Dragon Graphics Screen Transformed

Competitions Win Gordon Bennet plus a year’s sub

Shark Attack Machine Code

Summer Book Offer Don’t miss it!!!
Welcome Shock Trooper Squad Commander! Intelligence has intercepted a coded message revealing a plan to conquer Earth. Four of your Shocktroopers must infiltrate the heavily defended underground enemy base and steal all of their secret TRG-5 attack saucer sub-assemblies. Return them to our scientists for analysis. This secret information is crucial to our defence.

Good Luck!

5 Star Review

The public can’t be wrong. Shocktrooper was the TOP seller on our 1985 Roadshow selling twice as many copies as its nearest rival.
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What to be rich and famous? OK, so we can't help with that one — but if you've got something to say and want to reach tens of thousands of Dragon Users throughout the country, then this is the place to do it.

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The only nationwide poll of what you think is the best in Dragon Software — compiled each month by you, the consumer. Vote, vote, vote!

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Your spot for those times when you need a little help from your friends. Write into us, we'll publish your problem, and maybe someone can help ... or maybe you can help someone else!

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Questions, questions ... Brian Cadge once again stretches his might and comes up with some answers for those annoying technical problems.

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Mike Gerrard reporting again — this time focusing on Space Trek II ... plus the usual bunch of clues and tips for troubled adventurers.

Editorial

This month marks the beginning of a new phase for Dragon User — indeed Dragon users all over the country. As from next issue (July 1986) Dragon User will be available to the Dragon community BY SUBSCRIPTION ONLY. And while this means that you won't have to trundle down to the newsagent to get your favourite read (we'll send it to you), it does mean forking out just over a tenner in one month, in order to get the next 12 issues, if you don't already have a sub. So why do it?

It's our firm belief that Dragon User is still essential reading for all Dragon owners, beginners and experienced alike. We'll still have all the same regular features, news and reviews, with new ones planned even as I write! In fact, as a controlled circulation publication, we're hoping to pack even more in than usual — a new upgrading series, new languages for your Dragon, teach-in's, reader offers, competitions — we are determined to provide you with the service and information you want for your computer.

Take the Book Offer in this month's issue ... where else could you get so much for so little?

As the number of active Dragon owners has diminished (and there's no denying that the total is down to the few tens of thousands) it seems to us that the enthusiasm of the existing Users has actually increased — and it's people like you we are committed to supporting in the future.

It would be a shame if many Dragons (still a worthwhile piece of hardware — until the £300 Amiga arrives!) were put away, all for the lack of information and a regular national magazine. No Dragon User — no Dragon? We hope you'll join us.

June 1986 Dragon User 3
Letters

Mail Order
I RECENTLY had cause to return my Al commodor cartridge to Grosvenor Software, as I just couldn't get it to work. It arrived back 48 hours later with a letter explaining how to ensure good connec9tor contact, and the cartridge connectors had been tinned for good measure.

I call that excellent service, and shows how buying goods for our Dragon postal may not necessarily be as risky a business as any April editorial implies.

Martin Parker
14 Redwood Close
Radstock
Bath

Poke Error
In the April 1986 issue of Dragon User, Brian Cadge answered Neil Peel with a short routine to send all that appeared on the screen to a printer. This routine did not work due to the small typing error in the listing of the last POKE being POKE 361,248 whereas it should have read POKE 361,249. I am sure that many Users have written in to point out this error but in case they haven't I am. As proof, this letter has been written using the very route.

Andrew Jenkins
44 Tudor Terrace
Gadlys, Aberdare
Mid-Glamorgan
South Wales
CF44 8EB

Flee Flaw?
THE PROGRAM Flee Flee in March's issue — I typed the whole program in, about 12 hours long. The problem is, when I ran the program nothing happened. But I did check the program, and it was correct.

Danny Bowies
32 Bridge Street
Minnow
Lancs

If you typed it in on a Tandy Co-Co, Danny, you'll need the alterations we outlined this month. Otherwise, all we can say is — it works!

Upgrade
I AM SURE you will be pleased to know I have just managed to purchase an upgrade kit for my 48K Spectrum — it's called a Dragon 64! I am sure that this news will lighten a few hearts, as it has done my pocket. The real problem is, that reading through your magazine, I realise how much I have missed, for example, what the hell is an OS-9?

In fact, the only fault I could really find in your mag, or should I say, the only fault I knew the meaning of, was that natty swear word, Jet Set Willy.

Now come on — there must be something, some book, some program, some potential pen-pal that would be able to teach me more. Even Clive (our cat) knew more about the Dragon than I did — and even that was restricted to the CLOAD command (DIM CAT).

So please help — before I start suffering Sinclair (or is it Amstrad) withdrawal symptoms.

Robert Hammond
24 Beechtree Close
Oakley
Basingstoke
Hants

2 + 2 = 4
I DO hope that my embarrassment of the esteemed Brian Cadge only awarding two 'Dragons' to my excellent Disk-Kit product (Reviews, Dragon User, May issue) is, as suggested by one of my very satisfied customers, a case of missing 'Dragons' (the programme award being a bit off topic). I point out that every review normally has the Dragons right or left justified — whereas these two are centred, suggesting that two have been dropped off the right-hand corner.

Should the two Dragons be his considered opinion, then I am obviously wasting my time on the Dragon.

P A Chirico
158 Empingham Road
Stamford
Lincs
PE9 2SZ

Co-Co Club
I WOULD like to start up a Co-Co/Dragon users club in the Basildon area, to swap programs, ideas, etc. Anyone interested, please contact me at the address shown below.

S R Kilcoy
187 Spurriers Lane
Laindon
Essex
SS15 5NG

Fringe
RE User Groups and the Dragon — there are many different aspects of the Dragon and the 8009 microprocessor that it is impossible that any one group or publication can satisfy all the possibilities.

The National Dragon User's Group does not have a monopoly and is in no way "official". So any other group, from "lunatic fringe" to dedicated professional is welcome. All that is required is enthusiasm and a common interest. Bulletin boards are also a form of user group — and I thank all those who have set them up.

On a more serious note the Data Protection Act comes into force on the 11 May 1986 and may have an impact on user groups, clubs, bulletin boards and anyone storing names/addresses etc. on a computer. If any reader needs more information they should contact The Data Protection Registrar on Wilmslow (0625) 535777.

Stan Opychal
Compusense

4 Dragon User June 1986
**Dragon User People’s Chart**

**Results April 1986**

1. Shocktrooper ............... (Microdeal)
2. Juxtaposition ............... (Wintersoft)
3. Jet Set Willy ............... (Software Projects)
4. Speed Racer ............... (Microdeal)
5. Eddie Steady Go ........... (Incentive)

**Chart Five**

Voting for Chart No. 5 closes at 1 pm on Friday 13th June 1986. Entries received after that time will not be eligible for inclusion in that month’s voting. The editor’s decision is final. Only one entry per individual per month will be allowed.

My top 5: Voting Month 5

1. ................................ Name ........................................
2. ................................ Address ....................................
3. .................................................................
4. .................................................................
5. .................................................................

My phrase is: .................................................................

---

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<th>COMPUTER</th>
</tr>
</thead>
</table>

I enclose my cheque/P.O. for £

Name ..............................................
Address .............................................

June 1986 Dragon User 5
GOOD NEWS — following the disappointment that, for a second year, Dragon owners were not to be given the opportunity to join in with the software industry's charity effort (last year Soft Aid; this year Off the Hook), it looks like we might be in with a chance after all — thanks to Christopher Bayne.

Bayne, proprietor of CB Software, is proposing to put together a compilation tape exclusively for the Dragon — and like Off the Hook, proceeds would go to the Prince's Trust for the rehabilitation of drug addicts. "I was annoyed last time round that we didn't get a chance; this time we've been excluded again! Dragons deserve a chance," he commented.

Chris is aiming at 5-10 titles on one tape, selling for £6.95 to £9.95, depending on quality and quantity. "I've already got support from Design Design and Peaksoft, and have contacted Microdeal," he continued. "I'm looking for anything from text adventures to shoot-em-ups, primarily commercial software — but if anyone wants to donate their own programs, we will consider them."

Chris was quick to emphasise that after costs have been recovered (primarily tape duplication and postage), all profits would be going to charity. "I'm not taking anything," he said. "It's all for a good cause."

Dragon User has already pledged full advertising support for the venture, so come on . . . if there are any companies or individuals out there that can help CB Software put this project together, write to 58 Ash Grove, Wheathampstead, St Albans, Herts, AL4 8DF — or phone 0582839216. Watch this space for developments.

It is not certain if another weekend will be organised; that's really up to you. If you want one, then write to Bob Morgan, Mid Wales Tourism Council, Canolían, Owain Glyndŵr, Machynlleth, Powys.

FAR, FAR into the future, the Sol Federation constructed the TIME GRIDS — zones of neutral matter used by hyperspaceships for faster-than-light travel. Because of the heavy traffic on the grids it was then decided to extend them. However, in doing so they uncovered a sleeping Time Demon.

They carefully erected the grids around him but were unable to stop his regeneration process.

It was then that they called on you, Time Lord, a genetically engineered Supernaut capable of travelling in the grids without the aid of a spaceship. Your task is to find the four pieces of the Demon's Talisman, which is scattered in the grids.
Communication
Send in your questions, requests, and pleas to Communication, Dragon User, 12-13 Little Newport Street, London WC2

Problem I have recently acquired an Atari joystick and equipment to convert it to a Dragon. I would be very grateful if someone could inform me how to wire it up.

Enquirer Andrew French, 13 Fairfield, Pepperlenni, Pontypool, Gwent, NP4 0AP

Problem I have a Dragon 32 and am very pleased with it. However, what are the pro's and con's of changing to a Dragon 64 (assuming I can get one second-hand) - apart from the larger memory? Would I still be able to use my HR5 Brother printer with the 64?

Enquirer J E Lawrie, 15 Sycamore Grove, Southam, Warwickshire.

Problem I would be very happy if anyone could answer a couple of questions which bother me recently. a) Could the second CPU for the Dragon 32 be any CPU or just an 8-bit one — if yes then could that be a 6502 (8-bit) one? b) Could you have a disc system without having a second CPU, and if not, what type of CPU would that be?

Enquirer Yionnios Grekas, 9 Knosou St, Galatsi 11146, Athens, Greece.

Problem I have recently purchased a TRS-80 CGP-115 (compatible with the TRS-80 CGP-220) four colour printer and I was wondering if anyone could tell me how I can dump the graphics screen on my Dragon 32 to the printer.

Enquirer C Carey, 57 Eastbourne Grove, Westcliff-on-Sea, Essex, SSO OQE

Problem I cannot obtain an OS9 Programmers Manual — has anyone got one for sale, or could I borrow a copy?

Enquirer Tony Dangerfield, 26 Lansdale Drive, Croston, Nr Preston, Lancs, PR5 7SB.

Problem Require the Dragon Games User Group Newsletter — will pay up to £1.00 in good condition. Also Dragon wings cassette — will pay up to £1.75. Please send details.

Enquirer Andrew Hill, 13 Parry Jones Close, Forge Srd, Blaina, Gwent, South Wales, NP3 3NH.

Problem Wanted — Super Dragon Writer II Cartridge or name and address of distributor. Also wanted — name of a good book on electronics for beginners.

Enquirer Barry Caruth, 132 Donaghadee Rd, Bangor, Co Down, Northern Ireland, BT20 4NH.

Problem Dragon owners in the Gosport area — I own a Dragon but don't know anyone else who does. I am very lonely!

Enquirer P J Beed, 27 Findon Road, Elson, Gosport, Hants, PO12 4EP.

SMASH HITS FROM BLABY

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Fingers — If you fancy yourself as a safecracker then read on. Twenty screens of disappearing floors, combinations and will you find out for yourself. Help tight-finger Fred to collect his golden keys to open the safe.

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Joystix

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We need your games! Send now!

June 1986 Dragon User
**Dragonsoft**

**Arcade Hit**

Program **Moon Cresta**
Price £7.95
Supplier Incentive Software, 54 London Street, Reading, RG1 4SQ. Tel: (0734) 551678

ONE MORE go... just one more go and I'll crack it. This is something you will say a lot when you part with your hard earned pennies in exchange for a copy of Incentive's latest release **Moon Cresta**. In fact you will probably say it for hours on end after day. It's not that this game is addictive you understand; just one more go and I'll leave it alone, just one more go.

One of you too young to remember the original arcade version of **Moon Cresta**, it was probably the first machine that I ever saw with a queue of people waiting to play it.

It has that marvellous quality that allows everyone to play a reasonable game straight away but gets progressively harder the better you become. You can never say that you have mastered it; it will always get the better of you in the end.

Incentive have obtained the official licence for the game from the originators Nichibutsu, and John Martin (the author) has produced the most faithful arcade copy that I have ever seen.

If you like the space shoot 'em up games then this must be the king of them all.

To aid you in blasting the cold eyes, supper flies, tour-D's, meteors and atomic piles, you are given a spaceship that consists of three parts, each having its own weaponry. If you successfully manage to repel four waves of inevitable aliens, then you are given the chance to dock your craft with the next section. If successful then you can double your firepower and (in theory) make life much easier for yourself. You start with just the top section of the spacecraft, with only one gun, and if you dock with the other two sections, you end up with five.

For those who think they have pretty good reactions when it comes to arcade games, if you manage to obtain a score in excess of 30,000 you will be given a secret message.

This enables you to enter a draw to win a real **Moon Cresta** arcade machine.

**Editor**

Program **Diskpix** — Supplied on tape (Disc compatible)
Price £3
Supplier: Pamcomms Ltd, 21 Wycombe Lane, Wooburn Green, High Wycombe, Bucks HP10 0HD.

**Diskpix** is a quite powerful graphics editor supplied on cassette, but readily transfer-able to disc. Side One of the tape contains the program, plus some demonstration programs. After loading the program checks if Dragonos is present (by looking at where the graphics pages start in RAM) and adjusts itself to operate with tape only, or disc and tape as applicable.

The software is supplied with the usual well written manual from Pamcomms.

The basic idea behind **Diskpix** is that graphics pages can be created and edited down to pixel accuracy and then saved for use in other programs, or as character sets. The whole thing is completely menu driven in the usual Pamcomms way.

The editing is done on a magnified version of the block, using the cursor keys to point to the required pixel, and then pressing the required colour number to fill in the pixel. It is also possible to clear the whole block to one colour for fast filling in.

Other editing functions include use of GET/PUT and copying and moving graphics pages around. Anyone who has a copy of Dragon Data's **Pixel Editor** will be interested to know that **Diskpix** files are compatible with those output by it.

Supplied with the program are character sets for use in Pmode 3, 20 columns, and Pmode 4, 42 and 51 columns. The demonstration programs include a nice version of the 'sliding puzzle' puzzle game, which unfortunately runs rather slowly in parts (a little machine code could go a long way here!).

All of the programs are totally unprotected and would be of interest to anyone new to programming in Basic graphics. However, the best thing about this software is its price, just £3 for a genuinely useful program, which once again shows just what skillful Basic programming can achieve.

Brian Cadge

**Control**

Program **Printer Control** (Disc) — Dragonos/Cumana
Price from £20
Supplier MacGowan Consultants, 6 Arnhem Drive, Caythorpe, Nr. Grantham, Lincs. NG32 3DQ

MacGOWAN'S powerful word-processor **Printer Control** has, at last, appeared on disc. I reviewed the cassette version back in the August '85 issue of Dragon User and gave it 5 out of 5. All of the original functions have been kept in the disc version, these were explained in the original review, so I won't go through them all again here, but for anyone new to this program, what you get is a very powerful wordprocessor, (40 column screen) and a simple graphics editor.

The big difference between this and other wordprocessors is that MacGowan will supply a custom version to suit almost any printer (they claim to have done 57 varieties so far). So to the disc version; a four page supplement is supplied to augment the main manual, explaining the slight differences in operation. A useful, and very necessary option for upgrade- ers is the 'extension' program. This is loaded into the high-res pages used for the 40 column display and so does not affect any text file to RAM which called (the display reverts to 32 column). The extension menu allows access to Dragonos functions such as DIR, DSKIN, KILL, RENAME etc. It also allows loading and saving of files to cassette.

Unlike the cassette version, the disc version only runs in 32k mode; it will not access the additional 32k on a Dragon 64. A little extra programming could have made it possible to use all of the available RAM surely? **Printer Control** was one of the first (and only programs to use the extra 32k on the 64.

Cassette owners will be glad to hear that MacGowan are offering an upgrade service, which depending on your printer type, will cost between £10 and £18 to replace your cassette with a disc and supplementary manual — a little expensive maybe, but at least they are offering the service to those who want it!

Brian Cadge
DON'T FORGET!

The Dragon Computer Show

at

Ossett Town Hall (just off Junct. 40 on M1)

SATURDAY, MAY 31, 10.00-4.00

Terrific bargains from the major retailers and lots of demonstrations.

Adults — £1.00. Children and OAPs — 50p

For further details ring BORDON (04203) 5970

June 1986 Dragon User 9
THE FASCINATING world of bulletin boards and other telephone-line-oriented information systems has been available to home micro users for quite some time now, and Compusense have just produced two packages which enable Dragon 64 users running Flex (and soon for OS9) to exploit just about any of these systems regardless of transmission speed or data format. The two packages are Chatplus 2 and Viewdata.

Although there are many modems available on the market priced from £20 up to well over £200 the software has been written with the Dragon modem in mind (although any other modem should work quite happily with this software).

Although the Demon modem is not BT approved, it is becoming more and more popular amongst the bulletin board users, owing to its excellent features per pound spent ratio. Having made enquiries through many of the bulletin boards, I could not find anyone who had anything but praise for the Demon. In fact, there are some bulletin board services which actually use a Demon modem as their link to the telephone network and hence to the user.

**Demon**

The Demon supports auto-dialling, originate and answer modes, either Bell or European telephone standards which enables those transatlantic calls to be made (preferably on some one else's phone bill!) and dialling speeds of between 75 baud and 1200 baud.

Physically, the modem is well constructed both inside and out, and being housed in a plastic box which is roughly the same size as a single disk drive, you won't have to fight for more table space to accommodate it.

The connections to the unit are made via flying leads which exit from the rear of the case. These are the power cable, the telephone cable, and the RS232 cable. The power for the Demon is derived from a transformer which forms an integral part of the mains plug. The telephone cable is terminated in a standard BT-type phone plug, and the RS232 cable is a 5-pin "doming"-type DIN plug suitable for a BBC computer, although a suitable adaptor is available from the suppliers Compusense.

The first of the packages, Viewdata, allows a user with an appropriate modem to connect up to any of the Viewdata services such as the Prestel/Micronet systems which have proved so popular with BBC owners owing to the block graphics employed by the system (BBC MODE7). The Viewdata package shows a 40 x 24 character display as used by Prestel and the character set contains all the necessary block graphics to display the Prestel pictures. Even though the Dragon's limited display capabilities restrict this package to two colour operation, the effect is very impressive. The package allows the user to save, review and print frames from whichever system is being used. Flex commands may also be passed to the DOS for processing whilst the Viewdata package is in use.

**Chatplus**

The Chatplus package is a very comprehensive communications package with a multitude of options to allow connection to either bulletin boards via the BT network or to another Dragon (or any other RS232 computer system) using receive and transmit speeds of between 75 baud and 19200 baud. The data format (start/stop bits, number of data bits, parity, etc.) is completely variable with the most common settings being held ready at the press of a key. The default settings on invoking the program were used quite happily with all bulletin boards accessed for this review.

Like Viewdata, Chatplus 2 allows auto-dialling for either data or voice calls. This feature is enhanced by the use of an on-line telephone directory which utilises a text file stored on disk containing the names, phone numbers and all the setting up details required for every entry, so that by simply typing the name of the bulletin board or person that you wish to contact, Chatplus 2 will retrieve the setting up details and phone number from the disk file, phone the chosen number, and either put you on-line or prompt you to pick up the phone without any intermediate user intervention. For the secretive amongst us, Chatplus 2 has an option which allows bulletin board pass-words, etc, to be protected from prying eyes by substituting an asterisk (*) for each character typed until the <+ENTER-> key is pressed.

Because the flow control may be toggled between either the DTR or X-ON/X-OFF forms of protocol, Chatplus 2 allows the Dragon to be connected directly to all sorts of other computer systems. For the purpose of this review a Dragon 64 was connected directly to another Dragon 64 and information passed back and forth with no errors at 9600 baud. Connection was also made to both a DEC-VAX-11/780 cluster running under the VMS system and a DEC PDP-11/34 system running under RSX11-M. Again information was passed back and forth at 9600 baud and at 1200 baud with no errors. The only problem with using a Dragon on a main-frame system is that of terminal emulation. Most mainframes expect the user to be using a specific type of terminal in order to utilise screen-editors and applications packages. Maybe a few terminal emulation packages could be made available? (Chatplus 3??)

The ability to up-load and down-load files enables information and programs on the bulletin board systems and mainframes to be down-loaded into the Dragon's memory or on to the Dragon's disk, and files already held on the disk can be up-loaded to the file area on the host system.

Compusense have also written a program designed to run either as a stand-alone package or from within the Chatplus 2 program. It allows the transfer of data to or from the Dragon, using the XMODEM protocol found on many of the bulletin board services. I have only had time to use this software once to upload and download a program listing from a bulletin board and this worked with no problems encountered.

The XMODEM standard of data transfer includes a checksum routine, which means that all incoming data is checked for validity before being stored. If an error is detected then the block is re-sent until either the data received is correct or the transfer fails more than a specific number of times. (This may be pre-set by the user.)

In conclusion, all the features of both software packages and the Demon modem worked as advertised. The software was fast, easy to use and reliable. If you have a modem and can stand the phone bill then you can't really go wrong with either of these packages — but you'll need a 64 running Flex, remember.

**Extras**

The only additional cost, for those who wish to access it, is the membership fee for the Prestel service. This is some £16.50 a quarter, but is good value if you are going to use it regularly. Prestel is only a local call and there is an incredible amount of constantly updated information available to its users. Everything from the latest news and weather to Mailbox systems, second-hand car sales, photography hints and tips, etc, etc.

Finally I would like to thank the Sysop's of all the bulletin boards that I have accessed whilst testing the software for this review. In particular the Tandy Users group bulletin board (TUG), REACT, and the Liverpool Mailbox BBS. (The numbers for these are 01-200 7577, 0376 518818 and 051-426 8924 respectively.)

---

**Hardware**

**Demon Modem (Not BT approved)**

Price £69.00 + p&p

**Software**

Chatplus 2 & Viewdata

Price £24.95/£14.95 + p&p (Flex)

**Supplier**

Compusense, PO Box 169, 286D Green Lanes, London N13 5XA.
PEAKSOFT DRAGON SUPPLY CENTRE

PRISM MODEM
Enables you to join the fun on Micronet, Prestel, Radio Dragon and 1200/75 Vizadatas bulletin boards!

There are now FOUR HUNDRED THOUSAND pages to explore on Micronet and Prestel alone, offering interactive games, nationwide "chat" lines, advice on computer problems, teleshopping, a micro market, electronic bank accounts, your own free mailbox... the list just goes on and on.

The Prism Modem uses your phone line to link your Dragon to mainframe computers throughout the country -- the special cheap call rate costs just 40p an hour.

OUR BREAKTHROUGH PRICE IS JUST £64.95 complete with all leads and "plug-in-and-go" cartridge software, and including a FREE 3-month subscription to Micronet and a FREE copy of the Dragon User's Communications Directory.

ONE DAY EVERY HOME WILL HAVE ONE
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TATUNG TP100 DOLLIER PRINTER
This is the one we use -- that's how widely we recommend it! Just look at these incredible features!

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And the price? An unbelievable £249.95! (Load £11.95 if required)

PEAKSOFT BRAND NEW HEAVY DUTY POWER SUPPLIES £14.95 complete. Compare this with the price of "reconditioned" units!

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June 1986 Dragon User 11
Jaws!

Just when you thought it was safe to go back to the keyboard...

arcade action from Steve Gathercole.

IMAGINE yourself as a scuba diver out hunting fish. All you have to do is shoot the fish with your spear gun using the 'ENTER' key. There are three fish, two of which are moving up and down, but the third fish is coming towards you and you must not let it reach your side of the screen else you will lose a life. You score 100 points for the fish moving down, 60 points for the fish moving up and 40 points for the fish moving towards you. There is also a random chance of an extra score — this happens if the fish coming towards you ‘bumps’ into any of the other fish you will score whatever the fish bumped into is worth. (after practice you can learn how to make this happen).

Shark

However, life is never that simple and you find that your lead boots are too heavy so you have to keep pressing the 'UP ARROW' key to stop yourself falling — also after a random amount of time a very nasty Shark appears. You are frozen stiff with fright unable to move or shoot and your only chance to drop a depth charge on to the nose of the Shark. The depth charge is located at the top of the screen and is released by pressing the 'ENTER' key, you must hit the Shark just in front of or on the nose, else the charge will not explode. If you hit the Shark you gain 1000 points, if you miss, the Shark will come straight for you and eat you, (this is not a pretty sight).

The game is in PMODE 4, uses bit movement for smooth graphics, several sound routines and has a simple hall of fame at the end. To enter the game proceed as follows:

First type in LISTING 1 this is the hexloader, (as previously printed). Once RUN you will be asked for the start address, this is 28000. Type this in, press 'ENTER' and you will be asked for the finish address, this is 31519. Type this in, press 'ENTER' and you must now type in the first row of digits up to but not including the = sign, (LISTING 2). Press 'ENTER'. You must now type in the checksum, this is the number in the column after the = sign. Type this in and press 'ENTER' — if all is well the next address will be displayed. To save the whole game to tape use CSAVEN "JAWS", 28000, 31519, 28000.

If you want to type in LISTING 2 in small parts, then when asked for the finish address type in the address you want to finish at, then when you get the 'OK' sign save to tape using CSAVEN "JAWS", 28000, N, 28000 where 'N' is the finish address you specified. Don't forget to CLOADM each part before running the hexloader next time. Each time you restart you use the finish address you specified last time as you start address.

To run the game type in EXEC 28000; if you have any problems, (with computing!!), contact me at 16 Hankinson's Est, Walpole St Andrew, Wisbech, Cambs 7NA PE14. Also I can supply a copy of the game for £1.50 which will include autorun. Good luck!

Listing 1

10 CLS
20 REM HEXLOADER - ENTER THE
30 REM STRING OF HEX DIGITS FIRST
40 REM AND THEN THE CHECKSUM
50 CLEAR200,27999
60 PRINT"ENTER START ADDRESS";:INP
70 PRINT"ENTER FINISH ADDRESS";:INP
80 FOR N=START TO FINISH STEP 11
90 PRINTN;":":
100 TT=0:INPUT A$:Z=0
110 FOR G=1 TO LEN(A$) STEP 2
120 P=VAL("BH"+MID$(A$,G,2))
130 TT=TT+P:POKE(N+Z),P
140 Z=Z+1:NEXT
150 PRINT"";
160 INPUT T$
170 IF T$<>HEX$(TT) THEN SOUND 20
180 :PRINT"ERROR - ENTER LINE AGAIN"
180 :GOTO 100
190 NEXT

Listing 2

28000 1600A2F000000000000000000 = 0F
28011 000000000000000000000000 = 0
28022 000000000000000000000000 = 0
28033 000000000000000000000000 = 0

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HELLO, and welcome to Part Four of the series that looks set to make 'War and Peace' look like a pamphlet. And there is something very different about this month's tutorial... Yes, I'm writing it in the first person singular. There's a very good reason for this:

About three weeks ago Geoffrey came into my room at about eight o'clock and said: "I hope you don't mind Jason, I used your toothbrush."

"I'm sorry Geoffrey," I replied, "but I do object actually because you have plaque and gum disease and lots of other horrible things like that.

"That's all right," he said, "I used it to clean my shoes."

Suffice is to say that Geoffrey is now seeking new accommodation. But we'll return in a conditional branch next issue!

And so to work. Firstly an apology. We promised "a complete explanation of the assembler directives, full coverage of addressing modes and a tutorial on the branch instructions," last month, but in fact these things will follow in later articles. This month there are some more important things which occurs to me need explanation, namely, base numerology (as promised) memory organisation, and the precise meaning of single and double precision.

**Numbers**

Firstly then, base numerology. The way I intend to teach it is the way I myself was taught. Although the next few paragraphs may appear patronising and an insult to the intellect, they are written assuming a total lack of mathematical knowledge, as base numerology simply must be understood if machine code programming is to be achieved with ease (it is quite possible to program in decimal only, but what about reading dis-assembled code or writing in a way where the numbers actually mean something?)

The base numerology lesson runs thus:

1) We live on a planet where the dominant species is the human being. Humans in general have ten fingers. Therefore, the most convenient system ofnumeration is one which works in multiples of ten; one in base ten (known as decimal).

2) We therefore have ten digits (zero to nine) which can be used to describe any real, rational, non-infinite number.

3) A number is arranged in columns each of which stands for a multiple, or to be more precise, a POWER of ten. The powers of ten are more clearly explained in the following 'table'.

<table>
<thead>
<tr>
<th>Power</th>
<th>Decimal</th>
<th>Binary</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>1</td>
<td>0000</td>
</tr>
<tr>
<td>1</td>
<td>10</td>
<td>1000</td>
</tr>
<tr>
<td>2</td>
<td>100</td>
<td>1001</td>
</tr>
<tr>
<td>3</td>
<td>1000</td>
<td>1010</td>
</tr>
<tr>
<td>4</td>
<td>10000</td>
<td>1011</td>
</tr>
<tr>
<td>5</td>
<td>100000</td>
<td>1100</td>
</tr>
</tbody>
</table>

10^2: Ten to the power zero: 1 = 1
10^3: Ten to the (power) one: 10 = 10
10^4: Ten squared: 10^2 x 10^2 = 100
10^5: Ten cubed: 10^3 x 10^2 = 1000

10^6: Ten to the four: 1.10^4 x 10^2 = 10000
10^7: Ten to the five: 1.10^5 x 10^2 = 100000

And so on up until ten to the power infinity which is a number too big to represent! NB in this table the dot represents a multiplier, i.e. 10.10 = 10 x 10 = 100.

We can see that to write ten to the power 'X' where X is any number between zero and infinity we simply write a one with X number of zeros after it. Very simple really! So what use is it?

4) Any number can be written in word form in three standard ways, which are the ways the number can be spoken. Thus the number 12 can be written as 'twelve' or "one lot of ten and two units" or "one lot of the power one and two lots of ten to the power zero". The last is both the most useful and the most appropriate to base numerology of the three. The reasons for this require demonstration thus:

**Demo**

Take this number: 1159395129. It can be expressed in each of the three ways:

A) "One thousand one hundred and fifty nine million three hundred and ninety five thousand one hundred and twenty nine."

B) "One lot of a thousand million, five lots of ten million, nine lots of a million, three lots of a hundred thousand, nine lots of ten thousand, five lots of a thousand, one lot of a hundred, two lots of ten and nine units."

C) "One lot of ten to the nine, one lot of ten to the eight, five lots of ten to the seven, nine lots of ten to the six, three lots of ten to the five, nine lots of ten to the four, five lots of ten to the three, one lot of ten to the two, one lots of ten to the one and nine lots of ten to the zero."

Description (C) can be re-written in figures thus: 1159395129 = 1.10^9 + 1.10^8 + 5.10^7 + 9.10^6 + 3.10^5 + 9.10^4 + 5.10^3 + 1.10^2 + 2.10^1 + 9.10^0

It is arguable which of the word descriptions are easiest to get to from the original number, but it is obvious which word description is easiest to reach the number from.

5) Let us now imagine a planet where the dominant race is a species with only eight fingers. The best system for them to use would be one that works in multiples of eight. The base eight system (known as octal). This system has eight digits (zero to seven) and any real, rational, non-infinite number can be represented within it.

Every octal number is arranged in columns each of which stands for a power of eight thus:

8^0: Eight to the zero: 1
8^1: Eight to the one: 1.8 = 8
8^2: Eight squared: 1.8^2 = 64
8^3: Eight cubed: 1.8^3 = 512
8^4: Eight to the four: 1.8^4 = 4096
8^5: Eight to the five: 1.8^5 = 32768

and so on up to eight to the power infinity which again is a number too big to be written down.

7) Any number in octal can be written down in words in one of three ways, again these are the ways the number can be spoken. Thus the number 12a where the subscripts represent the base can be written as "One two base eight", or "One lot of eight and two lots of units", or "One lot of eight to the power one and two lots of eight to the power zero."

The advantage of the last method must again be shown by example: 347621

A) "Three four seven six two one base eight."

B) "Three lots of thirty two thousand seven hundred and sixty eight, four lots of four..."

**Conversions from Binary to Decimal**

Pick a number. Any number. Say 11010110 binary. To convert this to decimal, we make use of the fact that, working right to left, each digit represents rising powers of two. Therefore our binary number is:

10^5 + (10^4 + 10^3 + 10^2 + 10^1 + 10^0)

We can discard all zero digits, giving:

10^5 + (10^4 + 10^3 + 10^2 + 10^1)

Multiplying out the powers of two gives:

(10^5 + (10^4 + (10^3 + (10^2 + 10))

or

2 + 4 + 16 + 64 + 128 = 214

The powers of two are 1, 2, 4, 8, 16, 32, 64, 128 and so on, so it becomes fairly easy, with practice, to scan a binary number and work it out on the go.

**Conversions from Hex to Decimal**

The principle here is the same as for binary, except that we are using powers of sixteen:

$9C = (9 \times 16^1) + (12 \times 16^0) = 144 + 12 = 156$
Thus used work We 0. 0
Thus, pure convert from (C) to version (B), and from there to decimal. The maths would look like this:

$$34762_{10} = 3.8^2 + 1.8^2 + 7.8^2 + 1.8^2 + 2.8^1 + 1.8^0$$

$$= 3.32768 + 4.4096 + 7.512 + 6.64 + 2.8 + 1.1$$

$$= 98304 + 16384 + 384 + 16 + 1$$

$$= 1.26875$$

The above can be dropped, as any number without a subscript is assumed to be in base ten in mathematics.

From here we can generalise:

8) Let us imagine a planet where the dominant species is a creature with 10 fingers (where Q is any positive whole number above one). Here, the simplest system of counting to use would be one that works in multiples of Q. The base Q system. There are Q digits (zero to Q - 1).

9) The numbers in base Q are presented in each column of which represents a power of Q. The powers are calculated thus:

$$Q^0$$ to the zero: 1
$$Q^1$$ to the one: 1.Q = Q
$$Q^2$$ squared (or Q to the two): 1.Q.Q
$$Q^3$$ cubed (or Q to the three): 1.Q.Q.Q
$$Q^4$$ to the four: 1.Q.Q.Q.Q

and so on up to Q to the power infinity which is a number too big to be written down.

Any number in Base Q can be written in two ways; thus 12 can be written "One two base Q" or "One lot of Q to the one and two lots of Q to the zero."

10) To convert from base Q to decimal the maths is worked out thus:

$$123411_Q = 1.Q^2 + 2.Q^1 + 3.Q^0 + 4.Q^3 + 1.Q^1 + 1.Q^0$$

$$= 1.Q.Q.Q.Q.Q + 2.Q.Q.Q.Q + 3.Q.Q.Q + 4.Q.Q + 1.Q^1 + 1.1$$


We cannot continue from here satisfactorily without knowing what Q is.

**Lesson**

Thus endeth the lesson in Pure base numerology. Now comes its application. Fortunately when computing we need not work in terms of a base of an unknown constant (e Base 2) but using the structure of the constant enables us to work in any given base. The two bases most commonly used in computing are Binary (base 2) and Hexadecimal (Base 16).

Binary is used because this is the base that a computer "works" in. As has been explained before a computer circuit can be in one of two states at any given time. It can either be on or off. These states are represented mathematically by the digits 1 and 0. Thus, when designing a picture in PMODE 4.1 any particular pixel can be black or white (or green in SCREEN 1.0). Thus if we take eight pixels which are alternatively on and then off a binary representation of them would be.

10101010₂ = 170

(The number is represented to the assembler by use of the Prefix % which tells the assembler that the next number is in binary, i.e. %10101010)

And by an amazing non-coincidence, to produce this exact pattern in the top left of the screen in this mode we simply POKE location 1024 with 170. More of this much later when we come onto graphics. Base two is used also for mathematical work as we shall see in this month's time.

Hexadecimal uses sixteen digits they are, in ascending order, 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, A, B, C, D, E, F. Thus a hex (short for hexadecimal) number can look like this: 3AB2e or, in assembler language, 3AB2 with the dollar sign (or Encoder at least) telling the assembler that the next number is in hex.

To convert Binary to hex is incredibly easy, all that is needed is the following table:

<table>
<thead>
<tr>
<th>Decimal</th>
<th>Binary</th>
<th>Hex</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0001</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>0010</td>
<td>2</td>
</tr>
<tr>
<td>3</td>
<td>0011</td>
<td>3</td>
</tr>
<tr>
<td>4</td>
<td>0100</td>
<td>4</td>
</tr>
<tr>
<td>5</td>
<td>0101</td>
<td>5</td>
</tr>
<tr>
<td>6</td>
<td>0110</td>
<td>6</td>
</tr>
<tr>
<td>7</td>
<td>0111</td>
<td>7</td>
</tr>
<tr>
<td>8</td>
<td>1000</td>
<td>8</td>
</tr>
<tr>
<td>9</td>
<td>1001</td>
<td>9</td>
</tr>
<tr>
<td>10</td>
<td>1010</td>
<td>A</td>
</tr>
<tr>
<td>11</td>
<td>1011</td>
<td>B</td>
</tr>
<tr>
<td>12</td>
<td>1100</td>
<td>C</td>
</tr>
<tr>
<td>13</td>
<td>1101</td>
<td>D</td>
</tr>
<tr>
<td>14</td>
<td>1110</td>
<td>E</td>
</tr>
<tr>
<td>15</td>
<td>1111</td>
<td>F</td>
</tr>
</tbody>
</table>

It is clear that %1111 is the highest number possible with four binary digits, or bits (a nybble, remember?) and that $8F$ is the highest number possible with a single hex digit. Thus a byte, composed of eight bits can always be represented by two hex digits. To convert into its own two hex digits. To convert into its own.

Simply split the Binary number into groups of four adding zeros to the beginning of the highest cluster thus:

a) %10110110 splits to %00010 and %1101 %0010 = S2
b) %10111101 splits to %00110, %1110, %1101 and %1001 %0010 = 02
     %1110 = $E
     %1101 = $D
     %1001 = $9

This leads us rather neatly into single and double precision. They are now very easy to explain. Simply, a single precision number can be held in one byte and thus represented by up to eight digits in binary (up to two digits in hex) and a double precision number can be represented by between nine and sixteen digits in binary and either three or four digits in hex.

And so, finally, to the organisation of memory which must be visualised to enable skilled programming. Basically, we can think of memory as a long line of boxes placed next to each other (yes, I know it's a cliche, but why do you think it's a cliche—because it's a very good description!)

Each of these boxes can hold a single precision number, i.e an integer between %0 and %1111111111 or $0 and $FF or 0 and 255 inclusive. In the Dragon there are %1111111111111111 or $FFFF or 65536 boxes although half of them (from 32768 onwards) have been locked with a set number inside that cannot be changed—they are in ROM. The first 32768 (from 0-32767) can have the number within them changed at any time by the programmer.

```
0-3FF Systems Use
0FF Direct Page RAM
3FF Extended Page RAM
400-5FF Text Screen Memory
600-35FF Graphics Screen Memory
3600-7FFF Program & Variable Storage
8000-8FFF Basic Interpreter
C000-FFFE Cartridge Memory
FF00-FF5F Input/Output
FF60-FFDF SAM Control Bits
FFEE-FFFF MPU Vectors
```

If a double precision number is stored at a location the high byte (the first eight binary digits when zeros have been added on to the front) makes the number of binary digits up to sixteen and hex digits up to four) is stored at that location and the low byte (the remaining eight binary digits or two hex digits) in the next location.

Eg. to store %1110011110 ($3BE) in location 1024, location 1025 will contain %000000111 ($03) and location 1025 will contain %10001110 ($8E).

**Revision**

I hope that this month's article (which has diverted somewhat from the practical course) has helped to clear up any problems that existed about the basics of programming. From here onwards all the terminology used in this tutorial will be assumed understood and used frequently without explanation in future parts. To briefly run down what has been assumed understood: Base notation in mathematical and assembler form, the exponential or power theory, single and double precision numbers, Memory organisation. Mathematical notation for multiplication, conversion from any base into decimal, conversion from Hex to Binary and vice versa. Got that?

Next month, an explanation of the Branch instructions and an introduction to dry running. If there is anything you do not understand that has been covered please write to the usual Dragon User address, and maybe I can help.

I must go now, there's someone at the door about renting Geoffrey's room!
Print the text on the graphics screen — all is revealed by Peter Whittaker

Graphics Display

FOR A long time I have been bored with the Dragon's black on green display, and so eventually got around to doing something about it. I wanted to write a routine which would allow printing on both the usual green text screen, and the orange alternative screen. It also had to print text to the PMODE4,1 graphics screen, in a variety of different ways, allowing the mixing of text and graphics. Lastly, it was not to interfere with the normal running of the computer, so that tape and printer operations would still function normally.

The end result was 'Graftext', which resides in memory from 29000. This program will intercept the Dragon's print routine and replace it with its own. This means that all text messages can be displayed on the graphics screen, and not just deliberately printed strings.

Graphics

There is no need to display the text screen for anything at all. The Dragon becomes a true graphics machine, with error messages and loading program titles being displayed on the graphics screen. It is even possible to program the Dragon from the graphics screen!

First CLEAR 29000, then Enter and RUN the loader program (Listing #1) and then type in the code for 'Graftext'. When this has been saved to tape, EXEC 29000 to install the routine. The screen will switch to graphics, and display the Copyright message. The CLS command and the <CLEAR> key have been redirected to alsoCLS the graphics screen. The routine is completely transparent to Dragon Basic.

To change the display screen just use the SCREEN command (SCREEN1,0 or SCREEN0,1 etc). Another noticeable feature is that the graphics screen can be displayed by a simple SCREEN1,0 command. The display does not revert to the text screen when the computer prints its 'OK' prompt.

There are several special functions written into Graftext to give greater control over the printout. These are all called from the PRINT CHR$()- command. (Table #1 gives a full list.)

CHR$0 — disconnects the routine. The program still remains in memory, and can be recalled by EXEC29000, but will not interfere if other routines want to be run (eg, DASM assembler cartridge).

CHR$1 — stops the routine from printing on the graphics screen. Text will still be displayed on the text screen, and commands can still be entered from the keyboard, but they will not be listed on the graphics screen. This will stop the computer from printing ugly messages over greater works of art on the graphics display.

Table 1

<table>
<thead>
<tr>
<th>CHR$</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>DISCONNECT</td>
</tr>
<tr>
<td>1</td>
<td>PRINT OFF</td>
</tr>
<tr>
<td>2</td>
<td>PRINT ON</td>
</tr>
<tr>
<td>3</td>
<td>SCROLL OFF</td>
</tr>
<tr>
<td>4</td>
<td>SCROLL ON</td>
</tr>
<tr>
<td>5</td>
<td>PRINT &quot;OR&quot;</td>
</tr>
<tr>
<td>6</td>
<td>PRINT !!</td>
</tr>
<tr>
<td>7</td>
<td>PRINT 'EOR'</td>
</tr>
<tr>
<td>14</td>
<td>SET WHITE</td>
</tr>
<tr>
<td>15</td>
<td>SET BLACK</td>
</tr>
</tbody>
</table>

This has the effect of producing a white print on a black background, or a black text on a white background. Any underlying graphics are not destroyed.

CHR$8 — still the code for a black-space.

CHR$14 — changes the background colour from black to white. It also recolours the backspace, the CLS command and the scroll routine. It will also select the EOR text of CHR$7 so that the print can be seen on the white background.

CHR$15 — reselects the standard black background, undoing the effects of the CHR$14. However, it does not change the print type (5-7).

‘Graftext’ comes complete with its own predefined graphics character set. These can be redefined by POKEing the appropriate codes into memory. Listing #2 is a program to do just that. When run, the program will display the letter 'R' and wait for a prompt. Pressing the <Shift> key with either the up or down arrow key will cause the program to display the next letter above or below. In this way the whole character set can be examined at leisure. To find a letter quickly, press the <L> key, and the program will then ask which letter to display. Pressing the <#> key will allow you to select a character by its ASCII code (eg, 65=A, 66=B, etc). Pressing the <Q> will quit the program.

When the program runs it displays each graphics character in a large grid to the left of the screen. If the character is not the desired shape, press the <-> key to redefine it. The computer will then prompt for 12 string inputs on the right hand side of the screen, opposite the graphics character. Each input should be eight characters long, and be comprised of a series of ones

<table>
<thead>
<tr>
<th>Listing 1</th>
</tr>
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<tbody>
<tr>
<td>10 'HEX LOADER FOR 'GRAFTEXT' MEMOR</td>
</tr>
<tr>
<td>Y DUMP. BY PETER WHITTAKER</td>
</tr>
<tr>
<td>20 START = 29000</td>
</tr>
<tr>
<td>30 FINISH = 32000</td>
</tr>
<tr>
<td>40 FOR N=START TO FINISH STEP 8</td>
</tr>
<tr>
<td>50 PRINT NJ&quot;=&quot; &quot;$</td>
</tr>
<tr>
<td>60 TT+0:INPUT A$:Z=0</td>
</tr>
<tr>
<td>70 FOR M=1 TO LEN(A$):STEP 2</td>
</tr>
<tr>
<td>80 L=VAL(&quot;&amp;H&quot;+MID$(A$,M+2))</td>
</tr>
<tr>
<td>90 TT+T:POKE Z+L,0</td>
</tr>
<tr>
<td>100 Z+1:NEXT M</td>
</tr>
<tr>
<td>110 PRINT&quot;=&quot; &quot;$</td>
</tr>
<tr>
<td>120 INPUT T</td>
</tr>
<tr>
<td>130 IF T&gt;TT THEN PRINT&quot;error -- ENTER LINE AGAIN&quot;:GOTO 50</td>
</tr>
<tr>
<td>140 NEXT N</td>
</tr>
</tbody>
</table>
and zeros. (The ones will select a white pixel in the graphics window, whilst a zero will select a black pixel.) If the input is longer or shorter than eight characters, the computer will ask you to re-enter it. When all 12
lines of the character code have been entered, the computer will display the new graphics character. In this way the whole character set can be redesigned to taste.

'Graftext' can be resaved to tape with the new character set, by CSAVE/"GRAFTEXT", 29000, 32765, 29000. Alternatively, pressing the <S> key will save the character set alone. Several character sets can be saved separately, and then reloaded for use as desired, without interrupting the functions of 'Graftext'.

Modification

At the moment, 'Graftext' will print out characters from CHR$(32) to CHR$(255). The Graphics blocks from CHR$(144) to CHR$(255) are identical in shape to the earlier blocks, and so can be redefined as new shapes (eg, space invaders, missiles, bombs, etc). However, if you want to, you can restore the normal graphics blocks by a simple POKE&H733C,&H25. This will check the value of each character before it is printed. If it is greater than CHR$(143) then 16 is subtracted until it is low enough to print. The only noticeable difference will be on the text screen, where all the graphics blocks will be the same colour (CHR$(128)–(143)). On the graphics screen there is only one colour. The full character set can be restored by

POKE&H733C,&H20.

The routine is set up to work on the PMODE4,1 screen, but will also work quite well on the PMODE3,1 screen. The character set will appear as a mix of colours, and so will need to be redefined to take account of the two-bit wide pixels of the colour graphics modes. The display can also be set to PMODE2,3 or PMODE0,4, but care will be needed. These two resolutions are only 16 bytes wide, and not the full 32 of the PMODE4 screen. As a result this code will be printed only twice on each line if a full 32 characters are printed. Keep each line of print to 16 characters or less, and the display will be okay.

Because the routine prints out its character on a 32-bit line, each line of print will take 24 lines of the screen, and each line of a graphics character will be separated by a blank line. This can be solved by POKE&H739A,16 which squashes the display back to 12 lines.

The scroll routine EXEC &H73A3 stores the background colour at location &H73B2/3. The PCLS colour code is stored at location &H73CC. The Backspace colour is stored at &H731C. These codes can be altered from Basic, but will be changed whenever a CHR$(14) or CHR$(15) is printed on the screen. It is not easily possible to modify the routine to work with the disc drive attached.

If you do not fancy typing in the whole program, I can supply a copy on tape. Send a cheque for £3.00 to Peter Whittaker, 96 Upper Holly Walk, Leamington Spa, Warwickshire CV32 4JP. Finally, remember to CLEAR 200,29000 before reloading 'Graftext'!!
What about the parts the story tellers couldn’t reach? After all, in Giantland, everything was bound to be larger-than-life. Jack would have come across human sized birds and insects as well as giant caterpillars which changed, at will, to and from the butterfly stage in their search for human prey.

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Danger Zone

The in's and out's of the Clear command on the Dragon explained by Pam D'Arcy

YOU MAY have tried to run some machine code and had quite unpredictable results occur because of having omitted to carry out a required CLEAR statement prior to LOADM/EXEC. As some disk users have found out to their cost, failure to follow such operating instructions when a disk is in the drive can cause the catastrophic destruction of both the main AND backup directory sectors of the disk. "But the machine was clear...I had only just switched on...Such a major disaster from such a small slip..." are some of the comments.

I am afraid so, but here I offer this brief insight into what goes on in the Dragon's memory, in the hope that it will fix itself in the forefront of your memory and ring the danger bells before disaster envelops your system. Take a look at Fig 1 and the associated Table 1.

Even when you haven't given the Dragon any work to do, it is not idle. It is, amongst other things, continually checking for keyboard input and updating the TIMER value approximately 50 times a second. When carrying out such actions, it is using an area of memory for temporary workspace. This area of memory is known as the Hardware Stack. Even when our programs are running, unforeseen to us, the Dragon continues to carry out the keyboard check and updating of the TIMER value, using the Hardware Stack for temporary storage, as before.

At switch on, the Hardware Stack starts at the highest address of Area D and works backwards towards the start or lowest address of Area D. It is not a fixed size, but expands and contracts (always from the highest address down) as is needed, though normally uses only a few bytes at a time when carrying out the hardware functions, such as checking for keyboard presses and TIMER updates.

This doesn't generally bother us unless we want to run some Machine Code in an area of memory that clashes with the Hardware Stack at any time or that a Basic program may be using that area for its variables storage. It is the corruption of these areas by our machine code that causes the chaos because it causes the Dragon to lose its way as in its very necessary, strictly ordered, existence. The high address end of the Dragon, even more so at switch on, is particularly vulnerable.

The CLEAR statement is used to guarantee a 'safe' house for machine code, using the syntax: CLEAR parameter 1, optional parameter 2.

Parameter 2 is the start address of Area F — an area 'reserved for machine code use' (the manual is a byte out). Whenever this start address is changed, the start/end addresses of Areas E and D are automatically adjusted, that is, the highest address of Area E becomes this address -1, the highest address of Area D (and hence the Hardware Stack) becomes the highest address of Area E-length of Area E.

Parameter 1 is the required length of Area E. The highest address used is unchanged; its lowest address is the highest address - parameter 1 - 1. The length of Area E is set to 200 at switch on, else is set as parameter 1 of the last CLEAR statement issued (whether from the keyboard direct or from within a program). This then automatically adjusts the highest available address of Area D, and hence the starting position of the Hardware Stack.

For example, if immediately after switch on, you wish to run a machine code routine that is 400 bytes long at its default load address of, say, 32200, if you do not make the 'safe' house for it, it will load into the area occupied by the Hardware Stack (see Fig 1) with unpredictable results.

By typing CLEAR200,32200 <ENTER> the resulting top end of memory map would be as shown in Fig 2.

The HARDWARE STACK now starts at address 31999, working downwards. One or more machine code routines may now be loaded into Area F, 32200-32767, and be EXEC'd with no fear of corrupting any of the Dragon's vital workings (unless the machine code itself is naughty!) and no fear of anything corrupting it unless a Basic or other machine code routine POKE's into this area directly.

To those who have suffered because of the Dragon's way of doing things, I can only commiserate and say — believe me, it is not a stupid way of organizing things but a very powerful, dynamic system that outstrips other popular micros by miles.
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June 1986 Dragon User 25
Cyclic Error

I WAS interested to read your reply in the February issue to RF Stib- 
thorpe's query about Cyclic Redun-
dancy.

The first disc I used to back-up all my taped programmes de-
veloped this error after the work had been done. I have done a 
sector search and isolated the error to one of the Directory 
tracks. I would like to know:
a) if there is a fault on one of the directory tracks, why does the 
machine not read the second one?
What is the point of two copies of the directory if the back-up cannot 
be used?
b) How can I salvage this disc?

Paul Roxworthy
11 St Johns Road 
Windsor

DRAGONOS automatically 
keeps a backup of the directory 
on track 16, and uses the di-
rectory on track 20 for all its I/O. 
Quite why the authors of Dragon-
ros never wrote the code to 
automatically use the backup 
directory if the main one failed is 
a mystery. However, you can 
salvage a disc with a directory 
error simply by typing in the 
following:

CLEAR 500
FOR S=1 TO 18:READ 
1,1,6,AS,BS:SWRITE 
1,20,6,AS:BS:NEXT

Wordy Problem

PLEASE could you tell me how to make the following program 
accept a word instead of just one 
letter. I want the input to be 
ignored with a buzz if the word 
is wrong.

100 K$=INKEYS:IF K$="": 
THEN 100
110 K$=INSTR("A";K$):IF 
K$=THEN SOUND 1;1: 
GOTO 100
120 REM rest of program

Howard Woodcock

2 Seabrook Cottages 
Topsham Rd 
Topsham

Yes, it is not a simple matter to call the ROM's 
line drawing routine from 
main code. In fact, doing so 
will not speed up your program 
very much anyway, as the major-
ity of the time is spent in the 
routine, and not in the Basic 
evaluating the coordinates.

The reason the ROM routine is 
not that fast is that it has been 
written to work in any of the Basic 
graphics modes. Using vari-
ables, and no literal numbers in 
the LINE command will speed 
things up a bit, but the only real 
way to get very fast line drawing 
is to write your own routine which 
operates in one mode only.

Paul Ranson

Coventry Road

Shelton

Strings

PART OF a program I am writing 
involves adding and subtracting 
strings of numbers, such as 
"3+8-23+1", etc. I have tried 
using the VAL command, as in 
X=VAL("3+8-23+1"), but this just 
returns the value of the first 
number. Can you tell me what I'm 
doing wrong, or suggest a solution?

Paul Ranson

Coventry Road

Shelton

THE VAL command only expects 
a single literal number in the 
string as its argument. What is 
needed is an EVAL command, 
which the Dragon lacks.

The routine listed below is a 
very simple 'expression eva-
ualator' which can be called 
to return the value of the string AS in 
the variable T. As it stands only 
adition and subtraction 
are allowed, but the routine could 
"easily be expanded to deal with 
other operands and parentheses.

500 P=1:LEN=AS:GOSUB 
569:T=V
510 IF P>L THEN RETURN ELSE 
OP$=MIDS(AS,P,1):
P=P+1
520 GOSUB 569
530 IF OP$="+":THEN T+=V
540 IF OP$="-":THEN T-=V
550 GOTO 510
560 FOR P=2 TO L
570 INSTR(8123456789", 
MIDS(AS,1)) THEN NEXT
580 V=VAL(MIDS(AS,P)):P=J:
RETURN

From your letter, I assume that 
you are trying to check for a 
password in your program. The 
routine below will wait for the 
word in PS to be typed in, but will 
not print the character typed.

500 FS="-"PASSWORD":WS="-
510 KS=INKEYS:IF KS="": 
THEN 510
520 IF KS=CHRS(8) AND 
WS="-" THEN WS=LEFTS 
(WS.LEN(WS)-1):GOTO 
510
530 WS=WS+KS:IF LEN(WS) < LEN(PS) THEN 510
540 IF WS<>PS THEN SOUND 
1;1:GOTO 568
550 REM Rest of program . . .
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Due to a legendary piece of wheeling and dealing, Greenweld and Dragon User are able to offer you £22.80 worth of Dragon books — at an almost giveaway price of £3.40 including p&p (inside the UK). How's that for value? The package consists of four titles, as follows:

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HELLO AGAIN, and welcome to a very special column. Yes, this is a celebratory column. This column is two months old today! And all over the country the celebrations have started, dancing in the street, dancing in the dark, strangers in the night, exchanging glances, wandering in the night, what were the chances, that The Expert might write a complete column without mentioning arcades.

Yes, indeed, this is the second edition and I'd like right now to thank all those of you who wrote saying how wickedly zany you found the first one. In fact this column was awarded the coveted title of "Best Arcade Column In A Publication Called Dragon User!". I stand a proud man.

So, to work. Thank you for the Pokes you have sent and please keep them coming, this month's contribution comes from one Mr M R Vine of Dagenham (nothing like formality is there), who, after an affectionate dig at Paul D Burgin has presented pokes for your delectation. He says that the colour location should be poked with 224, 222, 240, and 248 for Green 4-colour, Buff 4-colour, Black/Green, and Black/White screen colours respectively.

Some of these pokes require the autonum to be disabled using the aforementioned Paul Burgin's methods (see Letters Dragon User, February '86). Here they are:

DUNKEY MUNKEY: LIVES 15120, COLOUR 19852
ASTRO-BLAST: COLOUR 21067
SCREAMING ABDABS: COLOUR 10999 (BUFF IS BEST)
JET BOOT COLIN: COLOUR 7329
MUDPIES: COLOUR 22902
MANIC MINER: COLOUR 13825, LIVES 13146 (UP TO 25 ONLY)
CAVERNS OF CHAOS: COLOUR 26860, LIVES 26865 (POKE TO ZERO FOR 100 LIVES)
COSMIC CRUISER (Do you mean crusader?): LIVES 9398 (POKE TO ZERO FOR UNLIMITED)
CUTHBERT IN THE COOLER: LIVES 8295 (MAX 14)
OHAMBERS: LIVES 13339

MOONHOPPER: COLOUR 12287
QUAZIMODO: LIVES 15644
ROMMEL'S REVENGE: LIVES 16516
TUBEWAY ARMY: LIVES 12157, STAGE 12388 (1-6)
JET SET WILLY: COLOUR 7959
CAVE FIGHTER: LIVES 27078 (POKE TO ZERO FOR UNLIMITED)
GALACTIC RAIDERS: LIVES 19668
HORACE GOES SKIING: COLOUR 28356
ROBIN HOOD: LIVES 15712, COLOUR 19884
SEA DRAGON; COLOUR 20599
SHOCKTROOPER: LIVES 13935

And Mr Vine claims the title of "King of the Hackers", unless, as Esther would say, you know better.

The next item was good fun, and what's more, it works! It comes from Simon Mythen who lives in Chertsey (see you down the lock some time Simon?) and runs thus:

"After recently purchasing 8-Ball from Microdeal" (where have you been for the past million years Simon?), "I was determined to find some sort of formula for potting all seven balls and the eight-ball. Well, I have succeeded! The procedure is as follows:

**Break** — Put the joystick in the top left position. The flashing line will appear after pressing the fire button. Leave the joystick where it is and press the fire button again. Finally, give the ball at the top, top right spin. Then, hit the ball with maximum force.

**2nd Shot** — Put the joystick in the bottom left position. Use bottom left spin and hit the ball with the third power.

**3rd Shot** — Again, bottom left on joystick and top right spin. Use full power.

**4th Shot** — As the second shot but use full power.

**5th Shot** — Top left on joystick and top right spin. Third power.

**6th Shot** — Joystick top right and for spin put the joystick slightly to the right of middle bottom. Maximum force.

**7th Shot** — Leave the joystick where it is. Top left spin and second power.

**8-Ball** — Make sure that the flashing line passes straight through the middle of the 8-Ball, use middle spin and the second power.

I've tried this and believe me it works (even a Cabinet Minister can do it and they have very, very, very small brains!) and it's great. If you have any "solutions" to other arcade games then please send them in. I think you'll agree that they're more fun than Pokes!!

Just to make things interesting this month, below you will see a number of screen shots of some old Dragon games — just like a stroll down memory lane, isn't it?

Well — if you think you can identify them, then write in to me — and the first one out of the hat (the ceremony to take place on June 13) will win a year's worth of subscription to this august journal! Best of luck!

So, that's about it for this month, except to say to D. Fowler of Glasgow that if he ever sends me another letter in that luminous green pen I shall personally come around and show him a new use for "Jet Set Willy" possibly redefining it in the process! Because he has won the award for "Worst Letter Ever Written Ever Since Year Dot When The World Began Ever" I do not intend to tell him the pokes he wants for "Jet Set Willy" for several months, even though we'll be publishing a map next time!

So, that's it for this award winning second birthday column. I wonder if this one can win the award for "Most mentions of Cabinet Ministers ever in an arcade column in a magazine called Dragon User". Let's hope so, eh?

Remember, Cabinet Ministers are human too.

Remember, Arcade column writers often lie.
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LAST MONTH I said I'd hope this time to look at both The Weards of Kesh and Space Trek II, so being a man of my word I'll do just that. Let me deal with Space Trek II first, and if you read the last column you'll know I was very enthusiastic about Space Trek I, written by a reader and being sold by him in his guise as Broomsoft. This was quite a comprehensive adventure — I don't mean it was set in a school, but on board the starship Endeavour. Though the plot was derivative of many a Star Trek tale, the program was well done and the game had many unusual and enjoyable touches.

**Sequel**

So what of Space Trek II? Sad to say it relies rather too heavily on the first program, although the story has moved on somewhat. You have managed to arrive at the planet Foskirk, and the first starship Endeavour is circling above it — you're in the fifth shop in the Endeavour series, and have to find out what happened to the first four. Here's one of them at any rate, and a scan of the ship has given you the useful information that the crew have all lost their minds. Probably been watching too many Star Trek repeats. But no, their ship is trapped by a strange force coming from the planet, and you must organise a landing party to find the minds, beam them up and disengage the force.

The program works in the same way as the first part, in that you can switch between any of four characters: James, Selvon, Spears and McCrindle. Just as impressive as before, except that the author has decided that the adventure will still begin by centring on the vast number of locations on the Endeavour V. I explained last month that the starship really is vast, and mapping it out gives you the feeling of actually exploring the shop as you move up and down between the six different levels of locations. As you begin Space Trek II, you soon realise that the starship has been reproduced exactly as before, and you encounter the same objects and people in the same places as first time round. I found this to be very disappointing and an awful waste of precious memory.

I admit to being limited on this as I hadn't worked out from the first game how to get off the ship and on to the surface of the planet beneath, and perhaps when you do this the adventure opens up more and becomes very different, but even if that is the case I can't see that there's going to be the memory available to make Space Trek II sufficiently different from its elder brother.

A quick inspection of the unprotected program shows the locations that are on the planet's surface, but they're far fewer than the ones in the starship that are duplicated from Part I. With the ability to switch between characters and move them independently, the game should have perhaps begun with them already down on the planet, which would mean you could have had any type of setting that you cared to create — jungle, desert, deserted city — and made it much more comprehensive, and as convincing as the first part was.

Nevertheless, if you're at all interested in adventures and particular in writing them, you should invest £4 and get at least one of these two titles from Broomsoft at 30 Broomhills, Welwyn Garden City, Herts AL7 1RF. I'd certainly like to see some more from the same author, but with settings sufficiently different.

Very different in its approach is The Weards of Kesh, also written by a regular reader, Bob Aldridge from Enfield, and now available for £5.95 from Quickbeam Software, 67 Old Nazeing Road, Broxbourne, Herts EN10 6RN. Though it's been out a short while now, Quickbeam's boss was telling me that very few copies have been sold, which I can't understand as it's a very good adventure. What's wrong with you adventurers out there? Every month I get lots of letters complaining that there are so few new Dragon adventures, and yet when people bring them out no one seems to bother buying them!

**Brigands**

End of sermon and on to the game itself which is also going to be a multi-part adventure, if enough people buy this first part, subtitled 'Skull and Bones'. In this, your role is as the only child (male or female, and that's later relevant) of a poor tradesman in the port of Ras Sharna. On his deathbed your father gave you a gold ring, and begged you to return it to the inner sanctum of the Temple of Kesh. This you set out to do, but when just in sight of the Temple a gang of brigands rob you of all your possessions and dump you in an oasis.

With this watery start you begin the adventure, and it's important to read this and other location descriptions carefully, as clues are sometimes contained in them as to what you should do or where you might try to go. The parser that reads your two-word inputs is a little fussy, and frequently you're searching round for the right couple of words even though you think you know what it is you should be trying to do. If this aspect of the game's vocabulary is a bit restricting, the location descriptions certainly aren't, which is something that enhances the game. A lot of care has been taken to make the text more descriptive, such as in the lonely waste land where you find not merely a dead tree but "A dead tree stands close by like a skeletal monument to some dead hero." Or outside Selim's Cave where "thin wisps of smoke drift out of the entrance and curl gently upwards," though little do you know from that soothed description what awaits you inside the cave!

**Input**

The program response tends to be rather slow, and it's a little irritating that once the response to your input is being computed, you then have to press another key to have the screen updated, after a suitable pause. Also, what initially seems like a virtue later proves to be something of a drawback. This is the feature that gives you a full location description on your first visit, but only a brief one should you return to that place. For the most part this doesn't matter, but in one place I found a red dragon barring my way, then when I later returned with what I hoped might see the beast off, it was no longer there. At least it seemed not to be, so I was at a loss for a while as to what to do. Then I typed LOOK to summon up the full location text and there was my adversary... which I promptly dispatched.

These little drawbacks don't prevent your enjoyment of the game, however, and this is definitely one that's more suited to the patient and experience adventurers. Fewer locations, it seems, than the two Space Trek adventures, but more description and tougher problems all round. Try it.

Now I recently reviewed Cowen Software version of Colosseum Cave, and mentioned that it didn't have a SAVE feature, which the original mainframe version of this classic adventure didn't have either. That has now been rectified, however, and the command STOP will send you into the SAVE routine, so don't let that lack put you off sampling this abbreviated version of a piece of
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solving page, an adventure page etc. as classified and full page adverts, sort of a mini Dragon User! As well as those usual features will be the programs sent in by readers and articles on
anything from OJD to Bulletin Boards to anything at all that you Dragon owners send in to us.
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June 1986 Dragon User 31
Close, 'large points Adventure Address Problem and Adventure cheap the how help Hayden sent adventure to me this month. Carl Truett of 11 Hayden Road, Rushden, Northants NN10 OHX has completed a few adventures now, but is struggling to map Juxtaposition. He asks if anyone has made a successful map of the lands, which they might be prepared to photocopy and let him have, 'at a small cost.' Over to you, map-makers.

Some clues on that same game come from Michael Emsley, 3 Ladywell Road, Kintore, Aberdeenhshire ABS 0UG. He reminds other readers that you need to use the camera twice, and that you should be able to cross the Yellow Baron's lands by starting at the fortress of BaronesSES Brown and Green and moving carefully from building to building. In return, Michael would like someone to tell him if you can control the bus in Cricklewood, and also help with three questions on EI Diablero: how to get the eagle's feather, where to dip the stick; and what use are the two columns.

Sgt John Moore of RAF Wildenrath plays adventurers when he's not knocking back cheap beer in the Sergeant's mess, and he's currently lost, wandering round the endless Rez Zone in Juxtaposition. My first advice could be REEB EHT FFD YAL, John, but more helpful is a simple MEHT RETNE OT DEEN ON SI EREH.

More successful in this game, which does seem to be dominating the postbag lately, is Ola Eidoy, one of several Norwegian readers I hear from regularly. Ola's scored 87% so far, with all 1D tags except the black one, so maybe by the time this appears you'll have successfully completed that and have your order in for the follow-up, Ola. He's also written for himself a little machine code routine which has enabled him to list all the available commands in Trekdoor and EI Diablero. There are too many to list here, but if anyone thinks they might be useful send me sae and I'll make a few copies available.

More room to list a few magic words from Mark Ingram on The Ket Trilogy: HTTLO-NOM and IKEELB IKEE. I'll leave you to figure out where they work. Thanks also to Ray Thomas of Haverfordwest and C Vaughan of Cardiff for clues on Sea Quest, and a final piece of help to Stephen Langdell of Carterton who was having trouble breathing on the Forest Moon in Return of the Ring. For that you need a KSAM REHTAERB, Stephen, and you get that from the EROTS LARENKG, but only if you've reached Gestalt Level 2. That's something that applies to both Winters's 'Ring' adventures — if a problem seems insoluble, it may be because you haven't built up enough experience to enable the solution to the problem to become available to you.

Experience tells me I'll be back again next month, and do let me know if there's anything you feel isn't sufficiently covered in the corner; won't you?
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June 1986 Dragon User 33
JUNE PUZZLE

Gordon Lee takes a random walk around number generation — and sets this month's poser

READERS with programming experience will be familiar with the "random" feature available in Basic, although this is a command which must be used with care, as we shall see later. Outside computing, tables of random numbers are used for statistical sampling techniques. Even so, this use is a relatively modern phenomenon. I can do no better than quote from an article by Alfred M. Bork on the subject: "... before the twentieth century no one would even have thought of the possibility of producing books like this; no one would have seen any use for it. A rational nineteenth-century man would have thought it the height of folly."

Methods used for producing lists of random numbers have been many and varied. In 1927, a table of 41,600 random digits was produced by taking the middle digits of the areas of parishes in England, while in 1949, a table of 105,000 digits was extracted from United States freight waybills. Other methods have involved dice, roulette wheels, and measurement of the rate of decay of certain radioactive isotopes.

With the arrival of computers (and calculating machines before them) it was soon realised that random number facilities could be used in conjunction with these machines would be an advantage. Clearly, programming in an actual table of random numbers would be both impracticable and wasteful of memory, so methods were devised which would enable the machine to generate its own series of random numbers.

An early method proposed by John von Neumann was known as the "middle of the square" method. Here the computer is first "seeded" with a random sequence of digits chosen by the operator. The computer then squares this number, extracts the middle digits of this square and repeats the procedure as often as required. For example, if we were to start with the number 5878, and extracting the middle four digits each time, we would get the series 5878; 2396; 7408; 8784; 1586; ... and so on.

Note that in generating this series, any square with less than eight digits is supplemented with extra zeros added to the left-hand side of the number to bring the total number of digits to eight, before the middle four digits are extracted. This method rapidly fell into disfavour as the sequences produced were too short, usually terminating in an endless loop of repeating values. Consequently, other, more sophisticated techniques were devised.

As was mentioned earlier, the random number generator on the Dragon is straightforward in use, but requires a little care to ensure that random numbers are, in fact, random. After selecting a number, the user can then execute a short program after switching on the Dragon type in and run the following line: FOR N = 1 TO 10: PRINT (RND (9)): NEXT.

As you might expect, the computer will dutifully print out a list of ten numbers at random, each number being in the range of 1 to 9. There is nothing surprising about this, but what is surprising is that the numbers so produced are always the same sequence. In the case quoted, a sequence 5, 3, 2, 6, 5, 3, 6, 3, 1, 8, was produced. In practice, this means that some device needs to be written into any program to prevent this degree of predictability occurring.

A program which, for example, deals with a card game of little use if it always selects the same cards every time the game is run from "cold."

Next month we will be looking at ways around this problem, but in the meantime readers might be interested in the following curiosity based on a random number selection routine. First of all switch on the Dragon from cold and then type in (or load from tape) the following program:

10 CLS: X = 15: Y = 7
20 PRINT @ Y + 32 + X;"***
30 R = RND (4)
40 IF R = 1 THEN X = 1
50 IF R = 2 THEN Y = 1
60 IF R = 3 THEN X = Y + 1
70 IF R = 4 THEN Y = Y + 1
80 IF Y = 1 THEN 80
90 GOTO 20

When run, the program prints a star in the centre of the screen and then selects a series of random numbers in the range one to four inclusive. A route is then traced moving up, left, down, or right, depending on whether the random number was one, two, three or four respectively. At each new location another star is printed to mark the new position. After 90 steps execution of the program when the end of the line is reached, the program halts and the operator can move the cursor to the top edge of the screen. The curious feature is that (at least on the author's Dragon) the pattern so produced resembles the Dragon logo Remember though, that each time the program is run the computer must first be switched off, then on again, and the program run again.

For this month's competition we are returning to John van Neumann's "middle of the square" method of producing a series of random digits. As was mentioned, certain numbers produce short sequences, some even are self-repeating. One such example is 3792 whose square is 4393264. However, can you find a four-digit number, all of its digits being different, which repeats itself after four operations? Good luck!

Prize

For the June competition, we've got something to excite Dragon arcade fans — the lucky winners will be receiving a copy of Gordon Bennet, from Smithsonian Computing, which they describe as, "a multi-screen megagame for the Dragon 32/64." Hold on a bit — they also say it's, "thoroughly daft, silly and enjoyable," ... and with man-eating toilets on the loose, I'm not arguing with that! In any case, surely a prize fit for ... a competition winner?

Rules

As usual, to win the game, you must show the answer to this month's competition and show how you solved it, with the use of a program written on your Dragon. For the sake of our strange administrative purposes, please do not send in cassettes containing a copy of the program, and don't forget to mark your entry — JUNE COMPETITION. And we know it sounds obvious, but don't forget to clearly mark your name and address on your entry — some always forgets ... and next month we're throwing a Hall of Shame, so watch it!

This month's tiebreaker — yup — you're going to have to come up with another of those phrases. Try completing the following in less than 10 words — Bathrooms can be dangerous because ... Anything rude will be circulated around the office, and then disqualified!

March Winners

The March goodie giveaway was 25 copies of Quickbeam's 6809 express — and congratulations go to the following, who will soon be receiving their prize: M Owens of Tonelt, Rachel Edmunds of Sedgefield, Dave Lardner of Rutherglen, Ray Woods of Barkingside, J Taylor of Acklam, Nils Lindgren of Sweden, C Dean of Enfield, C Richardson of Hesley, Douglas Mootrie of Rainham, J Hunt of Carnforth, J Slinger of Tylers Green, A Breakwell of Wyken, Richard Moss of Blackpool, E Newman of Addlestone, Mark Heaps of Washington, G Barber of Sutton Coldfield, D Marston of Bredon, D Grey of Middlesborough, Hywel Roberts of Newport, P Weedon of Alderley, M Stonton of Stoke, Brue, Simon Aubrey of Swindon, Kieron Brooks of Abercarn, J Gilcreest of Carlisle, and finally Matthew Oldfield of Norashamptoo.

The tie-breaker produced many fascinating programs, but Mark also provided the best, with "The train approaching Platform Five is the (screaming feedback) to (incomprehensible destination) stopping at (rambling double dutch)." Will Philippe Elkaouby of France please write in and explain his entry which went ... "it was observed ... there was hundreds of cows." It obviously loses something in translation — and we're losing sleep trying to plumb its enigmatic depths.

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