

DIGICOM

The Newsletter of MAXPAK, The Midlands AX25 Packet Radio User Group

DC 85

February / March 2008

Node/BBS News

Correct 1st February 2008

GB7MAX /BLOX Node

(Bloxwich)

The BBS/Node, using WinFBB/ XROUTER continues to perform satisfactorily. Current user access to both BLOX and GB7MAX is as follows:

2m 144.9375 MHz 1K2

70cm 432.675 MHz 1K2

Direct Telnet access to the BBS on Port 4001

And to the BLOX node on Port 2323 is

Now available

Contact Chris, G0CNG, sysop, for further Information or access password authorisation for either or both BBS and the Node.

GB7WAL

(Walsall)

This BBS is now back on air on

GB7WV NODES (TheNet X1J-4)

(Wolverhampton)

These continue to function satisfactorily. User access available as follows:

2m (9K6) WV22 GB7WV-2 144.975 MHz

70cm (1K2) WV72 GB7WV-7 432.675 Mhz

DY NODES

These nodes closed down on 25th May 2007 when our current agreement at Sedgley Scout HQ ended.

DUDLEY GB7DN (XROUTER) NODE

(Dudley)

Sited at the QTH of our Secretary, G4GSB in Dudley, user access is as follows:

1 144.850 Mhz 1K2 User/Forward

2 432.675 Mhz 1K2 User/forward

3 432.625 Mhz 9k6 User/forward

4 1240.950 MHz 2k4 Forwarding

5 Direct Connection to G4GSB PMS

Salop Node See Chairmans Jottings

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WINTER / SPRING DIARY.

Monthly Member's Meetings continue to be held at The **Sir Robert Peel Public House**, located on the Main A4124 Bell Lane adjacent to the Lichfield Road / Broad Lane Junction and traffic lights.

A to Z Reference: Square 7G, Page 25.

Postcode = WS3 2JS

All meetings commence about 19.45 hrs in the downstairs Lounge Bar.

Monday 4th February 2008 Natter evening

Monday 3rd March 2008 Natter Evening

Monday 7th April 2008 A.G.M. All Welcome!

We hope you may be able to pay us a visit at one of our meetings.

CHAIRMAN'S JOTTINGS

Greetings and a very happy new year to you all.

We have been busy over the Christmas break!

Since the last issue of Digicom, we have re-instated Tony, G7BUG's "SALOP" node (G7BUG-8) on 144.950 MHz in Newport, Shropshire. It is a single port radio node, operating at 1K2 using G8PZT's XROUTER software and also has an AXUDP Internet link to BLOX giving east Shropshire based users an alternative path into GB7MAX as well as access to the worldwide Node network and also DX-Cluster mailboxes. Any reports from users would be very welcome to either G0CNG or G7BUG both @ GB7MAX or alternatively via Email, see last page for email addresses.

In addition, our secretary, Miles, G4GSB is planning to add an experimental 2m 9K6 user access port to his GB7DN, DUDLEY node which will operate on 144.975 MHz Keep an eye on GB7MAX for further announcements.

Just to remind all readers that Telnet access via the Internet to GB7MAX is available for all Members who are outside radio reach of GB7MAX in Bloxwich, West Midlands.

Contact myself for a Telnet password if you wish to give this means of access a try. The popular Winpack terminal software has an excellent Telnet client and I can give anyone full support in setting up Telnet access for the first time using Winpack. Winpack is available for download from our Website, www.maxpak.org

Does anyone fancy a year on the Committee this year? Fresh blood and new ideas are always welcome. Please contact myself or Miles, G4GSB for more information if you are interested. This year's Annual General Meeting will be held on Monday 7th April 2008 at the Sir Robert Peel in Bloxwich.

The agenda will be circulated to all Members nearer to the date. Please keep this date free in your diaries.

In the meanwhile, enjoy this Digicom and my thanks to Miles for composing and editing it.

73's Chris G0CNG, MaxPak Chairman 2007-08.

www.maxpak.org.uk

Many thanks to Albert, G0KFS for sending us this article.

High Speed Modem for Packet Radio

Designed and Manufactured by GMSK Data Products - UK

Reviewed by

Roger J. Cooke, G3LDI

GMSK Data Products is a partnership company set up by two professional electronic design engineers who are also keen radio amateurs, **Matt, G6WPJ**, and **John, G8STW**. They are the sysops of the TCP/IP packet stations GB7WPJ and GB7STW respectively. Matt and John are keen members of their local TCP/IP group, the Essex IP Group or EIPG.

The first project was to design a high speed modem for use Radio Amateurs. From the desire to see if better than 9600 b/s was possible in normal 25kHz channels and also to modernise on the excellent design some years ago by James Miller, G3RUH. The result was the Vfast28.8 modem adapter for a TNC2. This proved very effective and as a result of an approach from the Essex group and also the East Anglian Data Group (EADG), Matt and Oh decided to develop a real time bit repeater for speeds up to 38,400 b/s. In fact they managed 57,600 b/s and two further products resulted, the AX384 and the AX576.

These new TNC designs have generated a lot of interest and are now being looked at by a number of packet groups around the UK as the basis for the new High Speed Network. The Vfast28.8 modem adapter also developed into a full RS232 driven radio modem for transparent data transfer not using the overhead of AX25 - the RSM192, latterly a smaller more compact version, the RSM192S has been produced as a custom project for a company in the USA.

These well engineered products use modern design techniques including the PIC family of micro-controllers for high speed bit processing. In the RSM192, the PIC micro is used to manage the RS232 comms, handle a complex 2-speed fast frame acquisition sequence, generate a very effective Data Carrier Detector and provide real time bit randomising. The PCB's are very high quality and the layout done to ensure good analogue to digital separation. Quality in design and production is taken very seriously by both Matt and John.

GMSK.

A method of data modulation known as **Gaussian Minimum Shift Keying** (GMSK) is used to pass data as fast as practicable in the radio channel. GMSK modulation and demodulation and the modems' control and data coding are all performed in the latest integrated circuit devices. This gives a compact design and layout which is easy to build with high performance.

The following is a list of features:

- Radio Port speeds of 4800, 9600, 19200 and 38400 b/s with AX384 or 7200, 14400, 28800, 57600 b/s with AX576.
- High Speed Radio Modem operates full duplex at all the radio speeds above with no component changes.
- RS232 port speeds from 9600 to 38400 b/s (AX384) or 115200 b/s (AX576).
- TAPR TNC-2 EPROM compatible including NET/ROM & 64K EPROM's such as TheNet X1J, and ROSE.
- A Real Time Bit Repeater can be enabled from software. Provides a contention free LAN in its coverage area. An intelligent FIFO buffer allows transmission of long frames without bit under/over -runs. Other TNC functions are unaffected allowing simultaneous use, e.g. as a Node - TheNet X1J.
- "Set-up" Software in ROM allows modem configuration to be modified on screen.
- Live Link Bit error Rate Measurements enable easy set-up of data links.
- Full Morse Ident as per the UK license regulations, regardless of TNC software fitted. This can be disabled for use elsewhere.
- 96k ROM Space allows in addition to "Set-up and Kiss ROM", 1 x 32k EPROM, 1 x 64k EPROM or 2 x 32k EPROM images to be fitted.
- 128k RAM can be fitted in place of the normal 32k if required.
- Radio Control Signals PTT and Mute can be set active high or low from Set-up software
- 10 Mhz Z80 Processor ensures no lost or missed frames due to software errors.
- Choice of data randomizer allows G3RUH or GRAPES method to be used.
- Bi-Phase Data Coding can be selected in place of data randomizer to allow simple interfacing to most types of voice radios (Includes FM / PM crystallised or synthesized)
- RS485 Interface Option allows multiple TNC's to be connected in "Node Stack" with simple 4-wire cable. No more diode matrices!

Theory of Operation.

Frequency Shift Keying

The simplest method of sending data signals over an FM radio is to use a frequency shift in one direction to represent a logic 1 and a frequency shift in the other direction to represent a logic 0. As an example, a transmitter may operate on a carrier frequency of 144.500Mhz and move its' carrier down by 3kHz to 144.497 to signal a logic 0, and then up 3kHz to 144.503Mhz to

represent a logic 1. Note that no audio sub-carrier is used. This is shown in Fig. 1.

This method, known as FSK, in fact works well and is used widely at present on the UK network with the usual 2 meter and 70cm rigs. However, it has been shown that an efficient form of FSK occurs when the frequency shift (dF) is half the data rate (DR) of transmission. This form of FSK is known as Minimum Shift Keying (MSK). Expressed in mathematical terms, the definition of MSK becomes:

$$dF = DR/2$$

In the example in Fig 1, the total frequency shift is 6kHz. It can therefore be inferred that if MSK is being used with this deviation the data rate must be 1200 b/s. A further requirement of MSK is that the change from signalling frequency to the other must be done with a continuous waveform and with no phase discontinuities. This may not be true when using the Vfast28.8 modem but has no practical effect on its' actual performance.

It is apparent that although the Vfast28.8 modem is described as a (G)MSK modem, this will only be true if the radio peak deviation is set up to be half the data signalling rate, e.g. 7200Hz for 14400 b/s transmission speed.

Gaussian Filters

The main reduction in bandwidth comes from the use of frequency shaping before FM modulation takes place. This is done by taking the square waves of the serial data signal and passing them through a low pass filter. One type of suitable filter is the Raised Cosine Filter which is used in some radio modem designs.

The Vfast28.8 modem uses a so-called Gaussian Filter. A Gaussian low-pass filter is a filter which, when excited by a single impulse at its' input, gives a Gaussian shaped output response. The shape known as a Gaussian curve is also sometimes known as a Normal Distribution Curve.

The Gaussian filter provides an excellent shape for radio data applications. If the basic FSK transmitter is modified by the use of MSK and the addition of a Gaussian input filter to give a GMSK system, the resultant bandwidth of the data signal is now much reduced and is suitable for transmission by a narrow band FM radio.

The frequency at which the low pass Gaussian filter starts to filter has a direct influence on the bandwidth used for transmission. The lower the frequency relative to the data rate of the signal, the narrower the transmission spectrum, but the higher the likelihood of bit errors during transmission. The ratio of the -3db point of the low pass filter (F1) to the data rate is known as the BT value. This can be shown by:

$$BT = F1/DR$$

The Vfast28.8 design provides the ability to select two BT values (0.5 and 0.3) for each data rate. As a guide, the following figures can be regarded as the

maximum data rates which can be achieved in different channel bandwidths using BT values of 0.5 and 0.3

BT = 0.5 BT = 0.3

4800 b/s in 12.5kHz 8000 b/s in 12.5kHz

9600 b/s in 25.0kHz 1600 b/s in 25.0kHz

19200 bb/s in 50.0kHz 32000 b/s in 50kHz

GMSK as a method of transmission is simple and effective. It does, however, require care with some points. These mainly concern the transmission of long strings of "1's and 0's".

A string of 1000 logic "1's" will appear as a single frequency shift at the beginning of the string and a further frequency shift at the end of the string. This can lead to problems with the receiver not being able to track the incoming signal correctly. Both bit timing and level information can be lost. When a BT value of 0.3 is being used, problems also occur with single bits bounded by their complement being sent repeatedly. For example, the bytes 00010000 or 11111110 sent many times over can cause the GMSK demodulator to give out bit errors.

All problems of this type can be avoided by the use of a data scrambler or randomizer in the modem design. The Vfast28.8 modem includes this function in the modem controller device. As the data will still contain some low frequency content, the radios must be able to carry, without distortion, frequencies as low as 30Hz in transmit and 40Hz in receive. The upper frequency limit required is dependent on the data rate used.

Considerations

The Vfast28.8 full duplex radio modem provides excellent performance in the most demanding conditions. When used at 9600 b/s it is compatible with other modem designs. However, it is capable of much more. Both versions, the AX384 and the AX576 include the K9NG data-randomizer as a default option. The GRAPES randomizer is also included. However, the user can also select the alternative method of data coding, known as "Bi-phase coding", as described above. This makes interfacing to typical voice radios much easier.

A unique feature in both modems is the inclusion of a "Real Time Bit Repeater". This allows the user to install a contention free LAN in an area. The operation is as follows. The repeating station is equipped with an AX384 or AX576 TNC and a Full Duplex radio. This radio has split transmit and receive frequencies. The stations wishing to use the repeater use split frequency half-duplex radios. This is the same situation as with a voice repeater. As soon as one of the user stations starts to transmit data the repeater keys its' transmitter and starts to relay the input data. As soon as the other user stations detect that the repeater is sending they are inhibited from transmitting. Thus all contention to access the repeater is avoided. Since the data is resent in real-time this is unlike a normal Node, where the packet must be fully received before it is forwarded to its' end destination. The bit repeater in the AX384 and AX576 includes full data bit rate clock regeneration to avoid excessive clock jitter on the repeated data.

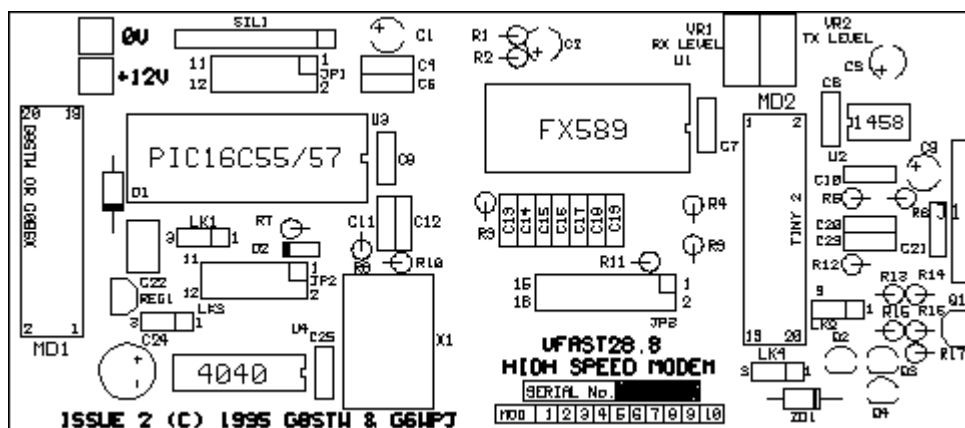
It also include an extending FIFO buffer to ensure bits cannot over-run or under-run where the bit rate clocks of the user stations and the repeater are slightly different.

Software and set-up

The main operating software ROM supplied includes a KISS mode driver for the TNC and a "Set-up" program. For many users such as those running G8BPQ Node, KA9Q TCP/IP, and Linux AX25 software this is all that is required. The "Set-up" program allows the user to simply configure some TNC and modem functions. The "Set-up" program may be driven by a simple terminal program or a Windows based program (supplied with the TNC's). The "Set-up" mode is activated by holding in the "Set-up" button while switching on the TNC. It also allows various test signals to be generated by the radio modem to enable the user to get the best performance from the connected radio equipment. When used on a radio link with a AX384 or AX576 at each end the users may do bit error rate measurements on the link to allow fine-tuning of the RF equipment for the best performance.

As can be seen, the AX384 and AX576 are state-of-the-art TNC's, yet are available in both kit and built versions.

Full user documentation is included in electronic form along with a Windows based program to control the "Set-up" mode.



The construction is from high quality materials including an RFI screen coated stylish grey casing. The styling is designed to match well with modern office and computer equipment. The PSU is extensively filtered and smoothed to ensure correct operation of the TNC even in the presence of strong RF fields.

This TNC is being used in the local East Anglia area as the basis of our High-Speed Backbone, hopefully operating at 19200 b/s full duplex on 23cms. Some problems are being experienced with the RF gear for 23cms at present, but hopefully these will be resolved soon. For anybody looking for a High-speed TNC, at up to 57600 b/s then this would be an ideal answer.

For further information contact GMSK at:

Email: sales@nuthatch.dungeon.com

or info@gmskdata.co.uk

They also have a WEB site on: <http://www.gmskdata.co.uk>

PROVISIONAL MAXPAK AGM AGENDA 2008

TO BE HELD AT **THE SIR ROBERT PEEL PUBLIC HOUSE** **APRIL 7th AT 20:00**

1. MINUTES OF THE LAST ANNUAL GENERAL MEETING
2. MATTERS ARISING
3. CHAIRMANS REPORT
4. PRESENTATION OF ANNUAL ACCOUNTS
5. SUBSCRIPTIONS FOR THE FORTHCOMING YEAR
6. ELECTION OF CHAIRMAN
7. ELECTION OF SECRETARY
8. ELECTION OF TREASURER AND MEMBERSHIP SECRETARY
9. ELECTION OF COMMITTEE MEMBERS
10. A.O.B

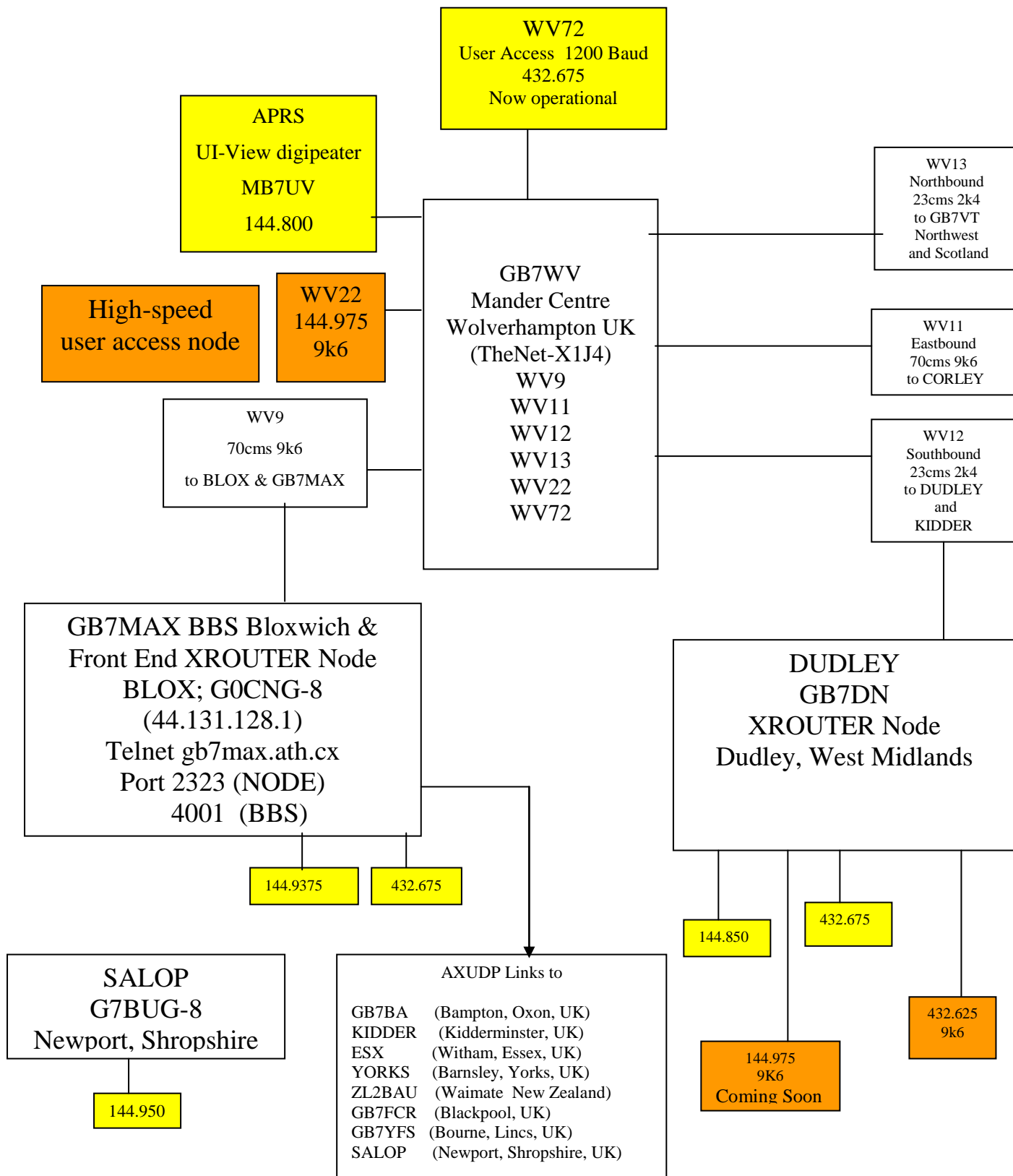
If you would like the committee to consider any additions to the agenda, please contact Miles G4GSB, by 17th March 2008

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Or 01384 254199.

The MaxPak Local Area AX25 Network; January 2008

1K2 user ports in yellow, 9K6 users ports in brown



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