TDARS
NewsLetter

Issue 228 March 2008

www.TDARS.org

Programme

www.telfordhamfest.co.uk

March 19	**Enginuity Museum Project: Progress reports by Members**
March 26	***Annual General Meeting. Agenda etc. last Newsletter.***
April 2	***Open House / Committee at The Huntsman***
April 8 (Tues)	***Committee only—start of 2008 Telford Hamfest Meetings. The Huntsman 7.30 pm. Note: As previous years—second Tues. each month***
April 9	***2008 Out & About—Come and Find Out ! (poet– don't he know it)***
April 16	***Whaddon Mk7 SAS Paraset. Talk by Tony M0TAW***
April 23	***Getting the Club Projects going—led by Richard G0VXG***
April 30	***Talk on Radio Astronomy—guest speaker (provisional)***
May 7	***Open House & Committee. Club HQ***
May 14	***Ten Minute Technical Talks (by members)***
May 21	***Social Evening with Food ! (TDARS HQ)***
May 22– 27	***N. Wales TDARS mini-expedition. (Caernarfon area) Come when you like!***
May 28	***Bring and Sell Auction with Jim G8UGL***
June 4	***Open House & Committee. The Huntsman venue.***
June 11	***VHF NFD Planning meeting.***
June 14-15	***Museums on the Air Weekend—at Enginuity site.***
June 18	***Local Foxhunt in Little Wenlock. 2 metres. From 7:30pm***

G3ZME Telford & District Amateur Radio Society. Founded 1969 G6ZME
Village Hall, Malthouse Bank, Little Wenlock, Telford. Shropshire. TF6 5BG

Editorial

HF propagation seems to have been very poor for the past thousand years—well my records say that the daily solar flux (which drives the ionosphere into frenzied action when it's in a mind to do so…) has been below 100 since January 2005—so it almost **seems** like a thousand years. It's currently stuck around the seventies anyway., with little prospect of improving greatly before, say, 2010.

Talk of going on an expedition (for HF at any rate) seems sheer folly, and would be likely to end in tears and an almost empty logbook, dominated with European callsigns.

However, our illustrious Chairman Richard (G0VXG) has suggested that perhaps now is a good time to put our minds to such a TDARS project in a couple of years, or so, hence—I distinctly heard him say **he'd** be happy to organise such an occasion. So here it is in hard print.

A number of members have lots of experience of touring around the British Isles and S. Ireland and arranging portable activity, but only holiday experience of more distant shores, which I think Richard had in mind. Perhaps the superb presentation by Don G3BJ in January (3B7C Indian Ocean Expedition) put the idea in his head.

What perhaps we lack in experience—especially the HF 'pile-ups' from a rare location—we could replace with enthusiasm and some careful planning. Would it be semi local (Shetlands, Faeroes, Lundy?), Mediterranean (Menorca, Cyprus, Crete?) or farther afield (Madeira, Iceland, Caribbean ?). Getting the gear, especially antennas and their supports, on regular flights, is challenging; finding time is tricky; persuading the family is something else (why not bring them along?); costs can get frightening; planning logistics migraine inducing;…….

Still, we can all dream—and why not?

MIV

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THANKS for Newsletter input from M1RKH, G0VXG, G3JKX, M0RJS, G0EYX, G8VZT M0FHM, G4EIX, Kurt Feldmesser of Shrops. Astronomical Society.

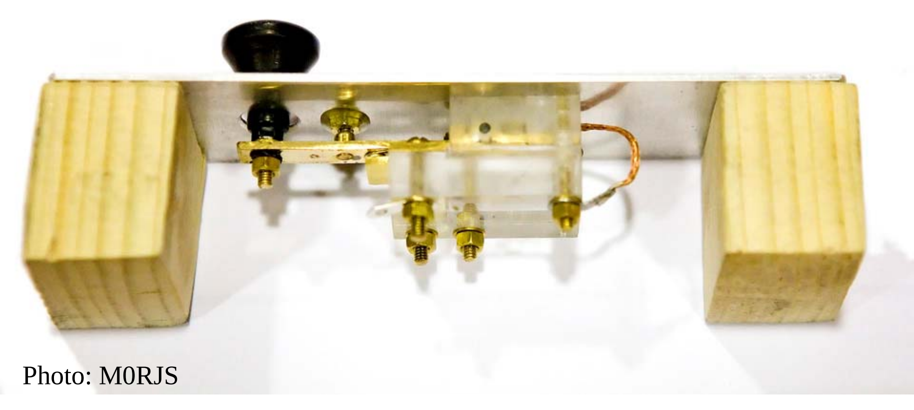

Photo: M0RJS

Tony's M0TAW-winning entry for the Under-a-Fiver Construction Competition. It is a mini morse key for Tony's Whaddon Mk7 Paraset project.

QTC? News & Information

Following the **2m, 70cm and 80m AFS contests Dec-Feb, plus the Club Calls (160m) contest**, all the results have been published . For the Club Calls in November, operating from Richard's QTH in Jackfield, we came 28 out of 92 entries, with 1214 points. Only G0VXG and G3UKV were available that Saturday night, and we both felt it was harder going than last year. The 2m AFS entry in December seems to have gone pear shaped, as only Martyn's (G3UKV) entry is recorded on the results table; he came 13th out of 40 entries with 4170 pts. I'm not sure whether a 70 cm entry was made, but no TDARS call-signs appear in the results table. On 80 metres, there are TDARS entries for both the CW and SSB events. On CW, (G4EIX, G3UKV, G0EYX) we came 37th out of 89 entries, with 3840 pts., whilst on SSB (G0VXG, G4EIX, G3UKV) we were 33rd. out of 89, with 3850 confirmed score. To give an idea of the popularity of the HF AFS contests, there were 241 and 254 individual entries respectively for the 80m contests. Can we manage at least 4 TDARS operators per AFS contest next 2008/9 season ? Even a lowly individual score makes a marked difference in the overall team results tables.

FOR SALE: Brand new and boxed Cushcraft 6 metre vertical AR6. Cost £80 a few months ago. Make Ray 2E1HTU an offer he can't refuse!

FOR SALE: Chester Milling Machine with dozens of accessories. Mounted on sturdy steel framework with shelves. Motorised table. Stored in dry garage for past 2 years. £175. Buyer collects, but I will assist buyer with loading ! Martyn G3UKV (01952 255416)

There were just 3 entries for the **Under-a-Fiver Construction** competition, which was won by Tony M0TAW with a superbly engineered morse key for his Paraset retro-project. Hopefully we will see it in place at Tony's talk scheduled for TDARS meeting on April 16th.

Slightly better supported was the recent **Main Construction Competition**, which was won by Jim G8UGL, with a very well built battery charger and battery re-constructer project, in a neat case. Thanks to all who made the effort to enter either/both competitions that keep the hobby alive!

Eventually, TDARS have negotiated a fairly satisfactory **venue arrangement with Little Wenlock Village Hall Committee**. The room where we meet is available every Wednes-day EXCEPT for alternate First-Wednesday-in-the-month, plus AGM. In practice, this mainly affects the Committee meetings, of course. Their AGM took place in February, so the only other dates in 2008 where we have to ***meet at The Huntsman are 2 April, 4 June, 6 August, 1 October and 3 December.*** Dates will be shown in the programme.

Don't forget the **TDARS A.G.M.—Wednesday 26 March at 8pm**. Little Wenlock Hall. Agenda details were published in the last Newsletter. Subscriptions due then too !

The Committee has decided to charge **a flat rate of 50p. for the tea/coffee/squash** provided by Gordon each Wednesday. Usually biscuits are also included in this charge. **Please place your donation in the container provided** (or rattled vigorously).

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How to use GB3ZI: The Stafford Voice Repeater

GB3ZI is a wide spaced repeater. The output is 430.975 and you will need a +7.6 Mhz split to use the repeater. Its recommended that you use a 103.5 Hz (Group G) CT to access the repeater. 1750 Hz toneburst can also be used for a limited period of time, the repeater goes into talkthrough very quickly after sending a toneburst so you only need to send it for half a second. The repeater will latch after about 10 seconds and is indicated by 3 rapid pips, you can reply to a station after the three rapid pips. If nobody replies the repeater sends one pip every second until it send its callsign in CW and then closes.
It is important to keep transmitting between a toneburst and talking otherwise it will drop out. The timeout is set to 2 mins. Narrow deviation is required otherwise clipping will occur.

GB3ZI Factfile:

Keeper Brian Gallear - G8VPR
Site Address Staffordshire University, Beacondside, Stafford ST18 0AD
Grid Ref SJ94474240424
Locator IO82XT

Repeater Callsign GB3ZI Type UHF 70cm Voice
Output Frequency (Tx) 430.975 Mhz FM Narrow
Input Frequency (Rx) 438.575 Mhz FM Narrow
CTCSS RMC Group G - 103.5 Hz
Height 92 metres ASL (ground level)
Rx antenna Colinear 5.5DB Jaybeam 7530 @ 24m above ground
Tx antenna Dipole, 22m above ground
Transmitter Nokia BSR 450 Receiver Nokia BSR 450. Power 10w ERP

(**Information provided by Derek G0EYX**)

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TDARS Information and pictures Web Site www.tdars.org

CHAIRMAN: Richard Wilkinson G0VXG (883671)
VICE-CHAIRMAN: Martyn Vincent (255416)
SECRETARY: Mike Street G3JKX (299677)
TREASURER: Jim Wakenell G8UGL (684173)
CURATOR: Derek Southey G0EYX (01785 604904)
NEWSLETTER EDITOR: Martyn Vincent G3UKV (255416)
Committee: Richard M1RKH;Mike G4NKC;Simon G0UFE;Chris M0ECM;
Dave G4EIX; Tony M0TAW;
Trophies/Certs: G3UKV, M1RKH
QSL Manager David M0EMM
Assistant Curator: Kevin Hutchinson G8UPF (07974 535585)

TELFORD & DISTRICT AMATEUR RADIO SOCIETY. MEETINGS EVERY WEDNESDAY AT LITTLE WENLOCK VILLAGE HALL UNLESS INDICATED OTHERWISE ON THE FRONT PAGE PROGRAMME. ROOM BOOKED FROM 7PM - 10PM. MEETINGS USUALLY COMMENCE AT 8PM.

"Astronomy Begins at Home": Re-published by kind permission of kurt Feldmesser and the Shropshire Astronomical Society

When one surfs their websites one finds the interest of radio amateurs in solar activity is astronomical in fervour – even down to the number of protons per cubic centimetre in the solar wind! By contrast, amateur astronomers give scant attention to radio energy unless it is the microwave remnant of the Big Bang received from the depths of outer space! If this article can help to restore the balance it will have achieved its purpose.

When Guglielmo Marconi spanned the Atlantic Ocean with radio waves by transmitting the famous three dots 21,000 miles from Cornwall to Newfoundland in 1901, he presented the scientific community with something of a mystery: Heinrich Hertz had shown that radio waves behave exactly like light, that is to say, they travel in straight lines and can be reflected and refracted. Since the Atlantic Ocean bulges mightily between Newfoundland and Cornwall, the radio waves had somehow managed to circumvent this obstacle.

The genius Oliver Heaviside suggested the existence of a reflecting layer in the upper atmosphere, which was duly named after him. He suggested that the upper layers of the atmosphere could be electrically conducting and hence reflectors of radio waves.

The youngest Professor of Radio at that time, Sir Edward Victor Appleton, managed to measure the height of the Heaviside layer in about 1931 and found it to be at 100km. Much to his surprise, he also found a second layer at 300km, which, naturally, became the Appleton layer. Today's notation refers to them as E and F.

Watson Watt, the "father" of radar, then director of the Radio Research Station at Slough, coined the term ionosphere by analogy with the atmosphere since it was shown that a radio wave would interact with an ionised medium which the atmosphere becomes at those heights. An American improvement to Appleton's apparatus, in which reflected pulses of radio energy were used for regular measurements of the ionosphere, was used at Slough from 1931 until the 1980s and, now, at Chilton.

During the International Geophysical Year of 1957/58, about 200 ionosondes (frequency scanning , pulsed transmitters)were deployed worldwide to study the ionosphere. Plans are ongoing for similar studies in this 50th anniversary year. (As an aside, the circuitry for these ionosondes was the precursor of WW II radar.)

After some twenty years in the radio industry, I had joined the Radio and Space Research Station (as it then was) in Slough and found myself sounding the ionosphere.

My contribution to the art was to develop a diagram that allowed the day-to-day, even hour-to-hour, variation of the ionosphere to be plotted alongside the graph of sunspot number. The correlation is pretty good even on such a short-term basis.

After a few years it became clear that the ionosphere kept in step with the number of sunspots, recorded for 300 years or so.

Which parameters of the ionosphere do we measure apart from the heights of the layers? The ionosphere is very selective in which frequencies it chooses to reflect. Anything below 1MHz is strictly confined to an earthbound existence. Anything above 30MHz passes through into space. Between the two is where the fun begins. The change in height of the E layer meant that domestic medium wave radio transmissions at night suffered interference from continental broadcasting stations. In part, this was why medium wave gave way to FM at about 100 MHz.

It is the highest frequency (the critical frequency) that the F layer will return to earth from a vertical sounding that measures the intensity (i.e. the number of ionised molecules per unit volume) of F layer ionisation, and that is a very variable quantity indeed! It depends on the height of the sun – and, thus, the latitude of the station and the time of day – and solar activity.

This bears a close correlation to the number of sunspots and to solar flares and the rest of the emissions from the sun from the extreme ultraviolet radiation to the number of protons per cubic centimetre in the solar wind.

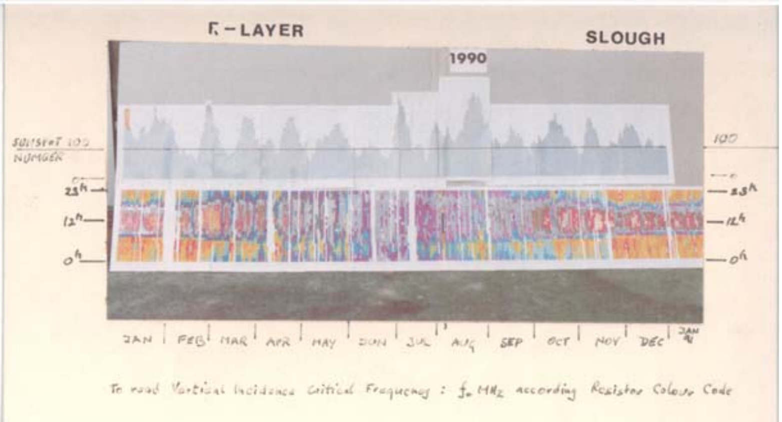
In order to correlate sunspot numbers with F layer ionisation, I plotted them on the same time-line as a representation of 24 hourly measurements of the critical frequency using a colour code of 16 colours. Visually, the correlation is pretty evident.

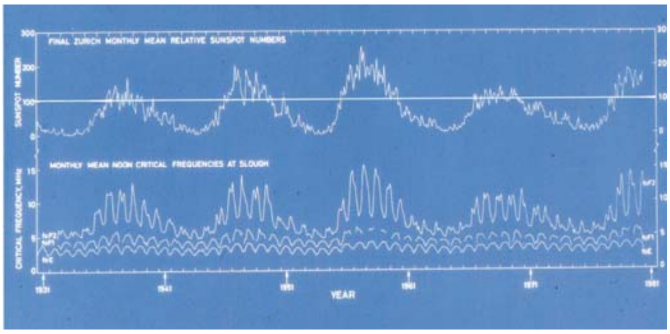
How can a radio set provide some useful data? First, it must receive frequencies from 3 to 30 MHz, preferably without gaps. Ideally, it should be capable of receiving “single sideband” transmissions, a method of modulation used by radio amateurs and some utility stations – but this is optional. Then one needs to choose a number of stations at as great a distance as one can receive to ensure that the radio waves have to travel via the ionosphere.

Many broadcasters use a range of frequencies to reach their target audience, regardless of ionospheric variability. The higher the frequency that can be received (Maximum Usable Frequency), the more intensely the ionosphere must be ionised and, hence, more active is the sun. Thus, even on a miserably wet winter night, you can explore solar activity at first hand. As radio amateurs might say: “Happy DX-ing”!

By the way, during a solar maximum that occurred some years back, I received a transmission from the National Standards WWVH station in Hawaii and, only yesterday, from a station in Beijing broadcasting in English at a frequency of 16.6 MHz.

For an astronomer’s kit of instruments, I would recommend the addition of a short-wave radio (preferably covering single-sideband as well as AM) which will allow, so to speak, keeping a finger on the pulse of atmospheric ionisation and hence solar output that would work even on a cloudy day.





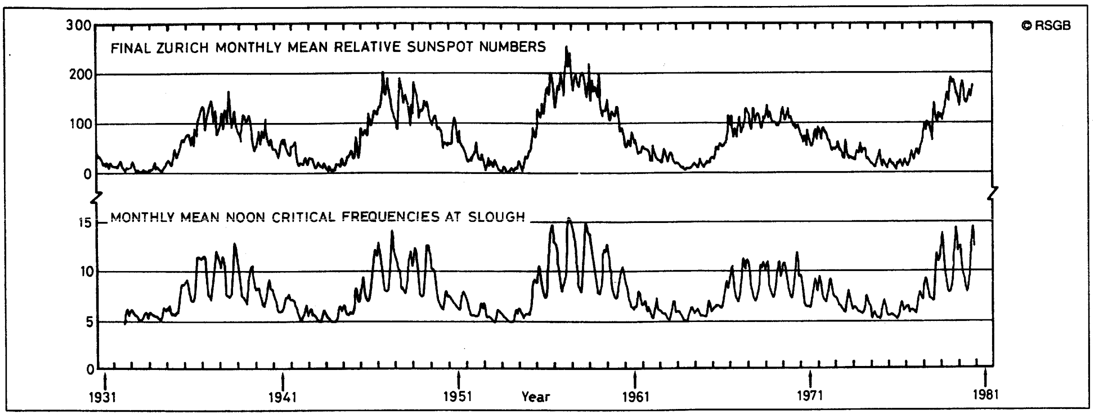
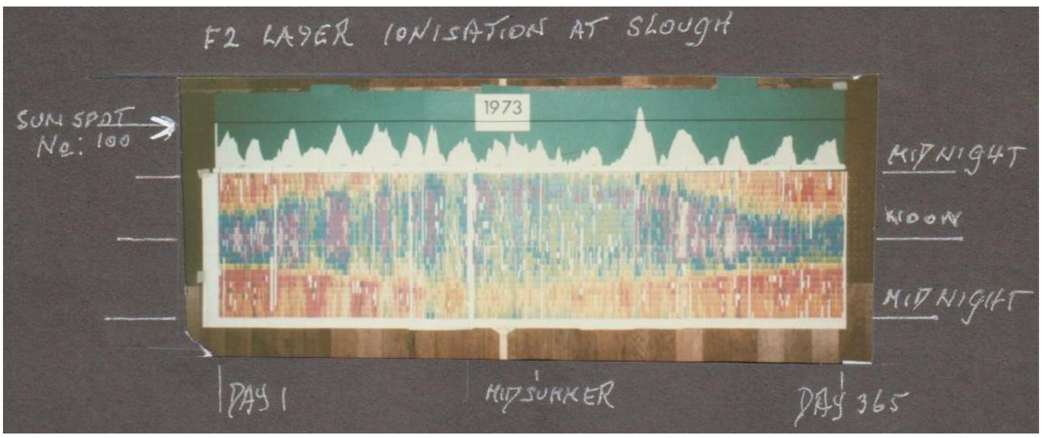


Fig 2: The usefulness of the short-wave (HF) bands (lower graph) follows closely the sunspot count (upper graph). Data from Rutherford Appleton Laboratory.



Earlier articles published by Kurt Feldmesser :-
Sunspots, the Ionosphere and H. F. Propagation .Wireless World Feb. 1979
Eleven Years in the Ionosphere, Wireless World, Nov. 1986.

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TDARS Club project : DDS unit by Richard G0VXG

This year's club project is built around the Analog Devices chip AD9834CRUZ and is driven by the PIC16F690. The unit will fit into a standard box 120x65x40, have a 16*2 LCD display and be driven by a 12volt , 50ma PSU. The frequency range will be from 10KHz up to about 20MHz in 1Hz steps (see step menu). There are 2 impedance outputs Xlo and Xhi. The Xlo will typically give 3v pp into 50 ohms @ 10MHz about 45mw. The waveform looks very stable and a good sine wave is produced after the LPF, which is built into the unit. Using the Xhi pin the frequency is extended by a few megs. The absolute theoretical maximum is 25MHz when using a 50MHz crystal oscillator and 37.5MHz when using a 75MHz oscillator.

To produce a particular frequency the chip is sent a serial 28bit word, the math is, Frequency out = (DDS number / 2E28) * 50,000,000 so if we required 12.5MHz the DDS number would be 2E26 this would give ¼ of 50MHz. I have to point out that I wrote a good chunk of the project, but the maths bit I left to others with larger cerebral cavities! The chip actually has 2 frequency registers FREQ0 and FREQ1. These 2 registers are selected by pin PSEL, 0 gives FREQ0, 1 gives FREQ1. This is useful for DC receivers that require an offset when receiving CW. For example if the remote station is transmitting on 10.106,000 your local oscillator would have to be set to say 10.106,800, giving an 800Hz tone. So the current project adds the offset onto FREQ0 and loads it into FREQ1. In this example PSEL could be connected to your CW key and would toggle the frequency between 10.106,000 and 10.106,800. For those interested in Superhets then the 5.xxx MHz offset could be used. The unit can be used with an optical encoder instead of the Up/Down keys. This is a typical device used on modern rigs and is better than using switches. However they cost about £30 and would not fit into the box described above. I have added two extra analogue inputs, these may be useful for monitoring QRP rig power or could be used as an S meter input.

At this point in time there is no room on the PCB for a frequency meter, however there is room in the box for another PCB – CP 2008?

The menu system –

This is a first pass and can be modified if required.

There will be 5 keys on the unit, 3 will be for the menu system and 2 for the Up/Down keys.

M	<=>	**Menu**
S	<=>	**Set**
X	<=>	**eXit**

On pressing the M key, the following will be displayed:

STP – BND – OFF – EXT

Step: 1Hz-10Hz-100Hz-1KHz-10KHz-100KHz-1MHz
Band: 600m-160m-80m-40m-20m-17m
Offset: NONE-400Hz-500Hz-600Hz-700Hz-800Hz-900Hz-5600kHz
Extra: Future !

Using the UP and Down keys or the optical encoder (optional extra) the cursor will move along the line and by pressing the S key, one of the 3 current options can selected. Using the UP and Down keys or the optical encoder, the cursor will move up or down one of the three lists. So if the 80m band is required press the M key, select BND then move down the Band list to 80m and press the Select key then press the eXit key. To test the unit I have built a simple DC transceiver for 30m. I found that to tune from one end of the band to other (10.100 – 10.150 MHz) I needed to be in Step 1KHz . I found it a little annoying to have to go back into the menu and select Step 100Hz to fine tune the CW signal then back again to select 1KHz. So I have made the Select key dual purpose. When in the menu system it does what it says above, but when out of that function it toggles the Step between 100Hz and 1KHz.

I hope to be able to save the settings into EEprom so that it remembers your setting from last time.

Various readouts on the two line DDS LCD display

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The answer to the mystery item in Newsletter 227 was "a solar - battery powered garden light" . The coil pulsed the 2.4v battery voltage to about 5 volts thus giving quite a bright light. No one actually got it right, most thinking it was one of those yellow road side lights. I am afraid 'RJS was completely wrong! (Bob's suggestion follows ……)

I have identified the function of the widget found by Richard and published in Newsletter 227. It is an ATOMIC CONSTRUCTOR.

This particular configuration, when connected to a PP9, breaks down the molecules of CO_2. The resultant oxygen is released into the atmosphere but the free carbon has its atomic structure changed to that of the element gold. There is a small component missing from Richard's diagram so that particular circuit will not function. The modification of the carbon atom to produce the heavier atom of gold has a similar outcome to the fusion of hydrogen atoms to produce helium.

Just thought you would like to know. (Bob, M0RJS)

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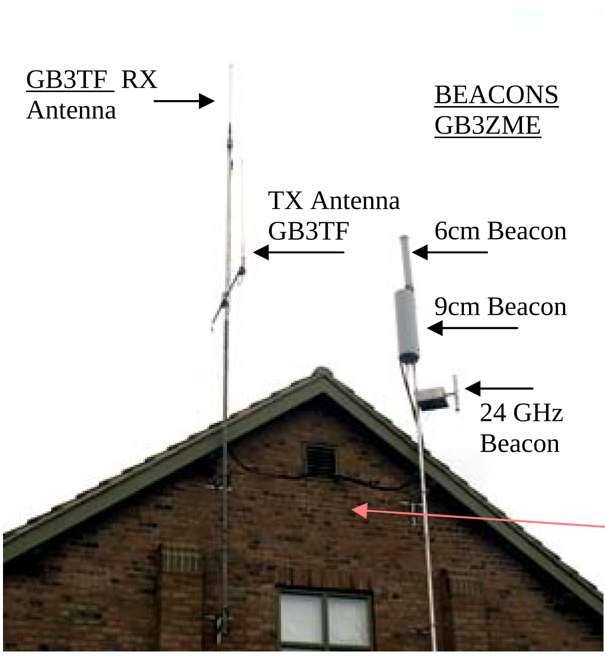

NEW ANTENNA INSTALLATIONS AT NEW TDARS HQ.

Since these pictures were taken in February, the GB3TF receive antenna (top left) has been raised somewhat to increase the TX/RX antenna spacing to ~ 3m. The equipment is located behind this wall in the roof space.
We have also tested reversing the TX-RX antennas on 'TF.

Mike's Piece No. 1 on Loops.

When I was in Borneo in the 90's, I was lent a large MFJ tuned loop and was pleasantly surprised by how effective it was. The V8 call-sign and the loop being 60 feet up at the top of a block of flats did help of course! It proved to be fairly inefficient on transmit but, more importantly, remarkably good on receive. This was partly because any local RF interference, e.g. from lightning strikes, became much less of a problem. This is because the interference signals on opposite sides of the loop are almost exactly in phase, so cancel out. I was thus able to continue to operate during the almighty thunderstorms that you get daily in Borneo.

If you live in an electrically noisy QTH, near to a garage using welding gear for instance, it might be well worthwhile making a tuned receiving loop aerial. My first effort was a degaussing coil taken from around the 19 inch CRT[1] of a duff PC monitor. (also a useful source of insulated copper wire, ribbon wiring and other nice electronic bits come to that, including ferrites)

I soldered a 500pf variable capacitor across the two ends and taped a single turn of wire around the loop, as a pick-up and connected across the coax going to the Rx[2]. I then suspended the (vertical) loop by a piece of string from the ceiling in the shack so it was very easy to rotate. Lo and behold, once tuned in and turned to get max signals or the least interference, the loop proved to give much less noise than my very long loop around my garden. It did not seem to make much difference if the loop was inside or out of the shack…..so inside it stayed. There's just one problem though....you can't transmit through it! Shame. So you have to use that dipole or whatever for transmitting and means, using the loop on Rx, that you must have some form of switching to change the rig over from one to the other.

If you are really lucky you rig will have a separate Rx socket which you can use for the Rx loop….but if not, then use a coaxial changeover switch or, do it properly , using a relay to swap the Tx aerial and the Rx loop over going to rig.

By the way, a loop aerial doesn't *have* to be round! You can wind some turns around a square cardboard box or a made up wooden or plastic frame. Cut notches at the corners so that each turn is held in place nicely. Don't forget to allow one or two notches for the pick-up loop if you are using that method of coupling to the Rx[2].

Do try this. I promise that you will be pleasantly surprised.

Notes.

1. A larger CRT uses a bigger coil providing a more sensitive loop.

2 An alternative method is to wire the 500pf capacitor in *series* with the loop and connected directly to the coax. You may need an insulated knob on the shaft though.

Vy 73….Mike G3JKX

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Service resumed!

REMINDER: Paid up Members are welcome to borrow items of Club Equipment, so long as they're returned the following week and the usual "signing out" process is followed strictly. That's a privilege of TDARS Membership. If you can't return it on time, please find someone else who can, or don't borrow it that week!

New TDARS HQ Update:

Following the Society's move to Little Wenlock Village Hall last December, it seems appropriate to record some of the things that have happened since then at TDARS.

Following a successful Planning Application, the ***microwave GB3ZME beacons*** have been erected and recommenced operation on the 3.4, 5.7 and 24 GHz bands. Reports have come from as far south as Surrey and Dorset, eastwards to Suffolk and northwards to Yorkshire. Unfortunately the resurrected beacons just missed the tropo openings in January.

GB3TF the 70cm voice repeater was only off-air for 24 hours. The mast was erected alongside the beacons and became operational Saturday 23rd. February. Thanks to Chris M0ECM for the temporary antenna arrangements when we had to vacate Dawley Bank in January. Some further work is still being done to overcome some de-sensing effects on the receiver.

12 ***Storage lockers*** have been placed in the loft storage area for most of our equipment. Some redundant items have also been sold off. One large cabinet has been placed in the main hall storage room, and now contains larger items of G3ZME station equipment. Further plastic storage bins (with lids) have been purchased to tidy up loose items, such as reels of coax, ropes and numerous sundries. These are also safe in the roof area.

We are currently paying the Village Hall Committee £5 per week for ***storage and the extra electricity consumption***. A meter was placed for one week in the supply lead, and revealed a week's usage was about 55 kilowatt hours. That was close to our estimate. There is some more work to undertake to tidy up the AC supply arrangements to the storage area and for GB3TF & GB3ZME.

Whilst we have assured ***access to the Meeting Room*** every Wednesday evening, we have had to agree to the Village Hall Committee meeting there every other month on the first Wed. (April, June, August, October, December). On these dates, Members are welcome to meet informally in The Huntsman Inn lounge. TDARS Committee will also meet there on these evenings. Richard G0VXG has been elected to serve on the Village Hall Committee, and for his sins he is now also a Trustee of the Hall. However, he is allowed to delegate his attendance at the regular Village Hall meetings, which he will no doubt welcome at times!

The new venue is now registered as the official TDARS ***Examination Centre*** with the RSGB, and the first Foundation Exam session took place there on Sunday 16th March, for 4 candidates—three of whom were successful.

Ambitious plans to make some ***conversions to the roof loft area*** were postponed after the Village Hall Committee expressed a number of concerns, which the TDARS Committee felt might sour early relations with the Hall Trustees/Committee. However, overall the upstairs arrangements have gone extremely well, and almost everything has been sorted and stored safely. We felt that an upstairs station was not appropriate at this time, and the loft-ladder access would be a real obstacle for less-sprightly TDARS Members. It is therefore planned to regularly set up ***the station*** in the main Meeting Room, using easily arranged antenna and mains connections available from the roof storage area. This will be accessible to all, and may be established in the hatch area on the side of the kitchen. The antenna(s) have yet to be installed, but may include an indoor loop or ZS5BW multiband dipole, plus VHF/UHF collinear.

One or two members have commented favourably on the ***loss of the multiple rooms*** we had at Dawley Bank. Members are now shepherded together and perhaps mix more than hitherto. This is good socially of course, although the other side of the coin is that noise can become a problem at times. However, the kitchen (Gordon, Ray et al) is sometimes a useful retreat, and nomads may drift upwards to the loft area at times …. !

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Mike's Piece on Baluns, Part 1.

What is a Balun? Well, one thing it isn't is a balloon! It's basically a kind of transformer. A **Bal**-anced to **Un**balanced transformer. What does that mean and what does it do?
Read on McDuff.

Nearly all rigs come with the antenna connection being a 'supposedly' 50 ohm impedance coaxial SO 239 socket into which fits a PL259 plug. I say supposedly because 50 ohms impedance they are not! But below VHF this doesn't matter too much. Above 2 metres don't use them. N types are far superior and nicely waterproof!

Coaxial cables are basically unbalanced because there is only one inner conductor to convey the power up to the antenna, inside a screened copper tube. This tube keeps the RF on the inside and prevents rubbish getting in from the outside. The RF on the centre wire radiates magnetic fields and causes currents to be induced on the *inside* of the tube. These then radiate and induce in-phase RF currents on the inner wire, provided this is exactly in the centre of the tube. If it isn't, then some cancellation occurs, meaning losses, so less RF comes out of the other end!

It is when the RF currents appear at the antenna end that there is a problem! If we connect the centre wire to one half of a dipole, that's fine. But, if we connect the coax screen to the other half, then we have *also joined the inside of the screening to the outside of it*. This means that this dipole element is now part of an inverted L long wire made up of itself and the *outside* of the coaxial cable. Remember, the dipole elements have been carefully cut to resonate in the middle of the band, but there's now a long length of copper connected to it, severely detuning it. (* see below) Two other things.

Firstly, if the dipole is part of a yagi array and the dipole balance is lost, the radiation pattern will be all over the place: the back to front ratio will be badly degraded. Plus the directivity and forward antenna gain seriously reduced. What we need is a Balun!

Secondly, some of your precious RF power intended to be used by this antenna element is now going to go down the *outside* of the screening and radiate from there. Some of it may well get back into the shack and cause EMC problems. Also, interference is picked up by the screening and transferred into the centre wire. So, what can we do about it? Simple, prevent RF currents going up and down the *outside* of the coaxial cable. We need a Balun!

The simplest one is an RF choke, near to the dipole connection. Wind some turns of the coaxial cable onto a plastic tube; held in place by glue or self amalgamating tape. Or you can thread as many ferrite rings as you can find onto the cable. You can even try putting the cable into a tube, surrounded by steel or aluminium wool and then the ends sealed up. Any of these methods has the advantage of not affecting the *bandwidth or the impedance* of the antenna they are connected to.

I know that this article is headed Baluns, and there's hardly a mention of them yet, but I will get to them in Part 2, so watch this space in the next issue.

Vy 73 Mike G3JKX

[* Editor's Note: In para 4, I would question that connecting the wire directly (ie no balun) to the coax outer "severely de-tunes" the dipole. The feeder remains the feeder, and an antenna analyser or GDO shows resonance is unaltered. Some members have heard me question the wisdom of using baluns at all on HF wire antennas in Foundation and Intermediate exam training sessions!]

A FEW SHOTS FROM THE PAST—CAN YOU IDENTIFY THEM ?