

THE BRISTOL 70cms REPEATER GROUP

GB3BS & GB7BS

NEWSLETTER 2014

RU68 - 430.850MHz - TONE J: 118.8Hz.

DVUI3 - 439.6126MHz - Colour Code 3.

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W elcome to the 2014 Bristol 70cms Repeater Group Newsletter.

I cannot believe a whole twelve months have past already. I know I seem to start the newsletter with the same old words. I think it's simply because I am getting older. Although, speaking from experience being busy at work with things to occupy the whole day does (in my opinion) make the day's go faster.

The same is true about our time Mark and I spend working on things for the Repeater Group. It has been a busy, active, challenging, expensive and most of the time enjoyable year for us, and the group.

We have had some new members to the group which we would like to welcome and we would also like to thank those who continue to support us.

This Newsletter has been broken up into sections, much like previous years, however unlike previous editions; I think this one will be a bumper one, mainly due to this year being generally busier and seeing GB7BS coming online.

Items covered include:

- GB3BS status.
- GB7BS introducing our DMR repeater.
- An overview of working DMR and specifically GB7BS.
- Antenna Problems.
- Updates on our WiFi Microwave link.
- Site activities and maintenance.
- Rallies and talks the Repeater Group have been involved with.
- YouTube.
- The Bristol 70cms Repeater Group on social media.
- Membership.

Both Mark and I hope you enjoy this newsletter and its updates on The Bristol 70cm Repeater Group activities over the last year. We are sorry for any damage this newsletter may have caused falling though your letter box, as I said; it's a bit of a bumper edition.

So, without further a do, let me had over to Mark, G4SDR for his Technical report.

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Mat G7FBD / KQ7FBD



Technical Reports by G4SDR & G7FBD.

News in Brief

This year sure has been a busy one. At the start of 2014 the “pips” on GB3BS were voted on and subsequently changes were made, bringing the two pips closer together and moving the time-out timer reset point to the second pip.

Also in January we were issued with the NoV to run GB7BS, a DMR (Digital Mobile Radio) repeater. This came as a bit of a shock as we had expected a wait of some 8 to 12 months before being granted.

In March we carried out some DMR tests to prove antenna combining for both repeaters and some basic range tests, which proved to be very good.

Much work was also carried out to decide which equipment to buy for the DMR Project. It was Hytera verses Motorola. The in house antenna combining design was being built after much searching for parts.

Mat was in discussions with a Chinese company (BFDX) to try and import DMR/FM equipment. Mat managed to obtain some “Samples” for us to try and report back to the company.

In April a final decision was made and we purchased the Motorola DR3000 DMR Repeater. This was delivered a few weeks later and underwent testing and configuring.

While Mat was away on his months USA tour I completed the antenna combining unit. On site, changes were made to the rack space and various bits of hardware were installed in readiness to accommodate the DR3000 and antenna combining network.

In late June we had GB7BS installed and tested, all looked good. However, problems developed as soon as our backs were turned. We had a problem and locating it was becoming frustrating and very time consuming. The launch of GB7BS had to be delayed so that further tests could be done.

During the months of June & July the antenna combining system was modified and a fault with one of the filters was identified and subsequently repaired. Also during this month we carried out a successful test of our 2.4GHz WiFi link to the repeater site.

Towards the end of July it was found that we had a site antenna fault which was affecting the performance of GB3BS so yet again the launch of GB7BS had to be postponed. GB3BS was switched to low power because of the high VSWR.

August came, a brand new antenna was purchased and the job of getting our tower riggers to do the job was underway.

A month later in mid September the new antenna was installed on the tower. The old faulty antenna looked fine. Mat later performed an autopsy to find out why its life was cut short. Work to get our WiFi link installed also continued.

GB3BS was restored to normal and effort was now put into getting GB7BS on the air!

On the 16th October GB7BS finally went live and was working extremely well. Integrating GB3BS & GB7BS to run on the single antenna performed better than expected.

Throughout November we did a small amount of house maintenance at the site. We also installed a Network Switch to link GB7BS onto the network and later to accommodate the other repeaters for the S.W. Cluster project.

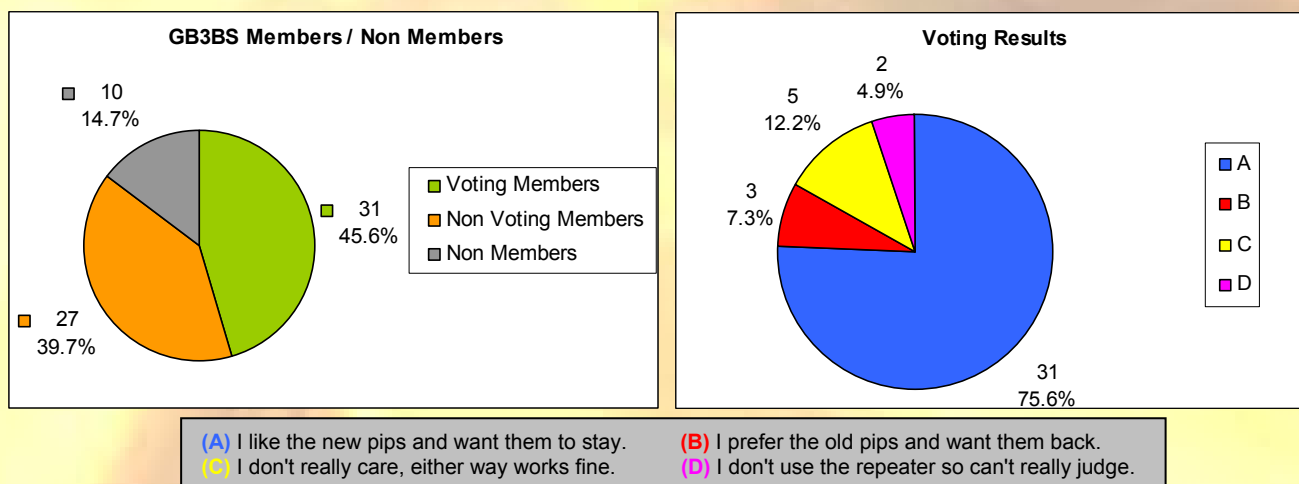
A battery backup supply was also installed for GB7BS along with a few configuration changes to how GB7BS handles Group traffic.

And now the news in detail.

Changes to GB3BS.

Back in January of this year requests for changes to the two “pips” were proposed. This was to move the two pips closer together and using the second pip to reset the time out timer. This would allow for people to “Break In” on a QSO easier without stations doubling with each other.

The pips were subsequently changed, initially as an experiment and put the final decision to a vote. The results of the vote were comprised of members and non members, voting on-line, email and by post. The outcome is shown below:-



As a result of this result the pips arrangement was made permanent. Although, as time went on some people still could not get the hang of it or failed to wait for the second pip and consequently kept timing out. Please remember that the Time Out Timer is **only** resets at the second pip. Apart from that it would appear that it has made improvements and made “over’s” a little more slick!

1750Hz Tone Access Ends.

Shortly after the new pip sequence was introduced on GB3BS we decided, after looking at the access logs, the 1750Hz Tone Access facility was not being used. The repeater was subsequently switched to CTCSS ONLY access. So far, to date, no complaints or queries have been received.

Notice of Variation issued for GB7BS.

Also in January we were surprised to be granted the NoV by Ofcom to operate the proposed DMR Repeater GB7BS. This was totally unexpected so quickly as time scales were expected to be 8 to 12 months, plenty of time to get things organised we thought!

However, there was a little glitch in the initial application process whereby the ETCC told us that we were unable to have the channel that we had requested in our application. This was no big problem and was not a concern following some quick calculations.

But it has come to light that according to Ofcom our original channel requested was “not a problem” and could have been issued to us after all. I was a little dismayed that the ETCC had taken it upon them selves to change our application.

I do not understand why they wanted this change and following further talks with Ofcom we were offered to move GB7BS back to the channel originally asked for! The ETCC has no powers to make such changes to applications, it is down to the primary user and Ofcom to accept or reject all applications. It would seem that the ETCC, a self appointed body of men, overstepped their boundaries, once again!

GB7BS Build Starts.

During February and March we were very busy putting a shopping list together for the GB7BS build. This was at times difficult as we knew that some items just had to be purchased. A set of Vari Notch filters were purchased which would be used on the Receive lines of both GB3BS and GB7BS.

Much time was put into retuning these filters and getting the depth of notch right while keeping the insertion losses to a minimum. I don't think I have ever spent so much time staring at an analyser trace for so long! But it did pay off.

One of the main components of the antenna combining system was the Circulator (black unit shown in the picture right). It was an item that was crucial to the project and its specifications had to be right.



It was with great fortune that Tony - G4CJZ, the keeper of GB7AA, found and sourced what we were looking for, a nice 2 section Circulator. The spec too was just fine, with a Tx & Rx insertion loss of just less than 0.5dB and a return loss of some 20dB.

March came along and Mat and I carried out some basic DMR test from the Repeater site. We carried out a full sweep test of the antenna and found no problems at the frequencies we would be using.

Using a Mobile as the base station we did a quick range test and found it to be as good as GB3BS and with none of the draw backs we found with our D-Star trial before.

Deciding on the make and model of the repeater equipment was difficult. In one corner you had Hytera, a well established Chinese company that made a very nice DMR Repeater and was loaded with features and a full monitor interface.

In the other corner was Motorola, a very well established company. Their Mototrbo Range of equipment is impressive. Their DMR flagship, the DR3000, is well known and tested in the DMR market and is the market leader, just.

However, it does have a few disappointments. It does not have a visual user interface. It also lacks a local audio interface facility to allow, in real time, the monitoring of time slots and talk groups.

One bigger consideration we had to make was one of compatibility. This was not just dealing with the radios that the users would use but the ability to connect the GB7BS repeater to the DMR-Marc national and international networks, should we wish to do so, now or in the future.

The DMR-Marc network only interfaces with Motorola repeaters. So if we purchased a Hytera repeater we could not connect to the DMR-Marc network. Although there were rumours that an interface was being developed to overcome this problem.

Finally the decision was made to go for the Motorola DR3000 as it was fully compatible, was at a good price that Hytera could not match and had a 3 year warrantee! In April we took delivery of one Mototrbo DR3000 repeater. It should be noted that this cost was totally funded by Mat – G7FBD and I, as current Repeater Group funds were simply not sufficient.

Site Preparations.

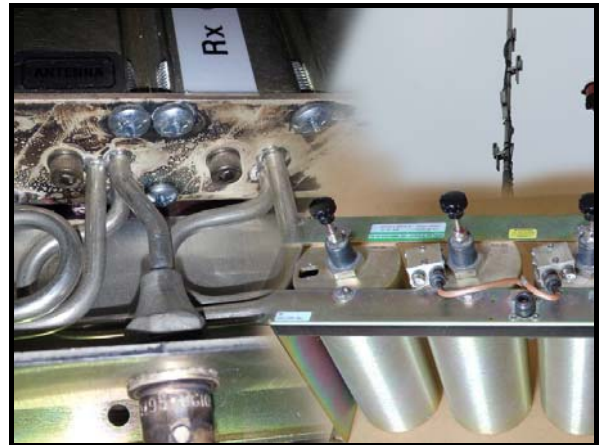
While Mat was away on his month long grand tour of the USA, I carried on relentlessly getting the site ready for the addition of the antenna combining network and the mounting of the DR3000 in the rack. Some blood was spilt during this work, mainly to the back of my hands, so that was bound to be a good omen,...or not!



Mat at the VLA Telescope New Mexico

Much work has gone into this and with the very close adjacent frequencies between GB3BS and GB7BS made it even harder, all the time striving to keep insertion losses and receiver de-sense to an absolute minimum was a challenge, keeping in mind that Tx to Rx separation was only 687.5KHz at one end of the band.

The DR3000 was installed at site and tested; everything was looking and performing great. Much effort and time was put in to get GB7BS going and live and ready in time for the 2014 Frome Rally where we were hoping to make the announcement and to demonstrate the new repeater in action.



Although initial testing went fine problems soon became apparent. For some reason we could see that when GB7BS was transmitting at the same time as GB3BS then receivers on both repeaters would show signs of de-sensing, but this was not happening all the time,...very strange.

After a lot of time and repeated site visits we could not catch the “fault” while on site, which is just typical. Checks and tests were proving to be inconclusive and the Circulator was at one point swapped out as there was nothing left to try. But this did not change a thing.

It was during one hot summers evening in July I noticed that the signal level at my home QTH for GB3BS and GB7BS were both down by the same amount. Em,...what's common here I thought,...the feeder or more likely, the Antenna!

A quick dash to site and a look at the SWR immediately revealed the problem, suddenly all the symptoms fell into place. With a SWR of around 2.5:1 and climbing it was a no-brainer as to the cause of all the problems. **Bugger!** I said, rather loudly but at the same time relieved that I had actually found and isolated the problem.

But then, all of a sudden, the VSWR slowly returned to normal and everything was fine again, both repeaters working without any problems. What the heck was going on???

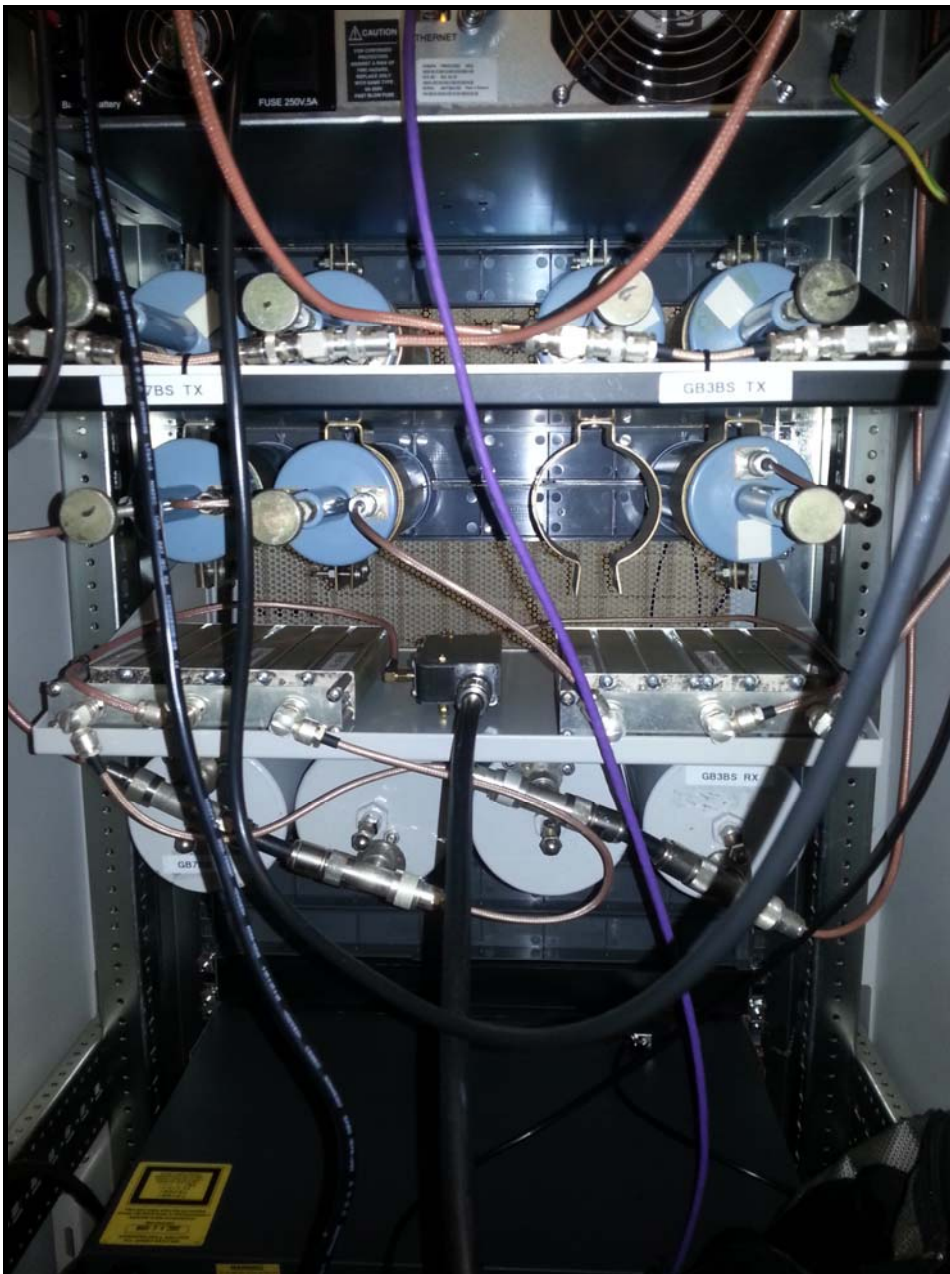
Yet More Problems.

Yes, more problems showed up, this time it was with one of the Diplexers and the improper mounting of the Circulator.

One of the Diplexer ports was not performing as it should, or did, when it was on the bench at SDR HQ. Long story short, this turned out to be nothing more than the failure of a locking ring on one of the cavities. This allowed the tuning of the cavity to become detuned. A new locking ring was fitted, problem solved.

The other problem we had was non linearity of the Circulator. The Circulator is a passive device but uses a very powerful magnet as part of its construction. It was found that although the Circulator had been positioned off the main steel chassis it was not enough. The steel chassis was causing small distortions with the magnetic field and thus the performance of the Circulator. **Bugger** I shouted, again!

I decided that enough was enough and swapped out the entire chassis for an all aluminium one, problem sorted!



The Picture (Left) is a more detailed picture of the Filter and diplexer trays Built by Mark G4SDR.

At the top of the picture You can see the bottom rear of the DR3000 Mototrbo repeater.

The blue plunge filters in the next layer are the TX Notch filters for GB7BS and GB3BS (left to right)

The three filters below this are the band pass filters for GB7BS TX, the missing filter, and the filter on the right (not connected) are the proposed band pass filters for GB3BS TX (if needed).

The next tray down is the Diplexer tray, the left diplexer is used for the repeaters receiver path. The set on the right are the repeaters transmitter combining path. In the middle is the circulator and antenna feeder.

The four filters below this are the RX notch filters, on left are GB7BS & on the right are GB3BS each delivering some 60dB of notch.

Antenna Replacement.

Following the findings with the SWR problem further testing, and following a lot of observations, it was found that the recent spell of hot weather was causing the Antenna to go faulty and once the temperature of the day decreased the SWR would return to normal, until the next day when temperatures rose again.

Replacing the Antenna was the only option. My thoughts turned to when GB3BS was at Cossham Hospital and the antenna system there developed a problem. I remember so vividly even now working with Phil - G4KUQ up a flimsy ladder against the guyed stacked aerial array on the roof and him sucking the water out of a co-ax joint like it was poison in a snake bite. Great days and so dangerous looking back! I must re-publish the original story as written by Phil for one of our long ago Newsletters as it was such a good read.

Attempts to go live with GB7BS had to be curtailed until the Antenna could be replaced. It was also decided that the Tx power of GB3BS be reduced so as to cope better with the high SWR and thus keeping it on the air.

Although the reduction was by only 3db it did generate much confusion and the usual spreading of misinformation. Our intention was to do everything to keep GB3BS on the air. We regularly monitored the SWR and it was lucky that it did not get any worse which would have forced us to shut the repeater down completely.

The next few weeks were then busy in trying to obtain a replacement antenna. Unfortunately the antenna manufacturer that we had used in the past no longer made antennas. Many phone calls later and promises of help from various companies secured a brand new replacement antenna at a slightly reduced cost to the Repeater Group.

Although the antennas design was very slightly different, it was still a 4-stack omni directional base antenna of commercial grade. And it would not suffer the same fate as the faulty one it was to replace. For more about this read Mat's Antenna Autopsy story.

The next hurdle was to get the Antenna installed on the tower. This, as we have said before in past newsletters, is not a simple task as people think, unless your bank balance can handle it.

The Repeater Group MUST use fully qualified and certified professional riggers. We cannot just pop up to the top of the tower ourselves, despite some kind offers from people to do so.

Normal rigging costs per day run at around £800 to £1000, depending on what's needed.

I managed to make contact with one of the rigging companies that I knew who used to do a lot of antenna installations and rigging for the company I worked for. The offer was to do the work for free if they had other planned work in our area. Sadly time went on and their availability was not to be, and we felt that we did not want to wait too long to get the antenna sorted and both repeaters operational.

However, the company were very helpful and asked if any of their crew wanted a special week-end job! So, one misty Saturday morning we were on site and the riggers arrived as promised. They were soon up the tower and could not see any signs of damage to the antenna, never the less; it had to be swapped out.

Within a few hours the new antenna was installed, weatherproofed, tested on the sweep analyser and connected. Our costs were for the riggers time, at a reduced rate I may add, and for the cost of their fuel, the total cost coming to £400.

Finally, both Mat and I would like to thank everyone who rallied around in helping with direct donations of money to get the Antenna purchased and for its installation. Special thanks must go to the North Bristol Amateur Radio Club, Mark - G8PKY and G7AES. This was very much appreciated and a big relief to our survival. All of this hit us at the wrong time, when our bank balance was probably at its lowest in a long time.



Sweep of the GB3BS/GB7BS Antenna.



The picture on the left is the type of antenna we are now using. It is the "Radio Structures UHF 4 stack". It has almost the same if not a better RF specifications as the old SA460 at 5.5dbd.

The picture on the right shows the new antenna right at the top of the tower (30m AGL).



GB7BS Installation and Operation.

It's probably worth mentioning to newcomers that the DMR repeater is based on Motorola's Mototrbo DR3000. This is an "out of the box" product and apart from some configuration programming is ready to go!

October came and every amount of time was put into the final installation of the DMR Repeater and integrating it into the antenna combining system. Initial tests were completed and everything was looking good, gone were all the bugs that had been a problem to us earlier in the year.

The repeater was left for a few days while further testing was carried out just to make sure that there was no interaction between GB3BS and GB7BS as they were now fully sharing the same antenna.

A slight adjustment was needed as we found that the Motorola DR3000's transmitter was producing a little bit more adjacent channel noise than we liked. We wanted to be squeaky clean. Although this was not directly causing any problems we decided to fit a Band Pass high-Q filter in line with the transmitter.

It would seem that manufactures today do not bother quite so much with fitting good quality integral Band-Pass Filters as everything is "Software" tuned. They prefer to let the customer fit, tune and pay for them! You can't beat the good old days of manual tuning and alignment!

GB7BS in Operation.

On the evening of October the 16th the repeater officially went live. It was good to hear a number of stations on to "greet" its arrival and since then there has been a steady increase in activity which is encouraging. We hope that it will continue to grow especially when the linking project comes on-line.

We are only too aware that in these early days equipment cost is to be considered. Currently there are no traditional Amateur Radio rigs that are capable or compatible for DMR. It is only from the commercial manufactures out there or second hand dealers that equipment is available.

However, this will change. I am very sure that the usual manufactures of Amateur Radio equipment will come into line and develop multi mode and multi band rigs that will be compatible as they will not want to lose an opportunity!

During October a few changes were made to the repeater, this was to change how Talk Groups are handled and the time a Talk Group is allowed to remain active. Yes, GB7BS does have a Time-Out Timer, this is currently set at 4min, just like GB3BS.

Further changes will be needed but not until the South West Cluster is rolled out. One of the first repeaters to become connected will probably be GB7AA and GB7SD, others will follow.

As the South West Cluster is rolled out we will keep everyone involved and informed on how it will all function and how to access it. This leads me onto a bit about Talk Groups.

Talk Groups, Time Slots & the DMR Marc Network.

Talk Groups are a bit like chat rooms. It's where everyone can listen or join in on conversations. These Talk Groups are given numbers and initially Talk Group 1 was allocated to GB7BS. However, we quickly found that some stations, mainly from outside our region, were using the wrong talk group.



We then decided to adhere to the DMR-Marc Network of agreed Talk Groups so that people with DMR-Marc programmed radios could use the repeater. The Repeater Group decided to move to Talk **Group 9**, thus allowing

everyone to hear each other. A full list of DMR-Marc Talk Groups is available from www.dmr-marc.net and is also a good starting point for people wanting to know more.

Each of the repeaters, GB7AA, GB7JB, GB7SD and GB7DR will also use **Talk Group 9** to carry local repeater traffic; this is the same for every other UK DMR Repeater whether they are connected to the DMR Marc National Network or not.

At the moment, like a few other repeaters, we are not rushing to connect to the DMR Marc Network.

This may or may not disappoint some people, but our first priority is to get the Cluster up and working. We see little point in the South West Cluster relentlessly relaying local State side QSO's all over the South West, with no one listening or using it and at the same time tying up Time Slots.

But, we do want to take on board what people want. Nothing is cast in stone. So, if you have a view on whether you would like to see GB7BS and the Cluster connected to the DMR Marc Network, or not, then do please get in touch with us and let us know your thoughts and views. **Do have a say**.

Mat - G7FBD has however been in talks with DMR Marc and we have now been allocated a dedicated Talk Group for the South West Cluster. This Talk Group will be **950**. Talking on Time Slot 2, Talk Group 950 will allow you to talk out through all the repeaters in the Cluster and thus any stations using the same Talk Group on any of the other repeaters to be heard by you via GB7BS.

Roaming.

Ok, so what is Roaming?

If your radio is equipped with roaming then you will be able to enter all the repeaters into a "Roam List". Once tuned to a repeater your radio will automatically retune itself to the strongest Repeater within the Cluster, so you won't need to retune every time you go out of range of one repeater and into another's range. It operates a bit like a normal Scan but is smarter in its operation & selection.

Etiquette.

The operation of GB7BS, or for any other DMR Repeater, has to bring with it a slightly new style of operating. As people will find out, DMR Repeaters do not send any pips or "K's" in Morse, nothing, zero, zilch. These are all generated in the user's radio itself, so how your radio operates is, to a large degree, up to you.

DMR can offer several new features to repeaters, such as checking to see if your friend has his radio turned on before you call him or is in range, Sending a text message to his radio. The person(s) Callsign and Name you are talking to in a Talk Group can be seen on your display (if you have one). Personal calls, point 2 point as they are called can also be made between just two radios.

So with all this comes a slightly new way of operating. There are some basic do's and don'ts. The DMR Marc Network people have a few tips and advice on this. Again, they can be found on their web site www.dmr-marc.net. These rules are only there so that everyone can benefit from the facilities DMR offers and so as not to hog a wrong or non-allocated Talk Group and/or a Time Slot.

The main ones being:-

Ensure your radio is properly programmed and set up, if in doubt please ask.

Please ONLY use the agreed Talk Groups and on the appropriate Time Slot.

Do not use the Cluster Talk Group (950) for QSO's that will only be to another Local user.

Remember, when the Cluster is fully operational your QSO will be broadcast on all the Cluster Repeaters, GB7BS, GB7AA, GB7JB, GB7SD and GB7DR simultaneously.

If everyone follows this basic courtesy then everyone will benefit and enjoy the services DMR offers.

More information can be found about such Etiquette in this document:-

http://www.dmr-marc.net/Amateur_Radio_Guideto_DMR.pdf

Techno phobia!

We do appreciate that DMR can be, or sound a bit complicated, but like any technology it's a learning process. We do not want to use this newsletter to delve into the finer points as it would take a lot of paper to do so.

However, it should be remembered that when operating a DMR Repeater things are very different to that of an Analogue repeater. Firstly there are no confidence tones or pips to indicate that you have accessed the repeater.

As we have said, most of the functionality and confidence tones are generated in the user's radio, not the repeater. How this operates is very much down to how the user customises it. It is the repeater that tells the users radio when to make a sound or light/flash a Tx or Rx LED.

And there's more!

If anyone wishes to get into DMR then there is a lot of information out there, www.dmr-marc.net is a very good place to start.

It should be pointed out that there are a few **CRITICAL** settings to be made when programming a new radio for use on the repeater. This is for everyone's benefit and ensures that everyone using the repeater can receive and transmit in a logical fashion and if set up correctly, will prevent doubling of stations trying to break in, or who are not sure if it's their turn to have an over!

Remember, with DMR it's the Repeater that actually allows YOUR transmitter to transmit. Pushing your PTT button does not guarantee you that you are actually transmitting! And if you are indeed transmitting it is possible for you to be interrupted by the Repeater, forcing you to go back to receive even though your finger is pressing the PTT with much gusto!

Both Mat and I will do what we can to help anyone who is having difficulties getting their radio working or who maybe is unsure of the correct settings to get on the GB7BS repeater. Do please email us at info@gb3bs.co.uk and we will do our best to help.

Remember, it's not hard, it's just different.



WiFi Broadband Link.

Just prior to the new Antenna installation Mat and I were working on getting our 2.4GHz WiFi link up and working. This would provide us with basic broad band at the repeater site. This is needed to form part of the Cluster linking project to the other repeaters, GB7AA, GB7JB, GB7SD and GB7DR.

All the other Repeaters will use the Internet to link to GB7BS via this link, which will be the main focal point.

The link will also allow us to fully monitor and control remotely both GB3BS & GB7BS.

One end of the link had already been installed at Mat's QTH so one Sunday afternoon we decided to erect a temporary pole mast at the repeater site and prove that our predictions and

calculations were right. We raised the temporary mast up to about 15 feet and within only a few minutes Mat had full access to the Internet, the WiFi Link was working. We both had a sigh of relief and decided a cup of tea and a biscuit was needed.

Dish & Transceiver installation at Lansdown.

Imagine a cold, grey foggy morning with damp on the ground. Now imagine a cold grey steel structure reaching up 30m into the cloud.

Well that's how the tower at Lansdown looked at 10am Saturday 29th November this year.

We had been watching the weather forecasts for several weeks, looking for a dry and still weekend, with enough notice to contact our landlord to confirm things with him. The 29th did not look too promising, although the weekend weather had looked, at least on paper, to be the dry weekend we had been looking for.

I had managed to speak to the landlord on Wednesday to arrange Saturday, with the agreement I would contact him Friday Morning with a "Go or No Go" decision.

Friday reports confirmed the weekend as a whole was ideal. So the call was for us to "Go ahead" which the landlord Okayed and left instructions for the duty watch that we were attending site.

A Plan had already been discussed with him (the landlord) and safety instructions had been defined by both parties.

What a massive sinking feeling Saturday at 8am as I looked out of the window. I spoke to Mark at 9am just as the Sun was just starting to break through, and it was agreed that we would go to site, and do the final preparatory work and inspect the tower conditions and leave it for a while to see if the Sun would continue to burn through.

Yes, we were hoping to fit the "B" end of the Microwave, WiFi link. Before I left home, I made double sure I had powered up the link at my house, (The "A" end) as it would have been embarrassing finding out that I had forgotten.



We assembled the antenna mounting brackets, which had to be type rated for tower use. Then we mounted the dish (Panel) to the bracket, so far ever thing was going good. Connection of the feeder cable complete, Mark started work on bandaging the connection with Denso tape. Once totally embalmed we went back outside to take a look at the tower, it had turned into a nice sunny day. The Fog had almost totally burned off.

Fully rigged, Mark started his climb up the tower. Monitoring his progress I was amazed how fast he actually climbed to the 22m platform. Once safely tied on to the tower the tools and equipment was lifted to the work place (A rope and block were taken up with Mark).

Lifting the equipment took slightly longer than the climb as by this time, the dish and mounts had been separated and were lifted individually.

Once Mark had installed the dish, I conducted some point to point link tests using the RSSI Monitor built into the transceivers.

Mark was able to peak the link level, the dish was within 0.5° from the Radio Mobile heading. After peaking levels to the best we could get, Mark locked the mount, then after lowering the tools back to the ground he descended the ladder.

On the way down, the feeder was cleated. It was just starting to get dark when he finally made it down. It was decided the rest of the cable run would wait for Sunday to complete. The cable was made safe and left.

Inside I was continuing to test the link budget and over all speed of the circuit. It was giving a transfer rate of 1.8Mb downlink and >4Mbps uplink. This is more than enough for everything we need on site.

We even were streaming BBC News live while we finished up on site.

The following day (Sunday) we went back to site to finish routing the feeder cable outside and set up a test system to test just the link, no other equipment involved. As the visit was to just tidy up we were not on site too long. But the test setup was left running. As I type this section of the news letter the test system is still running, this has now been 77hrs continuous link testing. One thing that has come to light is a possible slight dish miss alignment at my end of the link.

Why do we think this? The uplink from my transmitter to Lansdown is being seen at the Lansdown end as -78dBm, yet I am seeing Lansdown at my end as -82dBm. This is a result of either an azimuth alignment problem, or the height of the dish AGL has placed it in a Fresnel Zone. Either way we need to see if we can peak this end a little more to see if we can balance out the levels, this work is planned for week commencing 8th December.

The link over all is showing to be good, BUT we now need to test it in a real pea soup of a fog, or in a torrential rain storm. Something with a high water content, rain would be the better option as it would see how the link survives with rain scatter attenuation we also need to load test the link.

A video of Marks tower work will be placed on YouTube in the not to distant future.





YouTube.

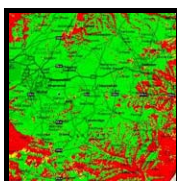
Many of you would have heard of YouTube, it's a free to use internet facility where you can upload videos or watch other videos uploaded by people from around the world.

Content varies from highly technical subjects, through explanation videos to, well let's say some find video's of cats doing crazy things amusing.

People who upload videos do so to things called "Channels" to help viewers find the content.

The repeater group has its own channel where we have uploaded some videos for our members (and non-members) to view. We try and put things on the channel people will find interesting (we hope)

To find our channel, simply log on to <http://www.youtube.com> and search for GB3BS. Our channel has a green/red coverage map icon.



Then select from our choice of videos

Enjoy.

Facebook & Twitter.

As always, we do our best to keep our Facebook page up to date and report on as much as we can. Our membership of the Facebook page has really grown over the last year with around 110 followers.



It's nice to see so much interest and activity by our followers who regularly add comment, post matters of interest and openly discuss or comment on repeater topics, so a big thank you to everyone who has contributed, please spread the word.

We appreciate that not everyone likes Facebook or wishes to join it. However, it is a good medium for everyone to have a voice and post items and pictures quickly, as things happen. While some people may not want to fully lay open their personal details on Facebook, you don't have to!

You can open a Facebook account with the bare minimum of details. Then only join the Groups, like ours, that you are interested in.



Twitter uses message of 128 characters to send information.

You "follow" people, groups or organisations that interest you to keep up to date with information or alerts.

@gb3bs is our identifier in the world of twitter. You can keep up to date with emergency communications about failures, planned work, or other information the repeater group wishes to share with speed.

Talks.

This year, most of North Bristol Radio Club (NBARC) are probably glad we only did the one technical talk for them this year, although I did put a video presentation together for them showing my tour of Dayton, and of the USA we (Gary M1GRY and I) did over four weeks back in May/June.



The Technical talk was titled "D.M.R. Radio – The Basics you need to know" I think was met with mixed

views, some positive, some not. The Talk gave a basic introduction to DMR Radio, how it differs from D*Star, types of radio you can buy to work DMR, the repeater and Customer Programming Software (CPS). The talk then went on to outline the essential items needed to be programmed into all DMR radios to get them to work. Finally we spoke about some of the "Gotcha's" we all can and do suffer while programming the radio to work DMR.

It was, at times moderately heavy, technically, but it was felt when I wrote it there was no simple way to put some concepts across

I am glad to say I did not send the whole room to sleep (one or two yes, but the room was warm, dark and cosy so I put it down to that).

Thank you to NBARC for having Mark and I along to deliver the talk. I know NBARC is my club, but it is nice to be able to give something back to the club.

Rally Visits.



This year, we were lucky enough to be able to attend two Rallies. Our first was the West Rally in Frome Somerset. On our stand we displayed two rolling videos about the Repeaters which Mat edited up for the group.

Both Mark and I were available for answering questions and general chats with people we have not seen for over a year.

We also were fortunate to receive some membership Renewals & donations. We had also a couple of new members join the group. The sweet bowl was well visited (especially a nice young gentleman who was awfully polite!). It did have the desired effect of getting people to come over and chat. Bribery does get you everywhere! Our thanks to Shaun and all those involved in organising the rally. A JOB WELL DONE.

We also attended the Chippenham Micro Rally held at Neston near Bath in October. The venue was well attended and again gave us a chance to answer question, mainly about the differences between DMR and D*Star.

We also met up with the keeper of GB3JB (soon to also look after GB7JB). The rally was well attended and I did notice some people still arriving at the end of the rally who were, err, disappointed - Thanks to Ian G0GVI and Jon G0IUE.



The Antenna Autopsy.

Mark has already mentioned that the main antenna on site that was fitted in 2009 developed a fault with an increase in SWR.

Its strange, at Cossham hospital we had a pair of these Finglas SA460 antennas (Right) that had been up for some 20 years. But, one of the main contributing factors for moving GB3BS from the dual antenna to a single antenna was the fact that the RX antenna (upper antenna array) had developed a high SWR and was becoming "Deaf" (glad we abandoned these when we left site).

Strangely this high SWR was also one of the symptoms of our antenna fault, yet it only appeared to happen at the hottest part of the day, and only during the summer time.

As the location of the antenna (at the very top of the tower) made the choice for us of repair or replace simple. Pay for a new antenna and a single climb by a rigging contractor as apposed to removal, repair, re-fit and pray with at least two climbs to pay for and maybe more expense if the antenna should fail again.

The antenna was replaced on a foggy and wet morning (we always seem to select tower work days when it's horrid) and the failed antenna was recovered.

Initial visual inspection for any damaged to the main feeder showed no possible cause of the SWR problem. So I removed the faulty antenna back to Mat Manor (QTH) to have a closer inspection



Firstly, before any work was undertaken, all radiating elements were labelled so their location could be identified once things had been disassembled.

Once labelled up, I started off by looking at the obvious parts first. The Feeder and N-Type connector, I was looking for signs of jacket fracture, water ingress or possible impact damage to the coax. Nothing was found, Denso had lived Up to its name!

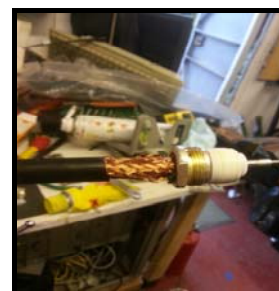
There was some grass residue on the inside of the connector. This was purely from where the antenna had been laid on the grass at site once it had been removed from the tower.



The outer sheath of the feeder was cut back to approximately 30mm from the plug, checking for water discolouration and, what in the electrical world is sometimes referred to as Cable Cancer. Again, nothing was found other than clean, bright copper. No sign of water in the coax at the plug end, this re-enforced the fact that the joint was water proof.



The stripped down plug was also fine inside. No water marks!



The final inspection of the feeder was to remove the plug from the terminated end completely, and remove the feeder from the phasing harness on the antenna itself, stripping back 130mm of sheath, braid and about 30mm of the inner foam dielectric.

Again nothing was found. What was going on?

I then removed the phasing harness from the elements and stripped off all of the Denso tape Mark had fitted to the splitter joints of the harness, visually inspecting all joints/cable entries as I went.

The phasing harness was made from a foam dielectric construction, double screened with foil. No markings were on the coax to its exact type, but configuration suggested it was a 75Ω, RG214 style coax similar to Satellite coax is probably the best way to describe it.

This also was stripped back about 130mm and checked for water ingress. Nothing was found.

Next the four folded “J” dipoles were removed from the supporting mast (The rivets were drilled out.) and these were individually disassembled, starting with element No.1 at the bottom of the antenna (Base) and working up towards element No.4 at the top of the mast.

Each antenna feed point was removed, broken down and inspected for anything that could cause a failure, especially a thermal related failure.



It was noted that the feed point formed a basic capacitor, between it, and the element. Stripping one of these points down confirmed this theory as construction was nothing more than an insulated stud connected to the inner of the coax, which then was electrically insulated from the folded element by insulated washers.

Elements one, two and four (counting from the bottom), all looked fine apart from a little surface corrosion to the element itself, and to the stud, but nothing to worry about.

However element 3 it was noted that the rubberised insulation washer insulating the stud from the element, forming the capacitor, was fractured in several places.

Gentle heating (Heat guns have many uses including shrink sleeve!) to a temperature that was uncomfortable to touch the over all DC resistance was reduced from $>100\text{M}\Omega$ to $<2\text{M}\Omega$

Unfortunately I was unable to test the capacitance.





After stripping this feed point down and removing this insulator, it was discovered it was in fact a steel washer with a rubber coating, and the coating was crumbling around the washer.



It was then theorised, using the tests done above, and observations made while the antenna was on site, that as the antenna warmed in the summer sun, its capacitance reduced to such a point that at UHF the feed point appeared as a low impedance on element 3. This was causing a high(er) SWR to be presented to the PA of the Transmitter, which in turn had its own SWR Bridge which caused the PA

to back off the power and therefore was also causing a loss of received signal to the end user.

The changing SWR also affected the Circulator installed as part of the GB7BS integration allowing more of GB7BS and GB3BS TX power to get into the opposing Receiver and causing a bit of desensitisation.

Both Mark and I spoke to others about the design of the SA460 and this "Capacitor". Those we spoke to confirm the notion of this capacitor coupling.

The bottom line of all of this work, not only having a large pile of aluminium, copper and rubber, is that this fault took me a couple of days to find, with the total destruction of the antenna.

A fault that to be honest, the repeater group would not of had 100% confidence in if we attempted a repair, and that with the aforementioned cost of a pair of riggers, changing the antenna was really the only sensible solution.



The picture left shows element No. 3 before I stripped it down. You can see the crumbly washer resting on the radiating element. Just below the locking nut and the plain "A" washer.

The gunge shown on the black nylon block below the element is factory applied silicon rubber.



Above, is element No.3 with the locking nut removed, look carefully on the right side of the washer, you can see its insulator coating has broken up badly.



One of the coax dividers forming part of the phasing harness.

The two white marked coaxes each go off to each of two elements. This is duplicated below for the other element pair. The black tails go off to a power divider then on to the incoming feeder.

Membership.

As we have already mentioned, 2014 has been a busy year and with it an expensive one. Apart from GB7BS's Tx/Rx we have still had the usual outlays plus some which were critical in the bringing together of both GB3BS and GB7BS.

With two repeaters on site we now have to pay two lots of insurance! The RSGB insurance scheme and policy only supports one repeater, even if they are on the same site and share the same antenna or mast. So we have to purchase a second policy for GB7BS.

With all of this we were hit with the Antenna fault on site. This not only delayed GB7BS going live but it also had the potential to wipe out our bank account.

As we have said earlier in this Newsletter, if it had not been for the donations received then events may have been quite different. We should mention, at this opportunity, that we received donations from people that wanted to remain anonymous, and we respect that, but wanted to say a big thanks to them.

We should also say that any donations we receive go into the general "pot" and is there for the upkeep of both repeaters as a whole.

Membership this year has been relatively good, with numbers bobbing around the 60 mark.

Looking forward, now the dust of 2014 has settled, Mat and I feel that it is now an appropriate time to increase our membership fee. It is not something we liked doing but it will go to help rebuild our funds and give the Group a better buffer against unforeseen events should they occur.

The membership fee of £6 has remained at this level for some 10 or 15 plus years, it's hard to remember! So, we feel that raising our membership fee by £2 to £8 a year is about right. This will come into effect as from 1st January 2015, so get your renewals in now.

As always, at this part in our newsletter, please have a look at the membership list below. Remember, if **YOUR** callsign is **NOT** listed then your membership may have expired and this will be the last newsletter you receive from us. If you think an error has occurred then visit our web site for an up-to-date listing, failing this do please email us so we can double check for you.

Please check your membership status below. If you are not listed there, then this could be the last newsletter you receive from us.

Membership snapshot taken on the 10th December 2014

2E0BKS	2E0JUW	2E0JWJ	2E0LJT	2E0PGS	2E0ZAW	G0ECM	G0GRI
G0GZW	G0XAY	G1FUA	G2BAR	G3LZN	G3XED	G3XOB	G4EIA
G4EJH	G4FJH	G4KUQ	G4MCQ	G4NFS	G4NKT	G4OJI	G4OTJ
G4SDR	G4SNU	G4TAH	G4WLC	G7AGI	G7FBD	G7FCT	G7ITD
G8CKK	G8JUT	G8PKY	G8VPG	G8YMM	M0AKF	M0GBH	M0GTT
M0HDJ	M0HTB	M0KEE	M0LHS	M0MGT	M0PRJ	M0SFT	M0XMM
M0XXX	M3JDK	M6BJL	M6FUA	M6GDP	M6KVM	M6LFA	M6OJI
M6RBY							



Membership about to expire.

Abbreviations and Qualifiers used within DMR technology.

All Call – This has a fixed ID of 16777215 (value is not editable). Similar to a Group Call.

BER – Bit Error Rate. Indicates the quality of the bit stream.
Eg. 1×10^6 is better than 1×10^3 bit errors.

Call ID – See Radio ID.

Code Plug – (*Motorola*) A CPS file that contains all the programmable variables and channels for a radio.

Colour Code – Is analogous to the sub-audible tones (CTCSS) used by analogue radios.
Value 0 to 15.

CPS – Customer Programming Software.

Downlink – The radio path between the Repeater and a mobile station.

Group – A dynamic area set aside for radio's who all wish to communicate with each other.

Group Call – A transmission made to either start a new Group or join an existing one.

Group Call Hang Time – The time a radio keeps the current Group active.
(Should be set the same as Repeater timer).

Group ID – The number given to a Group.

ID Range – 1 to 16776415.

Impolite Transmission – Allow a mobile to Transmit at any time, even if someone is already talking.

LBT – Listen Before Transmit. An automatic check to see if a mobile is in range of a repeater, if configured to do so.

Over-The-Air-Programming – Allows the radio to be re-programmed remotely.

Point 2 Point – A private radio conversation between 2 radios.

Polite Transmission – The mobile station will only be allowed to transmit when the active Talk Group is free.

Private Call – A private radio conversation between 2 or more radios.

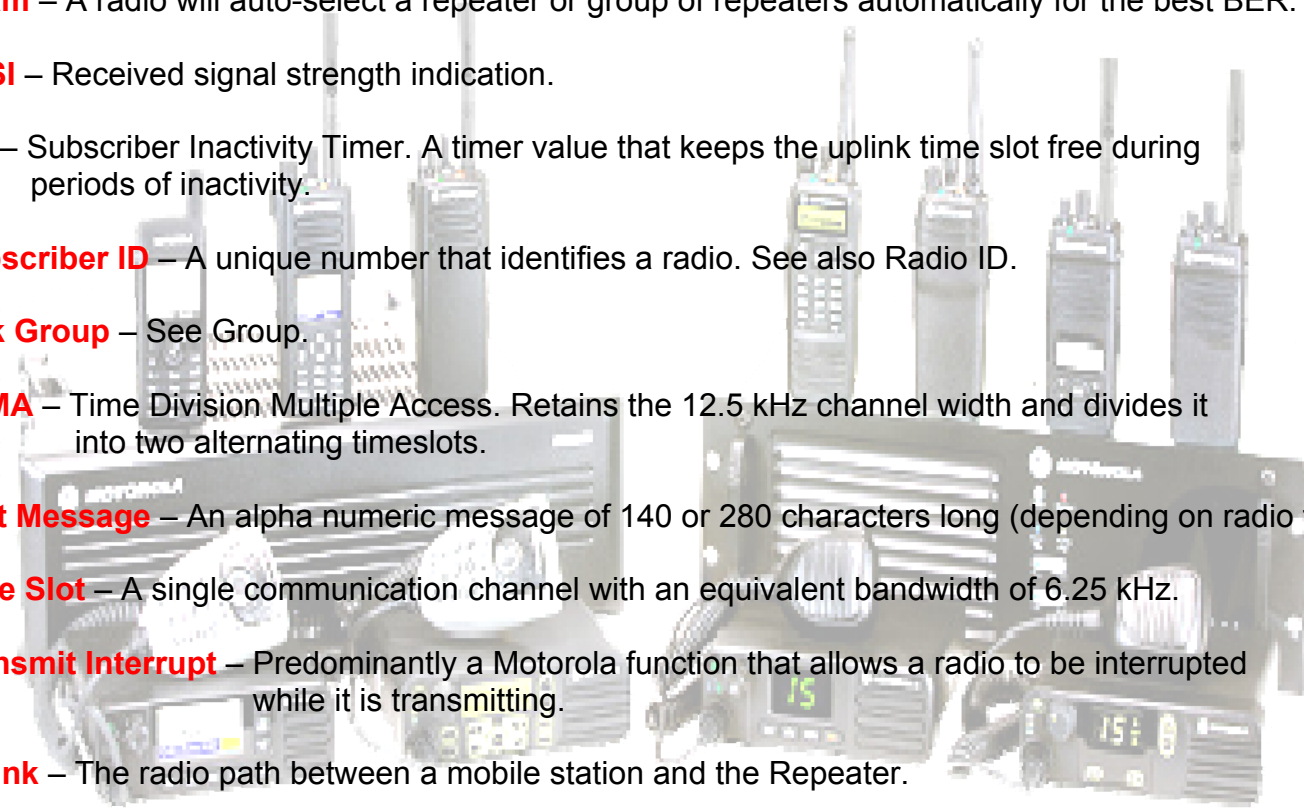
Radio Check – Silently check to see if a radio is currently switched on and subscribed to a repeater or network.

Radio ID – Sets an individual ID that uniquely identifies the radio. This ID is used by other calling radios when addressing the radio.

Radio Inhibit – Remotely inhibit a radio from working.

Radio Name – The name of the radio (alpha numeric entry). Eg: "My Radio".

Abbreviations and Qualifiers used within DMR technology.

- 
- Receive Group** – A single Group or multiple Groups that can be simultaneously monitored.
- Roam** – A radio will auto-select a repeater or group of repeaters automatically for the best BER.
- RSSI** – Received signal strength indication.
- SIT** – Subscriber Inactivity Timer. A timer value that keeps the uplink time slot free during periods of inactivity.
- Subscriber ID** – A unique number that identifies a radio. See also Radio ID.
- Talk Group** – See Group.
- TDMA** – Time Division Multiple Access. Retains the 12.5 kHz channel width and divides it into two alternating timeslots.
- Text Message** – An alpha numeric message of 140 or 280 characters long (depending on radio type).
- Time Slot** – A single communication channel with an equivalent bandwidth of 6.25 kHz.
- Transmit Interrupt** – Predominantly a Motorola function that allows a radio to be interrupted while it is transmitting.
- Uplink** – The radio path between a mobile station and the Repeater.
- Zone** – A group of RF memory channels that maybe scanned.
Can be a mixture of either Analogue or Digital.

STOP PRESS (1). GB3BS CRASH DIAGNOTSTICS

I am sure most users out there have been aware that very occasionally GB3BS throws a bit of a wobbly! This is where the repeater continually repeats announcements that it has gone into Time Out and then out of Time Out (Repeater Timeout, Repeater Timeout Cancel).

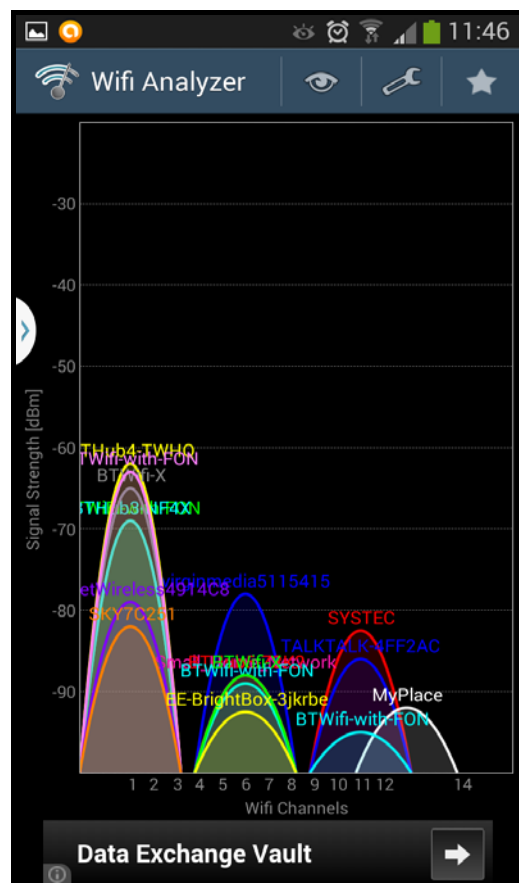
Unfortunately when this happens it means we have to attend site to fix it. Most problems we can fix remotely, but not this one.

We have been attempting to trace this problem for some time and to find out why it does it. The good news is that following discussions with Arcom, who make the RC210 Controller, we now believe that Time & Date information being sent to the Controller from our GPS Clock, at times, is either being wrongly interpreted or accepted as valid data. At the times when this error occurs it would seem that the GPS Clock data goes on to corrupt, or write over, other memory locations, causing the RC210 Controller to crash big time!

Firmware changes to the RC210 Controller have already been made and now we must make our changes to the GPS Clock Firmware to complete the Fix! Mat - G7FBD is currently writing a new version of Firmware and fingers crossed we should see the end of this bug. Installation if this new Firmware is imminent and may have already been done by the time this Newsletter hits your post box.

Please note that when this crash does occur then the Repeater is effectively **OFF LINE**. There is absolutely no point in repeatedly trying to access or use the Repeater. Please bear with us and wait until it's fixed.

STOP PRESS (2). WiFi link revisited.



Following on from the WiFi link story.

Since the link was installed I have been conducting some tests on it. Although using a ping tracer, the link looked stable, with a good RSSI (Received Signal Strength Indication) at both ends.

Simple data transfers across the link worked, but it was noticed that during transfers from my end to Lansdown was relatively quick, but pulling data from Lansdown to my end of the link was very very slow, and the FCS counter (Failed Check Sum) was increasing very quickly.

The link problem was verified when we did some over the net testing between GB7BS and the temporary location of GB7DR.

Audio being sent to GB7BS was clear and unbroken. The audio being returned to GB7DR was horribly broken.

This proved the problem was at my end! Looking at the 2.4GHz allocation at my location, we can see the wifi spectrum is horrid.

In the picture above you can see signals are peaking up to levels of -60dBm! and swamping my -81dBm link signal from Lansdown. What this picture does not show, is the constant level changes the signals are going through.

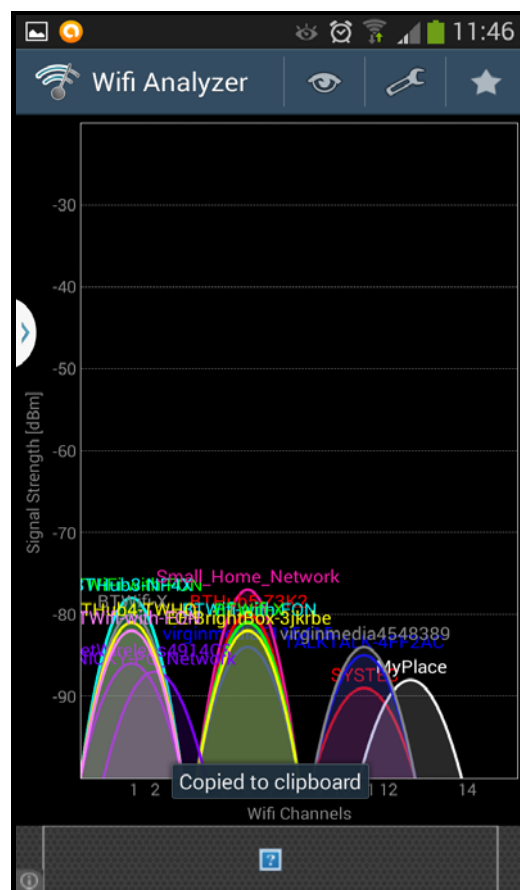
The next picture (Right) was taken only about 10 seconds after the first. It shows how fast things change.

I have moved the link to a different channel, okay there was a slight improvement, but still way below an operational requirement. I have spent an afternoon while Mark proof reads this newsletter changing various system variables to try and improve things, without much success.

It is worth noting at this point, the file transfers were done Using TCP/IP, a protocol with built in error correction. This is why the transfers were working, but slow due to the automatic retries.

Audio from the GB7BS is sent via a protocol called UDP. Although UDP does error check, it can only tell if a packet is correct or not, and is unable to re-request the packet to be sent again (TCP/IP). Instead, if UDP detects an error, it simply drops the packet! Hence the broken audio at the GB7DR end.

We now have some new 5GHz link equipment in sight which is bang up to date equipment, much more robust and intelligent. We hope that it will not cause too much of a delay in getting installed and GB7BS linked up.



Merry Christmas

And a
Happy New Year



That's it for this year. We hope you all enjoyed our 2014 Newsletter.

From Mark - G4SDR & Mat - G7FBD/KG7FBD



THE BRISTOL 70cms REPEATER GROUP.

GB3BS GB7BS

Website: www.gb3bs.co.uk Email: info@gb3bs.co.uk

If you use the Repeaters, GB3BS or GB7BS and would like to support the group then all you need to do is fill out this form and part with £8.00p. Your details and membership fee will then be passed to our treasurer. You can also subscribe using Paypal™ (also supports Credit/Debit card payment). See “Membership” on our website for detail. 100% of your membership goes towards looking after both repeaters and the site in which they are located.

PLEASE REMEMBER

Repeaters do cost money to run.

Without members the repeaters GB3BS and GB7BS would cease to exist.

Please help support what you use.

Please make cheques payable to “Bristol 70cms Repeater Group”



Please tick appropriate boxes and print clearly – Thank you.

☐

£8.00 Membership

☐

Donation Amount £ _____

I am paying by **CHEQUE / CASH** Please delete the appropriate.

Callsign: _____

Email: _____

Name: _____

Address: _____

Postcode _____

Please send to: The Bristol 70cms Repeater Group.

PLEASE NOTE: Membership is based on a yearly subscription (from the date processed). Although we can process advance early membership we would discourage this method. At present we DO NOT have a “Family” membership, or any other concessions. Please also note ALL membership fees and donations are NON refundable. We recommend you do not send cash through the postal system. The Bristol 70cms Repeater Group cannot be held responsible for lost or missing payments. Being listed on our website is confirmation of membership. No receipts are issued unless a stamped address envelope has been provided. Membership is used for the upkeep of BOTH Repeaters.

Any information/data provided will ONLY be used to mail or e-mail you our newsletter and send membership reminders. Data will be deleted 6 Months after the laps of any membership. Reminders of pending membership laps will be sent via email where possible one month before the expiration date. The membership section of our website also reflects this information.