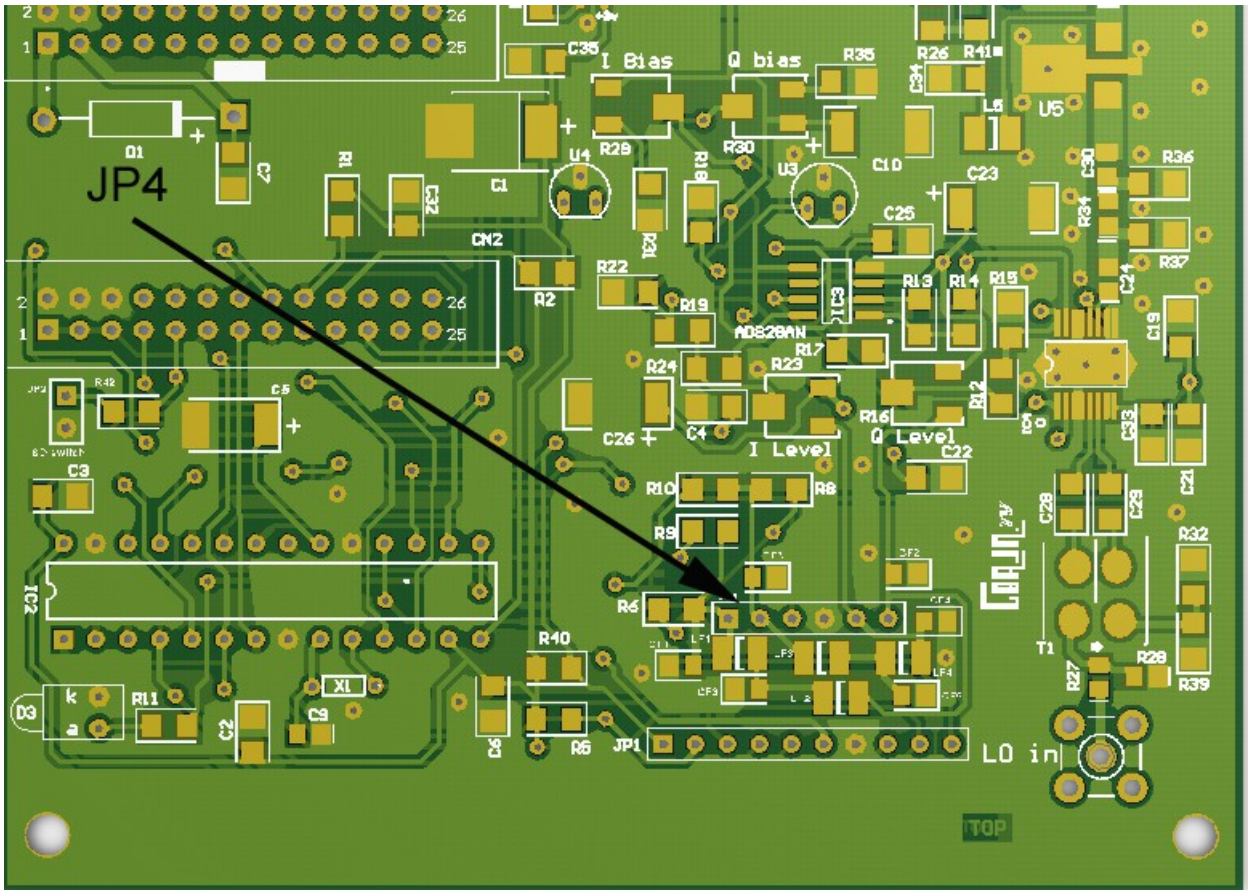
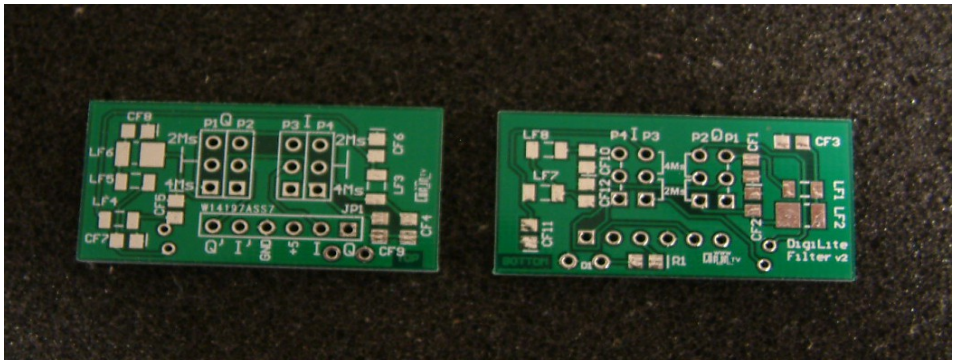
Dual Filter Board for DigiLite 5.9 by Dave Kenward G8AJN

The 6 way header JP4 on the DigiLite board is intended to allow the quick changing of Nyquist filters to suit different data rates. This tiny pcb allows a quick change of symbol rate and allows for either a single Ms/s option or for a switchable dual choice, for example 4Ms/s and 2Ms/s. Located near JP1 on the main DigiLite board the socket was included to allow for this sub-panel to be employed

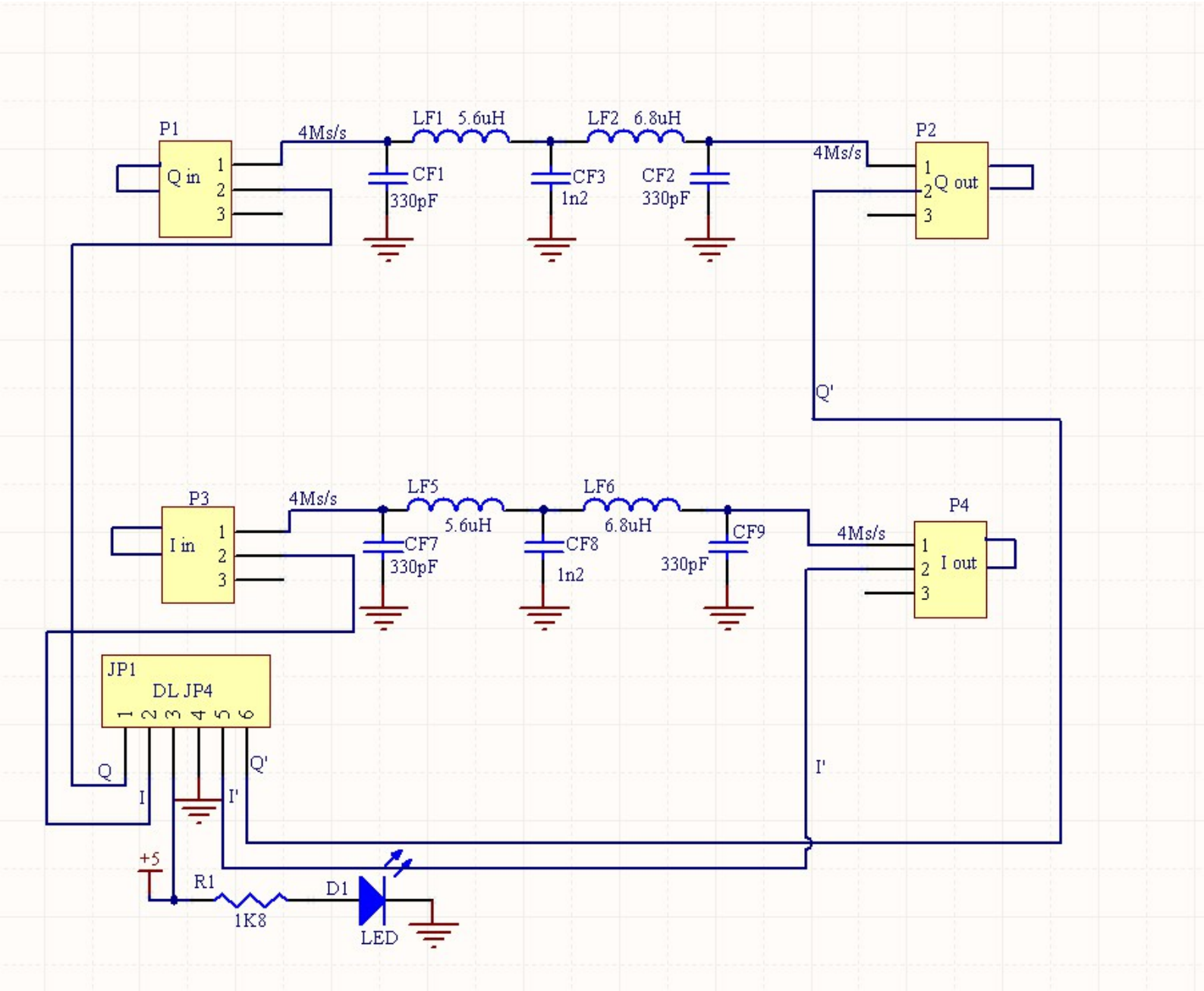


The selection can be either by moveable links like the ones used on a computer motherboard or can be run out onto a four-way two-pole switch on a front panel. At the low cost of these boards it is tempting to use one pcb per Ms/s option and simply plug them in as required. In this case the links can be permanently wired. This option is not ideal however if the equipment is mounted inside a box.

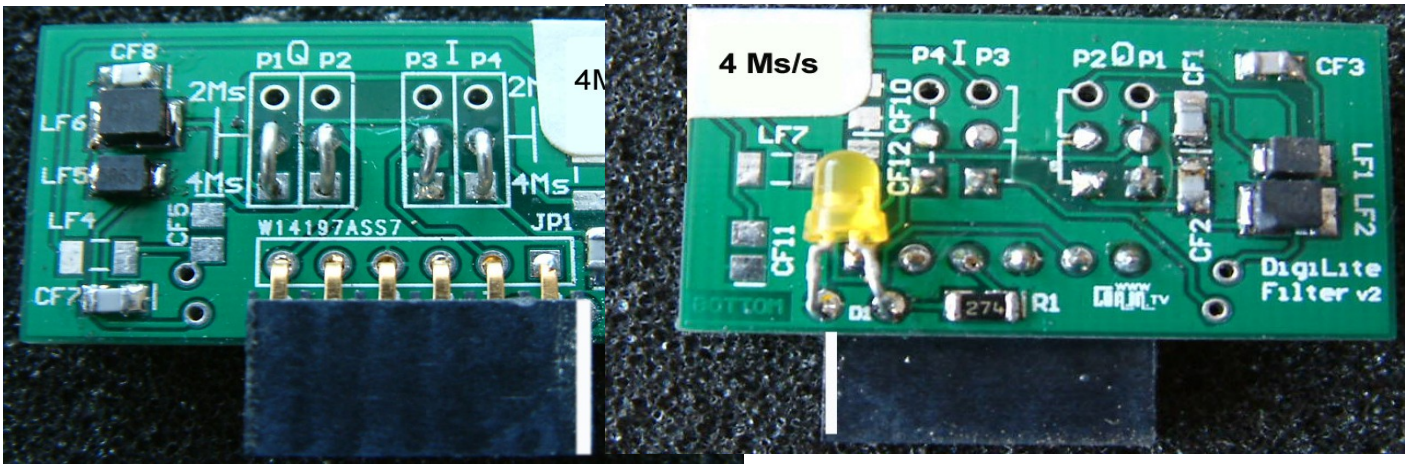


Top and Bottom views of the bare Filter board.

If you are using a boxed version a four pole two-way toggle or rotary style switch can be used. Two adjacently mounted 2 pole switches could perhaps be used, one for I and one for Q switching, keeping the cost down.



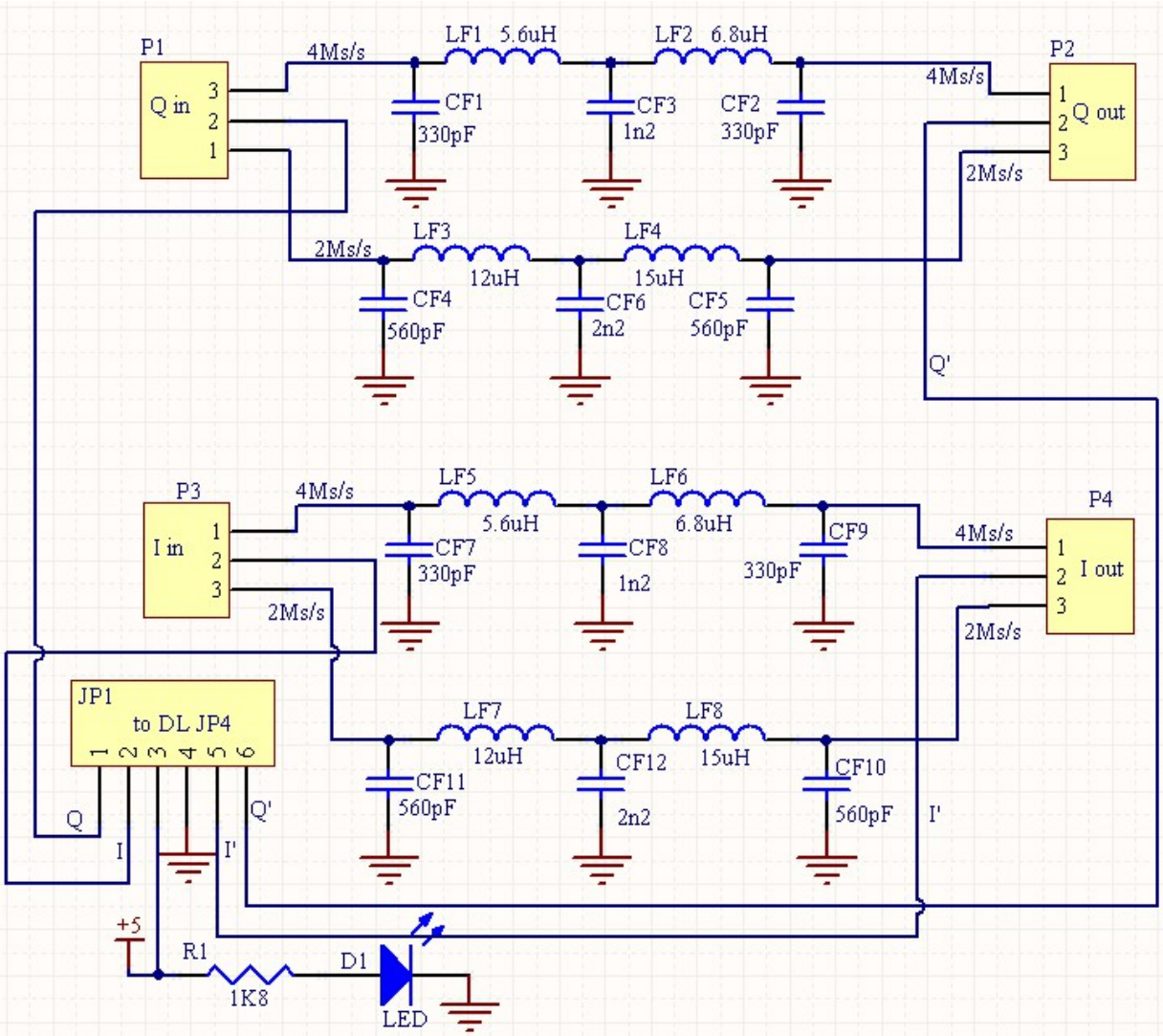
The circuit of the SINGLE symbol Rate board.



Both sides of a filter board wired for a single symbol rate.

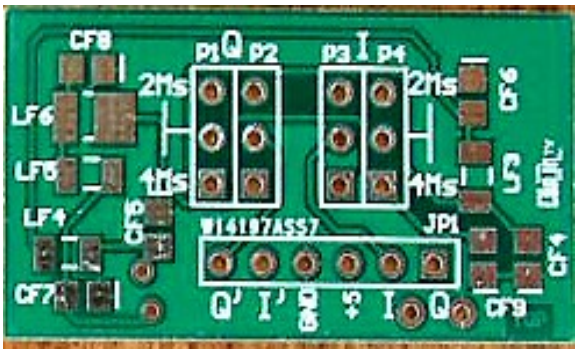
The difference between the various versions is only in the actual component values, the circuit does not change. The circuit of the single symbol rate is the same as the that used on the DigiLite board. If you choose to use one individual pcb for each data rate. a colour coded dot on the corner of each panel could indicate quickly for which symbol rate it is intended to be used, Yellow for 4Ms/s , Red for 2Ms/s and Brown for 1Ms/s. In the single option you can hard-wire the links on the filter board.

In order to offer two options on the same pcb the following circuit is used...



The circuit of the DUAL symbol rate board.

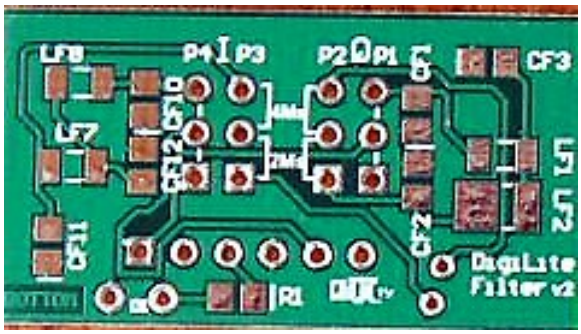
The values shown in this circuit are for 4Ms/s and 2Ms/s.



Top view 18mm x 35mm

If you have already fitted JP4 header on to your DigiLite board you will need to find

a suitable connector to fit to the Filter Board that will connect to JP4. As there is a chance that you have already fitted JP4 as a reversible header I have allowed for the optional fitting of a small LED to indicate correct orientation of the sub-panel. Incorrect fitting of the filter board will not do any harm but you will get no modulation and so the LED is there to show that you have fitted the filter board correctly. If you have used a polarised header then the LED is not required.



Bottom view

Here is a table of the different values needed if using a <u>SINGLE PCB</u> for each symbol rate.

	Values for 4Ms/s	Values for 2Ms/s	Values for 1Ms/s
LF1	5.6uH	12uH	27uH
LF2	6.8uH	15uH	33uH
LF5	5.6uH	12uH	27uH
LF6	6.8uH	15uH	33uH
CF1	330pF	560pF	1n2pF
CF2	330pF	560pF	1n2pF
CF3	1n2pF	2n2pF	3n9pF
CF7	330pF	560pF	1n2pF
CF8	1n2pF	2n2pF	3n9pF
CF9	330pF	560pF	1n2pF

Here is a table for DUAL 4Ms/s and 2Ms/s on the same board.

LF1	5.6uH	CF1	330pF
LF2	6.8uH	CF2	330pF

LF3	12uH	CF3	1n2pF
LF4	15uH	CF4	560pF
LF5	5.6uH	CF5	560pF
LF6	6.8uH	CF6	2n2pF
LF7	12uH	CF7	330pF
LF8	15uH	CF8	1n2pF
		CF9	330pF
		CF10	560pF
		CF11	560pF
		CF12	2n2pF

The pin spacing on the 6 way header JP4 is the usual 2.54mm (0.1”) and ideally it should be a shrouded or polarised type to ensure correct fitting. The 'plug' on the filter board can be a right-angle type to allow the board to lay flat over the DigiLite board, or a straight plug to let the filter board sit up vertically. As it is only 18mm tall it should not present a space problem in most builds.
As with all my articles I have had some professionally manufactured PCBs produced and they are available from my website, along with a number of more hard-to-find components. However the layout is not critical and veroboard or home-etched boards should work fine. Keep any wires to panel switches as short as possible .
If you have already made the DigiLite 5.9 and have fitted the inductors and capacitors onto the main pcb they will need to be removed if you wish to use the plug-in filter board. The SMD inductors should be re-useable on the filter board, always assuming you do not destroy them in the removal process!
As the values are fixed there is no set-up needed but do use the best quality lowest tolerance capacitors possible, 5% or better is good, never mix types, the balance of I and Q could be upset and affect the digital modulation waveform.

CONSTRUCTION NOTES:
The 6 way connector JP1 should be selected carefully to fit the type of header(socket) JP4 on the DigiLite main board. It can be fitted to either side of the filter board, note that pin 1 is the square solder pad.
The I and Q links can also be mounted on either side of the filter board as desired, depending mainly on the orientation of the JP1/PL4 connector. Take a careful look at which side the links will be best before soldering up. All vias are through-hole plated so they can be soldered on only one side satisfactorily.
If you are intending to use the optional LED make sure that the JP1 connector is fitted before the LED as it may be difficult to fit JP1 flat afterwards.
It would also be possible to permanently mount the filter board using hard-wired links to the main DigiLite board instead of connectors.

BILL OF MATERIALS:

There may be other suppliers but these are the ones I have found and used for initial tests. Some of the inductors are becoming difficult to find except in large quantities. I plan to hold a small stock of inductors and perhaps a kit of

inductors for 4Ms/s and 2Ms/s. See my website for details.

F = Farnell R = RS Components M = Mouser CPC = CPC.Farnell.com

LF1,LF5	5.6uH 1008		F 2455259
LF2,LF6	6.8uH 1210		M 70-ISC1210ER6R8K
LF3,LF7	12uH 1008		F 2455241
LF4,LF8	15uH 1008.		F 2455242
CF1,CF2,CF7,CF9	330pF 0805		F 2332768 R 464-6616
CF3,CF8	1n2pF 0805		R 741-4554
CF4,CF5,CF10,CF11	560pF 0805		R 723-6316
CF6,CF12	2n2pF 0805		R 766-1043
R1 (to suit LED used)	1k8 to 2k7 0805	Optional	
D1 (optional)	Miniature LED	Optional	Miniature wired or SMD
10 way header strip (x5)	Snap for 3 pins	Links	R 673-7486
JP1 6 way Socket	MOLEX 4455	Various	F 9731296 (or Right Angle: F 1668357)
2 Way 4Pole Switch	Multicomp	Optional	CPC: SW02871

Check for any mods and updates on my website www.G8AJN.tv before commencing construction (see PROJECTS page and STORE page).