

DRAGON USER

A stylized red dragon logo with wings spread, facing left.

The independent Dragon magazine

96p US\$3.25

March 1986

Exploring Dragon machine code

The Logical Dragon

Flee! — Arcade Action

Communication

6809 Express
coming your way

DRAGON USER



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Subscriptions

UK £14 for 12 issues
Overseas (surface) £30 for 12 issues
0034-0264-0177, Telex 290274
Dragon User, 12/13 Little Newport Street,
London WC2H 7PP

US address: c/o Business Press
International, 305 East 42nd St, New York,
NY 10017

ABC

Published by Sunshine Books, Scott Press
Ltd (© Sunshine Books 1988)

Typesetting by Chapman Press, Gratham,
Bucks, Printed by Westminster Harrison
(Southern) Ltd, Southampton-Sos, Essex
Distributed by S.M. Denstone, London
SW9 0J-234-8811, Telex 261640

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How to submit articles

The quality of the material we can publish in
Dragon User each month will, to a very great
extent depend on the quality of the
documents that you can make with your
Dragon. The Dragon computer was designed
on to the market with a powerful version of
Basic, but with very poor documentation.

Articles which are submitted to Dragon
User for publication should not be more than
3000 words long. All submissions should be
typed. Please leave wide margins and a
double space between each line. Programs
should, whenever possible, be computer
printed on plain white paper and be accom-
panied by a tape of the program.

We cannot guarantee to return every
submitted article or program, or please keep a
copy. If you wish to have your program
returned you must include a stamped,
addressed envelope.

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announced new releases and silence the
press — Delay on Watership's Janipod-
tion II ... inside for details — Dispatch
delay at Colgate-Palmolive.

Top Ten Chart

Yes ... a chart for Dragon software,
compiled by you, the user. Votes have
started flooding in — this is your chance to
vote in People's Chart Two.

Communication

Problems, problems ... we want to hear
about it. Send all your Dragon related
queries to this column and get results fast.
Or maybe this is your chance to help out a
fellow Dragon owner?

Fleet

The ultimate maze game for your Dragon
— this one is fast brought to your computer
by the programming team of Colin Hogg
and Dave Rogers.

Machine Code Tutor

So he's not just a pretty face ... Jason
Orbman of all start a series on machine
code for humans! Don't miss it.

Logical Dragon

Peter Winkler shows you how to make
your Dragon team with this expert systems
program.

Reviews

Some old, some new, some borrowed ...
Jason Orbman dips his hand in the goodie
bag and passes judgement on what comes
out.

Mixing it

Pan d'Arcy time again. This month a
detailed look at passing values from Basic
to machine code. Check it out.

Firmware

Brian Cadge continues his stroll around the
Dragon firm, this month dealing with
Assorted Vectors. Just what the doctor
ordered.

Cupid

Ah ... it's Springtime and romance is in the
air. Steve Gathercole starts to the occasion
in the shape of this arcade gem — in 1976
code.

Dragon Answers

Brian Cadge consults the oracle of Cupid
and comes back with some useful answers
to a whole bunch of readers' enquiries.

Adventure Trail

Mike Gerard is in a particularly helpful
mood this month. Page 29 for details.

Puzzgrid

Construct your own wordsearch puzzles
using this program sent in to us by G.L.
Naylor.

Competition

Gordon Lee sets out to bewilder and
baffle us again, but for the valiant, a
copy of Quickbeam's 6809 Express could
be waiting.

Editorial

UNUSUALLY, one of the major personal achievements of the last 18 months
was the *RedLine Aid* appeal, started by an individual as unlikely as pop-star
Bob Geldof. Moved by scenes of mass starvation in drought-stricken East Africa, his
idea of "getting people off their backsides" (astonishingly passed over in the New
Year's Honours List) swept the country and culminated in the global event known as
Live Aid, last summer. And there were plenty of spin-offs too; *Fashion-Aid*,
Opera-Aid, *Camera-Aid* ... and more relevant to the home computer industry,
Soft-Aid.

Masterminded by ex-Quickserve supreme (now Electric Dreams MD) Rod
Cousens, this compilation tape raised over £250,000 for the Ethiopian appeal — a
fine effort by everyone concerned. There was just one problem for Dragon owners
however — the tape was only for Spectrum and Commodore machines — which left
us just a little bit out in the cold.

Following the success of *Soft Aid*, another charity tape is being prepared as I
write. Entitled "Off the Hook", the proceeds from its sale will go to the Princess Trust
for Drug Abuse Rehabilitation — an organisation concerned with helping drug
addicts beat their addiction. A worthy cause indeed. And the good news for the
computing community is that even more people can join in the effort, as Amstrad
and BBC have been added to the list of machines catered for. But — still no Dragon.

OK, so maybe we understand the commercial reasons for not including us, but
that still leaves a minimum of 50,000 odd active Dragon owners all dressed up with
nowhere to go.

Of course, someone could always "get off their backsides," but that only happens
in fairy stories — doesn't it?

Letters

This is the chance to air your views — send your tips, compliments and complaints to Letters Page, Dragon User, 12-13 Little Newport Street, London WC2E 8PP.

Good Showing

RE THE November 680S Show, I felt that the show this time was not quite as good as previous ones, but it is needed to keep the Dragon alive. I always enjoy looking for special offers and the chance to look at and try the new hardware.

Having started with the Dragon as a games machine, I am now looking for much more useful educational software for my 11-year-old daughter, and am using the machine with Disc Drive and using Word Processor packages and programming aids.

We need Dragon User. We need a 680S show. We definitely need all new information and advertisers.

Bryan Smith

Book Errata

THANK YOU for arranging the special offers with the Mailboume House. I have studied the book *Dragon Machine Language for the Absolute Beginner* for several weeks. It is most interesting and can be recommended to persons like myself who are beginners.

There are, however, a number of errors which are most confusing. They are:

1. There are 27 simple specimen programmes in Chapter 14. None will work because of an elementary error in the loading program on page 128. To rectify, one must move the contents of "line 00" to a new line position, eg as "line 25".

2. There is a major loading program on page 155. It has an error in the subroutine which begins with line 600. The subroutine is intended for tests of machine code segments, but it does not have an "exit", or a "line" statement. The program may have another error in the subroutine starting with line 408. I could not make it work, but this may have been because I did not know what it was supposed to do. Finally, I do not understand the purpose

of "line 5" of this program.

3. There is a big mistake in the specimen program "MUSIC". On page 187, starting at address 40A000, the hexadecimal entries should be 5E, 28, 87, 28, 02, 28, 0F, 3D, 02, 30, 00, 30, 8E, 36, 7D, 39, 84, 30, and 0B.

In spite of the above defects, it is a most interesting book.

J B Slinger
Typos done
High Wycombe
 Bucks

Bulletin News

HAYMAJ recently started running a small bulletin board on my Dragon 64. I was wondering if you would be so kind as to inform other Dragon users about the service, through the pages of Dragon User. The details are as follows:

The board runs at 800x600 baud, 7 data bits, even parity, 1 start bit, 1 stop bit, and is on line 6 nights per week (Saturday to Thursday) 9:00 pm until 7:00 am, on file above number. The board auto answers and 20 minutes per call is allowed. Although running on a Dragon 64 there are users of other machines use the system, ie, Apple, BBC, Amstrad, etc. The board is called "waley" and was written with the intention of introducing some humour to the BBS scene.

M G Amentage
101 South Terrace
Mable Bar
Sheffield S21 6DE
Tel: (0595) 773554

Pokes

NOTICING that the only hint tip for games for ages was the one for Jet Set Willy (great), I decided to send in some Pokes I've found myself. Most of the games are getting on a bit, but hopefully that means most people will have them! Here they are then:

THE BELLS (keyboard version only) — Poke 10725-0-255 (Jesse)
COURTIER IN SPACE — Poke 7673, 0-255 (Jesse)
BLOCKHEAD — Poke 10840, 0-255 (Jesse)
TEATIME — Poke 15840, 0-255 (Jesse)

MONSTERS — Poke 2058, 0-255 (Jesse)
DUNKY MONKEY — Poke 15420, 1-127 (Jesse)
CHOPPER STRIKE — Poke 13108, 0-255 (Jesse)
POGO-JO — Pokes zero for "skill level" — your points, which usually go up in 10's will go up in 1000's!
BODIE STRADY GO! — type "FIDDLE" when the game starts (after pressing the up cursor key). Now using the left and right cursor keys, you can go forward and backward through the screens.

I hope these Pokes are of use!

Robert Gooding
52 Newton Drive
Inver
Ayrshire

Leap Year

I HAD always understood it to be common knowledge that Pope Gregory XII amended the leap year rule in 1582 and not, as written on Page 42 of the January 1985 edition of Dragon User, 1577.

This would be of little concern to me were it not for the fact that it caused me to lose a bet with my Father!

Peter Caldwell
35 Squirley Lane
Cefnau
DD2 7LD

Any other hints for the exact date of this momentous event? Meanwhile, Peter, may this exercise be a lesson to you on the perils of installing in gambling. (Send an SAE for definitive list of sites less damaging on your pocket).

Value

PAUL GRACE is right about the National Dragon Users Group. The newsletter, "Dragon Updater", is filled with useful information. Correspondence with several Group members gave me the information necessary to get my C64 software operational (no thanks to the manual) as well as introducing me to other Dragon users in Israel. They are the Dragon "Buy of the Year".

Harry C. Taylor II
Israel

Power Pack

AS SOMEONE occasionally asked to repair Dragon 32 computer bits and pieces, I have noticed two or three letters in your mag about the mains transformer burning out.

I have now had three burnt-out transformers sent in for repair in the last two months (they are inseparable of course), but the cause of the problem in every case is that the input plug to the rear of the computer has had a loose cable grip screw. The wires inside have twisted around each other and short circuited, burning out the power transformer secondary.

I would advise every Dragon owner to immediately check that the cord grip screw in the grey covered power plug from the transformer to the Dragon is securely tightened. Even better, open up the plug and check all the soldered connections are OK with no exposed wires inside.

An even better solution would be to break the transformer to computer lead and insert fuses and fuseholders in the line, thus protecting the transformer.

Really, this transformer would be better out of its box, and fixed in a large, ventilated box along with its new fused protection — if you are technically minded.

I am still working on a suitable replacement transformer for the Dragon, but I would advise people whose transformer has burnt-out to check their machine on someone else's transformer as internal damage could have been done to their Dragon, as well as the transformer.

M Eberley
3-5 Watford Cottage
Morden
Huddersfield

Thanks for those tips . . . we would emphasize that you should only attempt any repairs or modifications to your transformer if you have the necessary technical competence or you could be letting yourself in for a whole bigger bunch of trouble.

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News desk

If you have any new products for the Dragon — software or hardware — ring the News Desk on 01-437 4343

Incentive — new release

INCENTIVE wish to stop the spread of any scurrious rumours (started heaven knows where!) that they are halting development of new Dragon games, by announcing the development of their next game, Time Lord, for the Dragon 3D.

Described by Incentive's Ian Andrew as, "a multi-screened 3-D arcade adventure," the plot involves destroying the evil arch villain Nacco. During the game, you must explore Nacc's castle, seeking out and battling with various guardians, to locate parts of a magic talisman which will gain your access to the inner Temple where Nacco lies sleeping... and then on to the final confrontation.

This is the first Dragon game written by the long-time Incentive staff: Peter James and Roger Trank, but with the promise of Martin Madness

type 3-D, the game looks good. Time Lord should be available around mid-May from Incentive, priced at £7.95. Contact them on 0734 511678.



Re Dragon User News: Desk last month, the Incentive Moon Cresta competition to win an original Moon Cresta arcade machine will close at the end of 1988 — so don't say that you've not got time to practice.

Juxtaposition delay

THOSE adventurers waiting for Juxtaposition: Part Two (Usurper of Ruins) are going to have to wait that little bit longer than expected — as Winterset are having trouble fitting it all in memory.

"The game is going to be released later than anticipated," said Winterset's John Humphries, but is hoping for an Easter launch, "if all goes well." This compares to the original launch date of mid-February.

The actual game design has been extended to produce a bigger game — possibly in two

parts. The first part concerns the task of gathering together a band of companions to face the might of Baroness Black. The second part (a combination of strategy and conventional adventuring) deals with the confrontation itself, as you battle it out with the Evil Horde. The program will feature some drawn graphics, as well as the "Panoramic Graphics" that were such a hallmark of the original.

For further details, contact Winterset, 30 Uplands Park Road, Enfield, Middlesex, EN2 7PT. 01-267 5720.

Total Eclipse — the public wait

BIRMINGHAM based Software House Fenmar Ltd have recently been the subject of investigation by West Midlands Consumer Services, following complaints from dissatisfied customers (passed on to them by Dragon User). Company spokesman David Newstead blames faulty tape di-

rection and other technical problems on the delay in dispatch of their first release Total Eclipse, but is confident that orders will be fulfilled by the end of January. He added, "if anyone requires a refund, rather than waiting for the game, we can send a cheque within 48 hours."

West Midlands Consumer Services can be contacted on 021-734 2626 — contact Mrs S. Lewis.

Dragon User People's Chart

"Power to the People" is our motto here at Dragon User — so this month (and every month!) we are now going to offer you the chance to air your personal preferences to the software producers, by voting in the Dragon User People's Chart.

Ever since the majority of retail outlets received stocking Dragon programs (so that sales are now even more difficult to assess), the Dragon scene has lacked that one thing any self-respecting micro must have — a chart. Love it or hate it, a chart is a useful thing, if only to check to see if everyone else shares your good taste.

So, ever with the reader in mind, we are now introducing a People's Chart — for you to vote for your top five Dragon programs (games, utilities or applications) each month.

And just to make it that little bit more interesting, this month Microdeal are offering £25 worth of software (of your own choice) to the winner of our associated anagram competition. Who said anything about a competition?

Well, to make things even more interesting than that, we're asking you to construct an anagram from your top three — the cleverest winning the goodies. Give it a try... you know it makes sense!

This is what you do

Each month, Dragon User will be compiling its own special Dragon software Top Ten chart — compiled by you!

And each month we will be sending £25 worth of Microdeal software to the person who sends it, with their personal top five, the most original phrase or sentence made up from the letters (you don't have to use them all) in the titles of their top three programs.

You can still vote in the chart without making up an anagram — but you won't be in with a chance of winning the prize.

All you have to do is fill in the form below (or copy it out if you don't want to damage your Dragon User) and send it off to: People's Chart No. 1, Dragon User, 12-13 Little Newport St, London WC2H 7PP.

Chart Two

Voting for Chart No. 1 closes all time on Friday 14th March 1989. 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 1

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

My phrase is:

Communication

Send in your questions, requests, and pleas to Communication, Dragon User, 12-13 Little Newport Street, London WC2E 8JZ

Problem: Blasted! Has anyone out there got a copy of Dragon FORTH by Cassa Software. Any price paid, but must have instructions. Must be in fairly good condition.

Enquirer: Brian Rowe, 3d Marwick Road, Thornton Heath, Surrey CR4 8NA.

Problem: Need merge or append routine for Basic and/or machine code.

Enquirer: David Pope, 44 Friars Avenue, Sheffield, Essex CM15 8RU.

Problem: I am at present working on my 12 level computer project which is a database built to enter a Dragon plus tape and. I am finding difficulties when it comes to file handling (ie, record searching and file extension). Can anyone recommend a good book?

Enquirer: Michael Walker, 77 Lynton Avenue, Collier Row, Romford, Essex RM7 8NH.

Problem: I have a Dragon 32 with DragonDos disk system. Recently I was using a graphic program, when the disk started to error. Afterwards, I listed the directory and found that although it was showing the correct amount of free space, it

did not list the last few programs. Is there any way of recovering these lost programs?

Enquirer: P. J. Webb, 41 Goddard Avenue, Swinton SM4 4NE.

Problem: Could anyone explain how to determine the addresses for CSAVE, CLDAD, EXGEC and CLEAR? Also the same for assembler programs (ORG & PUT) written with Aldrom.

What do I have to do with PRT and END and labels like ROUTINE and how to CSADRM from Aldrom? I am a complete beginner in machine code.

Enquirer: Luc Bressanck, Wierandestraat 37, 2648 Waaslandorp, Belgium.

Problem: I am hoping to use my computer to control my very complex model railway. The only problem being is I wish to use infrared remote control, where the computer produces the frequencies and the necessary data for the decoder.

I do not know much about the output from my Dragon or which is the best port to use.

I have to use machine code but I am not sure how to address the necessary parts of memory for controlling the output ports. I would be very

grateful if anyone could help me.

Enquirer: S. J. Taylor, Fensley Lane, Barnetby, South Humberside DN21 8HA.

Problem: I am now using a Cornma DOS with my Dragon 84 and am anxious to convert a number of my programs to Disc Operation. Unfortunately the Cornma manual, and Cornma themselves, are not too helpful.

Can anyone please give me some assistance?

Enquirer: Peter Stagg, Byways, Oak Lane, Broadbridge Heath, Hounham, Sussex RH12 3LX.

Communication

Stuck for a routine? Need some obscure equipment? Feeling cut off? Fear not — someone, somewhere can help you! Write down your problem on the coupon below (make it as brief and legible as possible) together with your name and address and send it to Communication, Dragon User, 12-13 Little Newport Street, London WC2E 8JZ. We'll publish it as soon as we can — meanwhile, maybe there's someone you can help this month!

Problem.....

.....

Name.....

Address.....

.....



of the hill!

The **AtariSoft** is the biggest and best magazine available for the TRS-80 Color, TOP-100, MC-10 and Dragon-32 Computers.

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Flee! Flea!

A superlative name came by the name of Dave Rogers and Colin Hogg

FEEL this is a macrochess/Farman type game, but we have given it its own definite style and flavour, from the untypical use of the Dragon's resolution modes (including the usual Dragon blandness) to the distinctive and devious designs of the pieces. To play, it is fast, challenging, and we believe as good as (or better than) any game of this genre available for the Dragon.

All the features requested of a good maze game are included: multiple tunnels, power rings, mazes open in four directions, bonus fruits, a highly intelligent player-seeking algorithm, up to six 'Progressively Aggressive' opponents (and bonuses for catching them), six different scenarios and colours, extra lives for clearing them, and so on - yet the program is relatively short. Other main features include a control key response tailored to allow 'anticipation' when turning corners (giving much smoother play), 14 different sound effects/tunes, and a fully functional demonstration mode, which also copies through the six scenarios, so even if you can't clear them all yourself at least you can sit back and see what you're missing.

The only compromise we have made in the program is a slight delay between certain screens (15 sec.) while video images are altered, etc. to do this any leader would have required considerably more video.

It uses a "retrocard screen" system, and this is well worth discussing, because the concept could easily apply to almost any game. The game is actually played on the Dragon's low-resolution (text) screen, which is block character mapped and locked in a simple, straight-forward way, starting at address 1204. Only those parts that change on the reference screen are translated, by means of a machine-code span, only a few "slave screens", the latter being the only screen actually seen by the player.

By using this method, all of the game logic can be programmed using normal character codes and pokes on to a simple screen, which can also be easily ported to be perform collision checks, route-seeking, scores, level moves, etc.

Meanwhile, the virtual screen can be made as detailed as you like and its characters and objects can be switched around without affecting the actual operation of the game in the slightest! Since the virtual screen is never actually seen (unless you press Break) it doesn't matter what it looks like, so you also gain the freedom to choose characters with codes that make the programming easier. For example, we assigned all the characters

What are valid or invalid (for the player or for the "team" to move on to) into easy-to-differentiate numerical answers.

To update the `fixes` screen we use three different machine code subroutines. While we are describing these the main machine code functions will also be covered.

(10) **Hex Map (Map = 31531).** This updates the entire screen, but is too slow to be used all the time because it has to scan the 32 × 18 characters on the notepad screen, then refer to bit-pattern-tables to find the corresponding hi-res characters and poke a total of 32 × 180 bytes of these onto the hi-res screen (you can see the speed of this scan when it does a colour change "wipe-down" between screens, two and three).

(2) **Base 2195**. Updates the score display only (top left). Used for example when bonus is being consumed etc.

(3) **USP41-00** (address is 31067). This calls the main machine code routine that takes care of ALL Ring movements. It moves the Ring about the movement screen as dictated by the player's seeking algorithm, etc. (If player's position being passed via 28 in Line 100) but then it also updates specific areas of the 81-rs screen, these being: Each of the four positions each from previous position (replacement characters); the player's position above, below, left and right of the player (so whichever way he was moving the update will rub-off his previous position); and finally, the score display. This main routine also does the following: scans the screen for dots to see when it had been cleared; detects when the player has been caught by a flea if a power ring has been eaten then it starts to decrement the value in the power ring counter (address 31023) and detects when this reaches zero, it accordingly returns to Basic with a number between one and four, which is then used by the On-Gain in Line 10 to reach the appropriate Basic routine (17 for screen cleared, 2 for power ring expired, 3 for item1, 4 for power left).

Patient Name: P-23 **Referring Physician:**

Model 37042 includes "Flex" storage with 512 inclusions, etc.

Poster-Max FPG3/FPG5/FPG7 Selects video
channel used.

1000

The machine code data lists and the strings holding the compressed macro data are all checksummed, so you, first few rare will almost certainly result in error messages directing you to look at certain lines and correct typing mistakes. Unlike Sinclair machines, the Dragon checks lines in Run time, not when entered, so you should select Dzero mode and leave it to (type) through all its macros and before you go to

give the program the opportunity to spot any mistakes. Having corrected all errors don't forget to re-index as well (noted)

MD: Line 560: All inverse characters: A, A, sin Ts, A.D.A.I, nearly A's
Line 570: "Press P to play, D for Demo"
The well-known "speedup" Poke in Line 585 will work on most Dragons but not all if it doesn't, then just erase the line and since we used it only to accelerate noise decoding, the main game will still run at the same speed.

David survives game in FastMode, it won't load back!!! If in debug poke HEX FF05,0 in return to Slow Mode.

Future research

At any time during active game mode or at the end of a game you can press \square to play, and during play you can pause by pressing Shift+ \square . Screen one is particularly easy, while screens four (Sandy Castle) and five (Face the Face) are particularly difficult, but not impossible! In fact there are quite easy ways to clear all the screens, we have both done it, but unlike inferior Pacman type games, it needs practice and the formulation of definite strategies!

Methodological issues

(1) If you need to slow the game down, add: 24 FOR DE = 1 TO 25: NEXT DE. The delay figure of twenty can then be adjusted up or down to find your most comfortable speed.
(2) To make an Autoplaying version just add these lines:

120000 COUNTRY "PL. 88", INT. 170000.0
120000 COUNTRY 30.00 : 120000 30.00

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TOTAL

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To load this version you must use **CLDLOAD** since the author works by saving the whole program as a machine code file, with the two Pokes to restore 'End of Basic' pointers (we have deliberately over-estimated the latter in case you accidentally type in more spaces than intended, making the program slightly longer than as listed). It is best to still keep a tape of the normal version as a back-up.

(3) If you feel you must enter the keys used for (numbered) items you must select otherwise, the

the string "2024/" in Line 10 to the same letters, otherwise demo mode will not work at all.

(4) This program will work on the Dragon 64 if you change UCAR(30) in line 145 to 14560's.

Ready-typed versions of this program (including an expanded automating version of one table) are available for £2.00 from: J. Rogers, 11 Camarvon Road, Wotton, Liverpool, L30 1BB.

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Table 1

[illegible]

Figure 1 consists of two line graphs, (a) and (b), showing the percentage of respondents for different levels of agreement with the statement "The government should do more to help people who are struggling financially".

Graph (a) shows the percentage of respondents for different levels of agreement (Strongly agree, Agree, Disagree, Strongly disagree) across four categories: Total, White, Black, and Hispanic. The Y-axis represents the percentage of respondents (0 to 100). The X-axis represents the level of agreement. The legend indicates: Strongly agree (solid line with circles), Agree (dashed line with squares), Disagree (dotted line with triangles), and Strongly disagree (dash-dot line with diamonds).

Graph (b) shows the percentage of respondents for different levels of agreement (Strongly agree, Agree, Disagree, Strongly disagree) across four categories: Total, White, Black, and Hispanic. The Y-axis represents the percentage of respondents (0 to 100). The X-axis represents the level of agreement. The legend indicates: Strongly agree (solid line with circles), Agree (dashed line with squares), Disagree (dotted line with triangles), and Strongly disagree (dash-dot line with diamonds).

TO ORDER

1997, 1998, 1999, 2000, 2001, 2002, 2003, 2004, 2005, 2006, 2007, 2008, 2009, 2010, 2011, 2012, 2013, 2014, 2015, 2016, 2017, 2018, 2019, 2020, 2021, 2022, 2023, 2024, 2025, 2026, 2027, 2028, 2029, 2030, 2031, 2032, 2033, 2034, 2035, 2036, 2037, 2038, 2039, 2040, 2041, 2042, 2043, 2044, 2045, 2046, 2047, 2048, 2049, 2050, 2051, 2052, 2053, 2054, 2055, 2056, 2057, 2058, 2059, 2060, 2061, 2062, 2063, 2064, 2065, 2066, 2067, 2068, 2069, 2070, 2071, 2072, 2073, 2074, 2075, 2076, 2077, 2078, 2079, 2080, 2081, 2082, 2083, 2084, 2085, 2086, 2087, 2088, 2089, 2090, 2091, 2092, 2093, 2094, 2095, 2096, 2097, 2098, 2099, 2100, 2101, 2102, 2103, 2104, 2105, 2106, 2107, 2108, 2109, 2110, 2111, 2112, 2113, 2114, 2115, 2116, 2117, 2118, 2119, 2120, 2121, 2122, 2123, 2124, 2125, 2126, 2127, 2128, 2129, 2130, 2131, 2132, 2133, 2134, 2135, 2136, 2137, 2138, 2139, 2140, 2141, 2142, 2143, 2144, 2145, 2146, 2147, 2148, 2149, 2150, 2151, 2152, 2153, 2154, 2155, 2156, 2157, 2158, 2159, 2160, 2161, 2162, 2163, 2164, 2165, 2166, 2167, 2168, 2169, 2170, 2171, 2172, 2173, 2174, 2175, 2176, 2177, 2178, 2179, 2180, 2181, 2182, 2183, 2184, 2185, 2186, 2187, 2188, 2189, 2190, 2191, 2192, 2193, 2194, 2195, 2196, 2197, 2198, 2199, 2200, 2201, 2202, 2203, 2204, 2205, 2206, 2207, 2208, 2209, 2210, 2211, 2212, 2213, 2214, 2215, 2216, 2217, 2218, 2219, 2220, 2221, 2222, 2223, 2224, 2225, 2226, 2227, 2228, 2229, 2230, 2231, 2232, 2233, 2234, 2235, 2236, 2237, 2238, 2239, 2240, 2241, 2242, 2243, 2244, 2245, 2246, 2247, 2248, 2249, 2250, 2251, 2252, 2253, 2254, 2255, 2256, 2257, 2258, 2259, 2260, 2261, 2262, 2263, 2264, 2265, 2266, 2267, 2268, 2269, 2270, 2271, 2272, 2273, 2274, 2275, 2276, 2277, 2278, 2279, 2280, 2281, 2282, 2283, 2284, 2285, 2286, 2287, 2288, 2289, 2290, 2291, 2292, 2293, 2294, 2295, 2296, 2297, 2298, 2299, 2300, 2301, 2302, 2303, 2304, 2305, 2306, 2307, 2308, 2309, 2310, 2311, 2312, 2313, 2314, 2315, 2316, 2317, 2318, 2319, 2320, 2321, 2322, 2323, 2324, 2325, 2326, 2327, 2328, 2329, 2330, 2331, 2332, 2333, 2334, 2335, 2336, 2337, 2338, 2339, 2340, 2341, 2342, 2343, 2344, 2345, 2346, 2347, 2348, 2349, 2350, 2351, 2352, 2353, 2354, 2355, 2356, 2357, 2358, 2359, 2360, 2361, 2362, 2363, 2364, 2365, 2366, 2367, 2368, 2369, 2370, 2371, 2372, 2373, 2374, 2375, 2376, 2377, 2378, 2379, 2380, 2381, 2382, 2383, 2384, 2385, 2386, 2387, 2388, 2389, 2390, 2391, 2392, 2393, 2394, 2395, 2396, 2397, 2398, 2399, 2400, 2401, 2402, 2403, 2404, 2405, 2406, 2407, 2408, 2409, 2410, 2411, 2412, 2413, 2414, 2415, 2416, 2417, 2418, 2419, 2420, 2421, 2422, 2423, 2424, 2425, 2426, 2427, 2428, 2429, 2430, 2431, 2432, 2433, 2434, 2435, 2436, 2437, 2438, 2439, 2440, 2441, 2442, 2443, 2444, 2445, 2446, 2447, 2448, 2449, 2450, 2451, 2452, 2453, 2454, 2455, 2456, 2457, 2458, 2459, 2460, 2461, 2462, 2463, 2464, 2465, 2466, 2467, 2468, 2469, 2470, 2471, 2472, 2473, 2474, 2475, 2476, 2477, 2478, 2479, 2480, 2481, 2482, 2483, 2484, 2485, 2486, 2487, 2488, 2489, 2490, 2491, 2492, 2493, 2494, 2495, 2496, 2497, 2498, 2499, 2500, 2501, 2502, 2503, 2504, 2505, 2506, 2507, 2508, 2509, 2510, 2511, 2512, 2513, 2514, 2515, 2516, 2517, 2518, 2519, 2520, 2521, 2522, 2523, 2524, 2525, 2526, 2527, 2528, 2529, 2530, 2531, 2532, 2533, 2534, 2535, 2536, 2537, 2538, 2539, 2540, 2541, 2542, 2543, 2544, 2545, 2546, 2547, 2548, 2549, 2550, 2551, 2552, 2553, 2554, 2555, 2556, 2557, 2558, 2559, 2560, 2561, 2562, 2563, 2564, 2565, 2566, 2567, 2568, 2569, 2570, 2571, 2572, 2573, 2574, 2575, 2576, 2577, 2578, 2579, 2580, 2581, 2582, 2583, 2584, 2585, 2586, 2587, 2588, 2589, 2590, 2591, 2592, 2593, 2594, 2595, 2596, 2597, 2598, 2599, 2600, 2601, 2602, 2603, 2604, 2605, 2606, 2607, 2608, 2609, 2610, 2611, 2612, 2613, 2614, 2615, 2616, 2617, 2618, 2619, 2620, 2621, 2622, 2623, 2624, 2625, 2626, 2627, 2628, 2629, 2630, 2631, 2632, 2633, 2634, 2635, 2636, 2637, 2638, 2639, 2640, 2641, 2642, 2643, 2644, 2645, 2646, 2647, 2648, 2649, 2650, 2651, 2652, 2653, 2654, 2655, 2656, 2657, 2658, 2659, 2660, 2661, 2662, 2663, 2664, 2665, 2666, 2667, 2668, 2669, 2670, 2671, 2672, 2673, 2674, 2675, 2676, 2677, 2678, 26



Fig. 1. Influence of the amount of water on the rate of the reaction.

[illegible]

Figure 1

Journal of Management Education 34(10) 1179-1190

NAME	TYPE OF COMPUTER	1
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		1
		1
	POST & PACKING	1
	TOTAL ENCLOSED	1

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Spanish nationalism ... "culture wars" in Spain have failed to get beyond those like getting beyond the colonial past, starting but not ending ... no less than old national or other identities, such as the anti-Francoist one, influence and lay down Spanish identity and behaviour.

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"Computers present the quiz in an efficient and compelling way" — *Dragon User*, May '89



152

LINEAR

For gamers for two to six players, the object being to form words on the board and thereby score points. The computer automatically calculates all scores including double and triple word scores, 50 bonus etc. The game features colorful graphics with facilities for correcting mistakes spelling or exchanging difficult letters from the rack.

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"... a well written and thought out program" —Dragon
Mag. December '88

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and am very pleased with it. I
must praise your very prompt
service.
... well done
Paul Gardner
Hindon

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STATE OF THE INDUSTRY

TRADE EXCHANGES WITH OTHER

Machine code for humans

Part One of a massive opus by Jason Orbaum et al

MANY people originally bought a computer "to learn to program", and, after looking at the BASIC manual, gave up and played a few games. Anyone who did that, however, undoubtedly owns a Spectrum, so this series will be aimed at those with a reasonable knowledge of some sort of programming language, but to initial knowledge of the ins and outs of the Dragon, or the 68000 microprocessor at its heart. Hopefully, once we have antedived slowly through the complex pitfalls of assembler programming for a few months, even the most dedicated high-level language programmers will want to give it a try.

We will also be presenting a few complete programs, maybe one or two useful ones among the games! These will be given as complete assembler listings, so they can be used as tutorials, and to this end they will all be fully documented.

The beginning

Before we progress, who are we and why do we feel qualified to teach you? We have been programming in machine code as a team for several years now including, covering the entire range of computers from ZX81s through Dragon and BBC, onwards past IBM and Apricot PCs, to Pico microcomputers. This experience also covers a wide variety of languages, although we rarely use anything but assembler through choice (our experience covers C, Pascal, Logo, and C, so we are not just a pair of old-fashioned bit-badders!). The name Jason Orbaum may ring a bell in the dim recesses of your mind as one of the magazine's reviewing team. If so, then you will know our objectives in program construction, and will also know that we believe that a piece of code is nothing without a firm and workable initial design.

Starting very shortly and running parallel with this series will be a set of articles on the subject of writing adventures in machine code. These should be kept by beginners as they will be invaluable when this course is complete. That series will not attempt to teach machine code, it will, however, provide a fine example of code in use and firm grounding in design beyond the basic techniques of flowcharting we will introduce next month.

Most people think of this sort of programming as machine code, some call it assembler or assembly language, still others call it purgatory, but they are all the same thing (except purgatory that is which is something totally different and much more unpleasant). An assembler is a programming aid for converting a form of the code we can understand, the mnemonics, to a form the computer can under-

stand, the machine code. An assembler is not strictly necessary — for instance, Cosmic Crusader from Budge Software was written without one — but it will make things infinitely easier, and cut down development time a lot.

Choice of assembler is largely down to personal taste. Most of the programs for this series were written using (Crosstab) from Premier Microsystems, now sadly deceased, which uses the standard Dragon BASIC editor. Others are quite acceptable, but it is a good idea to get one that can assemble source files from tape (or disk), as having the source code in memory can take up a lot of space, limiting the size of the final program to a few Kbytes. The Dream editor from Dragon Data is a good example of this, the program in that case being limited to about 3K. All right for small programs, but unsuitable for big projects, although a few of the programs we will be presenting first saw the light of day in a Dream editor assembler. There is an updated version of Dream, called CosmicDream, which is rated by many as the best available, and runs under DragonDos.

Many people write off assembler, dismissing it as difficult to write in, and not worth the effort. It is true that every day these assembler BASIC compilers, or versions of Pascal that can perform benchmarks 10 per cent quicker, or with 10 per cent less code, but nothing will ever beat machine code for speed of execution and compactness of code. Any interpreted or compiled language (machine code is not compiled, no matter what the local BASIC expert tells you) must by nature be slightly generated, and therefore slower and more bulky. With machine code, the programmer has ultimate control over what is produced, and any inefficiency must be down to programmer error or a constraint imposed by the designers of the processor. This also makes assembler one of the most satisfying languages to write in. It is also possible to do anything the computer is capable of in assembler (including blowing the SAM chip — more of that later), whereas most high-level languages stick to a standard of one part or another. The day the International Standards Organisation get at 68000 assembler, we can all buy Commodores and settle down to play games for the duration of our retirement!

Rem calls

Another part of assembler programming is the arduous: there is to discover about the machine itself. There is a lot of memory used by the system for various purposes, which an assembler programmer can use to make the Dragon sing (literally? Who knows...?). This can also lead to some

particularly spectacular crashes. As most programmers find out very early on in their association with assembler, the real solution is not always the cure — all it is in BASIC.

Machine code is composed of a set of relatively simple instructions, covering simple arithmetic, memory access, and a few hardware functions for interrupts, etc. The 68000, that the Dragon uses is very powerful for an eight-bit processor, much more so than the barbaic 6800, and significantly more so than the reasonably refined Z80. This is due to the fact that, although technically an eight-bit chip, most of its internal structure is that of a 16-bit chip (as opposed to the 6801, the 68008, which Sinclair call a 32-bit processor, although it is in fact an eight-bit device with ideas above its station). The way processors are defined is basically down to the size of the address bus, which is the part of the chip that carries the address to be operated on. If this is eight bits (binary digits) wide, the maximum address that can be reached is 1111111111111111 binary, or 65535 decimal. This is because the address is sent in two parts, a high byte and a low byte.

Next month we will launch into flowcharting and also describe the internal architecture of the 68000.

Glossary

Address bus: The address bus is one of the processor's paths of communications to the outside world. It is used to transfer addresses to the rest of the hardware, and so the size of the address bus dictates the size of memory the processor can access.

Bit: Binary digit. As most computer lovers will insist on telling you, computers work in binary, or base two, just as humans work in base 10. (Do not, however, let this lead you to believe A: that machine code programmers are limited to using the digits zero and one, or B: that computers possess only two feelings. A bit is therefore either a one or a zero.)

Byte: A byte is a number, the maximum value of which is dictated by the computer used. In most papers, a byte is from 0 to 255 (or -127 to 126). This is a function of the memory chips used, rather than the processor, and therefore varies little from machine to machine. A byte consists of eight bits.

Data bus: Similar to the address bus, except that the data bus is used for data.

Nibble: A nibble is four bits, or (you guess) half a byte. From this last it might be expected to hold any value in the range 0-157. Wrong. A nibble can be in the range 0-15. Look at the definitions for bit and byte, then work it out.

Continued next month

The Logical Dragon

The elements of an expert system by Peter Whittaker

THE DEBATE over just exactly what 'intelligence' is has gone on for a long time, and as yet there is no sign of an answer in sight. However, computer programmers have not waited for the answer to start exploring the fascinating area of intelligence on computers. Instead, they have decided upon a definition of intelligence which suits them, and then gone on to experiment with it. They say, "If a machine can behave in such a way as to be indistinguishable from a person, and if the person can be said to be intelligent, then so too can the machine." It is from this very practical position that we shall start.

One of the biggest problems computers have in imitating intelligent behaviour is their inability to understand English. They do not of their own accord remember what you tell them, and use the information thus gained to help them to draw new conclusions for themselves. A prime example of this is in the area of syllogisms. Syllogisms are deductive arguments which take the following form:

'A is a B'

'B is a C'

Therefore 'A is a C'.

For example:

Peter is a man.

A man is an animal.

Therefore Peter is an animal. The first two lines are propositions, giving us the raw data to work with, and the third line is the conclusion based upon the first two statements. The conclusion is itself a new fact previously unknown.

I have written this program to handle just such deductive arguments. The program may best be explained by running it. When the prompt appears, type in the statement: "A student is a layabout" and press ENTER. This is accepted by the program in Line 40 as A8. Nothing happens to A8 until Line 120, where any initial 'scientific' gets removed. This should bring the subject of the sentence (student) to the front. Then Lines 160-190 remove the verb from the middle of the sentence. This leaves the subject and object standing alone, to be read into B8 and C8. (Line 210 B8="student" C8="layabout".)

This new information is then stored in an array. Lines 240-260 check to see whether the subject (B8) has been encountered before. If it has, then it will be recorded as a heading in the array (Line 280). If it has not been recorded in the array, then it is placed at the top of the first available blank column (Line 285). The program now checks down the column of entries under the subject, to see whether it has already been linked with the object (Lines 290-340). If the object cannot be found, it gets added to the bottom of the list (Line 320). Having stored the data

in its array, the program now returns to Line 40 to await the next input. Type in "Peter is a student", and the program will go through the same steps.

Having set up a database with the program, we can now start to examine the information we have stored in it. The first method is to list out the data under subject headings. Type "Subject" and when the computer asks which subject, type "Peter". Under this heading we will find the only "student", and if we had entered "Student" we would have found "layabout". The link between the two is obvious to us, but will the computer notice it?

Searching

This brings us onto the second, and more interesting way of questioning the database. Questions asked must be of the form "Is this ---- a/b/c/d/e ----". Type in "Is Peter a layabout?". Once again, this is accepted as A8 by Line 40, but this time the /W as at the start of the question gets detected by Line 50-180 and the program jumps to the question handling routine at Line 360. Here the question is chopped up to extract the subject (B8) and the object (C8). The program then proceeds to search its database to increasing depths for a link between the two.

The first search is only one level in depth, and the program is not trying to discover new links between various pieces of data, but looking to see whether it already knows the answer. The program scans along the top line of the array trying to find the subject (Lines 480-520). If it cannot find it then the search is terminated, a 'No data' message is printed, and the program returns to Line 40 to await the next input. If the subject is found, then the program scans down the list of objects listed under the heading trying to find a match for the object in the question. If it finds a match then it prints "YES" and returns to Line 40, otherwise the program moves on to search a level deeper.

The second level search (Lines 560-760), which is the true equivalent of the syllogism argument, starts by finding the subject in the top line of the array, as for the first level search. Then it works its way down the list of objects listed under this heading. However, this time, instead of looking for a match with the sought for object, the program uses each object in the list as a new subject, and searches along the top line of the array to see if there is a column under this new heading. If there is, it then looks down this column searching for a match with the question object. If it finds a match it prints "YES", and copies the new information to the bottom of the subject column, and then returns to Line 40 to await the next input. In

this way the program can expand its knowledge database for itself. If it doesn't find a match, it looks up the list stored under the next item in the original subject heading list. This continues until the program has examined all of the items in the subject heading list. If this happens the program moves on to search yet another level deeper.

The third level search (Lines 780-1000) goes one stage further than the usual syllogism argument. (A is B. B is C. C is D. Therefore A is D.) Again it does not immediately look for a match, but uses each item in the subject list as a new heading to search. It then uses the items in the new list again as new headings, and only when it examines items in this third list does the program look for a match with the question object. As with the second level search, when the program finds a match, it updates the information in the original subject list.

The "learning" process of this program can be examined using the "SUBJECT" command. If we type "SUBJECT", and then answer the prompt with "ALL", the program will list out all of the information stored under each of the subject headings. Under Peter we will find "student", and under student we will find "layabout". Next we ask the computer to find the relationship between the two. Type "Is Peter a Layabout?". The program will do a level one search and not find a link. Then it will do a level two search, and find the link (student) between the two terms, and print the answer "YES". If we now examine the database by subject again, under Peter we still find "student", but we also find the new information "layabout".

Deduction

The program has added the result of its deductions to its knowledge base. To help us check up on the program's logic, it also prints out the route it followed to reach its conclusion. (Peter — Student — Layabout.) Further, the program does not require an exact match to deduce a link, it can find a partial link it will accept it. (eg. Searching for Man and finding Human will still produce a "YES" response.)

The LOAD and SAVE options (Lines 1080-1090 and 1290-1300) called by 'LOAD' and 'SAVE' are set up for disc, but can easily be converted to work with tape. They assume that the data file will be called "SYLLOGISM" but this can be easily altered if you are going to convert the program for tape, also delete the error trap at the end of the program. Try experimenting, and see what links your Dragon can deduce between different pieces of information.

```

8 ERROR GOTO 1418
10 CLS:PRINTSTRING$(64,128):PRINT$
  A,"SYNOPSIS: EXPERT":PRINT$
  "BY: PETER WHITTAKER":PRINT:PRINT$
  "PRINT/LOAD.....LOAD DATA FROM
  H DISC":PRINT$
  "SAVE DATA TO DISC":PRINT:PRINT$
  "SUBJECT.....PRINT
  WORKING DATABASE":PRINT
20 CLS:PRINT$
30 READ$=0
40 INPUT $
50 IF $="" THEN 40
60 IF LEFT$($,7)="SUBJECT" THEN 10
  50
70 IF $="SAVE" THEN 1250
80 IF $="LOAD" THEN 1350
90 IF LEFT$($,2)="IS" THEN 520:PRINT$
  "REQUEST DONE"
100 IF LEFT$($,4)="FIND" THEN 300:PRINT$
  "REQUEST DONE"
110 IF $="CLEAR" THEN 400
120 IF LEFT$($,2)="IS" THEN READ$=RIGHT$
  $(LEFT$($,3)-1):GOTO 400
130 IF LEFT$($,2)="IS" THEN READ$=RIGHT$
  $(LEFT$($,3)-1):GOTO 400
140 IF LEFT$($,4)="FIND" THEN READ$=
  RIGHT$(LEFT$($,4)-1)
150 IF $="FIND SUBJECT/OBJECT"
  500
160 READ$(1,1)=""
170 READ$(1,1)=""
180 IF $="FIND" THEN 100
190 READ$(1,1)=""
200 IF $="FIND" THEN 100
210 IF $="FIND" THEN 100
220 IF $="FIND" THEN 100
230 IF $="FIND" THEN 100
240 IF $="FIND" THEN 100
250 IF $="FIND" THEN 100
260 IF $="FIND" THEN 100
270 IF $="FIND" THEN 100
280 IF $="FIND" THEN 100
290 IF $="FIND" THEN 100
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950 IF $="FIND" THEN 100
960 IF $="FIND" THEN 100
970 IF $="FIND" THEN 100
980 IF $="FIND" THEN 100
990 IF $="FIND" THEN 100

```

```

1000 IF $="FIND" THEN 100
1010 IF $="FIND" THEN 100
1020 IF $="FIND" THEN 100
1030 IF $="FIND" THEN 100
1040 IF $="FIND" THEN 100
1050 IF $="FIND" THEN 100
1060 IF $="FIND" THEN 100
1070 IF $="FIND" THEN 100
1080 IF $="FIND" THEN 100
1090 IF $="FIND" THEN 100
1100 IF $="FIND" THEN 100
1110 IF $="FIND" THEN 100
1120 IF $="FIND" THEN 100
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1150 IF $="FIND" THEN 100
1160 IF $="FIND" THEN 100
1170 IF $="FIND" THEN 100
1180 IF $="FIND" THEN 100
1190 IF $="FIND" THEN 100
1200 IF $="FIND" THEN 100
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1800 IF $="FIND" THEN 100
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1960 IF $="FIND" THEN 100
1970 IF $="FIND" THEN 100
1980 IF $="FIND" THEN 100
1990 IF $="FIND" THEN 100

```

[illegible][illegible]

Roy Cohen
presents

BEAN STALKER

What about the parts the story tells inside? I mean? It may all be Christian, everything was bound to be larger-than-life. Jack would have some exotic human-sized birds and insects as well as giant lizards and such, or well, to-and-fro from the latter's point of view, he'd search for human ones.

In this up-to-date version of the well-known story, can you guess Jack as he collects golden eggs, hares, hens and even golden bananas? Help him to negotiate the beautiful, spider's web, startled cheese and to swing across rivers and chains in his quest to finish the tale. Show him which life to use and which kinds of objects to handle through.

But beware! There are forces to stall anti-racism work:

in his house in this all-section, machine-coded, portable/unlocking game with the 50 screens of the 1980s and 1990s.

Abstract

£7.95

1000



MICRO MISSION

1. **PROPOSED** 2. **RECEIVED** 3. **RECEIVED**

After V'ron is slain, someone dedicated to suppressing the Dragon and its minions is spreading the false story.



Disk utilities

Program: Disk Utilities, Ian Elkington, 11 Whitendale Gardens, Biddison, Shipley, West Yorks BD17 6PR
Price: £10

DISK UTILITIES is a collection of 12 programs, some of which will be useful to any DragonDOS owner. All of the utilities are entered from a main menu which is called up by typing RUN "M". The menu is displayed in a very readable 40 column display and selection is made by moving the cursor line to the required utility and pressing Enter. Most utilities then require you to press enter again, although for no apparent reason.

The first utility is to send a copy of the directory to the printer. I have commented before that this can be done from basic with POKE (11,254):DR, so the disk space could have been used for a more useful utility here.

A more useful option is "Disk View". This allows any sector of the disk to be viewed, using the cursor keys to step forward or backwards a track or sector at a time. The sector is displayed as ASCII characters at the top of the screen. My only complaint here is that there is no option to dump the sector as HEX codes.

Four separate utilities provided allow programs to be copied from disk to disk, tape to tape, tape to disk and disk to tape. This all sounded very promising until I found that the only files which could be copied of any of the utilities are binary files which load above address 7000. The program will not copy basic or data files. Again, these are potentially very useful utilities, spoilt by ineffectuality.

Perhaps the most useful program on the disk is the one which recovers accidentally KILLED files, providing nothing has since been written to the disk. This utility allows any file type to be recovered and gives you the option of Protecting the recovered file.

Another well implemented utility is the Sector Editor. Any sector may be loaded in and edited using the cursor keys. Bytes can be changed either by entering the ASCII character or the ASCII code. The ASCII code of the byte under the cursor is also printed

which is essential for identifying non-printing characters. The most common use for the sector editor would probably be to change filenames on the directory track directly (especially useful for mail filenames), or, used in conjunction with the "Disk View" option, to locate the required sector of a program and to change it directly, although this can be potentially fatal.

An option which looked very useful was Disk Menu Creator; this purports to create a menu program on any disk enabling you to load any of the last twelve programs on the disk by a single key press. Unfortunately, all my attempts to use this utility constantly resulted in the program crashing with "PT error" — so much for the "user friendly prompt".

The final couple of utilities included allow a complete disk to be saved and loaded from tape. One disk takes about 20 minutes to transfer to or from tape, and as cassettes are cheaper than disks this is an economical way of backing up disks for safety — providing you can stand the wait!

Apart from the few annoying features of this disk, such as not being able to return to the main menu from any of the utilities and the fact that error messages are not explained — DISK ERROR is all you get — this is a genuinely useful set of utilities for disk drive owners. It is a shame that there is no option to use two or more drives, which would save a lot of disk swapping.

Unlike Domino's Disk Doctor program reviewed in the September issue of Dragon Clear, there is no utility to automatically recover damaged programs — you'll have to do this manually using the Sector editing option. However, at £10 this offering is considerably less expensive than Domino.

Brian Cudge



It's war!

Program: Mail War, GP Guardians, 18 Fishersbridge Road, Preston, Weymouth, Dorset DT3 6DT

BACK IN the mists of time (when the OS was just a twinkle somewhere in Sir Oliver's anatomy) there was a computer called the Z8-in for which routines used to go somewhat like this:

"I cannot review this game as I cannot get it to load due to the bad loading system on the computer. However, it is described by the manufacturer as..."

Hey! Guess what? A touch of nostalgia I can't get Mail War to load either. At least not more than once. But that, I'm sad to say, was enough (I'm not actually that sad to say it). It took me three cassette recorders to get Mail War to load and now it has given up altogether!

The game has aspirations to be a play by mail game, it runs in DR without the need for loading and saving of data except at the end of a game!

This is the equivalent of me saying, "I want to be Ramrod! I have a nine-ton chest and can carry three potatoes at a time!"

Play by mail games are big. They have to be, otherwise no one would still be interested in them after having waited two weeks since their last move. This game is not big.

To play this game by mail would also require supreme cassette I/O. The data file workings of the Dragon, especially through I/O, are notoriously bad and to have to save the game after every move would be a nightmare!

When the game did eventually load I was, as I've said, an immense disappointment as it was written, it seems, in BASIC and runs very slowly.

The instructions appear to have been written by someone who has never actually played the game, as in play they were about as useful as the Pac-Man copyright (hello Alan!)

For example, "If a friendly unit occupies the same location as the cursor you will enter 'Control' mode for that unit. The cursor will change from red/green/blue/yellow to red/green/red."

The "cursor" described is a pair of pixels, not three pixels apart as the PIMC081 screen and the colour change appears to be totally indeterminate! The manual goes on to say how the mathematics of conflict is done by the computer and then tells you what the computer is doing, in case you

want to do it on paper.

The game cannot be played solo as both my sister and myself were forced to play this appalling drivel for far too many hours as a test.

Jason Gribson



It's just a must

Book: DRAGONDOS: Programmer's Guide, Groovernor Software, 22 Grosvenor Road, Seaford, East Sussex BN25 2BS

Price: £2.90 inc p&p
IT HAS always been difficult to get detailed information regarding the DragonDOS hardware and software — until now that is. Groovernor Software, better known for their excellent assembler-editor, has released a 12 page booklet entitled DragonDOS — A Programmer's Guide. The text is not for the beginner, but will be invaluable to the seasoned machine code programmer.

A memory map of the DOS locations used in page six is given (this does not give locations used for commands such as AUTO) as well as all the page zero locations used to store track and sector numbers etc. Very detailed information is given regarding the layout of Directory entries — useful for writing programs to MAF, UNRA, a file.

All the entry addresses of useful routines are given, such as READ and WRITE to a file, KILL, PROTECT and RE-NAME a file. Each routine is clearly documented with entry and exit conditions and there are a couple of useful example programs listed at the end of the booklet.

Finally, there is a short section on known errors in the DragonDOS ROM, however this is not as extensive as the article in Dragon Clear, May 1985.

At just £2.90 (inc p&p) this booklet is a must for any DragonDOS owner with an assembler.

It is also the perfect size to fit in a Christmas stocking — and will ensure rapid access over Christmas!

Brian Cudge



Mixing it with Basic

Pam d'Arcy shows how to pass values between Basic and machine code routines

This is not exhaustive but seeks to demonstrate, using simple techniques, how to access data commonly between BASIC and machine code routines.

1. Use EXEC

Directed USR in favour of EXEC. This overcomes problems caused by known PCBM bugs and techniques used in passing parameters using EXEC would be needed anyway if it is required to pass across more than one officially allowed parameter when using USR.

2. Use EQUATES

Set up the addresses of machine code routines in variables at the beginning of the BASIC program and use the variable name rather than addresses themselves within the main body of the program.

eg. 20 BANG=25614: REM sound of explosion

300 EXEC BANG

330 EXEC BANG

This is the equivalent of using Equates in machine code with its great attendant advantages:

To it assists in maintenance such as if the address of the machine code routine is altered, only the easily found line near the beginning of the program needs to be amended, avoiding a hunt through the entire program for every reference to the amended value.

It assists in coding accuracy as use of a nominally meaningful NAME or LABEL for storage of digits such as machine code routine addresses is less likely to lead to transposition of characters or miscoding as with numbers alone.

3. Parameters

Whether using USR or EXEC, passing of parameters between BASIC and machine code has the same end result — data is placed by BASIC at a place in memory that the machine code can get hold of in a form that it can use and vice-versa.

4. Parameter storage area using EXEC

Structure machine code routines thus
ENTRY LRMA PROG

parameter
storage
area
PROG

POKE'd and
PEEK'd by
BASIC programs

RTS

The first instruction could be a short unconditional branch if the storage area is less than 128 bytes long but by standardising on the use of a Long Branch, which takes up before additional byte of memory, you are not limited and so do not have to change it when that odd additional byte of storage added in tips the balance. Perhaps, more importantly, an area of potential confusion is avoided in the BASIC programs if the parameter area always commences at the machine code routine address +3.

5. Dragon numbers

Often a difficult concept to grasp is that although Dragon machine code is very powerful, at its bare bones level, it arithmetically deals only in Whole or Integer numbers, as opposed to fractions. The range of numbers it can deal within a single instruction is 0 to 65535 if the numbers are only ever positive (known as unsigned numbers) and 0 to +32767 or -1 to -32768 if the numbers may be positive or negative (known as signed numbers). This may seem limited but most home microcs can only deal, at this level, with values in the ranges 0 to 255 or 0 to +127, -1 to -128. Larger numbers and fractions are possible by programming techniques, that is, by dealing with the values a byte or two at a time.

Dragon BASIC contains more truly to many experts' opinions of how a BASIC language should handle numeric values than many other of today's micro BASICs in that to it, a number is just that, a number. That covers an amazing range of possible values (-999,999,999 to +999,999,999 in whole numbers alone can be printed normally on the screen).

It manages this by holding its numbers, regardless of the value involved, in five bytes of memory in a format variously referred to as Real, Exponential or Floating Point. This enables values in the range 1E-14 to the power of plus or minus 55 to be available to BASIC programs before it runs out of puff and gets an 'Overflow' error.

BASIC ROM is after all only machine code. To carry out arithmetic on such numbers requires them to be converted using available machine code instructions to a form that can be handled by the available arithmetic instructions, carry out the arithmetic function and convert them back into their five-byte Real format.

6. Numeric parameters using USR

I have not experimented with them as cannot vouch for any other limitations such as coping with negative values, but it seems that the recommended BASIC ROM routines associated with the USR routine for converting BASIC numerals to a form usable by machine code (INTCONV/CONVABF) cope only with the range of whole numbers 0-65535. (No doubt Brian Cagge's Firmware Utilities will assist here!) Guidance in using these routines also starts using the word Integer in its usual computer context of meaning a Double-Byte, sometimes called Word, unit of storage (a pair of adjacent memory bytes), rather than the English context as used as far in these pages of Whole number. For clarity, I shall use the words Whole or Double-Byte as appropriate.

7. Numeric parameters using EXEC

Anyone wishing to process fractions or whole numbers outside the Bare Bones signed or unsigned range in machine code will not find the answer in these paragraphs.

Passing numeric data to machine code

To put the parameters (—data) into the machine code parameter area, POKE is used. POKE deals with a single byte of data at a time, automatically converting the value involved from its internally held five-byte Real format to a single byte providing that no attempt is made to POKE a value other than a whole, positive number not exceeding 255 (else an FC error occurs).

Unsigned single byte parameter

If an unsigned single byte value (0 to 255) is involved, it can be passed across directly such as shown in Fig 1.

Signed single byte parameters

The value range of each byte is 0 to -127,

-1 to -128. As far as machine code is concerned, it is not bothered about the CONTFMTS of a byte. It is the way that we test it in our coding that determines whether it is being used in a signed or unsigned manner, or even as an ASCII character. To the machine, a byte containing \$41 is a byte containing \$41. To us, it may be the decimal value 65 or the character 'A' being output to the screen or printer. Similarly, a byte containing \$FE is just that to the machine. To us, it represents the unsigned value \$FE or the signed value -2 depending on the context.

Thus, when we have a negative number in BASIC to pass across to machine code, adding 256 to it will create the FORTRAN 'positive' complement.

For example, -2 can be POKEd directly in either of the following ways with identical results:

```
POKE P1,40FE
POKE P1,$254
POKE P1,$256+(-2)
```

A variable containing a signed value can be reliably dealt with thus: IF N=0 THEN POKE P1,\$256-N ELSE POKE P1,N

Unsigned double byte parameters

Double byte unsigned values (range 0-\$FFFF) need to be POKEd into the parameter area a byte at a time, manipulating the value to ensure that each POKE stays within the 0-255 range. The most significant byte (lower address) of a double byte storage location contains the number of 256s in the value and the least significant byte contains the remainder. This can be easily derived thus:

```
POKE P2,INT (N/256):POKE P2+1,N AND 255
```

Use of INTEGER pops off any remainder from the division. Doubling with machine code, the AND 255 can probably be recognised as the equivalent of the machine code logical AND (ANDA,AND) r0FF instruction, and neatly isolates the value in the

least significant byte of a double byte value. As with single byte negative values, double byte negative values need to be converted to their 'positive' equivalents, this time by adding \$FFFF to the value. A temporary variable is used (TEMP) for clarity.

```
IF N=0 THEN TEMP=$FFFF-N ELSE
TEMP=N
POKE P2,INT (TEMP/256):POKE P2+1,
(TEMP AND 255)
```

Receiving numeric data from machine code

On return from the machine code routine, the corresponding PEEK process needs to be used.

Single byte numbers N=PEEK (P1)

If the number is signed, add the line IF N<127 THEN N=N-256

Double byte numbers N=PEEK (P2)+256*PEEK (P2+1)

Similarly if the number is signed, add the line IF N>32767 THEN N=N-\$FFFF

8. String parameters using USR

This appears to be an area particularly affected by ROM bugs.

9. String parameters using EXEC

As with numbers, an understanding of how BASIC deals with strings is necessary if other than simple manipulation is required. Such information is not to be found in these paragraphs.

Locating the string data

Each different variable that the BASIC program encounters while the program is running has a five-byte control area set up for it. For Numeric variables, the control area contains the value itself in its Real format. For String variables, the five-byte area is known as a 'String Descriptor' and it contains four items of information. Two of the items are of special interest when accessing the string in machine code. They are the Length of the string and the Address that the string data actually starts at in memory. The Length is in the first byte (byte 0) of the String Descriptor and the Address is in the third and fourth bytes (bytes 2-3). These values are already in machine code format so need no further conversion to use them within machine code routines.

The first stage in passing string data to machine code is to obtain the memory Address of the String Descriptor for the required string variable. This is acquired using VARPTR, ADDR=VARPTR (NAME)

The variable that the address has been placed in, ADDR, is a standard BASIC numeric variable that is in its five-byte-Real format. Its content (ie, the address of the string descriptor) falls into the category of being a whole, unsigned number in the range 0-65535 so can be passed to the machine code routine in the manner previously described (see Fig 2).

The machine code routine can now locate the string data and its length:

```
LDX $DEPTR,PC : get address of NAME's descriptor into Reg.X
```

Fig. 1, 2 and 3 (from top)

BASIC	Machine code routine starting at address 20000
40 DIM=20000	ENTRY LEA R000
50 P1=500:R2=PC:P1=1	MOVW R000 R00 1
1	MOVW R000 R00 2
1	
1	
120 POKE P1,'value'	POKE R000 R00 1
10	
POKE P1,0	
where 'value' is	
or N contains	R00
0 positive number	
ie: 0 to range 0-255	
130 EXEC 50	

BASIC	Machine code at 20000
40 DIM=20000	ENTRY LEA R000
50 P1=500:R2=PC:P1=2	MOVW R000 R00 2
1	MOVW R000 R00 2
1	
1	
10 INPUT 'NAME';NAME	POKE R000 R00 1
100 ADDR=VARPTR (NAME)	
120 POKE P1,INT (ADDR/256):	
POKE P1+1,ADDR AND 255	R00
130 EXEC 50	

BASIC	Machine code at 20000
40 DIM=20000	ENTRY LEA R000
50 NAME=JANES,NAME	MOVW R000 R00 2
1	MOVW R000 R00 2
1	
120 ADDR=VARPTR (NAME)	POKE R000 R00 1
130 ADDR=ADDR AND 255	
140 POKE P1,ADDR	
150 TEMP=PEEK P1	R00
210 ADDR=TEMP*256+TEMP	

(Continued from page 2)

```
LDX 0,X      ; get length of NAME$
              ; into Reg.A
LDY 2,X      ; get address of start of
              ; actual 'name' into
              ; Reg.Y
LDB 0,Y      ; get the first letter of the
              ; 'name' into Reg.D
```

etc.

Assemblers equipped to deal with indirect addressing can achieve the same result with fewer instructions. Alternatively, Turn-er PEEK and POKEs in BASIC can extract the Length and Actual String Data Address from the String Descriptor and set it up directly as parameters for the machine code, eg where P1 and P2 are as in previous examples).

```
POKE P1,PEEK(ADDR+2);REM need significant byte of actual string address — it doesn't need 255 conversion as it is not a standard BASIC variable but a machine code format double-byte.
```

```
POKE P2+1,PEEK(ADDR+3);REM least significant byte of actual string address — doesn't need AND 255 mask etc. as above BASIC ISA.
```

There is no way of doing anything when programming!

Setting up new strings for BASIC from machine code

In BASIC, define a 'target' string variable set up to the length, if known, else maximum possible length, of the string to be set up in the machine code routine.

Depending on how you want to deal with

it on its return to BASIC, if it is a variable length string, fill it with space characters or recognisable 'end of string' characters, eg MICROSIG—\$!RNDG\$555,"~"~

Obtain the string address's descriptor address, pass it address to the machine code routine, set up the actual string data and return to the BASIC program. The string is then available for instant use in BASIC.

Adjusting variable length strings

If a shorter than maximum length string has been set up, it seems that no harm will be done in physically amending the Length byte in the String Descriptor to the new actual, shorter, length.

However, to err on the side of caution in the early stages is sensible, so get BASIC to adjust the string length itself in one of two ways—either pass back to the BASIC as a separate (named) parameter the actual length of the string as set up in the machine code or indicate the end of the string of data with an arbitrary 'end of string' marker byte as a most convenient from the programming point of view. BASIC can then adjust the string length accordingly thus:

```
1) Using a Length parameter (see Fig 2).
2) Using String End Marker
```

As above except to initially fill the string with what will be the end of string marker, eg MCS=STR\$(NBS255,"~")

On return to BASIC, the MCS length can be adjusted thus:

```
200 TEMP=(INSTR$(MCS,"~"))
210 IF TEMP=0 THEN MCS=LEFT$(MCS,TEMP)
```

(If TEMP was 0 no 'end of string' marker

was found as the string was filled to its currently set maximum thus needs no adjustment.)

10. Relative parameter addressing

Give Label names to the parameter fields in the machine code area and refer to the fields by Label within the code. This greatly reduces maintenance if fields are altered as re-assembly automatically adjusts the addresses, avoiding searches for references to fields where there may be a location offset.

Similarly, define the addresses of the parameters in variables at the beginning of the BASIC program (relative) to the previous one as in the small examples above. Should, say, the size of a parameter near the beginning of the area be changed, a whole list of addresses do not have to be amended, for example:

```
40 LA=26000
50 P1=6A+3
   P2=P1+2
   P3=P2+1
   P4=P3+2
```

This shows that P2 starts at the address two bytes after P1; P3 starts one byte after P2 etc.

Should the length of P1 be reduced to one byte, using this 'relative' method of addressing, only the P2 statement needs to be altered (to P2=P1+1) and the other addresses will be automatically computed correctly saving much potential maintenance.

The fewer the opportunities of making errors, the better!

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REAL VALUE FOR MONEY SOFTWARE

Firmware

Brian Cudge explores the Dragon's ROM in a special series which builds up month by month into a firmware manual.

This month we look at the Miscellaneous Firmware locations and routines. These are those not already covered which do not fall into any particular category, but which may be of use.

Miscellaneous Firmware Data Locations

25-26	Start address of Basic program.
33-34	Address of top of machine stack.
36-40	Top of Firmware RAM.
41-42	Line number used in CONTINUE command.
43-44	Temporary general purpose line number store.
47-48	Direct mode command text pointer.
154-155	Current line number (55555 in direct mode).
159-161	Physical end of RAM.
159-159	General purpose 16 bit scratch pad.
157-158	EXITGate entry address (initially points to routine giving an IYC error on power up).
160-167	Address of current/significant byte of current command.
175	TRDCH/THOFF flag — non-zero=trace on.
176-177	Address of start of UPR address table.
207-208	RENUMMer increment value.
209-210	RENUMMer start line number value.
211-212	CLOADM Z's complement load offset value.
213-214	RENUMMer new start line value.
215	Editor line length — not user available.
274-275	Current value of system TIMER.
277-281	Random number seeds used for RND function.
288	Number of Basic commands.
288-289	Address of list of Basic commands.
291-292	Address of command dispatch table.
293	Number of Basic functions.
294-295	Address of list of Basic functions.
296-297	Address of function dispatch table.
298	Number of disk commands.
299-300	Address of list of disk commands.
301-302	Address of disk command dispatch routine.
303	Number of disk functions.
304-305	Address of list of disk functions.
306-307	Address of disk function dispatch routine.
346	Value of Joystick (3)
347	Value of Joystick (1)
348	Value of Joystick (2)
349	Value of Joystick (3)

Miscellaneous firmware Routines

SysEr — (Dragon 36664, Tandy 44102)

This routine generates the appropriate action for an error code in the R register.

The routine resets the stack, turns the cassette motor and audio off and returns to the Basic command mode. Errors should always be cleared by entering this routine, even if it is initiated by the DCS in the System Error Trapline. Error numbers start at zero which is an NP error, and go up to 52 in steps of 3. DCS errors start at 129 and go up to 186 in steps of five. The error codes are in the following order: NP, SN, RC, OC, FC, OV, CM, UL, SS, DO, O, ID, TM, OS, LS, ST, CH, UF, FO, AO, CA, ID, FM, NO, E, OS, NE.

CmdMode — (Dragon 33649, Tandy 44147)

Finishes the "OK" prompt and returns to the command mode, all return addresses, and subsequent commands on a multi-statement line are lost.

BasicVect1 — (Dragon 33623, Tandy 44321)

Sets up various necessary vectors; one a Basic program has been loaded. It should be followed by a call to BasicVect2.

BasicVect2 — (Dragon 33773, Tandy 44271)

Completes the initialisation process after a Basic program has been loaded. It should be preceded by a call to BasicVect1.

ResetStack — (Dragon 33844, Tandy 44238)

Resets the Basic stack to its initial position, all entries are lost. This routine is used as part of the power-up and error recovery procedures.

NEW basic — (Dragon 33815, Tandy 44312)

Removes the current basic program from memory (if any), resets the basic stack, clears all variables. This routine has exactly the same effect as the NEW command in Basic.

RUN Basic — (Dragon 33861, Tandy 44448)

Runs a basic program in memory. This routine is most often used to autostart basic programs after loading them from tape or disk and calling BasicVect1 and BasicVect2. This routine cannot be called directly from Basic.

Random Number — (Dragon 36798)

Generates an 8 bit random number and places it in location 275.

RESET — (Dragon 46004, Tandy 42999)

Resets the whole machine as if the RESET button had been pressed. The basic program and variables are not affected.

Boot Basic — (Dragon 46098, Tandy 44142)

Resets the Basic interpreter as if the machine had just been powered up and

reset. This has the effect of leaving any program in store and displays the normal sign on message.

Read Joysticks — (Dragon 44449, Tandy 42488)

Updates all the joystick data locations — stored in 346-349.

Uri Basic — (Dragon 36622, Tandy 46948)

List the Basic programs in memory to the Device whose device number is in (D)976 (location 111). The A-register must be zero on entry. This routine can not be called directly from Basic.

Boot Basic004 — (Dragon 46000)

Boots up the 4th version of Basic and goes into RAM mode. The complete routine only exists in the Dragon 64 vROM. A small section of machine code is copied into the cassette buffer. This selects an alternative on board ROM which contains the 64k basic. This is copied into RAM at 48152 onwards and the new basic is entered. Programs are preserved, variables are cleared.

Reset D/A — (Dragon 47628, Tandy 43327)

Puts the value 576 into the D/A converter address.

Write D/A — (Dragon 47630, Tandy 43389)

The A register on entry must contain the data to be placed in the D/A converter, bits 0 and 1 should be clear.

Select J8K — (Dragon 48449, Tandy 43420)

Selects the joystick sources (ports 0,1,2,3) from the A register on entry. This routine writes to CA1 and CA2.

This is the seventh in Brian's series on the Dragon Rom routines. Next month, he will be covering the area of DragonDos Firmware. If you have missed any of the previous issues, they can be obtained from Dragon User, Back Issues, 12-13 Little Newport Street, London WC2H 7PP, at £1.25 each, inclusive of postage, packing and administration charges. Just to remind you of the previous months:
Sept 85 — *Cassette Operating System*
Oct 85 — *COS Firmware Routines*
Nov 85 — *Text Manager Routines*
Dec 85 — *Graphics and Sound*
Jan 86 — *Variables*
Feb 86 — *Assorted Vectors*

Cupid Cupid

More machine code action for the keyboard of Steve Gathercole

THIS GAME is all about Cupid. He has to get his practice so first of all you must shoot your arrows at the moving targets using the Enter key. This is not too bad as Cupid does not move on this first level, but once you have shot 10 arrows you move on to level 2. In this level, Cupid's little wings are getting tired and he keeps falling to the bottom of the screen. You must press the up arrow key to stop him falling and ending the game, but don't go up too high or the game will finish.

After another 10 arrows you move to level 3 where a man and woman appear at the top of the screen. This time instead of a target you will have to hit little hearts — if you hit one then the man will move closer to the woman. The game ends when the man reaches the woman or you use 10 arrows.

For each hit of the target you will score points for the next hit, depending on where you hit the target, in other words, a bull on the first hit will get you more for the next hit on the target. Your hit is also reflected on a large target at the top of the screen. A single half of fame at the end of the game will show your relative score position.

To type in the game proceed as follows. First type in Listing 1, the loader. It is the same as my previous loaders so use it again if you already have it on tape. Run it and you will be asked for the start address (26000). Type this in and then you will then be asked for the finish address (30000). Type this in, then Enter.

Now you must type in the row of hex digits up to, but not including, the "=" sign from Listing 2. Press Enter and then type in the checksum (this is the number after the "=" sign). Press Enter and if all is okay you will see the next address displayed and you carry on like before until the whole of Listing 3 is finished. If you want to type in the listing in small sections, then type in the finish address you want to finish at then save this using COLNAM "CUPID" 26000,1,26000 where "1" is the address you finished at. Next time you carry on, the start address will be the finish address you used last time — don't forget to COLNAM each part before restarting each time, though.

The whole game is saved using COLNAM "CUPID" 26000,30000,26000, then once loaded use EXEC 26000 to start. If the game is too much to type in then I will supply a copy for £1.50. Also if you need any help or advice, then don't hesitate to contact me at 18 Hantsdown Estate, Walsley St Andrew, Wakefield, Ganges WF14 7NA. Happy St Valentine's!

```
10 CLS
20 REM HICLOADER - ENTER THE
30 REM STRING OF HEX DIGITS FIRTS
40 REM AND THEN THE CHECKSUM
50 CLEAR 200,27999
60 PRINT"ENTER START ADDRESS";:INP
UT START
70 PRINT"ENTER FINISH ADDRESS";:IN
PUT FINISH
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("6H"+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
,30:PRINT"ERROR - ENTER LINE AGAIN
":GOTO 100
180 NEXT
```

Listing 1



292199	88C98F604668684D818326	=	474	298115	8C9819378888841876D48328	=	398D
292218	88189C8CFD8888928841888	=	362	298226	88C4268848881888887888	=	384
292231	6F88861717FF8C8C192125	=	343	298237	18C61017FD4817FFC8817FC	=	53C
292232	8018888D7E17FF888888788	=	48F	298468	6C38F88868C0188887888	=	58F
29243	8F866878863843888886881	=	4F8	298559	18C61817FD381888781788	=	413
29254	8127488E888888884848C87	=	348	29878	60CF8818C61017FD238888	=	40F
29265	6D878184C81888481788488	=	388	29881	38888886888183272C8884	=	288
29276	8888C61F8C888818888F82	=	343	29882	388818888F8888888C61F17	=	384
29287	17FF4888818888888488C8	=	376	29883	FC87178888884888888818	=	3C8
29288	C88F221F8888888C61F17FF	=	38E	29816	888F728818C61017FCF817	=	518
29289	3817F8D888886C38887818C	=	44F	29820	88C7381888888888888888	=	384
29328	8F8D4CF18888F88888C8C1E	=	419	29836	38C8888D76381F8C888888	=	38C
29331	17FF23C888888888888881	=	44C	29847	F88888888888888888881827	=	487
29342	882748C888888881CF88888	=	444	29858	13887887815188FF8878155	=	483
29353	6C8C8C888188388888188C8	=	328	29869	88888881582888288171388	=	352
29364	482888888888F8888888888	=	419	29888	884218888D788817C8101817	=	3F8
29375	6F88288888888888888888F	=	588	29891	FC813888888888888888813	=	512
29386	486C88F78D8C8C14C88C8F7	=	4FC	29892	8888888888888888888888	=	497
29387	686C8C88888888888888888	=	4F8	29813	17FC8888888888888888888	=	58F
29488	8D724C878D7238888888888	=	4FC	29824	38488888888888888888888	=	477
29419	8888887843C88888888888872	=	52F	29835	8887FF22178888888888888	=	65F
29438	81172588888888888888888	=	358	29846	22178888C17FC2258888818	=	3C8
29441	8888888888888888888888888	=	38A	29857	888F2288888888888888888	=	388
29482	68178238888888888888888	=	429	29868	FC823888117FC38888888888	=	488
29483	4F8788D788788888888888888	=	538	29879	88101E188888F82888888881F	=	378
29484	8881888888888888888888888	=	488	29888	17FC8888888888888888888	=	538
29485	688F18888888888888888881E	=	3C9	29881	82281417F88817F88888888	=	44E
29486	FE8F388888888888888888888	=	576	29812	81188888F38888888888888	=	38D
29587	1827888F8C18881827888C1E	=	3C8	29813	8C388888888888888888888	=	388
29518	F888811822288188888888888	=	388	29814	88888888888888888888888	=	388
29529	F888313F188888888888888888	=	38E	29815	88F8C888888888888888888	=	75A
29548	8888783121188888888888888	=	437	29816	88F887FF228888888888888	=	588
29551	2E88888888888888888888888	=	388	29817	8C188888888888888888888	=	381
29562	8138188888888888888888888	=	38A	29818	81888888888888888888888	=	529
29573	8D78178D788178D7888888888	=	47C	29819	38821888888888888888888	=	388
29584	8C88888888888888888888888	=	387	29888	88888888888888888888888	=	588
29595	188F887888888888888888888	=	585	29811	C888FF88888888888888888	=	68F
29686	8818878888888888888888888	=	1F7	29822	188F1888888888888888888	=	38F
29617	8822388188888888888888888	=	45C	29833	FD881288888888888888888	=	44C
29628	F88717FD88888888888888888	=	388	29844	EF88188F188888888888888	=	42C
29629	288F188888888888888888888	=	488	29855	81778888888888888888888	=	389
29658	7888888888888888888888888	=	488	29866	C8888888888888888888888	=	55E
29661	8888817888728888888888888	=	38E	29877	28888888888888888888888	=	388
29672	17FD81A17FD17FD1881788	=	495	29888	88888888888888888888888	=	488
29683	1117FD8817FD8888888888888	=	38E	29899	88888888888888888888888	=	38F
29684	8888888888888888888888888	=	328	29818	8881288C188888888888888	=	388
29785	8F88788888888888888888888	=	519	29821	17888888888888888888888	=	388
29716	1827888811788888888888888	=	389	29832	F8888888888888888888888	=	47A
29727	FD8C188888888888888888888	=	533	29843	1D17FD88888888888888888	=	38A
29738	8818C61D17FD8888888888888	=	588	29854	88888888888888888888888	=	32E
29749	68643888817FD81A188888888	=	488	29865	188C88F725F318888888888	=	4C7
29768	17FC8C2318F18888888888888	=	38C	29876	8888817FD888888888888888	=	388
29771	1888888888888888888888888	=	3C9	29887	12888888888888888888888	=	589
29782	F83F888888888888888888888	=	588	29898	48F78D88888888888888888	=	588
29793	C81E17F88888888888888888	=	495	29889	68788F87888888888888888	=	58A
29884	8888F8717FD87C888888888888	=	589	29898	87888888888888888888888	=	588

If you've got a technical question, write to Brian Cudge. Please do not send a SASE as Brian cannot guarantee to answer individual inquiries.

Dragon Answers

Dream Patch

I RECENTLY purchased a Dragon 64 and was disappointed to find that the "Address" assemblies will not work in 64 mode.

Is there any way of patching this program to make use of the extra memory?

G Turner
2 Alder Lane
Great
28 Helms
Lancs

IT IS not possible to "patch" Address to use the extra RAM. However, the solution I use is to copy the Basic into RAM using the program below. This then allows you to use the RAM from 49152 to 65536 for object code and data. The program also copies the first 16 of the cartridge area in case ROM is present, in which case you can use RAM from 57344 onwards.

```
BRCC = 016
LDX = 02726H
LOOP STA 0FF0C
LDX X
STA 0FF0F
STD X++
CMP# 02734H
BLO LOOP
ANDCC = 028
END
```

Memory Port

I WONDER if you can help me. I have a cartridge I no longer require. I am wondering if it is possible to remove the EPROM in the cartridge and replace it with a RAM chip. If this is possible please could you recommend a RAM chip. Also would I need special software to access the RAM?

O Black
27 Buckingham Road
Belmore
Dorset
BH12 2BJ

ALTHOUGH it is certainly possible to add extra RAM to your Dragonette the cartridge port, it is not usually possible to simply replace the system with a RAM chip. The types of system used in Dragon and Coze cartridges also varies so it is not easy to recommend a way of "plugging-in" RAM chips.



The cheapest solution requires a little hardware knowledge, but a minimal of components — just a prototyping cartridge, RAM chip and Address decoder. The RAM would simply be accessed directly from address 49152 onwards.

Breaker Break

EVERYONE talks about the famous F0RKS, to disable the BRK key, but personally I have never come across them. Could you please tell me?

Gray Henderson
29 Woodbury Avenue
Somerset
BA2 2JH

THERE ARE two ways to disable the BREAK key. The first consists of a few poles to the CPU vectors and does not disable BRK as INPUT statements — limiting you to using INPUT. The second method which I favour is rather longer, but works in all situations that I know of. Simply add the three leads (below) to the start of your programs.

```
1. Connect BRK to pin 1 of CPU
2. Connect BRK to pin 2 of CPU
3. Connect BRK to pin 3 of CPU
4. Connect BRK to pin 4 of CPU
5. Connect BRK to pin 5 of CPU
6. Connect BRK to pin 6 of CPU
7. Connect BRK to pin 7 of CPU
8. Connect BRK to pin 8 of CPU
9. Connect BRK to pin 9 of CPU
10. Connect BRK to pin 10 of CPU
11. Connect BRK to pin 11 of CPU
12. Connect BRK to pin 12 of CPU
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Shacking

I RECENTLY purchased a Radio Shack TP-1 Thermal Printer as a companion for my Dragon 64, specifically for the printing of listings. I assumed compatibility would not be a problem, as it was

designed for the Tandy 100-16 and TRS 8 Colour Computer.

I had no trouble in making up a 4-pin DIN to 7-pin DIN cable, with only Data, Status, and Ground connections necessary on each plug. However I ran into my doubts, because after F0RKS:1000, I for the serial port access, the only print-out that I can achieve is a solid block, determined in length by the input string! Direct instruction by Print=2,DRG(0) also gave the same single block print-out.

Nigel S Woodberry
29 Windsor Lane
Bournemouth-on-Sea
Somerset
BH2 5LJ

I CAN'T see any problem in interfacing this printer with the Dragon 64 as you describe. I think the problem you are having is due to the baud rate being incorrect. The Coze points up a cable with a default rate of 9600 baud for the serial port, and so most Tandy printers expect serial input to be at this speed. The Dragon 64 powers up with a default rate of 1200 baud. I suggest you try the following, which will set the 8255 port to 9600 baud and select 8:
PORT: 49FF0F, (P0049FF0F)
AND: 4FF: ON 7-P00E: 1023, 1

High Speed

RECENTLY, I've extended my Dragon from a 32 to a 64 machine. While working in the 64 mode, a problem arose. P00E: 65495,0 which speeds things up in the 32 mode doesn't seem to have this effect in the 64 mode.

As the Basic is copied in the 64 mode to the RAM, there must be a

new location where I can F0RKS and get extra speed.

Maybe you could tell me what is the 64 mode's equivalent to the speed F0RKS in the 32 mode?

Jason Loner
28 Herria Road Street
49132 Patch-Dave
Lancs

THE INFAMOUS "speed-up" poke has been mentioned regularly over the years on this and other pages. P00E: 65495,0 actually causes the processor to run at double speed when accessing ROM. As the Basic is normally stored in ROM it has the effect of speeding up Basic programs. Machine code programs stored in RAM do not run any faster with this poke.

In 64x mode the Basic is, as you say, stored in RAM and so does not run any faster than normal as the processor is not accessing ROM memory. There is no equivalent "speed-up" poke for RAM I'm afraid.

Printer Problem

I HAVE a Tandy dot matrix printer running with my Dragon and I occasionally notice characters being randomly ejected through-out listings. I have had the printer checked but I'm told there was nothing wrong with it. Could this be a fault with my Dragon's electronics port?

I have a Dragon 64 and DragonDex.

David Jones
Purton Road
London SE18

THE PROBLEM is actually caused by the interrupt routine. With DragonDex attached the interrupt routine, which runs 50 times a second, is so long that if it occurs between the strobe line being switched (which tells the printer that there is data at the port) then there is time for the printer to take two characters — hence the repeated characters which seem to randomly appear in listings.

The solution is simple — disable the interrupts before sending information to the printer with:
P00E: 65303
P00E: (65303) AND 254
and re-enable them after printing with:
P00E: 65303
P00E: (65303) OR 1



OVER THE last few months I've had lots of letters from readers generously offering to share their adventure successes by giving clues and sometimes complete solutions to games, while at the same time I've been getting letters from new readers and adventurers asking for more hints for beginners. There's never enough space to list all the clues people send me every month, so I've decided to catch up with the backlog this time and have a bumper column of clues and solutions. As always, any information that might be too revealing will be printed backwards to prevent a being seen by anyone who doesn't want to know the answers, though some of the more general clues will be printed ordinarily.

Beverly Lowell of Narnston has solved *Spyge* and offers the following advice:

- 1) Big ugly creatures don't like things thrown at them
- 2) Read numbers carefully
- 3) To kill Darth needs patience
- 4) Carry as much as you can
- 5) Holding your breath is a very useful exercise

More on *Spyge* from Darren Cash of Birmingham:

- 1) To tell alien: TITA YZZU FWO RHT
- 2) To get in deep pit: DMR TSDM AJER. MALL GMD LOHE LHWY PMLU
- 3) To help in killing Darth, unplug right joystick and use left joystick, trying to keep your left sword crossing over Darth Vader's.

Justaposition

John Baker of 108 Bishopwood, Buxton, Bridgend, Mid Glamorgan has written with lots of clues and answers on *Justaposition* which he says he solved in a few sittings but enjoyed very much nevertheless. If anyone's stuck, write to John with a clue, but meanwhile some of the following general advice might help:

- 1) Examine all objects you find
- 2) Most items have a logical use and are only needed once
- 3) Eat regularly or you'll weaken before the end
- 4) Always carry your ID tag
- 5) If night falls then get inside quickly
- 6) Save the game regularly, as several things happen which may catch you out.

John's also sent lots of specific answers to problems, while many readers seem to be having trouble dealing with the floods at

the start of the game. The first drop you meet can be avoided if you don't immediately rush out into the corridor, and afterwards take carefully for its approach to enable you to hide. You should also be able to get over the balcony and out of the first few locations—perhaps an idea might come to you in bed? After that you will then encounter another drop. To deal with this one you will need what might be called a solution.

Darren Doherty of Hayling Island has sent a few tips for the cheats among you. In *Lost in Space*, for protection against the security robots you can add TR(8)=8 at the beginning of Line 1010 in the program. In *Forever of Death* you can get yourself a permanent cloak by adding L(1,10)=50 at the start of Line 1100, and a permanent hammer by adding L(1,27)=50 at the start of Line 1200.

Ice Kingdom

Just to show he can solve adventures the proper way, Jon, Darren sent a few clues for *War of the Kingdom*:

- 1) In the armory: SREG ITH TWOB
NOD DASH LLUP
- 2) To get past the undertaker: RGT STN
ROP
- 3) When you meet the small giant: RULO
PEHT MINE VIG

I've received several clues from Darren Royal of London SW15, firstly on *El Dabbers*:

- 1) The coyote is not who he seems to be
- 2) To enter the cave in the canyon: EVA
GER AWAN GHTM AGRD
- 3) Found the magic bush? GIV TASN
MTH OCTI
- 4) Get a bag? LIO MIT IPID
- 5) Man with machete a problem? ELB
REPE ULWA ORBIT

And secondly on *Time Machine*:

- 1) To get out of the dark opening: RMW
DRCH TWR EVEL MAM DHTV EVEL
LLUP
- 2) Generator? RMM AHHT FWTI KACRG
- 3) Police-boy? THE ROM GI

A few months ago in the advantage contact section a reader named J.P. Thorpe was asking for help in *Paradise's Tangle*, but unfortunately his address was omitted. R. Tuck of Chippinghams took pity and sent the solutions in to me:

- 1) To get into the water room, go to where the walls have ears and say a word that connects the pictures on the walls that you pass off your way there. (You

almost need a clue to the clue on the one.)

- 2) To give the rabbit the carrots: TBB
ARCE EPRI. PERS
- 3) To open the sarcophagi: RALLD
EPW MCHP ENVR HUCP

If there was a European Adventure Contest then Rolf Mathiesen of Norway ought to stand a good chance of winning, as he's sent me solutions to no less than six adventures. In there nothing else to do in Norway, Rolf? I'm very grateful to him for taking the trouble to do this, the adventures he's covered being *Justaposition*, *Never Mission*, *Caverns of Doom*, *Time Machine*, *Lost in Space* and *Wings of War*. I'll pick a few hints out of each, starting with *Justaposition*, where two readers have already written to me saying they've been having trouble dealing with the Nightmare Droid.

- 1) Nightmare Droid? ARE MAD DITE
SUOS THOI LTHD MBS ETAH
 - 2) Container a problem? EEP FOOS BAV
SULI PDM PEEL STUP
 - 3) To get back across the river: TSV
RDM ESSE TDSU
 - 4) To disarm the bomb: GULB DERN
EERO DERE ULDS SEAP
- Some of Rolf's clues on *Never Mission*:
- 1) To reach the ledge: RLD RICE RHTI
WYOD HWK AGRS
 - 2) No use for the magnet? TIK SUPP
 - 3) To get into control room: RGD DENT
RGR

In *Caverns of Doom*:

- 1) To open lockhest: NOT DLE KSEH
TBN MAKE
- 2) To move raft over deep water: LLAP
RSTA WOP HEST AGSR EDNU
KODL
- 3) To get rid of the large bear: RAERT
ANUG EPRI

In *Lost in Space*:

- 1) To escape the maze: KWAH WOPR
AFSH OLO PDM DWI
- 2) To find blue acid: EPT AEDH AEN
HAGM GOCOP MYS DCTI HHTH ESM
- 3) To open security box: MLK NARF SDR
CHWS SAP

For *Wings of War* Rolf has included the following clues:

- 1) To find a car to escape in: SCAL PERP
RAEN STER GARS MPUT
- 2) Key for car? SCAL HTW TDOH SREG
EYF DSH
- 3) How to fix the container? MUM MBL
AFOP ARCS DMAM CMR WESU

Steve Gerrard of 126 The Medway, Daren-

by. Northants NN11 4QR has already been mentioned in these pages and repeats his offer to help anyone stuck in *Minotaur* and the *Minotaur*. Steve has also now sent me some more information on the game, including several maps, so I'm going to have to see how best to make use of these. Meanwhile, here's a note of the effects that various spells in the game have:

Water: PMAL SORO TSER
 Mine: GMI TSN DIPP OCSG ERUC
 Asterion: BARRAC SGANI YTHRA DFIN DITO
 ETOR PCMO SSRE FPOG NAAR DTHS LLK

Celan: ERUSA ERTS DNP
 Nergal: GO FSLR PBD
 Being: BPM LUSE ETBA RAUG
 Cym: HTAP PKPO UBAU
 Istian: TSE ROP OTUO YEKH TOTY EMT
 ESRH TERS

I've had several letters now from adventurers in Israel, where there seem to be plenty of Dragons about, and the latest is from Dudi Marzahn, 1 Hazmat Street, Givat Haasaga 76586, Rehovot, Israel. Dudi is an enthusiastic correspondent, like all the Israeli adventurers I hear from, so if anyone would like to correspond with him (or her, I'm never quite sure with Israeli names!) then I'm sure Dudi would like to hear from you. Particularly if you're having trouble

with *Triskoper*, on which Dudi offers help and a few clues:

- 1) To kill the spider: ELU SPA GENT ENVO
- 2) To see the dark room: HCT WASE THW
 SORR POKA DRUG ELRU DPMH HTHW
 KACD LUP
- 3) Kandas flower? MOOR KRAD GHTIN
 ITT HALP

Triskoper has also been solved, and help is also offered on it, by Eran Tal-Shatan, Eran-Shatan 21 & 3, Simet Itzack-Wely, Tel-Aviv, Israel, and if you're in the mood for setting abroad and perhaps swapping

some software then contact Daniel Mendes, 8 rue de Volvite, 75015 Paris, France. Daniel's interested in getting hold of some of the more recent Dragon adventures and offers in exchange your choice from his collection of over 800 arcade and adventure titles. I didn't realise there was quite that much Dragon software around.

Anyway, I hope you've found this month's bumper crop of clues helpful, and I'm sure you're grateful, as I am, for all the readers who have taken the trouble to send information in. Thanks folks.

Adventure Contact

To help puzzled adventurers further, we are instituting an *Adventurers' Helpline*—simply fill in the coupon below, stating the name of the adventure, your problem and your name and address, and send it to Dragon User *Adventurers' Help*.

Adventure
 Problem

Name
 Address

Mar 86

Adventure Contact

Adventure: *Shenarigang*
Problem: I have gold coins, Kinde, Shies, Tish, Githes and Mallet. What do I do now?

Name: Gwyn Morris
 Address: 15 Wilmston Road, Elgin, Moray, Scotland, IV36 1SY.

Adventure: *The Cuckoo's Nest*
Problem: How to get past the White Rabbit?
Name: Conrad Meyer
 Address: 5 Cotswold Road, Dorchester, DT1 2AH

Adventure: *Shenarigang*
Problem: How to cross the deep ravine in the caves and how to find a use for the 128 gold.
Name: Matthew Wells
 Address: 48 Farnside Drive, Banbury, Oxfordshire, Banbury, OX9 3DQ.

Adventure: *Triskoper*
Problem: Cannot get past the second spider or find a command for Inegrate.
Name: David Griffiths
 Address: 16 Sedgemoor Court, Newport, Gwent, NP2 5EQ.

Adventure: *Justaposition*
Problem: Cannot find Minotaur to start journey (have escaped the island and am on the street level).
Name: David Griffiths
 Address: 16 Sedgemoor Court, Newport, Gwent, NP2 5EQ.

Adventure: *Ring of Darkness*
Problem: Everything—I need help!
Name: Paul Vassiliades
 Address: 15 Waverley Drive,

Bellon, 61 Yarmouth, Norfolk, NR21 3JU.

Adventure: *The Kat Trilogy*
Problem: How do I go from the mountain onwards? I've got the wand and with the Magic Sorcerer, but I cannot find my way any further.
Name: V. Ganes-Savithi
 Address: 4 Beacon Road, Redman, Cornwall, PL31 1AL.

Adventure: *Jurassic*
Problem: How do I get into Baron's White's foot, The Pyramid, The Snake, etc?
Name: Nigel Nicola
 Address: 10 Wensley Way, Barton, Great Yarmouth, Norfolk, NR21 5AY.

Adventure: *Mountains of Kat*
Problem: I don't convince the Cartographer to let me go to the second floor of his house.
Name: David Palmer
 Address: Via Molino Di Pescatore 72, Bologna, 40121, Italy.

Adventure: *Justaposition*
Problem: How to get out of the corned city?
Name: Stephen Sherman
 Address: 11 Church Lane, Cambridge, Market Harborough, Leicestershire LE16 8PW.

Adventure: *Synagog*
Problem: Have got light sabre and Mandal transporter, but how do you use it and what do you do in the garden area? Can offer help with *Justaposition*, *Ring of Darkness* and *Return of the*

Ring.
Name: Stuart Beasley
 Address: 3 Stockton Close, Claxton Kings, Chalfonts, Glen.

Adventure: *Justaposition*
Problem: How do you get down to the balcony?
Name: Gertard Pursell
 Address: 35 Marlton Lane, Newton, Swansea.

Adventure: *Shenarigang*
Problem: What use is the 12 foot pole and how do you get it into the cave?
Name: Andrew Pann
 Address: 185 Blue Ash, Clock Face, St Helens, Merseyside.

Adventure: *The Cuckoo's Nest*
Problem: What is the two word command which enables you to enter the box and train?
Name: J. R. Claxton
 Address: Sain Coats, Shob Road, Hedling, Norwich, Norfolk NR12 0YS.

Adventure: *Triskoper*
Problem: How do you get past the force field?
Name: Lorna Tinsy
 Address: 14 Malton Close, Ratwell, Northants NN14 2AY.

Adventure: *Minotaur and the Minotaur*, *Ring of Darkness*, *Lost in Space*
Problem: Everything... all I can do is get killed!
Name: Alan M. Coleman
 Address: 15 Eustace Street, Warrington, Cheshire.
Adventure: *Pirate Adventure*.

Problem: How do you get to Treasure Island from Pirates Island?
Name: Douglas Prid
 Address: 14 Lakenwood, Moxley, St. Harmondsworth MK13 0PT.

Adventure: *Triskoper*
Problem: How do you pass the force field on the garden plane?
Name: Martin Mather
 Address: 3 Ave Bridge Avenue, Sutton Leach, St Helens, Merseyside.

Adventure: *Justaposition*
Problem: Return of the Ring.
Problem: How to find Dead of Screams? How to get away with Endless Emerald?
Name: Graham Rysior
 Address: 30 Hough Lane, Hough, Rochdale, Lancs.

Adventure: *Kat Trilogy*
Problem: How do I get past the skull in the cave?
Name: Stuart Jones
 Address: 9 Heath View Crescent, Cardiff, Kent.

Adventure: *Shenarigang*
Problem: How to get from the river from the window? Also need help with El Diablero.
Name: Phil Godkin
 Address: 203 Upper Elms End Road, Beckenham, Kent.
Adventure: *Justaposition*
Problem: Many and various.
Name: Robert Gassmann
 Address: 35 Ashley Road, Marthall, Dorset DT10 1LQ.

Puzzle it out!

A crossword creator brought to you by C. L. Naylor

PUZZGRID will create the familiar "find the words in the grid" puzzle from your own set of 10 words.

Initially you will be asked to input your 10 words. Naturally with the 10 x 10 grid they must not be longer than 10 letters, and in practice it is better to input the longer words first; the puzzle will be produced in a much shorter time.

After the 10th word has been input you can watch as the computer finds places for all the words in the grid. Finally it fills all the

empty spaces with randomly-chosen letters and the words are listed alongside the puzzle.

You are then given the option of a printout in the form shown in Fig. 1, creating a different puzzle using the same words, or making a completely new puzzle. If you are just doing a one-off puzzle for your pal, then of course he'll have to look away while it is being produced on screen.

The program is relatively simple. The grid is made up from a number of strings which

are then manipulated in Lines 110-280 to fit in your chosen words. A random direction and initial position in the grid are chosen and the current word is temporarily fixed for a fit. If it won't fit, this process is repeated until it does.

The whole routine is then repeated for the next word until all 10 words are in. Lines 290-298 then fill the 'holes' with random letters.

The Printer dump peaks the text screen to produce the final puzzle.

Find the words hidden in the Grid
Across, Down, Diagonally or Backwards

Z E T P E X P E R T	B I P R O S
W E S I T E N D L	S T R I D E
A D G E S T R I D E	C O M P U T E R
H S L K P H S J C V	I N T E R
P I E T T P S E W A	B O X
A X O M S X X Q Q W	P A R T Y
D B I D I N E R N	D I N N E R
L F K E T U P M O C	A B L E
E B F T N E C S E N	S C E N T
E F A R T Y N T N V	R I P E R T

Program Listing

```
100 REM ***** PUZZGRID *****
110 REM ***** C. L. NAYLOR *****
120 REM ***** 1988 *****
130 REM ***** 10 X 10 GRID *****
140 REM ***** 10 WORDS *****
150 REM ***** 10 LETTERS *****
160 REM ***** 10 LETTERS *****
170 REM ***** 10 LETTERS *****
180 REM ***** 10 LETTERS *****
190 REM ***** 10 LETTERS *****
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950 REM ***** 10 LETTERS *****
960 REM ***** 10 LETTERS *****
970 REM ***** 10 LETTERS *****
980 REM ***** 10 LETTERS *****
990 REM ***** 10 LETTERS *****
1000 REM ***** 10 LETTERS *****
```


MARCH PUZZLE

Gordon Lee sets the pace — and this month there are 25 copies of Quickbeam's 6809 express to be won

IT IS remarkable to think that it was only just over a decade ago that the first simple pocket calculators were making their first appearance on the domestic market. These early models generally had just the four basic mathematical functions — addition, subtraction, multiplication, and division, and consequently it was sometimes necessary to devise methods of calculating values whose functions were not provided on these machines. The calculation of square roots is a case in point. Readers who are familiar with the classical "pencil and paper" method for the extraction of square roots will appreciate the complexity of this method, and will realise the advantage of an easier method of calculation. Nevertheless, the calculation of square (and cube) roots using just the four basic mathematical functions is still possible. It may be thought that this method has now only a curiosity value, but the actual technique is still applicable in solving problems in computing which do not lend themselves to other, more conventional, methods of solution. This month's competition problem may well be such a case!

But first, the method for finding square roots is as follows:

- 1) Make a rough guess as to what the square root might be.
- 2) Square this value (using the ordinary multiplication function).
- 3) Compare this result with the original number.
- 4) Adjust your guess by a proportional amount to give you a revised value.
- 5) Go to step 2.

By continuing the procedure until the square of the guess is the same as the number whose square root we are trying to find, we arrive at the correct root by a method of approximation. In actual prac-

tice, using a simple calculator, an accuracy of eight significant figures can be obtained in only five or six iterations of the sequence of operations. Mathematically, this is known as a "recursive" method of solution because the method uses each solution as a basis for a further, more accurate, assessment. In effect, the calculator is "learning" by its own mistakes.

This can be translated into the following BASIC program:

```
1 INPUT "ENTER NUMBER X: " GUESS
2 G=
3 S = GUESS/GUESS
4 IF ABS(S-R)-0.00001 THEN PRINT
   THE SQ. RT. OF X IS GUESS
5 A=0.000001+R/2 GUESS=
PRINTS/2
6 GOTO 2
```

The unusual line numbering of this program is so that each line corresponds with the step numbers of the method outlined earlier. If the command PRINT GUESS is added to the end of Line 2, and the program run for a couple of trial examples, it will be noticed that each successive value computed rapidly stabilises towards the correct evaluation of the square root. The final accuracy is dependent on the mathematical accuracy of the computer, but all mathematical operations are subject to this restriction. Curiously, the accuracy of the original guess at the start of the operation is not at all critical. This guess can be wildly out without affecting the final result, the only difference being the number of iterations carried out before the result stabilises. In fact, the program listed dispenses with the need to input a guess as it takes as its first approximation a value of half the number whose root we wish to find.

The creation of such an interactive loop

may provide a method of solving the following problem posed recently by Professor Otto Han to some of his students:

"I have here", announced the professor, "two imaginary spheres, each one a foot in diameter". The professor stood with his arms outstretched, balancing each imaginary sphere on the fingertips of each hand.

"You will realise that the volume occupied by each sphere is a little over half a cubic foot, which will make the total volume of both spheres to be slightly in excess of one cubic foot.

"Now, if I slowly move the spheres closer together there will come a time when the two spheres begin to merge. Unlike real spheres, they do not distort, but like ghosts, they just melt into one another, with the extra volume of the overlapping portion just disappearing.

"You will understand that, if I continue merging the spheres until they are both exactly superimposed I would be left with a single sphere with its original volume of just over half a cubic foot. The second sphere would have vanished.

"What I would like to know is, how far apart are the centres of the spheres when the total combined volume is exactly one cubic foot?"

That was the professor's problem. To solve it you will need to know that the volume of a sphere is given by $V = \frac{4}{3}\pi r^3$, and also that the volume of a spherical segment is given by $V = 1.5\pi r^2(h - \frac{1}{3}h)$. Note that if a slice is removed from a sphere by means of a straight cut, the small lens-shaped piece produced is called a spherical segment. In the formula r is the radius of the sphere itself, and h is the height of the segment. If it is laid on its flat cut surface, the height of the curved dome).

Prize

This month we are offering 25 copies of 6809 Express from Quickbeam Software — a sort of cross between Rambo and Thomas the Tank Engine, where you must rescue your captured comrades in your locomotive. Can't be beat ...

Rules

To win your Quickbeam game, you must first solve the answer to the above competition, and demonstrate how you solved it with the aid of your Dragon. Please do not send in a cassette containing your program. Make sure that your name and address are clearly printed on your entry, and make the envelope "March Competition".

tion". Envelopes which do not state which month you are entering for will be disqualified.

As a tie breaker for this month, we're asking you to finish the phrase, "The train now approaching Platform Five ... " is not more than 12 words. Marks will be given for originality, wit and good spelling.

December Winners

This month winners get a copy of Michael's adventure game Trektron. Congratulations go to Simon Ashby of Seinton, Wilt, H G Woods of Oakdale Gardens, Borekingside, Bore, Essex, Mr E G Haslett of Paxford Road, Eith, Kent, M Ingram of Broadlea Avenue, Leeds, G A

Meenan of New Haw Rd, Addlestone, Surrey, Rachel Schurman of Sandhurst, County Durham, M W Stanton, Bridge Road, Stoneham, Tewkesbury, Northants, J W Davis, Radnorshire Drive, Cheshire, Cheshire.

Inviting tie-break answers (I want to visit a Dark Star because ...) included, "because all my friends have been", "because I want to go where no hacker has gone before", and "my wife told her orange egg is one".

Apologies to anyone who hasn't received their monthly puzzle prize recently — we've been having a spot of bother in that department. If you're one of the unlucky ones, then drop us a line and we'll pop it in the post.

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Master Address Book	M & T	Card	£12.95	£2.99	£2.99
Stock Control	M & T	Card	£12.95	£2.99	£2.99
Calculator	M & T	Card	£12.95	£2.99	£2.99
Invoices/Statements	M & T	Card	£12.95	£2.99	£2.99
Business Accounts	M & T	Card	£12.95	£2.99	£2.99
Master Address Book	M & T	Card	£12.95	£2.99	£2.99
Stock Control	M & T	Card	£12.95	£2.99	£2.99
MST Tools	MST Print Range	Book	£24.95	£19.95	£19.95
Stock Control	MST Print Range	Book	£24.95	£19.95	£19.95
Graphics System	Salomander	Card	£9.95	£3.99	£3.99
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Latest Arrivals

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"C" Compiler	Card	£18.95	£13.99	£13.99
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and Programmer's Manual	Card	£18.95	£13.99	£13.99

Other Utilities

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GAMES

Latest Arrivals

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