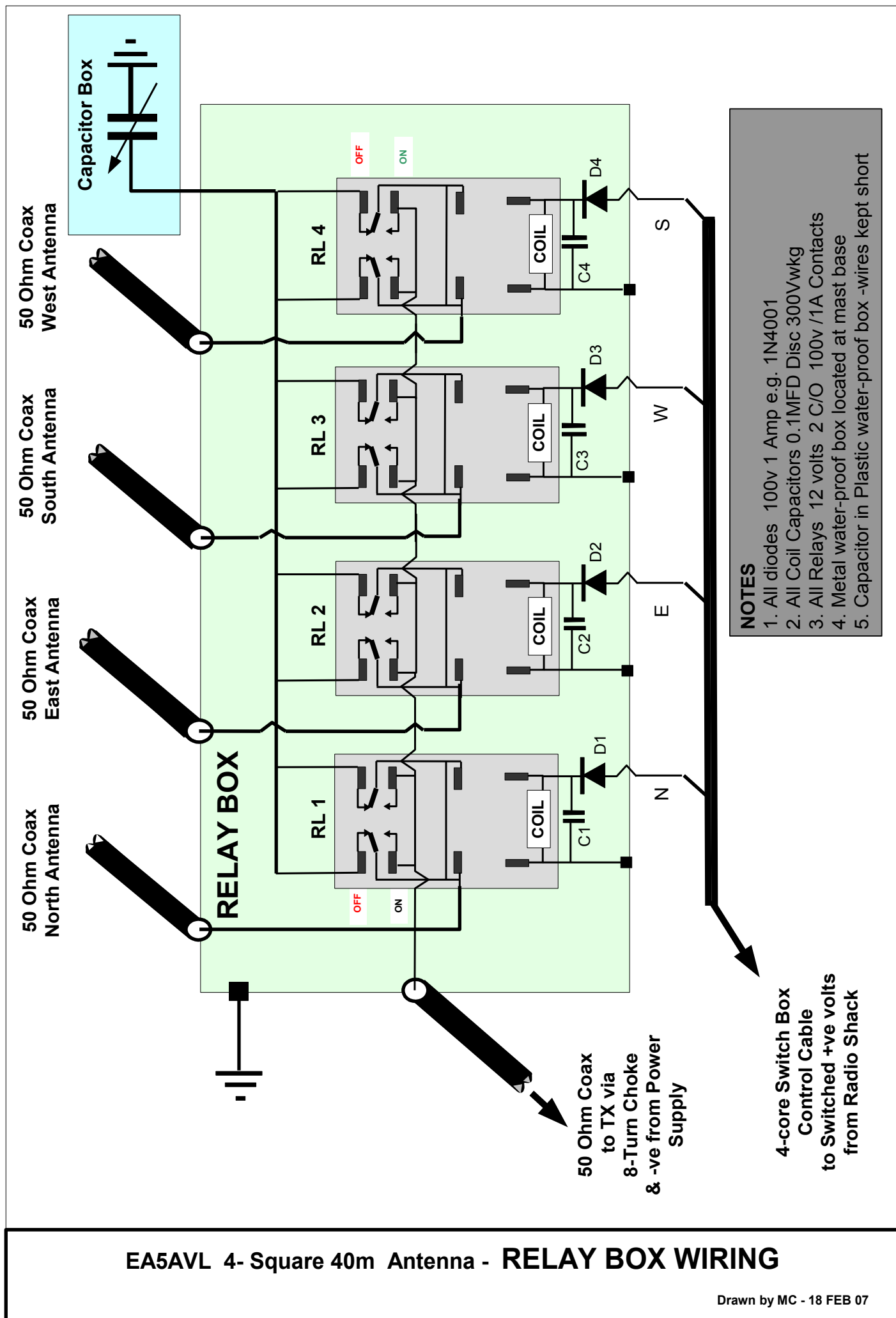
PLAN VIEW OF ANTENNA SITE

Drawn by MC - 18 Feb08



NOTES

1. All Switches & Relays have both contacts wired in parallel to improve reliability of operation.
2. Coaxes to the antennas earth at the Relay Switch Box, and are 1/4 wavelength long.
3. Relays 2 Change Over 12 Volt coils, Clamping diodes are 1N1004 100v 1A, Capacitors 0.1 MFD Disc 100V
4. All Switches are heavy duty toggle switches. For Correct SWR ONLY one Antenna should be selected 3 remain Reflectors
5. Reflector tuning capacitor ex domestic radio air-spaced variable.
6. Negative of the Power supply is connected to the coax braid going to the antenna relay box
7. The switches and relays are all shown in the OFF or non-operated positions.

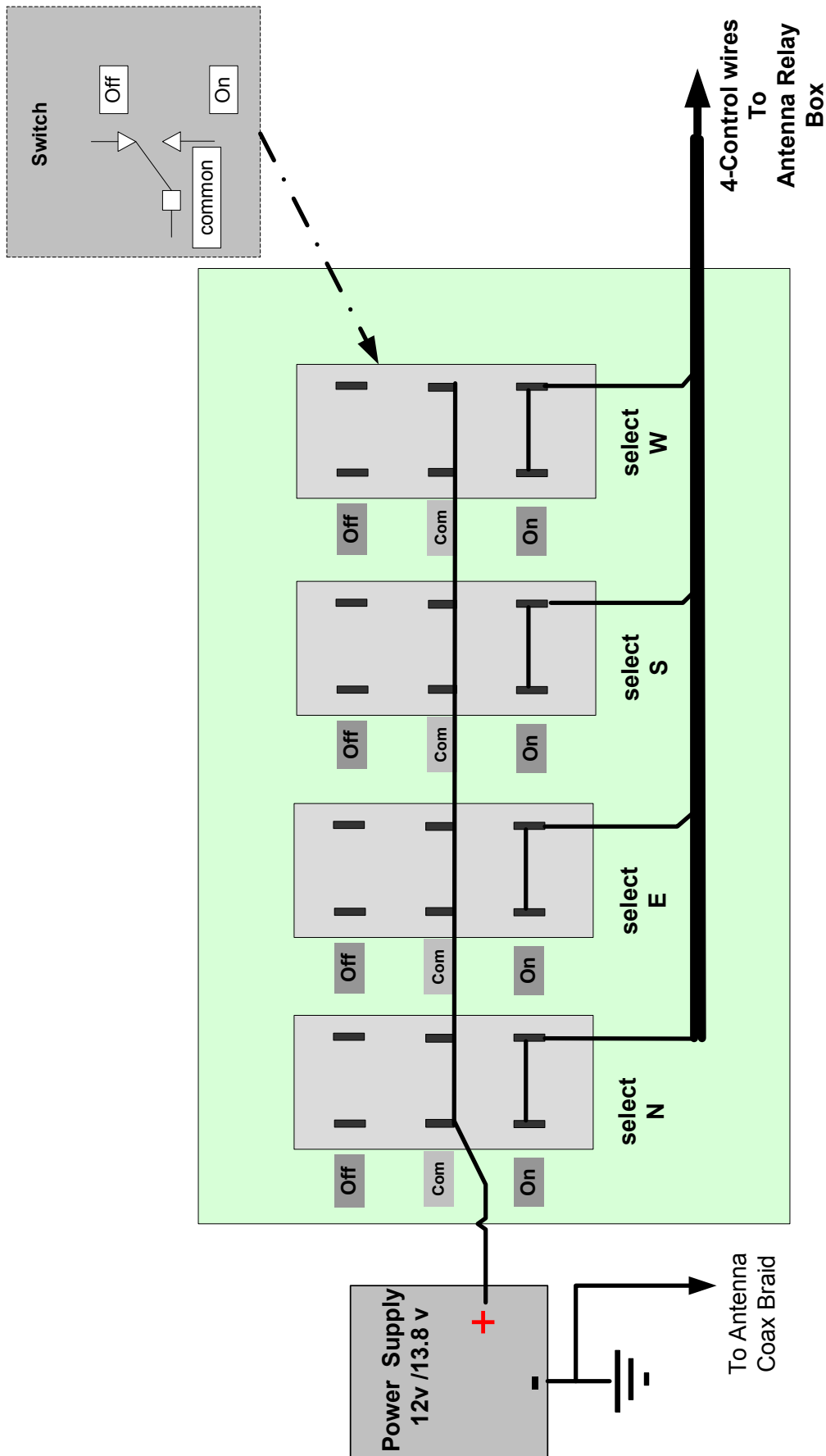


EA5AVL 4- Square 40m Antenna - RELAY BOX WIRING

Drawn by MC - 18 FEB 07

EA5AVL 4-Square 40m Antenna - SWITCH BOX WIRING

Drawn by MC - 18 FEB 07



NOTES

1. Switches are heavy duty DPDT (Double Pole Double Throw) i.e 2 x CHANGE-OVER
2. Make contacts are wired in parallel for reliability. These are rated at 10-15 Amps DC
3. For correct operation ONLY one switch is operated to the "ON" position at any one time.
4. Case for the switches can be plastic or metal.
5. A terminal is provided to connect the +ve of the power supply to the Switch-Box. The -ve of the power supply connects to the coax braid connecting the antenna. This is to prevent an earth loop being created .

EA5AVL COMPACT 4-SQUARE ANTENNA NOTES

1. Antenna wires are plastic coated single core, and shorter than normal due to Inter-capacitive effects between the other elements of the antenna etc.

Also plastic coated wire will further reduce the calculated lengths slightly. The 40 metre version described here uses 665 feet or approximately 202 metres of insulated wire.

The Ground wires are also single core plastic coated wire.

2. The antenna tuning will alter by 100 KHz for a change of 6 inches (15cm) in length

Add more wire to LOWER the antenna frequency
Remove some wire to INCREASE the frequency

REMEMBER it is easier to remove than add wire to an antenna.

Match the 50 Ohm coaxial cable power rating & insulator size to the power levels Of the transmitter to be used, i.e. RG-8X for power levels up to 400watts and RG213 over 400watts.

3. All guy ropes should be made of nylon or polypropylene so that the antenna tuning is not affected. The Tension for supporting the mast is in the guys not the antenna wires
5. The spreader Cross arms at the top of the mast are made from aluminium alloy tubing & wooden broom handles, and designed to rotate horizontally.
6. The cross arms at the top of the antenna swivel so that any compass direction can be set to suit personal DX requirements
7. The mast is 36ft tall (11m) and should be made of a non-electrically conducting material such as wood, but if a metal Mast is used, then it should be insulated from ground and be a non-resonant length.
8. The antenna feed point plates (antenna wire length adjusters) are made from 0.25 inch (6mm) thick Perspex sheet, but other plastics can be used. Black plastic is not recommended as this is loaded with carbon particles and will eventually break down and conduct.
9. The Reflector Tuning capacitor is a large air spaced version, 250 pF+250 pF wired in parallel Measured as
10. The copper earth rods are 1.5 metres long and should be sited close to the antenna base and the Relay Box and the plastic Capacitor Box

TUNING THE EA5AVL COMPACT 4-SQUARE ANTENNA

1. The four wire vertical elements must be tuned to within a few hertz of each using an MFJ antenna analyser or by ensuring the SWR is the same for each wire.
2. The top cross arms are 16 feet long (4.9m) or 1/8 wavelength and the bottom spacing is 34 feet (10.4m) or (1/4 wavelength)
3. The variable 500 pF capacitor tunes the reflectors . The tuning is quite sharp and noticeable when listening to the transceivers via headphones extended to the antenna base by the antenna. This is very important if best performance of the antenna is to be achieved.
4. Four identical lengths of 1/4 wavelength 50 Ohm coaxes from the Relay Box to the Perspex plate feed points.

METHOD OF TUNING

5. Having erected the 4-wire antenna, tune each vertical element to the required frequency i.e. 7.050 kHz for the UK where as 7.100 KHz for the USA, by using the wing nuts at the bottom to shorten each wire make the adjustments.
6. An antenna analyser or SWR meter has to be used. The 500pF capacitor should be set to 3/4 meshed before adjusting any wire lengths. (approx 350-400pf)
Do not alter until later !

TUNING THE ANTENNA - REFLECTORS

7. An MFJ-259B (or any similar RF Signal Device) with a short vertical antenna to radiate a low power RF signal is placed at least 100 feet (33m) away from the antenna.
8. Use a long cable to extend a pair of headphones from the transceiver to the capacitor box at the antenna mast base.
9. At the shack set the receiver to the signal frequency and select CW with a fast AGC setting.
10. Using the 4 -way Control Switch Box, to select the antenna element which is farthest away from the MFJ signal source, and adjust the receiver for an S7 signal. If the reading is steady, connect a long extension cable with some earphones and listen to the signal next to the capacitor box.
11. Ignore any static or other stray signals or noises. Use the 500pF capacitor to tune for a NULL signal in the earphones. This will be quite noticeable, and the receiver should then be showing a smaller reading, S1 or S2.
12. Tuning the variable capacitor for one compass direction will automatically tune the other directions.

ALTERNATE METHOD OF TUNING THE ANTENNA

- 13 Listen to ARRL CW practice transmission, weekdays,
W1AW, USA transmissions on 7045.50 KHz between 2300-0100Z.

Use the same procedure as in “5-12” above; again using the capacitor for a NULL.

14. There is also an Canadian SSB Net ,
transmissions on 7.063 KHz daily between 2300-2400Z

The Net is called “The Sand Box Net” – listen out for the net controller and only use his signal – ignore any other signals.

15. Performing the reflector tuning during darkness is probably best
i.e. During “DX time” when there is less local noise and the occasional nut case!

N.B. The EA5AVL Compact 4 –Square antenna is intended for DX working and is not suited for short haul communications i.e. around UK.

With patience and attention to detail you will be pleased with the results.

Les EA5AVL RSARS 506

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ANSWERS TO FREQUENTLY ASKED QUESTIONS:-

(Updated May 2008)

A1. My name is **Les EA5AVL/G3WMZ, (RSARS Member 506)** I have been a "ham" for 46 years, and served with the British Army Royal Corps of Signals Radio for 22 years, then 12 years with PHILIPS TELECOM as a Telecoms, radio and data engineer. I moved out to Spain 16 years ago, got married to a lovely lady and love it and off course the radio. I am now at the tender age of 74.

A2. The 4 Square. I put it up 3 years ago and it is used on 40 meters almost every night for 4 hrs plus, all component parts are the same as they were when first erected no problem with relays, switches, etc., it has withstood gale force winds of the last 3 winters with no damage, the wire elements have stretched a little and now need slight attention.

A3. My central support is 36ft tall and is insulated at the base on a "CHAMPAGNE" bottle. The aluminium mast and spreaders only act as a supporting structure.

A4. The coax feed points on each element are 5 - 6ft above ground, the slopping wires are adjusted on the top wing nut off the plastic connection plate, to resonance.

A5. Measuring the 500Pf variable tuning capacitor on the MFJ 259B measured 380Pf for capacitor 3/4 meshed when tuned.

A6. RG213U coax is used throughout the system.

A7. The 4 slopping wire elements were not measured, but are shorter than the expected 33ft 2ins due to :
(a) plastic coating (b) capacity hats (c) mutual coupling.

A8. Recent VSWR plot (March 2008) shows that the wires have stretched a little over the 3 years, even so, the frequency of the 4 wires was within 8.0 KHz of each other.

Resonant frequency = 6.930 SWR measured as 1 to 1

Bandwidth from resonant frequency = 1.18 MHz @ SWR 2 to 1 Points , 994Khz @ SWR 1.6 to 1, 600Khz @ SWR 1.3 to 1

On the MFJ gave the following readings appeared at: 6.930 SWR = 1.1 R44 - X 2 - coax loss 9db

These measurements were taken on the shack end of the feeder 50ohm coax cable, so one can see it is not a narrow HI Q system, however 30db plus front to back is obtained from at least 7megs to 7.150megs, my operating range.

A9. EA5AVL Stations is located 25 miles west of Alicante & operates on CW & SSB modes using ICOM PRO3 + Kenwood TL922AMP at 500 Watts

A10 Stations worked SSB last 2 wks March-April 2008 ... during Low Sunspot activity

March 15 PY4 - PY2 - TI2 - 6W1,
" 19 UN7
" 25 ZS1 - VK7 - JA5 - VR10 - VK6 - YB0
" 27 D44 - VE3 - HK1
" 29 K3 - NE1 - KY1 - KD4

March 17 VA3 - VE3 - NA4
" 20 W4 - AA4 - KB8 - 5T5 - VQ9
" 26 V01 - FG - VE1
" 28 NC1 - NQ4 - VA2 - KP2 - 8P9
" 31 9K2

April 1 C08 - VK7
" 6 VP2 - PY1

April 3 7X5
7 W1 - N5 - K4 - K3.

Lowest report 5 and 7 **Highest** report 5 and 9 + 20, **Farthest north** = Iceland and Japan over North Pole , **Farthest east** = YB0 VK6 VK7, **Farthest south** = Antarctica ZS1, **Farthest west** = XE1 CE.

Best wishes from 25 miles west of Alicante Spain

Les EA5AVL/G3WMZ and Alexia (the computer slave)



EA5AVL Compact 4-SQUARE 40m ANTENNA



EA5AVL Compact 4-SQUARE 40m ANTENNA