



Amateur Television

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Computers and ATV... putting the 2650 to work

I am sorry about last month's issue, purely my fault. I am afraid that I didn't observe ARA copy deadlines properly.

In this issue of ARA I plan to divert somewhat from ATV to cover computers, outlining some more aspects of the affinity between Amateur Radio — and ATV in particular — to small microcomputer systems.

I also have the usual interstate news. In addition there is an updated version of Ian Davis' solid state ATV transmitter, which is presented elsewhere in the magazine as a constructional article.

Firstly let me restate that I am not a computer buff nor am I trying to convert readers. My first love is amateur television, however I have developed a very satisfying interest in microcomputing based on my entirely 'homebrewed' 2650 based system.

To those who may at this point be preparing to move on to 'Bearing 240' for some more interesting stuff let me drop a few pearls of philosophy about computers before you go.

A year or so ago I, no doubt like many readers, considered computers and particularly computer buffs as a nasty, mysterious and intrusive aspect of technological advancement that society in general and hams in particular could well do without. The evening that I made my VERY modest Dick Smith minicomputer produce automatic ATV calling routines changed all that! I realised, like many other amateurs, that these 40 leg devices are quite surprisingly clever and definitely are a vehicle for much satisfying experimentation both in the hardware (ICs, wire, power supplies, etc) and software (program material) areas.

An example is the rather crude basic-oriented graphics that I detailed in a previous ATV column. Although rough and obviously capable of much software improvement I had quite a lot of enjoyment in producing this program.

The connection between amateur radio and computing is one that has definitely not been explored in any depth here in Australia, at least to my knowledge.

As an example of what can be done, it is quite simple to transmit computer software over the air. ASCII or binary data can be 'dumped' straight from your computer's cassette interface into your transceiver's microphone input.

At modest data rates (110 to 300 baud) quite reliable transfers can be achieved, particularly on the VHF FM bands. I have heard of successful exchanges using narrow band FM on HF bands — among the QRM and QRN!

Recovery is simply a matter of patching your receiver speaker into the computer cassette interface audio input using the plug that normally goes to the cassette earphone socket.

I merely have a DPDT switch to change over the audio from cassette recorder to my IC-21A FM transceiver.

Once a group of amateurs interested in computing is formed a new world opens where you can discuss problems — there are always plenty of those — with fellow hams on the air. You can quickly send that program that 'won't go' for a check by other operators.

The convenience of an on-the-air discussion group and software exchange avoids the time consuming business of travelling about to exchange software and test hardware.

With amateur radio computer links it is possible to 'talk' directly to other computers from keyboards via the cassette interface at each end. This is great fun if computer games turn you on. Games are NOT my bag but I do like to have one ready to load for demonstration purposes. The uninitiated are always taken by some 'mindless' games, especially if it has space ships and phasor cannon etc.

It can see that amateurs have a lot going for them in the way of quick, convenient communication about hardware and software. ATVer's have a lot MORE going for them. Apart from the obvious camera shots of your 'latest piece of hardware ego trip', think of the possibilities of exchanging your computer video with a fellow ATVer while you talk to each other's computers from your keyboards.

This is a wonderful way to teach beginners how to 'talk' to a computer or how to run a program. Imagine playing a computer game — chess for example — with a fellow ATVer via ATV and an FM data channel. It is quite simple technically. Just hook up as described and you're away.

Just a few points about transmitting terminal or computer video on ATV. Many — the majority I think — of 'packaged' computers, such as the TRS-80 for example, and many computer terminals do not employ Australian standard line and field video frequencies. A significant number of units employ USA standards (15,625 Hz line and 60 Hz frame frequencies). Another group use odd numbers quite close to these standards.

In the normal computing environment this is unimportant as most video monitors will accommodate some deviation from standards. Transmitting computer video on ATV can and has caused some problems as some ATV receiving setups do not cope too well with these variations. The Melbourne ATV repeater for instance may well have something of a 'nervous breakdown' if any significant deviation from usual line and field frequencies are thrown at it.

There are some computer terminals that use exactly the same standards as the Australian TV system. The E&M Electronics 'EME' series of terminals and the Applied Technology DG-640 software controlled VDU are a couple of examples.

As readers are no doubt aware I started out with the Dick Smith 2650 mini-system.

The following listing is a copy of HYBUG, a 2850 monitor program written by Brian Young. Terminal speed is 300 baud. To operate at other baud rates make the following changes.

for 600 baud
12A8 2B C8 C8 C8 C8 C8 C8 C8
12B0 A8 F8 7E 17
for 1200 baud
change 12B8 from A8 to 58

0000 07 3F 20 CF 44 00 5B 7B 04 77 CC 04 09 04 1B CC
0010 04 0B 04 B0 CC 04 0C 1B 09 01 60 01 6E 04 3F 3F
0020 02 B4 75 FF 3F 00 8A 04 3E 3F 02 B4 3B 2D 20 CC
0030 04 27 0C 04 13 14 41 1C 00 AB E4 4D 1C 01 60 E4
0040 53 1C 01 DA E4 4C 1C 03 10 E4 47 1C 01 3A E4 44
0050 1C 05 6A E4 51 1C 00 F4 1F 00 1D 07 FF CF 04 27
0060 E7 14 18 19 3F 02 86 E4 7F 98 0E E7 FF 18 71 0F
0070 64 13 3F 02 B4 A7 01 1B 67 E4 0D 98 18 05 01 03
0080 1A 02 85 02 CD 04 2A CF 04 29 04 0D 3F 02 B4 04
0090 0A 3F 02 B4 17 05 02 E4 0A 18 64 CF 24 13 3F 02
00A0 B4 1F 00 60 CD 04 0D CE 04 0E 17 3F 02 DB 3B 74
00B0 3F 02 69 0D 04 0E 3F 02 69 3F 03 F2 0D B4 0D 3F
00C0 02 69 3F 03 F2 3F 00 5B 0C 04 2A E4 02 1E 00 22
00D0 18 11 CC 04 11 3F 02 DB CE B4 0D 0C 04 11 E4 04
00E0 7C 00 22 06 01 8E 04 0E 05 00 77 08 BD 04 0D 75
00F0 08 1F 00 AE 3F 02 DB 3F 00 A4 3B F9 CD 04 0F CE
0100 04 10 3F 00 8A 0D 04 0D 3F 02 69 0D 04 0E 3B F9
0110 04 20 3F 02 B4 0D B4 0D 3B EF 08 F0 E8 E2 98 07
0120 08 E4 E8 D9 1C 00 00 09 DD 06 01 BA DF 98 02 B5
0130 01 3B C5 46 07 18 4B 18 57 00 3F 02 DB 3F 00 A4

0140 0C 04 07 92 0D 04 01 0E 04 02 0F 04 03 77 10 0D
0150 04 04 0E 04 05 0F 04 06 0C 04 00 75 FF 1F 04 09
0160 3F 02 DB 3F 00 A4 3B F9 AE 04 0E 77 0A AD 04 0D
0170 75 08 1A 04 19 04 5A 02 9B 1D CD 04 0F B6 01 CE
0180 04 10 3B DD CE 04 12 CD 04 11 E9 E2 1A 08 19 24
0190 EA D7 19 2C 18 62 0A E3 18 16 07 00 05 FF 0D A4
01A0 0D CD E4 11 FB 7B 5A 02 9B 22 05 01 3B 1F FA 6C
01B0 0B CE 1B 68 0A C5 CB C8 02 C1 86 01 7B 0F 0F C4
01C0 0D CF E4 11 5B 7B 05 FF FA 72 1F 02 1D 0C 04 0D
01D0 81 CB FB 0C 04 11 81 CB FB 17 3F 02 DB 3F 00 A4
01E0 3B F9 CD 04 00 CE 04 01 3B F1 CE 04 02 3B 12 E8
01F0 FA 98 7A 09 8D 3F 02 69 09 8B 3B FA 3F 00 8A 18
0200 8C 0D 04 0D 0E 04 0E 86 01 77 08 B5 00 75 08 3B
0210 CD 0C 84 0D E9 CD 98 04 FA CC 18 01 17 20 FB 7E
0220 FB 7C 9B 00 3F 02 86 3B 1D D3 D3 D3 D3 CF 04 12
0230 3F 02 86 3B 11 6F 04 12 03 C1 3B 01 17 01 2C 04
0240 2C D0 CC 04 2C 17 07 10 EF 42 59 14 E7 01 9A 7B
0250 0C 04 07 64 40 92 1F 00 1D 30 31 32 33 34 35 36
0260 37 3B 39 41 42 43 44 45 46 CD 04 12 3B 4F 51 51
0270 51 51 45 0F 0D 62 59 3F 02 B4 0D 04 12 45 0F 0D
0280 62 59 3F 02 B4 17 77 10 04 80 B0 05 00 06 08 12
0290 1A 74 20 B0 3B 17 3B 10 12 44 B0 51 61 C1 FA 76
02A0 3B 06 45 7F 01 75 18 17 20 C0 C0 C0 C0 FB 7E 04
02B0 60 F8 7E 17 77 10 76 40 C2 05 08 3B 6B 3B 67 74
02C0 40 3B 65 52 1A 04 74 40 1B 02 76 40 F9 73 3B 5B
02D0 76 40 75 10 17 0C 04 2A 18 07 17 20 C1 C2 CC 04
02E0 2A 0F 04 27 EF 04 29 14 0F 24 13 CF 04 27 E4 20
02F0 18 63 3F 02 46 04 0F D2 D2 D2 D2 42 D1 D1 D1 D1
0300 45 F0 46 F0 61 C1 03 62 C2 04 01 CC 04 2A 1B 51
0310 20 CC 04 01 75 08 05 00 06 FF 20 86 00 18 02 FA
0320 00 B4 80 18 7C 07 21 FB 7E B4 80 18 6E 5A 67 3B
0330 35 58 13 3B 22 CC 04 00 3B 1D C2 3B 1A CE E4 00
0340 81 C1 DA 77 1B 54 21 50 84 50 3F 02 B4 3F 00 8A
0350 1B 44 B5 01 14 1B 02 04 01 B4 80 18 7C 07 21 FB
0360 7E 80 B4 80 18 6C 64 01 1B 78 3B 87 CD 04 00 CE
0370 04 03 3F 02 DB CE 04 02 75 08 20 C1 0E 04 03 CC
0380 04 01 3B 3E F9 7C 04 01 3B 3B 0F 04 02 18 27 A7
0390 01 CF 04 02 3B 31 0C 04 00 3B 27 02 3B 24 14 0E
03A0 E4 00 C3 B1 C1 03 3B 1F DA 75 0F 04 00 87 01 CF
03B0 04 00 3B 12 1B 50 01 64 01 3B 0C DB 7E DB 7C 1F
03C0 00 00 07 07 1B 03 C0 07 04 80 64 01 FB 7E B5 01
03D0 18 04 07 18 1B 03 07 31 14 CF 04 04 76 40 FB 7E
03E0 74 40 0F 04 04 A7 16 FB 7E 80 07 0B 5B 5E 17 00
03F0 0C 0C 07 03 1B 02 07 32 04 20 3F 02 B4 FB 79 17

While the 2650 processor is not considered a first line, modern device it is an extremely versatile base for a modest or not so modest system. Limited to a maximum of 32k of memory, it will operate with as little as 1k which is quite enough for a page full of alpha-numerics for an ATV transmission.

By the way the DSE 2650 kit is no longer available, however Applied Technology can supply 2650 based systems at quite reasonable rates. It is also possible to 'roll your own'. The original 2650 mini-system PCBs and parts are available from Dick Smith, McGraths and All Electronic Components. To contact any of these companies see the list of addresses at the end of this column.

So much for hardware. What about software? Well, in view of the popularity bestowed upon the 2650 by virtue of the many Electronics Australia articles and the DSE kit the 2650 has retained and expanded its popularity as a somewhat old but never the less powerful processor.

There are several local Melbourne amateurs – mostly ATVers – who have 2650 systems going. No doubt Melbourne VHF FM users will have heard the chit-chat on

'HYBUG' Command List

Commands available are: A, D, G, L, M, Q, S. Their functions are as follows –

A. Same as PIPBUG.

D. High Speed Dump To Tape.

Type D (AAAA) (BB) (CR).

where AAAA is start address of dump.

where BB is number of 256 byte blocks to be dumped.

Example: A dump of 1k will require 4 blocks to be entered. Typing 2 (CR) will provide a dump from 0440 to 05FF. (Leading zeros are not required).

G. Same as PIPBUG.

L. High speed load.

Type L (CR) then switch the sense port of the processor to output of tape recorder via the squaring Op Amp. After completion of load switch sense back to normal and press reset.

M. Block move.

Type M (AAAA) (BBBB) (CCCC) (CR)

Where AAAA is start address of memory to be moved.

Where BBBB is end address of memory to be moved.

Where CCCC is start address of destination of memory to be moved (new address).

Q. Query memory

Type Q (AAAA) (BBBB) (CR).

Where AAAA is start address.

Where BBBB is end address.

This is a hex listing program.

S. Block Search.

Type S(AAAA) (BBBB) (CC) (CR).

Where AAAA is start address of area to be searched.

Where BBBB is end address of search area.

Where CC is hex byte you are searching for.

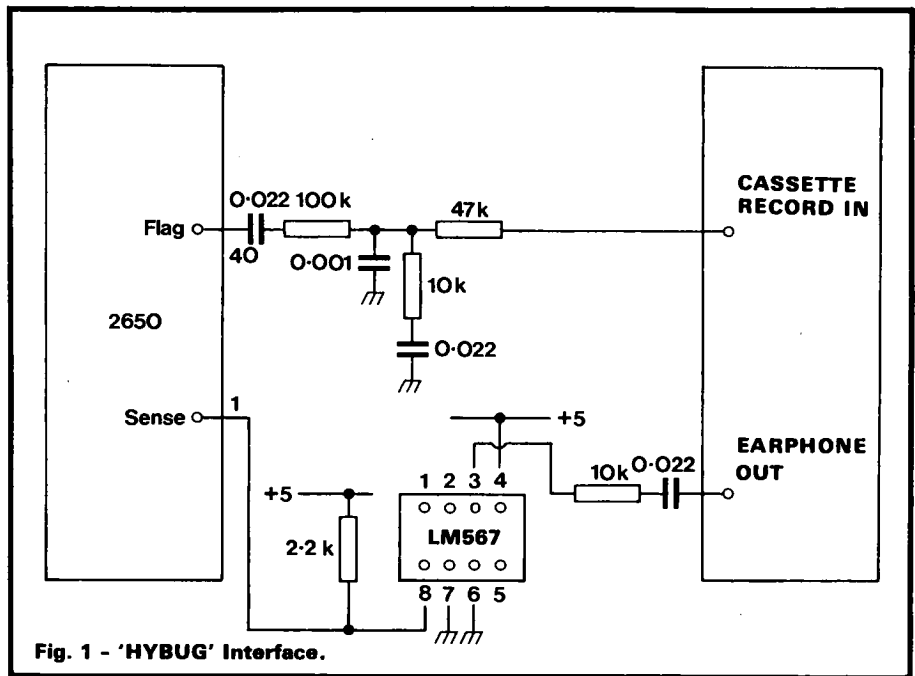


Fig. 1 - 'HYBUG' Interface.

various frequencies. These groups accumulate software as a normal result of developing systems and talking to other 2650 users. Consequently there is quite a lot of user produced software available from this source.

There is also a 2650 Users Group that has quite a pile of material available. There is a \$40 joining fee which is good value from what I hear. The address is c/o Applied Technology.

Brian Young VK3BBB and Bruce Reily VK3ZSR – both QTHR – operate a 2650 enthusiast's group on a strictly non-profit basis. Contact Brian or Bruce for further information.

The most exciting recent development regarding the 2650 is the appearance of MICROBYTE, a new and vigorous supplier of 2650 software at modest prices. It is run by Ian Binnie and Martin Hood who write the software and manuals respectively. I have just received a very nice looking cassette tape handling system and 6k Basic from this firm and I am very impressed with both the product and the service. I advise anyone interested in the 2650 to get themselves on the Microbyte mailing list by writing to their Canberra address or their Melbourne agent – David Thomas VK3ZGC c/o Cottage Computers.

Programs for ATV graphics are very much in my mind and I will be presenting 2650 software for this area especially, as I get the time to write them. Readers are invited to send me 2650 software for publication, particularly if ATV graphics are involved. Full credit will be given to the originator, of course.

One VK3 amateur, Brian Young VK3BBB, deserves some credit for producing a very clever 1k monitor program which he terms 'HYBUG'. This replaces the regular Signetics monitor 'PIPBUG'. Brian's monitor has additional utility routines for a high speed load,

block move, memory list and block search.

Its chief claim to fame is the fast load and dump. With the simple interface shown in Fig. 1 this routine will 'bang off' 1k of memory to tape in nine seconds. This is great for recording ATV announcements. If your tape deck is of reasonable quality and your processor is a 2650A model you can halve this to approximately 4.5 seconds per k by switching in a 2 MHz clock. But don't forget to adjust your terminal speed by a factor of two as well!

For those 2650 system owners with a DG-640 software controlled VDU, both 1 MHz and 2MHz clocks are available from IC40 (74LS92) pins 12 or the junction of 14 and 8 respectively.

A source listing of Brian Young's 'HYBUG' monitor is reproduced here with a list of available commands. This is reproduced with the help and permission of its author, thanks Brian.

At this stage you could be excused for thinking that you've transferred to 'Printout', however such is not the case. I plan to keep the subject of computers 'alive' in the pages of ATV but promise not to let the ATV section become another 'Printout'.

Quite enough about computers for one issue. Here is some genuine ATV.

TELEGRAM

TELEGRAM

TELEGRAM

THE FOLLOWING IS AN EXPLANATION OF 'HYBUG', A 2650 MONITOR
WRITTEN BY BRIAN.L.YOUNG.

TERMINAL SPEED IS 600 BAUD.

THE COMMANDS ARE A, D, G, L, M, Q, S.

METHOD OF USE.

A. SAME AS PIPBUG.

D. HI-SPEED DUMP TO TAPE,
TYPE D(AAAA) (BB) (CR)

WHERE AAAA IS START ADDRESS OF DUMP.

" BB IS NUMBER OF 256 BYTE BLOCKS TO BE DUMPED.

IE, A DUMP OF 1K WILL REQUIRE 4 BLOCKS TO BE ENTERED.

BY TYPING D400 2(CR) WILL PROVIDE A DUMP FROM 0400 TO 05FF.
(LEADING ZERO'S ARE NOT REQUIRED.)

G. SAME AS PIPBUG.

L. HI-SPEED LOAD.

TYPE L(CR) THEN SWITCH THE SENSE PORT OF PROCESSOR TO OUTPUT
OF TAPE RECORDER VIA THE SQUARING OP-AMP.

AFTER COMPLETION OF LOAD, SWITCH SENSE BACK TO NORMAL AND
PRESS RESET.

M. BLOCK MOVE.

TYPE M(AAAA) (BBBB) (CCCC) (CR).

WHERE AAAA IS START ADDRESS OF MEMORY TO BE MOVED.

" BBBB IS END ADDRESS OF MEMORY TO BE MOVED.

" CCCC IS START ADDRESS OF WHERE THE MEMORY IS TO BE
MOVED TO, (NEW ADDRESS).

Q. QUERY MEMORY.

TYPE Q(AAAA) (BBBB) (CR).

WHERE AAAA IS START ADDRESS.

" BBBB IS END ADDRESS.

THIS IS A HEX LISTING PROGRAM.

S. BLOCK SEARCH.

TYPE S(AAAA) (BBBB) (CC) (CR).

WHERE AAAA IS START ADDRESS OF AREA TO BE SEARCHED.

" BBBB IS END ADDRESS OF THIS SEARCH AREA.

" CC IS HEX BYTE YOU ARE SEARCHING FOR.

AM

TELEGRAM

TELEGRAM