STARLITE

The Award Winning Newsletter for Members and Friends of

G6OI
1938

Stourbridge and District Amateur Radio Society

G6SRS
1938

incorporating

Old Swinford Hospital School Radio Club

G4CVK

1969

ISSUE 06/2015

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MEETINGS

Visitors always welcome
The Society holds its full meetings on the
1st and 3rd Monday of each month at

Old Swinford Hospital School
Heath Lane
Stourbridge
(8.00pm – 10.00pm)

Additionally the shack is open during the same times on the intermediate Mondays

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EDITORIAL

We are again grateful this month for an article on Power Supplies from Geoff (G0KVK).

Adrian (G0NLA) Starlite Editor

MESSAGE FROM THE PRESIDENT

Highlights of recent committee meeting:-

From matters arising at AGM:- Further work to be undertaken in valuation of medallion. Cost of £2 to non members for attendance at main meetings*. Further £500 to be invested in Premium bonds.

Dates arranged for further shack work, outside aerial box connection, roof visit.
Possible trips to Bridge Radio, Bletchley Park and Ambulance call centre HQ.
As always ideas and people to give talks, slots available are October & January for this Society year.

3 possible people wish to retake foundation, suggested dates TBC 22nd and 29th June with Exam 6th July.

It was agreed that Dr Alan be given the honour of life membership of the society, certificate to be produced for Alan and also Doug G4FYQ.

Discussion took place about a club construction project, also what is involved with running the intermediate course. Further research to be undertaken.

Once the shack is fully up and running it was agreed to push (again) to making the first meeting of the month a proper on-air night with the rigs in use.

Since the committee meeting...

*comments have been received from an ex member of the society regarding the £2 for attending main meetings for non-members. This will be mentioned at the next committee meeting – June 8th. If you have any comments then please pass them on to Hon Sec John.

Certificate of life membership has been presented to Dr Alan at recent club night. One also produced for Doug G4FYQ.
Wayne had a large turn-out for his talk on software radio (on the cheap)

Congratulations to Mark for passing his intermediate and full licence, his new call sign is to be confirmed.

It is with regret that Peter M6ZXH has decided to step down from the committee.

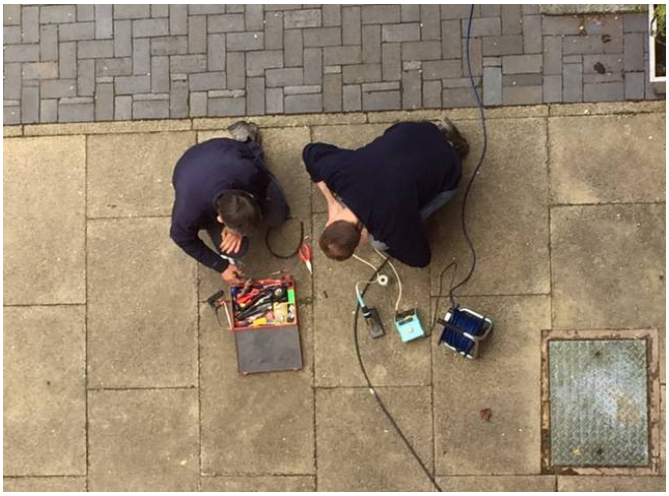
AERIAL ROOF WORK

Thanks to those who attended the aerial roof work on Saturday, despite the pouring rain Friday, Saturday the Sun was out.

Instead of remounting the existing 2m co-linear a new dual band co-liner donated by Adrian was

installed. A new PL259 plug had to be soldered onto the coax as the previous one had been ripped off when the previous aerial came adrift!

Thanks to Keith for arranging the supply of the ladders.



Top Left - The aerial site

Above Left - Tim and Adrian fixing the new plug

Top Right - James and Jeff making the initial inspection

Left - Geoff fitting the new 2/70 collinear

Right - The new 2/70 collinear installed

James French (G7HEZ) President

SEEN ON THE INTERNET

Graphene

Jim has passed on a URL from his Australian contacts on graphene and its use in radio.

To give you a brief introduction to the article, graphene is a form of carbon. Some atomic elements can exist in several different physical forms and a particular example of this behaviour is the element carbon. Other more familiar forms of carbon are soot which is the powder form (amorphous) and diamond which is a crystalline form and graphite as found in pencil leads. Graphene is another form made up of carbon, but in a form that is like a mesh net at an atomic level. Researchers at Manchester University have found ways of increasing the electrical conductivity of graphene by compressing it. It is then possible to incorporate graphene into paint which can then be used to make aerials. The article talks of aerials sprayed on to tee shirts. The article is a little tongue in cheek, but gives an interesting overview of one of the uses of graphene.

Perhaps I am getting a bit cynical in my old age, but I checked the date of the article just to make sure it wasn't dated April the first, but it seems to be genuine.

If you want to see the article take a look at :-

http://www.cnet.com/au/news/that-next-gen-antenna-it-may-be-printed-right-onto-your-shirt/

Eric John Brickstock

15th March 1920 - 27th March 2015

Eric's Father was seriously injured in the great war and was invalided out with a metal plate in his head. His life was however shortened due to his injury and he died when Eric was still young.
Eric however persevered and made a successful career in engineering. He married the love of his life and had two fine sons and a daughter. This was although he had a medical problem with his one foot. During the second world war he was classified as not fit for military service and worked in the "Rover" under Kinver Edge as a tool maker.
He first appears in the Society's lists in 1948 living at 1,Randle Rd Stourbridge without a call sign. In 1950 he had moved to 27,Manor Lane Norton still without a call. The entry in the 1953 list shows that he was now the holder of G3IVQ.
The first entry in his log book shows a QSO at 22.50 on the 2nd May 1953 with G3IYK on 1923 kc/s. Joe Hogg G2OG was also in the QSO. The last entry in Eric's log was at 09.03 on the 5th July 2000 with G3GYZ on 7.056 MHz.
He really enjoyed his membership of the Society and held several of the Society's awards as follows.

1960 The G6OI Junior Trophy

1964 The Alec Higgins G8GF Rose Bowl
1980 The Bristol Trophy
1990 The Bristol Trophy
1991 -1995 The Alec Higgins G8GF Rose Bowl
1998 The Bristol Trophy
2000 The G6OI Senior Trophy

At the height of the Society's involvement in contests Eric was in charge of the erection of the masts and antennas. On one occasion, during the night, he was required to move one of the masts so as to change the direction to enable the operators to get calls that up to then were just off the side of the antennas directivity. This he successfully managed along with his team enabling the Society to increase their score.
His wife died some years ago leaving Eric on his own and failing health, due to his age, gradually curtailed his activities. Following several falls he became resident in Hollycroft Nursing Home where on the 27th March 2015 he shirked off his mortal coil and became a silent key.

Eric was given life membership of the society in February 1997.

R.I.P Eric G3IVQ.

POWER SUPPLIES PART – 3

Forward

This is the first of several articles about power supplies. This month we look at switched mode power supplies. The article is adapted from lecture notes supplied by Geoff G0KVK. The course was for City and Guilds.

Switched Mode Power Supplies (SMPS)

This type of supply has been used for some time in the TV and computer fields; the basic principle is shown in figure 1 and the block diagram format in figure 3. Look first at figure 1.

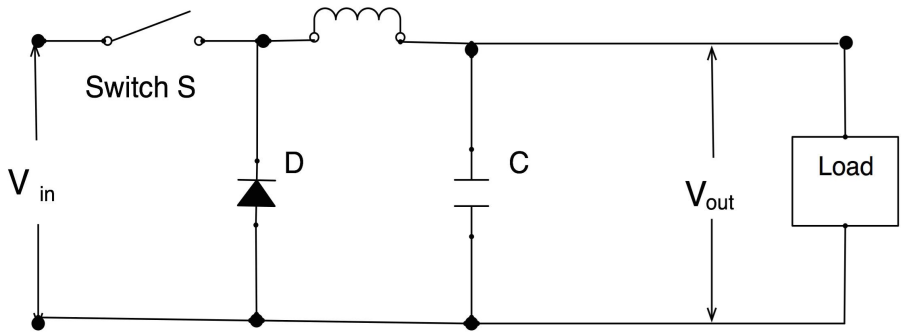


Figure 1.

When the switch S is closed, current flows through the inductor L to power the load and charge the capacitor C. When the switch S opens, the magnetic field that has built up in L now collapses, which causes an emf in L which tries to keep the current flowing. This 'back-emf' is able to flow through the diode D1 and, since current can still flow through the load, the capacitor voltage falls. Because the diode helps to keep current flowing through the load it is often called a 'flywheel diode'. If now S is closed again the capacitor recharges. Obviously in a practical circuit the switch function is carried out by either a transistor arrangement or an integrated circuit.
When a transistor or integrated circuit switch is used, then figure 2 represents a typical switching waveform, and the resulting output voltage.

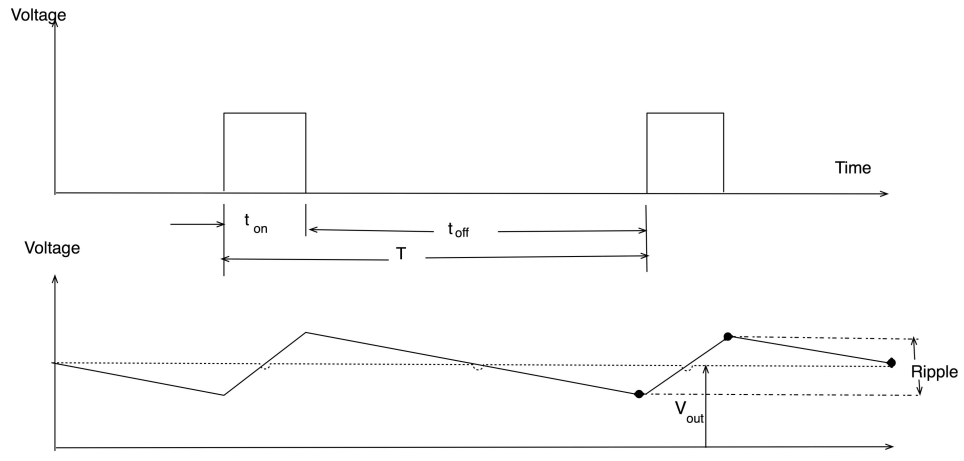


Figure 2.

With this circuit increasing the 'on-period' will increase Vout, whose average level is given by the

equation:- $V_{output} = \frac{V_{input} \times t_{on}}{T}$

So by changing the mark-space ratio, which increases the on-time relative to the total periodic time, we can control the output. Any unwanted ripple is filtered in the usual way.
Turning now to figure 3, we have the 50Hz mains feeding into a half-wave rectifier with little smoothing, the output being a series of 50Hz ripple pulses. This is then switched or 'chopped' at a high frequency. The switching may be done by a transistor and, in TV, it is usual to have a switching rate of 15.625kHz which is the line frequency (the frequency at which electrons move across the face of the tube horizontally). For industrial applications a frequency of 20 to 25kHz is more common and it may be even as high as 100kHz. The chopped waveform is applied to the primary of a high-frequency transformer utilising a ferrite core for greater efficiency. The secondary output is now rectified and filtered to give the desired d.c. output voltage. This output is then sensed by a control section which compares it to a reference voltage to produce a correction signal which is then used to change the mark-to-space ratio of the switching circuit to compensate for any variation of output voltage. This action is in effect a form of pulse-width-modulation.

The ripple frequency at the input of 50Hz has been converted to a frequency of 20 to 25kHz at the output. Hence the ripple frequency has been increased by a factor of some 400 to 500 times. As a result the smoothing and filter capacitor values can be reduced by the same factor.

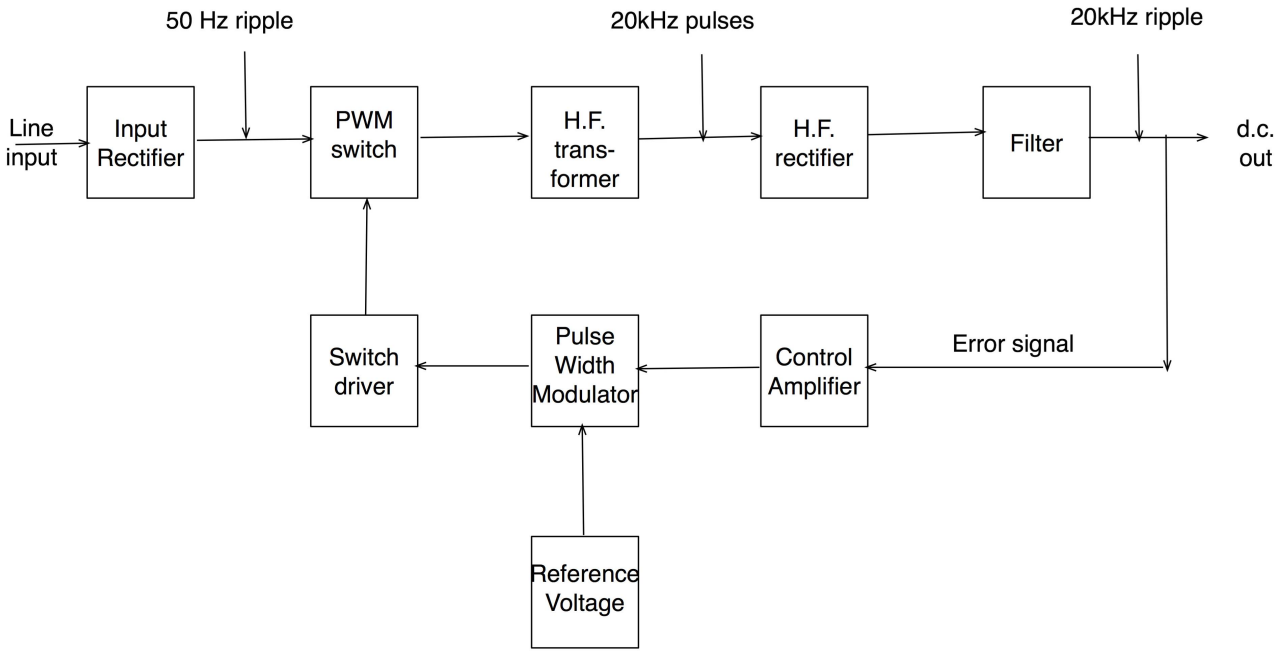


Figure 3.

The SMPS does tend to generate more radiated and line conducted noise (interference) than the conventional linear supply. This can be reduced to acceptable levels by using:
Mains intput filters balanced about earth to reject the switching frequency (see figure 4(a) and 4(b).

A suitable filter on the output line.
An electro-static screen between the primary and secondary of the mains transformer. This is often called a 'Faraday screen' and consists of a flat sheet of thin copper plate, soldered, insulated and with a connection to a terminal marked 'screen' or 'SCR' (**no, not that scr**) which is connected to earth during the wiring routine.

Efficient screening of the whole unit by putting it in its own well-earthed enclosure.

With care SMPS efficiencies of 80% are not unusual.

Because they are often part of the an SMPS I have included the skeleton diagrams of two protection circuits in figures 6 and 7 which, in a simpler form, are also used in linear power supplies.
When using mains-powered equipment it is important that the minimum of noise and interference generated should be fed back into the mains. This is particularly important where data-processing is operating in close proximity to high-current industrial equipment. Power supplies of the SMPS type , or any using oscillators in particular, must have their mains inputs well filtered to prevent pollution of the mains supply. Figures 4 (a) and 4 (b) show typical filter circuits and component values.

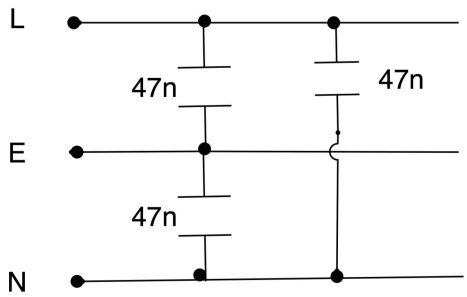


Figure 4(a).

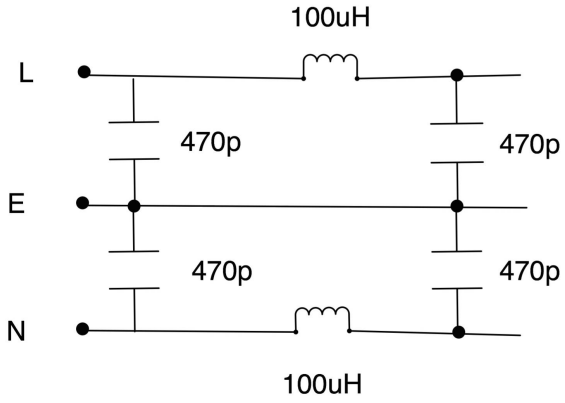


Figure 4(b).

The inductors and capacitors used in these applications should have a working voltage and/or current ratings under fault conditions. Such filters are **low-pass** with very low, if any, attenuation at 50Hz and at least 30dBs over the frequency range of about 100kHz to 50MHz. Data processing equipment is particularly sensitive to mains-borne interference. Data may be corrupted by the high voltage transients produced from inductive loads (e.g. motors) on the mains supplies.

This difficulty is fairly easily solved by wiring a device called a **varistor** across each pair of the mains supply wiring. Varistors are normally made from zinc oxide or silicon oxide, the former having a faster response. A typical characteristic (not too accurately drawn I'm afraid) is shown in figure 5 (a) and its symbol in figure 5(b).

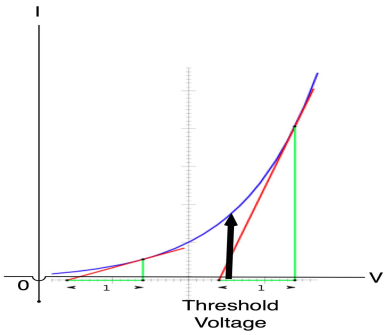


Figure 5 (a)

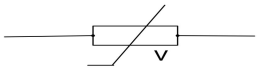


Figure 5 (b)

The varistor has a high resistance below a critical voltage (the threshold voltage) but above this it rapidly conducts to short circuit any large over-voltage condition. The working voltages of these devices, which can be used for both a.c. and d.c. range from around 60V rms up to some 460V rms

(85V to 650V d.c.). They are also often used on the aerial input circuit of car radios to offer some protection to either transistors or ICs from the static voltages which can build up to high levels when passing through a thunderstorm.

Filtered mains power outlets and mains lead plugs, particularly the IEC type, are now available for low power (up to around 2kW) applications. They contain both filters and surge suppressors. They are especially suited to the mains supplies for mini- and micro-computers.

These protection circuits are to give 1) protection against and excessive output voltage the **excess voltage trip (crowbar)** and 2) excess current protection (**dynamic current trip**). It must be stressed these only give an outline of the necessary circuitry and the voltages quoted are typical of those in a computer 15" (38cm) monitor.

Excess voltage trip (crowbar). This is figure 6. D1 is the usual input rectifier, Tr1 is the switching transistor, D2 is a 72-volt Zener diode and Thy 1 and SCR. When the output voltage is at its normal level, say 65 volts, D2 is reverse-based so is non-conducting. There is, then, no voltage across R1 and the gate voltage on Thy1 is zero.
If the output voltage rises above 72 volts , D2 conducts, draws current through R1, and Thy 1 gate voltage rises to trigger it into conducting. Thus a short circuit is applied across the supply input which can either blow a mains input fuse or cause a thermal cut-out to break the circuit. The effect of causing Thy 1 to conduct is therefore akin to placing a very low resistance (the crow-bar) across the supply rails.

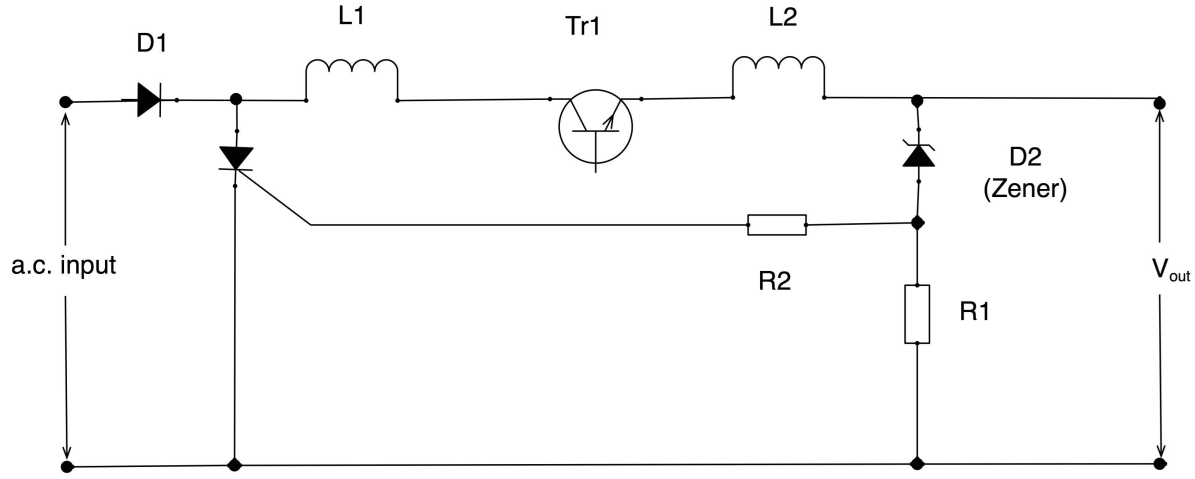


Figure 6.

Excess current protection (dynamic current trip). This is figure 7 which provides the SMPS with protection against excess current demands. L1 offers a high impedance to the switching frequency current and is bypassed by R1 and C1. There is then an a.c. voltage developed across R1 which could cause Thy 1 to conduct if the negative swing exceeds the gate voltage set by R4, R5 and R6. If now under fault conditions, the current drawn from the +65 volt-line rises there would be a corresponding increase in the a.c. voltage across R1. On the negative swing Thy 1 will then be fired, short out the switching pulses, which causes the 65-volt line to fall so that Thy 1 switches off, and becomes a high resistance, so the circuit resets. If the fault persists this process of 'trip and reset' repeats at the switching frequency thus allowing only a limited current drain to occur.

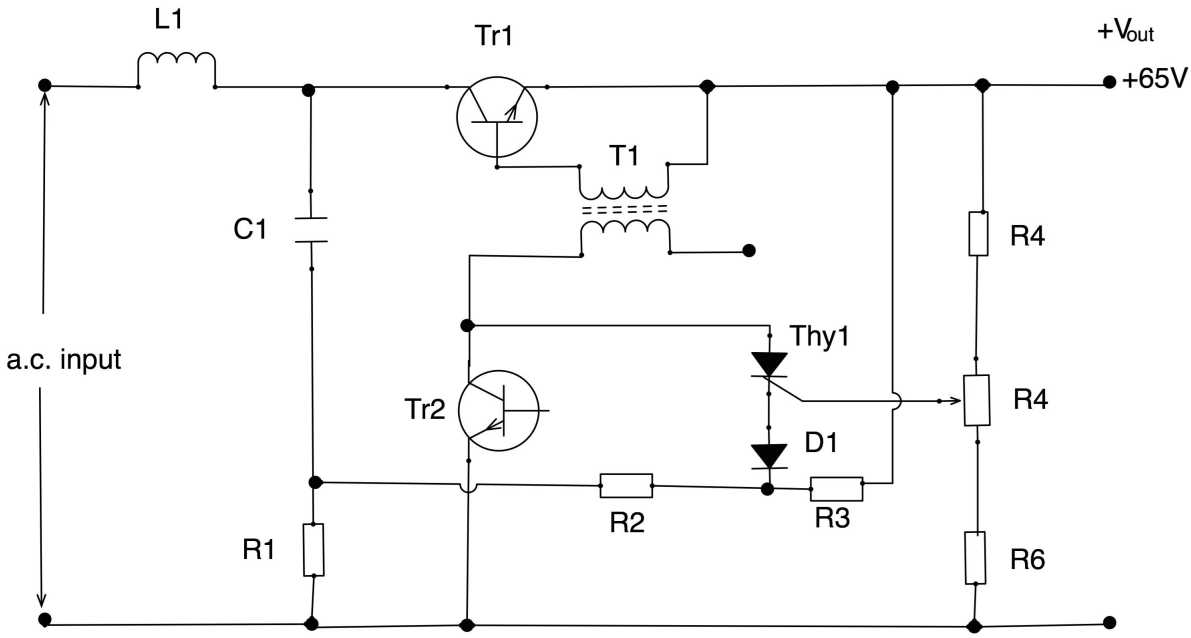


Figure 7.

Many thanks to Geoff G0KVK for allowing use to use his notes. If there are any errors, I have probably introduced them during the transcription of the article.

Adrian (G0NLA) Starlite Editor

For those interested, Starlite is produced using OpenOffice 4.1 running on an Apple Mac mini. Diagrams are produced using ElectricDesign software. OpenOffice runs on Microsoft Windows and files are interchangeable between Apple Mac and Microsoft Windows, but the ElectricDesign software runs on Apple Mac only. OpenOffice software is free courtesy of the Apache Software Foundation

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YOUR COMMITTEE

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	WAYNE	M5LLT	
Starlite Editor	ADRIAN	G0NLA	

CALENDAR OF EVENTS

It should be noted that the Shack will be open every Monday evening unless shown otherwise in the Calendar

June	Mon 8th	Committee Meeting
	Mon 15th	Sheepwalks BBQ
July	Mon 20th	Tim 4x4 Response
August	Mon 17th	No Main Meeting
	Mon 31st	Bank Holiday – No Meeting
September	Mon 14th	Roger G4ROJ . Kite Aerials
October	Mon 19th	Main Meeting TBC
November	Mon 16th	Annual Surplus Sale
December	Mon 7th	December Christmas Gathering
2016		
	Mon 18th	Digital Radio and Repeaters = Phil (G4SPZ)