

# LYNX USER GROUP



MAGAZINE  
Vol. 1 Issue 2.

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## EDITORIAL

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Well at long last here is the second issue of LUG magazine. I must apologise for the delay in producing this issue, I had intended to get this one out before Christmas 84, but as usual the best laid plans of mice and men etc... One of the problems was that the word processor disc lost a good part of its oxidell It was rather ancient dated Digital Research 1979!! For your interest, I thought I'd mention on what equipment I use to put the magazine together. Firstly the computer is an ALPHATRONIC which has twin disk drives as part of its make-up. It uses an 8085 processor and runs CP/M, the word-processor package is one called LEXICOM/2 which is generally quite user friendly but on occasion does CRASH, ouch!! This was loaned to me by another LYNX owner who also obtained his LYNX, Xmas '82.

The printer was obtained at an auction and is a NEWBURY DATA machine Model no 8920, it was obtained for a fraction of its normal cost ie £350, they are normally £1700!! To give an idea of the way it is made, the print head is driven by a power grip belt running from a 1/4 HP motor!! It is very noisy and shakes the floor but it does print in letter quality at the rate of 200 characters per second!! However enough said, there is far more important news.

The remains of COMPUTERS have been bought up by a new company called:-

### ANSTON TECHNOLOGY LTD.

The intention is to continue with the development of the 128K and upwards to 256K and to aim this at the business market, in particular at the markets that require good graphic capability, for example at CAD/CAM applications. I am sure that I speak for every owner of the LYNX that we wish them every success and hope that this time they are more successful in their venture.

I must point out that there were a few blunders in the first issue: 1) CHR\$(13) or &OD is of course carriage return only and not CR plus line feed in the ASCII table. While we are again on the topic of printers, a member has passed through all the LYNX upgrades, 48K-96K-128K and he bought a SEIKOSHA 250, which was compatible with the 48K/96K but is now incompatible with the 128K, this is set for the EPSON FX80!! Thus he finds that the VPRINT facility is useless as the printer throws out garbage! The printer routines in the LYNX should have been set for standard ASCII codes with details on how to patch or configure for other codes. He is not alone with this problem as another owner with a CP80, wishes to use the VPRINT command for colour separation with applications in the printing trades. If the new company wants to reach this type of market, then they must correct the printer routines, especially as there are indications that the FX80 is soon to be replaced!! Finally there were typing errors in PRINTER PATCH 1b, Lines 10 & 11 should read; 10 POKE &61BD,4 and 11 POKE &61BF,0.

In this issue you will find several items of interest, namely details on the upGRADE system which will provide an enormous boost to the LYNX no

matterwhich model you might possess. The principal concept is that the LYNX is used as an intelligent terminal and doesn't require an enormous memory to implement the system. The upGRADE was originally conceived as a Z80 second processor option to the BBC, but now RADE Ltd wish to expand the idea, so the LYNX will effectively ride on the back of the BBC!! They already have completed the system for the NEWBRAIN and have plans for the AMSTRAD, MSX, and any other "serious" micro. So those of you who are working on the 80 column idea and scrolling, please hurry up as we could be left behind. I have received four attempts at scrolling, all near but not quite. In one, the cursor reaches the bottom of the screen and then drops off never to be seen again! Another routine actually scrolls one line!

The other big article is a beautiful FILL routine which will fill ANY enclosed shape on the screen. However if there is a gap it will "leak" out and fill the remainder of the screen!! It is relocatable and a careful study of the addresses will show how this can be done. It was sent in by a LUG member in HOLLAND, a Mr AXEL CLEERMANS who laboriously wrote it byte by byte as he doesn't have an assembler!!

Plans are afoot for other hardware add-ons, a sideways ROM board to take up to 6 ROMs plus a battery backed 8K RAM for temporary storage. Another "goodie" is a daisywheel typewriter which will be fully interfaced to the LYNX and having a specially written word-processor package built into ROM, to take advantage of the typewriter's features. Amongst other features will be the provision for semi-proportional justifying, which does make for more presentable text.

I feel I must make one thing very clear, DO NOT call up the ROMs directly for any program, although it might work with your particular version of the LYNX it most certainly WON'T work with any other. This is because to my knowledge there were at least 4 versions of the 48K, 2 versions of the 96K and of course 1 version (to date) of the 128K. Use the pointer/vector table instead. Those of you who possess my DATA CARDS will of course realise this point. The only certain places in the ROMs are the different colour bank addresses.

Some of you who may have bought their LYNX after JUNE of this year, are perhaps unaware that Computers produced two magazines called LYNX USER. These contained valuable information on the Pointer table and certain ROM locations, as well as interesting FAST print routines and Memory maps. In a way they were supplements to the manual which is supplied with the machine. If anyone would like photo-copies of these, I have a limited number available at £1.00 per issue, this is simply to cover postage and copying costs.

Although little is really finalised yet, it has been proposed to have our own show in March in the vicinity of Birmingham, volunteers are required for talks, catering, manning the doors etc.

Finally as promised, the next issues of LUG magazine will, with any luck, be typeset and thus the quality will be improved.

COMPARISON OF TWO PAC-MAN PROGRAMS:-

\*\*\*\*\*

MAZEMAN By ABERSOFT  
GOBBLE DE SPOOK By CAMSOFT

The Camsoft game contains the usual packaging, excellent. MAZEMAN comes complete with a colourful cassette inlay. I tend to favour MAZEMAN because of the joystick option, making the game more fun to play but GOBBLE-DE SPOOK is by far a better all round version of the arcade original.

Camsoft offers 8 levels of play, invisible maze option etc while, all MAZEMAN offers is a joystick option. Neither are slow (though MAZEMAN is slightly faster) and graphics on both are more than adequate. Camsoft favour conventional graphics while Abersoft have what looks like a man on a motorbike. Sound on MAZEMAN is poor but GOBBLE-DE SPOOK has superb sound effects. I only wish it had a "sound off" option. I say this because the menu screen has sound effects which don't stop until you choose to start the game, and the sound does get on your nerves after a while.

In conclusion, if you wish to pay the extra, I would advise GOBBLE-DE SPOOK at £9.90. But don't ignore MAZEMAN at £4.95 it is well worth considering.

A.T. Stanfield.

DUNGEON ADVENTURE by LEVEL 9

\*\*\*\*\*

All LYNX owners should have heard of Level 9 by now, and if you have't already tried one of their adventures, have a go at this one. I have all the Level 9 adventures, but this one is definitely my favourite.

The Demon lord is dead, but his treasures live on. You, the intrepid hero are sent to recover his treasure. To recover his treasure you will come across about 100 puzzles, some of which are near impossible. This game has about 200 locations and 700 messages to add to the 100 puzzles. A huge game, and a bargain at £9.90.

A.T. Stanfield.

ROADER by FL software

\*\*\*\*\*

This is a straightforward racing game where you compete against the clock. Personally I would have preferred to race against other cars. However this is a good version of the original roadrace game. The scrolling is superb and flicker free, and 3 different speed settings are available. The game has 4 controls, left, right, accelerate and decelerate. The main aim is to complete 50 laps in the fastest possible time.

Occasional fuel pumps allow you to refuel if you're running low. I found this game too easy after a while and rather repetitious but it is still definitely worth £5.95. The one amazing feature was the speed of writing on the screen, blink and you'll miss it. If your budget is limited try ROADER.

A.T. Stanfield.

LOGICHESS from CAMSOFT

\*\*\*\*\*

The interesting feature of this chess program is the method of establishing the level of play. You specify the time the program is to take over its first 40 moves. No more 2 hour waits for the computers next move! Your own moves are not subject to any time limit.

This is quite a friendly program, if you regret a move when you see the computers reply, you have the option to go back and change it. The program will recommend a move to you on request, or take over and play your position for you. During the analysis the move under consideration is displayed, together with its evaluation and the depth of analysis (which is controlled by the time limit you set). You can force an immediate move if you get tired of waiting. Positions can be set up or altered using the editor. At the end of the game, a listing of the moves is available. One point to note is that castling requires the letter O, not zero as shown in the leaflet.

Playing strength is considerable, I have yet to beat LOGICHESS at anything over the 5 minutes level (my strength is average club standard). However at very restricted levels some rather bizarre moves can be encountered. In particular the program seems rather prone to pushing its Queen and Rooks forward into vulnerable positions too early in the game. This of course highlights the weakness of any computer chess program, i.e. a lack of strategic awareness. An entertaining way to see this is to let the program play both sides whence some most strange positions can result. So, if you want to improve your game, find an experienced human opponent. However, as an occasional sparring partner to keep the wits sharp then LOGICHESS is to be thoroughly recommended.

A L SHAW.

FLOYDS BANK by ROMIK software

\*\*\*\*\*

Floyds Bank MLOADED in about 50 seconds using TAPE 3. Once loaded a title page is displayed showing a score for each of the 9 levels. You play the part of a bank robber and you control him with the cursor keys.

On playing the game a quick and crisp display appears along with some very good sound effects.

All that's involved is getting your bank robber through 4 stages of the banks defence system. The first stage requires you to get from the door on the right to the door on the left without having a mine exploding to close to you, other stages have randomly changing mazes, collecting valuable keys and finally escaping from robots and trying to find exits.

To conclude this game is good with an average display and some very good sound effects. A joystick option and a hold facility would have improved playability. Expensive at just under £10, value for money 7/10.

P.Taylor.

PENGO by PLAY IT software

\*\*\*\*\*

This is the follow up game to a superb version of "CENTIPEDE" for the 48K or 96K LYNX.

PENGO consists of a penguin, who is yourself, blocks of ice, your weapons and defense, and the aggressors. The object is to push the ice blocks over the monsters and crushing them between other blocks or the walls. Unfortunately the monsters can destroy any block not being pushed, apart from 3 special diamond filled blocks which are indestructible. At the start of a sheet a timer starts counting back to 0, this is the amount of BONUS you will receive when the sheet is completed. If the BONUS gets down to 0 then you are passed straight onto the next sheet without any extra score. Should you manage to push the three diamond filled blocks together you receive a large bonus of 1500 immediately. An extra penguin is gained every 10000 points. As an added treat, if a wall is "PUSHED" while a monster is on the wall, it will be stunned for a couple of seconds, allowing escape from a dodgy situation.

For a micro with MULTICOLOUR SPRITES, SOUND CHIP & 16 COLOURS, it would be good. For the LYNX, Gary Howland has excelled himself. Large, multicolour poly-sprites (the penguin walks, etc), constant sound, i.e. as well as explosion sounds, a tune plays all the time the game is being played. The format or layout of the game is similar to "CENTIPEDE" in that once loaded a title screen swaps with a HIGH-SCORE sheet, with room for 10 names, until the game is played by pressing "PUSH". Again, as in "CENTIPEDE", multicolour writing has been used but this time in an ITALIC style.

The title screen describes the controls which are as follows:-

Q....UP  
A....DOWN  
<....LEFT  
>....RIGHT  
SPACE...PUSH

also (ESC) aborts the game but it was not documented in my (one of the first few out) copy.

As would be expected in a place where ICE is about, white, cyan and blue have been used well to produce a "COLD" scenario. In the cassette version I have, a "FREEZE GAME" (please excuse the pun) option has not been included, but apparently one is to be added. I have the WHS computer-cassette recorder and "PENGO" loaded first time at TAPE 0 & TAPE 5.

USE OF GRAPHICS 9  
USE OF SOUND 8  
PLAYABILITY 10  
VALUE FOR MONEY 7

G.Hindle.

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DIGGERMAN from GEM SOFTWARE

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It is becoming more evident that program writers are beginning to get to grips with the intricacies of "driving" the LYNX. There are few people who although maybe familiar with m/c writing, are capable of handling efficiently multipage switching in their programs. Such an example is the latest release from GEM software, called DIGGERMAN. Although the idea of the game has been available in various forms for other micros, it has not been written until now for the LYNX. The idea is that a "man" figure must climb various ladders and dig holes to trap and kill off different "nasties" by hitting them on the head with his spade!

There are 3 levels of difficulty, choice of keyboard or joystick and a GEM feature of presetting the volume level before one starts. It is a very addictive game and the graphics quality is of a very high standard, with "sprites" being generated for the "man" and "nasties". This latter aspect illustrates that the LYNX is capable of achieving superb screen graphics with careful programming. For keyboard use the arrow keys are used to move the "man" left, right, up and down with the space bar to wield his spade. Two types of "nasties" are produced, the "shy" ones coloured green and the aggressive variety coloured magenta, who chase you if you are unsuccessful in killing them when they are at the green stage, both types will kill you if you are caught or even touch them so beware! With the speed of the game, I strongly suggest you use a joystick, as the game gets increasingly more chaotic as you progress through the several screens, each one having more "nasties" than the previous one. As usual a tune plays at the beginning which in spite of the low level produced by the LYNX is quite musical to listen to. Overall I can strongly recommend this game to all you "arcades" and therefore award it 9/10.

R B JONES.

QUACMAN from QUAZAR COMPUTING

\*\*\*\*\*

This is another version of that ever popular game PACMAN, where this one is perhaps slightly different in the size of the characters, making it ideal for children, they are kingsize! It was written by one of our Norwegian members, H.Heggelund and is a program which is part BASIC and part m/c. It is LOADED at TAPE 0 and does take a minute or two to load, perhaps future copies could be recorded at TAPE 3. It is fairly easy to play and does support both keyboard and joystick control and 3 levels of difficulty to choose from. The game is recorded on both sides, normal phase on side 1 and reversed phase on side 2, so most cassette recorders are catered for. It is graphically quite good using protection for the grid, although because of the character size, when the beasties get you, there are fragments left remaining on the screen before a new screen is set up. Recommended 7/10.

R B JONES.

## EFFICIENT BASIC - Timing tests

Continuing the theme of efficient, readable LYNX BASIC started by Colin Clayman in LUG issue 1, I performed a set of comparative timing tests on 96K LYNX BASIC constructs. Using my digital watch's stopwatch facility, I timed FOR loops of (in most cases) several thousand iterations, containing only the construct under test.

```
100 FOR J=0 TO 999
110 <CONSTRUCT>
120 NEXT J
```

For each construct I took 3 timings, averaged them, and then subtracted the average of the 3 timings of the empty FOR loop (ie with the construct replaced by REM) for the same number of iterations. Since this subtraction should also have eliminated my reaction time on using the stopwatch, I was left with a timing for the iterations of the construct alone, which I then normalized by multiplication to a time for 1000 iterations. The results can also be interpreted as approximate timings in milliseconds, per construct.

To compare a simple, parameter-less procedure with its equivalent labelled and unlabelled subroutines, I defined an empty procedure/subroutine placed immediately after the FOR loop. In the memory tests I stored/retrieved the value 255, which takes two bytes of data store using ISTORE (integer store function) but 6 bytes using STORE (read number store). Here are my results, for 1000 iterations:-

FUNCTION	TIME	FUNCTION	TIME
PROC I	0.65	LET I=PEEK(J)	3.2
GOSUB LABEL I	0.77	I=PEEK(40000)	3.2
GOSUB 130	1.2	I=DPEEK(40000)	3.0
POKE 40000,255	1.7	EXT FETCH 1,I	2.7
DPOKE 40000,255	1.7	(integer)	
EXT ISTORE 1,255	1.6	EXT FETCH 1,R	1.1
EXT STORE 1,255	1.4	(real)	
LET I=PEEK(0)	2.7		

Some useful conclusions can be drawn using these results:-

1. Since PROC is 16% faster than GOSUB LABEL and takes 1 byte fewer to call, always use procedures in LYNX BASIC.
2. DPOKE and DPEEK take about the same time per call as POKE and PEEK, so they move data twice as fast.
3. A lot more integers than real numbers can be stored in the data store, but the penalty is that they take 2.5 times as long to retrieve; even so, the time is comparable to PEEK/POKE or DPEEK/DPOKE. STORE/FETCH of real numbers are the fastest memory accesses and should therefore be used whenever moderate amounts of data are being manipulated.

One further tip, not from these timings but because I have seen it "disobeyed" so often, always use ENDPROC rather than GOTO <ENDPROC line number>, and END rather than GOTO <END line number>. The LYNX does not object to several ENDPROCs/ENDs per procedure/program, but simply executes the first instance it encounters. C.Mathews.

## SOUND and how it can be used

To use the SOUND command the user must first program into memory the waveform of the sound to be produced. At the SOUND address, a delay tells the computer (BASIC interpreter) to output the values (6 bit) from the specified address onwards to the Digital-Analogue converter with a specified delay between outputs, until it reaches a value of 0. There are three ways how it can be used, the third being a combination of the first two.

The first is by using, as an example a triangular waveform, generated by the computer. This is actually a square wave, as the output is held at the previous value until another is output. This waveform is of constant frequency dependent on the value of the delay as specified in the SOUND command. But the amplitude is varied for different effects such as in the example below, where the note will fade away.

```
100 FOR A=63 TO 1 STEP -0.1
110 POKE &94EC-A*20,1
120 POKE &64ED-A*20,INT(A)
130 NEXT A
140 POKE &94CC,0
```

As it is above it would produce a fading tone, but it would be very short, unless very long delays were used. This program sets the volume level (63 to 1) into memory with a 0 to specify the end.

This programs the SOUND into the memory starting at &9000 and ending at &94CC. Try experimenting with various delays (I suggest below 2000). This produces quite a pleasant sound but it does use over 1K of memory.

The second method is to create a new waveform such as a square, sine or sawtooth waveform. In the example below I have used a sawtooth wave. Here I have used values from 1 to 61 and each "tooth" takes up 7 bytes. In reality the wave is not evenly sloped but instead is stepped, this shows that the more bytes used for a cycle the more nearly perfect the waveform generated. The program below will program 200 cycles of the waveform into memory starting at &9000.

```
100 FOR A=0 TO 1400
110 POKE &9000+A,(A MOD 7)*10+1
120 NEXT A
130 POKE &9579,0
```

This method does use more memory and when the sound is programmed in, it is a little less flexible as much lower delay values have to be used (something like 1 to 50) as otherwise you hear each step as well as the whole wave.

More complex sounds can be created using this method by altering the frequency, and in combination with the first program, by altering the amplitude of the waveform.

Simeon Warner.

## ADVERTISEMENT FEATURE

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### THE upGRADE

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The upGRADE is a small unit designed not only to enhance the performance of your LYNX but to give you many features that have previously not been available. It consists of a Z80 second processor, 64K of RAM, a floppy disk controller and a unique expansion bus allowing further expansion of the system to meet your requirements exactly.

The addition of a second processor releases your computer's main processor and memory from many of its current tasks allowing it to concentrate on the screen handling and some of the input/output tasks. With two processors and the addition of more memory the system becomes more powerful and potentially faster. The upGRADE retains all of your computer's graphic capabilities. In fact, because of the upGRADE's additional RAM these capabilities may be considerably enhanced.

The upGRADE communicates with your LYNX by means of the serial interface, this being the only requirement that the upGRADE makes of your LYNX. A small machine code program is then loaded into your LYNX (will be in ROM) and when this program is run, control is passed to the upGRADE. You can then simply flip between the upGRADE's operating system and your computer's system.

### SPECIFICATIONS

Processor.....	Z80A running at 4Mhz.
Memory.....	64K RAM (fully expandable)
Operating system.....	CP/M 2.2
Keyboard.....	Uses LYNX's own.
Screen resolution.....	Uses LYNX's own.
Disk drives supported.....	40 or 80 Track, Single or Double density, 5.25" or 3.5" Disk drives can be shared with host computer if host has a drive controller.
Disk Drive Capacity.....	Will vary depending on the disk drives used. (Example; 80 track DD/DS gives 800K when formatted.
Interfaces.....	One Serial I/O channel operating at 9600 Baud.
Expansions.....	Include;- Dual RS-232 Serial I/O Dual 8 bit Programmable Parallel interface. IEEE-488 GPIB controller. RAM expansions in blocks of 64K or 192K to a maximum of one Megabyte. Standard Centronics Interface. Prototyping boards for users own projects. Real time clock with battery back-up.
Power requirement.....	240V AC.
LYNX requirement.....	Serial Interfacing with handshake (design in this issue by RADE Ltd). Full scrolling to run on any LYNX model. 80 column screen. Plus conversion of certain keyboard CONTROL codes for CP/M use.

Please note that it is planned that instead of running via the serial port that it will be possible to operate the system on the LYNX's parallel bus and thereby to have full dual processor power.

### FLOPPY DISK CONTROLLER

Unlike other Z80 second processors, the upGRADE is supplied with a powerful floppy disk drive controller as standard. This works in conjunction with your computer's drive controller if you have one fitted, or provides you with one if you don't! Connection is easy, simply plug your disk drives into the port on the back of the upGRADE. The upGRADE's floppy disk drive controller is capable of handling up to four 5.25" or 3.5" disk drives. These can be either 40 or 80 track drives, and either single or double sided. The upGRADE will work with all of the common makes of floppy disk drives giving you the choice of which drives to acquire or the ability to use your existing drives.

Disks can be formatted in either single or double density mode giving increases in both capacity and disk access speed. For example a double-sided, 80 track disk will hold 800K of data (over 800,000 characters) after formatting.

### EXPANSION

The upGRADE has been designed with expansion options built in. It features a unique expansion BUS allowing further option cards to be added quickly and easily by simply plugging them into the expansion BUS inside the case of the upGRADE. There is room inside the case of the unit to plug in one extra option card at any one time. If you wish to permanently expand your system further, a larger case is available to accommodate up to five extra boards in addition to the supplied floppy disk controller pcb.

There are several option boards currently available (with more coming) to provide the following:-

- Dual serial RS232 interfaces with fully programmable baud rate selection and handshaking allowing the upGRADE to communicate with external serial devices such as Printers and Modems using the RS232 standard.
- Dual parallel interfaces for connection with devices using parallel communications. These may be configured to the CENTRONICS standard used by most printers.
- A CENTRONICS interface that works in addition to your computer's printer interface (if fitted) allowing you to add a second printer or some other CENTRONICS compatible device.
- A choice of 64K or 192K additional RAM cards, one or several of these can be fitted to provide additional memory. One or several of these boards may even be used as a Silicon Disk or RAM Disk, the software for this being provided.
- An IEEE488 option card providing a standard interface to scientific instruments etc.
- A Winchester interface that allows the upGRADE to access up to 110 Megabytes of hard disk storage.
- Additional Floppy Disk controllers which can be added to cater for up to sixteen disk drives and even 8" drives. Each controller will handle up to four floppy disk drives and is preset for either 5.25" (and 3.5") or 8" disk drives.

There are other options boards available for the upGRADE that perform more specific tasks and further boards are constantly being added to this list.

#### SOFTWARE

The upGRADE uses the standard CP/M 2.2 operating system and is not a look-alike that might not be fully compatible. Because of this, and the widespread acceptance of CP/M as the standard, there are literally thousands of programs available for use with an upGRADED LYNX.

Unlike home computers' operating systems, which are unique to each make of computer, CP/M was created to provide a standard working environment for software that is machine independent - that means that software written for one CP/M based computer can be run on any other make of computer running under the CP/M system. For example it means that via the upGRADE, LYNX owners will be able to exchange software with BBC, NEWBRAIN, AMSTRAD owners possessing the upGRADE unit, i.e. effectively a disk based 'MSX' type system.

The choice of software that is available seems limitless. If you are interested in using your computer within your business there are packages such as WORDSTAR and MAILMERGE from Micropro, DBase II from Ashton Tate and Supercalc from Sorcim, not to mention the vast range of accounting software and specialised packages available.

If you are more interested in programming your LYNX then the choice of languages cannot be bettered. Languages such as FORTH, PASCAL, and FORTRAN are all available as are various versions of both BASIC and COBOL. The presentation and documentation of CP/M software reflects the standard demanded by users of CP/M.

#### THE CP/M 2.2 OPERATING SYSTEM

The upGRADE is supplied with the standard CP/M operating system from Digital Research. CP/M is the most popular and widely used operating system for any computer. Its main function is to control all of the system's input and output, organising the memory and disk files that programs use.

Also supplied with the upGRADE are a host of utility programs that allow you to set up the system to work with your disk drives, printer and modem if you have one. There is a utility that allows you to interrogate data on your disks, providing information on file names and size as well as giving information on the remaining space on your disks. Another program allows you to move files around from disk to disk and even computer to computer, while another allows you to format new disks and take copies of complete disks. One feature of CP/M is its facility to store data within separate "user areas" on your disks. This gives you the facility to hide private information or to allocate different user areas to different people. We have added the facility to access a public area on your disks allowing you to share files with other private user areas and also to display which user area you are currently working in.

CP/M is also supplied with a line editor and an assembler allowing you to write your own assembly language programs. There is even a program to assist in debugging programs.

NB CP/M is the registered trademark of Digital Research Inc.

#### THE UPGRADE'S "USER PACK" SOFTWARE

There is a specially commissioned software package also available with an upGRADED LYNX. This software has been specially configured to take full advantage of the power and capacity of the upGRADE. Christened GRADE ONE it provides an extensive bundle of software ideal for most applications. There is a complete Word Processor, a Database and a Spreadsheet allowing full "what if ?" style predictions to be made, using calculator style commands. There is also a mailing system allowing data to be merged with a letter generated using the wordprocessor. All of this software has been specially designed with particular emphasis being placed on both user friendliness and performance. The programs all use similar English language commands, eliminating the need to learn different commands for the different programs. To further enhance this software "bundle" and to help you to get the most from the upGRADE system there is also a COS COBOL compiler and a Forms Generator. Together these two programs allow you to write and compile COBOL programs; the Forms Generator allowing you to design screen layouts and to incorporate them into your programs.

## FILL ROUTINE

~ ~ ~ ~ ~

It has already been said that the LYNX has a tremendous graphic potential, and indeed its dot resolution/colour ratio is still unsurpassed among its competitors. However as usual, with the LYNX, this capability is completely underexploited by software writers. The single serious published attempt to greatly enhance the LYNX's graphics was Chris Cytera's XOR drawing program (NILUG,vol1,no5).

One really important utility not supported by the LYNX is a FILL routine. Computer's claim that such a routine is useless once you have the EXTCIRCLE, EXTTRIANGLE, and EXTCLW commands is obviously unjustified, and at any rate it doesn't cure the problem for 48K owners. The machine code program provides a FILL routine. Apart from speed, it has some nice features: you will be able to fill any closed shape, drawn in any colour(s) using any normal or patterned colours.

Now for a few remarks:

The patterned colours are produced by alternating the INK and PAPER colours for any pair of two adjacent pixels. So to specify the wanted colours, just use the INK and PAPER statements.

If both colours are the same, you will get a pure colour. Homogeneous new colours can be produced by using two light normal colours, such as white and yellow or white and green.

### GRAPHICS SOFTWARE: A MACHINE CODE FILLING PROGRAM

NB. You can only fill on black paper.

- 1) The speed of the program depends on the length of the moving front end and not on the area to be filled. (Please watch the fill within the "DEMO" program). PROTECT can be used in the normal way to improve the speed.
- 2) The program tests for the ESCape key, so that you can stop the fill when things go wrong. (eg When you have an un-enclosed area). When you ESCape, the INK is set to GREEN, PAPER to BLACK and PROTECT to 0.
- 3) Enter the machine code via the MONitor. It has been written for a 96K LYNX, but relocation should not be a problem if you change the few relevant addresses. To be able to use the program from BASIC, you need to DPOKE one of the USER execution addresses with the start address of the program. For example, DPOKE &627D,&A000 will direct USER 0 to the program as it stands. The argument is the start point for the filling routine. It must of course be within the shape you want to fill. Due to the fact that USER only accepts a single argument, you have to use the following syntax;- (x co-ordinate + 256 \* y co-ordinate). See "DEMO" program.
- 4) For more information about the algorithm, have a look at the excellent "Advanced programming techniques for the BBC micro" published by Addison-Wesley).  
Ed. Sorry about this, but we don't have an advanced book for the LYNX !!  
Part of my program has been stolen from XOR drawing, but I hope Chris won't get too angry!
- 5) Lastly I'm far from being an expert machine code programmer, as I'm certain this program could be much improved on for speed and compactness. Any offers?

### "DEMO" program

100 CLS	370 DRAW 130,95	640 PROTECT CYAN
110 WINDOW 0,125,5,200	380 MOVE 120,105	650 FOR S=68 TO 188 STEP 120
120 PROC message	390 DRAW 130,95	660 MOVE S,128
130 PROTECT CYAN	400 INK 7	670 FOR a=0 TO (360#7)+(180#(S-188)) 5
140 DPOKE &627D,&F800	410 MOVE 120,70	TEP 20
150 EXT CIRCLE 0,70,100,30	420 DRAW 120,95	680 LET X=S+COS(RAD(a))#a/40
160 INK 0	430 MOVE 130,70	690 LET Y=128+SIN(RAD(a))#a/40
170 MOVE 100,95	440 DRAW 130,95	700 DRAW X,Y
180 DRAW 100,105	450 MOVE 120,105	710 NEXT a
190 INK 7	460 DRAW 120,130	720 NEXT S
200 MOVE 100,95	470 MOVE 130,105	730 PROTECT 0
210 DRAW 150,95	480 DRAW 130,130	740 VDU 1,5,2,6
220 MOVE 100,105	490 PROTECT YELLOW	750 LET P=USER0(64+256#130)
230 DRAW 150,105	500 MOVE 35,5	760 VDU 1,4,2,0
240 EXT CIRCLE 0,180,100,30	510 DRAW 215,5	770 PROC message
250 INK 0	520 DRAW 215,195	780 PROTECT YELLOW
260 MOVE 150,95	530 DRAW 35,195	790 FOR Q=36 TO 40 STEP 4
270 DRAW 150,105	540 DRAW 35,5	800 MOVE 128,128
280 INK 7	550 PROTECT 0	810 FOR a=0 TO 360#7 STEP 20
290 EXT CIRCLE 0,125,40,30	560 VDU 1,6,2,7	820 LET X=128+COS(RAD(a))#a/Q
300 EXT CIRCLE 0,125,160,30	570 LET P=USER0(36+6#256)	830 LET Y=128+SIN(RAD(a))#a/Q
310 INK 0	580 PROTECT 0	840 DRAW X,Y
320 MOVE 120,70	590 VDU 1,4,2,3	850 NEXT a
330 DRAW 130,70	600 LET P=USER0(125+256#100)	860 NEXT Q
340 MOVE 120,130	610 VDU 1,4,2,0	870 DRAW X-3,Y
350 DRAW 130,130	620 PROTECT 0	880 DRAW X+b,Y
360 MOVE 120,95	630 PROC message	890 PROTECT 0



```

900 VDU 1,2,2,5
910 LET P=USER0(127+256*129)
920 VDU 1,6,2,7
930 LET P=USER0(196+256*126)
940 VDU 1,4,2,0
950 PROC message
960 MOVE 50,50
970 DRAW 150,50
980 DRAW 150,155
990 DRAW 50,155
1000 DRAW 50,50

1010 INK BLUE
1020 FOR N=1 TO 10
1030 INK RED
1040 PRINT @ 28,43+*N*10;"stuvwxy stuv
wxy";
1050 NEXT N
1060 VDU 1,1,2,4
1070 LET P=USER0(51+256*51)
1080 VDU 1,4,2,0
1090 WINDOW 3,123,200,245
1100 EXT CLW

1110 END
1120 DEFPROC message
1130 VDU 1,4,2,0
1140 PRINT @ 3,210;"stuvwxyDemo program
Cleeremans 1984.";
1150 PRINT @ 3,220;" - Press any ke
y to continue -";
1160 LET G=GETN
1170 EXT CLW
1180 VDU 1,7,2,0
1190 ENDPROC

```

MACHINE CODE ROUTINE

Add.	Opcode	Mnemonics	Add.	Opcode	Mnemonics	Add.	Opcode	Mnemonics	Add.	Opcode	Mnemonics
FB00	21 00 F0	LD HL,(F000)	FB70	00	NOP	FC06	00	NOP	FC7C	00	NOP
FB03	22 F0 FA	LD (FAF0),HL	FB71	00	NOP	FC07	00	NOP	FC7D	00	NOP
FB06	22 F2 FA	LD (FAF2),HL	FB72	01	POP DE	FC08	7D	LD A,L	FC7E	00	NOP
FB09	CD 97 34	CALL 3497	FB73	F1	POP AF	FC09	E6 07	AND 07	FC7F	00	NOP
FB0C	CD 50 FB	CALL FB50	FB74	47	LD B,A	FC0B	3C	INC A	FC80	08	EX AF,AF
FB0F	2A F0 FA	LD HL,(FAF0)	FB75	A5	AND L	FC0C	06 01	LD B,01	FC81	F5	PUSH AF
FB12	ED 58 F2 FA	LD DE,(FAF2)	FB76	20 1A	JR NZ,FB92	FC0E	08 08	RRC B	FC82	C5	PUSH BC
FB16	AF	XOR A	FB78	78	LD A,B	FC10	3D	DEC A	FC83	05	PUSH DE
FB17	ED 52	SBC HL,DE	FB79	00	NOP	FC11	20 FB	JR NZ,FC0E	FC84	E5	PUSH HL
FB19	C8	RET Z	FB7A	EB	EX DE,HL	FC13	ED 43 F7 FA	LD (FAF7),BC	FC85	51	LD D,C
FB1A	2A F0 FA	LD HL,(FAF0)	FB7B	4F	LD C,A	FC17	08 3C	SRL H	FC86	7A	LD A,D
FB1D	5E	LD E,(HL)	FB7C	00	NOP	FC19	08 1D	RR L	FC87	2F	CPL
FB1E	23	INC HL	FB7D	CD 80 FC	CALL FC 80	FC1B	08 3C	SRL H	FC88	5F	LD E,A
FB1F	56	LD D,(HL)	FB80	D1	POP DE	FC1D	08 1D	RR L	FC89	05	PUSH DE
FB20	23	INC HL	FB81	2A F2 FA	LD HL,(FAF2)	FC1F	08 3C	SRL H	FC8A	3A 6B 62	LD A,(6268)
FB21	7C	LD A,H	FB84	73	LD (HL),E	FC21	08 1D	RR L	FC8D	0F	RRC A
FB22	E6 F3	AND F3	FB85	23	INC HL	FC23	E5	PUSH HL	FC8E	38 15	JR C,FCA5
FB24	67	LD H,A	FB86	72	LD (HL),D	FC24	ED 58 8E 62	LD DE,(628E)	FC90	3A 58 62	LD A,(6258)
FB25	22 F0 FA	LD (FAF0),HL	FB87	23	INC HL	FC28	19	ADD HL,DE	FC93	0F	RRC A
FB28	E8	EX DE,HL	FB88	7C	LD A,H	FC29	CD 69 00	CALL 0069	FC94	38 02	JR C,FC98
FB29	CD 00 FC	CALL FC00	FB89	E6 F3	AND F3	FC2C	3A F8 FA	LD A,(FAF8)	FC96	16 00	LD D,00
FB2C	2C	INC L	FB8B	67	LD H,A	FC2F	A5	AND L	FC98	3E E8	LD A,EB
FB2D	CD 50 FB	CALL FB50	FB8C	22 F2 FA	LD (FAF2),HL	FC30	28 05	JR Z,FC37	FC9A	08	EX AF,AF
FB30	2D	DEC L	FB8F	EB	EX DE,HL	FC32	3E 01	LD A,01	FC9B	3E 63	LD A,63
FB31	24	INC H	FB90	C9	RET	FC34	32 F6 FA	LD (FAF6),A	FC9D	01 00 80	LD BC,8000
FB32	CD 50 FB	CALL FB50	FB91	00	NOP	FC37	E1	POP HL	FCA0	CD 86 08	CALL 0886
FB35	2D	DEC L	FB92	E1	POP HL	FC38	E5	PUSH HL	FCA3	01	POP DE
FB36	25	DEC H	FB93	C9	RET	FC39	ED 58 90 62	LD DE,(6290)	FCA4	05	PUSH DE
FB37	CD 50 FB	CALL FB50	FB94	FF	RST 38	FC3D	19	ADD HL,DE	FCA5	3A 6B 62	LD A,(6268)
FB3A	2C	INC L	FB95	FF	RST 38	FC3E	CD 69 00	CALL 0069	FCA8	08 4F	BIT 1,A
FB3B	25	DEC H	FB96	FF	RST 38	FC41	3A F8 FA	LD A,(FAF8)	FCAA	20 14	JR NZ,FCC0
FB3C	CD 50 FB	CALL FB50	FB97	FF	RST 38	FC44	A5	AND L	FCAC	3A 58 62	LD A,(6258)
FB3F	0B 80	IN A,(80)	FB98	ED 58 8E 62	LD DE,(628E)	FC45	28 08	JR Z,FC4F	FCAF	08 4F	BIT 1,A
FB41	0B 77	BIT 6,A	FB9C	19	ADD HL,DE	FC47	3A F6 FA	LD A,(FAF6)	FCB1	20 02	JR NZ,FCB5
FB43	20 CA	JR NZ,FB0F	FB9D	CD 69 00	CALL 0069	FC4A	06 02	ADD A,02	FCB3	16 00	LD D,00
FB45	21 04 00	LD (6258),HL	FBA0	7D	LD A,L	FC4C	32 F6 FA	LD (FAF6),A	FCB5	3E E8	LD A,EB
FB48	22 58 62	LD (6258),HL	FBA1	32 F4 FA	LD (FAF4),A	FC4F	E1	POP HL	FCB7	08	EX AF,AF
FB48	AF	XOR A	FBA4	E1	POP HL	FC50	E5	PUSH HL	FCB8	3E 63	LD A,63
FB4C	32 6B 62	LD (626B),A	FBA5	E5	PUSH HL	FC51	ED 58 92 62	LD DE,(6292)	FCBA	01 00 C0	LD BC,C000
FB4F	C9	RET	FBA6	ED 58 90 62	LD DE,(6290)	FC55	19	ADD HL,DE	FCBD	CD 86 08	CALL 0886
FB50	E5	PUSH HL	FBAA	19	ADD HL,DE	FC56	CD 70 00	CALL 0070	FCC0	01	POP DE
FB51	7D	LD A,L	FBA8	CD 69 00	CALL 0069	FC59	3A F8 FA	LD A,(FAF8)	FCC1	3A 6B 62	LD A,(6268)
FB52	E6 07	AND 07	FBAE	3A F4 FA	LD A,(FAF4)	FC5C	A5	AND L	FCC4	08 57	BIT 2,A
FB54	3C	INC A	FBB1	B5	OR L	FC5D	28 08	JR Z,FC67	FCC6	20 14	JR NZ,FCDC
FB55	06 01	LD B,01	FBB2	32 F4 FA	LD (FAF4),A	FC5F	3A F6 FA	LD A,(FAF6)	FCC8	3A 58 62	LD A,(6258)
FB57	08 08	RRC B	FBB5	E1	POP HL	FC62	06 04	ADD A,04	FCCB	08 57	BIT 2,A
FB59	3D	DEC A	FBB6	E5	PUSH HL	FC64	32 F6 FA	LD (FAF6),A	FCCD	20 02	JR NZ,FCD1
FB5A	20 FB	JR NZ,FB57	FBB7	ED 58 92 62	LD DE,(6292)	FC67	E1	POP HL	FCCF	16 00	LD D,00
FB5C	C5	PUSH BC	FBB8	19	ADD HL,DE	FC68	E1	POP HL	FCD1	3E E4	LD A,E4
FB5D	08 3C	SRL H	FBBC	CD 70 00	CALL 0070	FC69	3A F6 FA	LD A,(FAF6)	FCD3	08	EX AF,AF
FB5F	0B 1D	RR L	FBBF	3A F4 FA	LD A,(FAF4)	FC6C	ED 48 58 62	LD BC,(6258)	FCD4	3E 65	LD A,65

FB61 CB 3C	SRL H	FBC2 B5	OR L	FC70 A9	XOR C	FCD6 01 00 C0	LD BC,C000
FB63 CB 1D	RR L	FBC3 6F	LD L,A	FC71 C0	RET NZ	FCD9 CD B6 08	CALL 0886
FB65 CB 3C	SRL H	FBC4 C3 71 FB	JP FB71	FC72 79	LD A,C	FCDC E1	POP HL
FB67 CB 1D	RR L	Ed. Addresses FBC7 to FBFF		FC73 48	LD C,B	FCDD D1	POP DE
FB69 E5	PUSH HL	contain 00 NOP.		FC74 47	LD B,A	FCDE C1	POP BC
FB6A C3 98 FB	JP FB98	FC00 E5	PUSH HL	FC75 ED 43 5B 62	LD (625B),BC	FCDF F1	POP AF
FB6D 00	NOP	FC01 AF	XOR A	FC79 C9	RET	FCE0	08EX AF,AF
FB6E 00	NOP	FC02 32 F6 FA	LD (FAF6),A	FC7A 00	NOP	FCE1 C9	RET
FB6F 00	NOP	FC05 00	NOP	FC7B 00	NOP		

MDUMP by Chris Mathews

```

100 DIM A$(1)(15),B(15)
110 WINDOW 3,123,5,245
120 TEXT
130 J=INP(&007D)
140 FOR J=0 TO 15
150 READ A$(J)
160 NEXT J
170 DATA 0,1,2,3,4,5,6,7,8,9,A,B,C,D,E,F
180 INPUT"Dump from which address ";I
190 LET A=(I DIV 16)£16
200 FOR J=A TO INF
210 LET K=J MOD 16
220 IF K=0 THEN LPRINT "      "£J;"
";
230 LET X=PEEK(J),P£=A$(X DIV 16)+A$(X
MOD 16)
240 LPRINT P£" ";
250 LET X=X MOD 128,B(K)=X
260 IF X<32 THEN LET B(K)=46
270 IF K<15 THEN GOTO 320
280 LPRINT " ";
290 FOR N=0 TO 15
300 LPRINT CHR$(B(N));
310 NEXT N
320 NEXT J

```

Ed. This an interesting short program, it produces a screen dump of the memory to a printer, identical to the display when the H command is used under the MONitor mode. That is, addresses on the left, hex bytes in the middle, and equivalent ASCII codes on the right. But 80 columns wide !!

On line 220 the £ sign should read as a hash symbol.

FILL FINDER for the 128K LYNX

```

100 VDU 1, GREEN, 2, BLACK, 3, BLACK
110 MOVE 150, 100
120 DRAW 400, 100
130 DRAW 400, 300
140 DRAW 150, 300
150 DRAW 150, 100
160 MOVE 150, 123
170 DRAW 400, 123
180 I=BLUE, P=BLACK, F=1
190 PRINT @ 77, 51; "INK - "; I; " PAPER - "; P; " FI
LL - "; F;
200 WINDOW 76, 199, 62, 149
210 REPEAT
220 LET A=INP(&0080), O=INP(&0980), Z=INP(&0780), X=
INP(&0680)
230 IF A=223 AND I>0 THEN LET I=I-1
240 IF A=239 AND I<7 THEN LET I=I+1
250 IF O=251 AND F>1 THEN LET F=F-1
260 IF O=223 AND F<65535 THEN LET F=F+1
270 IF Z=247 AND P<7 THEN LET P=P+1
280 IF X=247 AND P>0 THEN LET P=P-1
290 IF O=215 AND F< 65525 THEN LET F=F+10
300 PRINT CHR$(1)+CHR$(GREEN)+CHR$(2)+CHR$(BLACK)
; @ 95, 51; I; @ 131, 51; P; @ 164, 51; F;
310 VDU 1, I, 2, P
320 EXT FILL F
330 EXT CLW
340 UNTIL FALSE

```

S.French.

Ed. At last a useful utility for all 128K owners, w ho have been starved of any specific programs.

SURFACE by Chris Cytera

```

100 PROTECT BLACK
110 VDU 2, RED, 1, CYAN, 4
120 A=2.5, B=20, C=25
130 FOR X=0 TO 9 STEP 0.3
140 PROC X(X, 0)
150 PROC Y(X, 0)
160 MOVE P, Q
170 FOR Y=0 TO 9 STEP 0.3
180 PROC X(X, Y)
190 PROC Y(X, Y)
200 DRAW P, Q
210 NEXT Y
220 NEXT X
230 INK GREEN
240 FOR Y=0 TO 9 STEP 0.3
250 PROC X(0, Y)
260 PROC Y(0, Y)
270 MOVE P, Q
280 FOR X=0 TO 9 STEP 0.3
290 PROC X(X, Y)
300 PROC Y(X, Y)
310 DRAW P, Q
320 NEXT X
330 NEXT Y
340 REPEAT
350 UNTIL FALSE
360 DEFPROC X(x, y)
370 LET P=108+(0.8£x-0.6£y)£8
380 ENDPROC
390 DEFPROC Y(x, y)
400 Q=222-(0.2£x+0.4£y)£C+(SIN(x)£SIN(y)
£4)£A)
410 ENDPROC

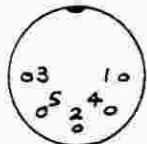
```

Transferring programs from LYNX to BBC.  
 .....

As a school teacher in a school which has BBC and RML machines I often use my LYNX to develop programs at home, which I later use on these machines. Although each has its own version of BASIC, much is common to all three. I am already able to transfer from the BBC to the RML and I can avoid much duplication of typing by dumping programs directly from LYNX to the BBC.

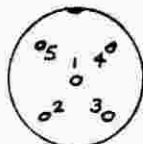
HARDWARE

LYNX serial port



both  
viewed  
from  
back

BBC RS423 port



You need about 1 to 1.5 metres of 2 core cable, a 5 pin DIN plug for the LYNX serial port and a 5 pin "domino" plug for the BBC RS423 port.

Connect pin 1 (O/P to 232) on the LYNX plug to pin 4 (Data In) on the BBC plug. The other core of the cable joins the 0v pins. (pin 2 on the LYNX to pin 1 on the BBC).

N.B. If you subsequently need to transfer the other way (BBC to LYNX) you will also need to connect pin 3 (I/P from 232) on the LYNX to pin 5 (RTS) on the BBC plug. This article does not tackle this.

SOFTWARE

.....

I have modified the program given in NILUG news 4, page 5. This program was intended to drive a serial printer at a speed less than 2400 baud but the BBC can easily be set to receive at this speed so all you need to do is to send the bits to port 82 on the LYNX, rejecting graphics and some of the control codes.

The modified program is;

"LYNXTOBBC"

9FBF	FE 80	SEND	CP 80
9FA1	D0		RET NC
9FA2	FE 20		CP 20
9FA4	30 0E		JR NC,OK
9FA6	2A 02 62		LD HL,(6202)
9FA9	01 19 00		LD BC,TABLE-SEND
9FAC	09		ADD HL,BC
9FAD	06 00		LD B,0
9FAF	4F		LD C,A
9FB0	09		ADD HL,BC
9FB1	7E		LD A,(HL)
9FB2	B7		OR A
9FB3	CB		RET Z
9FB4	D3 B2	OK	OUT (82H)
9FB6	AF		XOR A
9FB7	C9		RET
9FB8	00	TABLE	DEFB 0
9FB9	00		DEFB 0
9FBA	00		DEFB 0
9FBB	00		DEFB 0
9FBC	00		DEFB 0
9FBD	00		DEFB 0
9FBE	00		DEFB 0
9FBF	07		DEFB 7

9FC0	00	DEFB 0
9FC1	09	DEFB 9
9FC2	0A	DEFB A
9FC3	0B	DEFB B
9FC4	0C	DEFB C
9FC5	0D	DEFB D
9FC6	0E	DEFB E
9FC7	0F	DEFB F
9FC8	00	DEFB 0
9FC9	11	DEFB 11
9FCA	12	DEFB 12
9FCB	13	DEFB 13
9FCC	14	DEFB 14
9FCD	00	DEFB 0
9FCE	00	DEFB 0
9FCF	00	DEFB 0
9FD0	18	DEFB 18
9FD1	00	DEFB 0
9FD2	00	DEFB 0
9FD3	18	DEFB 18
9FD4	00	DEFB 0
9FD5	00	DEFB 0
9FD6	00	DEFB 0
9FD7	0D	DEFB 0D

This I have entered at the top of RAM in my 48K LYNX. The starting address will be different in other versions. It takes 57 bytes and I entered it starting at address 9FBF using MON and the M command. Once entered save it using the D command. I called it "LYNXTOBBC".

The transfer is now very simple. In what follows, L: means "this is to be carried out on the LYNX" and B: means "this is to be carried out on the BBC".

- L: RESERVE HIMEM-57
- L: MON (go to monitor)
- L: R"LYNXTOBBC" (load machine code to LYNX)
- L: J (jump to BASIC)

Now load the program to be transferred in the normal way.

- L: CCHAR &80EF (stop the cursor sending spaces)
- L: DPOKE &6202,&9FBF (give LINK address)

- B: #FX7,5(2400 baud receive)
- B: #FX2,1(get character from RS423 port)
- L: LINK ON
- L: LIST (or LLIST)

The program then copies. When finished;

- B: Break key
- B: OLD

The program is now in the BBC computer. LIST it to see it. I have used this method to "write" BBC programs on the LYNX. Those statements in BBC BASIC not liked by the LYNX can be entered as REM statements and "REM" removed once transfer has taken place.

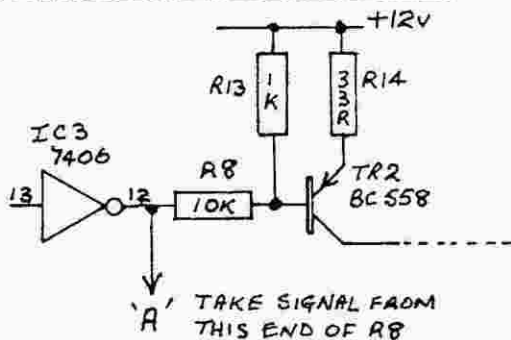
Mike Edwards

**SERIAL HANDSHAKE for the 48/96K LYNX**

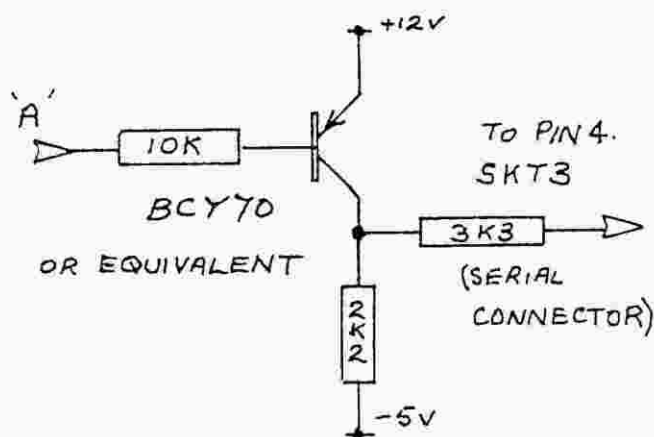
One of the omissions in the earlier design of the LYNX was the absence of a handshake line on the serial port, this prevented the LYNX from interfacing with other peripherals, for example, modems. This particular approach was configured by RADE Ltd so that even a very early LYNX was capable of communicating with the upGRADE unit so that it could run CP/M, albeit with only 40 columns and no scrolling. As evidence of this, an early LYNX was used as a "test bed" to prove the idea, and has since been implemented on a recent 96K with 100% success. I was demonstrating this at the recent PCW show in September on my 96K, although the screen display was a bit of a mess, the first 40 characters being on one line followed by the next 40 characters on the next line and then a blank line when the LYNX carried out a carriage return and line feed but it did prove that the idea was perfectly feasible.

For those of you who are deft with a soldering iron, the design should prove very easy to install. There could be other approaches, but this is very simple and has only one disadvantage, it is a mod. to the cassette motor driver circuit so don't leave the cassette recorder switched on otherwise it will start running! The code is completely relocatable and could either be placed in high memory via the monitor or could be in a CODE line and used within a BASIC program. As a final point, although the idea was to operate the upGRADE unit to run CP/M, it could be used for other applications, as it is not specific for this purpose. If any other owners have alternative ideas then please submit them for inclusion in the magazine.

**EXISTING CIRCUIT for cassette motor**



**ADDITIONAL CIRCUITRY for RS232 handshaking (CTS)**



**MACHINE CODE to direct LYNX to & from Serial Port**

ADDR.	BYTES	Description
x000	3E 02	; Enable Serial I/O.
x002	D3 80	;
x004	CD BD 09	; Check to see if a keyboard
x007	20 80	; character is ready.
x009	DB 84	; See if the Serial Port has a
x00B	CB 7F	; character ready.
x00D	20 15	;
x00F	18 F3	;
x011	F5	;
x012	DB 84	; Check if Serial port is ready
x014	CB 77	; to transmit another character.
x016	28 FA	;
x018	F1	;
x019	FE 00	; Exit to LYNX cold start if "NUL"
x01B	20 03	; is typed.
x01D	C3 00 00	;
x020	D3 B2	; Output characters to Serial
x022	18 E0	; Port.
x024	3E 00	; Disable CTS so no characters are
x026	D3 80	; missed.
x028	DB 82	; Get characters received and
x02A	CD 2F 35	; and display on the screen.
x02D	C3 00 80	; Go to the beginning.

From BASIC:-

```
10 CODE 3E 02 D3 80 CD BD 09 20 08 DB 84
    CB 7F 20 15 18 F3 F5 DB 84 CB 77 28 FA F
    1 FE 00 20 03 C3 00 00 D3 B2 18 E0 3E 00
    D3 80 DB 82 CD 2F 35 C3 00 80
```

1000 CALL LCTN (10)

R B JONES.

**BREAK KEY enable.**

This short M/C routine will enable the BREAK KEY and was written for a 48K LYNX.

When called the routine will reset the machine, and by calling the routine again, it "OLDS" BASIC programs.

```
1 CODE 21 4C 69 23 7E FE 0D 20 FA 23 7E
    FE 80 20 F4 22 FC 61 3E C0 32 4D 69 3E 0
    E D3 86 3E 3F D3 87 21 00 00 22 98 62 FB
    C9
```

The routine is initialised by CALL LCTN(1) and the program is recovered by CALL &6954. This routine does not work if interrupt driven software is used. K.J. Dietz

**BUG CORNER**

- An odd "bug" occurs on the 128K:-
  - 1) Type VDU 24 (For double height characters)
  - 2) Choose any letter, let it repeat to fill the line then watch what happens on the right of screen. OOOER!!!
  - 3) Now try to delete the dummy line!!!
- Happy bug hunting. R B JONES.

ADDITIONAL SOUND COMMANDS (Part 2)

The 96K LYNX has an additional 4K of ROM, which contains some useful preformatted sound commands; EXPLODE, KLAXON, LASER, AND ZAP. Last issue we looked at ZAP and LASER, in this issue we will finish off with KLAXON and EXPLODE.

KLAXON is a simple two tone routine that may be called several times to produce an acceptable sound effect. Using an Assembler, type in the mnemonics and assemble to a convenient position in memory. The code is completely relocatable in memory; alternatively, type in the code line and call LCTN(10) from BASIC.

EXPLODE is the more interesting sound command. Using an assembler, the code must be assembled so that HL (line 30) points to the start of the sound table; alternatively, type in the code line. This is not relocatable in memory, so that this must be the first line of the program. HL must point to the start of the sound table. This is address 697A hex in the code line.

For the adventurous, it is possible to make ones own sound table of twenty bytes (set by the C register, line 40) and adjust HL to point to the beginning of the new table.

The preformatted sounds we have looked at are available to 96K LYNX owners in the 4K extension ROMs. The routines listed are not the same as those in this ROM, but they sound similar. For reference, the routines reside in this 4K extension ROM in the following positions:-

4A22 EXPLODE 4A5C KLAXON  
4A85 LASER 4AA7 ZAP

KLAXON ROUTINE ASSEMBLY LISTING

```

010 3E 01      KLAX  LD A,1
020 D3 80      OUT (80),A
030 11 96 00   LD DE,0096
040 0E 0E     LD C,0E
050 AF        START1 XOR A
060 D3 84     OUT1  OUT (84),A
070 41        LD B,C
080 10 FE     LOOP1  DJNZ,LOOP1
090 3C        INC A
100 FE 40     CP 40
110 38 F6     JR C,OUT1
120 1B        DEC DE
130 7A        LD A,D
140 B3        OR E
150 20 F0     JR NZ,START1
160 11 C8 00  LD DE,00C8
170 0E 09     LD C,9
180 AF        START2 XOR A
190 D3 84     OUT2  OUT (84),A
200 41        LD B,C
210 10 FE     LOOP2  DJNZ,LOOP2
220 3C        INC A
230 FE 40     CP 40
240 38 F6     JR C,OUT2
250 1B        DEC DE
260 7A        LD A,D
270 B3        OR E
280 20 F0     JR NZ,START2
    
```

```

290 AF      XOR A
300 D3 80   OUT (80),A
310 C9     RETURN
    
```

From BASIC:-

```

10 CODE 3E 01 D3 80 11 96 00 0E 0E AF D3
84 41 10 FE 3C FE 40 38 F6 1B 7A B3 20 F
0 11 C8 00 0E 09 AF D3 84 41 10 FE 3C 40
38 F6 1B 7A B3 20 F0 AF D3 80 C9
    
```

EXPLODE ROUTINE ASSEMBLY LISTING

```

010 3E 01      EXPLODE LD A,1
020 D3 80      OUT (80)
030 21 7A 69   LD HL,TABLE
040 0E 14      LD C,14
050 5E        START  LD E,(HL)
060 23        INC HL
070 06 64     LD B,64
080 7B        LD A,E
090 D3 84     OUT1  OUT (84),A
100 ED 5F     LD A,R
110 3D        LOOP1  DEC A
120 20 FD     JR NZ,LOOP1
130 AF        XOR A
140 D3 84     OUT (84),A
150 ED 5F     LD A,R
160 3D        LOOP2  DEC A
170 20 FD     JR NZ,LOOP2
180 10 EE     DJNZ,OUT1
190 0D        DEC C
200 20 E7     JR NZ,START
210 AF        XOR A
220 D3 80     OUT (80),A
230 C9        RETURN
240 1E 3F 3E 3D TABLE DEF B,1D,3F,3E,3D
250 3C 3A 38 35 DEF B,3C,3A,38,35
260 32 30 2D 2A DEF B,32,30,2D,2A
270 24 27 20 1C DEF B,24,27,21,1C
280 18 14 10 0C DEF B,18,14,10,0B
    
```

From BASIC:-

```

20 CODE 3E 01 D3 80 21 7A 69 0E 14 5E 23
06 64 7B D3 84 ED 5F 3D 20 FD AF D3 84 E
D 5F 3D 20 FD 10 EE 0D 20 E7 AF D3 80 C9
1D 3F 3E 3D 3C 3A 38 35 32 30 2D 2A 24 2
7 21 1C 18 14 10 0B
    
```

Colin Tame.

BOOKSHELF

\*\*\*\*\*

Further books to consider:-

- ✦ Z80 Applications  
by James W Coffron. Publ. SYBEX. Approx. £12
- ✦ CRT CONTROLLER HANDBOOK (Info. on the 6845).  
by Gerry Kane. Publ. McGraw Hill. Approx. £12.  
Z80 Assembly Language programming.  
by Ian Sinclair. Publ. Newnes Approx. £6
- ✦ Discover FORTH.  
by Thom Hogan. Publ. Osborne/Mcgraw Hill. £12  
Exploring FORTH.  
by Bishop. Publ. GRANADA £7

\*\*\*\*\*

GRAPHICS

I would like to look in detail at user defined graphics but first some observations on the results of the bench tests. Comparing the timings for Horiz. and Vert., we see that :-

- a) The plot routine in ROM updates the screen one pixel at a time.
- b) The fast plot routine used by 96K CBS-FORTH allows horizontal lines to be drawn at 5 times normal speed ( and incidently also allows XOR plotting ).

The correct approach to graphics on the LYNX, is to view each figure as made up of a series of horizontal lines and to use a fast draw routine. 48K owners don't despair, I hope to give in a future article, a horizontal draw routine which will output not one pixel nor one byte at a time but up to 8 bytes at a time.

USER DEFINED GRAPHICS

Camsofts FORTH :- The top 1K of memory is reserved for user defined graphics up to 128 characters may be defined by setting GRAPHIC to point to FC00 and storing 10 bytes per character in this area. This is both wasteful of memory and puts the onus on the user to determine where and how to store the graphic characters in RAM.

CBS-FORTH :- Graphic characters are named and created with the UDG command. There is no limit on the number of graphic characters which may be defined and no reserved memory area as such. The predefined block graphics may be displayed using EMIT even when UDGs have been defined, for example :- 243 EMIT 244 EMIT 245 EMIT 246 EMIT 247 EMIT 248 EMIT 249 EMIT will display the LYNX logo.

To give an example, imagine we are writing a card playing game and wish to define a "diamond". First create a bit pattern :-

BITS	HEX.
000000	00
000000	00
000100	04
001110	0E
011111	1F
001110	0E
000100	04
000000	00
000000	00

Then, UDG DIAMOND 00 00 04 0E 1F 0E 04 00 00

If you now type DIAMOND, a diamond will automatically be displayed at the current cursor position.

For the technically minded, UDG is a defining word, its action is to create a new word with graphic attributes. UDG sets up a dictionary header with code pointing to the graphic output routine, smudges the header and executes CODE (normally used for machine code definitions), which allows a string of HEX bytes to be typed and compiled into the dictionary. Thus if you accidently type <RET.> before keying in all 10 bytes, type CODE and then any remaining bytes. The graphic output routine sets GRAPHIC to point to the first byte of the graphic

character to be displayed, displays ASCII 128 and resets GRAPHIC to its default value, this is why the block graphics are available alongside any user defined graphics.

Graphics and normal characters can be positioned with AT (Camssoft Forth) and the current cursor position examined with POS and VPOS. CBS-FORTH unfortunately only provides X and Y which return the addresses of the x and y co-ordinates, you must use CI to set and CE to examine the cursor positions, alternatively you may define AT HPOS and VPOS as follows :-

```
: AT Y CI X CI ;
: HPOS X CE ;
: VPOS Y CE ;
```

CBS-FORTH in addition provides WX and WY for setting horizontal and vertical window co-ordinates and WI to restore the window to the normal BASIC default.

Lastly I would like to say a word about control codes. For both versions of FORTH, control codes may be sent to the screen via use of EMIT (e.g. 4 EMIT will clear the screen). An apparent bug in Camssofts FORTH allows the use of the CONTROL key, (normally disabled in CBS-FORTH) during keyboard input, which means you can mess the screen up in a rather meaningless way if you want to.

MIKE LEIGH

FORTH CIRCLES (part 2)

\*\*\*\*\*

A game could well have this structure :-

```
: GAME INTRO BEGIN SETUP INST SCORE .
      " Another game ? " GETN B9 = WHILE
      REPEAT ;
```

INST is the main loop taking instruction from the player; one of the options is to shoot a ray at a target.

: RAY AIM HIT? IF Ray OUTCOME ELSE MISSED THEN; MISSED doesn't do anything yet, but when I decided whether I want it to print a message, make a rude noise, play the national anthem or whatever, all I have to do is to define MISSED accordingly and slot it in; the rest of the program is not affected.

Here is Ray :-

```
: Ray ( x,y-- ) 2DUP NEXT.INK b CIRCLE NEXT.INK
  3 CIRCLE ( draws circles radius b pixels
  and 3 pixels at same centre x,y with
  colours specified by NEXT.INK ) ;
```

Which is what I wanted CIRCLE for in the first place

I hope this shows how FORTH programs can be built up. The highest-level word can be thought of as corresponding to the "core" of a structured BASIC program; INST and RAY are equivalent to PROCedures and their sub-routines; the next level (Ray) we can think of as being like a line or group of lines of BASIC, and the lowest levels correspond to the pre-defined BASIC statements used within lines.

A L SHAW.

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