COMPETITION EDITION

TRS8BIT

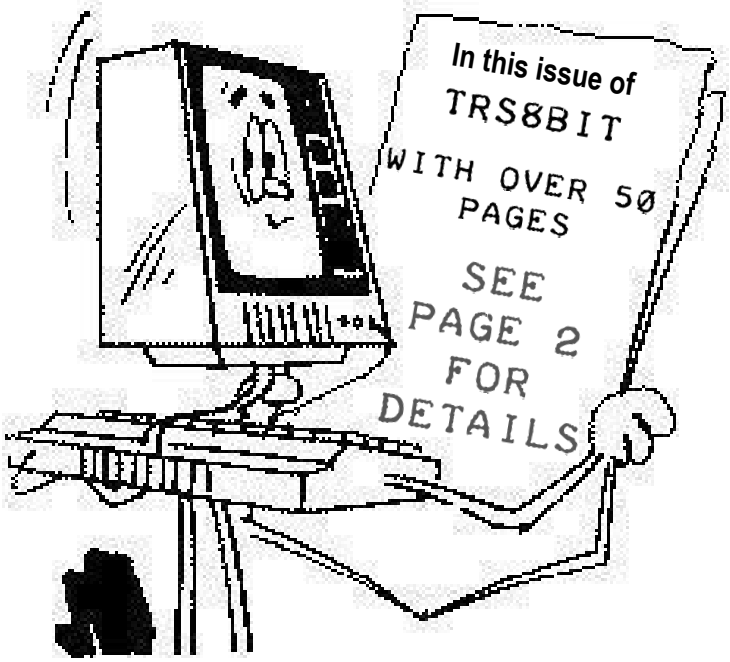
PRODUCED AT TRS-80.ORG.UK



HI EVERYONE AND WELCOME TO THIS EDITION OF TRS8BIT, THE START OF OUR 12TH YEAR.

WE'VE HAD QUITE AN EXCITING TIME HERE AT TRS8BIT DURING JANUARY. WHEN THE ONE LINER BOOKLET WAS PUBLISHED WE HAD OVER 1000 VISITORS TO THE WEBSITE ALL IN A COUPLE OF WEEKS! THANKS TO EVERYONE WHO VISITED AND DOWNLOAD A COPY OF THE BOOKLET. THANKS ALSO FOR ALL THE KIND COMMENTS I RECEIVED VIA EMAIL. IT REALLY WAS QUITE AN AMAZING FEW DAYS.

I MANAGED TO FIND A M2 KEYBOARD THANKS TO GAZZA AND ERROL IN AUSTRALIA. MANY THANKS FOR YOUR HELP GUYS. I'VE NOW PLACED THE M2 BITS WITH 'BETAGAMMA COMPUTING' WHERE IT'S IN A QUEUE AWAITING BAS TO APPLY HIS USUAL MAGIC.



THERE HAS BEEN QUITE AN AMOUNT OF U.K. EBAY ACTIVITY DURING THE LAST 3 MONTHS WITH YOURS TRULY, WINNING A COPY OF M2 SCRIPSIT COMPLETE WITH DISKS AND MANUAL FOR THE TRULY AMAZING PRICE OF £1.20 THERE ARE HIGHLIGHTS OF SALES ON PAGE 48.

TIM MANN'S WORK IN PROGRESS IS NOW HOSTED ON GITHUB. HE REPORTS THAT, CURRENTLY, COMPARED WITH THE STABLE XTRS 4.9D RELEASE, THE GITHUB VERSION INCLUDES AN OPTIONAL GTK GUI (INCOMPLETE BUT USABLE), EMULATION OF THE EXATRON STRINGY FLOPPY (NEEDS MORE WORK AND DOCUMENTATION TO BE USABLE), A BATCH OF CODE AND DOCUMENTATION PATCHES FROM BRANDEN ROBINSON (THANKS!), AND A FEW OTHER FIXES AND CLEANUPS.

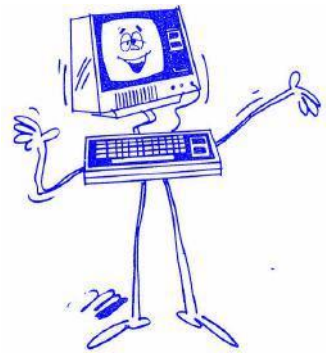
PETER CETINSKI HAS RELEASED EPISODE 21 OF TRASHTALK AND A **TANDY ASSEMBLY** FOR **2018** IS DUE TO BE HELD IN SPRINGFIELD, OHIO ON THE 13/14 OCTOBER. CHECK THE T.A. WEBSITE FOR FURTHER DETAILS.

AS YOU CAN PROBABLY GUESS BY THE BANNER ACROSS THIS PAGE, THERE IS ON PAGE 47 DETAILS OF THE 2018 COMPETITION. MAV HAS VERY GENEROUSLY DONATED A FANTASTIC PRIZE WHICH I HOPE WILL ENCOURAGE YOU ALL TO 'HAVE A GO'.

SO UNTIL JUNE - TAKE CARE EVERYONE

DUSTY





CONTENTS

PAGE 03 IN MAV'S WORKSHOP
IAN MAVRIC
USING CO-CO DISK DRIVES ON THE M1,3 AND 4

PAGE 07 FROM .JPG TO /BAS IN EAST STAGES
JUST ONE OF THE WAY I USED TO CREATE
'NORMAL' /BAS FILES FROM A .JPG IMAGE

PAGE 10 A REVIEW OF THE 'COLOUR GENIE'
SIMON GOODWIN - COMPUTING TODAY, MARCH 1983

PAGE 16 IN MAV'S WORKSHOP
IAN MAVRIC
TRS-80 PRINTER - LINEPRINTER VI, DMP400/20

PAGE 25 BINARY COUNTDOWN
ET FONEHUME
ET STARTS OF, WHAT HE HOPES WILL BE VOL. 2 OF
TRS-80 ONE LINERS, WITH THIS VERY NEAT COUNTDOWN

PAGE 27 POSTCARDS TO THE EDITOR
THE 1ST EVER TANDY POSTCARD I'VE RECEIVED !

PAGE 29 THE FREHDAPTER
GAZZA
WANT TO CONNECT YOUR VIDEO GENIE OR SYSTEM-80 TO
A FREHD? THIS IS JUST WHAT YOU'VE BEEN WAITING
FOR.

PAGE 37 IN MAV'S WORKSHOP
IAN MAVRIC
IAN COMPLETES HIS TRS-80 FARMING ARTICLES

PAGE 47 *** C O M P E T I T I O N P A G E ***

PAGE 48 EBAY.CO.UK REVIEW

PAGE 49 "DEAL OR NO DEAL"
ALAN WALLACE INVITES YOU TO PLAY!

PAGE 51 IN MAV'S WORKSHOP
THE MODEL 4 ROUNDUP

In Mav's Workshop

Using Coco disk drives on the Model I/III/4

by
Ian Mavric

Old mate Jay Newirth emailed me asking if he could use a Coco disk drive on his Model I system. It's been well established for a long time that the early Coco disk drives work well on the Model I, you just plug them in, insert a Model I DOS disk and boot.
This works for the early grey TEC Coco drive (cat. no. 26-3022/3023) as well as the later white TPI Coco drive (cat. no. 26-3029), just use the Model I cable. Things get a little more complex when you want to use the later Coco FD50x series disk drives, and this article talks about a quick and easy way to connect them up to your Model I/III/4.

THE COMPELLING CASE FOR FD50x DISK DRIVES

Starting in 1985 the FD500 disk drive was released for the Coco, and it marked a change away from the old full-height disk drives to the new half-height disk drives which were cheaper to make and consumed less power.
Instead of being mounted vertically, they now mounted horizontally in a neat little case which easily allowed adding a 2nd disk drive, and a by-product of the design was a neat place to sit your tape recorder on. I have used a FD500 for more than 20 years connected to my Model I, though the drives themselves have been changed over the years. The setup neatens up the rather messy setup of the Model I just a little bit.

In 1986 the FD501 was improved further and became the FD501, and finally in 1987 the drive was improved once again by installing double-sided disk drives and renamed the FD502. All are quiet, and with the exception of the FD500, reliable drives. All three come up regularly on eBay making them easy to snap up and use on your early TRS-80.

CABLE DIVIDER BETWEEN 3/4 AND 5/6

When the Model I was released there was no such thing as a keyed floppy connector cable. Indeed for a long time there was seen to be no need for it because the worst that could happen was if you plugged the cable in upside down the disk drive motor and activity light would come on, indicating you need to unplug it, turn it around and try again.

As the 80s progressed attempts were made to try to power disk drives through the data cable, feeding 5V to pins 3,5,7,9,11 and 12V on pins 29, 31, 33. Plugging this one upside down could damage the disk drive so a key was put into the cable between pins 3/4 and 5/6, and a matching slot cut into the 34-way PCB connector on the controller and disk drive. It was felt that this would be foolproof enough that people would not be able to damage their systems by plugging the cable the wrong way. As it turned out, most manufacturers didn't go down the path of putting 5V and 12V down the data cable, the only computer I can think of which has that arrangement is the Tandy 1000TX.

Once the keyway became ubiquitous in the computer world it also appeared on the FD50x series cables which are built into the disk drive unit, and in the case of the FD502, wasn't even a ribbon cable anymore but a bunch of collected wires (34 of them) in a circular cable holding tube. Tandy's solution for this was to cut a matching slot into the floppy connector on the FD50x controllers. The same solution can be used to connect the FD50x drives to Model I/III/4.

ONE CUT AND THE PROBLEM IS SOLVED

The picture below show an Expansion Interface circuit board removed from the case. J5 is the floppy connector and we can clearly see pin identification numbers 2 and 34. All that needs to be done is to cut a slot between pins 3/4 and 5/6.

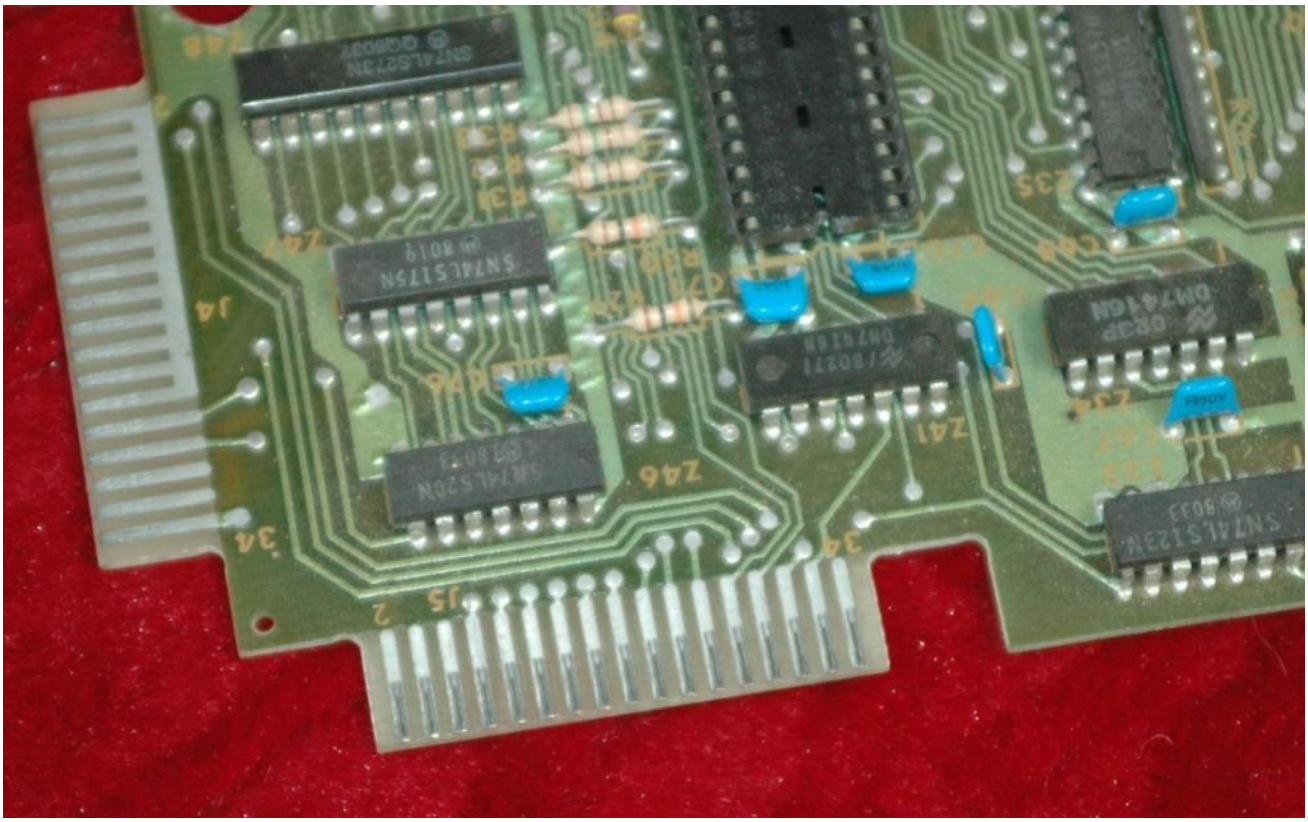


Photo: EI floppy port (J5)

To achieve this I used a plain Stanley hacksaw. It will cut through the fibrous material the PCB is made from very easily to go slowly in a downward motion, it should only take about three strokes.



Photo: Stanley standard hacksaw.

The hacksaw blade is just the right width to neatly cut a slot between pins 3/4 and 5/6, so you are aiming to get the first 4 pins (2 per side) separated from the rest of the connector:

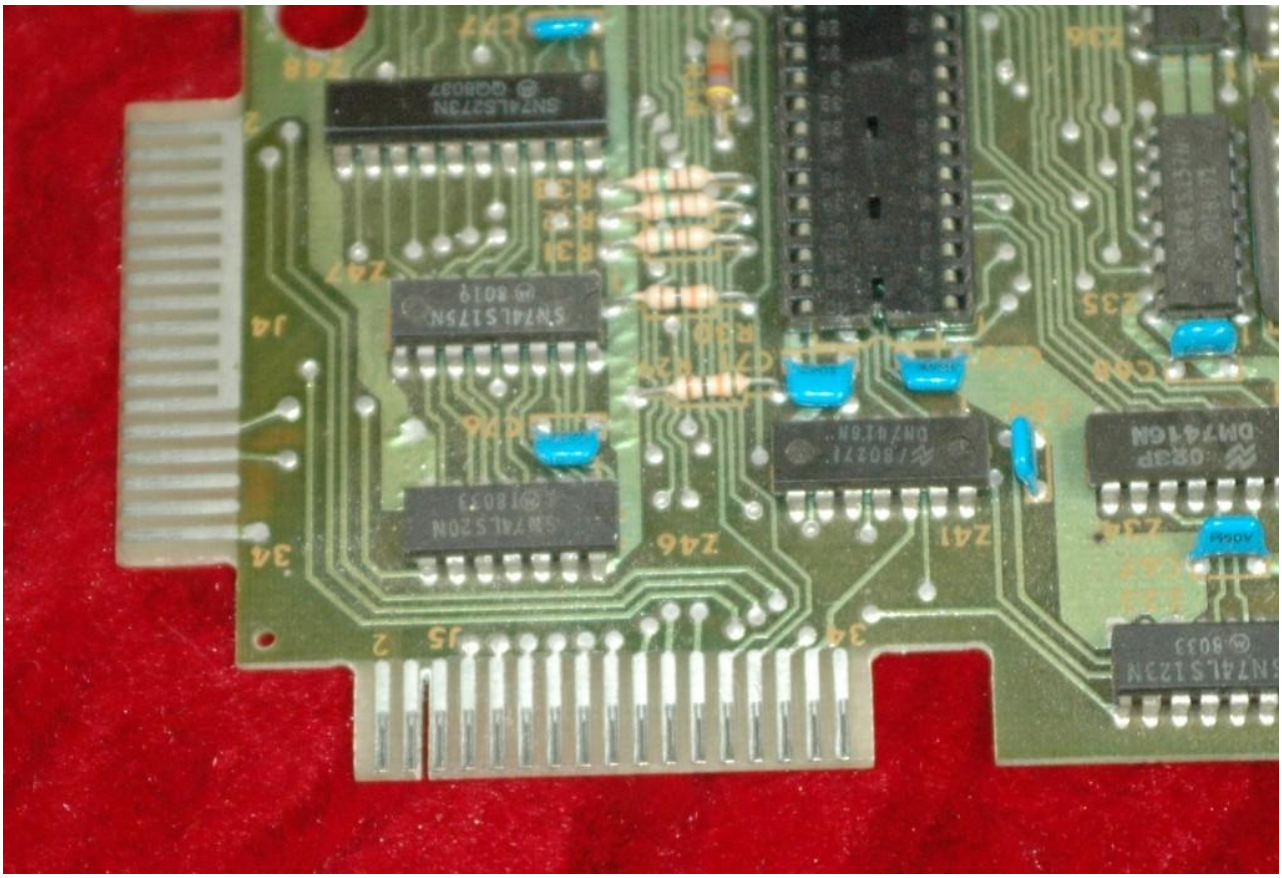


Photo: slot cut into floppy connector (J5)

Check the solder side of the EI circuit board and make sure you haven't cut right through the ground plane which connects all the odd numbered pins together:

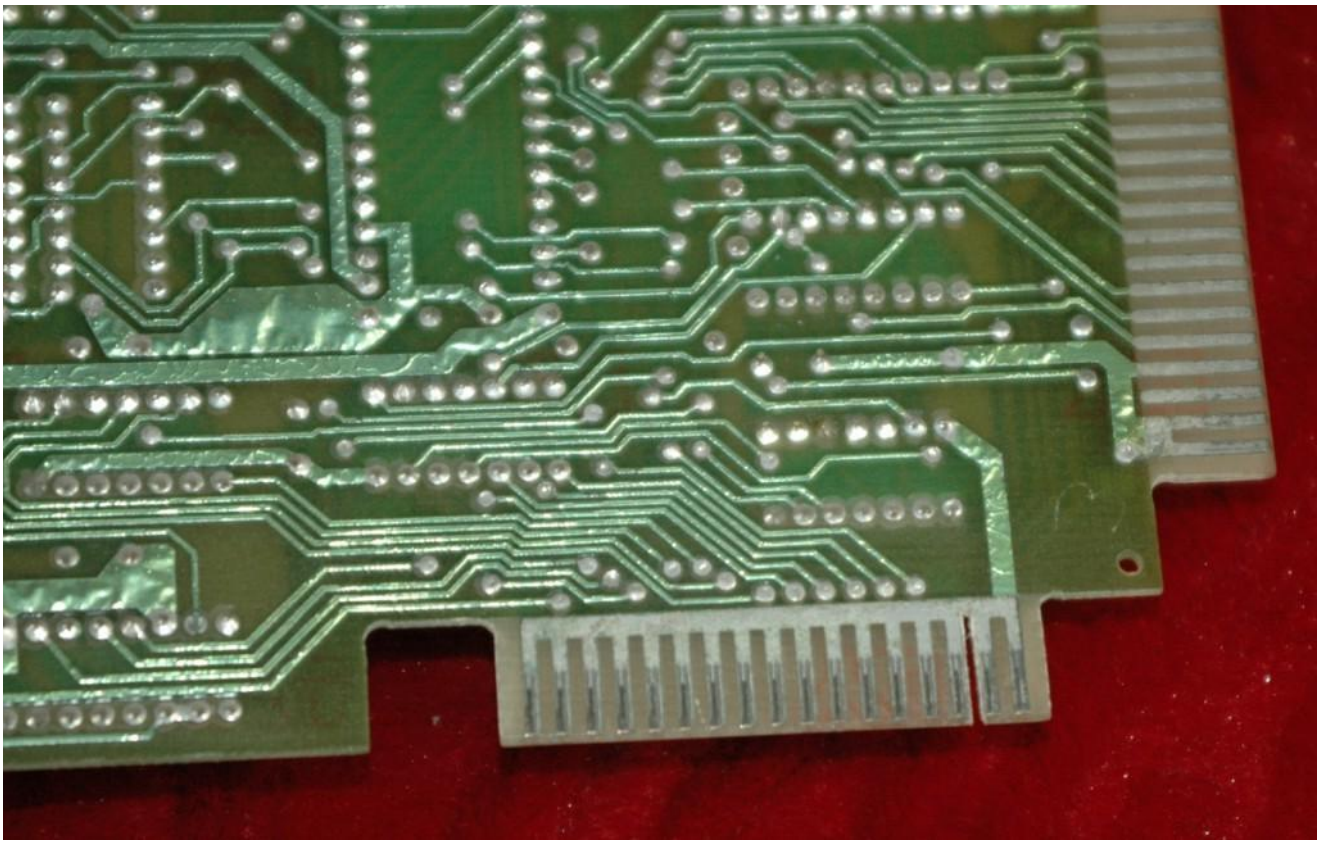


Photo: underside of the slotted J5 floppy connector

And there you have it, now the Coco FD50x disk drives will connect to the Model I.

MODEL III AND 4

The Model III and 4, and even the 4D, all have the same style of external floppy connector and the same solution can be used to connect external disk drives to those systems. In this case the drives become #2 and #3 (the internal drives being #0 and #1).

CONCLUSION

As supplies of good working early upright disk drives for the Model I dry up, adding the Coco disk drives makes sense. Rather than making new (potentially) expensive cables, this simple slot solves an annoying problem.

ianm@trs-80.com



Ian Mavric is an IT Specialist who also restores and collects TRS-80's and classic cars. He live with his wife and kids in Melbourne, Australia.



FROM .JPG TO /BAS

ONCE THE CHRISTMAS EXCITEMENT HAD DIED DOWN, THE GRANDKIDS HAVING GONE HOME, TIME SOON STARTS TO DRAG A BIT. I DECIDED THAT A LONG-AWAITED IDEA I'D BEEN MUSING OVER WITH, A COLLECTION OF THE TRS8BIT 1 LINERS, REALLY SHOULD BE INCLUDED IN MY NEW YEARS RESOLUTIONS LIST.

I SET ABOUT CREATING AN A4 BOOKLET AND DECIDED THAT IT WOULD BE NICE TO INCLUDE THE ACTUAL PROGRAMS AS WELL, BUT ALSO IN A USABLE FORMAT, AT LEAST FOR MATTHEW'S EMULATOR. I.E. NOT JUST A .JPG FILE.

MOST OF THE 1 LINERS FROM THE EARLY EDITIONS OF TRS8BIT WERE ONLY AVAILABLE AS .JPG IMAGES, SO, MY NEXT THOUGHT WAS, IS IT POSSIBLE TO CONVERT A .JPG IMAGE INTO A /BAS FILE? I DECIDED TO 'HAVE A GO', NOT HAVING HEARD RECENTLY OF ANYONE DOING IT. HENCE THE TITLE OF THIS LITTLE PIECE. IF IT'S OLD HAT TO YOU, PLEASE FORGIVE ME, BUT I DARE SAY, IT MUST BE NEW TO SOMEONE, SOMEWHERE.

I DECIDED TO USE SOFTWARE THAT I ALREADY OWNED, OR ANY FREEWARE THAT WAS AVAILABLE SO I DIDN'T NEED TO COMMIT TO ANY HEAVY EXPENDITURE. (WHO SHOUTED 'TIGHT OLD GIT'?)

THE PROGRAMS I DECIDED TO USE WERE :-

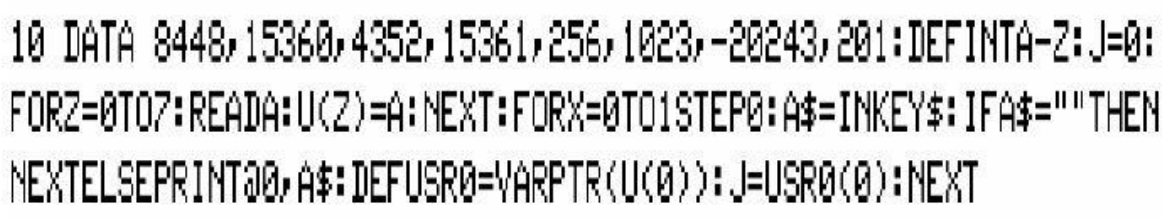
FOR GENERAL TIDYING AND EDITING THE ORIGINAL .JPG FILE - IRFRANVIEW. AVAILABLE FROM HTTP://WWW.IRFANVIEW.COM/

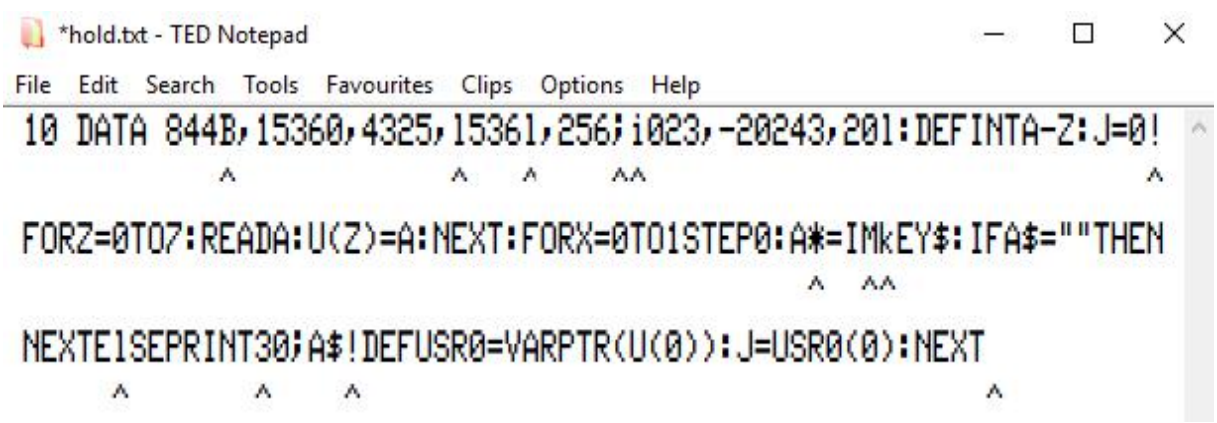
FOR CONVERTING THE .JPG TO A .TXT FILE - ABBYY FINEREADER "SPRINT" V9.0. AVAILABLE FROM HTTPS://WWW.ABBYY.COM/

FOR EDITING AND ERROR CORRECTION OF THE .TXT FILE - TED NOTEPAD. AVAILABLE FROM HTTP://JSIMLO.SK/NOTEPAD/

TO LOAD A .TXT FILE ON TO A .DSK IMAGE - THE OBVIOUS CHOICE WAS MATTHEW REED'S TRS-TOOLS WHICH EASILY COMPLIMENTED MATTHEW'S TRS32 EMULATOR. BOTH FROM WWW.TRS-80.ORG

BY WAY OF EXAMPLE, I'M USING ONE OF THE 1 LINERS FROM THE RECENT COLLECTION OF 1 LINERS FOR THE M1 (STILL AVAILABLE FROM THE DOWNLOADS PAGE AT TRS-80.ORG.UK).
HERE IS THE ORIGINAL .JPG IMAGE AND BELOW IS THE TEXT FILE CREATED BY ABBYY 'SPRINT'. I'VE HI-LIGHTED WITH A CHEVRON, WHERE THERE ARE A COUPLE OF PROBLEMS.

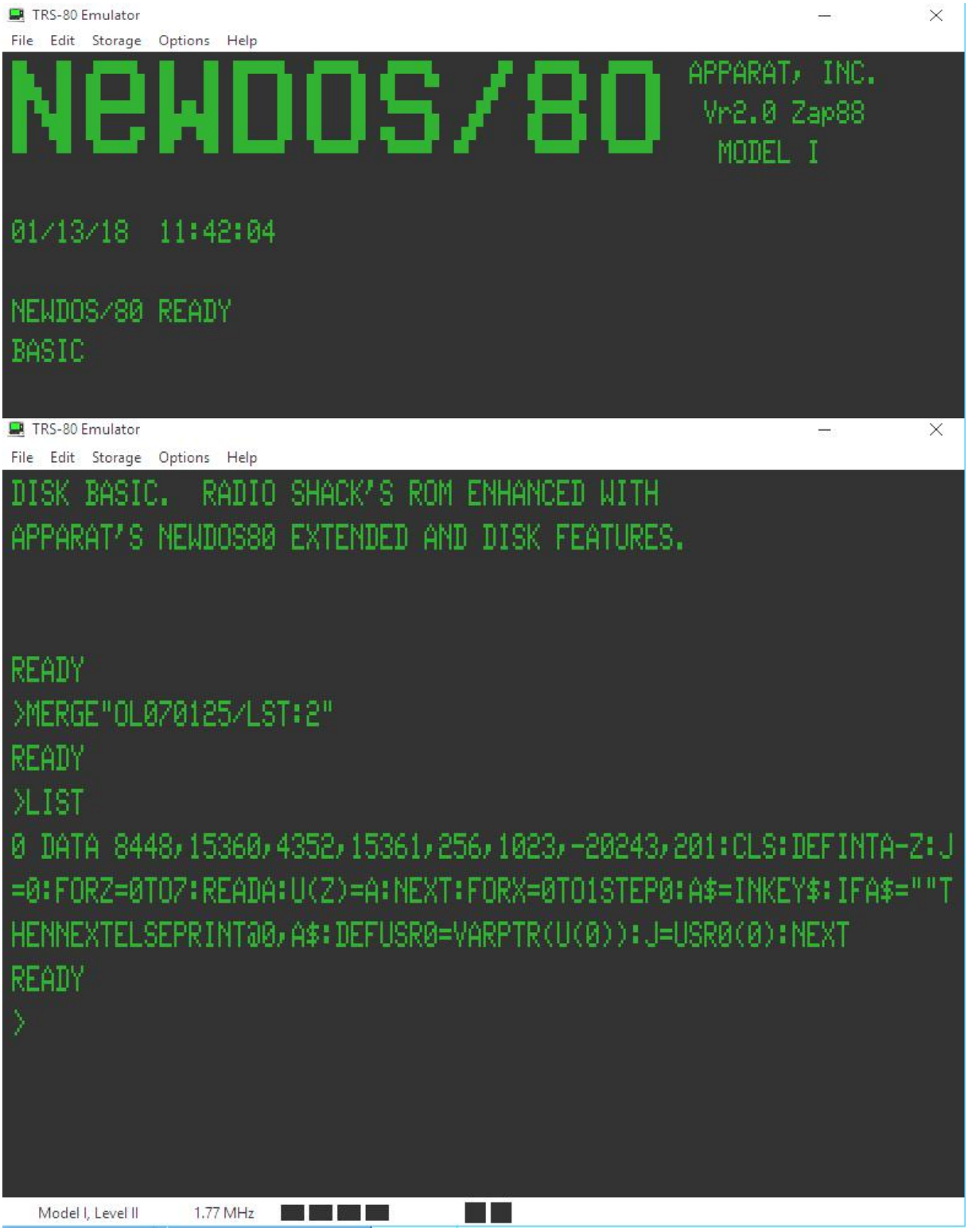




MOST OF THE MISS-READS ARE VERY EASY TO SPOT AND CORRECT, BUT JUST A COUPLE ARE RATHER SNEAKY!
LOWER CASE 'L' AND '1' ARE EASY TO MISS BUT TED NOTEPAD HAS A 'CASE CHANGE' OPTION SO THAT IS EASILY TAKEN CARE OFF.
IT'S ALSO IMPORTANT TO CHANGE ALL LOWERCASE ENTRIES BECAUSE, THE M1 WILL RECOGNISE THAT 'L' AND 'SHIFT/L' ARE DIFFERENT (EVEN IF THERE IS NO LOWERCASE MOD ON THE COMPUTER) AND THESE CAN BE **VERY** DIFFICULT TO FIND WHEN EDITING A PROGRAM WITHIN BASIC.
I'VE ALSO HIGHLIGHTED THE LAST CHARACTER IN THE TEXT FILE BECAUSE THE M1 WILL REQUIRE AN END OF FILE MARKER, A HEX 'ØD' AND NOT ALL EDITING SOFTWARE WILL DO THIS. ONCE AGAIN, THERE IS AN OPTION IN TED NOTEPAD TO TAKE CARE OF THIS, JUST TYPE CTRL/ENTER.
WHEN YOU'RE HAPPY WITH THE FILE, EXPORT (NOT SAVE) THE FILE AS 'ANSI' TEXT. YET ANOTHER TED OPTION. YOU CAN PERHAPS APPRECIATED WHY I LIKE 'TED'.

THE NEXT STAGE, PUTTING THE TEXT FILE ON A VIRTUAL DISK IS VERY EASY, THANKS TO MATTHEW'S 'TRSTOOLS'. JUST CLICK ON EDIT, THEN CLICK ADD AND MAKE SURE YOUR FILE NAME IS TRS-8Ø COMPLIANT. I.E. 8/3 CHARACTERS. I ALWAYS USE /LST AS THE EXTENSION FOR TEXT FILE. JUST AN OLD HABIT, FROM THE DAY.

THEN LOAD UP THE TRS32 EMULATOR, (AGAIN FROM MATTHEW). MAKE SURE THE CORRECT DISK IS LOADED IN THE EMULATOR.
LOAD BASIC, (I STILL HAVEN'T MOVED FROM NEWDOS TO LDOS, AS YOU CAN SEE FROM THE IMAGES OVERLEAF).
TYPE - MERGE "FILENAME/EXT"
THEN - LIST AND CHECK ALL SEEMS OK
IF THE PROGRAM RUNS OK AND YOU'RE HAPPY WITH IT, SAVE AS A BASIC PROGRAM, JUST AS NORMAL.



THERE ARE JUST A COUPLE OF OTHER POINT I NEED TO MENTION. IF THE PROGRAM YOU ARE 'MERGING' HAS HAD EXTRA CHARACTER WITHIN THE LINE INSERTED, USING THE EDIT COMMAND, THE MESSAGE, "DIRECT STATEMENT IN LINE" IS DISPLAYED AND THE FEW 'ADDITIONAL' CHARACTERS WILL BE MISSING FROM THE END OF THE LINE AND WILL NEED RE-ENTERING.

SECONDLY, THE MERGE COMMAND IS ONLY AVAILABLE IN DISK BASIC.

Simon Goodwin

PAINTING BY NUMBERS

The latest offering from the company that brought you the rival for the TRS-80 is a colour computer for the home market. Will its magic shine through against the strong opposition?



The Colour Genie is the second computer from Hong Kong box-makers EACA. It follows the Video Genie, a computer which closely resembled the TRS-80 (to the extent that the memory-maps and ROMs were almost identical).

The Video Genie (later modified and renamed 'GENIE I' and 'GENIE II') has sold quite well in the UK through the importers Lowe Electronics, an amateur-radio firm turned computer-shack. Since that machine was introduced it has been undercut and outperformed by a wide variety of cheaper computers. The BBC Micro, Sinclair ZX Spectrum, Dragon 32 and other machines have arrived on the UK computer scene and the market for personal computers has shifted from the hobbyist to the home market. EACA have responded to that challenge by producing a new, cheaper machine aimed fair and square at the market-slot occupied by the VIC, Dragon, Atari and BBC computers.

OVERVIEW

The Colour Genie is supplied with a demonstration cassette of programs and leads to connect it to a UK colour or black-and-white TV set, a standard cassette-recorder (motor-control is not provided) and the 240V mains. The computer contains 16K of ROM BASIC and 16K RAM memory, with connections ready for optional joysticks, parallel for serial printers and a Hi-Fi amplifier. It contains a modern graphics chip and a sound-generator similar to the one used in the BBC Micro (need I say more!). A 'bus' connector will eventually allow the computer to control discs, although the appropriate controller is not yet on the market, the original Video Genie Expander is *not* compatible with the Colour machine.



The Colour Genie keyboard features the available graphics character set clearly market *a là* VIC-20.

HARDWARE

The Colour Genie is similar in appearance to the Commodore VIC computer, although slightly larger in each dimension. This resemblance is emphasised by the presence of four user-programmable keys on the right-hand side of the keyboard, and the preset graphics legends on the front faces of some keys. It is possible to program the user-keys to generate any sequence of up to seven characters, with an optional automatic Return at the end of the sequence. Graphics are obtained by pressing the 'Mode Select' key and then the appropriate sequence of letters.

Unlike its competitor the Dragon 32, lower-case (small) letters can be entered from the Genie keyboard. A ratchet-action Shift lock button is provided to select capitals only, but this unfortunately acts upon the numeric keys as well, meaning that the user must release 'Shift lock' button is provided to select capitals only, but this unfortunately acts upon the numeric keys as well, meaning that the user must release 'Shift lock' while typing in numbers. A repeat key generates the last key pressed over and over again when it is selected — useful when editing or filling graphics strings — and the clear key can be used to blank the screen and move the cursor to the top left-hand corner of the display.

Four 'arrow' keys are useful for cursor movements in games and a Control key permits graphics and colour selections. The usual Return key marks the end of a line and Break can be used to halt BASIC programs. The original Genie had a hardware reset button on the back panel, useful for stopping machine-code programs or escaping when the computer decides to wait for messages from a non-existent device (such as a printer). The Break key will not work in these cases since the computer will be devoting all its attention to the machine-code.

The Colour Genie reset button has been relocated so that two but- ▶

tons on either side of the keyboard must be pressed simultaneously before the machine will reset. That is a sensible precaution since an accidental reset could halt a program in the middle of a statement, making continuation impossible. The reset is, however, quite forgiving, since it does not delete the program unless the 'R' key is pressed as well as both of the other buttons.

The television or colour monitor display is handled by a specialised Hitachi controller-chip. Curiously, slightly fewer colours are available when using a monitor. The computer performed creditably on both black-and-white or colour televisions, although older sets tended to blur the colours and lines slightly. The picture produced was comparable with that from a ZX Spectrum, only slightly inferior to the colour display of a BBC Micro.

The new Genie has two graphics modes. Text mode allows 16 colours to be displayed at once on a 40 by 24 grid of characters, while the other mode allows medium resolution graphics with 160 by 96 point resolution. Four different colours can be used on the medium resolution screen, and the colour of each point can be set individually.

In text mode the use of colour is more limited, since each character position may contain only one colour on a black background. The pattern of 8 by 8 dots in each character position can be varied by POKEing binary values into reserved memory, allowing 128 user-defined characters similar to those on the BBC Micro or VIC-20. Quite attractive displays can still be produced in text mode, since it has, in effect, twice the resolution of the standard VIC display. Problems come when the graphics will not fit on a character grid — in this case the medium resolution screen is easier to use.

Technical notes about the display controller indicate that it has considerably more power than is used by the standard graphic modes. From these notes it appears possible for an ingenious programmer to modify the instructions given to the chip and hence increase the graphics resolution purely by software, although this would be a fairly complex process.

SOUNDING OFF

Sound on the new Genie is handled by another custom chip, almost identical to the one used in the BBC Micro. This allows three simultaneous notes to be sounded, along wih a 'noise' channel — useful for sound effects such as 'explosion in sandpit' noises. This is a very powerful device, and a connector on the back of the Genie allows the user to connect the computer to a Hi-Fi system if required. BASIC commands allow direct access to the registers in the controller, making a wide variety of effects possible. Unfortunately the only waveform which can be generated is a square-wave, giving all of the sounds a rather 'reedy' tone.

The cassette system works at 1200 baud, which means that a 4K (4000 character) program can be saved or loaded in about 35 seconds. That rate is more than twice as fast as the original Video Genie, but, along with format changes, it unfortunately means that tapes written by its predecessor cannot be read by the Colour computer. A program has been written to allow an old-model Genie to generate tapes for one of the new machines, and it is hoped that a similar program can be produced to run in the Colour Genie, allowing tapes of the old format to be read. The time-constants used by the cassette routines are, most sensibly, stored in RAM so it is possible to POKE new values and modify the speed of the interface accordingly. Rates much higher than 1200 baud could certainly be used for transfers between machines.

The claim that the Colour Genie contains both a parallel and serial interface is a half-truth, hardly surprising in view of the low price of the machine. The serial interface consists of little more than a facility to set and test the voltage levels of two wires from the machine. There is no software support for the interface and no documentation of its facilities. The Colour Genie would support 'software RS232' in which a new machine code program would handle all of the timing needed for serial communication. Existing owners may be interested to know that the interface is wired to port 255 — bit one is used for input and bit two for output.

The parallel port is designed for connection to a dot-matrix printer. The ROM contains routines to communicate with it, using LPRINT and LLIST from BASIC, but an external adaptor is needed to generate signals for a standard Centronics printer.

The processor in the Colour Genie is a Z80, running at 2.2 MHz (30% faster than the TRS-80 or Video Genie). This choice is unusual for a home computer — all the computers listed above with the exception of the ZX Spectrum use the Motorola-style 6502 or 6809 processors, and the Z80 in the Colour Genie belies the similar name and parenthood of Tandy's Color Computer. They are completely different machines.

THE BASIC

Colour Genie BASIC is derived from the original Microsoft BASIC interpreter for the long-gone Altair computer. That interpreter has been modified and used in the TRS-80, NASCOM, and CP/M MBASIC, making it one of the most popular interpreters in existence, with over half a million copies in circulation.

Altair BASIC was an 8K program written in machine code for the 8080 processor. Most computers now running it use the more powerful Z80 processor, which can run 8080 programs (although some of its power is consequently wasted). The Genie ROM occupies 16K, and is written in a mixture of Z80 and 8080 code. The bottom 12K closely resembles the extended cassette BASIC of the TRS-80, although there have been a few changes to hook in an extra 4K of graphics, sound and utility routines.

Altair BASIC was an 8K program written in machine code for the 8080 processor. Most computers now running it use the more powerful Z80 processor, which can run 8080 programs (although some of its power is consequently wasted). The Genie ROM occupies 16K, and is written in a mixture of Z80 and 8080 code. The bottom 12K closely resembles the extended cassette BASIC of the TRS-80, although there have been a few changes to hook in an extra 4K of graphics, sound and utility routines.

EACA have tried hard to preserve compatibility between the new ROM and the 12K BASIC in earlier Genies. They have been fairly successful, although there is one annoying inconsistency. The old read character, print and display routines can all be entered at their original addresses, but there has been one change. The display routine now 'forgets' the character after it has been printed. Consequently any program that displays a character and then acts on its value will no longer work. The original ROM used to retain the character code after a call to 'display', so that many programs must be converted to save and restore the value. That can force major alterations. EACA have even left in some of the old TRS-80 bugs, although they are presumably not important since half a million users have been able to put up with them!

Old and new Genie users might be interested to discover that their computer issues an error message when asked to find VAL("%"), whereas VAL works perfectly for

any other non-numeric character, returning the value zero.

Type SYSTEM and then press the Tab or right-arrow key repeatedly. After about twenty presses strange numbers start to appear on the screen. This is because BASIC has assumed that you will want to load a machine code program soon, and consequently it has moved the Z80 stack into the BASIC input buffer for safe-keeping. The TAB characters overwrite the computer's list of return addresses, so that it gets lost.

There is one new bug in the Colour Genie. When you turn the machine on it displays a MEM SIZE? message, asking the user to reserve memory for machine-code if required. A number is expected here, and strange things happen if you repeatedly type text instead!

Despite these minor idiosyncracies Colour Genie BASIC is a powerful language, allowing four different types of variable: strings (length 0-255 characters); integers (whole numbers between −32768 and 32767); and single or double-precision floating-point numbers. Variables are assumed to be single-precision, accurate to six decimal digits, unless declared otherwise. Double-precision calculations are carried out to an accuracy of 15 decimal places, but they take longer to process than single-precision and occupy more memory.

Integer variables are handled very quickly by the Colour Genie. If calculations can be carried out with whole numbers only (when extracting arrays elements, for example) integer variables can be twice as fast as single-precision.

Variable-names can be any length, although Genie BASIC will not distinguish them beyond their first two characters, so that GENIE and GEISHA would be treated as the same variable. Variable names must not contain imbedded reserved-words, which means that variables such as TO and XLENGTH are not allowed. Programs can be entered in capitals or lower-case letters — the Genie will automatically capitalise text outside strings and comments.

Genie BASIC allows arrays of every variable-type, and there is no limit to the number of dimensions other than the size of available memory. On a 16K Genie there is just under 10K free for BASIC programs after space has been reserved for the display and the interpreter's working storage. This can be increased to about 14K if the MODE SELECT key is held down when the computer is tuned on, since the machine will then assume that medium-resolution graphics are not required and the appropriate memory will be released. To avoid powering-down the machine the memory can be freed from the keyboard by pressing 'R', MODE SELECT and both reset buttons, all at once!

Normally the Colour Genie reserves memory for both the text and graphics displays, using up over 5K of RAM but allowing the user to skip back and forth between displays without losing either picture. The display modes are explained in more detail later in this review.

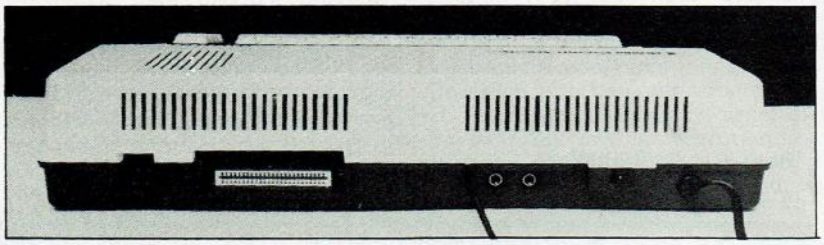
EDIT IT

Colour Genie BASIC allows program lines up to 240 characters long to be entered, and structures such as IF... THEN... ELSE enable the programmer to take full advantage of this facility. There is a line-editor built into the ROM. This allows the programmer to insert or delete text within a line, so that incorrect lines don't have to be retyped from scratch. Unfortunately this is not a proper screen-editor so it is not possible to duplicate or renumber lines using the EDIT command.

To call up the editor type 'EDIT line number', or 'EDIT .' if the line concerned has just been listed or entered. The '.' is an abbreviation for 'current line', and can be used in LIST commands — 'LIST.−' would list onwards from the current line, for example, and 'LIST 10−.' will list all lines between 10 and the current one. The Genie does not check the syntax of lines when they are entered, but it automatically sets up the current line and calls the editor if a syntax error occurs while a program is running.

Other abbreviations include ? for PRINT, ' (apostrophe) for :REM, and &H used to denote hexadecimal numbers — &H7FFF would be 32767, for example.

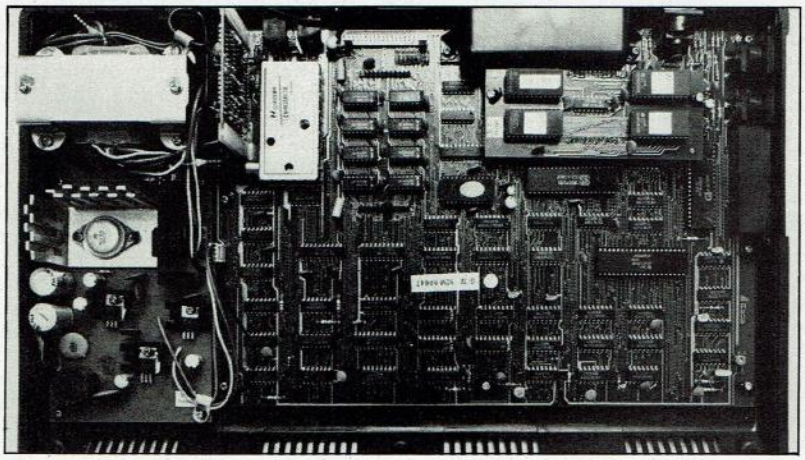
Error messages on the new Genie are rather odd — rather than issue error-numbers or English explanations, Genie reports take the



The rear of the machine offers plenty of I/O socketry, see Fig. 1.



FACTSHEET	Colour Genie	
CPU	Z80	
Clock	2.2 MHz	
ROM	16K	
RAM	16K	
Language	BASIC	
Keyboard	QWERTY 63 keys	
	Cursor controls	
	Four programmable function keys	
Display	Text mode: 24 by 40	
	16 colours	
	Graphics mode: 160 by 96 points	
	Four colours	
	128 user-definable characters	
Cassette I/O	TV or monitor output	
	1200 baud (can be software controlled)	
	Serial and parallel ports	
	Lightpen port	
	Cartridge/bus expander port	
	Audio output	
Options	16K RAM	£38.50 (inc VAT)
	Pair of joysticks	£49.49 (inc VAT)
	Lightpen	£17.25 (inc VAT)
	EG 603 printer	£270.25 (inc VAT)
	Discs	£TBA
Costs	Colour Genie	£224.48 (inc VAT)
Supplier	Lowe Electronics	
	Bentley Bridge	
	Chesterfield Road	
	Matlock	
	Derbyshire DE4 5LE	
	0629-4995	



The positioning of the video circuitry and modulator so close to the mains transformer leaves much to be desired.

form 'SN Error at 1010' or 'NF error'. Two character abbreviations indicate the error which has taken place, so that 'SN' would be short for 'Syntax', 'NF' means 'NEXT without FOR', (contrary to what right-wingers might tell you) and the ingenious '/0 Error' indicates that a program has attempted to divide by zero. The Genie can generate 23 such messages, and it takes a while to learn what they mean. They are an improvement over the 'WHAT?', 'HOW?' and 'SORRY?' of the early micros but it seems strange that EACA could not use some of the extra 4K ROM to include more helpful comments.

Colour Genie BASIC contains a few useful programming utilities including an AUTO command which can be used to generate line numbers in any regular sequence without the need for the programmer to type them in by hand. The RENUM instruction reorganises the line-numbers of the program in memory, evenly numbering the lines and correcting the target numbers of GOTO and GOSUB at the same time. BASIC provides an ON... ERROR... GOTO facility which means that program errors can be trapped without a return to the READY message. Two variable ERL and ERR are set up to contain the line number in which the error took place and a number corresponding to the type of error. Unfortunately the RENUM command does not correct references to ERL, which is rather annoying.

The BASIC is, on the whole very comprehensive, though it lacks facilities to handle user-defined functions or procedures. There is a full set of mathematical functions (unfortunately only accurate to six digits) and all of the usual string functions are there too. One function, VARPTR, allows the programmer to find the addresses of variables in memory. On the TRS-80 this feature has been used for a wide variety of subtle purposes, including high-speed graphics and linkages between BASIC and Z80 machine code. Two statements, CALL and USR, can be used to call up machine code routines previously POKEd into memory. It is possible to reserve memory above BASIC to leave room for such routines.

GRAPHICS

The Colour Genie features a quite extensive set of graphics commands, although it is annoying that their syntax is inconsistent — some of them require brackets around values while others object to them.

The colour of characters in the text mode can be selected by use of the COLOUR command. Sixteen different colours can be displayed on a TV, while a colour monitor will show only eight.

The FGR statement selects the medium-resolution graphics display. Normally it will show whatever was last plotted there, although FCLS can be used to clear that away. BGRD sets the background colour to pink, blue, orange or green, although black can replace pink if the NBGRD statement is used instead.

FCOLOUR selects the ink colour from the four possibilities, and then lines or circles can be drawn on the grid of 160 by 96 points.

It is possible to POKE tables of 'shapes' into reserved memory — each four bits of RAM stores the colour-code for a point (0-3) and a movement direction (up, down, left or right). A painstaking programmer can use this facility to set up complex designs and then move them across the screen with a set of SHAPE commands.

My favourite command is PAINT, which is used to colour in an area of the display. Simply draw a line around the area to be coloured and then PAINT into it. PAINT X, Y,C1,C2 starts from position X,Y, plotting points in colour C2 until a boundary in colour C1 is reached — just like emptying water into a pool.

SOUND

The sound generator in the Colour Genie can be controlled in two ways. A simple PLAY command is useful for music, while more complex effects can be generated by writing directly to the control registers of the chip using the SOUND instruction.

PLAY(CH,OC,NT,VL) will play a single note. VL is the volume (0-15) and CH is the channel number (1-3). At any time there can be a different note sounding on each channel, so that three-note chords can easily be generated. The pitch of the note is selected by NT, where 0 represents a rest and 1,2,3 represent the notes C sharp, D sharp, and so on. OC contains the octave number (1-8).

MANUAL

Much of the information above is not in the provisional manual for the Colour Genie — a hand-bound photocopied document that has accompanied early computers. A pair of printed manuals should be available soon, and a prospective purchaser would do well to ensure that these are available with a 'new' machine. Hopefully EACA have improved their technical writing since they produced the final manuals for the Video Genie system. Those were rather poor, and a set of TRS-80 manuals was needed to get the most from the machine.

Luckily TRS-80 manuals are available cheaply from Tandy shops — they documented many features of the original Genie which EACA did not mention, and may well be useful to users of the Colour Genie — from the point of view of BASIC only the display format has changed. With luck the new EACA manuals will make these purchases unnecessary, but it is useful to know that alternative documentation is available. Of course TRS-80 manuals will not cover features such as the Colour Genie sound and display.

SOFT OPTIONS

The future of the Colour Genie will be decided by the availability of software for the machine. The UK

distributors, Lowe Electronics, have announced that they do not intend to market software for the machine, and this decision could cost them a substantial share of the hobby market. The Colour Genie is a good computer, typical of its class although not oustanding. Colour Genie graphics are inferior to those of the cheaper ZX Spectrum, and the Dragon 32 boasts twice as much memory as the Genie.

Each of those machines also has disadvantages — the inferior keyboard and slow BASIC hamper the ZX Spectrum, while the Dragon 32 lacks lower-case characters. Both rival computers are outclassed by the Genie's sound generator. In practice it is the availability of software that will determine whether or not an informed hobbyist buys the Genie, and in this respect it currently lags behind all of its competitors.

There are a few encouraging signs for the new Genie. Many machines have been sold to people who used to own Video Genie or TRS-80 systems, and these people are well equipped to translate the vast library of TRS-80 programs onto the new computer. In theory this conversion should be quite simple — certainly a small fraction of the effort needed to write new software — and converted programs are already becoming available.

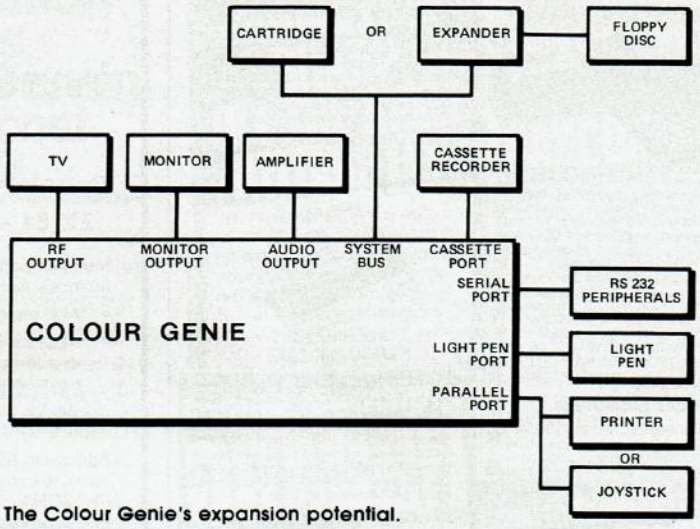


Fig. 1. The Colour Genie's expansion potential.

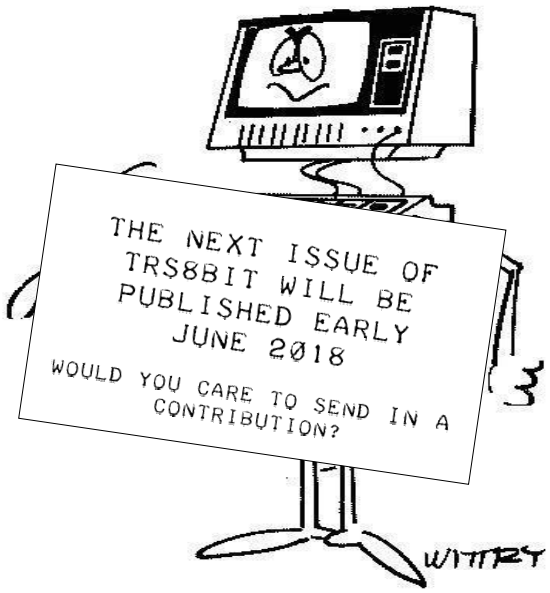
THANKS

We'd like to thank Marc Leduc for helpful information about the Colour Genie. He is an ex-TRS-80 user who has set out to tackle the software problem by forming a National Colour Genie Users Group. He has converted a number of machine-code programs for the Colour machine, including adventures, an assembler and arcade games. If you've already taken the plunge, he can be contacted on 0602-225165.

Benchmark	Time
BM1	2.6
BM2	11.1
BM3	25.2
BM4	26.0
BM5	29.1
BM6	48.0
BM7	73.2
BM8	10.5/100

Table 1. The Benchmark test results.

DRACO 64
BeaSomma Computing



Sharp 80:
TRS-80 Model III Emulator for Windows



This is a full-featured emulator of a TRS-80 Model III microcomputer. It is free of charge and all source code is publically available. It includes:

Complete and self contained with ROM and DOS built in
Faithful Z-80 CPU emulation (including undocumented opcodes -- passes all ZEXALL opcode tests)
Runs at standard 2.03MHz (or run up to 100MHz on a modern PC)
Bundled disk and tape library includes applications, utilities, operating systems, and games
Supports up to four virtual floppy drives, and all major virtual floppy formats (DMK, JV3, JV1)
Tape drive emulation supports high and low speed reading and writing (CAS format)
Windowed and full-screen modes with zoom
Authentic sound support
Built-in Z-80 assembler and disassembler
Real-time monitor of Z-80 CPU internals and IO device status
Printer to file support
Save the entire state of the computer with snapshots
Support for all video modes, including wide characters and Kanji mode

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IN MAV'S WORKSHOP

by Ian Mavric

TRS-80 PRINTERS FROM THE BEGINNING SERIES PART 4: LINE PRINTER VI, DMP-400, DMP-420

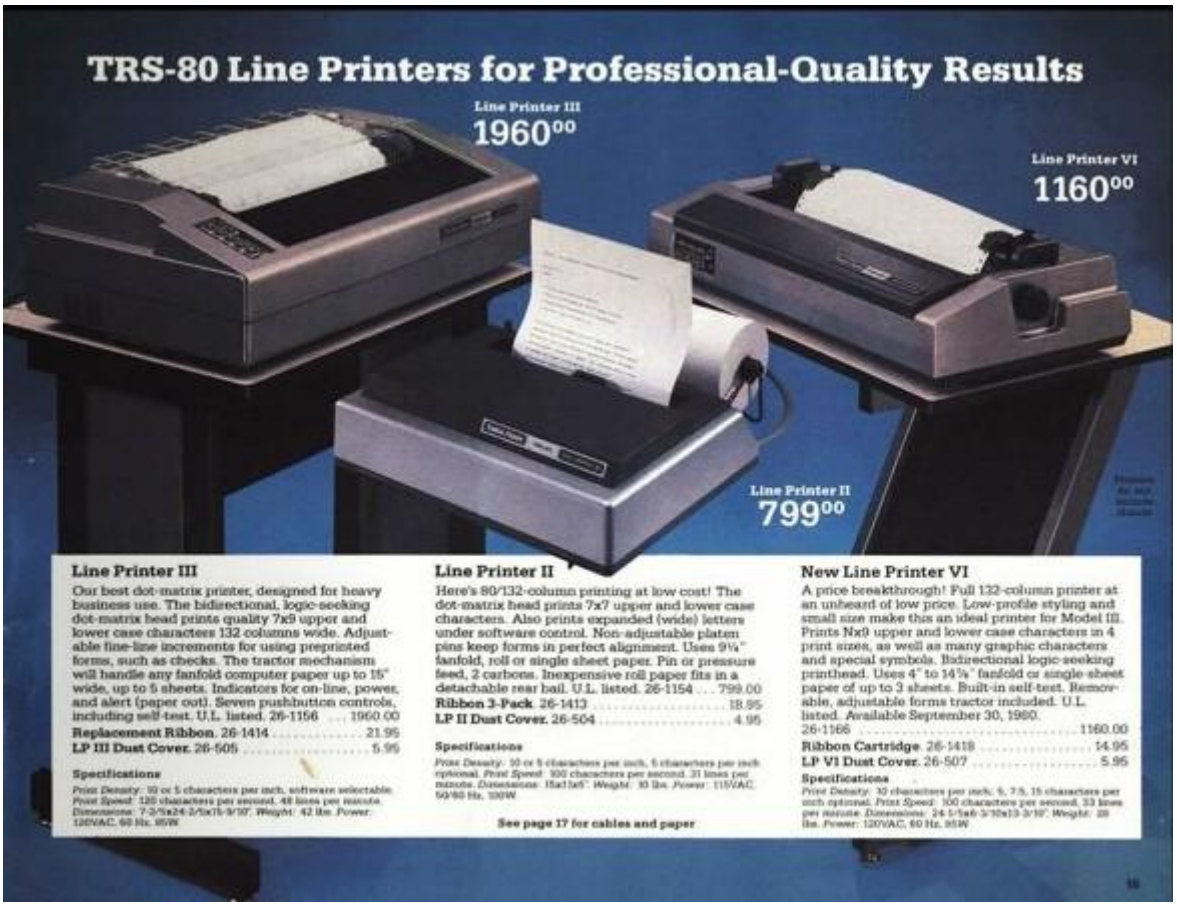


Last time I talked about the Line Printer III, V and DMP-500, Tandy's serious business printers. Large and fast, these expensive printers were designed for heavy office datamation and were over engineered for long life. A little too large and expensive for home use, they had superior print quality to the previous LP1 and LP2/4 printers. TRS-80 customer feedback indicated the market was ready for a 132-column printer that was smaller and cheaper than the LP III/V but didn't skimp on too many features. Tandy's answer was the Line Printer VI, which in this article will be referred to as the LP6. It would have to come in under the psychological $1200 barrier but at the same time, not be so good that it impacted on LP3/5 sales.



DESIGNED FOR SMALL BUSINESS

The advertisement below from RSC-4 shows a LP6 sitting next to a LP2 and a LP3. Where the LP2 approximates the size of 1980s Epson 80-column dot matrix printers, the LP6 is a full 132-column business printer. Paper handling was adjustable tractor feed which could be set to any paper width from 10cm (mailing labels) to 38cm (full 132 column "computer paper"). Like the LP3, there was no cut sheet feeder or practical way to feed single sheets of A4 or Letter paper. Print speed of the LP6 was 100 characters per second (down from 120cps for the LP3). It was also bi-directional which was something we took for granted by the mid 1980s but was pretty novel at the time. For those new to retro computing, bi-directional printing was when then print head can print in both directions, the first line with the head going right, then the next line with the head going left. The print head was a 7-pin which gave a pleasant print quality for uppercase printing, but lowercase letters lacked descenders. The target market for these printers, mainly inventory control, spreadsheets and ledgers, and scientific data output printing meant they were mainly going to be printing uppercase letters and numbers.



SPECIFICATIONS - 1980s STYLE

Taking another look at the picture above, you can see that the LP6 is physically much smaller than the LP3 to appeal to those who needed 132 column output in perhaps a smaller workspace. The LP6 could print up to 3 carbons. On a diet compared to the LP3 the middleweight LP6 weighed in at 28lb (or about 13Kg) and measured 61.5cm wide X 33.7cm deep X 16cm tall. That compares favourably to the heavy LP3 (42lb or around 23kg) and 62.5cm wide X 40.3cm deep x 18.7cm tall. Like all the previous printers it had a single parallel printer interface, and could connect to any computer with a Centronics compatible printer port.

DOES IT LOOK THE PART?

Any wide-carriage printer will look large compared to the computer it sits next to, however the LP6 does look rather more applicable to the size of the TRS-80s it was connected to as can be seen in these pictures below:



Photo: the LP6 even fits on the TRS-80 System Desk with the Model III



Photo: likewise with a Model II system

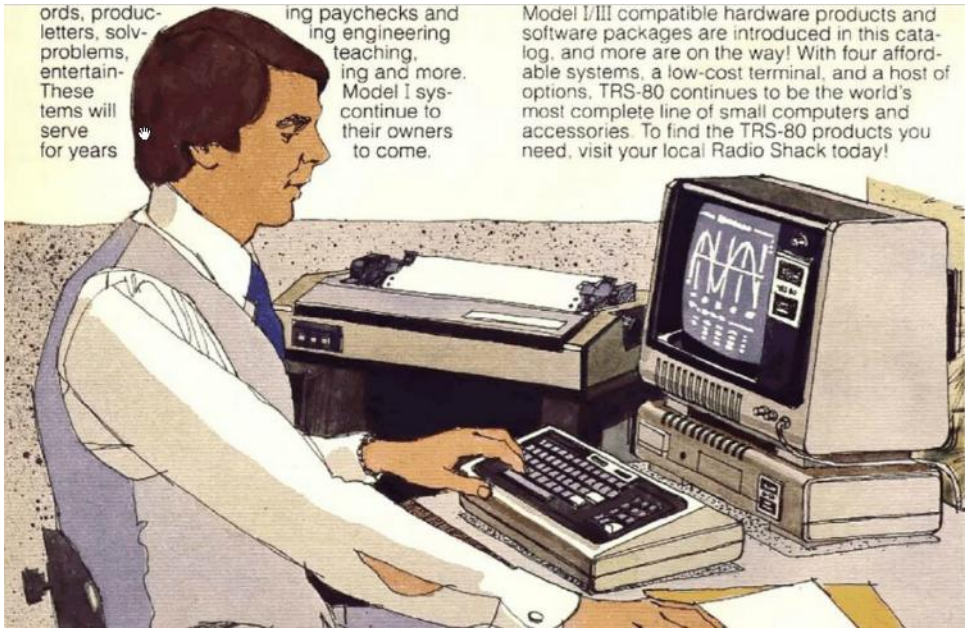


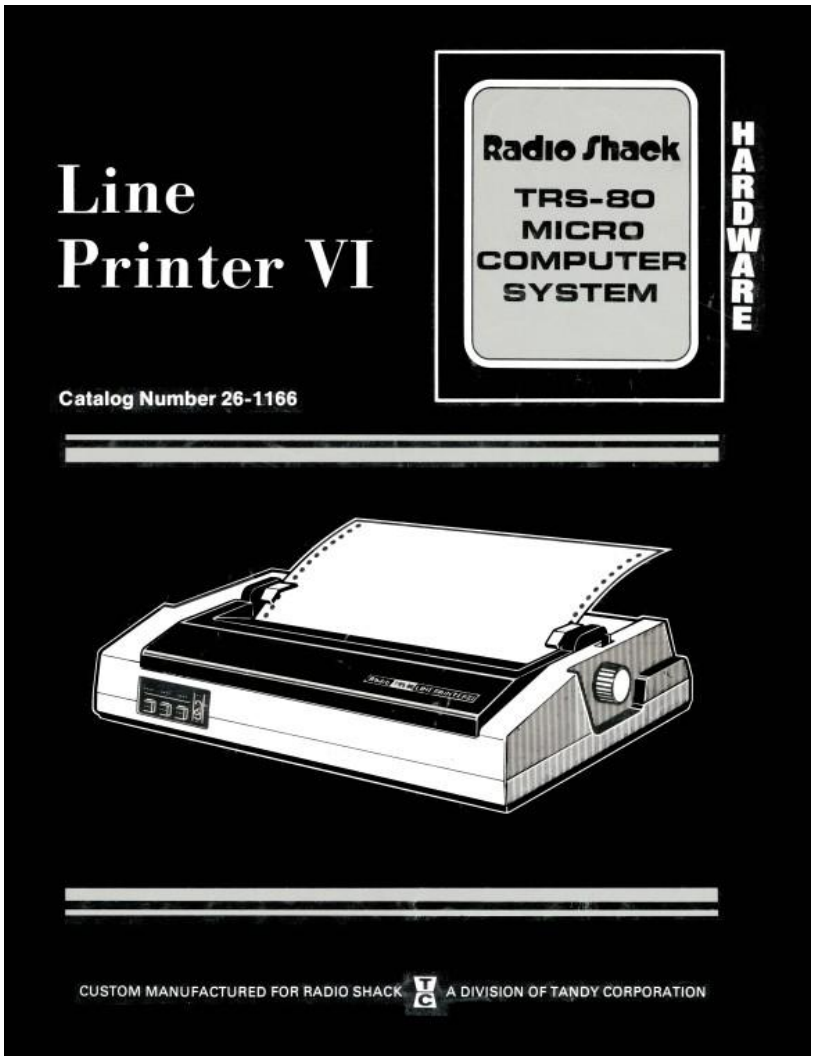
Photo: artists impression of a LP6 connected to a Model I

PRINT SAMPLE

One of the ways to reduce the cost of the LP6 over the LP3/5 was to go back to a 7-pin print head. Its great for data processing but not much chop for word processing, since it lacked lowercase descenders. As stated before people mainly used the LP6 to print capital letters and numbers from inventory management spreadsheet type programs. That said, it was still one of the better, clearer 7-pin dot matrix outputs, a cut above the LP1/LP2, and more like an 80s Epson printer just with no lowercase descenders.

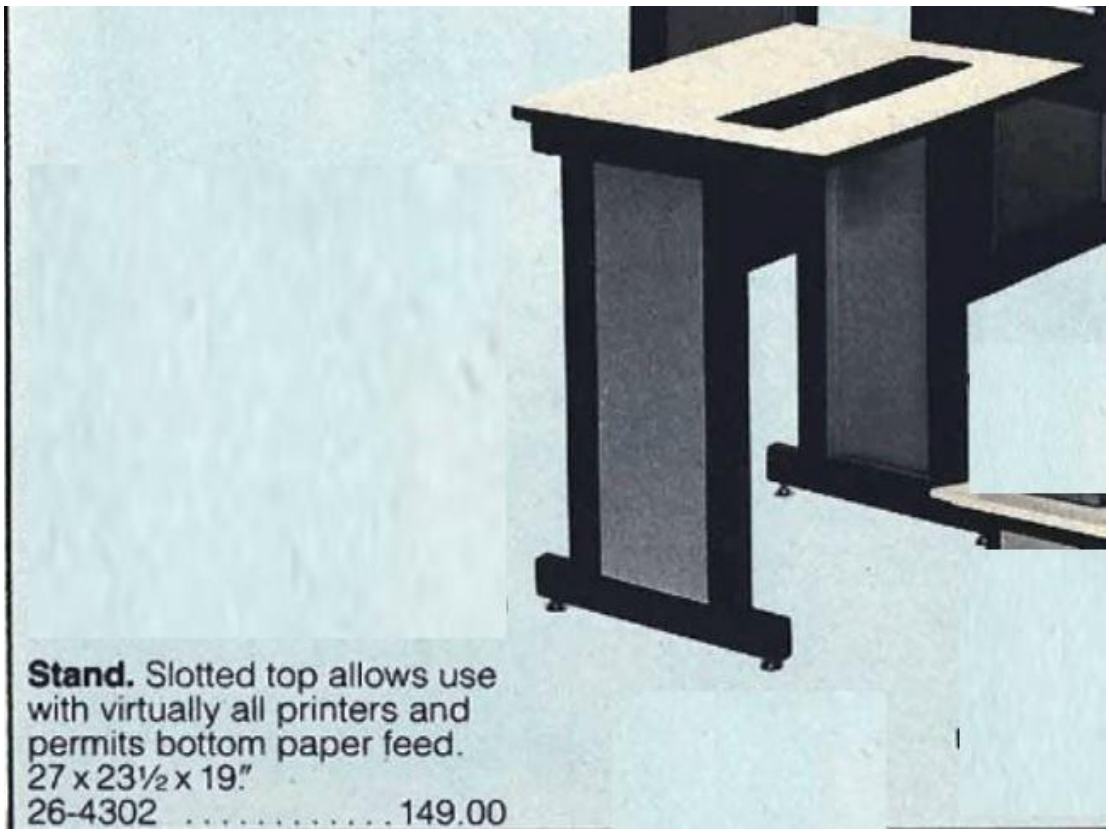
MANUALS SUPPLIED

The typical manual was included so the end user could get their printer up and running quickly. For those with a more technical side to them there was also a Service Manual available at a extra cost (not pictured).



IT WAS ALSO A BOTTOM FEED PRINTER

The LP6, true to its business-oriented data-processing nature had the ability to feed the tractor "computer paper" up from underneath the printer, and produced a special printer stand which facilitated this. You would simply buy you box of 5000 sheet continuous tractor computer paper, open the top of the box and place it under the printer. Feed the paper up and onto the sprockets. It was really convenient instead of having a large box of paper sitting behind an already big printer. On the downside if you were printing something really humungous an enormous volume of printed output tended to pile behind the printer...



PRICING and CONSUMABLES

The usual accessories like vinyl cover and printer stand were released at the same time as the LP6. The printer hit the market in 1980 at a price of $1160. Listed below are prices and catalog numbers related to the LP6, remembering the prices are listed in 1980 US dollars: (Source: Tim Mann's Radio Shack Catalog Number compilation)

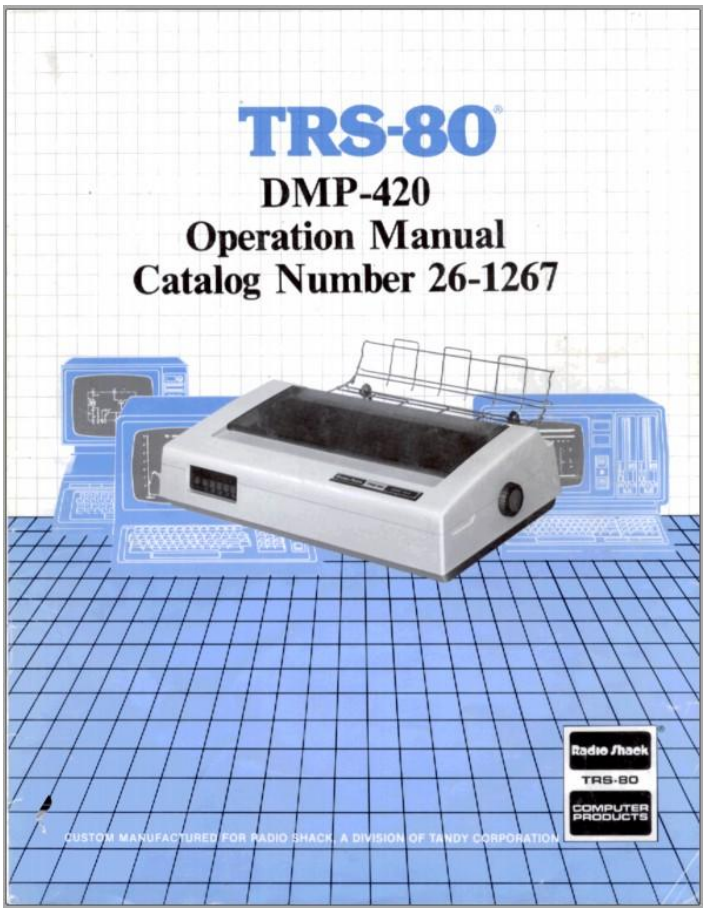
DERIVATIVES

The LP6 was popular enough that moving forward Tandy decided to keep the good elements of the printer but fix some of it's drawbacks and so thus was born the DMP-400 at the time they changed the name of all their dot-matrixes from Line Printer to DMP. Around 2 years after the LP6 was released the updated DMP-400 (cat. no. 26-1251), and some very handy improvements included for a modest $35 price increase to $1195.
The lid was changed to one which helped keep the printing noise down, now covering the tractor feed mechanism in addition to the printing engine. The print head was increased to 9-pin which solved the lowercase descenders problem and while at it engineers put their foot on the gas increasing the print speed from 100 to 140cps. Finally, incorporated now was a Colour Computer compatible 600/1200 baud serial interface, which makes the DMP-400 the first printer in which Coco users could print to 132 column (15in) computer paper. It also used the same printer ribbons as the LP6.



Finally, when everything else in the TRS-80 line-up was changing from silver to the new white paint scheme, the DMP-400 was one of the products which was selling too well to discontinue it however it was looking a little old in the looks department. In 1984 Radio Shack once again came back with a minor update, this time named the DMP-420 (catalog number 26-1267) which this time was able to drop below the psychological $1000 barrier to ensure sales continued of what was basically a different coloured re-styled DMP-400 that was no faster. It sold continuously well that it stayed in the catalogue until 1986.





CONCLUSION

You most often see LP6s sold alongside Model III computers when they come up for sale on eBay. The serial and parallel interfaces of the DMP-400/420 meant this was one of the first Tandy printers which could be used on a large number of TRS-80s including not just the I/III/4, the 8in business machines, but also the Coco, Model 100 and early MS-DOS machines... all you needed was to purchase the correct printer cable. If you are after one they come up from time to time, as do the ribbons. I rate this printer a 3.5 out of 5, mainly due to its size. One the one hand it's still too big for most people to want one in their vintage computer labs, but on the other hand if you have an application which requires 132 -column 15in output, these are probably the most compact of their peers. My pick of the three is the DMP-420 if you have a white TRS-80 like a Model 4, 12, or Coco 2/3, and the DMP-400 if you have a Model I, II, III or Coco 1.

NEXT TIME: Line Printer VII (catalog number 26-1167), DMP-100 (catalog number 26-1253), DMP-110 (catalog number 26-1271)

Ian Mavric

ianm@trs-80.com



Ian Mavric is an IT Specialist who also restores and collects TRS-80's and classic cars. He live with his wife and kids in Melbourne, Australia.

SYDTRUG NEWS

Newsletter of Sydtrug Inc.

Sydney TRS-80/MS-DOS Users' Group

C/- Peter Wignell PO Box 95 NARWEE NSW 2209

AUSTRALIA

Website : www.sydtrug.org



BINARY COUNTDOWN

E.T. FONEHUME

HI DUSTY -

AFTER ENJOYING THE ONE-LINER BOOK YOU RECENTLY PRODUCED; (DOING THE ACTUAL PROGRAMS ON A VIRTUAL DISK WAS A FANTASTIC IDEA, BYE THE WAY!); I SUDDENLY REALISED THAT I NEVER DID GET ROUND TO MAKE MY ORIGINAL BINARY COUNTDOWN PROGRAM INTO A ONE-LINER. SO, CARRYING ON WITH YOUR NEW-YEAR RESOLUTION INITIATIVE, I'VE SET TO AND PRODUCED ONE.

LET'S HOPE THIS IS THE FIRST OF MANY, AND A VOLUME 2 CAN BE PRODUCED IN THE FUTURE EH?

I'VE CREATED IT TO RUN FOR APPROXIMATELY 20 MINUTES. IF YOU REMEMBER, IT WAS USED TO CREATED AN 'EXTRA' NUMBER OF MINUTES BEFORE BEDTIME FOR THE GRANDKIDS, ALTHOUGH, AS THEY ARE NOW OLDER, EXTRA TIME BEFORE GOING TO BED IS NOT THE ISSUE IT ONCE WAS!

AS BEFORE, THE INITIAL IDEA WAS FROM LEWIS ROSENFELDER'S, SUPER BOOK, "BASIC FASTER AND BETTER", PUBLISHED IN THE EARLY 1980'S.

SO PLEASED THAT YOU (AND JUDGING BY THE EMAILS I RECEIVED MANY OTHERS TOO), ENJOYED THE ONE-LINERS. I QUITE RIGHTLY AGREE WITH YOU IN CALLING LEWIS'S BOOK FANTASTIC.

I WONDER IF PETER COULD INTERVIEW HIM ON TRASHTALK? (ED)

```
0 CLEAR1000:CLS:N=2000:A=N:L=15:FORZ=ATO0STEP-1:A$="":FORX=1TOL:
A$=STR$(N-(INT(N/2)*2))+A$:N=INT(N/2):NEXTX:IFZ=0THEN:CLS:PRINT@
400,"TIME FOR BED!":END:ELSEPRINT@400,A$:N=Z:NEXTZ
```

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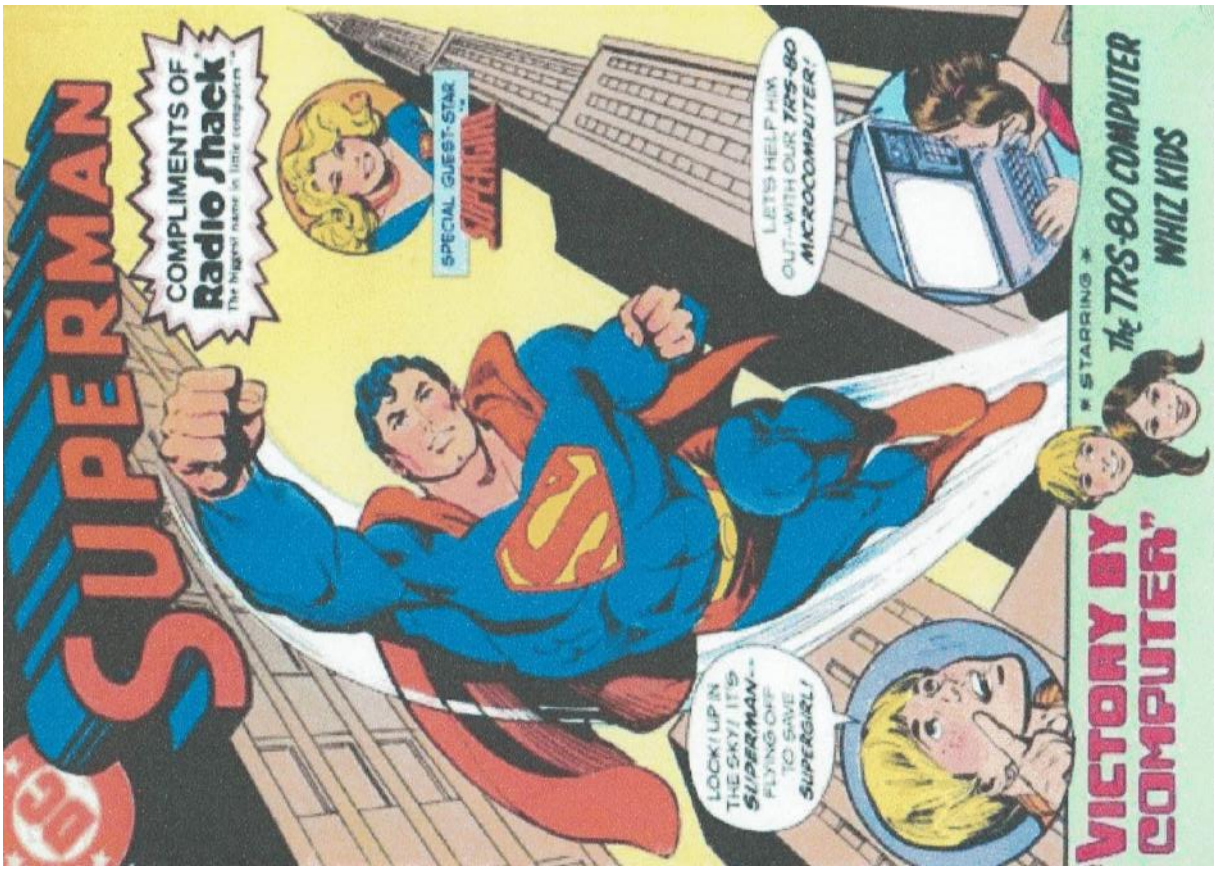
RETRO RESTORATION SPECIALISTS





Email: bgcompute@aol.com

POSTCARDS TO THE EDITOR



FIRST CLASS MAIL POST CARD



For the British Isles only, this space as well as the back may be used for correspondence, *vide* Post Office regulations

Hello Dusty and Dee!
The most splendid ever edition of TRS-8BIT arrived! It is packed with one liners very impressive – absolutely marvellous – thank you so much for sending copy.
Kind regards John Peel.

The TRS-80 Computer Whiz Kids
© JP Print and Design Services

The Address only to be shewn here

FIRST CLASS MAIL

IT'S NOT VERY OFTEN I'VE RECEIVED A TANDY POSTCARD SO I THOUGHT YOU ALL MIGHT LIKE TO SEE IT.

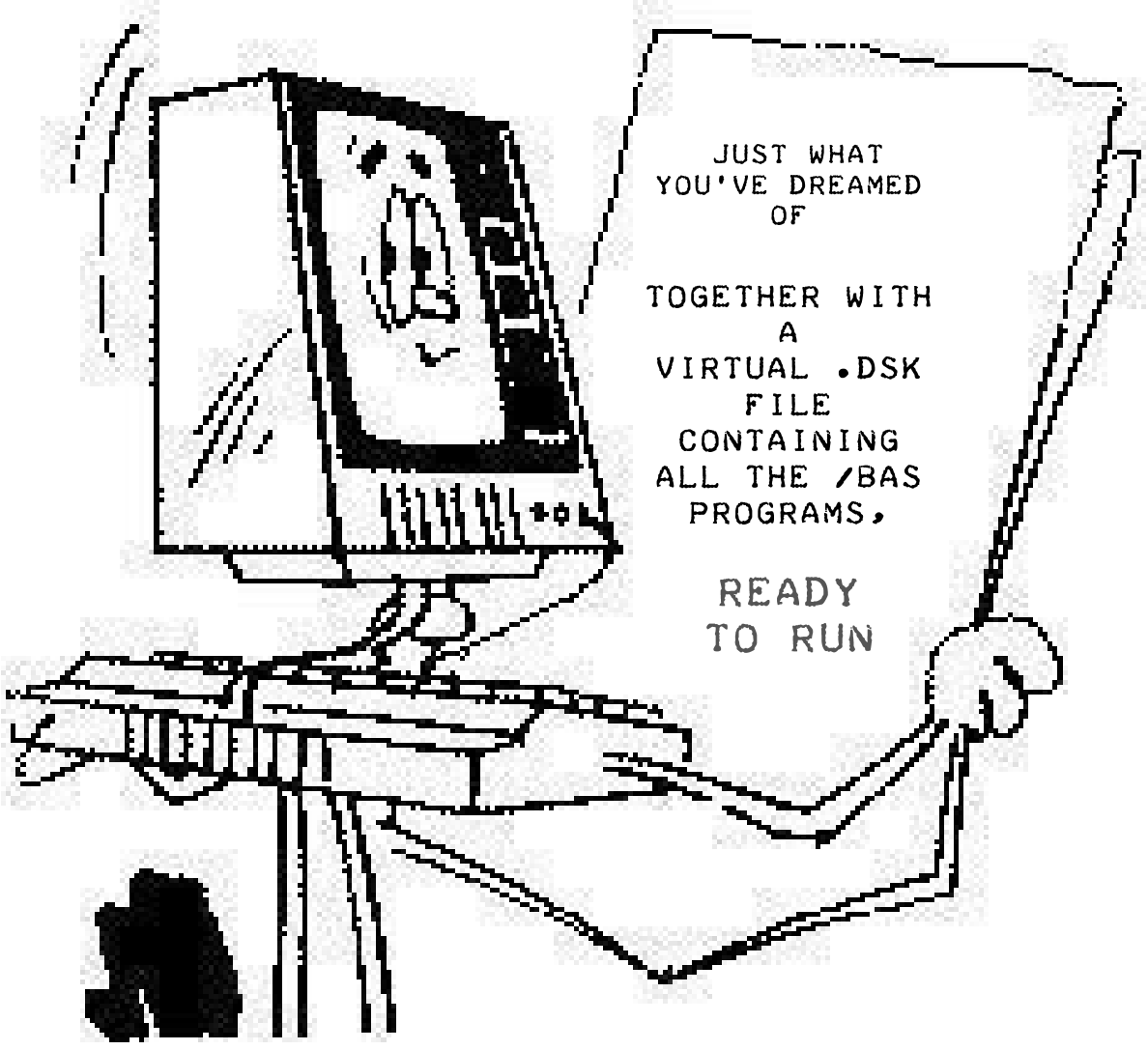
THANKS FOR YOUR KIND WORDS JOHN, THEY'RE MUCH APPRECIATED. PLEASE TO HEAR YOU ENJOYED THE BOOKLET

TRS8BIT'S

THE

ONE LINER COLLECTION

FOR THE TRS-80 MODEL 1



PRODUCED AT TRS-80.ORG.UK - JAN 2018

AVAILABLE FROM THE DOWNLOADS PAGE AT
TRS-80.ORG.UK

THE FreHDaptor
Another Fine Product From RAG ENTERPRISES

Gazza

Actually the FreHDaptor is the only product from RAG ENTERPRISES. RAG ENTERPRISES consists of **R**ay Whitehurst, **A**ndrew Quinn, and **G**arry Howarth.

The FreHDaptor is a board that plugs into an X-4020/EG-3014 expansion unit and allows the connection of a FreHD hard drive emulator to the System 80/Video Genie. It may also work with the Lo-Tech IDE adaptor but as yet no drivers have been written so that function remains untested.



Without going into all the gory details, the FreHDaptor takes the data, address and other signals from the expansion unit, shuffles them about and presents a Model III/IV compatible connector on the output. A 74LS245 is used on the data lines with pull-ups on all data, address and control lines. A 74HCT688 was used in an effort to stop corruption of the FreHD's RTC. A jumper was added to enable/disable the 74HCT688 and the board is powered by an SMD 5 volt regulator.

With the addition of a System 80 ROM adaptor, a 2732 eprom can be used to replace the original E3001 ROM and this will add a Boot Menu allowing the selection of either LDOS 5.3.1, NEWDOS 80 2.5 or DosPlus 3.5 operating systems.

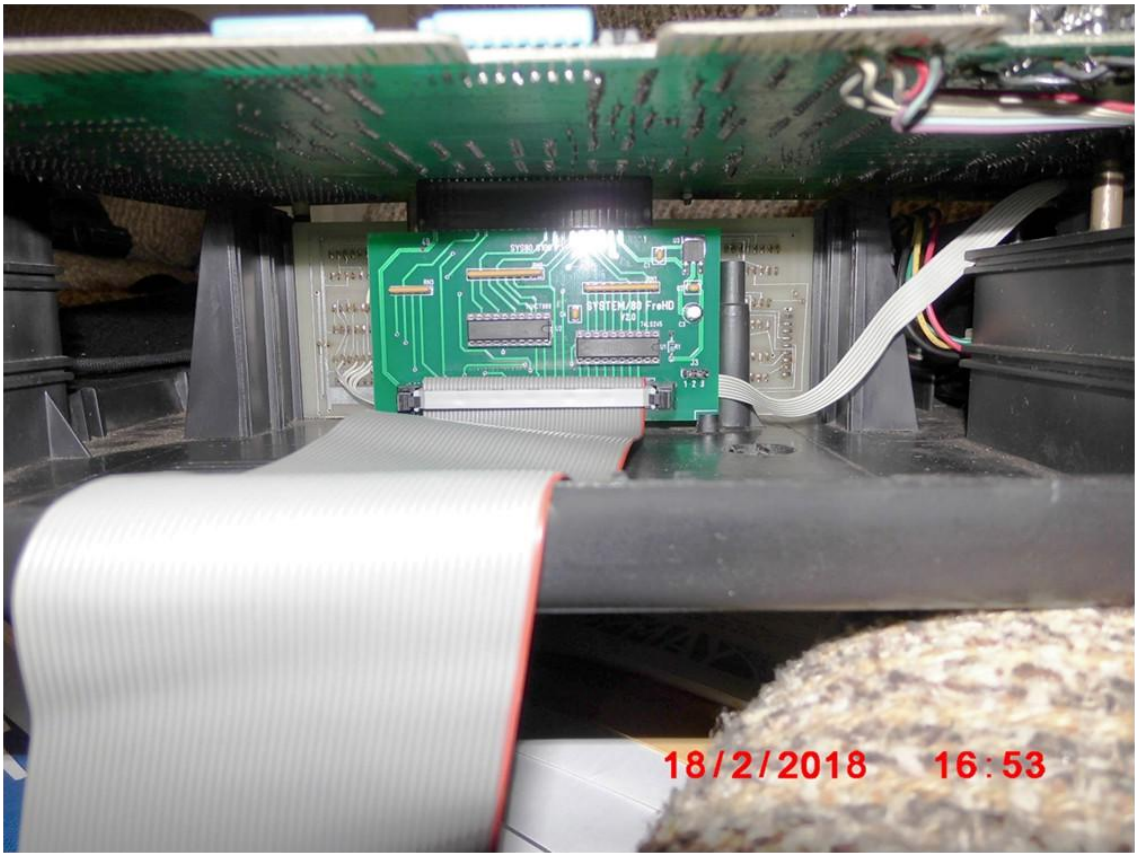
The original work for this project was done by Ray and Andrew back in 2014 with Andrew designing the circuit and Ray building and testing the prototypes, all built on Veroboard. The details can be found on Andrew's site.

http://www.quicktrip.co.nz/jaqblog/home/88-system80fhd1

The project then stalled until the middle of 2017 when we decided to resurrect the project, design a PCB and modify Dean Bear's Model I software to suit the System 80/Video Genie.

The FreHDaptor V1.0 was designed, built and installed and yes you guessed it, it didn't work - sigh
Working on vintage equipment can be extremely frustrating, with broken wires, faulty connectors and the cheap single wiper sockets that EACA used causing me no end of problems, which resulted in a brain explosion on my part and the computer was back in it's box until my blood pressure returned to normal.

Having regained my sanity or what's left of it, I repaired the computer, expansion unit and tracked down the fault with the FreHDaptor which was nothing more than a faulty wiper on a brand new IDC socket. A new socket was installed and success, it all burst into life. Happy dance.



At this stage the new ROM had not been installed and we still had to boot the computer from floppy but it was working and working perfectly, or so we thought.

The FreHDaptor was left to run for a couple of hours and given a good test, checked out on the CRO and all looked good until I pressed the reset button. **CRASH**

MISOSYS never wrote a Model I version of the RSHARD package but a couple of guys from CN80 modified the Model III version to suit the Model I, unfortunately they missed a few things which resulted in the computer crashing when LDOS loaded the configuration. Another problem resulted in the directory being formatted with the date of 'MM/DD/YY' instead of the System date.

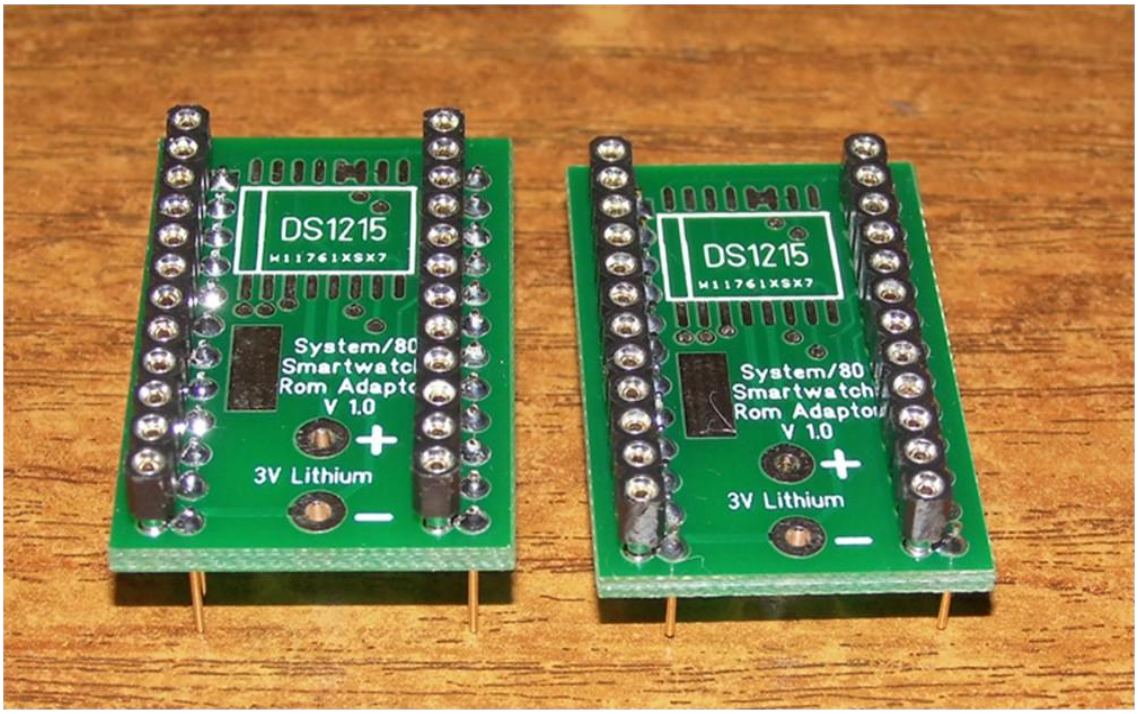
The offending problems were quickly found and eliminated and everything was working perfectly, or so we thought – again. On checking the time and date I found that the RTC in the FreHD had become corrupted. The battery showed over 3 volts so what had caused the corruption?

Incorrect power-up sequence was the culprit. Powering the expansion unit and computer before the FreHD was causing the corruption and this was a problem that could be duplicated. Not always but enough to be annoying.

According to my notes, with the System/80 and X-4020 powered-up and the FreHD switched off, I was measuring 2.4V Vcc on the FreHD. Removing the 74LS245 from the FreHDaptor would drop Vcc to 0.32V Back to the drawing board and the FreHDaptor version 2.0 was born and this 'seems' to have cured the problem. As yet I've had no corruption of the RTC.
Installation of the FreHDaptor requires the addition of a 50 pin socket to P3 on the motherboard and the board is designed to fit into the supports on the base of the expansion unit.

Due to the oversized after market RS232 board that is fitted to my expansion unit, the FreHDaptor had to be designed to fit both my expansion unit and a standard unit. The final design is a bit of a compromise but it fits both perfectly, or close to it.

The next step was to get the Model I Boot Menu running on the System 80/Video Genie. I armed myself with a copy of Jack Decker's TRS-80 ROM ROUTINES DOCUMENTED, an image of both the standard System 80 ROM and the modified Model I ROM which I downloaded from Mav's site.
HxD Hex Editor was then used to do a comparison of the two ROM images and isolate the code for the boot menu.
A ROM adaptor for the System80/Video Genie was designed that allows the use of a 2732 in place of the original Rom and being lazy I decided it was easier just to modify one of my existing Smartwatch designs rather than design a new board from scratch.



Yes, I did give in to temptation and fit a DS1215 but unfortunately the Smartwatch software could not find the clock.
Possible causes

1) I've stuffed something in the design
2) A faulty DS1215
3) A software problem

The main thing is that it works perfectly as a ROM adaptor and this computer already has two clocks so three would be a bit of over-kill.



A nice feature of this version of FreHD.Rom is that it automatically loads the date and time on reset with the only modification made to FreHD.Rom being to change 'TRS-80 Model 1' to 'SYSTEM 80 V1.0'.

All of the FreHD utilities, VHDUTL, IMPORT2, EXPORT2 and DSK/DCT seem to be working reliably unaltered on the System 80 with no problems encountered – yet.



The addition of the FreHD and the Boot Menu has put some life back into the old System 80 and it has come a long way from it's original 16K of ram and cassette storage. Loading of any of the three supported operating systems is instantaneous and with about 60 Megs of storage for each operating system there is no shortage of space.

Many thanks must go to Andrew and Ray for doing the original hard work on this project and to Dean Bear, Fred Vecoven and all the other FreHD gurus that are helping to improve and keep these old machines running.


RITRON
Options: Smooth, KI, Fast
LDOS Ready
free
Drive :0 HARDA 01/28/18 203H1 Free= 1382.0/ 1624.0 Fi=184/240
Drive :1 HARDB 01/28/18 203H7 Free=11208.0/11368.0 Fi=249/256
Drive :2 HARDC 01/28/18 203H7 Free=11120.0/11368.0 Fi=253/256
Drive :3 HARDD 01/28/18 203H7 Free=11304.0/11368.0 Fi=254/256
Drive :4 HARDE 01/28/18 203H7 Free=11304.0/11368.0 Fi=254/256
Drive :5 HARDF 01/28/18 203H7 Free=11304.0/11368.0 Fi=254/256
LDOS Ready
GM-1211


RITRON
NEWDOS/80 READY
pdrive 0
0* HDS=(0,1024,0,1,32,0,0,32768,22,3,80,33)
1* HDS=(0,1024,1,7,32,0,0,45696,30,8,80,33)
2* HDS=(0,1024,1,7,32,0,45696,45696,30,8,80,33)
3* HDS=(0,1024,1,7,32,0,91392,45696,30,8,80,33)
4* HDS=(0,1024,1,7,32,0,137088,45696,30,8,80,33)
5* HDS=(0,1024,1,7,32,0,182784,45696,30,8,80,33)
6* TI=A,TD=A,TC=40,SPT=10,TSR=0,GPL=2,DDSL=17,DDGA=2
7* TI=A,TD=A,TC=40,SPT=10,TSR=0,GPL=2,DDSL=17,DDGA=2
8 TI=C,TD=E,TC=40,SPT=18,TSR=3,GPL=2,DDSL=17,DDGA=2
9 TI=C,TD=G,TC=80,SPT=36,TSR=3,GPL=8,DDSL=17,DDGA=2
NEWDOS/80 READY
GM-1211

TRS-80 Emulators . com

TRS32: A Model I/III/4/4P Emulator For Windows

written by Matthew Reed

Unregistered Shareware Version:

- Works under all current versions of Windows
- Full Windows application — no low-level hardware conflicts!
- Model I, Model III, Model 4, and Model 4P emulation
- Four floppy disk drives (with optional realistic disk drive sound)
- Cassette tape drive with graphical on-screen controls
- Exatron Stringy Floppy emulation
- Printer support
- Serial port for RS-232 communications
- Joystick support (using a Windows joystick — TRISSTICK and Alpha Products joysticks are emulated)

Registered Version:

- All features included in the shareware version
- Built-in emulation of an Epson FX-80 dot matrix printer (including graphics and control codes)
- High resolution graphics (Radio Shack and Micro-Labs)
- Up to 1 megabyte of additional memory in Model 4 and 4P modes
- Hard disk support
- Orchestra 85/90 music generation

Interested?

- Read the TRS32 emulator documentation
- Download the shareware version
- Register online



Actual Dotwriter output — emulated FX-80
click for larger sample

MATTHEW'S EMULATOR IS QUITE ASTOUNDING.
IT'S MY FIRST CHOICE WHEN DEVELOPING IDEAS FOR TRS8BIT.
HE OFFERS FULL SUPPORT AND IT IS STILL UNDERGOING ENHANCEMENT.
IF YOU HAVEN'T REGISTERED YOUR SHAREWARE VERSION YET, PLEASE DO SO AND ENCOURAGE
AND SUPPORT MATTHEW'S ENTHUSIASM TO CONTINUE WITH HIS WORK.

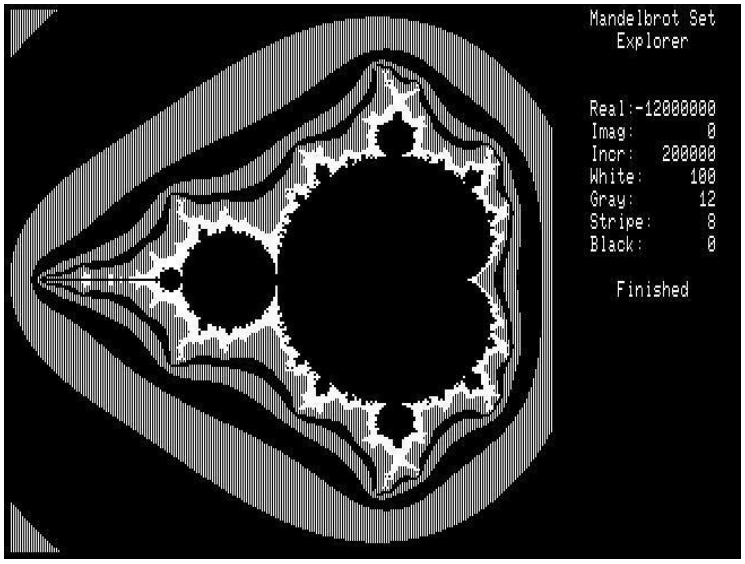
ED.

LOOKING FOR HIGH-RESOLUTION GRAPHICS FOR YOUR TRS-80 MODEL 4/4P/4D?

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-Compatible with most M3 and M4 Hi-Res software for Radio Shack HRG
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NEW REDUCED PRICE $USD99
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IN MAV'S WORKSHOP:

Tandy's Commitment to Agriculture

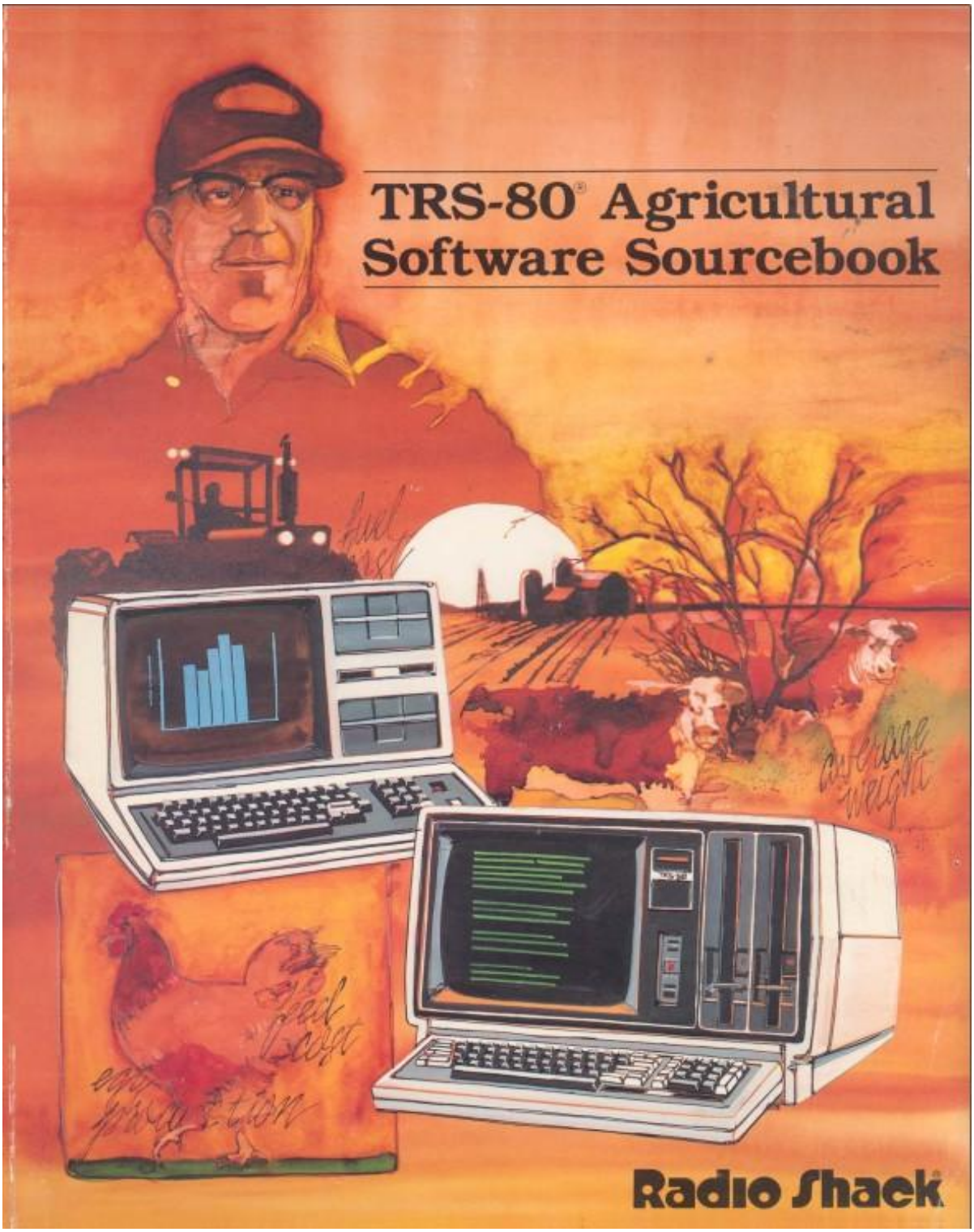
Part 2: TRS-80 Model III & 4

by Ian Mavric

Last Time: I wrote about how Tandy took computerisation to the agricultural sector seriously even going to the extent of marketing a book full of house and 3rd party applications which farmers and the like could use. As a result, despite being relatively unknown in the greater TRS-80 enthusiast community, the TRS-80 gained some traction in the rural environment. Last time I talked about the Model II and some of the software available for it, this time I'm going to look at some of the software available for the Model III and 4, both here in Australia and in its native USA.

TRS-80 Model III and 4: While Tandy had designed the Model II for business purposes, it was becoming clear by the early 1980s that a lot of software had been written for farmers on the Model I, and it was being used successfully. In a perfect world every farm would be making big yearly profits and easily be able to offset the cost of a Model II system, however smaller farms looked to getting results out of less expensive computers. This is where the Model III fits in. Later on when the Model 4 replaced the Model III many of the features which made the Model II attractive, like the 80x24 screen, 64K memory and it's ability to run CP/M meant popular Model II farm applications were ported over to the Model 4. It's no surprise then that the majority of programs in the Agricultural Software Sourcebook are listed for the Model II/III/4.

United States: Agricultural Software Sourcebook: In the USA the Applications Software Sourcebooks were a very popular seller for Radio Shack and year by year were getting larger and larger. While it would have been possible to include all the Agricultural programs, there are good reason to spin them out to their own volume. The main one being that the applications listed in the Agricultural Software Sourcebook would not have much appeal to buyers outside of that industry, ergo much of the software would be lost within the traffic of the rest of the applications software in the Application Software Sourcebook. A farmer, when looking for software, doesn't want to go through pages of unrelated educational, engineering and scientific programs. There was enough to fill its own 116 page book by 1983.


TRS-80® Agricultural
Software Sourcebook
Radio Shack

SUBJECT: FEED COST

AGSOFT CATTLE FEEDER COST ACCOUNTING SYS

PRIVATE FEEDER VERSION OF OUR COMMERCIAL FEEDLOT SYS.MAINTAINS RECORDS ON UP TO 150 PENS. PLACES HISTORICAL DATA & PEN PERFORMANCE AT YOUR FINGER TIPS. RATION FORMULATION & PERPETUAL FEED INVENTORIES ARE STANDARD.MENU DRIVEN.PRINTER REQ'D

OVER 300 HEAD:
MODEL III-48K-2 DISKS-MOD III BASIC
DISKETTE: $1000.00

USER SITE REFERENCE:
LINCOLN AG PRODUCTS
DELAYNE LOSEKE
BOX 42
O'NEILL
NE 68763 (402) 336-4210

ORDERING INFORMATION:
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14217 PACIFIC ST.
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NE 68154 (402) 330-3045

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MAINTAINS COST & PERFORMANCE DATA FOR UP TO 306 PENS.RECORDS DYNAMICALLY UPDATED AS TRANSACTIONS ARE POSTED.FEED INVENTORY/RATION FORMULATION/CUSTOMER BILLING EXCELLENT SCREEN DISPLAYS & AUDIT TRAILS MANY STANDARD FEATURES.REQUIRES PRINTER

OVER 300 HEAD:
MODEL III-48K-3 DISKS-MOD III BASIC
DISKETTE: $3000.00

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MAINTAINS SHIPMENT RECORDS FOR 30 DIFFERENT COMMODITIES AND 102 SHIPPERS/CONIGNEES. USER DEFINED PRICING STRUCTURES BASED ON TEST MOISTURE.ACCEPTS PAYMENTS AND MAINTAINS ACCOUNT BALANCES. FLEXIBLE AND USER FRIENDLY. REQUIRES PRINTER.

OTHER:
MODEL III-48K-2 DISKS-MOD III BASIC
DISKETTE: $1000.00

USER SITE REFERENCE:
LINCOLN AG PRODUCTS
DELAYNE LOSEKE
BOX 42
O'NEILL
NE 68763 (402) 336-4210

ORDERING INFORMATION:
AG-SOFT, INC.
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C.M.C. FEED INVENTORY SYSTEM

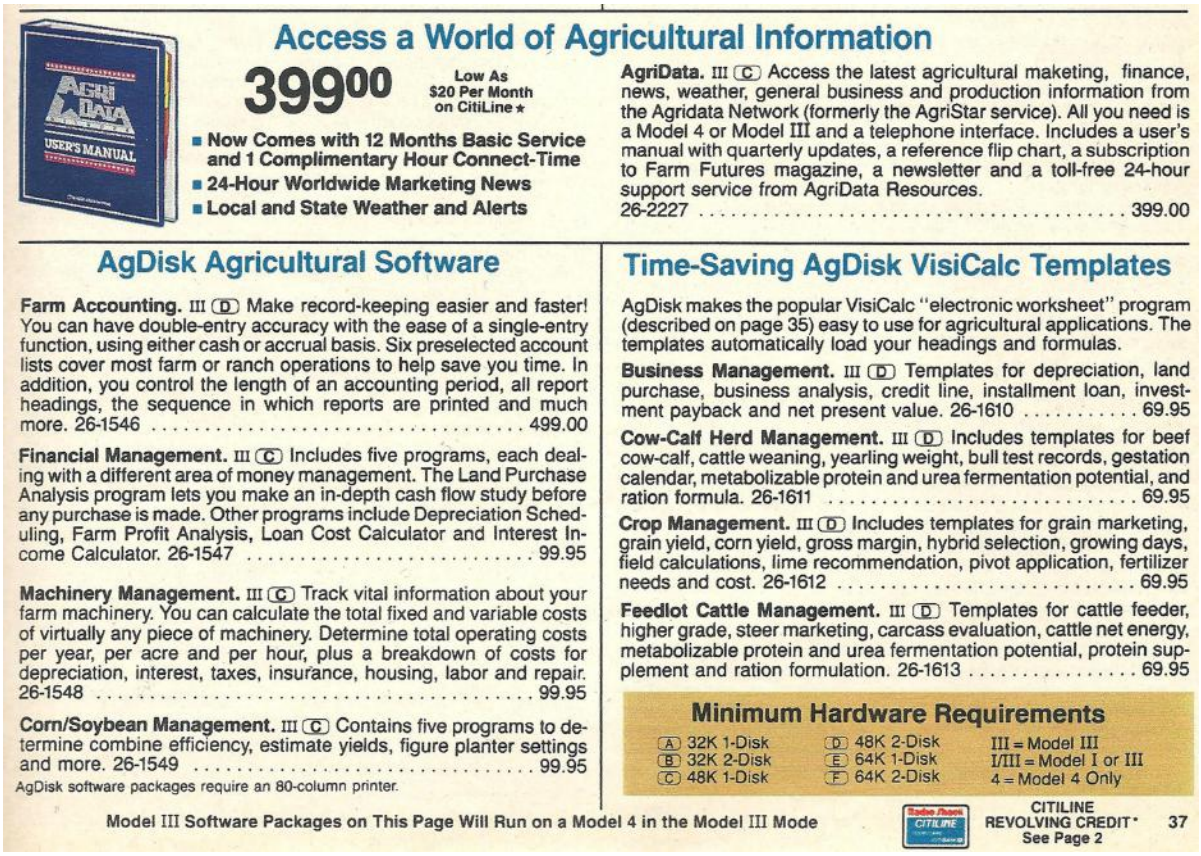
FROM START INGRED.TO END PRODUCT. KEEPS 3 SETS OF PRICES:ACTUAL COST,CURR MKT,& FUTURES MKT - FINISHED FEED PRICED USING CONFIG. MARGINS, W/ADDITIVE & DELIVERY CHARGES SHOWN SEPARATELY (12 REPORTS) (OPT.SUPPORT $95/MO) RSCOBOL RUNTIME REQ

AGRICULTURAL EXTENSION:
MODEL II-64K-2 DISKS
DISKETTE: $2900.00

ORDERING INFORMATION:
CHILSON'S MANAGEMENT CONTROLS, INC.
DANIEL MCMILLEN, COBOL OPERATIONS
9645 ARROW ROUTE, SUITE L
RANCHO CUCAMONGA
CA 91730 (714) 980-5343

Radio Shack Catalog: Agricultural software, for some time, had been absent from the yearly Radio Shack computer catalogues, possibly due to its perceived lack of broad appeal, but by the mid 1980s selected titles were also added to the 1985 RSC-14 and 1986 RSC-15.

It was a big decision by them because having something in the catalog meant that all the Radio Shack computer centres around the country needed to carry a copy. They must have figured the perception of the versatility of the computers offset the cost of stocking this potentially low-selling software. A half a page was allocated to it and in advertising terms it was probably a good deal if nothing else in PR alone.



Access a World of Agricultural Information

AGRI DATA USER'S MANUAL

399.00 Low As $20 Per Month on CitiLine★

- Now Comes with 12 Months Basic Service and 1 Complimentary Hour Connect-Time
- 24-Hour Worldwide Marketing News
- Local and State Weather and Alerts

AgriData. III (C) Access the latest agricultural maketing, finance, news, weather, general business and production information from the Agridata Network (formerly the AgriStar service). All you need is a Model 4 or Model III and a telephone interface. Includes a user's manual with quarterly updates, a reference flip chart, a subscription to Farm Futures magazine, a newsletter and a toll-free 24-hour support service from AgriData Resources.
26-2227 ..... 399.00

AgDisk Agricultural Software

Farm Accounting. III (D) Make record-keeping easier and faster! You can have double-entry accuracy with the ease of a single-entry function, using either cash or accrual basis. Six preselected account lists cover most farm or ranch operations to help save you time. In addition, you control the length of an accounting period, all report headings, the sequence in which reports are printed and much more. 26-1546 ..... 499.00

Financial Management. III (C) Includes five programs, each dealing with a different area of money management. The Land Purchase Analysis program lets you make an in-depth cash flow study before any purchase is made. Other programs include Depreciation Scheduling, Farm Profit Analysis, Loan Cost Calculator and Interest Income Calculator. 26-1547 ..... 99.95

Machinery Management. III (C) Track vital information about your farm machinery. You can calculate the total fixed and variable costs of virtually any piece of machinery. Determine total operating costs per year, per acre and per hour, plus a breakdown of costs for depreciation, interest, taxes, insurance, housing, labor and repair. 26-1548 ..... 99.95

Corn/Soybean Management. III (C) Contains five programs to determine combine efficiency, estimate yields, figure planter settings and more. 26-1549 ..... 99.95

AgDisk software packages require an 80-column printer.

Time-Saving AgDisk VisiCalc Templates

AgDisk makes the popular VisiCalc "electronic worksheet" program (described on page 35) easy to use for agricultural applications. The templates automatically load your headings and formulas.

Business Management. III (D) Templates for depreciation, land purchase, business analysis, credit line, installment loan, investment payback and net present value. 26-1610 ..... 69.95

Cow-Calf Herd Management. III (D) Includes templates for beef cow-calf, cattle weaning, yearling weight, bull test records, gestation calendar, metabolizable protein and urea fermentation potential, and ration formula. 26-1611 ..... 69.95

Crop Management. III (D) Includes templates for grain marketing, grain yield, corn yield, gross margin, hybrid selection, growing days, field calculations, lime recommendation, pivot application, fertilizer needs and cost. 26-1612 ..... 69.95

Feedlot Cattle Management. III (D) Templates for cattle feeder, higher grade, steer marketing, carcass evaluation, cattle net energy, metabolizable protein and urea fermentation potential, protein supplement and ration formulation. 26-1613 ..... 69.95

Minimum Hardware Requirements

(A) 32K 1-Disk
(B) 32K 2-Disk
(C) 48K 1-Disk
(D) 48K 2-Disk
(E) 64K 1-Disk
(F) 64K 2-Disk

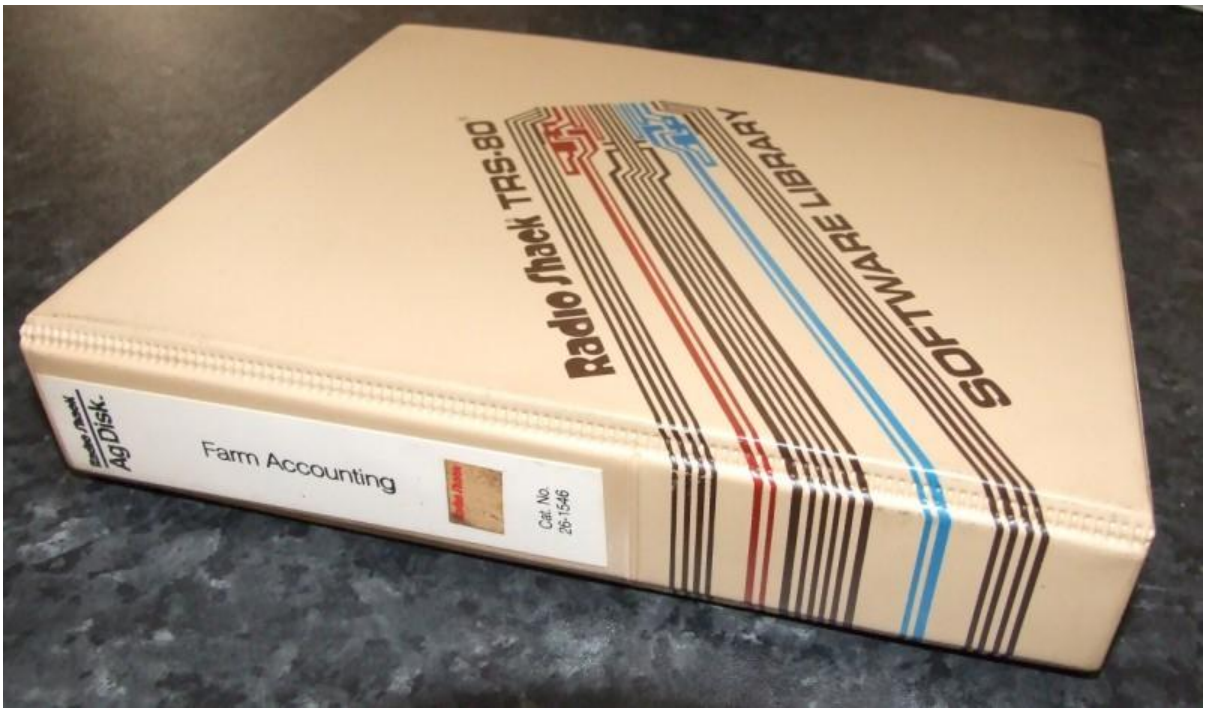
III = Model III
I/III = Model I or III
4 = Model 4 Only

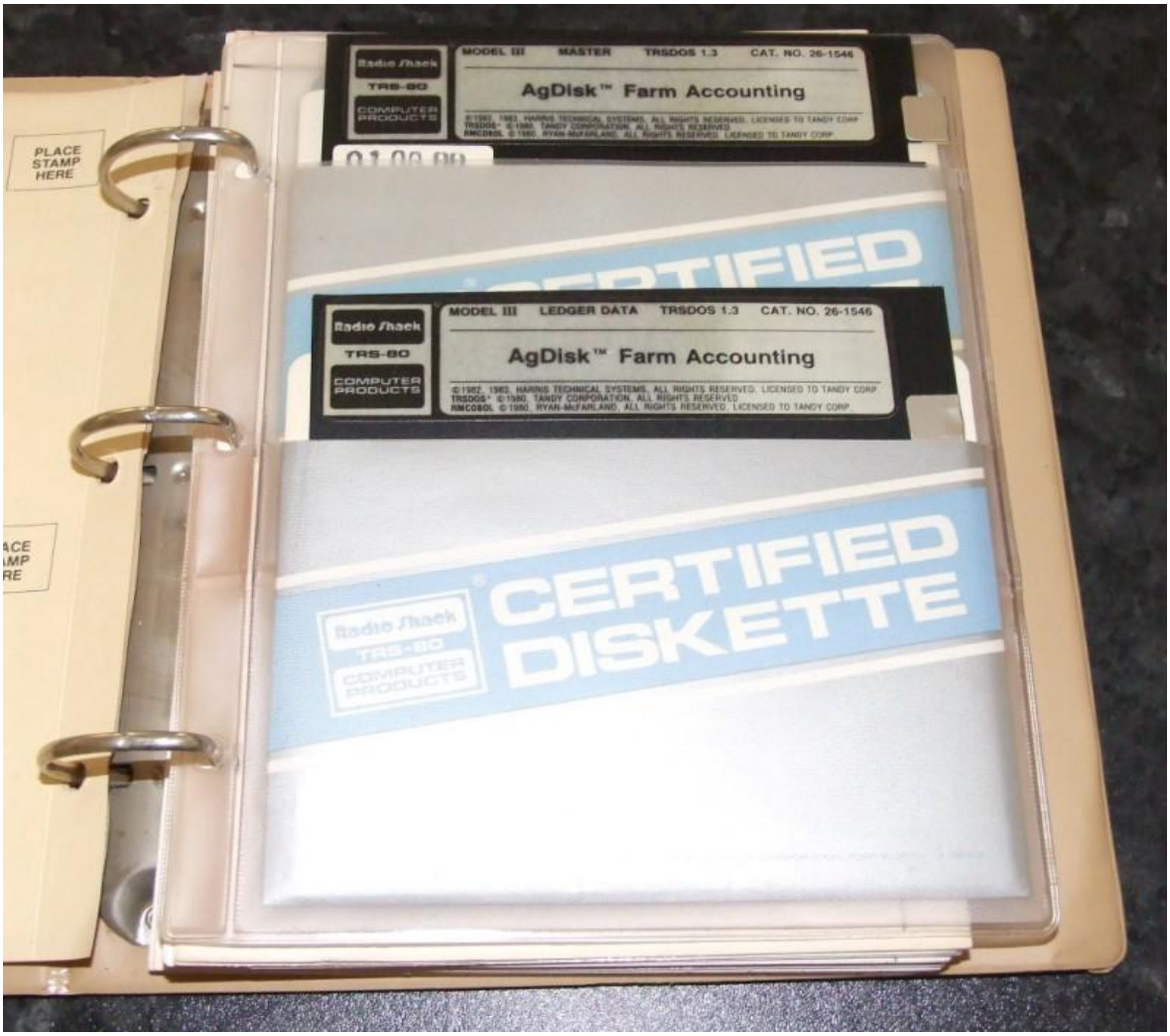
Model III Software Packages on This Page Will Run on a Model 4 in the Model III Mode

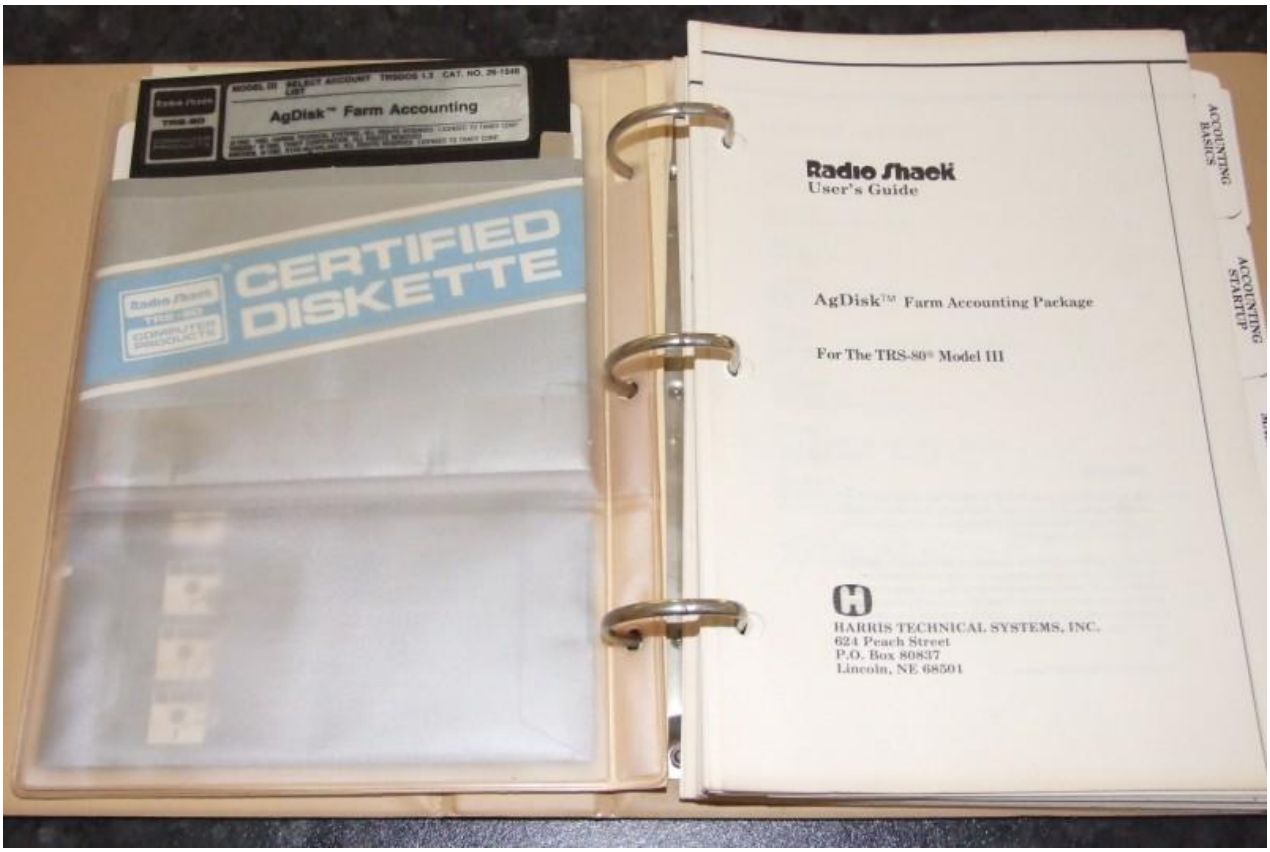
Radio Shack CITILINE REVOLVING CREDIT* See Page 2

37

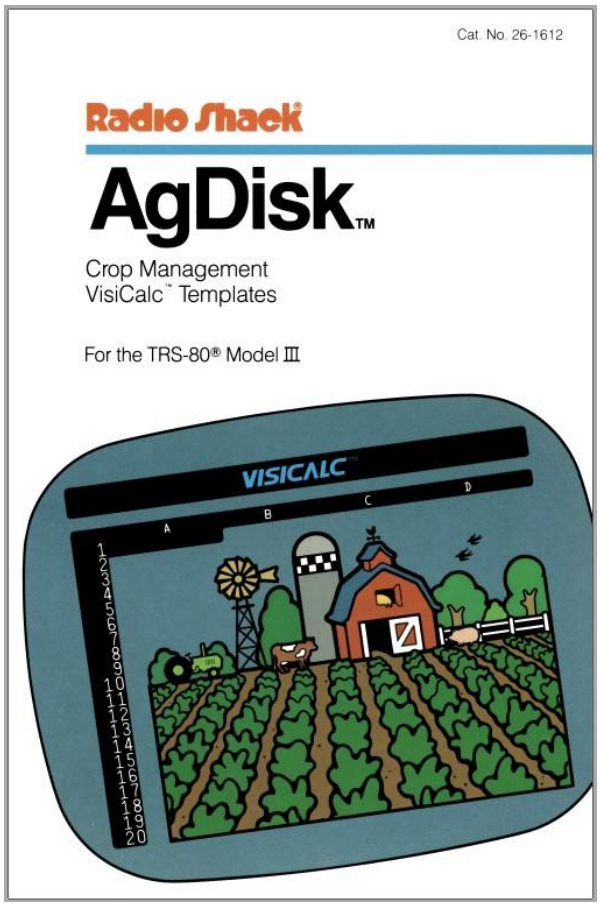
Even today, finding these few software titles is a difficult task for collectors. They rarely come up on eBay, and while they don't command high prices, the fact they so rarely come up for sale makes them collectable in their own right. One which I did manage to find was Farm Accounting, and it looks like it had never been used.

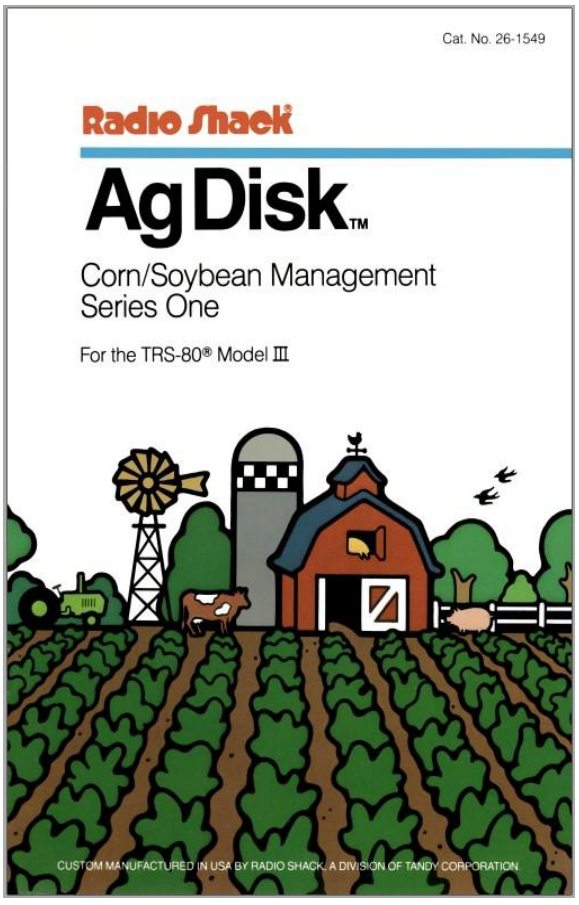

Radio Shack TRS-80
SOFTWARE LIBRARY
Radio Shack
AgDisk
Farm Accounting
Cat. No.
26-1546


PLACE
STAMP
HERE
Radio Shack
TRS-80
COMPUTER
PRODUCTS
MODEL III
MASTER
TRSDOS 1.3
CAT. NO. 26-1546
AgDisk™ Farm Accounting
MODEL III
LEDGER DATA
TRSDOS 1.3
CAT. NO. 26-1546
AgDisk™ Farm Accounting
CERTIFIED
DISKETTE



Other titles only exist only in the form of cover scans, the programs themselves long lost to the ravages of time:





Australia: As mentioned last time we had our own version of the Agricultural Software Sourcebook however I had to look really hard to find any reference to agricultural programs in the official Radio Shack computer catalogues. Finally I did find something in the 1987 computer catalog, which gave me the name for this two part article.

The only farm related title ever advertised in an Australian Tandy Electronics computer catalog is KYFARM at the rather high price of $799.95 and available in versions for the Model III, 4 and MS-DOS. Trivia buffs will be interested to know that makes it the most expensive Model III or 4 program listed in a Tandy computer catalog. It comes from and is supported by a small company called Kyabram Computer Services in rural Victoria, up near the Victoria/New South Wales border. It's how the program came to end up with such a strange name.

KYFARM has always been on my list of unobtainium for my collection having never seen the program in use in a Radio Shack Computer Centre (it was a special-order non-stocked item) and never even seen backups of the disks or indeed anyone who has ever heard of it. Interesting that one day a lady from the rural NSW town of Orange had her late father's Model 4P collection to clear out, a deal was cut, and in one of the boxes low-and-behold was a set of KYFARM Finance Manager original distribution disks. Surely the only set left in existence. Now I just need to find a manual... and buy a farm :-)

Ian Mavric

ianm@trs-80.com



COMMITMENT TO AGRICULTURE



When Tandy introduced the world's first mass produced microcomputer (the TRS-80 Model 1) to Australia, some of its first purchasers and users were Australian farmers.

These pioneers of a new age were so excited about the ability of these new machines to help them in farm management that they requested Tandy to do more to bring this technology to their farming colleagues.

Tandy responded in 1983 by creating an Agricultural Computer Division which continues today to assist many current and prospective Tandy farm customers with their computer needs. This part of Tandy's computer business has grown faster than any other and Tandy is still the only major computer company to provide this type of specialist service.

How are Tandy Computers Helping on The Farm?

Many hundreds of Australian farmers are now using Tandy Farm Computer Systems to improve the efficiency and profitability of their enterprises.

Stud Breeders especially have found their Tandy computers invaluable to store and rapidly retrieve a wealth of information on each animal as well as to perform calculations to rank or select animals according to averages, total scores, or other individual criteria for breeding, culling, sale, showing, treatment, etc.

Tandy's Hard Disk systems enable larger Stud Breeders to store not only the pedigrees of their current breeding stock but also previous generations, artificial insemination stock, and other breeders' stock where they have been used. These pedigrees can be instantly produced on either a high resolution Tandy monitor or one of the high quality Tandy Dot Matrix or Daisywheel Printers.

Dairy, poultry and pig producers have also found their Tandy computer systems great value for calculating feed rations and for recording ongoing production details so as to maintain the highest possible economic production level, thereby maximising profits.

Extensive graziers have found it a lot easier using their Tandy computers for recording their overall livestock numbers as well as their production figures for either individual animals or the whole herd or mob. They can also enjoy the considerable economic advantages of buying and selling their livestock on their Tandy computers through the C.A.L.M. service.

Crop growers and orchardists have found Tandy computers ideal for maintaining historical records on their individual paddocks or blocks and for calculating the returns so that they can plan which fertilizers, herbicides, insecticides and cultivation methods will give them the optimum return for each year.

Additionally irrigators and cane farmers have found running landforming programs on their Tandy farm computer to be the most economical approach to laser levelling of their properties.

Tandy has also solved the isolation problem for many Australian farmers. Using a Tandy modem and communications program these farmers have hooked up their Tandy computer to the telephone line and tapped into information services such as Elderlink, AgriData and Viatel.

Having instant access to constantly updated business, general and technical farm information 24 hours a day has helped them make more informed decisions and put more dollars in their pockets. Ask your local Tandy store or dealer for a demonstration of these services.

Why Choose Tandy?

There are many reasons why Australian farmers choose Tandy for their Farm Computer Systems.

Tandy offers the most complete range of computer products (terminals, printers, modems, software, accessories) of any company so you can get everything you need at the one location.

Tandy design and manufacture their own computers with features and quality control standards higher than any computer company and Tandy computers have proved their reliability all over Australia.

Tandy has Service Centres located in each capital city, staffed by highly trained technicians, and equipped both with the latest testing equipment and an extensive supply of spare parts.

Tandy's documentation on both their hardware products and software programs is second to none and easily understood by the new user.

Tandy is the only computer company which can offer you expert assistance in the form of a Software Sourcefile which is held in each store. It contains details of hundreds of programs suitable for Australian Agriculture and Horticulture, all of which will run on Tandy computers.

Tandy is the only computer company with a National Agricultural & Horticultural Co-ordinator whom you can contact for expert advice by either writing to P.O. Box 254, Mt. Druitt, NSW 2770 or telephoning on (02) 675 1222.

In summary, Tandy is committed to and able to provide the highest level of service, the best quality products, and total support of these products to their farm customers.

No other computer company offers this level of commitment and service throughout Australia and this is certainly the reason why Australian farmers have made Tandy their NUMBER 1 CHOICE IN FARM COMPUTER SYSTEMS!

KYFARM Accounting Software



Tandy's KYFARM Finance Manager program replaces the farm Cashbook. It's ability to not only neatly and accurately record the farm financial information but also to perform a variety of detailed analysis of that information in seconds makes it a must for all serious farm managers.

KYFARM Finance Manager makes farm budgeting easy and cashflow reports comparing the budget with actual income and expenditure can be produced at the touch of a button.

The program has the ability for you to use the same account codes as the farm Accountant and performs all the relevant calculations with complete accuracy, thereby greatly facilitating the preparation of the annual tax return.

KYFARM Finance Manager is also ideal for management as it has the ability to cost individual enterprises through gross margin analysis (on more than one property or business if necessary) and even to cost individual farm implements or areas if desired.

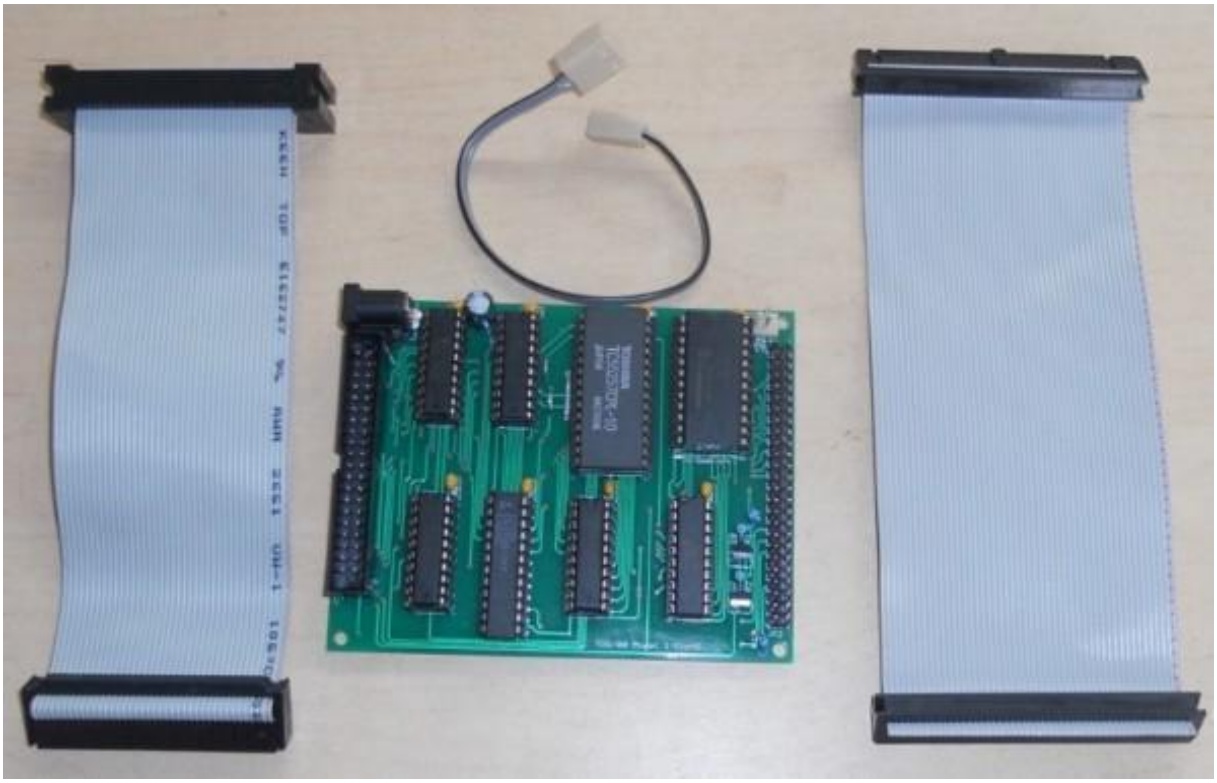
The program's bank reconciliation facility picks up any errors in either yours or the bank's records and enables you to find out what your true cash position is.

KYFARM Finance Manager is very easy to use, it doesn't require double entry or in-depth knowledge of accounting, and is suitable for all types and sizes of farming operations.

Model III. 26-9660 ..... 799.95
Model 4/4P. 26-9661 ..... 799.95
Tandy 1000/2000/3000. 26-9662 ..... 799.95

“Quinnterface” Mini Expansion Interface for 16K Model 1 FreHD users.

- COMPLETLY ASSEMBLED AND TESTED -



This is THE perfect device for all Model 1 users who own a 16K Level II unit, (which is most of us!), but no Expansion Interface or disk drives, especially if you don't want to modify your M1 with upgraded boot ROM or memory upgrade.

The ‘Quinnterface’, developed by J. Andrew Quinn from New Zealand, adds 32K RAM and auto-boot functionality to you FreHD.

U.K. And Europe, contact Bas. at BetaGamma Computing.
U.S.A. And rest of the world, contact Mav. At “The Right Stuff”

LOOKING FOR FAST, INEXPENSIVE, UNLIMITED MASS STORAGE FOR YOUR TRS-80 MODEL I/III/4/4P/4D?

The amazing

"FreHD"



-Emulates a TRS-80 hard drive, but faster than any hard drive!
-Works with your favourite DOS (LS-DOS, LDOS, CP/M, Newdos/80 2.5)
-Uses SD card for storage medium
-Bonus free Real Time Clock function!
-Designed in Belgium and proudly built and shipped from Australia
-Kit form or fully assembled

Order yours today
http://members.iinet.net.au/~ianmav/trs80/

2018 COMPETITION

HI-RES-LO



EITHER A **FREHD**, OR A **HRG BOARD**, OR IF THE WINNER HAS A COCO, THEY CAN CHOOSE AN **RE-FD502** COCO FLOPPY CONTROLLER.

MAV HAS VERY GENEROUSLY OFFERED THE ABOVE PRIZE FOR THIS INGENIOUS COMPETITION.

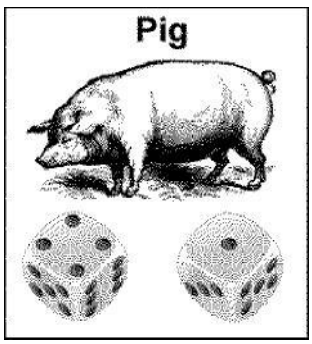
THE IDEA IS TO TAKE ANY HIGH RES IMAGE AND RENDER IT IN THE LOWEST POSSIBLE RESOLUTION, BUT ALLOWING IT TO STILL BE RECOGNISABLE.

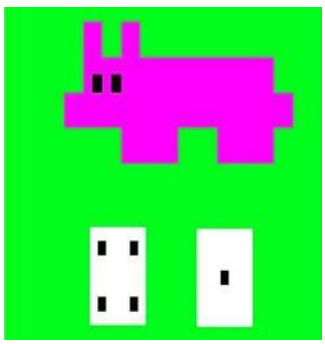
SO IN THIS EXAMPLE, THE PICTURE WAS FOUND ONLINE. USE **ANY** TANDY COMPUTER AND BASIC TO DRAW THE LOW-RES IMAGE. (IN THIS INSTANCE I USED A CO-CO).

ALL ENTRIES TO BE SENT TO DUSTY AT HIS USUAL EMAIL ADDRESS.
JUDGING:- DEE TO DECIDE WHICH ARE BEST PAIR OF CONTRASTING IMAGES.

COMPETITION CLOSES 21:00 HRS GMT 02 SEPTEMBER 2018

SEE THE WEBSITE FOR FULL DETAILS.





EBAY.CO.UK BARGAINS



WHAT A 'SNIP' AT £1.20 ($2) + A BIT OF POSTAGE. CAN'T WAIT TO SEE IF IT'S STILL USABLE !



BUY IT NOW AT £49.95 - ANOTHER SUPER BARGAIN FOR SOMEONE



THIS TWIN-DISK M4 (ALTHOUGH ADVERTISED AS A M4P) REACHED £152.22



A M1 KEYBOARD (ONLY) FETCHED £55.99

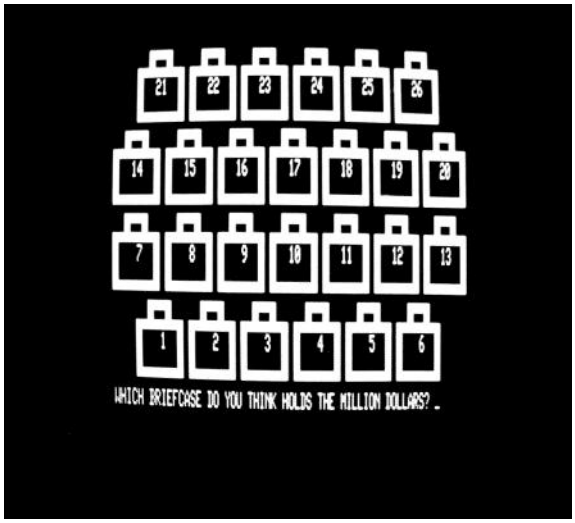


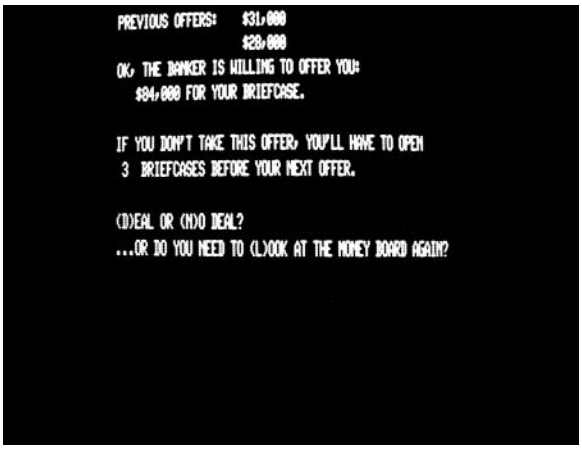
A BOXED SETUP MADE £110



AND FINALLY, I COULDN'T RESIST AN ACUALB FLOPPY TAPE WAFER. UNUSABLE OF COURSE, BUT JUST A NICE THING TO HAVE FOR £1.50 !









ALAN WALLACE HAS EMAILED ME A COPY OF HIS PROGRAM 'DEAL OR NO DEAL' AND PLACED IT IN THE PUBLIC DOMAIN. I'VE PLACED A COPY OF THE PROGRAM (AS A .DSK FILE) ON THE DOWNLOADS PAGE FOR YOU TO ENJOY. (IT CAME IN RATHER LATE SO I'VE NOT HAD A CHANCE TO PLAY IT MYSELF YET!)

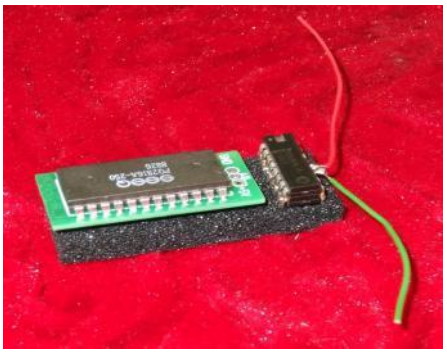
UNFORTUNATELY, HE IS UNWELL AT THE MOMENT AND HAS ASKED ME TO PUBLISH HIS NEW ADDRESS, WHICH IS :-
41795W, 12 MILE ROAD, NOVI, MI 48377, USA

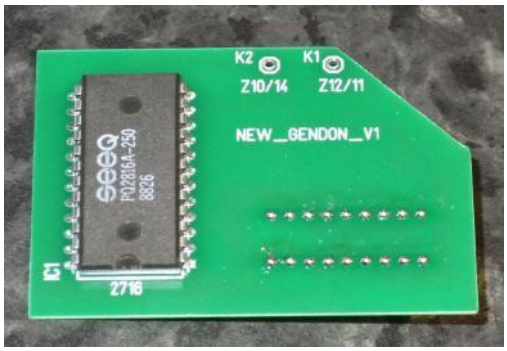
ALAN ALSO ASKED THAT, IF ANYONE CONVERTS THE PROGRAM TO ANOTHER LANGUAGE, PLEASE WOULD YOU SEND ME COPY AND I WILL FORWARD IT TO HIM AS HE IS SOON CHANGING HIS EMAIL ADDRESS.

ADVERTISEMENT

WANT LOWERCASE?
got lowercase!

Two new lowercase modifications for the TRS-80 Model I only $45ea!





Single line descenders



3-line descenders



Which do I need? Micro-LC-80 requires one trace cut and two wires soldered (just like Tandy's old kit).
New Gendon requires more cuts and soldering but the result is the more pleasing 3-line descenders.

Instructions included for both.

ORDER YOURS TO-DAY! ianm@trs-80.com

In Mav's workshop

The Model 4 Roundup

- All the Model 4 news that's fit to print -

by

Ian Mavric

1. Jim Eadie's "Super" Model 4 is up for sale. I was contacted by Jim Eadie asking if I would be able to help out with the sale of his Model 4 system. You may remember it from the 2012 TRS8Bit series "Building The Super Micro" in which I restored and kitted out a Model 4 with 128K memory, FOUR internal 80 track disk drives, and a simple speed-up modification. To this a hard drive was added which was the springboard for my series of articles about restoring TRS-80 hard drives. Jim needed a powerful system to help write and debug his TRS-80 emulator for the PC and the Super Model 4 fit the bill. Since the project was completed in late 2013 his TRS-80 has sat hardly used and now he's in the process of downsizing and moving interstate, it's time to let the system go. It will be checked over by me and sold to fund Jim's retirement. Asking price is $1200 including the hard drive system.



2. Phil Ereaut's Model 4. Phil was an early adopter of the TRS-80 having bought himself a Model I in 1978.
Along with Ray Whitehurst they wrote some interesting utilities for the Newdos/80 operating system going into the 1980s. A skilled Z80 programmer and an electronics technician to boot he tinkered with TRS-80s in various capacities until his passing in 2015. Ray helped with the cleanout of his computer and electronics hoard, and within it was his Model 4s and 4Ps.

Last week I acquired his last Model 4, a gate-array version in dire need of full restoration which I will be doing next issue, most likely starting with cleaning the case. Below is the picture of his computer sitting next to a Model 4D and a Model II. As you can see, it's quite yellow.
Phil was a chain smoker in the traditional sense, everything he owned was stained yellow with passive nicotine smoke. It's interesting to note that Phil died of old age one day peacefully in his sleep, not of lung cancer as one would have expected.



3. TCDev (a.k.a Mark McDougall) completed some ports of popular ZX Spectrum games to the Model 4 with Hi-Res graphics board. Although there is nothing new about these (they were completed back in 2016) I did have a play with Knight Lore, Alien Eight, and Pentagram and they worked well. Very playable. Since I needed to move my web site to a new address (see below) I've updated the Hi-Res Graphics web page and added download links to all three games. These pictures below show what you can expect when you run them on your Model 4.

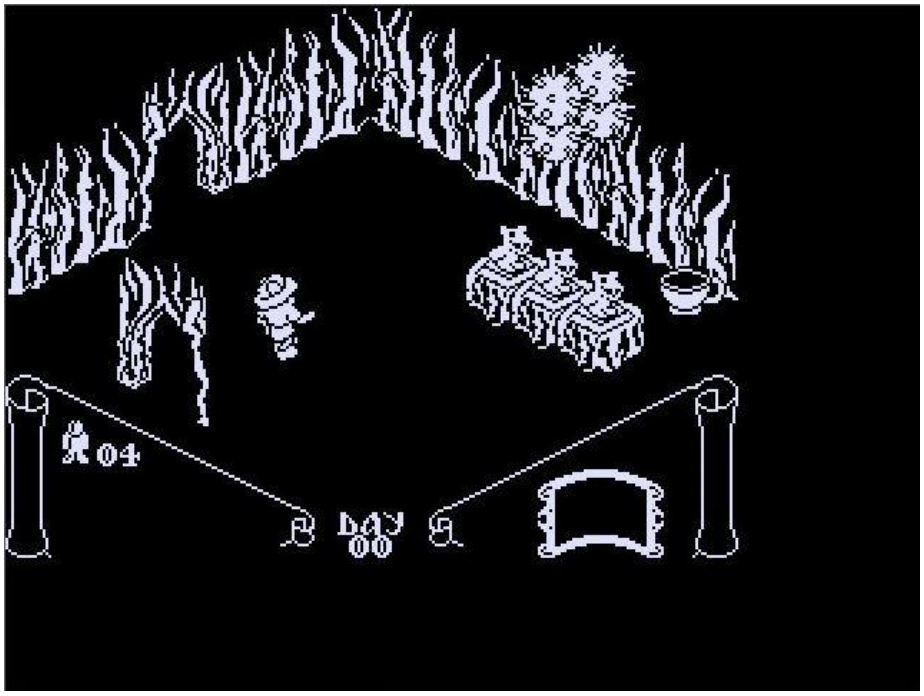


Photo: Knight Lore - one of the most popular ZX Spectrum games now on the Model 4

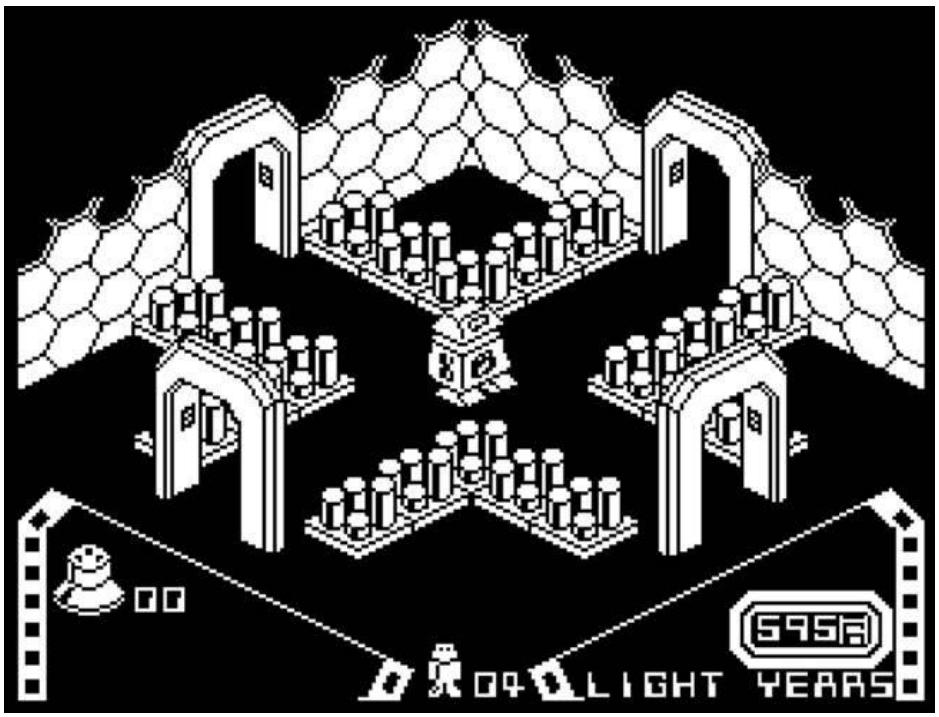


Photo: Alien Eight

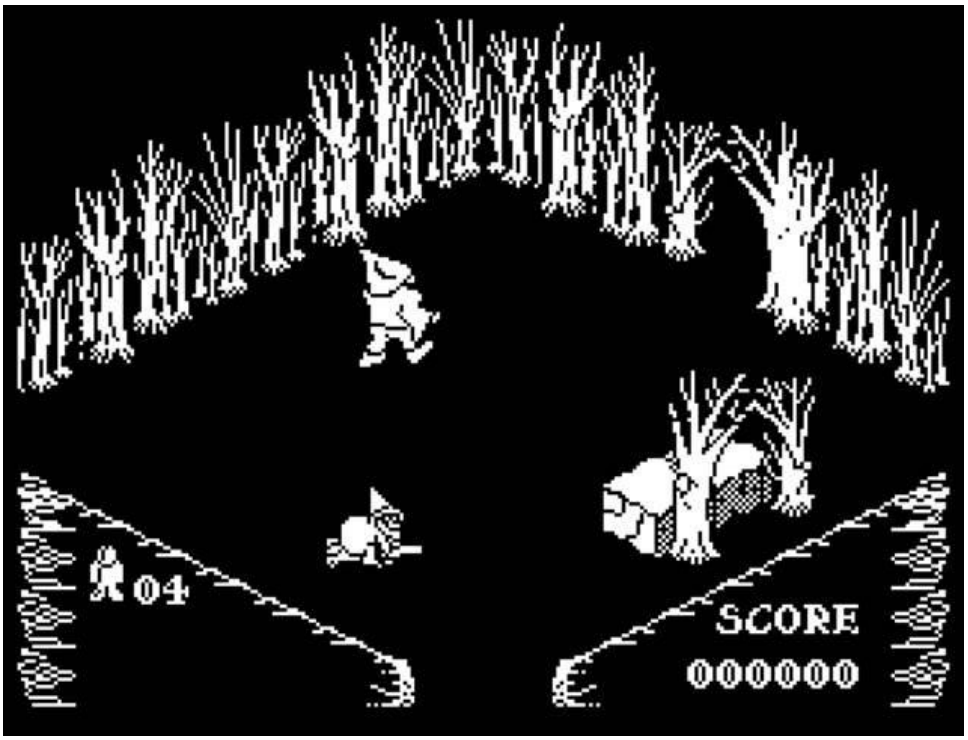
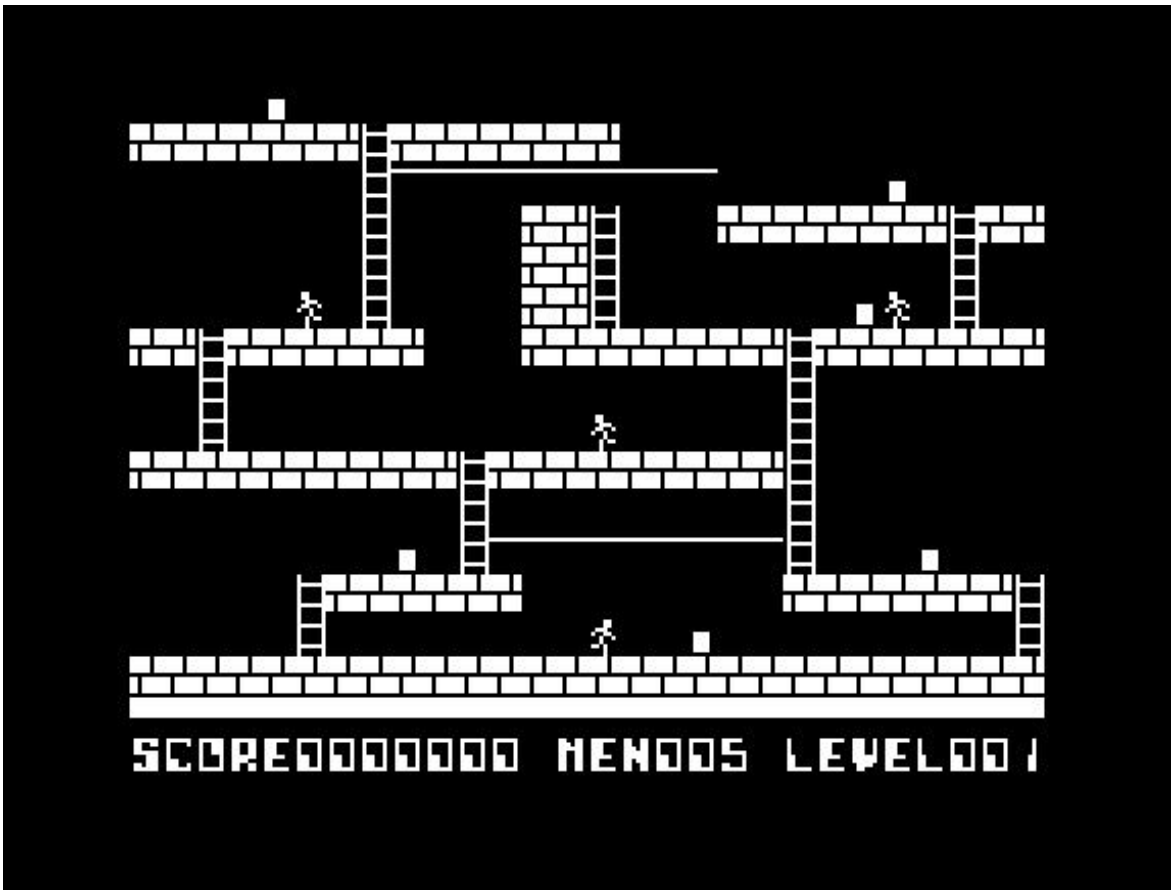


Photo: Pentagram

3a. Mark has also done a port of the classic Apple II game Lode Runner. The port comes from the MSX version, which is monochrome unlike the Apple version, but it is fully playable and great fun. If you were a Lode Runner fan from back in the day you'll know this is a welcome addition to the TRS-80 and makes great use of the Hi-Res Graphics boards.





Photos: Lode Runner port brings arcade style action to the Model 4

4. My web site: for those who haven't yet heard my ISP is having trouble with the web space server which the site lived on.
Basically the server is ancient and suffered a hardware failure. With no resolution in sight I have made the decision to move the site to this new address:
http://members.iinet.net.au/~ianmav/trs80/

where it will live from now on. In the advent the old site is restored, a re-direct to the new web site will be put in place but in all honesty I don't think they will restore the old server which offered free web hosting and when last checked only hosted web sites from six iinet subscribers.

Speaking of my web site, during the migration to the new place I've added the above Hi-Res games and added items to the Coco page.

ianm@trs-80.com



The *BEST* in TRS-80s

Call The Right Stuff

Ask for Ian
The number is +61 416 184 893

That's The Right Stuff
And he's in Melbourne







http://members.iinet.net.au/~ianmav/trs80/

COMPETITION EDITION

TRS8BIT

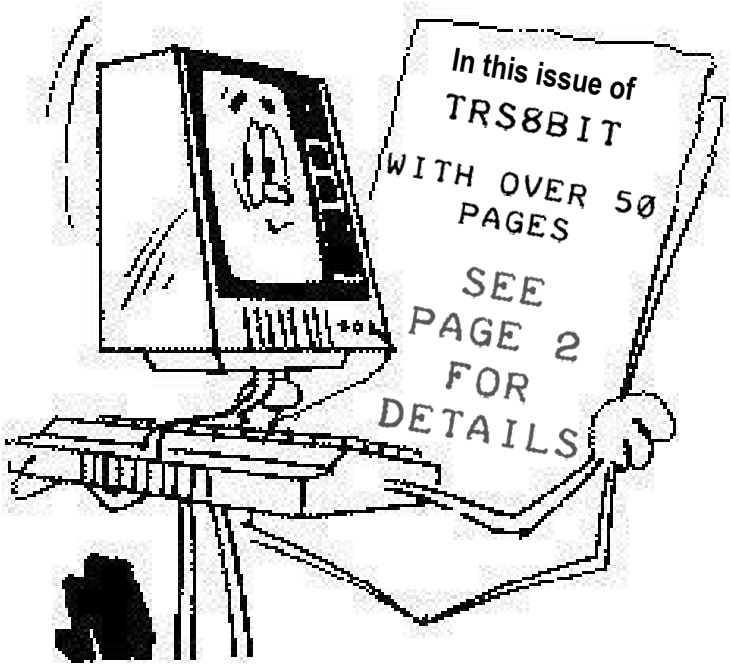
PRODUCED AT WWW.TRS-80.ORG.UK



HELLO EVERYONE AND WELCOME TO THE JUNE 2018 EDITION.

HOW'S YOUR COMPETITION ENTRY COMING ALONG? DON'T LEAVE IT TOO LATE AND MISS THE BOAT. THANKS TO MAV, THERE'S A FANTASTIC PRIZE ON OFFER. FOR FULL DETAILS, CHECK-OUT PAGE 43 OR SEE OUR WEBSITE.

SADLY, I HAVE 2 DEATHS TO REPORT, BOTH FROM THE USA. RICK DICKINSON, WELL KNOWN FOR HIS WORK ON THE SINCLAIR RANGE OF COMPUTERS IN THE UK AND FRANK DURDA. ALTHOUGH FRANK WAS PERHAPS NOT SO WELL KNOWN IN THE UK, HE WAS WITH TANDY/RADIO SHACK FOR MANY YEARS. A SAD LOSS TO THE VINTAGE COMPUTER COMMUNITY. OUR BEST WISHES GO OUT TO THE RESPECTIVE FAMILIES AND FRIENDS.



PETER CETINSKI HAS JUST RELEASED EPISODE 23 OF 'TRASHTALK'. PODCAST PIONEER DAVID GREELISH JOINS PETE AND MAV, AS A GUEST HOST. AS ALWAYS, THIS IS A MUST TO HEAR!

ONCE AGAIN, YOU HAVE ALL CONTRIBUTED SOME TRULY AMAZING AND INTERESTING ARTICLES.
ALAN WALLACE EXPLORES THE BASIC 'RND' FUNCTION. THERE IS AN UPDATE TO HIS PROGRAM 'DOND' AND A NEW PROGRAM, WTB/BAS.

MAV TAKES A DETAILED LOOK AT THE TANDY LP VII, WHICH, IN THE DAY, WAS ONE OF MY FAVOURITE BITS OF KIT. HE ALSO SHOWS US THE NEW PRODUCTS HE IS DEVELOPING FOR 2018 AND WITH THE HELP OF DAVID HAINSWORTH THEY HAVE A FIX FOR THAT ANNOYING M1 SCREEN WIGGLE.

I CAME ACROSS A COUPLE OF INTERESTING ARTICLES FOR THE FEATURE 'THE WAY WE WERE', BOTH FROM 80-US IN THE EARLY 1980'S.

BAS GIALOPSOS SHOWS HIS REMARKABLE ABILITY BY PRODUCING 'LIFE' FROM MY OLD M2, ORIGINALLY A 'SIGHT-UNSEEN' EBAY BARGAIN.

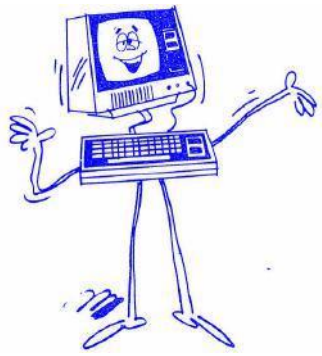
AND FINALLY, I LIST SOME OF THE TANDY BARGAINS ON EBAY, SINCE OUR LAST ISSUE.

SO, UNTIL SEPTEMBER

TAKE CARE EVERYONE

DUSTY





CONTENTS

PAGE Ø4 — RANDOM NUMBERS
ALAN WALLACE
ALAN EXPLORES SOME OF THE 'FINER POINTS' OF THE BASIC RND COMMAND

PAGE Ø8 — RICK DICKINSON OBITUARY

PAGE 12 — FRANK DURDA OBITUARY

PAGE 13 — IN MAVS WORKSHOP
IAN MAVRIC
MAV GIVES US A REAL TREAT WHEN HE DISCUSSES THE LINEPRINTER VII

PAGE 23 — SIERPINKSI'S SIEVE
GEORGE PHILLIPS'S GENIUS COMES TO THE FRONT WITH THIS TRULY BRILLIANT ONE-LINER. I JUST LOVE IT!

PAGE 24 — 'THE WAY WE WERE'
JUST FEATURING ARTICLES FROM 8Ø-US, FROM THE DAY. I COULDN'T RESIST THE PHOTOS OF THE M2 PRODUCTION LINE

PAGE 3Ø — IN MAV'S WORKSHOP
IAN TAKES US THROUGH SOME OF HIS NEW PRODUCTS HE'S DEVELOPING

PAGE 41 — BAS GIALOPSOS FROM BETAGAMMA COMPUTING HAS JUST CONTACTED ME WITH NEWS OF ASTOUNDING PROGRESS ON MY OLD, BATTERED M2

PAGE 43 — **COMPETITION PAGE.** IS YOUR ENTRY READY YET?
THERE'S A FABULOUS PRIZE TO BE WON

PAGE 44 — MAV GIVES US AN UPDATE OF ENTRIES RECEIVED TO DATE

PAGE 46 — I-SPY EBAY BARGAINS. WERE YOU LUCKY?

PAGE 48 — CURING THE MODEL 1 SCREEN WIGGLE
IAN MAVRIC & DAVID HAINSWORTH
THESE 2 HARDWARE EXPERTS SHOW US ALL HOW TO CURE THAT OLD PROBLEM IN A VERY CLEVER WAY



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RETRO RESTORATION SPECIALISTS





Email: bgcompute@aol.com

ALAN WALLACE, (OF DEAL OR NO DEAL FAME), RECENTLY CONTACTED ME WITH REGARD TO A PROGRAMING PROBLEM, WHICH, BYE THE WAY, GEORGE PHILLIPS VERY KINDLY SORTED OUT FOR HIM. I QUERIED, WITH ALAN, WHY HE HAD USED INT(RND(X)) WITHIN THE PROGRAM, INSTEAD OF THE USUAL RND(X). THE FOLLOWING, MOST INTERESTING, ARTICLE FOLLOWED AFTER OUR NUMEROUS EMAILS. I'VE INCLUDED A COPY OF THE WTB/BAS PROGRAM THAT ALAN REFERS TO ON THE DOND.DSK FILE FROM THE DOWNLOADS PAGE.



RANDOM NUMBERS

ALAN WALLACE

IT APPEARS THAT THE RANDOM NUMBER GENERATOR RND() WORKS SLIGHTLY DIFFERENT FOR INTEGERS THAN FOR REAL #'S. IT APPEARS THAT WHAT HAPPENS FOR INTEGERS IS THAT THE RANDOM NUMBER GENERATED IS ROUNDED UP AND TRUNCATED. THIS MEANS THAT RND(X) WILL ALWAYS PRODUCE A NUMBER BETWEEN 1 AND X UNLESS RND(X) RETURNS A VALUE OF PRECISELY ZERO (WHICH IS ALMOST NEVER).

IN MOST CASES, THIS IS OKAY, BUT IF YOU REALLY WANT A NUMBER BETWEEN Ø AND X YOU MUST OUTSMART THE MACHINE BY SPECIFYING THE INTEGER = INT(RND(X+1)-1), OTHERWISE YOU'LL GET 1 TO X, 99.999% OF THE TIME (BY SPECIFYING RND(X)).

USUALLY, THIS IS THE INTENDED EFFECT, BUT NOT ALWAYS. SOMETIMES, WE REALLY WANT A NUMBER THAT IS Ø OR 1 WITH NO BIAS.

THIS WAS THE EFFECT ON MATTHEW REEDS' EMULATOR FOR A M1. SINCE I NO LONGER HAVE ACCESS TO A REAL M1, I DON'T KNOW IF IT BEHAVES IN THE SAME MANNER. I'D BE CURIOUS TO KNOW. I DISCOVERED THIS BY ACCIDENT WHEN DEBUGGING ONE OF MY M1 PROGRAMS.

THIS ALL STARTED WITH THE MATRIX SCREENSAVER. I WANTED IT TO START ANYWHERE ACROSS THE TOP OF THE SCREEN (SHOULD BE EASY ENOUGH AND I WANTED IT TO GO UP OR DOWN BY 1 AS IT WENT DOWN THE SCREEN (THIS WOULD BE A LITTLE MORE DIFFICULT BUT ONLY BY A LITTLE BIT). THE FIRST CHANGE SHOULD BE A SIMPLE RND() CALL. THE SECOND CHANGE, I WOULD DO IN TWO PARTS, BOTH RELATIVELY EASY, USING MATH FOR THE FIRST PART AND AN IF FOR THE SECOND PART OF PART 2.

THEN, I RAN INTO THIS BRICK WALL.

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SO, THIS WHOLE THING REALLY STARTED WITH ME WANTING TO GET A RANDOM INTEGER BETWEEN -1 AND 1 INCLUSIVE OR -1, Ø, OR 1. I FIGURED THE WAY TO DO THIS WAS TO GET TWO RND NUMBERS OF Ø AND 1, SUBTRACT ONE FROM THE OTHER, GET RID OF ANY BIAS AND BE ON MY MERRY WAY. I PICKED B AND D FOR THE Ø AND 1'S AND E FOR THEIR SUBTRACTION. IN OTHER WORDS,

B	D	E	
Ø	Ø	Ø	
Ø	1	-1	
1	Ø	1	
1	1	Ø	PICK AGAIN.

SO, I CHOSE TO CHECK FOR (B=1 AND E=Ø) TO PICK AGAIN. I COULD HAVE CHOSEN TO CHECK FOR (B=Ø AND E=Ø) AND IT WOULD HAVE BEEN NEARLY EQUIVALENT.

MY PROBLEM WAS THAT B=RND(1) AND D=RND(1) HAS ALWAYS PRODUCED A VALUE OF 1. I STILL DON'T KNOW IF THIS IS A BUG OR A FEATURE.

THEREIN LAY MY PROBLEM.

I KNEW HOW TO OUTSMART THE MACHINE BUT I HAD TO CONDUCT MY TESTING.

SIMPLY, MAKE SURE RND(2)-1 WORKED. I DIDN'T KNOW IF =INT (RND... WAS NEEDED OR NOT. I HAD MY SUSPICIONS, OF COURSE, BUT ONCE AGAIN THE TESTING WOULD PROVE THAT OUT.

TESTING PROVED OUT SOME VERY IMPORTANT THINGS ...

PREDEFINED STRINGS ARE FASTER THAN LITERALS, SUCH AS CHR$().

I ARBITRARILY CHOSE 10,000 TIMES AS MY SAMPLE SIZE FOR EACH TEST.

I CHOSE B=RND(1) AND AFTER SOME PRELIMINARY TESTING OF B=INT (RND(2)-1). TESTING PROVED THE INT() WAS NOT NEEDED.

I ARBITRARILY CHOSE B=RND(100) AS MY "INDEPENDENT" TEST.

ALL WORKED SWIMMINGLY, THEN I WROTE SOME ADDITIONAL CODE REMEMBERING THAT MY ORIGINAL MI WOULD ON RARE BUT IMPORTANT OCCASIONS LOCK UP OR FREEZE WITHOUT MY KNOWLEDGE. I WOULD JUST STARE AT THE MACHINE WHILE I THOUGHT MY MI WAS "THINKING," WHILE IT HAD ACTUALLY STOPPED WORKING.

YOU KNOW THAT LITTLE CIRCLE-THINGY THAT MICROSOFT DISPLAYS AS SOMETHING IS LOADING OR STARTING UP? WELL, THIS BIT OF CODE IS MODELLED AFTER THAT.

IF YOU WANT NUMBERS, I HAVE THEM. ON MR'S EMULATOR, THE FILE WITHOUT THE WHEEL (RND1A/BAS) RAN ON AVERAGE OF 8:51; WHILE, WITH THE WHEEL (WTRNDNO/INT), THE FASTEST I COULD MAKE IT GO WAS 30:51. THAT SOUNDS SIGNIFICANT. MAYBE IT IS AND MAYBE IT'S NOT. REMEMBER THAT THIS BASIC SUBROUTINE WAS CALLED 30,000 TIMES. IT'S WAY BETTER THAN STARING AT A BLANK SCREEN.

THE NUMBERS BREAKDOWN THIS WAY: WITHOUT THE WHEEL IT'S 531 SECONDS; WITH THE WHEEL, IT'S 1851 SECONDS; THAT'S ONLY .044 SECONDS PER CALL. I THINK THAT'S WORTH IT TO KNOW MY MACHINE IS RUNNING.

THE WHEEL (WTA/BAS) CAN BE PLACED JUST ABOUT ANYWHERE - AVOID THE FIRST AND LAST LINE. IT STARTS AT 4,000. LOAD YOUR PROGRAM, THEN MERGE WTA/BAS. WITH A FEW QUICK CHANGES, YOU'LL BE UP AND RUNNING. REMEMBER THAT PREDEFINED STRINGS ARE ALMOST ALWAYS FASTER!

I'VE GOT MORE NUMBERS, IF YOU WANT THEM. JUST ASK VIA EMAIL OR TEXT MESSAGE.

AL.WALLACE1964@YAHOO.COM



ACTUAL REALITY



This all NEW 9ame for the TRS-80 Model 1-4 is written in 16k Level II Basic.
It is an adventure throu9h sPace and time.
One of both exPloration and war.
You take command of the IDF (Inter Dimensional Federation) Astron Just when mortal enemies the IDE (Inter Dimensional EmPire) are massin9 their forces in an attemPt to rule the multiverse in tYrannY.
OnlY YOU and Your shiP stand between them and their objective.
The 9ame is bein9 distributed in the PROPER old school format. On cassette in an A4 Packa9e reminiscent of back in the daY in TandY/Radio Shack. Also in the Packa9e is a 9uick start 9uide.
For further info inc: Instructional video, 1/4 PlaY throu9h, review and Promotional video, 9o to the YouTube channel: Retro Gamin9 Geeza.

The 9ame has been featured on the new Trs-80 trash talk Podcast (APril) You can Goo9le them or find them on Facebook. **For sale on EbaY**

Get readY for the adventure.

#UPDATE. The 9ame is now also available on 5.25 FLOPPY DISK, for MODEL ONE ONLY. If You would Prefer to receive it in this format, send a note on the buY Pa9e when You Purchase.

JUST FOR FUN, I CHOSE THIS TYPEFACE AS IT IS VERY SIMILAR TO THE LINE PRINTER VII - SEE MAV'S ARTICLE ON PAGE 13

RICK DICKINSON, DESIGNER OF SINCLAIR HOME COMPUTERS, DIES



Industrial designer who gave the ZX80, ZX81 and ZX Spectrum their distinctive look has died in the USA



The Sinclair ZX Spectrum,
designed by Rick Dickinson, was launched in 1982.
Photograph: Alamy

The designer of the Sinclair Spectrum home computer, Rick Dickinson, has died in the USA.

Dickinson joined Sinclair Research, a British consumer electronics company founded by the inventor Sir Clive Sinclair, in 1979 after graduating from Newcastle Polytechnic's industrial design programme.

He worked at the company during the period in which the ZX80, ZX81 and ZX Spectrum computers were released. The ZX80 was marketed as the first home computer in the UK to cost less than £100.

Dickinson designed home computers with touch-sensitive and rubber keys, giving them a unique aesthetic. In 1981 he won a Design Council award for his work on the ZX81.



The award-winning design of the Sinclair ZX81, which was launched in March 1981.
Photograph: Andy Drysdale / Rex Features

The ZX80 and ZX81 were forerunners to the popular ZX Spectrum. Initially available in 16k and 48k models, the computers cost up to £175. Including later models, it is estimated that more than 5m ZX Spectrums were sold.

In a 2012 interview with the BBC, Dickinson spoke about the risk involved in launching the ZX Spectrum. "No matter how much history one might have with successful products like the ZX80 and 81, there is always a niggling doubt in one's mind that to come out with something new and significantly different is a risk," he said.
"We were all overwhelmed by the demand and the number of products that were sold."

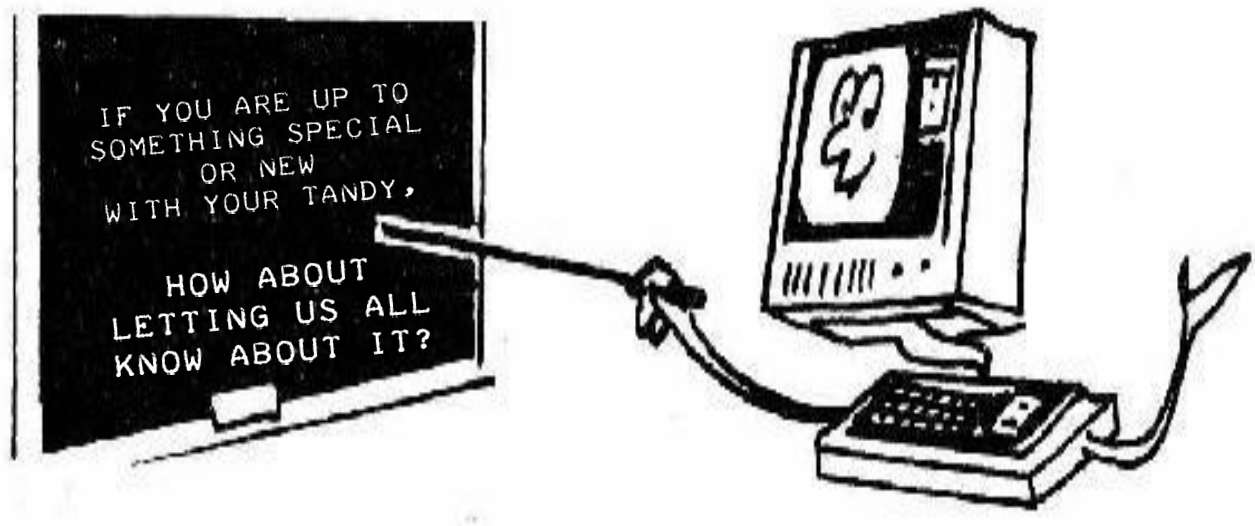
The rubber ZX Spectrum keyboard was the result of the company's mission to drive down production costs.

"With the Spectrum keyboard, We minimised it from several hundred components in a conventional moving keyboard, to maybe four or five moving parts using a new technology," Dickinson told the BBC.
The popularity of the games developed for the computers has endured and many have been repackaged in newer products.



A Sinclair ZX80 home computer.
Photograph: Alamy

In a 2014 interview, Dickinson said he was alerted to the continued popularity of his designs when a younger colleague wore a ZX Spectrum T-shirt. His co-worker's fashion statement inspired Dickinson to upload archive photos of the original ZX Spectrum design and in later years, Dickinson published re-imaginings of early Sinclair designs, producing a series of images of the ZX Spectrum Next.

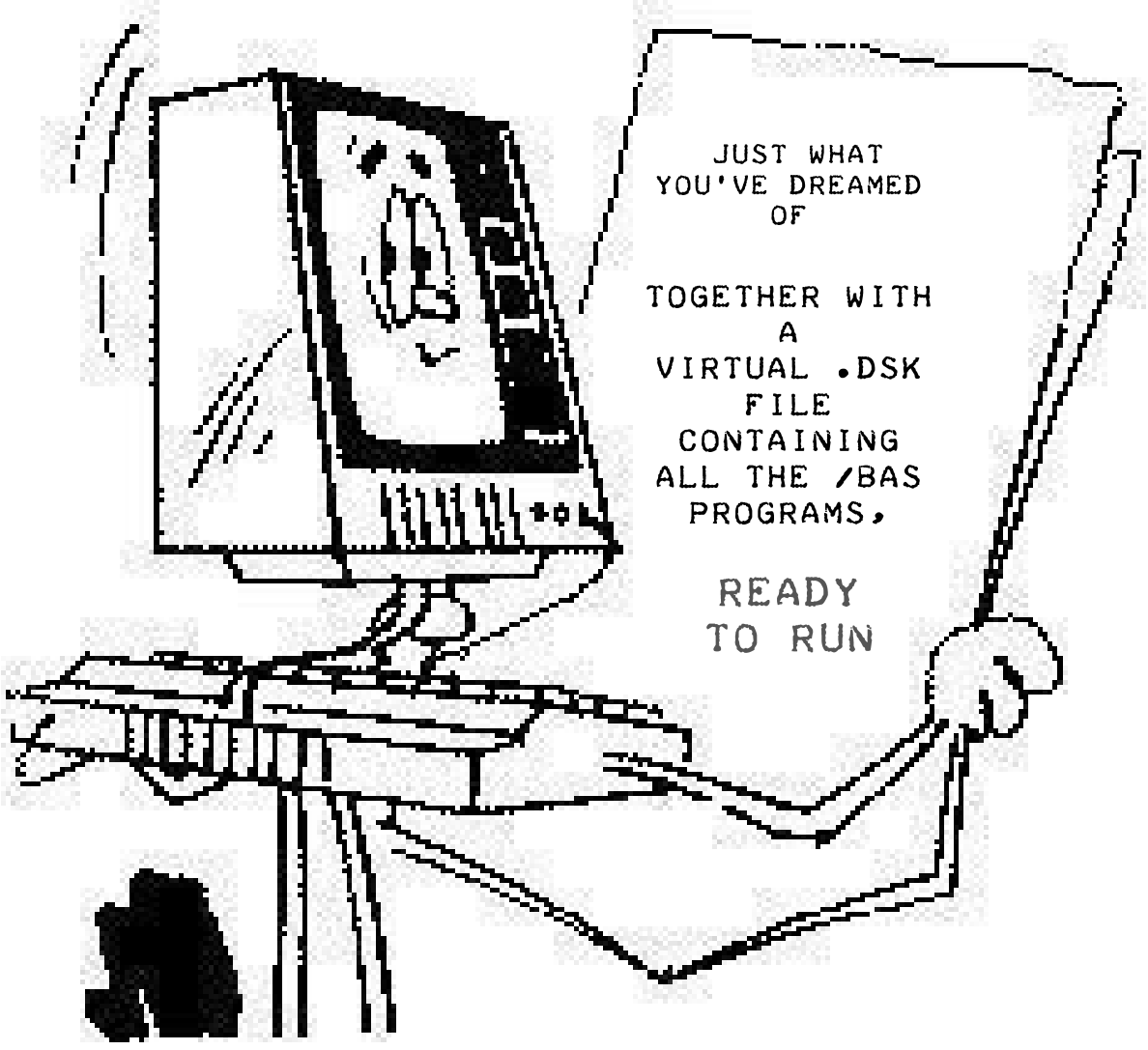


TRS8BIT'S

THE

ONE LINER COLLECTION

FOR THE TRS-80 MODEL 1



PRODUCED AT TRS-80.ORG.UK - JAN 2018

AVAILABLE FROM THE DOWNLOADS PAGE AT
TRS-80.ORG.UK



IF YOU'RE OF A CERTAIN AGE (I'M BEING POLITE HERE, BUT THEN I'M THAT OLD TOO, SO I CAN), YOU MIGHT REMEMBER THE MICROBEE COMPUTER IN YOUR EDUCATIONAL INSTITUTION OF CHOICE.

THE BRAND IS MAKING A COMEBACK, BUT THIS ISN'T A CASE OF SELLING NEW TECH WITH AN OLD BADGE ON IT. MICROBEE'S GOING TO SELL ACTUAL MICROBEES, ALBEIT WITH A FEW MODERN TWISTS. THE MICROBEE PREMIUM PLUS WILL, AS PER ITS WEB SITE, COME IN KIT FORM WITH KEYBOARD, Z80 CPU, PIO,6545 SCREEN CONTROLLER AND VIDEO CIRCUITS, ALONG WITH ASSEMBLY INSTRUCTIONS.

IT'S A SLIGHTLY WEIRD HYBRID NONETHELESS; WHILE IT'LL SUPPORT EVERYTHING AN ORIGINAL MICROBEE SHOULD (IN THEORY) ITS USE OF A DUAL PROCESSOR AND SD CARD FOR STORAGE (EMULATING THE FLOPPY DRIVE) MEANS IT'S ALSO GOT SOME 21ST CENTURY DNA IN THERE.



I AM SORRY TO REPORT THE UNTIMELY DEATH OF FRANK DURDA. I'M SURE HIS NAME MUST BE KNOWN TO MANY UK TANDY FANS, AS HE WAS A FORMER TANDY/RADIO SHACK R&D ENGINEER.

FRANK WAS CONSIDERED BY MANY OF HIS COLLEAGUES TO BE A SOFTWARE AND ALSO A HARDWARE GENIUS. HE WILL BE SADLY MISSED BY HIS FAMILY AND ALSO HIS MANY ADMIRERS FROM WITHIN THE TANDY COMMUNITY.

IN MAV'S WORKSHOP

by Ian Mavric

TRS-80 PRINTERS FROM THE BEGINNING SERIES PART 5: LINE PRINTER VII, DMP-100, DMP-110



Last time I talked about the Line Printer VI, DMP-400 and DMP-420, Tandy's budget range of wide-carriage home and small business printers. Aimed at the $1000-$1200 price range they sold incredibly well and for a long time.

Looking at the range for 1982, Tandy's printer offerings had the large business printers in the over $1000 price range, and some other very small rather forgettable printers in the sub-$250 price bracket (I'm talking about the Quick Printer II). What they needed was a printer capable of 80 column printing on standard Legal or A4 "computer paper" but would still be profitable in the sub-$400 range.

Previously the LP 2/4 attempted to fit in this category but Tandy couldn't produce them cheaply enough to drop below $800, and in any case it didn't work with the Coco which by 1982 was a roaring success.

Enter the Line Printer VII (LP7): an interesting uni-hammer dot matrix printer.



DESIGNED FOR HOME USERS

The advertisement above shows a plain looking very simple printer capable of printing on tractor pull-feed printer paper. There is no Online/ Offline switch or paper feed buttons. A single red LED indicates the printer is powered up, and below the LED is a manual roller to advance the paper. It has interfaces for both parallel port TRS-80s and the 4-pin DIN serial port for the Coco.

WHAT IS A UNI-HAMMER PRINTER?

In order to get the price below $400 a traditional 7-pin dot matrix head was going to be too expensive, so a uni-hammer system with a spinning ridged platen behind the paper and a single hammer in front will achieve the a similar result to a dot matrix printer, though rather more slowly. The Uni-hammer mechanism is supplied by Seikosha of Japan and is explained well in the LP7 manual so here is the relevant section:

Tandy Assembly

THE 2018 TANDY ASSEMBLY IS TO BE HELD AT:-

SPRINGFIELD, OHIO
ON THE
10TH & 11TH NOVEMBER 2018

TICKETS AVAILABLE NOW, SEE THE WEBSITE FOR DETAILS

THEORY OF OPERATION

This Printer uses a single printing hammer system which is different from other impact dot matrix printing systems. Notice the platen, with its series of raised ridges. These ridges are part of the secret. The carriage movement, the motion of the hammer, and the revolution of the platen are all minutely synchronized. See Figure 10 for the mechanical construction of the hammer, platen, and dot sensor. Figure 11 shows the relationship between the hammer, the printed dot position, and the dot sensor signal.

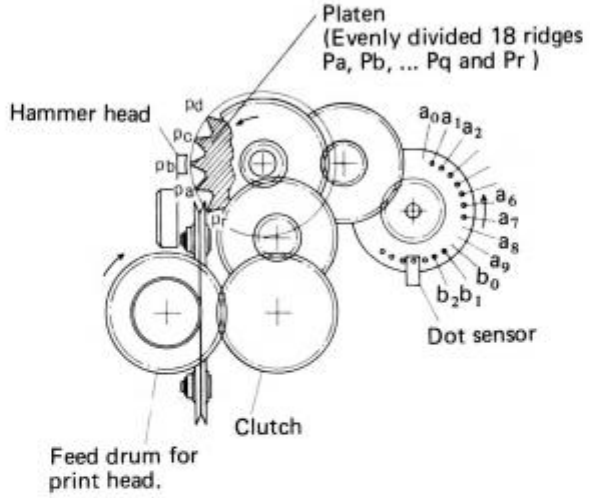


Figure 10

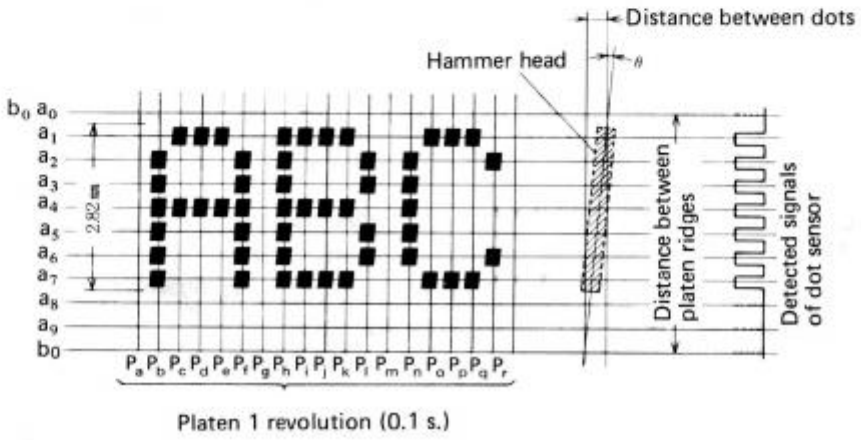


Figure 11

The ridges on the platen are set to account for ten dots, which is the height of one column. (The top and bottom dots are not printed. They are used for spacing between the lines.) While the platen rotates for each ridge, seven dot signals are sent to the head hammer. Each signal activates or deactivates the head according to the command being executed. The head is activated and deactivated seven separate times while one ridge passes by the hammer head. The hammer head is slanted to compensate for the constant rightward motion of the head position. Each pass of a ridge causes one column to be printed. There are 18 ridges on the platen, therefore 18 columns (three characters) are printed for each revolution of the platen.

SPECIFICATIONS - BUDGET PRINTER STYLE

A printing matrix of 5x7 with no lowercase descenders at 30 characters per second was as good as you got with the LP7. It was not designed for high speed office work nor for word processing quality output. At 30cps it took over 2 seconds to printer a full 80-column line and it was not bi-directional so the head had to make its way back to the start before printing the next line.

The tractor was adjustable from 8.5in down to 4in meaning this printer would take standard mailing labels which was a nice touch for the small home office or club mailing list duties, or to print disk labels. For these sorts of jobs speed was not an issue and these printers found their way into many low speed jobs like mailing list and programming hard copy for debugging etc.

Trivia: the first year of the iconic Color Computer magazine *The Rainbow* was printed on a Line Printer VII.

The lid was removable and not hinged, however it did do a good job of keeping the printing quiet. The LP7 was no noisier than a regular dot-matrix, which is to say that by today's standards it's still pretty noisy. On the back was a power switch on one side and an interface selection (600 baud, 1200 baud and Parallel) and a standard Centronics parallel interface and a Coco compatible serial interface.

Speaking of the Coco, this printer had dot-addressable graphics, meaning you could draw pictures with this printer. This was quite revolutionary at the time and was not just limited to the Coco as any TRS-80 could send dot-addressable commands to the LP7, however it was well suited to the Coco's hi-resolution graphics (a big selling point of that computer) so Radio Shack sold a hi-res screen dump program for the Coco which no doubt helped sales of the printer. Graphics screen dump programs for other TRS-80s like the Model I and III were regularly printed in magazines like 80micro and Computer User.

DOES IT LOOK THE PART?

The LP7 measures 16in wide, 5.32in tall and 8.25in deep. That makes it compact even by Epson printer standards of the 1980s. It's also mainly plastic so only weight 8.6lb or less than 4kg. Finally, a decent Tandy printer which doesn't try to bust your back.

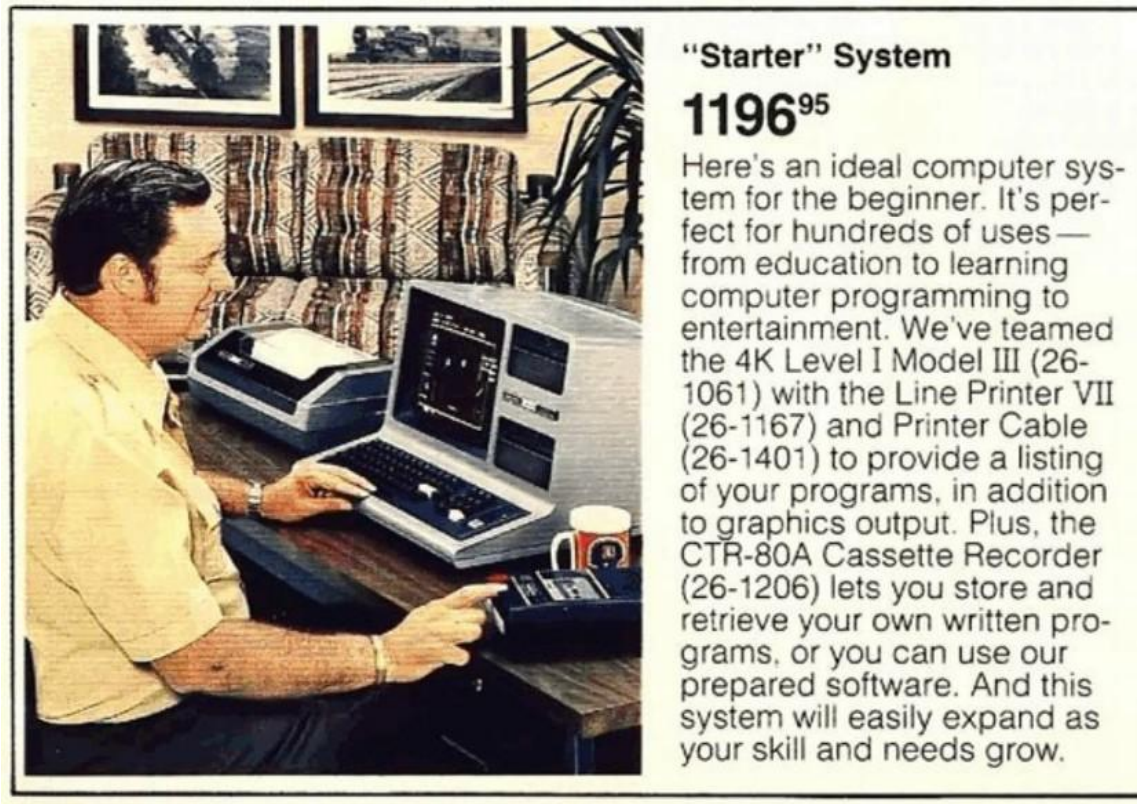


Photo: the LP7 in a home with the cassette-based Model III

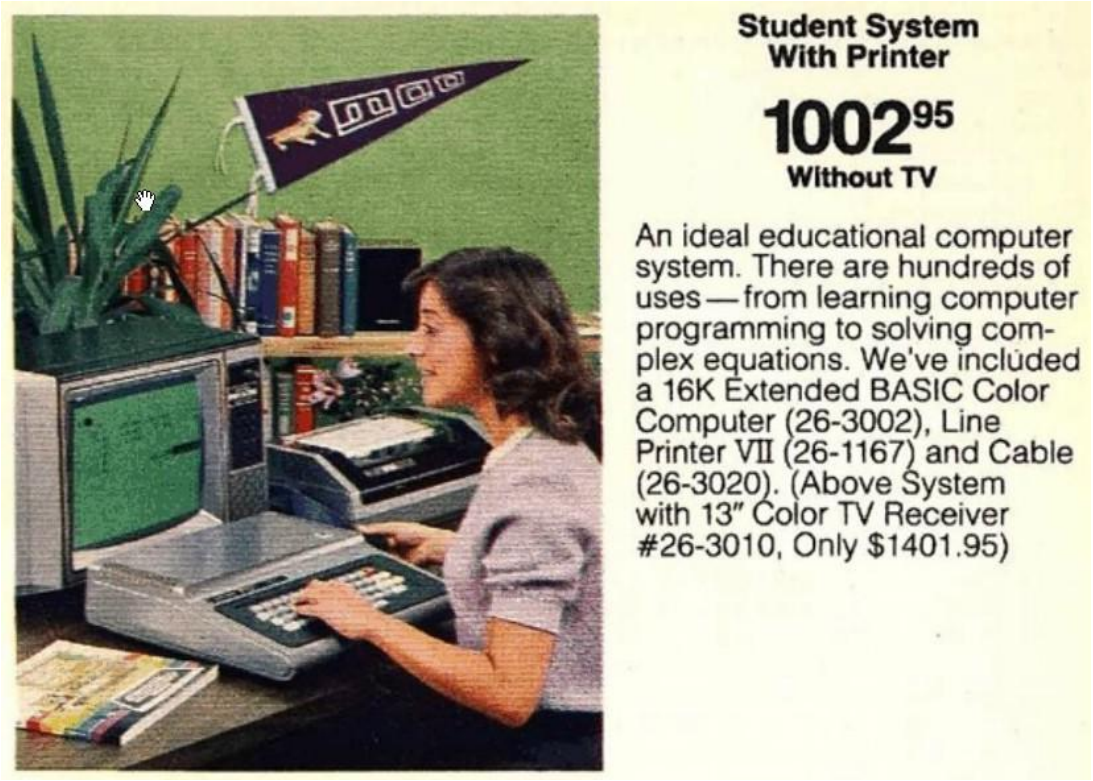


Photo: LP7 is particularly well suited to Coco use whether you have a simple setup

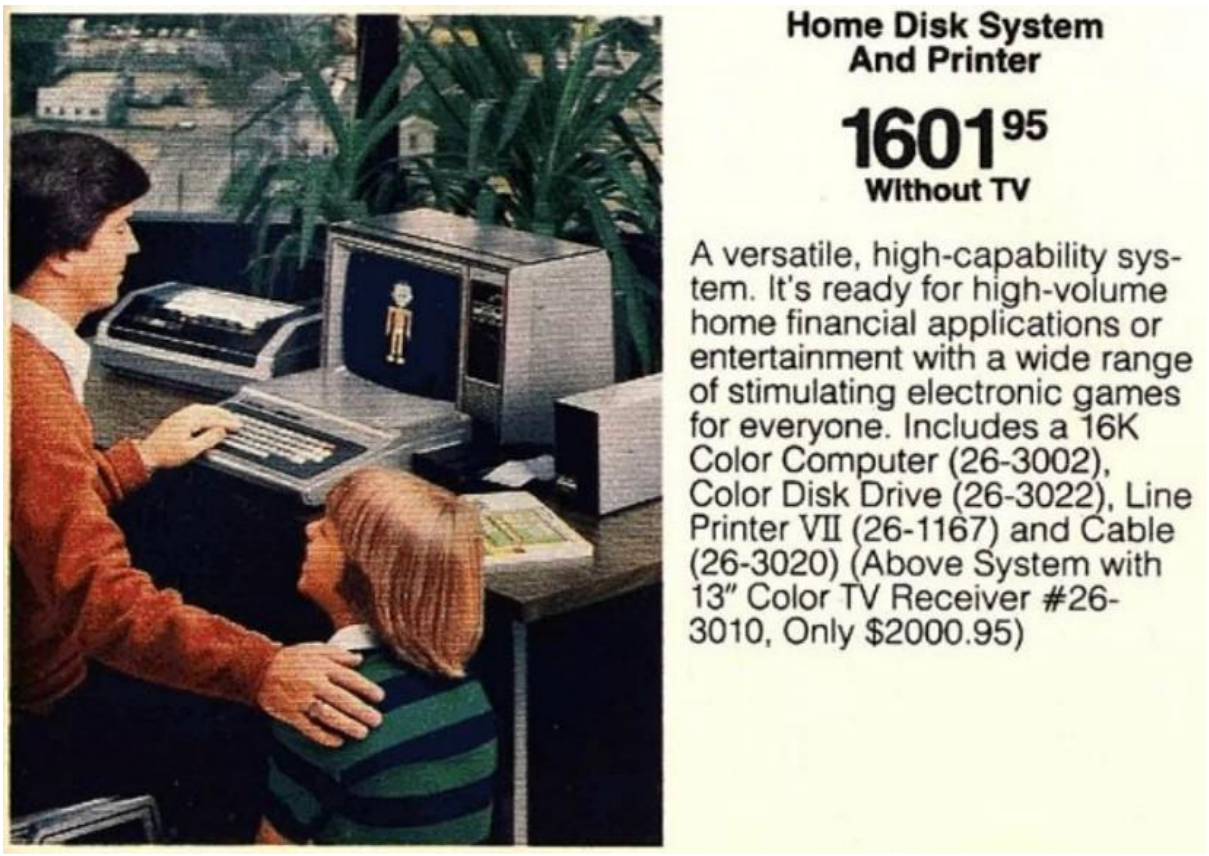
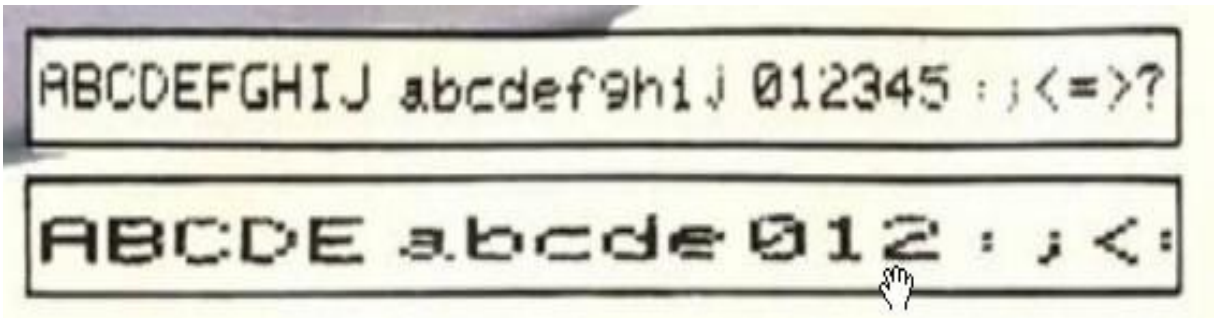


Photo: ... or a more elaborate Coco setup

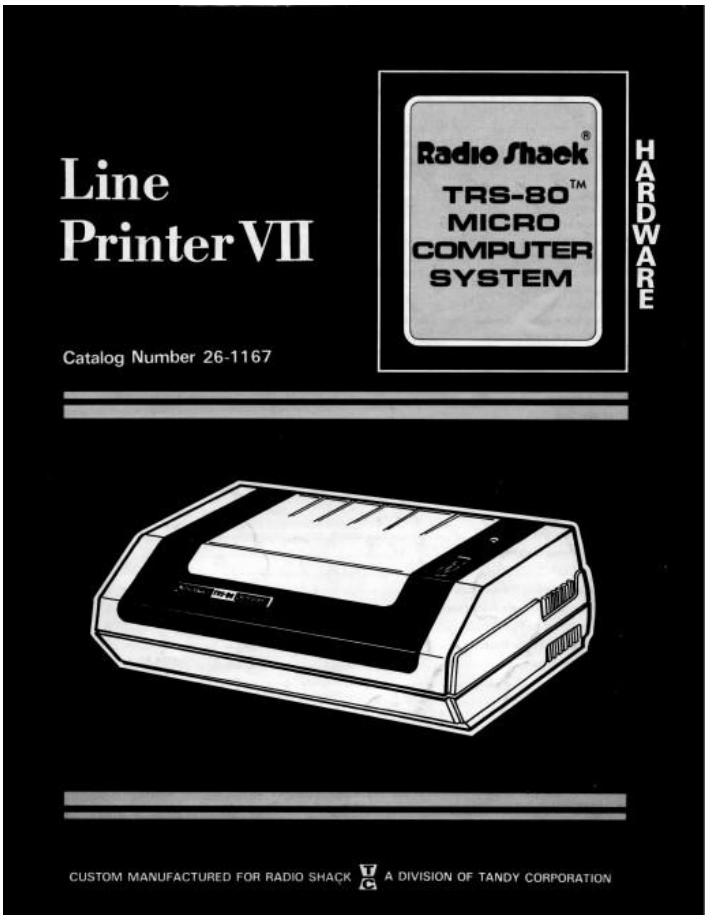
PRINT SAMPLE

Some concessions to price had to be made and for the LP7 it was print quality. The 5x7 matrix was about the minimum acceptable in 1982 (though some could argue this was dated even by 1982 standards) with no lowercase descenders. On the plus side they did include double width 40-column printing (an early version of what we might call Bold these days).



MANUALS SUPPLIED

The typical manual was included so the end user could get their printer up and running quickly. For those with a more technical side to them there was also a Service Manual available at a extra cost.


Line
Printer VII
Radio Shack
TRS-80™
MICRO
COMPUTER
SYSTEM
HARDWARE
Catalog Number 26-1167
CUSTOM MANUFACTURED FOR RADIO SHACK A DIVISION OF TANDY CORPORATION


Radio Shack
Service Manual
26-1167
TRS-80
LINE PRINTER VII
Catalog Number: 26-1167
CUSTOM MANUFACTURED FOR RADIO SHACK A DIVISION OF TANDY CORPORATION

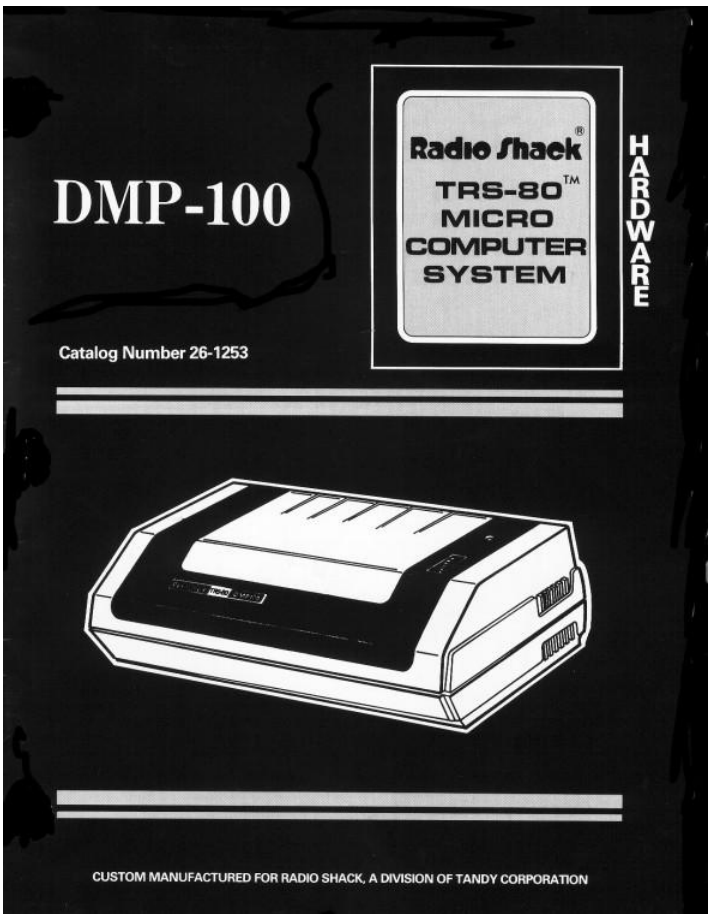
PRICING and CONSUMABLES

As you would expect from Tandy at the time, as well as replacement printer ribbons and tractor feed "computer paper", they also offered a vinyl cover for the LP7. The printer hit the market in 1982 at a price of $399. Listed below are prices and catalog numbers related to the LP7, remembering the prices are listed in 1982 US dollars: (Source: Tim Mann's Radio Shack Catalog Number compilation)

DERIVATIVES

The LP7 was popular enough that moving forward Tandy decided to keep the good elements of the printer but fix some of it's drawbacks and so thus was born the DMP-100 at the time they changed the name of all their dot-matrixes from Line Printer to DMP. Around a year after the LP7 was released the updated DMP-100 (cat. no. 26-1253), and a ROM upgrade increased the speed to 50cps and a bug with the dot-addressable graphics printing in 8-bit mode was fixed, however the price remained unchanged at $399.00

Finally, when everything else in the TRS-80 line-up was changing from silver to the new white paint scheme, the DMP-100 was one of the products which was selling too well to discontinue it however it was looking a little old in the looks department.



In 1984 Radio Shack once again came back with an updated model, this time named the DMP-110 (catalog number 26-1271) which took the uni-hammer design to its limits with an increased number of fonts while still coming in at $399.



CONCLUSION

Seikosha's Uni-hammer was an interesting way of getting cheap printers which used standard sized paper (Legal and A4) to users without breaking the bank. In fact many companies used the Seikosha uni-hammer print engine including Commodore with the VIC-1515, VIC-1525 and MPS -801, and the Amstrad DMP1. Due to the design of uni-hammer printing, the faster you go the blurrier the printing so the DMP-110 marked the end of that particular path for Tandy. Tandy did continue with limited feature printers in the sub $400 range with the DMP-105 and its derivatives which I will cover in a future article.

If you are after a LP7 or DMP-100 one they come up regularly on eBay, as do the ribbons. I rate this printer a 3.5 out of 5, mainly due to its low speed and lack of print quality. For collectors it does tick the boxes of being small/compact, and has an iconic character set - as well as being the first printer for many TRS-80 owners back in their formative years. My pick of the three is the DMP-110 if you have a white TRS-80 like a Model 4, 12, or Coco 2/3, and the DMP-100 if you have a Model I, II, III or Coco 1.

NEXT TIME: Line Printer VIII (catalog number 26-1168), DMP-120 (catalog number 26-1255), DMP-200 (catalog number 26-1254)

Ian Mavric

ianm@trs-80.com



Ian Mavric is an IT Specialist who also restores and collects TRS-80's and classic cars. He live with his wife and kids in Melbourne, Australia.

TRS-80 Emulators . com

TRS32: A Model I/III/4/4P Emulator For Windows

written by Matthew Reed

Unregistered Shareware Version:

- Works under all current versions of Windows
- Full Windows application – no low-level hardware conflicts!
- Model I, Model III, Model 4, and Model 4P emulation
- Four floppy disk drives (with optional realistic disk drive sound)
- Cassette tape drive with graphical on-screen controls
- Exatron Stringy Floppy emulation
- Printer support
- Serial port for RS-232 communications
- Joystick support (using a Windows joystick – TRISSTICK and Alpha Products joysticks are emulated)

Registered Version:

- All features included in the shareware version
- Built-in emulation of an Epson FX-80 dot matrix printer (including graphics and control codes)
- High resolution graphics (Radio Shack and Micro-Labs)
- Up to 1 megabyte of additional memory in Model 4 and 4P modes
- Hard disk support
- Orchestra 85/90 music generation

Interested?

- Read the TRS32 emulator documentation
- Download the shareware version
- Register online



Actual Dotwriter output – emulated FX-80
click for larger sample

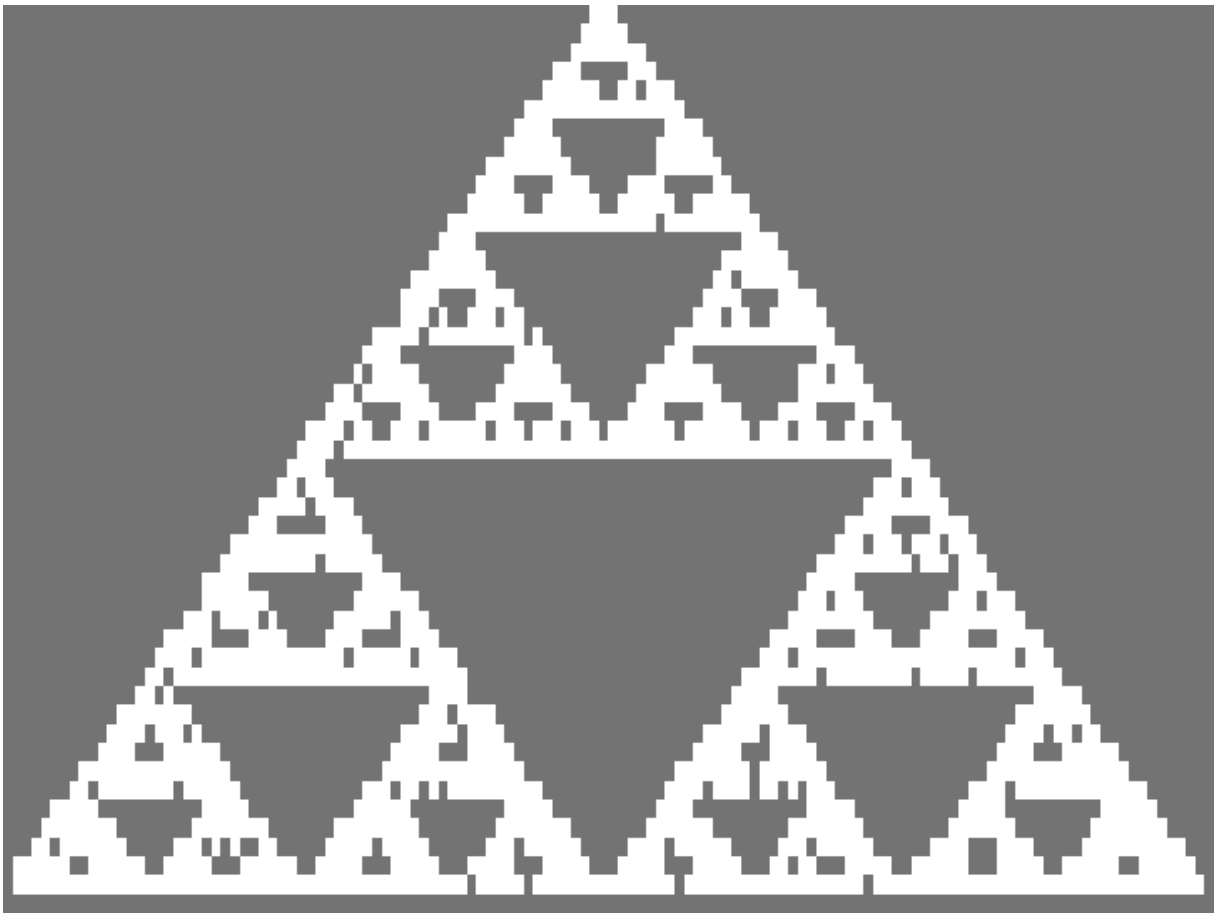
MATTHEW'S EMULATOR IS QUITE ASTOUNDING.
IT'S MY FIRST CHOICE WHEN DEVELOPING IDEAS FOR TRS8BIT.
HE OFFERS FULL SUPPORT AND IT IS STILL UNDERGOING ENHANCEMENT.
IF YOU HAVEN'T REGISTERED YOUR SHAREWARE VERSION YET, PLEASE DO SO AND ENCOURAGE AND SUPPORT MATTHEW'S ENTHUSIASM TO CONTINUE WITH HIS WORK.

ED.

SIERPINSKI'S SIEVE



GEORGE PHILLIPS



THIS ONE-LINER IS A BIT MORE MYSTERIOUS THAN MOST. AT FIRST GLANCE IT LOOKS LIKE IT WILL JUST FILL THE SCREEN WITH RANDOM DOTS BUT AFTER A LITTLE WHILE A PATTERN EMERGES.

FOR A FULL EXPLANATION (AND THE INSPIRATION) SEE THIS NUMBERPHILE VIDEO:
HTTPS://WWW.YOUTUBE.COM/WATCH?V=KBKTFN71LFS

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10 FORI=1TO3:READX(I),Y(I):NEXT:X=X(1):Y=Y(1):CLS:FORI=0TO1STEP0
:D=RND(3):X=(X+X(D))/2:Y=(Y+Y(D))/2:SET(X,Y):NEXT:DATA 64,0,0,47
,127,47
```

THE WAY WE WERE

Tandy topics

Ed Juge, Director Computer Merchandising, Tandy Corp.
1500 One Tandy Center, Fort Worth, Texas 76102

This column is the first of what I hope will be a continuing monthly dialog in *80-U.S. Journal* designed to improve communications between Tandy Center and you, our TRS-80 owners. I'm excited about writing it, (but it's your column too) since I'll try to answer some questions, and keep you posted on Tandy headquarters' thoughts, actions and new happenings. I'll try to make it as timely as copy deadlines allow. Mike approached me a year ago, but I was committed to writing in another publication, and my other duties simply don't permit two such efforts. I have called an end to the other commitment, and I'm very happy to be working with *80-U.S.* The atmosphere is refreshingly positive and constructive... great for helping you get the most out of your computer, and for helping us understand your needs and desires.

We'd like your input, too.

The staff responsible for new TRS-80 products and support activities appreciate your suggestions and your compliments. Sure we like to see our products reviewed favorably, but we also appreciate objective criticism. Feedback from users (that's you) is our best tool for continued improvement.

When you ask us for a product, or a product change, please bear one thing in mind... our size! For all the great sales bucks it puts into our annual report, it also imposes some not-so-great limitations. It says, for example, that our products must appeal to a very large market, no matter how exciting or revolutionary they may be. It says, too, that with an installed base of machines in the six-figure numbers, we can't make product changes at the drop of a hat that could affect those folks. And those "I'll bet you could do it for only $5.00 per unit" changes have to make sense for the majority of our buyers... we can't ask everybody to pay for a change which will benefit a few.

And as we've said all along, we can't furnish "custom" software or hardware engineering, nor can we furnish a "fix" to a problem until we are *really* sure the problem is well understood, and the fix won't upset any other applecarts (no trademark violation intended).

Non-Radio Shack products.

Specialized products and custom software is the special province of the hundreds of software and add-on hardware providers who support the TRS-80 from outside Radio Shack. Many of them are great, with dynamite products. There are a few "ripoff artists", but that is true in any field. We are often asked why we don't support the good outside vendors by recommending or selling their products. Did you know that sixty percent of our products do come from outside vendors? Our name is on them to let you know that they have met our rigorous standards, and we stand behind them. To recommend the others (and some are really great), would be to obligate ourselves to guarantee and support products we simply don't have the facilities to check out. We will not accept for repair, for example, a Model III with someone else's disk drive installed in it, so how could we possibly recommend the other vendor. We appreciate our "cottage industry" friends. They have helped make the TRS-80 a real success. Today, there is no small computer in the world as well supported with hardware and software. I hope we've been able to reciprocate a bit, since the TRS-80 has made many of their businesses possible... and profitable.

We can't always promise answers you will like...

We're always open to suggestions on new or improved products or services, so if you have any, pass them on to me, and I will see that they are delivered to the proper person. We are responsible for keeping a lot of people happy, and the majority (tempered with practicality) must rule. You'll probably get some answers you won't like, but we will tell it like it is. Also please realize that you may not get an instant action since our staff is limited. We may look from the outside like a bunch of slow-movin' Texans... inside, I guarantee, we're pedalin' as fast as we can!

Well, enough of that "get acquainted" stuff. For this issue, I thought I'd tell you a little about the operation that builds our Number One system, the TRS-80 Model II.

A look into our Model II plant.

The Model II is built right here in Fort Worth. The boards are stuffed and thoroughly tested by our Tandy Instruments facility. They're sent from there to the main Model II plant, Tandy Business Products.

"Business Products" occupies about 114,000 square feet of space, and currently employs roughly 350 people. Since I haven't had a chance to get out there lately, I took a tour last week in preparation for this story. Trying to look at it from your perspective, I was struck by one immediate and interesting fact... the large "manufacturing area" where the production lines are, appeared to have about 60% of its total space devoted to testing. Upon receipt, major assemblies receive a 100% inspection and test. They are then sent down the production lines for assembly. At the end of the line, off rolls a Model II assembled in its bottom cabinet half.

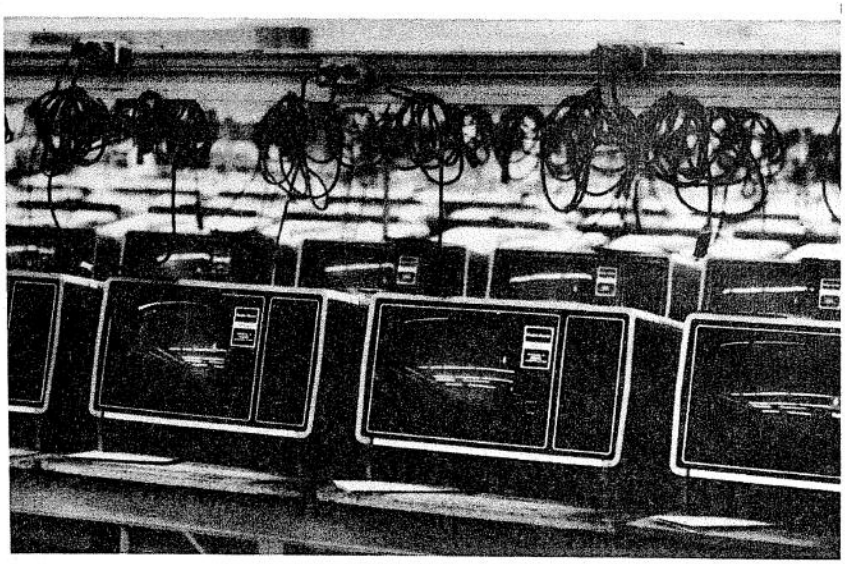
As a long-time ham radio operator, I referred to the next station on the line as the "smoke test" area. The Production Manager



Lisa Lindquist on the Model II assembly line bolts it all together.



First power-up test being performed here by Anita Rebman.



Model II computers patiently sitting through their final 24-hour burn in.

Photos courtesy the Tandy Corp.

(and our tour guide) assures me that my definition very rarely fits! Once in a great while, a renegade capacitor or power supply... oh, well! As an old electronics "home-brewer", I still admit to being just a little awed at seeing a complex product like a computer plugged in for the very first time - come up working 100%!

Testing and more testing.

The first test lasts only a few minutes, but from there every Model II, still only partially dressed, goes into a "hotbox" for 24-hour burn-in at between 110 and 115 degrees. Most of the "infant mortality" of component parts is caught during this period. Following burn-in, the computer, still hot, is run through a very thorough test of all functions... virtually everything it knows how to do.

Next comes alignment of the video circuit, and final tightening of all the mechanical elements to specified torques. The top section of the case is assembled, and the finished product is passed into the Quality Control testing area.

Again, every computer undergoes a 15 minute functional test, followed by another 24 hour automatic test... this time in full dress, as you will receive it. But, that's not all, our Quality Assurance department sample-tests functionality, and does a 100% visual inspection for cosmetic defects.

Of course all Model II's go from Business Products to our Tandy Electronics Warehouse, which is our only exclusively-computer warehouse. And, as you may have guessed, they get a 100% incoming quality assurance inspection at the warehouse.

We're working to make it better.

Sounds like we're covering about all the bases, doesn't it? Well, we're covering even more than you might think. Of course you would expect us to be watching all the time for problem areas which might crop up in reports from our service center folks. But we're also working all the time to see how we can improve testing, packing, shipping and more. The Business Products folks are very serious about their "Zero Defects" program. Just recently, for example, they began sample testing of about 40 units (new ones come and go daily), for increased testing time of 96 hours. Objective... to see if an increase in current burn-in time would catch any significant increase in infant mortality. All the results aren't in yet, but if more burn-in time will help get you a better, more reliable product, we'll do it!

Quite recently, there were another 97 Model II's that spent about eighteen hours riding the worst roads our quality assurance group could find, in the back of a Tandy Transportation truck, at about 100 degrees. They had been tested prior to the trip, and were checked again at the end to see how they would hold up under the worst possible shipping conditions we could conjure up. The resulting data will help us determine whether we need changes in construction, mechanical design, or packing.

Do we still have equipment getting to the field which will fail? Sure we do, but a lot less than we had six months ago, and more than we'll have a few months from now. If you add up the number of hours of testing in our recently extended burn-in, and the number of failures, we experienced approximately one failure per two-thousand operating hours! That's one failure in just about one year of 40-hour weeks... not a bad infant mortality rate. We're highly encouraged, but not satisfied.

Well, I hope you're not asking "So what..." Well, I hope it will make you feel like giving your Model II a little extra pat on the head next time you walk by, knowing that your money was well spent. And I thought you would like to have a little insight into what goes on down here in Texas.

New 1982 Computer Catalog.

On the off chance you might not have seen it yet, our 1982 Computer Catalog is available. It's a big 48 pages this time. Some of the rumor mongers with their "inside information sources" will note, please, that there is no Model IV or V which I believe I started hearing were imminent just about a year ago this month. What it does contain is a lot of exciting new items, including the long-rumored Hard Disk system and short-rumored color computer disk system (which lets you own the lowest-cost color computer disk system available). There is one unfortunate error in pricing in the Color Computer section... the 32K Color Computer price is $699.00, not $749.00 as listed.

There is a super new programmable originate/answer, auto-dial, autoanswer direct connect modem which is scheduled for availability this month, priced at only $249.00. We have a new graphics / DP / WP-capable printer with dot-addressable graphics, and a high-density proportionally spaced character set. It takes 9½ inch pin-fed, roll or single sheet paper, and contains both parallel and serial interfaces... at only $799. Of course for less demanding users, our other dot-addressable graphics printer, the Line Printer VII is still one of the lowest-cost impact printers you can buy. By the way... very important fact about the VII is that it uses standard 9½ inch wide fanfold paper you can buy anywhere. There is a "lookalike" printer on the market which uses a very unusual 9-inch fanfold, available only from Japan as far as we can determine.

We have a really exciting 6-pen intelligent plotter in the new catalog, for 6-color graphics on 8½ x 11 inch paper or acetate foils for overhead projectors.

For our Daisy Wheel II owners, there is a really great acoustic cover, which renders the printer as close to silent as you will ever get. It's really effective. For Daisy Wheel II owners, there is also a new automatic sheet feeder, which will feed stacks of letterhead through your printer for unattended continuous printing. Of course, it is quickly and easily removable for other modes of printing.

There is lots of new software, including about 23 color computer packages... a really impressive array that's growing monthly. We have software now for Model II to allow it to transfer files between TRSDOS and IBM 3741 single-density disks, and Bisync communications packages for 3270 and 3780 formats. Correct me if I'm wrong, but I think Model II may be the only 8-bit microcomputer currently capable of bisynchronous communications - but then, if you already have a copy of this new catalog, this won't interest you, and if you don't, I'll let you find out for yourself. Drop by your nearest Radio Shack outlet and ask for your free copy of Catalog RSC-6.

There are a lot of very exciting goings on I wish I could tell you about, but it's not quite time yet. So stay tuned from month to month, and we'll have some fun, while trying to help you get the most out of your TRS-80 investment through more and better communications. ■

MX-80 mods for Model I

. . . without an expansion interface

Model I and MX-80

Robert L. Green, Atlanta, GA

If you have a Model I with no expansion interface, but want to use the Epson MX-80 printer, this simple modification is for you.

I purchased the MX-80 for the Admissions Office of Dekalb Area Technical School to replace an old RO-33 teletype, but the MX-80 would not handshake through the Radio Shack Printer Interface (cat. no. 1411). I paid hundreds of dollars for a paper weight? A call to Jade (where I bought it) resulted in an engineer telling me he'd never seen it done, but someone had soldered a jumper to make it all work. A local Apple/Epson dealer said it could not be done. A Radio Shack Computer Center said it was not possible . . . so, I had to do it!

Put a towel on a flat surface and lay the printer face down (after disconnecting wire rack, cable, etc.). Use a phillips screwdriver to unscrew the corner screws, but leave them in their respective wells. Tape the holes (to hold the screws). Turn the printer back over and pull off the black plastic roller knob. Carefully pull the printer top up and to the right, being sure to clear the protruding roller stud. If resistance is felt, note the colored wires at the base. Push them down and forward (to you) to release them and slide the printer case top off—not pulling off the wires in the process. Stand the top on its side and slide the back corner of it under the printer base for support. The owner's manual should have covered all of this, before, to let you check out the two blocks of dip switches. (See Diagram A.)

Use a phillips screwdriver to remove the two screws holding down the small 3"x5" printed circuit (PC) board at the left rear. Cut a 3½ inch, small diameter, insulated wire. Bare both ends and coat them with solder. Use a small common screwdriver to carefully pry up the two rectangular black pin connector boxes between the PC boards. Lift up the small PC board to expose the shiny, flat input pins at the rear.

Bend one end of your jumper into a hook and hook it onto the farthest right shiny, flat, input pin connector (Diagram A again). Solder it. Note Diagram B. Solder the free jumper end to the bump of solder found above the lettering: 74LS3673B. The bump is above the main CPU (Diagram B).

Careful folks may wish to test the unit by hooking up the cables, paper, etc., before reassembly, but I did not. Replace the small PC board and carefully push the black pin connector boxes together and screw in the two screws.

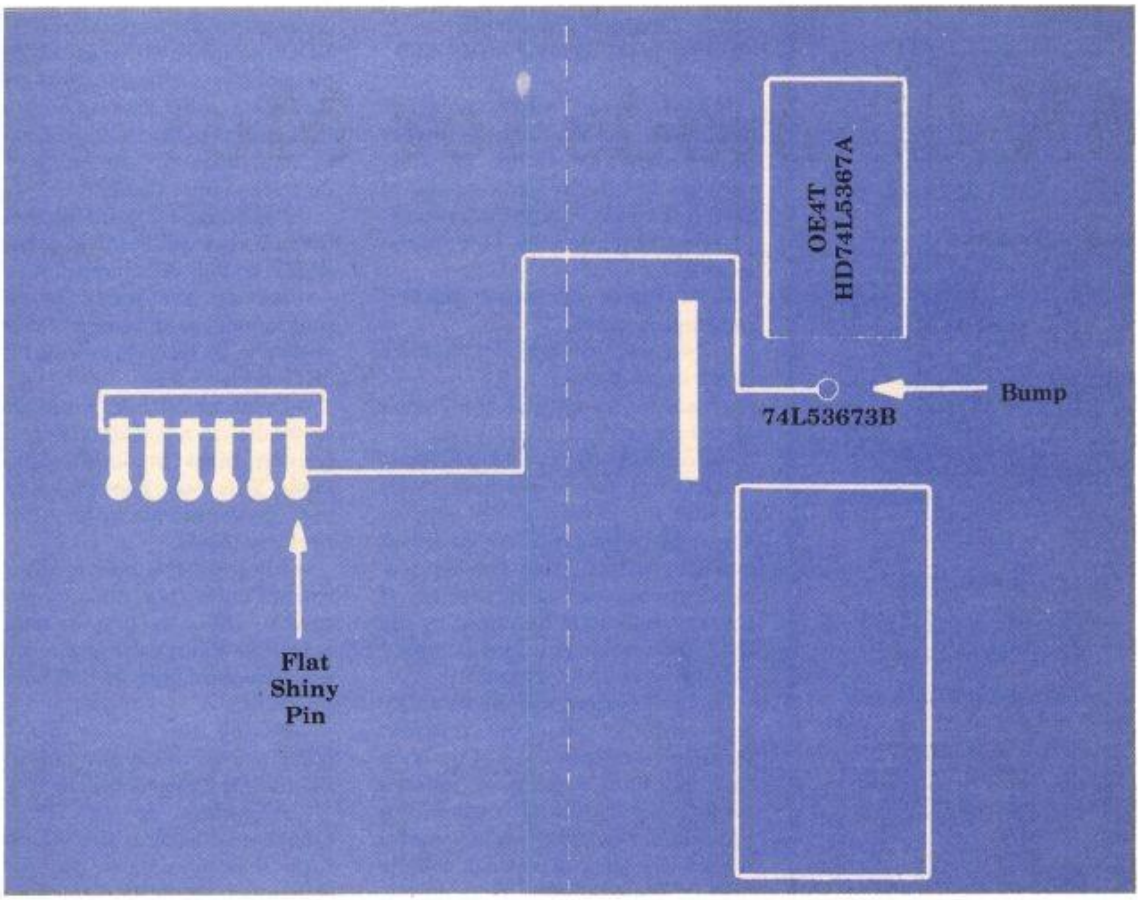
Option

Epson published a consumer bulletin for printers that encountered registration difficulties. You may want to take your printer in for the free modification (before you use mine) or do it yourself. A local dealer let me exchange the CPU for the three EPROMs kit. I popped out the CPU, following Epson's printed directions, then pushed in the three EPROMs and cut the jumper marked (J1) to the right of the CPU.

Slip the cover back on (watching to get the metal roller rod into the side hole). Replace the roller knob. Turn the unit over, remove the tape on the corners, and screw back the screws. Flip the unit back over and attach the cable and interface with the blue-coded wire to the left of the operator (coming from CPU, black box, and going into the rear of the printer). You now have a fully functioning printer at substantial savings of both dollars and time.

Diagram A

Diagram B



Circle # 48

OMNITERM

The ULTIMATE TRS-80 Terminal Package

What is OMNITERM?

OMNITERM is a professional communications package for the TRS-80 that allows you to easily communicate and transfer files or programs with almost any other computer. We've never found a computer that **OMNITERM** can't work with. It's a complete package because it includes not only the terminal program itself, but also **conversion utilities**, a **text editor**, special **configuration files**, **serious** documentation and **serious** support.

Why do I need it?

You need **OMNITERM** if you need to communicate efficiently with many different computers, or if you want to customize your TRS-80 for use with one particular computer. You need **OMNITERM** to **SOLVE** your communications problems once and for all.

What do I get?

The **OMNITERM** package includes the **OMNITERM** terminal program, four conversion utilities, a text editor, and setting files for use with popular computers such as CompuServe, the Source, and Dow Jones — just as samples of what you can do for the computer **you** want to work with. The package includes six programs, seven data files, and real documentation: a 76-page manual that has been called "**the best in the industry.**" And **OMNITERM** comes with real user support. We can be reached via CompuServe, Source, phone, or mail to promptly answer your questions about using OMNITERM.

What do I need to use OMNITERM?

A Model I or Model III TRS-80, at least 32K of memory, one disk, and the RS-232 interface, or Microconnection modem. **OMNITERM** works with all ROMs and DOSes, and **will** work with your special keyboard drivers.

What will it do?

OMNITERM allows you to translate any character going to any device: printer, screen, disk, keyboard, or communications line, giving you complete control and allowing you to redefine the character sets of all devices. It will let you transfer data, and run your printer while connected for a record of everything that happens. **OMNITERM** can reformat your screen so that 80, 32, or 40 column lines are easy to read and look neat on your TRS-80 screen. It even lets you get on remote computers with just one keystroke! The program lets you send special characters, echo characters, count UART errors, configure your UART, send True Breaks and use lower case. It accepts VIDEOTEX codes, giving **you full cursor control**. It will even let you review text that has scrolled off the screen! Best of all, **OMNITERM** will save a special file with all your changes so you can quickly use **OMNITERM** for any one of many different computers by loading the proper file. It's easy to use since it's menu driven, and gives you a full status display so you can examine and change everything.

"**OMNITERM** has my vote as the top TRS-80 terminal program available today" Kilobaud Microcomputing, June 1981, pages 16-19.

OMNITERM is $95 (plus shipping if COD) Call for 24 hour shipment. Manual alone $15, applied toward complete package. Visa, M/C, and COD accepted. MA residents add 5% tax. Dealer inquiries invited.

Contact Lindbergh Systems for your custom programming needs. We are expert at writing software to work with YOUR hardware, in assembler, high-level language, or Forth.

lindbergh Systems

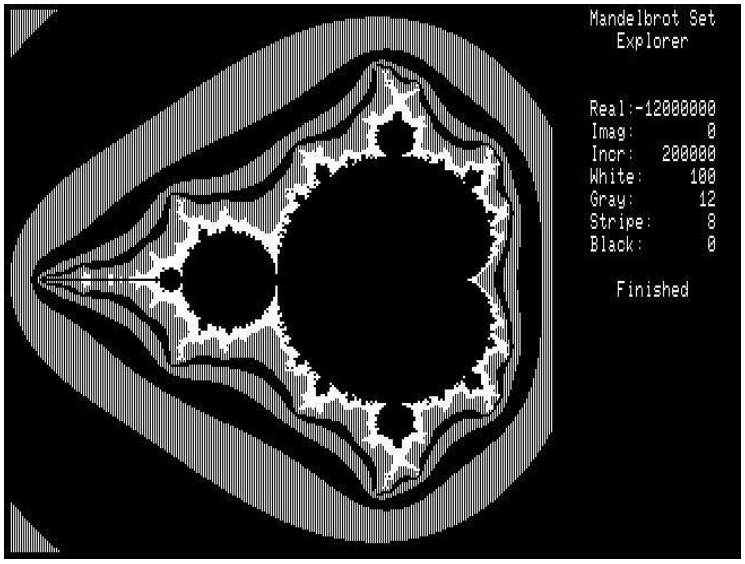
41 Fairhill Road, Holden, MA 01520 (617) 852-0233 Source: TCA818 CompuServe: 70310,267 TRS-80 is a ™ of Tandy Corp

LOOKING FOR HIGH-RESOLUTION GRAPHICS FOR YOUR TRS-80 MODEL 4/4P/4D?

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IN MAV'S WORKSHOP

by Ian Mavric

NEW TRS-80 PRODUCTS TO BE RELEASED SHORTLY

I try to release a few products a year as I see gaps in the TRS-80 hobbyist marketplace I aim to try to fill those with products which give a nod to both the past and the present technology. FreHD, for example uses a combination of old and new tech to achieve its ends, as does NewPerc (my double density adapter for the Model I), and the Quinnterface.

For mid-2018 I am aiming to release a number of new and interesting products which I think will be appreciated by those in the TRS-80 community. With offerings for the Coco, 8in business TRS-80s, and the faithful Model III/4/4P I've got something coming up for everyone.

FOR THE COLOR COMPUTER 1 & 2 FANS 2 new products

CC_NEW_JFD-CP: Repro J&M JFD-CP Coco Disk Controller

Ever since I saw the large full page ad in *The Rainbow* magazine for J&M's deluxe version of the humble Coco disk controller I wanted one for myself. And finally 20 years later I got one. It's interesting in that it has sockets for two Proms, one would normally be Radio Shack's RS-DOS 1.1 and the other would be for their customised supercharged 16K JDOS 1.23 which offered many improvements, the best one being faster head stepping for faster loads. A toggle switch allows you to switch between each operating system. In addition, J&M added a parallel printer port which uses a Model 100 printer cable to connect a standard parallel printer to the Coco. No longer are you limited to the Radio Shack bit-banger serial printers. The parallel port has the ability to drive a SASI hard drive with special drivers in OS/9 Level I. While I haven't tested that ability, I can say the parallel port works great with a printer. The CC_NEW_JFD-CP as shipped works on the Coco 1 and 2 and is $89. When I get my hands on a suitable Coco 3 DOS which supports parallel printing I'll make these available to Coco 3 owners as well.



Photo: CC_NEW_JFD-CP for the Coco 1 and 2 $89 + shipping

CC_RE-MAX: The CocoMax II Experience

Another great product from the golden era of the Coco 1 and 2 was Coco Max and Coco Max II. Both had full page adverts in *The Rainbow* and it was one of the most impressive drawing programs for the Coco 1 and 2, its speed and versatility up there with MacPaint which has recently been released on the 128K and 512K Apple Macintosh. The Coco version showed that with intelligent programming you didn't need more than 8-bits or 64K memory to achieve the same result. Coco Max and its update version Coco Max II required a special hi-res input cartridge to connect a TRS-80 Color Mouse and now I'm offering a repro of that device for people who want to re-live Coco Max in its original impressive form.



Photo: the Coco Max II Experience includes software disk $45 + shipping

FOR THE 8in TRS-80 (BUSINESS SYSTEMS) FAN

DOM CARTE INTERFACE FOR THE M2-6000

Definitive hard drive or SSD storage solutions have been tantalisingly close this last few years but nothing as concrete as, say, FreHD for the Model I/III/4 or CocoSDC for the Coco.
A few years ago work was done to connect a Lo-Tech IDE adapter via a Hans-01 or -02 to 8in TRS-80s and success was achieved with LS-DOS and CP/M. The piecemeal method of setting the system up (Lo-Tech IDE adapter PCB from one source, building it up, then a Hans-01 or -02 adapter from me, then setting up software and getting it all going) no doubt turned people off the project and as a result not many were sold. Those who did bother to set them up have been happy with the result and so the DOM Carte is an evolution of earlier efforts to get SSD storage on 8in TRS-80s.

DOM Carte is the first "actual sized" expansion card for 8in TRS-80s since the 1980s. Storage is via a Disk On Module (DOM) which fits neatly inside the case of the TRS-80. DOMs are a small capacity, high speed version of an IDE hard drive used for industrial applications. This makes them ideal for use in vintage computing. A re-thinking of the Lo-Tech IDE eliminates it altogether, the smarts needed to control the DOM is reduced from four on the Lo-Tech IDE down to just two on the DOM Carte.

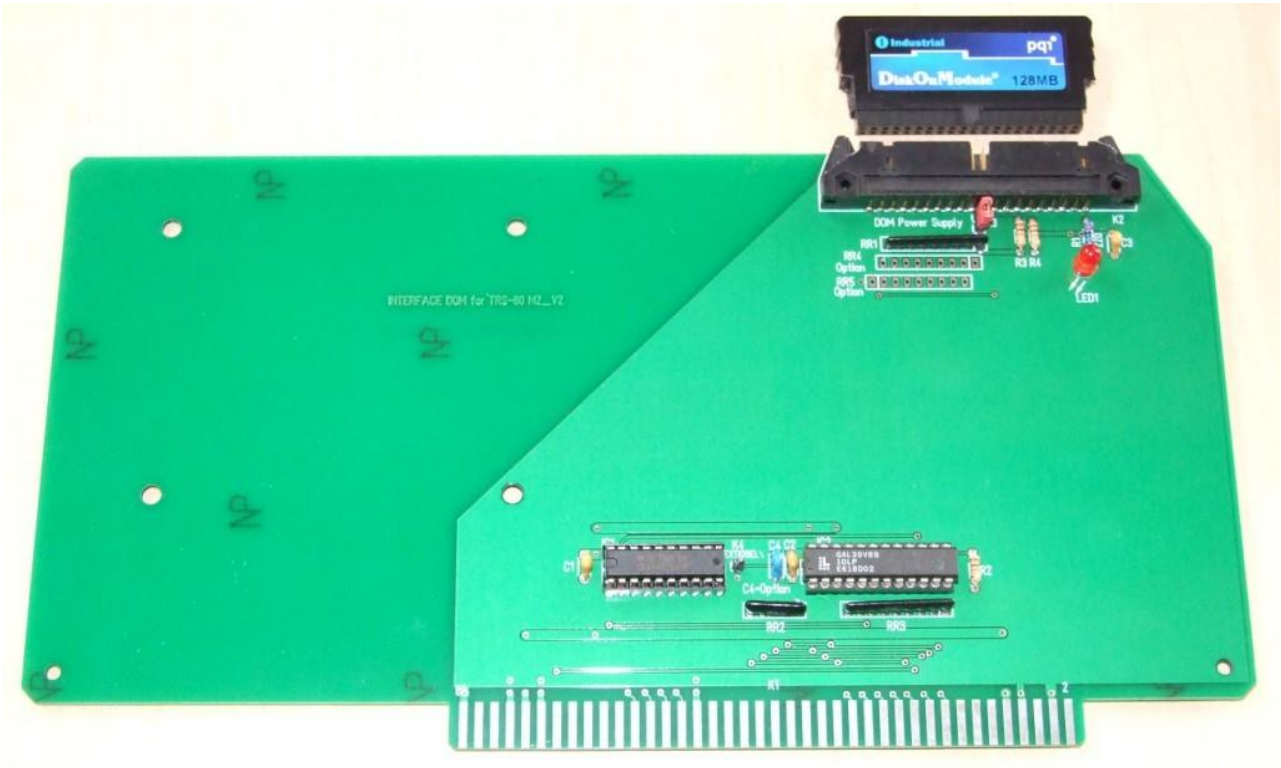


Photo: DOM Carte - the first new Model II card in decades

As you can see in the picture below, it comes with everything needed to plug in and start using it. When ordering please specify if you want the LS-DOS or CP/M boot disk. Due to the age of the 8in media I can locate and supply, please make many backups of the boot disk as soon as you get your DOM Carte. The drivers used for this product are thanks to the fantastic efforts of Hans Rietveld (LS-DOS) and JonB (CP/M).



Photo: DOM Carte set ready to plug in and use $119 + shipping

SYDTRUG NEWS
Newsletter of Sydtrug Inc.
Sydney TRS-80/MS-DOS Users' Group
C/- Peter Wignell PO Box 95 NARWEE NSW 2209
AUSTRALIA
Website : www.sydtrug.org

FOR THE MODEL III/4/4P FAN

HANS-05 ULTRA LO-TECH IDE FOR MODEL III/4/4P/4D

Hans Rietveld in The Netherlands continues his series of TRS-80 products with his fifth offering: the Ultra Lo-Tech IDE adapter for the Model III/4/4P. This devices simplifies the old Lo-Tech IDE using a completely new method using fewer and more readily available components, while still maintaining compatibility with the Lo-Tech drivers. It's designed to be used with the Model III/4/4P/4D under the same operating systems as old Lo-Tech. This one only supports using DOMs for storage, as it takes the guesswork out of making the traditional spindle hard drives (not 100% of hard drives work properly) and each of these Hans-05's is supplied with DOM, interface cable, and power connection.

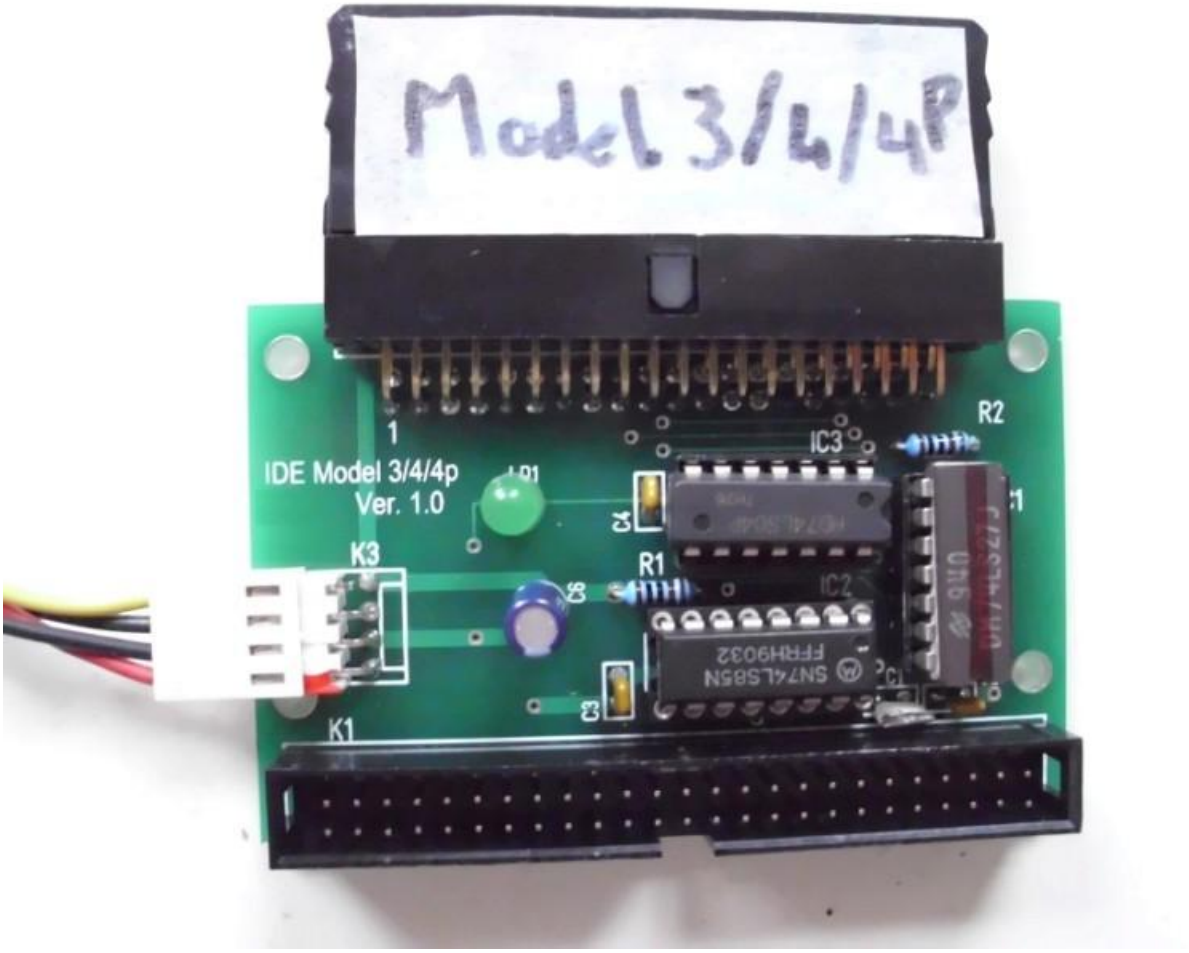


Photo: Hans-05 DOM IDE kit for the Model III/4/4P $44.99 + shipping

BARE NAKED FreHD FOR BUDGET THE CONCSIOUS

I've decided to streamline the FreHD product line to remove some of the less popular offerings on my web site so Kit A, Kit B and the CKD Kit will all be discontinued. In it's place is what I call the Bare Naked FreHD which is pictured below. It's completely assembled and tested and is only $64.99 so what is the catch? It's designed for enterprising enthusiasts who need to supply their own cables and SD card, and make their own boot floppy diskettes or burn their own Auto Boot Eproms. Price reduction is achieved by eliminating every part not needed for basic operation, which leaves just the core SD card hard drive emulation and real time clock. Even the Information and Support CD is left out and it's contents is emailed to the buyer in a single very large Zip file - you still get all the information always supplied with FreHD, you just need to burn your own CD or just put it in a folder on your PC.

This way, I can supply a FreHD solution for around the same price as it costs to kit out a TRS-80 with a Lo-Tech IDE set, with the flexibility of operating systems FreHD has always been known for. It's ideal for people who already have a FreHD and want another to put on a 2nd TRS-80, instead of moving your single FreHD from one computer to another.

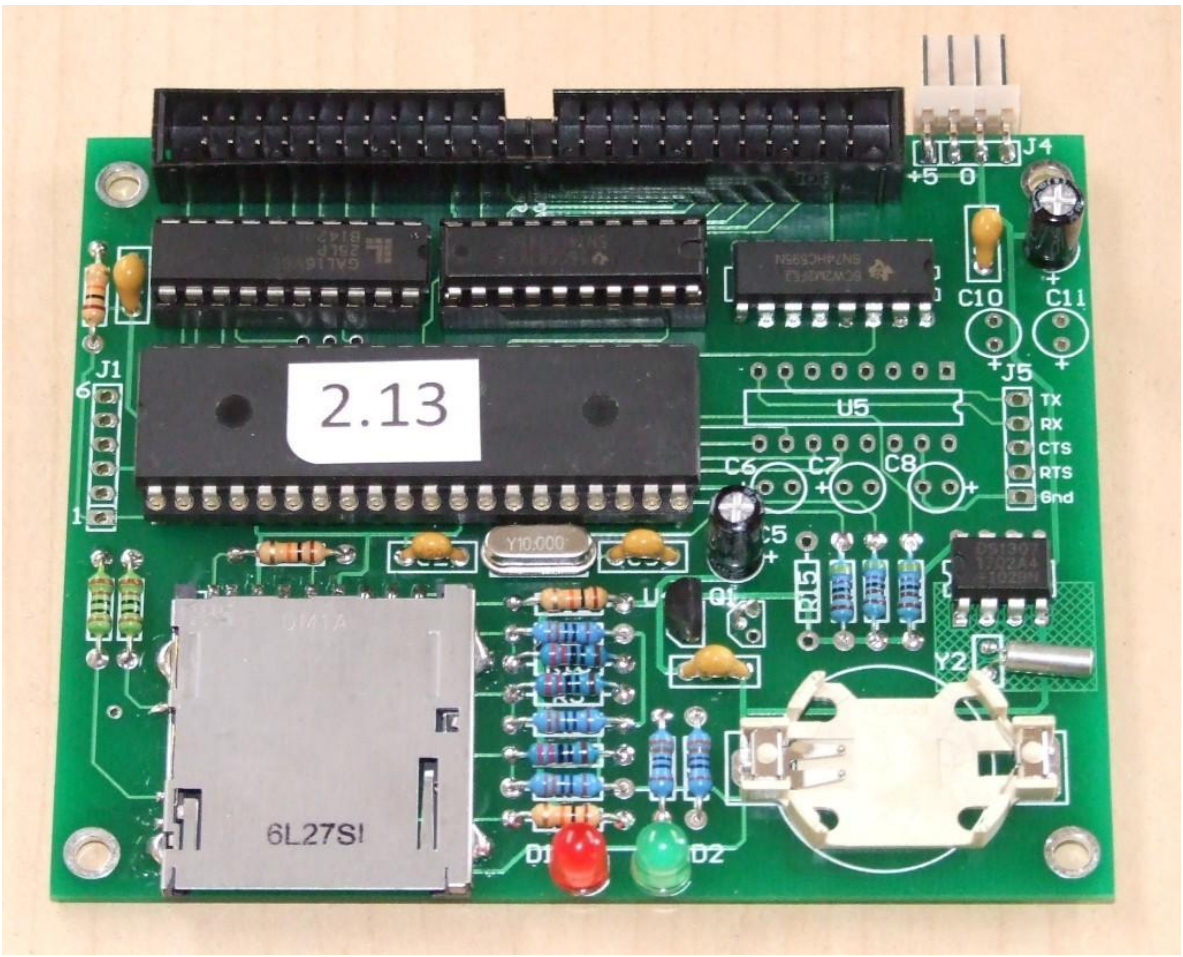


Photo: Bare Naked FreHD kit $64.99 + shipping

UPDATE TO FreHD KIT C

The venerable Kit C has been a mainstay of the FreHD line-up and has been by and far the most popular version until the Clearly Superior complete boxed FreHDs came onto the market a couple of years ago. Economies of scale mean I have reduced to the cost to $134 and updated the Kit to now include a power supply and data cable so the device can be just plugged in and used.

A special offer for all Kit C buyer's is that if they buy a Hi-Res board and/ or 128K upgrade for their Model 4/4P at the same time I'll take 15% off the price of the Hi-Res board and 128K AND include free shipping. I've done this because so many people want to max-out their Model 4s, 4Ps or 4Ds in one go.



Photo: Updated FreHD Kit C now $134 with free shipping

TRS80 — VIDEO GENIE SOFTWARE

Games and Educational software at a fraction of the usual prices send a large s.a.e. for comprehensive lists.

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* Uses Exatron Sensor Read/Write, a new high performance product similar to TRS-80 ESF.
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* Tape grade —— zero errors at 3200 fci
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* EASY-TO-USE BASIC interface



£165 including wafers & software

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Terms: Payment with order

TOR-DATA
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Exclusive TANGERINE dealer in Scandinavia.

Choose your operating system:

Model 4:



Model III:



Photo: as usual you have a choice of operating systems so just say which boot disk you want when placing your Kit C order

CHECK MY WEB SITE REGULARLY FOR NEW TRS-80 PRODUCTS

Recently my web site was force to change URL because the server which my site previously lived crashed. You can now find my site at http://members.iinet.net.au/~ianmav/trs80/ for the foreseeable future. Anytime I release anything new for any TRS-80 I put it there first, then in TRS8Bit.

NOTE TO U.S. COMCAST USERS

There is a known problem with the routing between my web site and the US ISP Comcast and most users can't get to it. I have alerted Comcast but they won't put in the resources to fix the routing problem. So if you are with Comcast and can't get to my site, you are not alone. Other's have reliably advised me you can get to my site via your cell phone's internet browser (if you are not on Comcast) or just take a laptop or tablet to a mall or McDonald's with free wi-fi and you can usually get to my site. It's an inconvenience, but one I can only solve by moving my site yet again to a URL that Comcast is happy with, a big job for me I'm hesitant to do.

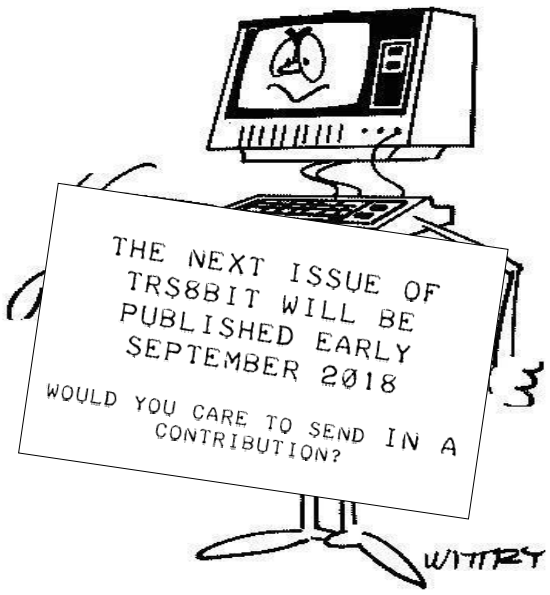
Ian Mavric

ianm@trs-80.com

(All prices in this article are quoted in $USD as it just makes life easier since 90% of my sales go to the USA. For people in other countries who want to work out the conversion rate to their currency, I recommend http://www.xe.com)

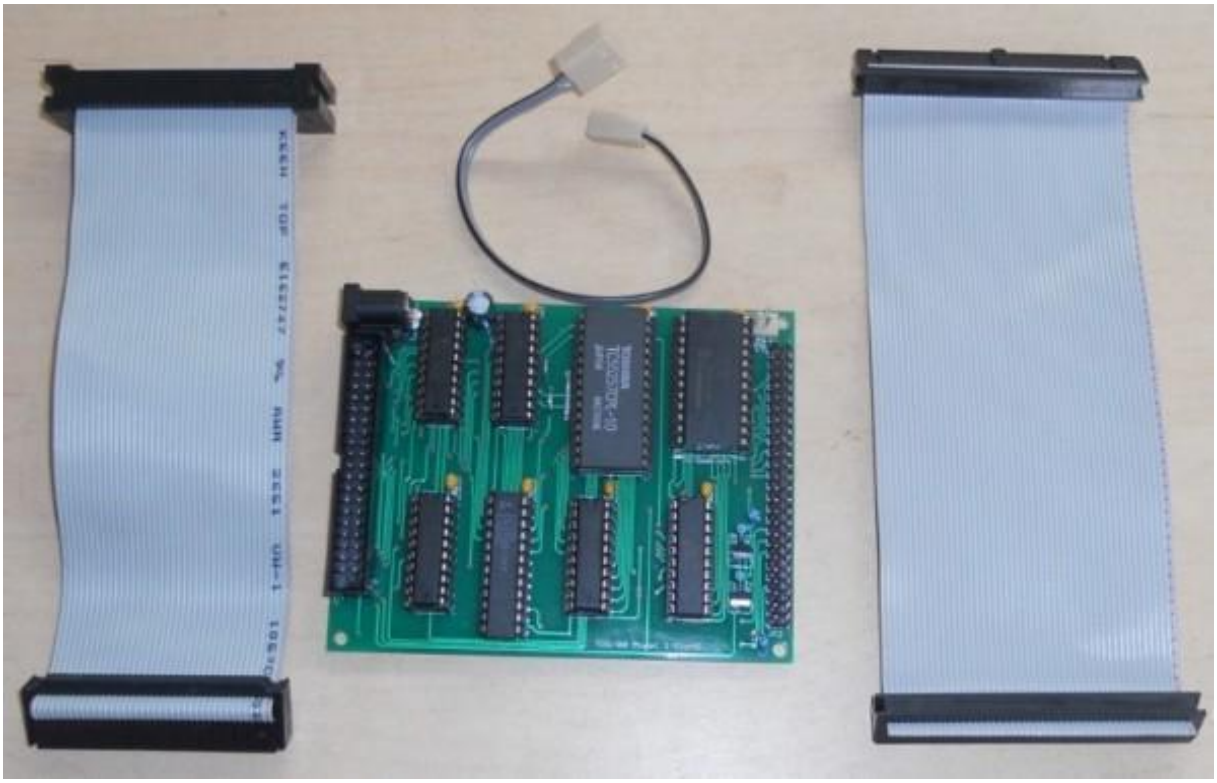


Ian Mavric is an IT Specialist who also restores and collects TRS-80's and classic cars. He live with his wife and kids in Melbourne, Australia.



“Quinnterface” Mini Expansion Interface for 16K Model 1 FreHD users.

- COMPLETLY ASSEMBLED AND TESTED -



This is THE perfect device for all Model 1 users who own a 16K Level II unit, (which is most of us!), but no Expansion Interface or disk drives, especially if you don't want to modify your M1 with upgraded boot ROM or memory upgrade.

The ‘Quinnterface’, developed by J. Andrew Quinn from New Zealand, adds 32K RAM and auto-boot functionality to you FreHD.

U.K. And Europe, contact Bas. at BetaGamma Computing.
U.S.A. And rest of the world, contact Mav. At “The Right Stuff”

LOOKING FOR FAST, INEXPENSIVE, UNLIMITED MASS STORAGE FOR YOUR TRS-80 MODEL I/III/4/4P/4D?

The amazing

"FreHD"



-Emulates a TRS-80 hard drive, but faster than any hard drive!
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-Uses SD card for storage medium
-Bonus free Real Time Clock function!
-Designed in Belgium and proudly built and shipped from Australia
-Kit form or fully assembled

Order yours today
http://members.iinet.net.au/~ianmav/trs80/

PROGRESS REPORT ON MY M2

IT LIVES AGAIN !





HELLO DUSTY

FINALLY, I SPENT THE WEEKEND WITH YOUR MODEL II WITH GREAT SUCCESS SO FAR.

SHE WAS TOTALLY DEAD INITIALLY AND I TRACED THIS DOWN TO MISSING SYSTEM +5V SUPPLY, SO I REPAIRED THE POWER SUPPLY, REPLACING A REGULATOR AND RECAPPED IT AS NECESSARY.

WITH THE 5V NOW WORKING AND THE PSU FULLY ACTIVE THE CRT CAME TO LIFE SHOWING A BLANK RASTER WHICH MEANT I HAD PROBLEMS ELSEWHERE TOO.

THE CPU CARD NEEDED A NEW Z80 WHICH NOW GAVE US A BOOT ERROR MF FAILURE WHICH WAS EXCITING AS THE OLD GIRL WAS AT LEAST BREATHING, THE MF TOLD ME THAT THE 64K RAM TEST HAD FAILED SOMEWHERE..

AFTER MUCH SELECTION AND REPLACEMENT THE FAULT WAS TRACED TO 5 BAD DRAM CHIPS WHICH I REPLACED WITH TANDY ORIGINALS I HAD REMOVED FROM A MODEL III RECENTLY.

THIS NOW GAVE US THE INSERT DISKETTE MESSAGE WHICH MEANS ALL START-UP DIAGNOSTICS ARE NOW PASSING AND FURTHERMORE THE DISK DRIVE CLUNKS AND THE RED ACCESS LIGHT COMES ON... THIS IS GREAT NEWS.

OF THE 3 DISKS WE HAVE, THE SYSTEM TRIES TO BOOT THEM, THE HEAD LOADS MOVES PERFECTLY BUT I GET A BOOT ERROR RS, WHICH MEANS IT IS READING THE DISKETTE BUT IT IS OF NON RADIO SHACK MODEL 2 FORMAT..

I HAVE TO ARRANGE TO POST THE DISCS TO A FELLOW MODEL II OWNER SO HE CAN CREATE SOME SYSTEM BOOT DISKS FOR US..OR MAYBE YOU CAN OBTAIN SOME PLEASE ?

SO FAR I AM VERY HAPPY WITH THE SYSTEM, THE ONLY MODULES I CAN'T FULLY TEST YET IS THE DISK CONTROLLER CARD AND THE DRIVE ITSELF UNTIL I HAVE A KNOWN GOOD FLOPPY BUT TO BE HONEST FROM THE INDICATIONS I CAN SEE WE ARE JUST TALKING SERVICING AND ALIGNMENT FROM HERE ON IN, NOTHING SERIOUS.

OF COURSE UNTIL I BOOT TRSDOS I CAN'T TEST THE KEYBOARD EITHER YET

I AM PUTTING THE SYSTEM TO ONE SIDE FOR NOW UNTIL I GET THE SYSTEM DISKS BACK AND THEN I SHALL FINISH THE OLD GIRL OFF AND GET HER READY FOR YOU TO COLLECT.

I ENCLOSE 2 PHOTOS OF THE SYSTEM AS SHE STANDS AT THE MOMENT

BAS

Sharp 80:
TRS-80 Model III Emulator for Windows



This is a full-featured emulator of a TRS-80 Model III microcomputer. It is free of charge and all source code is publically available. It includes:

Complete and self contained with ROM and DOS built in
Faithful Z-80 CPU emulation (including undocumented opcodes -- passes all ZEXALL opcode tests)
Runs at standard 2.03MHz (or run up to 100MHz on a modern PC)
Bundled disk and tape library includes applications, utilities, operating systems, and games
Supports up to four virtual floppy drives, and all major virtual floppy formats (DMK, JV3, JV1)
Tape drive emulation supports high and low speed reading and writing (CAS format)
Windowed and full-screen modes with zoom
Authentic sound support
Built-in Z-80 assembler and disassembler
Real-time monitor of Z-80 CPU internals and IO device status
Printer to file support
Save the entire state of the computer with snapshots
Support for all video modes, including wide characters and Kanji mode

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2018 COMPETITION

HI-RES-LO



EITHER A **FREHD**, OR A **HRG BOARD**, OR IF THE WINNER HAS A COCO, THEY CAN CHOOSE AN **RE-FD502** COCO FLOPPY CONTROLLER.

MAV HAS VERY GENEROUSLY OFFERED THE ABOVE PRIZE FOR THIS INGENIOUS COMPETITION.

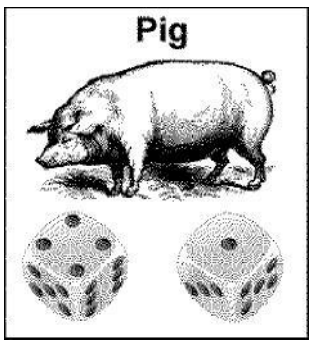
THE IDEA IS TO TAKE ANY HIGH RES IMAGE AND RENDER IT IN THE LOWEST POSSIBLE RESOLUTION, BUT ALLOWING IT TO STILL BE RECOGNISABLE.

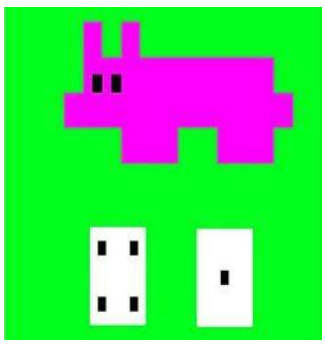
SO IN THIS EXAMPLE, THE PICTURE WAS FOUND ONLINE. USE **ANY** TANDY COMPUTER AND BASIC TO DRAW THE LOW-RES IMAGE. (IN THIS INSTANCE I USED A CO-CO).

ALL ENTRIES TO BE SENT TO DUSTY AT HIS USUAL EMAIL ADDRESS.
JUDGING:- DEE TO DECIDE WHICH ARE BEST PAIR OF CONTRASTING IMAGES.

COMPETITION CLOSES 21:00 HRS GMT 02 SEPTEMBER 2018

SEE THE WEBSITE FOR FULL DETAILS.



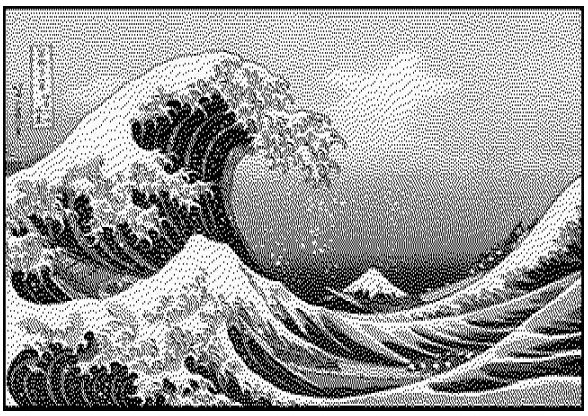


2018 HI-RES-LO COMPETITION UPDATE
by Ian Mavric

IDEAS FOR YOUR ENTRY IN THE COMPETITION

Mike Hawkey submitted this great picture of a wave. The first picture is the original 600Kb Jpeg image, and next to it is the 19K Model 4 Hi-Res version. Below it is the Lo-Res 1K Model I version.





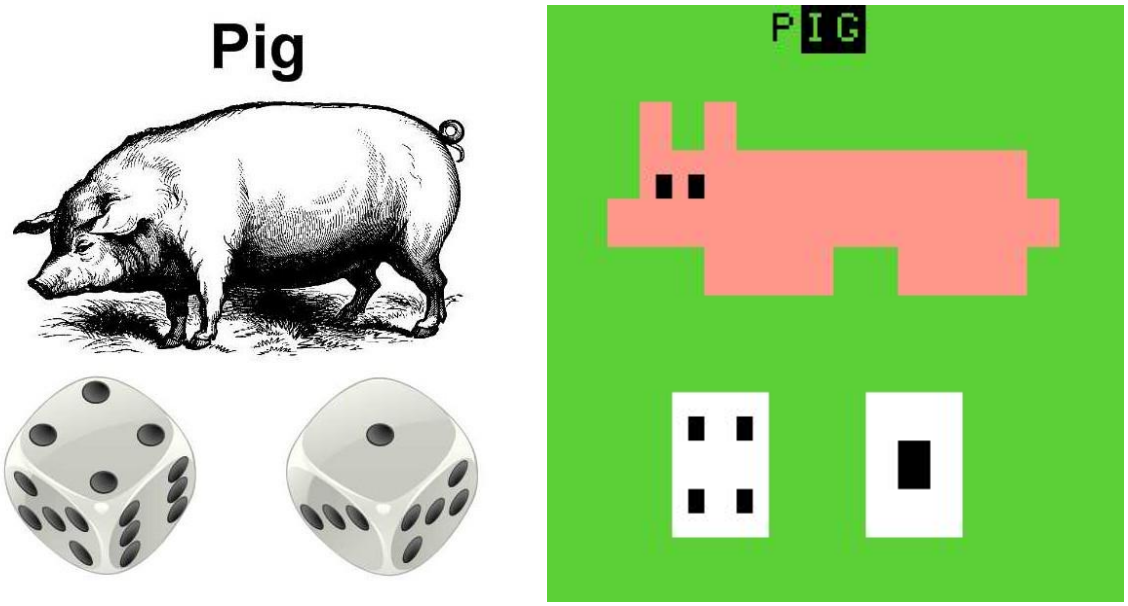


PROGRAM LISTING FOR 'Pig'

Last time I showed you my sample entry for the Hi-Res-Lo with a couple of pictures of pigs - one Hi-Res and one Lo-Res, and stated one way to enter was with a BASIC program. On the next page is my Coco Pig program in Color Basic.

```
20 CLS:FORP=1TO34:READA:PRINT@A,
CHR$(255):NEXT
30 FORW=1TO13:READA:PRINT@A,CHR$
(207):NEXT
40 PRINT@99,CHR$(254);CHR$(254);
:PRINT@299,CHR$(128);:PRINT@260,
CHR$(206);:PRINT@262,CHR$(205);:
PRINT@324,CHR$(203);:PRINT@326,C
HR$(199);:PRINT@7,"PIG";
50 DATA67,69,130,131,132,133,134
,135,136,137,138,139,140,141,142
,143,101,102,103,104,105,106,107
,108
60 DATA165,166,167,168,171,172,1
73,174,109,110,261,266,267,268,2
92,293,294,298,300,325,330,331,3
32
100 PRINT@384,"":END
```

Program listing: PIG.BAS



So I hope this gives you some ideas for your own entries. Vintage computing competitions are meant to be fun and the results can be both lame and charming at the same time. Don't forget the great prizes this year, supplied by yours truly. Choose from a FreHD, a Hi-Res board, a Coco FDC or a Dom Carte. The winner will be announced in the next issue.

Ian Mavric
ianm@trs-80.com

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HERE ARE SOME OF THE TANDY EBAY BARGAIN SINCE OUR LAST ISSUE



£210



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NOT
SOLD



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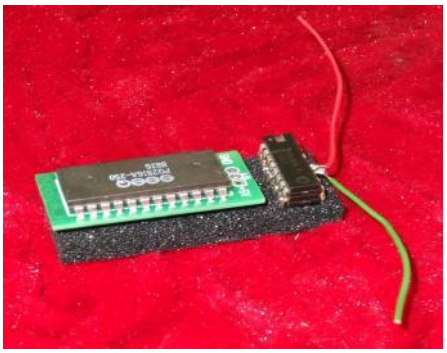


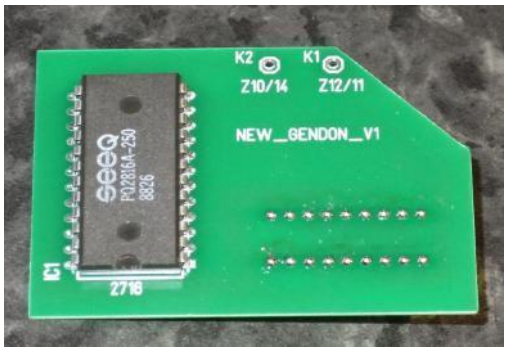
£70

ADVERTISEMENT

WANT LOWERCASE?
got lowercase!

Two new lowercase modifications for the TRS-80 Model I only $45ea!





Single line descenders



3-line descenders



Which do I need? Micro-LC-80 requires one trace cut and two wires soldered (just like Tandy's old kit).
New Gendon requires more cuts and soldering but the result is the more pleasing 3-line descenders.

Instructions included for both.

ORDER YOURS TO-DAY! ianm@trs-80.com

IN MAV'S WORKSHOP

by Ian Mavric with special guest David Hainsworth

CURING THE MODEL 1 SCREEN WIGGLE

If you're one of the lucky minority, you might have a perfectly stable image on your Model I video display. If you're one of the vast majority you would have noticed a slight wiggle to it, this article will talk about the reason behind it and ways to solve the problem.

VIDEO SYNC 101

The 64x16 display you see on your screen is achieved mainly by three parts: Z5, Z6 and Z56. These parts work together to provide a signal via a couple of transistors (Q1 and Q2) to your monitor which locks onto the signal. You tune the monitor with the familiar V-Hold and H-Hold like an old television set until the picture on the screen is stable. However if you look closely at it, especially if you have a Model III or 4 next to it for comparison, it may or may not have a slight wiggle to it.

CMOS devices Z5 (74C00) and Z6 and Z57 (74C04) degrade over time as compared to 74LS devices which are pretty reliable right up to the time they fail (if they ever do fail). Early CMOS devices are also somewhat more susceptible to heat-related signal drift which is why sometimes you find a Model I which has a nice display when cold but after it's been running for a few hours the screen has the wiggles. For an in-depth description on how the sync generation is accomplished, check the TRS-80 Technical Reference Handbook (RS cat. no. 26-2103) pages 39-44, 71.

RADIO SHACK FIX

On some of the later Model Is produced in the USA small capacitors have been placed over Z6 and Z57 in order to square up the signals coming out of them. I've never been able to determine whether this was done at the factory or at the service centre after people complained about the video quality. It's also a quick way to fix sync issues with Z6 or Z57 without the laborious job of replacing those ICs. Put a 102 capacitor between pins 4 and 7, and Z57 between pins 7 and 12. It's quick and worth a try before moving on to diagnosing an imminent complete sync failure.

COMPLETE SYNC FAILURE

These days you regularly see Model Is on eBay which appear to work fine but are noted to have sync problems. No matter how carefully you adjust the H-Hold or V-Hold on the monitor you can never get an image that doesn't roll or drift after a while. I made a video on how to fix this (https://www.youtube.com/watch?v=SLJBYRtztyg) but basically the sync failure is the wiggle taken to the nth degree.

POWER SUPPLY AND REGULATION IN THE MODEL I

Just as most of the parts values in the Model I keyboard unit may drift or degrade over the 40-odd years since the manufactured, the power supply can have a detrimental effect on the video display. This is especially the case if the 5 volt or 12 volt supply goes much higher than their ideal settings. Also remember that when you modify a computer with much additional gear inside the keyboard unit the extra parts draw more power, so a computer which has 5V on the 5V rail may have only 4.5V if a large additional board has been added inside the Model I case. If the 12V rail drifts to 13+ volts the system may still run properly (if rather hot) and exaggerate any screen wiggle.

Bear in mind that the 12V rail feeds the 5V rail, so if the 12V rail is reading 13 volts then its likely that the 5V rail is reading more than 5.5 volts. Even if it doesn't effect your computer it's probably a good idea to get that back into spec, and the adjustment is easy. Again, referring to the TRS-80 Technical Reference Handbook (RS cat. no. 26-2103) page 60 to check and adjust your power settings inside the computer.

AN ACTUAL SOLUTION - DAVID HAINSWORTH

Old mate David Hainsworth from Queensland, annoyed with the wiggle on his Model I display, looked at the way the sync was generated and decided it was too complicated and prone to electronic noise, heat, and component degradation. He simplified the design using a 74HC164 which solves the problem once and for all. The article below is by David and follows his solution, first with a 74HC595 as proof of concept and then the final solution using the HC164. Take it away, Dave.

TRS80 Model 1 video ‘wiggle’ remover
Introduction:

Most M1s have some horizontal whole-of-character ‘wiggle’ in the video display. This will vary from machine to machine. In my case it was about half a character width in amplitude which was quite distracting. I noticed that if R20 (horizontal position) was turned fully clockwise, so that the display was shifted as far as it would go to the right, the wiggle disappeared.

Unfortunately, this also meant half the display was not visible so was not a viable solution to the wiggle problem. Investigation revealed that, counter intuitively, maximum shift of the display to the right corresponded to the minimum value of R20 (why is explained later). This immediately led me to the conclusion that the instability was probably due to jitter in the Z6 horizontal sync delay circuit which is quite primitive in design having high circuit impedances and thus being susceptible to noise. It is steady only when R20 is near the low resistance (CW) end of travel. This effect can be shown while the M1 is in operation with the display centred by touching the pins of Z6. A gratifying hum-induced jitter in the display will result. This should not happen in a digital circuit!

The solution is to make the delay used in the horizontal sync timing for horizontal shift control synchronous with the clock train. In video controller chips there are programmable registers to set these clock-driven delays to suit the application. There would be multiple ways of achieving this in the M1 but my design goal was simplicity with the minimum number of added components. The solution requires one piggy back chip, some soldering and one convenient track (trace) cut.

New design:

Figure 1 shows the theory of operation and implementation of the synchronous delay generator.
First an explanation of how the horizontal shift control currently works. Start with waveform (1). This is HDRV which is the input to the sync delay circuit (Z6). When HDRV is high, the display is blanked (and the horizontal sync pulse is generated in this interval), and when it is low the display is active.

Waveform (2) is the output of the 'analogue' delay generator which is used to vary the position of the horizontal sync pulse wrt HDRV. The operation of this circuit is fully covered in the M1 technical manual (p39). Note that a replica of HDRV is produced at Z6/6 with delay 'd' (set by R20) to give what I call HDRVD. Here's where the instability that causes the wiggle arises and what the new design addresses.

Waveform (3) is the horizontal sync pulse formed at Z6/8 (TM p41, waveform A) which is triggered only by the rising edge of (2) so that there is one sync pulse per HDRV cycle. Note that the blanked area we see at the LHS of the screen is determined by the delay between the sync pulse (3) and the falling edge of HDRV (1). So the longer the delay in (2), the shorter the delay between the sync pulse and the start of the display portion of HDRV. This explains why zero ohms in pot R20 corresponds to maximum visible blanking on the screen and a large shift of the display to the right.

Waveform (4), the composite video output, shows this effect more clearly. Delay d1 corresponds to the blanked LH portion of the screen. As d increases (controlled by R20), d1 decreases, moving the visible display to the left.
Now that we know how the circuit works, how do we replace the analogue delay generator with a clock-driven delay? The easiest way to do this is to use a shift register. The waveform to delay is the serial input, and a clock signal is used to clock the serial data through the SR. Each Q output of the SR will then present a version of the input delayed by the number of stages reached in the register, each delay time being a clock period. Q1 will produce 1 clock pulse delay, Q2, 2 pulses, Q3, 3 and so on. I won't go into the gory design details but it turns out an 8 bit shift register with HDRV as the serial input and 'C2' (HDRV*24) as the clock will produce the sort of delay in HDRVD (I call the new waveform HDRVDD) we're after. Waveforms (5) and (6) explain.

Waveform (5) is 'C2' which gives 12 clock cycles per half cycle of HDRV. This means we could derive 12 discrete increments of delay in HDRVDD which gives us 12 selectable positions of horiz-shift. Unfortunately a single 16 pin SR chip (my design criterion) only has 8 stages so waveform (6) shows HDRVDD, with the minimum and maximum values of delay d2 that are achievable with an 8-stage SR. I was pleased to find that the delay required to centre the display on both my original TRS-80 monitor and an LCD screen is approximately the fourth stage of the SR – right in the middle of the range of delays.

At this time, HDRVDD could be injected into C21 to generate the horizontal sync pulse directly, eliminating most of Z6's activities, but because of the discrete nature of the available delays, the display would probably not be exactly centred (which would annoy me).

Fortunately there's a hybrid option available. As shown earlier, the existing Z6 delay generator is steady with small values of R20, so the synchronous delay generator output (with a selected display position too far to the right corresponding to too short a delay) can be fed into R20 and the existing sync generator circuitry can still operate to add a further short delay (~10% of the original delay) controlled by (very low values of) R20 to give the exact total delay required to bring the display to the left to centre it. In fact, the 100K pot as R20 could be replaced by a 20K, giving smoother control of fine horizontal shift. Waveforms (7) and (8) show the new waveforms at Z6/6 and Z6/8 with cascaded digital and analogue delays.

Implementation: I piggybacked the 74HC595 on Z8 making it P8. That position minimizes lead lengths to Z6 and R20 and Z8 is a 16 pin chip simplifying the piggyback procedure. It is close to where the Gendon3 mezzanine board goes but there should be vertical clearance between P8 and the Gendon3 PCB.

Solder pins 16 and 8 of P8 to the corresponding pins on Z8. Cut the other legs back and bend out in the usual way.

On P8, connect pin 11 to pin 12; pin 13 to ground and pin 10 to +5V.

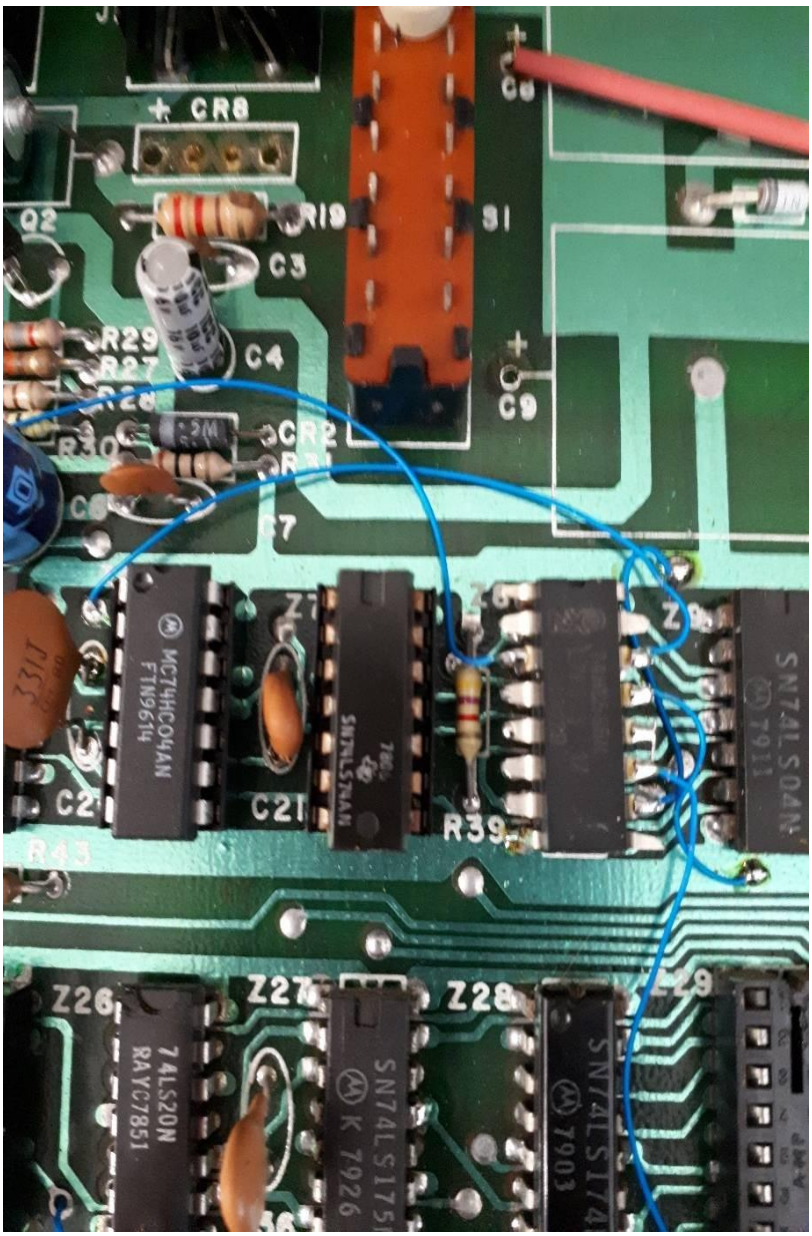
The 2 connections required P8/14 to Z6/2 and P8/12 to Z64/3 are easy to pick up. Note the connection from Z6/2 can be made at the via adjacent to the pin – saves soldering to the chip leg.

Cut the track to R20 as shown in the second image. This location gives plenty of room to work in but it can be done closer to Z6 if desired. Connect P8/3 to the LHS (R20 side) of the cut track.

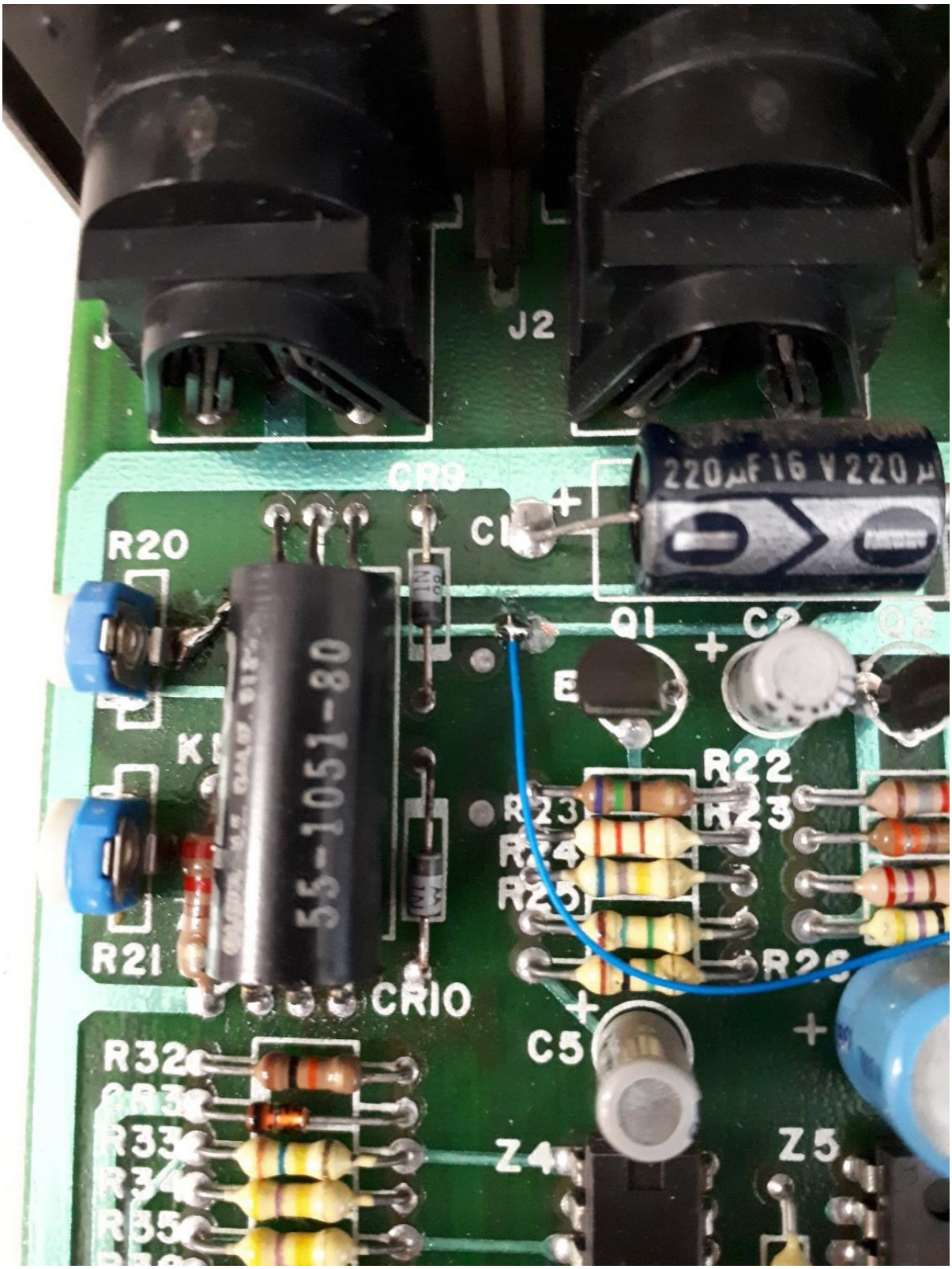
Setting up:
1) Turn R20 fully clockwise. This corresponds to minimum 'analog' delay.

2) Power up the M1. Ideally the display should be just to the right of centre and steady as a rock. If it is, proceed to the next step. If the display is to the left of centre, change the connection to R20 from P8/3 to P8/2 - QC, which will move the display further to the right. If the display is a long way to the right, try connecting P8/4 -QE to R20 which will bring the display back to the left.

3) Turn R20 anticlockwise until the display is centered to taste.



74HC595 piggybacked on Z8



Track to R20 cut and P8/3 jumper soldered to LHS of the cut

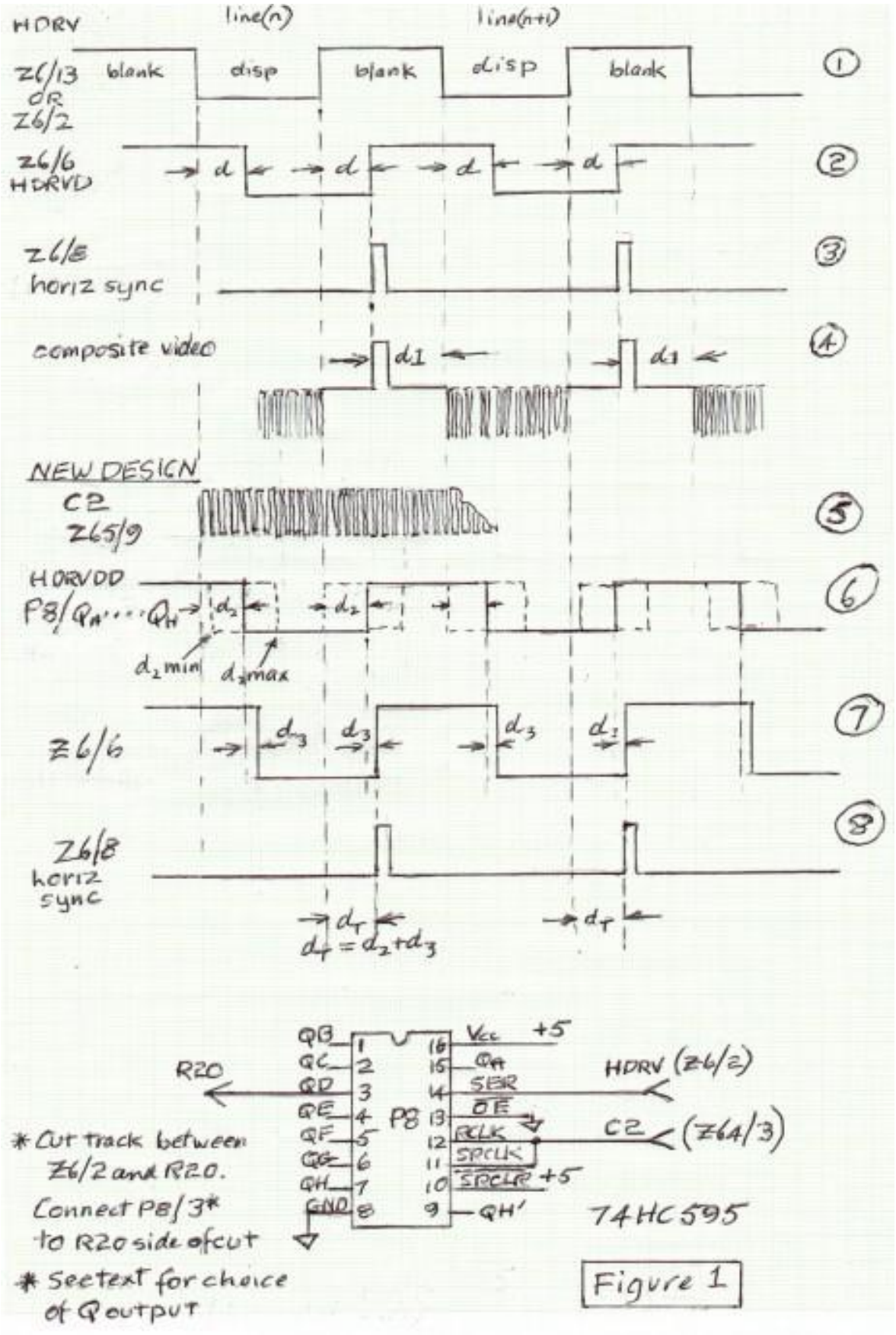
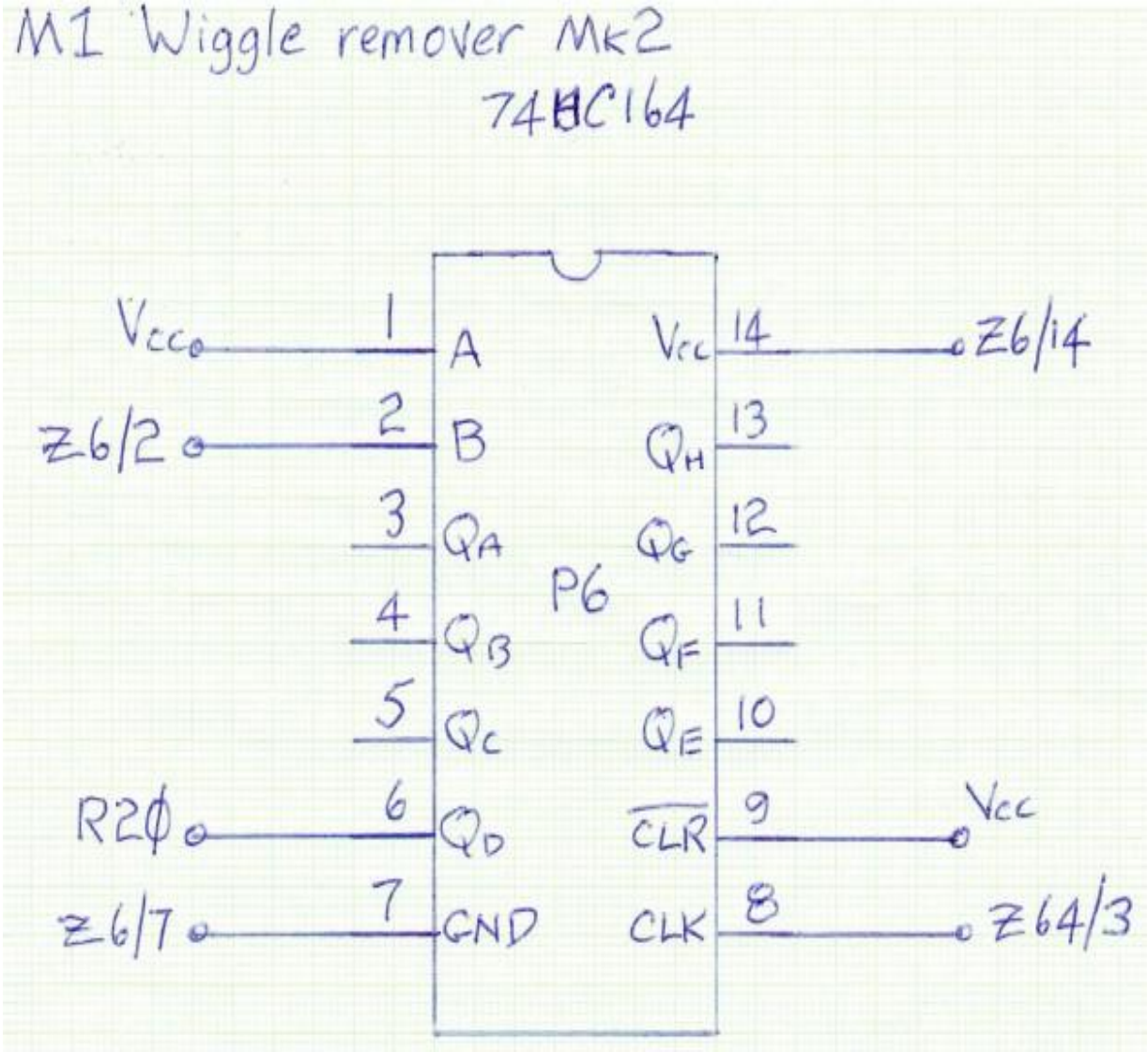


Figure 1: (Version 1 with the 74HC595)



Final version (Mk 2): 74HC164

Ian Mavric - ianm@trs-80.com

David Hainsworth - haicam@tpg.com.au

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COMPETITION RESULT

TRS8BIT

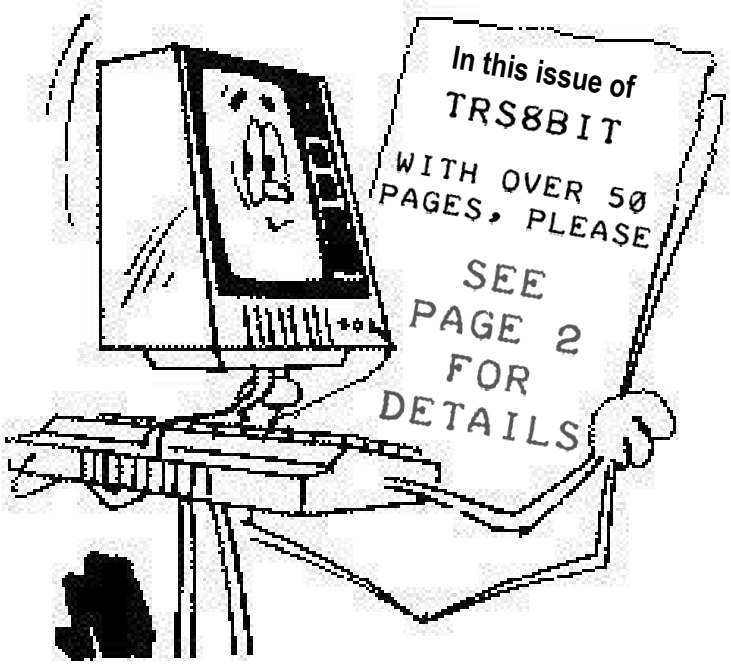
PRODUCED AT WWW.TRS-80.ORG.UK



IT'S EARLY SEPTEMBER, WE'VE JUST HAD A HEAT WAVE IN THE U.K. AND THERE'S A COMPETITION RESULT, SO IT CAN ONLY MEAN ONE THING - **TRS8BIT** HITS THE STREETS AGAIN.

WELCOME TO ALL OUR READER THROUGHOUT THE WORLD. THERE'S A FANTASTIC SELECTION OF ARTICLES (MIND YOU, I WOULD SAY THAT WOULDN'T I) FOR YOU TO ENJOY.

BUT FIRST, THE RESULTS OF THE 2018 COMPETITION. THERE WERE AN OUTSTANDING NUMBER OF ENTRIES THIS YEAR, AS DETAILED ON PAGES 4,5 & 6, SO, WITHOUT FURTHER ADO, THIS YEARS WINNER IS ... NO!, YOU'LL HAVE TO GO TO PAGE 4 AND SEE FOR YOURSELF :)



DEE WENT THROUGH ALL THE SUBMISSIONS AND BECAUSE THEY WERE ALL OF SUCH GOOD QUALITY AND INGENUITY, SHE HAD TO 'SLEEP' ON HER FINAL DECISION. HOWEVER, IN THE END, THE WINNING ENTRY WAS, BY FAR, HER FAVOURITE BECAUSE, SHE FELT, IT MET THE CRITERIA OF RECOGNISE ABILITY SO WELL, WITH A MINIMUM OF PIXELS.
I HOPE YOU AGREE WITH HER.

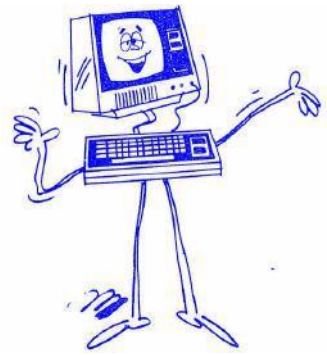
I IMAGINE MUCH EXCITEMENT IS BUILDING AS PEOPLE ARE LOOKING TOWARDS NOVEMBER AND THE TANDY ASSEMBLY. MAV WILL BE ATTENDING AS WILL HIS PAL JAY NEWIRTH. FULL DETAILS OF THEIR PRODUCT RANGE, WHICH WILL BE ON DISPLAY AT THE T.A. IS ON PAGE 15. I JUST WISH I WAS ABLE TO ATTEND TOO. HOWEVER, PETE INFORMS US THAT IT IS HOPED, ONCE AGAIN, TO HAVE VARIOUS LIVE FEEDS THROUGHOUT THE SHOW. I'M LOOKING FORWARD TO SEEING YOU ALL EVEN IF IT'S ONLY ON MY COMPUTER SCREEN!

SO... DOWN TO THIS ISSUE -

THE FIRST BIT OF AMAZING NEWS IS ON PAGE 7. GEORGE AND PETER PHILLIPS HAVE RELEASED VERSION 2.0.4 OF THEIR ASTOUNDING TRS-80 EMULATOR TRS80GP. **THIS NOW INCLUDES MODEL 2 EMULATION.**

I RECEIVED A REQUEST FOR INFORMATION ABOUT CHESS PLAYING ON A M1. I'M NOT A PARTICULAR 'CHESS FAN', BUT THE MAIN PROGRAM IN THE UK, AS FAR AS I REMEMBER IN THE DAY WAS 'SARGON'. HOWEVER, I MANAGED TO COME ACROSS AN ARTICLE IN THE 80-US MAGAZINE

(CONTINUED ON PAGE 12)



CONTENTS

PAGE Ø4 — COMPETITION ENTRIES AND RESULT.
THANKS TO EVERYONE WHO SUBMITTED AN ENTRY.
(AND TO MAV FOR A GENEROUS PRIZE)

PAGE Ø7 — TRS8ØGP - VERSION 2.Ø.4 NOW RELEASED
PETER & GEORGE PHILLIPS
MODEL 1, 2, 3 & 4 EMULATOR WITH ADDED GOODIES

PAGE Ø8 — IN MAV'S WORKSHOP
IAN MAVRIC
DOM CARDS FOR THE MODELS 2,12,16,16B & 6ØØØ,
(TOGETHER WITH EXTENDER CARDS)

PAGE 13 — PALINDROMES - 'DO GEESE SEE GOD'
ET FONEHUME
ET HAS BEEN INSPIRED TO WRITE A ONE-LINER
PALINDROME PRODUCING PROGRAM FOR US ALL TO ENJOY

PAGE 15 — IN MAV'S WORKSHOP
IAN MAVRIC
IAN GIVES US THE LOW DOWN ON HIS ATTENDANCE AT
THIS YEARS 'TANDY ASSEMBLY' ON THE 1ØTH & 11TH
NOVEMBER AT SPRINGFIELD, OHIO

PAGE 21 — 'THE WAY WE WERE'
HARKING BACK TO THE EARLY 198Ø'S, BY REQUEST,
HERE IS A REVIEW OF TWO CHESS PROGRAMS, A TWO
PART 'LDOS' FOR BEGINNERS AND A SOFTWARE
EVALUATION OF THE ZBASIC V2 COMPILER.

PAGE 37 — IN MAV'S WORKSHOP
IAN MAVRIC
MAV TAKES US THROUGH HIS LATEST HARDWARE
CREATION, EXTENDER BOARDS FOR THE 8" RANGE OF
TANDY COMPUTERS

PAGE 43 — EBAY U.K. BARGAINS
HERE ARE SOME OF THE HIGH-LIGHTS FROM THE LAST 3
MONTHS, THAT HAVE APPEARED ON THE U.K.'S EBAY

PAGE 46 — IN MAV'S WORKSHOP
IAN MAVRIC
TRS-8Ø PRINTERS FROM THE BEGINNING SERIES
PART 6: LINE PRINTER VIII, DMP-2ØØ, DMP-12Ø



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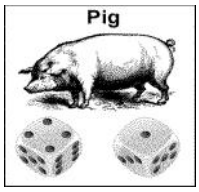


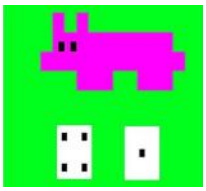
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2018 COMPETITION
HI-RES-LO
RESULTS

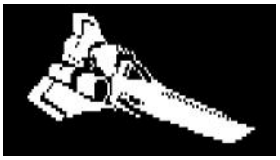
5 CONTESTANTS SEND IN THE FOLLOWING IMAGES FOR THIS COMPETITION AND AS YOU CAN SEE ON THIS AND THE NEXT TWO PAGES, THERE WERE SOME VERY CLEVER HI-RES-LO'S CREATED. IT TOOK DEE A FULL 24 HOURS TO CONFIRM HER DECISION, BUT AS

(CONTINUED ON PAGE 6)

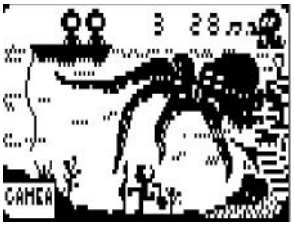








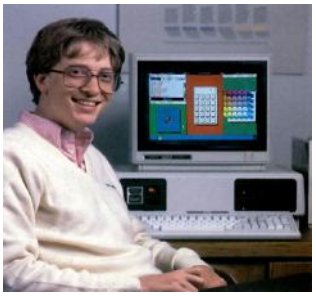


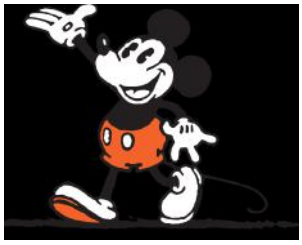
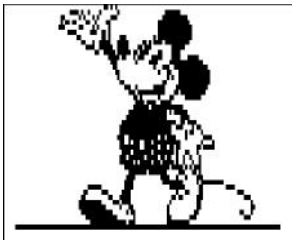












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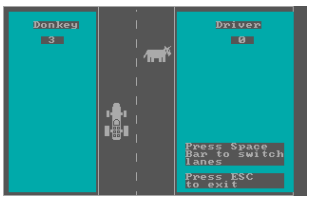
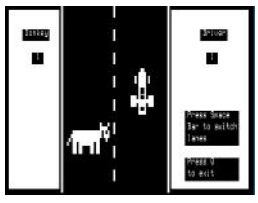
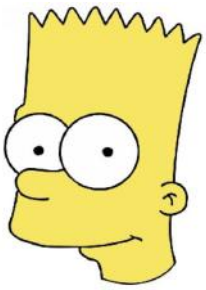
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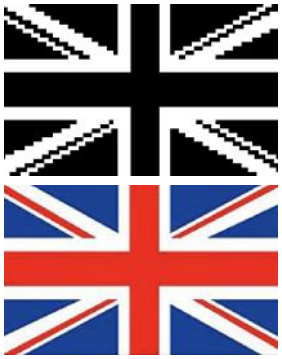


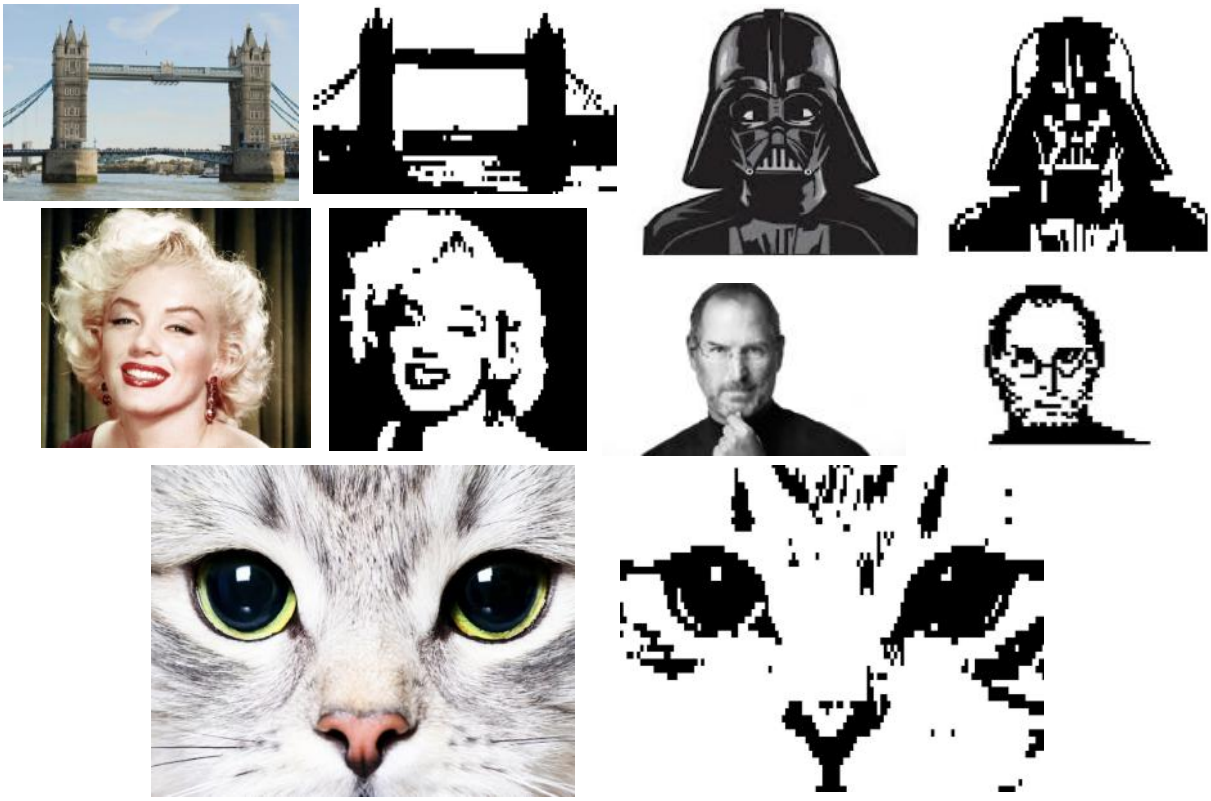






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Press ESC to exit









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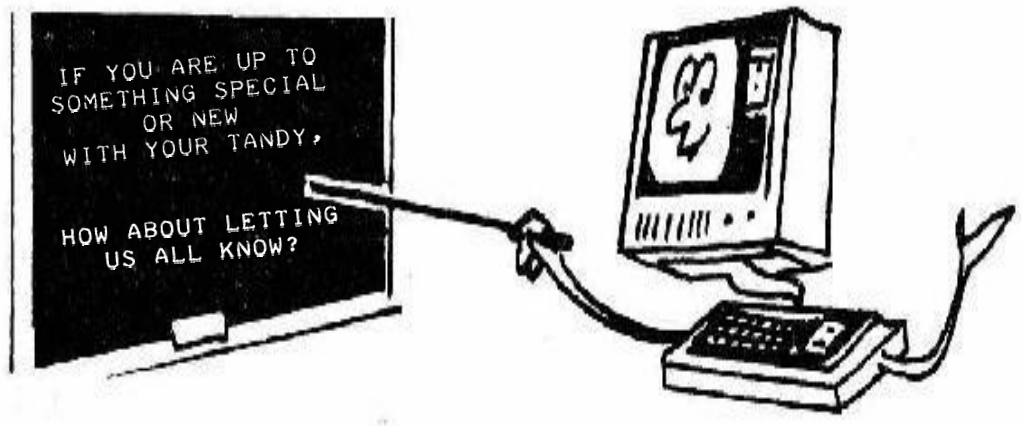
SHE SAID, "EVEN THOUGH I'M NOT A PARTICULAR CAT LOVER, THE IMAGE SENT IN WAS JUST SO IMMEDIATELY RECOGNISABLE AND QUITE STUNNING, IT JUST HAD TO BE THE WINNING ENTRY".

SO ... THE WINNER IS ... DRUM ROLL ...

KYLE WADSTEN

CONGRATULATIONS KYLE, PLEASE CONTACT MAV, THROUGH HIS WEBSITE, AND ARRANGE DELIVERY OF YOUR CHOSEN PRIZE.

KYLE INFORMS ME HE IS HOPING TO PUBLISH HIS LO-RES PRODUCING PROGRAM SHORTLY AND HAS OFFERED TO WRITE AN ARTICLE ABOUT IT FOR THE NEXT EDITION, OF TRS8BIT (WHICH, BY THE WAY, WILL BE THE XMAS EDITION).



George and Peter Phillips have release trs80gp version 2.0.4.

It features
* **Model II emulation** (and Model I, III and 4 as previously) *
* Hires graphics support *
* Floppy and Cassette emulation *
* Copy/Paste *
* Software Keyboard *
* Automatic keyboard input *
* Turbo Mode *
* Source-level debugging and many other programming features *

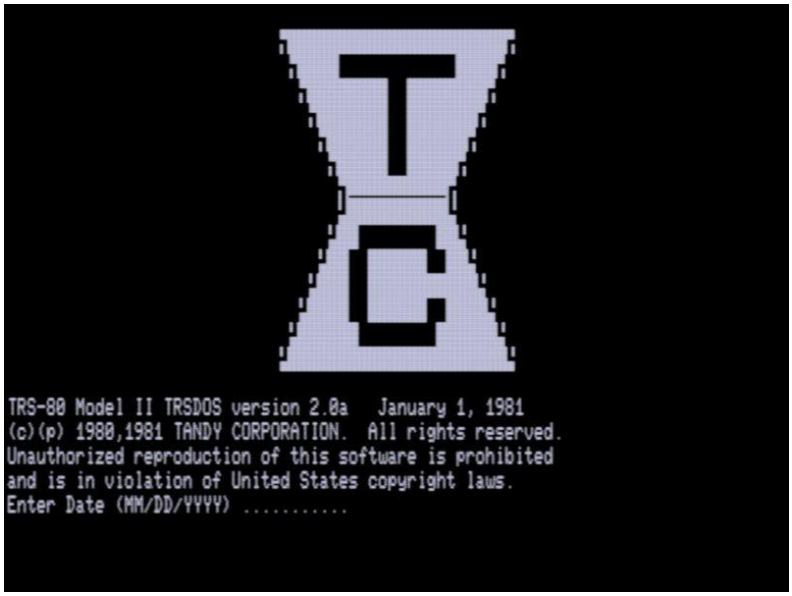
It runs on Windows 10, 8, 7 and maybe even XP and Vista. Runs well under Wine on Mac and Linux.

Learn more and get it at http://48k.ca/trs80gp.html

George has also updated his Z-80 cross assembler zmac and executable conversion utility trld. They both now feature .wav audio file output that can be loaded onto a real TRS-80. 250, 500, 1000 and 1500 baud are all supported.

zmac has a new import statement that is like include but only brings in each file once. There are -o, --oo, --xo and --od options to choose a particular output format. Common blocks can be put in .rel files for the Z-80 FORTRAN programmers out there. And finally there's a new .mds output format that can be fed to the MAME debugger giving an easy way to load Z-80 programs into MAME.

They can be found here:
http://48k.ca/zmac.html
http://48k.ca/trld.html



IN MAV'S WORKSHOP

by Ian Mavric

DOM CARD FOR THE MODEL II/12/16/16B/6000

WHAT IS IT AND WHY DO I NEED ONE?

As mentioned in the last issue, I'm now making and selling the DOM card for the 8in TRS-80 series. Designed by Pascal Holdry, the DOM card neatly combines what was previously achieved with the Hans-01/02 card, Lo-Tech IDE card, a hard drive or DOM and some cables and a lot of trial and error (and/or cursing). My kit is sold complete and ready to run CP/M simply by plugging in the card and booting from the included 8in floppy disk.

There are several reasons why people would need one of these, the main one being the lack of SSD-type hard drive system for the 8in TRS-80s. Another is the lack of hard disk systems for the 8in machines altogether. Radio Shack sold great hard disk systems for those machines ranging from 8Mb in capacity up to 70Mb in capacity. Apart from the hard drive itself, a controller was needed which can be difficult to source these days. The same can be said for working hard drives so the cost to outfit an 8in TRS-80 with a hard drive often runs to the same cost of the machine itself.



Photo: Dom Card set for CP/M on 8in TRS-80s. It's only $USD119.00 + shipping.

HISTORY

The Lo-Tech IDE adapter was a method of inexpensively adding a hard drive to a TRS-80 Model III or 4, the design of which lent itself to use on 8in systems. Hans Rietveld designed two adapters known as the Hans-01 and Hans-02 to accomplish this. Jon Bradbury wrote the driver pack for Lifeboat CP/M2 2.25-d, based on previous work done by Grant Searle. It works pretty well and Lifeboat is compatible with most standard CP/M 2.2 software. Those who set these systems up were happy with the result, hence the efforts by Pascal to simplify it.

WHAT IS A DOM?

DOM stands for Disk On Module. They have been around for years and are basically a small capacity IDE hard drive for industrial applications. They use the same 40-pin connector and a PC sees it as any other IDE hard drive. It uses similar technology internally to a USB flash drive and a SD card, so just think of it as an early small capacity version of SSD Sata hard drive which are so prevalent these days.



Photo: The DOM comes pre-programmed with CP/M

INSTALLATION

The DOM card itself is installed in the 8in TRS-80. The design of the card means the lid can be closed for a neat installation. On the Model II and 16 you will undo two screws which hold the rear cover and put it to one side. There will be a bar which holds the system cards in place, so undo that and plug the card in, and the DOM into the card. It can go into any slot, however I use slot 6 (with slot 8 being closest to the disk drive) on my Model II.



Photo: DOM installed in the DOM Card

On the Model 16B and 6000 you just open the hatch on the back and slide the card in on rails like the other cards. The slot you choose will be dictated by how many other flying wires are restricting access to installing new cards.

For Model 12 users you will need to have the card cage upgrade so you can use more than just the single KB/Vid card already in there. Look for one on eBay, they come up from time to time, often removed from a scrapped Model 16B/6000.

BOOTING AND RUNNING

How the system starts depends on which boot Rom is installed in your 8in TRS-80. Early Model II computers have Rev. A, B or C Z80 processor boards, which don't have the ability to boot from a hard drive. These will start to the familiar INSERT DISKETTE screen, at which point you simply insert the boot disk and the system will kick off the boot process.

Later systems, basically Model IIs with the Rev. D Z80 processor board, and nearly all Model 12, 16, 16B and 6000s may start with a screen full of nonsensical characters. Insert the boot disk and press BREAK, and the system will proceed to kick off the boot process.

You should see:

CP/M2 on TRS-80 Model II
58K Version 2.25-d
Copyright (c) 1980, Lifeboat Associates
TRS80 Model II LoTech IDE Extended Driver v1.9 Auto Loader
Inst 5: 06K free, 16 IDE drives available. Drive list:
Floppy A: B: C: D:
IDE: E: F: G: H: I: J: K: L: M: N: O: P:
A>_

The DOM holds drives E: onwards, and since using a hard drive system from a floppy in drive A: is slow and awkward, you now type E:<Enter> to log onto drive E: which is where CP/M lives (think of it like C: drive on a PC). You can new safely remove the boot floppy and store it away safely. Don't lose this disk: you can't boot the system without it. Don't leave it in the disk drive either in case of a power spike or outage zaps it. Likewise, especially don't leave it in the drive of a Model II which spins the disk continuously, it will wear out in a few short months.

Typing the familiar DIR command of drive E: shows all the usual CP/M programs you are used to seeing to run the system, which includes PIP, STAT, DUMP, and DDT.

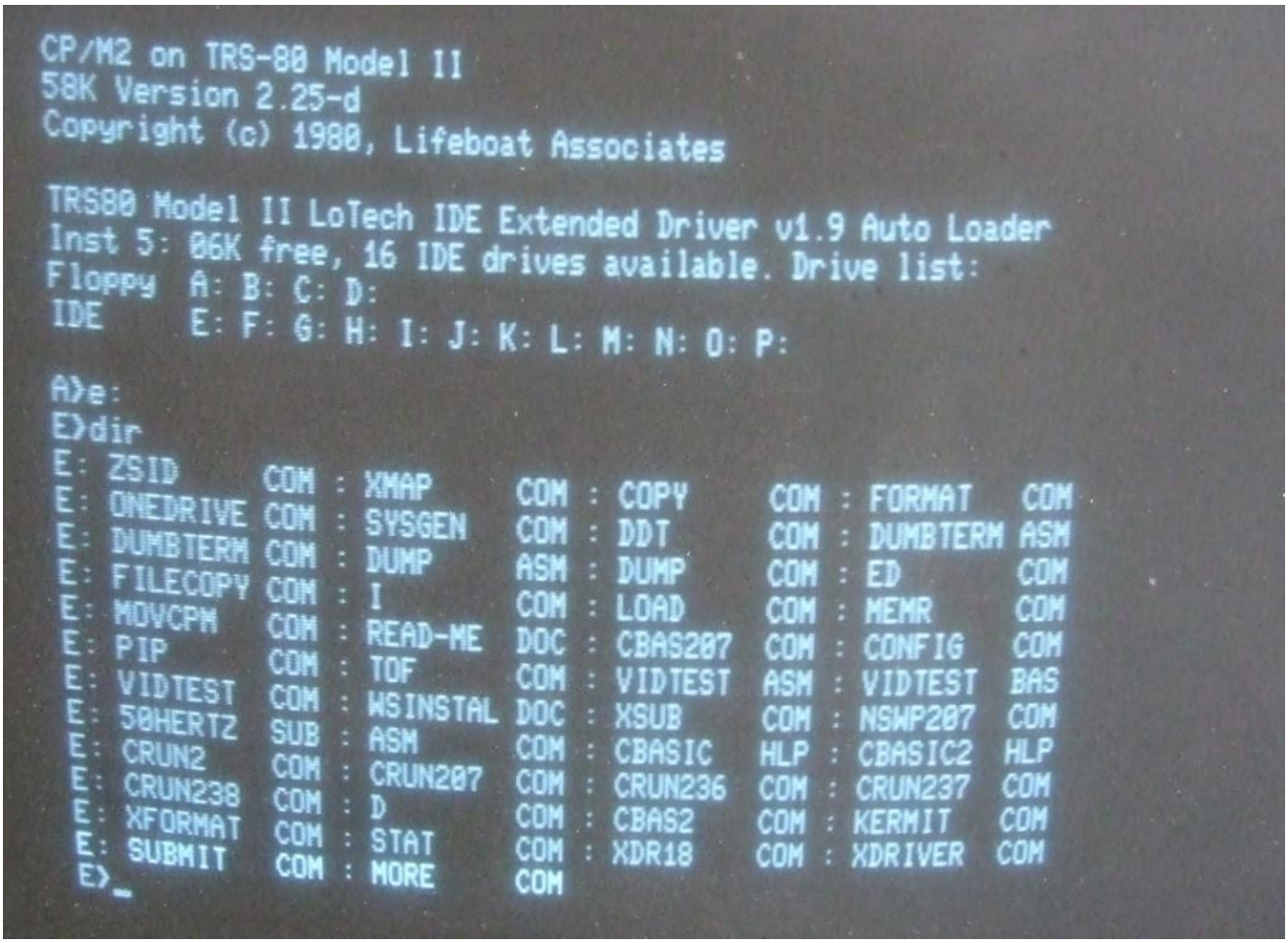


Photo: typical start-up screen and switch to E: drive

CONCLUSION

The DOM Card is a simple solution for owners of TRS-80 8in systems who want to get more out of their machines without adding the elusive and expensive hard drive systems. Currently DOM Card supports CP/M and LS-DOS, which I will discuss in the next issue.

Ian Mavric

ianm@trs-80.com



Ian Mavric is an IT Specialist who also restores and collects TRS-80's and classic cars. He live with his wife and kids in Melbourne, Australia.

--== oØo ==--

(CONTINUED FROM PAGE 1)

(JUNE 1982) WHICH WAS A SOFTWARE EVALUATION OF SARGON 2 AND SFINKS V3. BOTH OF WHICH PROGRAMS ARE NEW TO ME!

I MUST SOON START TO LEARN A BIT MORE ABOUT LDOS (BECAUSE OF THE M2 EMULATOR, TRS80GP AND THE IMMINENT ARRIVAL OF MY M2 FROM BAZ) SO, THERE'S A BEGINNER'S GUIDE TO LDOS (PARTS 1 & 2) AND VARIOUS OTHER ARTICLES, AGAIN FROM 80-MICRO, WHICH I HOPE YOU FIND OF INTEREST.

MAV, AS YOU'VE PROBABLY JUST READ, SHOWS US HIS NEW DOM CARD FOR THE M2 SERIES OF COMPUTERS AND ALSO HIS EXTENSION BOARDS WHICH MAKE TESTING MUCH EASIER. THERE IS ALSO PART 6 OF HIS TANDY PRINTERS REVIEW.

ET FONEHUME HAS YET ANOTHER ONE-LINER HAVING BEEN INSPIRED BY GEORGE PHILLIP'S PROGRAM IN THE JUNE EDITION. AND FINALLY, THERE'S MY USUAL REVIEW OF THE UK'S EBAY 'BARGAINS'.



SO, UNTIL DECEMBER & THE CHRISTMAS EDITION -

TAKE CARE - DUSTY

SYDTRUG NEWS

Newsletter of Sydtrug Inc.

Sydney TRS-80/MS-DOS Users' Group

C/- Peter Wignell PO Box 95 NARWEE NSW 2209

AUSTRALIA

Website : www.sydtrug.org

PALINDROMES



ET FONEHUME

HAVING BEEN INSPIRED BY GEORGE PHILLIP AND HIS ONE-LINER SIERPINKI'S SIEVE PROGRAM I REVISITED NUMBERPHILE AND CAME ACROSS A VIDEO ABOUT THE LYCHREL NON-PALINDROMIC NUMBERS.

I REMEMBER IN THE EARLY 1980'S THAT THERE WAS QUITE A BIT OF EXCITEMENT ABOUT REVERSING AND ADDING NUMBERS TO MAKE A PALINDROME. I THINK IT WAS POPULAR BECAUSE IT WAS A RELATIVELY EASY THING TO DO WITH YOUR 'NEW' MICRO AND LIKE ALL GOOD PROGRAMS IT WAS FUN! ALSO, IT SAVED A HECK OF A LOT OF UNINTERESTING CALCULATIONS. (NOTICE HOW I DIDN'T USE THE WORD BORING THEN DUSTY? REMEMBER, AT SCHOOL, MISS UPTON SAYING NEVER TO USE THE 'B' WORD AS IT WAS A SIGN OF IGNORANCE? MIND YOU, THOSE CALCULATIONS REALLY WERE BORING AND VERY TEDIOUS TOO EH!)

ANYWAY, I THOUGHT A PALINDROME PRODUCING PROGRAM WAS A GOOD CANDIDATE FOR A ONE-LINER, SO HERE IT IS. I ALSO LOOKED OUT AN ARTICLE FOR YOUR 'THE WAY WE WERE' PAGES. IT'S ORIGINALLY FROM 'BEST OF CREATIVE COMPUTING' AND LOOKS AT THE CREATION OF PALINDROMES. IT MENTIONS THAT THE LYCHREL NUMBER 196, HAD OVER 79,000 REVERSALS ON A CDC 6600 COMPUTER, WITH NO OUTCOME. I THINK THAT, CURRENTLY, OVER A BILLION REVERSALS HAVE BEEN TRIED, STILL TO NO AVAIL.

```
? 490
 1 490 094 584
 2  584 485  1069
 3  1069 9601  10670
 4  10670 07601  18271
 5  18271 17281  35552
 6  35552 25553  61105
 7  61105 50116  111221
 8  111221 122111  233332
READY
```

```
1 CLS:CLEAR1000:DEFDBLC:INPUTA$:FORZ=0TO1STEP0:R=R+1:FORJ=LEN(A$
)TO1STEP-1:B$=B$+MID$(A$,J,1):NEXT:IFVAL(A$)=VAL(B$)THENENDELSEC
=VAL(A$):C=C+VAL(B$):PRINTR;A$;" ";B$;C:A$=STR$(C):B$="":NEXTZ
```

Follow-up on Palindromes

Remember in the Jan.-Feb. issue on page 12 we asked if readers could improve on Tom Karzes' programs to turn any number into a palindrome by successive reversals and adding. Here's an example:

```
  76
  67
 ---
 143
 341
 ---
 484 a palindrome
```

In the Jan.-Feb. issue we said Tom Karzes' palindrome program "fails with greater than a 7-digit number." What we really should have said is that it will not accept input numbers of over seven digits. In retrospect, this is not much of a limitation at all since palindromic seed numbers are generally much less than 7 digits. His program, in fact, spews out a number as long as a Teletype line. Sorry, Tom!

In any event, Gregory Yob of Menlo Park, CA put some additional sophistication into a palindromic reversal program. Here's the program, a couple of sample runs and then a portion of the run using 196 as a starter (remember — that's the one that doesn't seem to ever become palindromic). Gregory interrupted that run after 101 additions.

He then wrote a souped up version that doesn't print out the calculations but rather just the final palindrome and number of steps to reach it. If a palindrome isn't formed by 254 digits the program quits and prints the last number. Here's a listing of the second program and a couple of sample runs including the run of 196 as a starter.

Want to carry on? Why not modify the program to try all the numbers between 100 and 200 in sequence? Or extend it, if your BASIC compiler permits, to handle a longer number?

```
0070  DIM A$(254),B$(254),C$(254)
0080  PRINT "STARTING #";
0090  INPUT A$
0100  S=0
0110  REM- PRINT LAST SUM
0120  PRINT TAB(10);A$
0130  REM: MAKE REVERSED #
0140   FOR J=LEN(A$) TO 1 STEP -1
0150   K=LEN(A$)-J+1
0160   B$(K,K)=A$(J,J)
0170   NEXT J
0180  REM: PRINT REVERSED # & STEP COUNT
0190  S=S+1
0200  PRINT S;TAB(11);B$
0210  REM- DO THE ADDITION
0220  C$=A$+B$
0230  REM: RESET AND DO AGAIN
0240  A$=C$
0250  B$=" "
0260  PRINT
0270  GOTO 120
0280  END
```

LISTING

```
STARTING #?8344
          8344
 1        4438

          6776
 2        6776

STARTING #?196
           196
 1         691

           887
 2         788

          1675
 3        5761

          7436
 4        6347

          707444981560820480178089187097511816511844460
 99       60844481156181157907819860710840205051894447O7

          1315889733188638059856887074805914682084789513
 100      3159587480386419508478788659503928821337985131

          4475777153449051561789069987156150844368777464
 101      4464777863446051651789960987165150944351777574
```

SAMPLE RUNS

```
STARTING #?176
           176
 1         671

           847
 2         748

          1595
 3        5951

          7546
 4        6457

          14003
 5        30041

          44044
 6        44044

STARTING #?776
           776
 1         677

          1453
 2        3541

          4994
```

AND HERE'S THE BIG ONE (196)

WE DIDN'T HAVE SPACE FOR ALL THE INTERMEDIATE PRINT-OUT (YOU RUN IT!). GREGORY ABORTED THE RUN AFTER 101 ADDITIONS.

A Non-Palindrome ?

Ever since the first article on palindromes appeared in *Creative Computing* in January 1975, I have received letters from people discussing the notorious 196 (or 1675). 1675 is merely two reversals and additions of 196 (196 + 691 = 887, 887 + 788 = 1675).

Three magazines seem to be keeping track of this problem. Darryl Francis of *Games & Puzzles* printed letters from R. Hamilton who reversed 196 100 times with no palindrome formed, Jonathan Kessell (4147 reversals), and Mike Lean (4850). Students of Fred Gruenberger, editor of *Popular Computing* reversed 196 well over 5000 times. Gregory Yob's program is printed here with which he performed 584 reversals. Tony Skaltsiotis and Andrew Glassner of Highland Park High School, N.J. took it out to 10,000 reversals.

The ultimate so far was done by Lynn Yarbrough who dedicated 3 hours of a CDC 6600 to the problem and performed 79,098 reversals. Still no palindrome. (Details of his run are in *Creative Computing*, Vol. 2, No. 1, page 34.

```
0010  REM: FIND A PALINDROMIC NUMBER BY REVERSALS AND ADDITIONS
0020  REM: BY GREGORY YOB  (415) 366-4039
0030  REM: PO BOX 310, MENLO PARK, CALIFORNIA 94025
0040  REM: --- INSPIRED BY ARTICLE IN CREATIVE COMPUTING
0050  REM: --- RUN ON BASIC TIMESHARING SYSTEM 3000
0060  REM: --- WHICH HAS LIMITED STRING ARITHMETIC
0070  DIM A$(254),B$(254),C$(254)
0080  PRINT "STARTING #";
0090  INPUT A$
0100  S=0
0110  REM- PRINT LAST SUM
0120  REM: REMOVED TO ELIMINATE PRINTOUT
0130  REM: MAKE REVERSED #
0140  B$=" "
0150   FOR J=LEN(A$) TO 1 STEP -1
0160   REM: RESULT STRING BEGINS WITH A BLANK, SO:
0170   K=LEN(A$)-J+2
0180   IF A$(J,J)=" " THEN 200
0190   B$(K,K)=A$(J,J)
0200   NEXT J
0210  REM: PRINT REVERSED # & STEP COUNT
0220  S=S+1
0230  REM: REMOVED & REPLACED BY A TEST
0240  IF A$=B$ THEN 340
0250  IF LEN(A$)=254 THEN 330
0260  REM- DO THE ADDITION
0270  C$=A$+B$
0280  REM: RESET AND DO AGAIN
0290  A$=C$
0300  B$=" "
0310  GOTO 140
0320  PRINT "IS NOT ";
0330  GOTO 350
0340  PRINT
0350  PRINT "PALINDROMIC AT STEP ";S-1
0360  PRINT " THE NUMBER IS:"
0370  PRINT A$(1,70)
0380  IF LEN(A$)<71 THEN 450
0390  PRINT A$(71,140)
0400  IF LEN(A$)<141 THEN 450
0410  PRINT A$(141,210)
0420  IF LEN(A$)<211 THEN 450
0430  PRINT A$(211,254)
0440  GOTO 450
0450  END
```

HERE'S THE SOUPED UP VERSION OF THE PROGRAM

AND HERE'S THE RUN USING 196 AS A STARTER.

```
STARTING #?196

STOPPED AT 800
XI?PRINT S;LEN(A$)
 425   188

XI?PRINT A$
 6082955420238988671775070810996318681611886105608317438193678313817488
6888039538119870088801811388004680884483131889235782318187891843713899
1573816186704889629070578185898743884658830S

XI?GOTO 800

IS NOT PALINDROMIC AT STEP  584  THE MAXIMUM STRING SIZE ON SYSTEM
 THE NUMBER IS:
 179783880484616008809688478533861045748085393473481170503083640758
4812966783184693965464473756116401999951577046685983358740047743195
4717751599989013588557373744703865308976688189284704639030507118338488
4680138530869765537388608976008684384033885896
```

IN MAV'S WORKSHOP

by Ian Mavric

TA-18: TANDY ASSEMBLY 2018

WHAT TO EXPECT ON MY STAND THIS YEAR

Back in the December 2017 issue of TRS8Bit I wrote about the great time I had at TA-17 and that I was looking forward to TA-18 being even bigger and better. Everyone reading this will be pleased to know that I have my airline ticket booked and will be there with my usual, if slightly jetlagged, enthusiasm.

This year I'll be bringing the usual assortment of items I am know for, which includes the every popular FreHD hard drive emulator, Model 4/4P/4D hi-res graphics board, Model 4 64K memory upgrades, Model I hard drive adapters, Model I lowercase kits, various cable assemblies etc.

For fans of the 8in TRS-80s I'll have with me the DOM Card (mentioned elsewhere in this issue) and the Extender boards (also in this issue - see pages 6 and 34). For the Coco enthusiasts I will have RE-FD502 floppy disk controllers as well as the new CC_NEW_JFD-CP controller in both assembled and kit form.
I'll also have some Coco Max II hi-res controllers, and some diagnostics cards for the Coco 1 and 2.

If there is anything specifically that I sell and you'd like to pick up from me at TA-18, drop me a line to make sure I bring one along. While I'll aim to bring at least one of everything I sell, if its popular it might sell before you get to me so the best way to not go away disappointed is place an order for items for collection from me.

On the next page is a photo from last year partly showing my table of some of the items I'll be selling. You can expect pretty much the same this year.



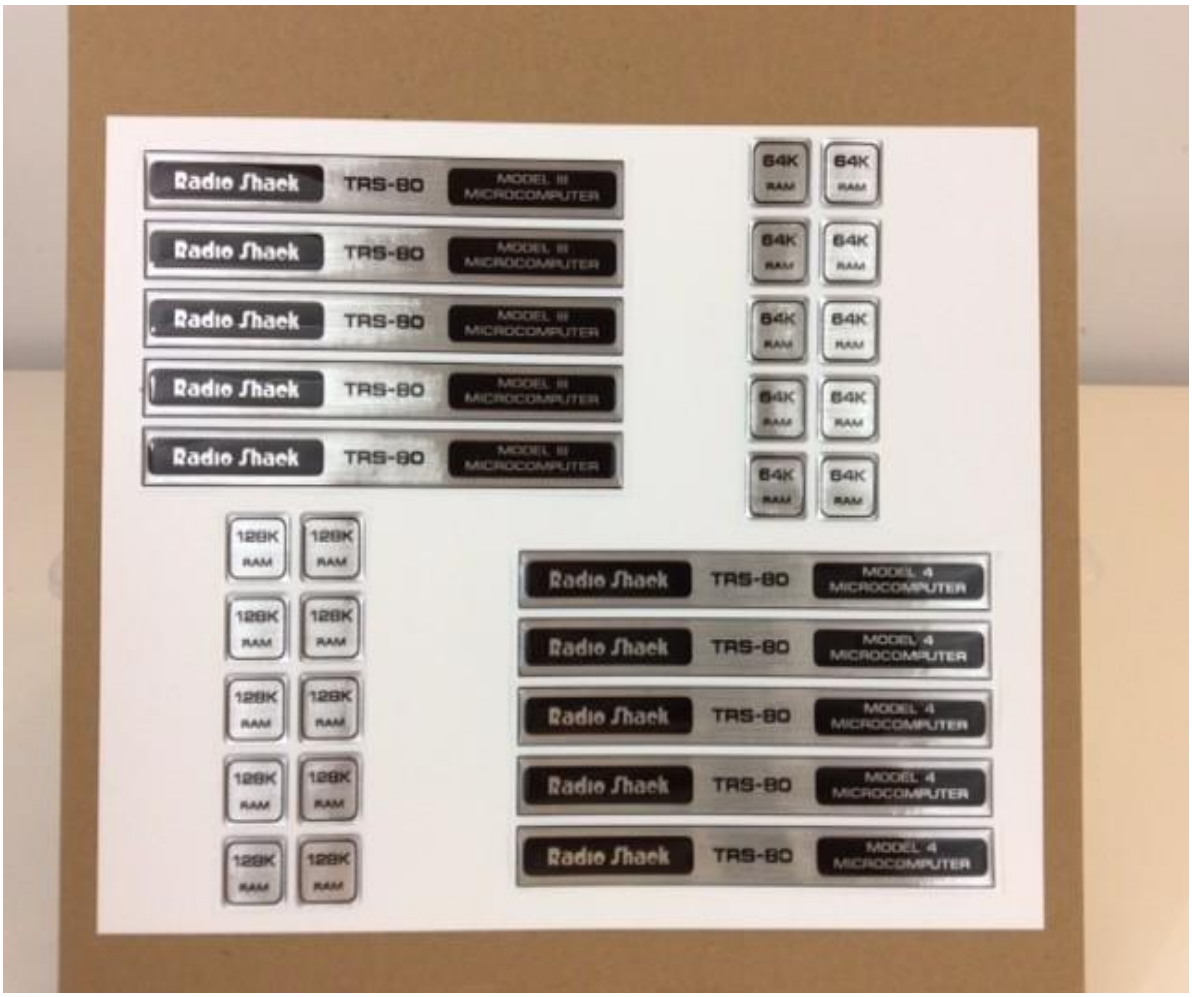
Photo: HRG boards at TA-17 (photo courtesy of P. Cetinski)

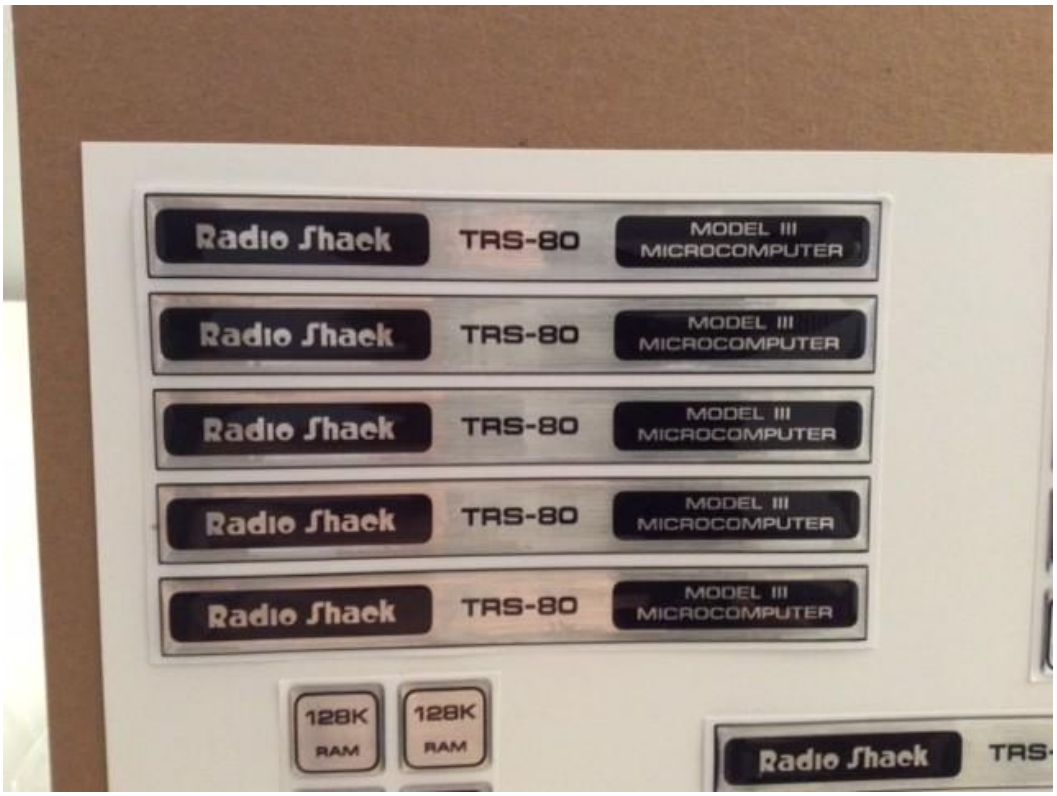
JAY NEWIRTH

On the next table over from me will be Jay Newirth from Maryland, who has been making inroads into becoming a supplier of hard to find repair and restoration parts for TRS-80 Model III and 4.

Jay's biggest achievement has been his line of reproduction nameplates and memory size badges, perfect for sprucing up your machine.

The 64K Ram stickers are great for those upgrading 16K Model 4s to 64K, as well as for Coco 1 (early type) with 64K Ram but still reads 4K, 16K or 32K on the Ram badge. The 128K badges are great for those who have maxed out the Ram on their Model 4s and 4Ds.





Oftentimes you may find that the nameplate of a Model III or 4 has turned yellow or tacky (or both) or sometimes just plain missing. Jay's repro nameplate stickers are very close to the originals, and are a great idea if your computer looks manky to return it to its former glory.



Photo: nice new nameplates should be part of any TRS-80 restoration

That's Jay standing next to me at TA-17.



Photo courtesy of Jay Newirth

Ian Mavric

ianm@trs-80.com

Tandy Assembly

THE 2018 TANDY ASSEMBLY IS TO BE HELD AT:-

SPRINGFIELD, OHIO
ON THE
10TH & 11TH NOVEMBER 2018

TICKETS AVAILABLE NOW, SEE WWW.TANDYASSEMBLY.COM
FOR FULL DETAILS

ACTUAL REALITY



This all NEW 9ame for the TRS-80 Model 1-4 is written in 16k Level II Basic.
It is an adventure throu9h sPace and time.
One of both exPloration and war.
You take command of the IDF (Inter Dimensional Federation) Astron Just when mortal enemies the IDE (Inter Dimensional EmPire) are massin9 their forces in an attemPt to rule the multiverse in tYrannY.
OnlY YOU and Your shiP stand between them and their objective.
The 9ame is bein9 distributed in the PROPER old school format. On cassette in an A4 Packa9e reminiscent of back in the daY in TandY/Radio Shack. Also in the Packa9e is a 9uick start 9uide.
For further info inc: Instructional video, 1/4 PlaY throu9h, review and Promotional video, 9o to the YouTube channel: Retro Gamin9 Geeza.

The 9ame has been featured on the new Trs-80 trash talk Podcast (APril) You can Goo9le them or find them on Facebook. **For sale on EbaY**

Get readY for the adventure.

#UPDATE. The 9ame is now also available on 5.25 FLOPPY DISK, for MODEL ONE ONLY. If You would Prefer to receive it in this format, send a note on the buY Pa9e when You Purchase.

JUST FOR FUN, I CHOSE THIS TYPEFACE AS IT IS VERY SIMILAR TO THE LINE PRINTER VII

Sargon II vs. Sfinks 3.0

Chess tournament

Don Scarberry, Editor

The title of the ad read "Prize Winning Chess". There was a small profile of the Sphinx of Egypt just to the left of the title. The ad continued: SFINKS 3.0 (new) — "Prize winner in Paris in the 1981 Microcomputer Chess Championship; Sfinks 3.0 is the fastest and strongest chess program ever written.

These seemed like awfully strong words for the small, inconspicuous advertisement I'd seen while browsing through a recent issue of *80-U.S. Journal*. At any rate, the ad did its job. I was definitely interested! I wanted to see if the claims were justifiable, so I immediately solicited a Model III disk version for review purposes.

In the days when the Model I was popular, I had followed the success of Sargon, and the later Sargon II. Sargon was a very popular chess game. It wasn't superb, but it was one of the best around at the time. What better way to review a new chess game, especially one that boasts being the fastest and strongest chess program ever written, than to have it compete in a tournament with a formidable opponent—Sargon II? I scheduled a tournament.

The stage was set. Sfinks would be played on a new Model III TRS-80, and Sargon II would be played using an older Model I. Both machines contained dual disks and 48K of RAM. Sfinks had somewhat of a hardware advantage, however. It requested to have a printer and small audio amplifier installed before it would commence with the tournament.

I checked the rule book (Sfinks' documentation) and sure enough, after each pair of moves, Sfinks would provide a printout if a printer was attached. It would also provide us with an audible indication of each of its moves if connected to an audio amplifier. This guy was prepared to play chess!

The Tournament

Both opponents would battle it out in my recreation room while seated face-to-face on parallel tables. I was to mediate (be a key punch operator for) a chess tournament consisting of three games.

Sfinks was to my left—Sargon II to my right. I went through some sophisticated mental calisthentics in order to determine which of the two players would start with white. Sargon II won the coin toss and Sfinks became the underdog by having to settle for black.

A major problem was determining which levels of difficulty to select for each player. Sargon II contains six levels, while Sfinks offers nine (see the table of response time for Sfinks later in the article). I chose level two for Sargon and reflected a bit about my choice for Sfinks. Sfinks sort of reminded me of Muhammed Ali. You know — high spirited and cocky. I decided that since he had made such brash claims in the advertisement, he ought to start at level two also. He just wouldn't be able to think about his moves as long as Sargon. Besides, no one was looking.

I fired up the machines, answered all of the prompts, and the first game was quickly underway. The ice was broken, and a chilly quiet settled over the room.

Sargon moved immediately D2-D4. Sfinks, just as quickly, replied with D7-D5. All of a sudden, the

silence was shattered by what sounded like a Bantam rooster suffering from a lack of male hormones! I shot up from my place, fell backward over my chair and crashed into the wall.

As I slithered to the floor, I remembered the little amplifier that Sfinks uses to alert his opponent after each move. I had inadvertently turned the volume all the way up. After regaining my keypunching composure, I cursed my way back to my seat. "Loud mouthed son of a . . . (gun)!"

I punched Sfinks' move into Sargon's keyboard, and the game was on again. The first four moves were swift and to the point.

Game Number One

	Sargon	Sfinks
	-----	-----
1.	D2-D4	D7-D5
2.	C2-C4	C7-C6
3.	G1-F3	G8-F6
4.	B1-A3	E7-E6

Sfinks seemingly becomes the aggressor on move five, and takes Sargon's knight:

5.	E2-E3	F8-A3

Sargon, not to be outdone, replies on move six by capturing a bishop. Sfinks evidently senses a battle and castles early:

6.	B2-A3	E8-G8

Sargon replies

7.	F1-D3	-----

But Sfinks begins to get real pushy with:

7.	-----	D8-A5+

and puts Sargon in check. After:

8.	D1-D2	A5-D2+

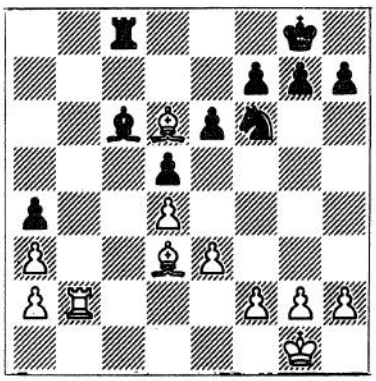
Sfinks has forced a queen swap and threatened Sargon's king again. A short verse began to run through my head: "Fly like a butterfly, sting like a bee."

Sargon manages to escape the ravages of Sfinks, and the game becomes a battle for position and control until move 18.

9	C1-D2	B8-D7
10.	D2-B4	F8-E8
11.	E1-G1	B7-B6
12.	C4-D5	C6-D5
13.	A1-C1	C8-B7
14.	C1-C7	A8-B8
15.	F1-C1	A7-A6
16.	B4-D6	E8-C8
17.	C1-B1	A6-A5
18.	F3-E5	D7-E5

Sfinks appears to be in trouble, but continues.

19.	D6-E5	C8-C7
20.	E5-C7	B8-C8
21.	C7-B6	A5-A4
22.	B6-C5	B7-C6
23.	B1-B2	F6-D7
24.	C5-D6	D7-F6



After move 24:
Sargon C5-D6
Sfinks D7-F6

At this point, Sargon seems to have overcome his initial shock over Sfinks' opening aggressiveness, and regains precious position as witnessed by the next moves.

25.	B2-C2	C6-B7
26.	D6-C7	G8-F8

Sargon is now on the attack:

27.	C7-D6+	-----

but Sfinks replies:

27.	-----	F8-G8

and the battle continues uneventfully for a while.

28.	D6-C7	G8-F8
29.	F2-F3	F8-E7
30.	G1-F2	F6-E8
31.	C7-E5	H7-H6
32.	C2-B2	B7-C6
33.	B2-C2	E7-D7
34.	D3-A6	C8-A8
35.	A6-D3	F7-F6
36.	E5-F4	E8-D6
37.	F2-G3	A8-B8
38.	H2-H3	B8-B7
39.	H3-H4	G7-G5
40.	H4-G5	H6-G5
41.	F4-D6	D7-D6
42.	G3-G4	C6-E8
43.	G2-G3	E8-C6
44.	D3-G6	B7-B8
45.	G6-D3	B8-H8
46.	F3-F4	G5-F4
47.	G3-F4	H8-G8+
48.	G4-F3	G8-G7
49.	F4-F5	E6-F5
50.	F3-F4	G7-C7
51.	F4-F5	C6-B5

Sfinks is again in trouble.

51.	-----	C6-B5

seems like a bad move, but Sargon fails to take advantage of it.

52.	C2-D2	B5-D3+
53.	D2-D3	D6-E7
54.	E3-E4	D5-E4
55.	D3-E3	C7-C2
56.	E3-E4	E7-F7
57.	D4-D5	C2-D2
58.	E4-A4	D2-D5+

Sargon captures another pawn and Sfinks' game seems almost hopeless at this point.

59.	F5-E4	D5-D2
60.	E4-F3	D2-A2

Wait! All is not lost! Sfinks seems to have equalized the game. The excitement begins.

61.	F3-E4	F7-G6
62.	A4-A5	A2-F2
63.	A5-C5	F6-F5+

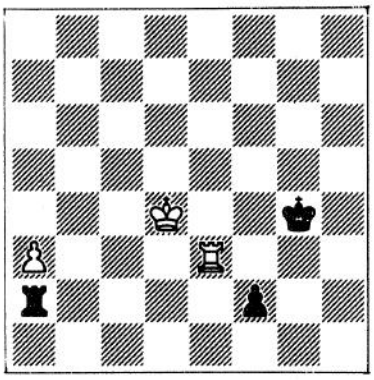
Sfinks is now on the attack and is very much the aggressor.

64.	E4-E3	F2-A2
65.	E3-F4	A2-F2+
66.	F4-E3	F2-A2
67.	C5-C3	G6-G5
68.	E3-D4	F5-F4
69.	C3-C5+	G5-G4
70.	C5-C3	F4-F3

With:

71.	C3-E3	F3-F2

it is obvious that Sfinks is after a queen.



After move 71:
Sargon C3-E3
Sfinks F3-F2

After:

72.	E3-E4+	G4-F3
73.	D4-E5	F2-F1

Sfinks has won a queen. The tension is mounting. Will Sfinks pull it off? Let's see for ourselves.

74.	E4-F4+	F3-G2
75.	F4-F1	G2-F1
76.	E5-D4	A2-A3
77.	D4-C5	A3-D3
78.	C5-C4	F1-E2
79.	C4-B4	D3-D4+
80.	B4-B5	E2-D3
81.	B5-C5	D3-E4
82.	C5-C6	D4-D5
83.	C6-C7	D5-C5+
84.	C7-D6	E4-D4
85.	D6-E6	C5-D5
86.	E6-F6	D5-E5
87.	F6-F7	D4-D5
88.	F7-F6	D5-D6
89.	F6-G7	E5-E6
90.	G7-F7	D6-D7
91.	F7-G8	E6-E7
92.	G8-F8	D7-D8
93.	F8-G8	D8-E8
94.	G8-H8	E8-F7

At this point, it is no less than obvious that Sfinks has come from the position of underdog all the way to the winner's circle. And he knows it. His next statement is "checkmate in two". To prove his point, the game is ended quickly:

95.	H8-H7	E7-E6
96.	H7-H8	E6-H6+
		Checkmate

In light of the fact that Sfinks was black and was playing at level two, he did a remarkable job of making a comeback. The next two games prove that Sfinks' claims do at least hold water. Whether or not he is the *"best"* remains to be seen.

Game Number Two

The next two games convinced me that Sfinks was, indeed, a formidable chess opponent. I will not bore you with a line-by-line description, merely print the moves as they developed. You can set up your own chess board and play out the moves to verify the shrewd, devious manner in which Sfinks crushes his opponent. Sfinks has white.

	Sfinks	Sargon
	-----	-----
1.	E2-E4	C7-C5
2.	G1-F3	B8-C6
3.	F1-B5	G8-F6
4.	B5-C6	D7-C6
5.	D2-D3	C8-G4
6.	C1-F4	E7-E6
7.	B1-D2	F8-D6
8.	F4-D6	G4-F3
9.	D2-F3	D8-D6
10.	E4-E5	D6-E7
11.	E5-F6	E7-F6
12.	C2-C3	E8-C8
13.	E1-G1	F6-F5



After move 14:
Sfinks D1-A4
Sargon F5-D3

14.	D1-A4	F5-D3
15.	A4-A7	D3-D5
16.	A7-A8+	C8-C7
17.	A8-A3	D8-D7
18.	C3-C4	D5-D6
19.	A1-E1	H8-D8
20.	F3-G5	H7-H6
21.	G5-E4	D6-D4
22.	E4-C5	D7-D6
23.	E1-E4	E4-F6
24.	E4-G4	F6-E5
25.	A3-A5+	C7-C8
26.	A5-A8+	C8-C7

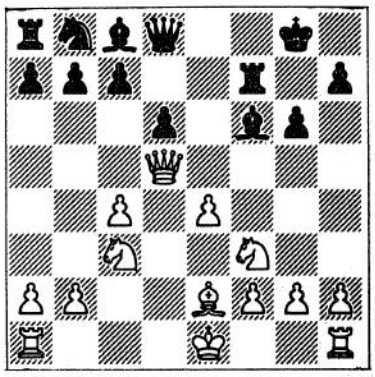
Sfinks literally crushes Sargon. This game was played at level three for both machines. Technically, Sfinks was the underdog, even though he started with white, because Sargon was able to "think" about his moves for a longer period of time. Remember, however, that Sfinks thinks while his opponent is thinking.

Game Number Three

I had intended game number three to be played at level four, but hardware problems and deadlines forced me to go back to level two. At about the 27th move, using level four, my Model I crashed. Each move at this level was taking up to twenty minutes. Multiply that by 27 moves, and you will see why I was running out of time.

One subsequent attempt at a level four game resulted in the Model III going off into never-never land after about the 34th move. I gave up and played the last game as quickly as possible using level two. Sargon has white:

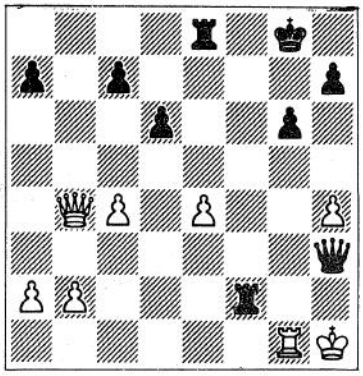
	Sargon	Sfinks
	-----	-----
1.	D2-D4	G8-F6
2.	C2-C4	G7-G6
3.	B1-C3	F8-G7
4.	E2-E4	D7-D6
5.	G1-F3	E8-G8
6.	F1-E2	E7-E5
7.	D4-E5	F6-E8
8.	C1-G5	F7-F6
9.	D1-D5+	F8-F7
10.	E5-F6	E8-F6
11.	G5-F6	G7-F6



After move 11:
Sargon G5-F6
Sfinks G7-F6

12.	A1-C1	B8-C6
13.	E1-G1	C8-G4
14.	F1-D1	D8-E7

15.	D1-D2	A8-E8
16.	E2-D3	F6-C3
17.	C1-C3	C6-B4
18.	D5-B7	G4-F3
19.	B7-B4	E7-G5
20.	D3-F1	G5-D2
21.	G2-F3	F7-F3
22.	G1-H1	D2-E1
23.	H2-H4	F3-F2
24.	C3-G3	E1-F1+
25.	G3-G1	F1-H3+
		Checkmate



After move 25:
Sargon G3-G1
Sfinks F1-H3 Checkmate!

This final game was decisive. Sfinks again crushes Sargon. Time permitting, I would have preferred to set both computers at their highest levels and let them battle it out. Things might be a little different under these circumstances, but, quite frankly, I don't see how. As far as this tournament is concerned, Sfinks demonstrated superior performance. I thoroughly enjoyed watching Sfinks as he demonstrated human-like chess playing ability.

I lit a cigarette and sat back to rest for a moment as I reflected on the outcome of these events. I haven't enjoyed myself this thoroughly in a long time. Both monitors sat quietly watching my actions. I reached over, pulled the diskettes from the drives, and laid them to the side. A sparkle coming from the direction of Sargon's monitor caught my eye. Poor thing. I pulled a handkerchief from my pocket, reached over and dabbed the small drop of moisture that had accumulated in the corner of the video screen. It couldn't be . . . could it?

A Look at Sfinks 3.0

Now, for a little background on Sfinks 3.0. The program is available on cassette or disk and requires 32K of memory. Documentation is provided which consists of five pages of instructions. This might seem rather skimpy at first, but not so. The instructions are simple, concise, and explain everything you need to know to get into trouble on the chess board.

Sfinks 3.0 will play at levels from one to nine. Each level of play represents the maximum response time of the computer. Below, is a table which lists those times:

Level	Max. Response Time
1	6 seconds
2	20 seconds
3	50 seconds
4	1 min. 10 seconds
5	1 min. 50 seconds
6	2 min. 14 seconds
7	2 min. 50 seconds
8	3 min. 50 seconds
9	unlimited

After selecting the level of play, a crystal clear representation of a chess board will be displayed, complete with chess pieces. The graphics used to represent each piece are very nicely done considering the limitations of the Model III. The screen not only displays a chess board, but virtually all other information you will need which pertains to the game.

In the upper left corner is the level chosen, while in the lower left, a digital clock (you didn't expect one with hands, did you?) displays the seconds, minutes and hours of each move. The space along the left side of the screen will display all of the moves up to the most current. When the number of moves exceeds the display capacity, they are scrolled upward without interfering with any other displayed information.

Entering moves into the computer is a snap. To enter the move P-K4 for white, press E2 and E4 in succession, without the hyphen. The hyphen is needed, but Sfinks enters it for you. This feature will save a lot of extra keystrokes during the course of a game. If you wish to correct an entry before the ENTER key is depressed, you may change it after first pressing the CLEAR key. If an illegal move is made, Sfinks will display "ERROR" and allow you to reenter a correct one.

During a game, Sfinks will let you know he is thinking by blinking an asterisk near the left of the screen. He also keeps you informed of the best move presently being considered and as better moves are discovered, the display will be updated. He will continue updating the moves under consideration until a "best" move is found, and then move the appropriate piece on the board. An additional feature allows you to stop Sfinks at any point during his analysis, and respond with a move.

If you are using the audio alert, Sfinks will audibly indicate each of his moves as they occur. Simultaneously, if you have a printer connected, Sfinks will print each pair of moves for later scrutiny. This feature saved me much time in preparing this article. The printout is excellent for post game analysis.

If Sfinks is checking your king, he will display a + after his move. If he has no legal move, he will respond with, "I LOSE". I never got to see this feature, however, since I only play average (my average) chess.

At times, if Sfinks can checkmate you, he will indicate his intention several moves prior to the actual mate. Was I shocked during a game when I saw the words "Checkmate in 2" appear on the screen! You never saw anyone perk up so fast in all your life! Sfinks can also detect a "drawn" game.

A handy feature for novice chess players is the "HELP" feature. Simply type S and Sfinks will usually suggest a move, if he can. To play a move other than the one suggested, simply remove the suggestion by depressing the CLEAR key and enter the desired move.

Herein lies much of the power of Sfinks as a formidable chess opponent. After he moves and is waiting for your response, the little asterisk doesn't stop blinking. As you are contemplating a move, Sfinks tries to anticipate what it will be. Sfinks thinks while you think! ■

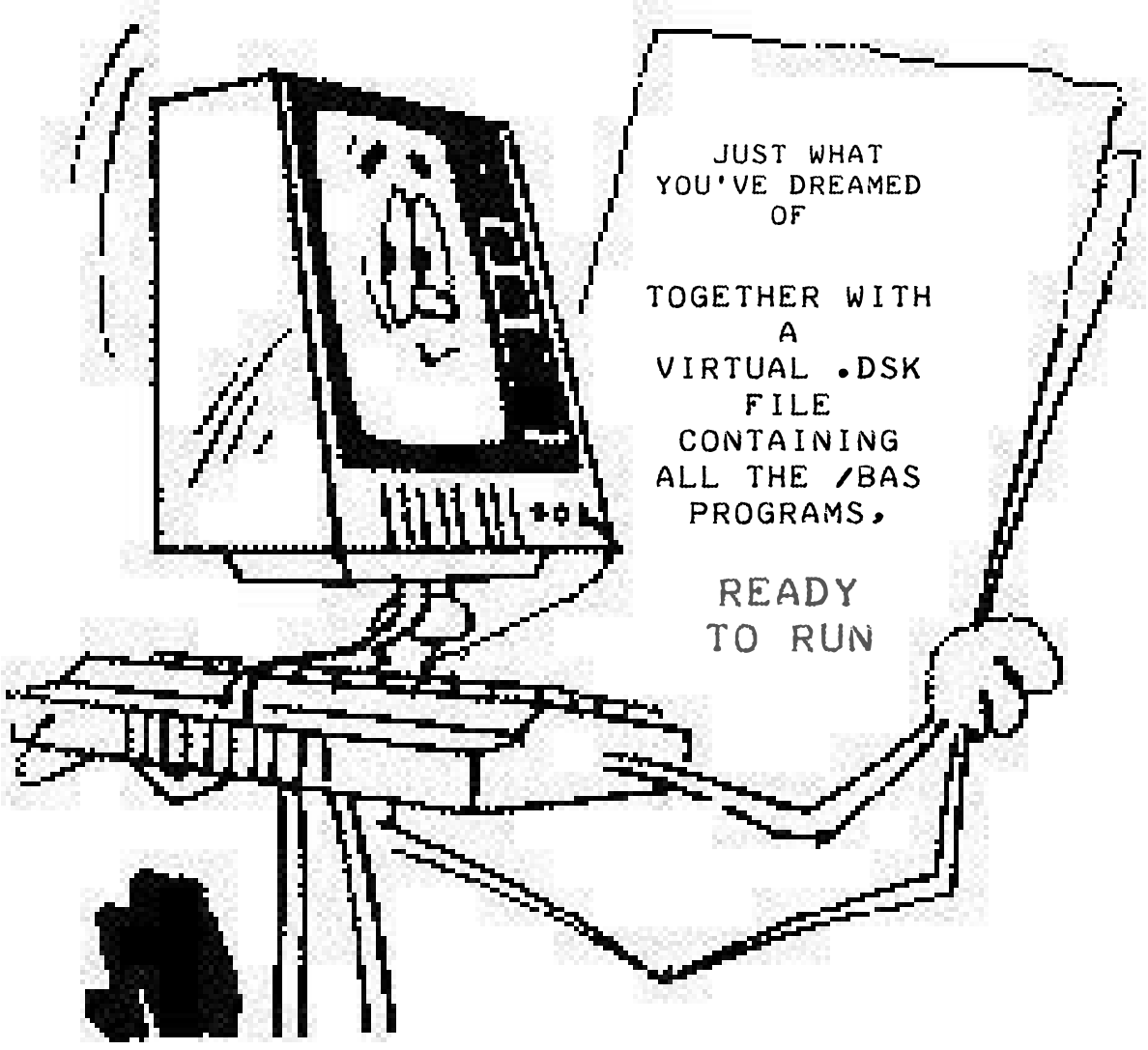
Sfinks 3.0 is available from William A. Fink, P.O. Box 5912, Lighthouse Point, FL 33074, (305) 942-5706, $39.95 for either version (cassette or disk).

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LDOS for beginners

Part I: Device independence, ROUTE, and LINK commands

Model I/III with disk

T. A. Daneliuk, Chicago, IL

Introduction

With the advent of the LDOS operating system for the TRS-80 Models I and III, a whole new world of sophisticated systems software has been opened to the computer user. There are, of course, other "advanced" operating systems for these machines, but not one of these competing products offers the diversity of hardware support, breadth of features, and ease of use in one package as does LDOS.

It is not my purpose here to start another endless debate on the merits of one DOS versus another (otherwise known as DOSWARS!). It is also not my purpose to do a product review of LDOS. This has already been done in the pages of many magazines by various authors, including myself. Rather, my purpose is to discuss some of the highlights of the LDOS system. In particular, I'd like to stress the main philosophy and concepts of LDOS, because they are such a radical departure in the field of microcomputer operating systems. In other words, this is not a rehash of the LDOS manual, but rather an attempt to understand *why* the system is constructed the way it is.

When I started to write this article I had intended to cover much more of the LDOS system than I actually ended up doing. It is simply impossible to cover in-depth, a system with as many facets as LDOS. Instead, I've tried to hit the real high points, and give you a flavor of what can be done once you learn to use the system.

A DOS overview

If you are new to the world of disk operation, the terminology and "buzz words" can be confusing. To understand the value of a package like LDOS it is important to have a good grasp of just what a disk operating system (DOS) is supposed to do.

We should first understand the notions of "devices" and "files" and how they differ. A device typically refers to one of the hardware peripherals like a keyboard or printer. Files (or "data sets") on the other hand, are collections of data arranged in some logical fashion. These collections are stored on the disks and given "filespecs" or names. A file could consist of pure data (like a mailing list), or it could be a program. The point is, that normally, devices and files are completely separate entities. As we shall shortly see, however, LDOS has the unique ability to interchange devices and files.

In its simplest form, a DOS is responsible for controlling and communicating with the disk memory systems attached to the computer. These may be five-inch or eight-inch floppy disks, or the newer sealed hard disk systems. The DOS is in charge of allocating space for each file and keeping track of where on the disk each file is kept. It is also given the task of "file maintenance". This includes showing the user a directory of all available files, eliminating unwanted files and making archival copies of all important files.

Normally, a DOS is also given charge of controlling all the other peripheral devices. These include the keyboard, the video screen, the line printer and the RS-232 serial ports. The exact reason why this is done will become clear in the following section, but for the moment it is important simply to realize that the DOS controls all input and output (I/O) between the computer and its associated peripherals. The DOS is also usually responsible for managing the memory inside the computer, by determining where programs are to load and if certain memory areas are "protected" from having new data written in them. The programs

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which control or "drive" the peripherals are called "Peripheral Drivers". The various commands which the user may use in the DOS comprise the "DOS Library". Also, there are certain specialty programs supplied with a DOS which simplify the chores associated with using disks. These are called "Utilities" and typical examples are the FORMAT and BACKUP programs which all good DOS (and most bad DOS!) systems have. Notice that FORMAT and BACKUP are not part of the DOS library, but are actually separate programs. You can prove this to yourself by doing a disk directory of all files (including the invisible ones). While you won't see a separate file named DIR or LIST which are DOS library commands, you will see the files called BACKUP and FORMAT.

Since the TRS-80 computers were designed to be able to work without disks attached, many of the driver programs are already incorporated into the TRS-80 ROM (Read Only Memory). When disks and a DOS are used, the DOS may use the existing drivers in the ROM, or it may have its own special drivers to control peripheral operation. It is also important to realize that at any given time the entire DOS is not resident in the computer memory. Only the bare necessities of the DOS are permanently loaded into the computer to conserve memory usage. Thereafter, when a DOS command is issued, the appropriate part of the DOS is loaded from the master or "system" disk for that one command. This technique is called "Overlaying".

It is not difficult to see that a well-written DOS is the key to using a computer efficiently. It will allow the user maximum control of the peripheral devices without requiring a Ph.D. in computer science to understand the commands!

LDOS and device independence

As I suggested earlier, LDOS is very flexible in its treatment of devices and files. It sees them as being entirely interchangable (with a few limitations). To be sure, the system has special drivers written for each specific piece of hardware, but these drivers all share a common heritage which makes device/file interchange very simple.

What exactly does "device independence" mean? In its purest form, device independence permits any device (i.e., a peripheral) to take the place of any other device as a source or destination of data. Moreover, a truly device independent system will allow the user to substitute a data set (i.e., a file) for a device as a source or destination of data. LDOS very nearly meets these criteria completely.

Some restrictions were imposed on the Model III because of a change Tandy made in the new ROM, but for all practical purposes, LDOS is fully device independent. In case you are wondering who came up with this great concept, it has its roots in an operating system called UNIX. UNIX was written some time ago at Bell Laboratories to run on Digital Equipment Corporation *mini*computers. It is therefore most impressive to see this concept successfully implemented on a *micro*computer like the TRS-80.

LDOS gives the user control of its devices with two commands. The ROUTE command simply changes the source to one of the other peripherals. For example, normally the LPRINT command in BASIC sends its data to the line printer. Using the LDOS ROUTE, you could tell the system to send everything intended for the printer to the video screen. From then on, all LPRINT statements would result in data being displayed on the video screen *instead* of the printer. Notice that *any* device in the system (capable of some kind of output) could have been the new destination for the LPRINT statement. For example, we could have LPRINTed to the serial port. Notice also, that the device had to be capable of output. It wouldn't make much sense to try and LPRINT to the keyboard!

Another fascinating possibility with ROUTE is to substitute a file in place of a device. We could, for example, ROUTE all printer data to a file by the name of PRINTER/DAT.PASSWORD:1. Each LPRINT statement after that would store the data normally printed into a disk file instead. Do you want a practical

example? Ok, how about this: you're doing a long complicated computation in BASIC, and the program is written to print the results on the screen. You would like to keep a permanent copy of the results because computations take four hours each (also you can't use the printer because it took you until midnight to debug the program and the cat is asleep already!). Rather than rewrite the program, you simply ROUTE the screen to a disk file, and thereby permanently save the data.

A similar command to ROUTE is LINK. The difference between them is that, while ROUTE provides a *new* destination for data, LINK simply adds *additional* destinations. In our midnight example earlier, we might want to send the data to a disk file, the video screen, and the printer (the cat sleeps too much anyway). By LINKing the two devices and the file together the data would be sent to the multiple destinations. LINK can also be used to create multiple sources of data. I have used this command to force the system to recognize two different keyboards, one in the computer and one via the RS-232 port. Oh, by the way, the keyboard on the serial port was in another part of town and was communicating to me through a modem! Presto — instant remote data entry without a "host" program. One last example really shows off the versatility of LDOS. Since devices and files are interchangable in the system, certain commands can be made to do unusual things. Instead of LISTing a file, try COPY FILENAME/EXT TO *DO (*DO is the video screen). Another useful application would be to send a file directly to the serial port (device *CL) by keying in COPY FILENAME/EXT to *CL.

All the possibilities of device independence cannot really be dealt with in depth here. Suffice it to say that the system is capable of doing much more than you will be able to dream up for it! ■

Part two of this article, covering file handling and the job control language, will appear in the next issue. —Ed.

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LDOS for beginners

Part II: File handling and Job Control Language

Model I /III with disk

T. A. Daneliuk, Chicago, IL

The heart of any disk system is the disk files themselves. A well designed DOS makes dealing with these files a simple, efficient process. It is important to realize that LDOS was intended, from the very beginning of its design, to be able to deal with hard disks. These disks have so much storage space that literally hundreds of files can be stored on one of them. For this reason, LDOS goes to great lengths to find and manipulate files easily.

File Handling in LDOS

The main file handlers in LDOS are the APPEND, COPY, LIST, KILL, DIR, CREATE and PURGE library commands, as well as the BACKUP utility. All of these have been enhanced significantly over their TRSDOS counterparts, but the commands of particular interest are DIR, PURGE and BACKUP. First, a few general observations are in order.

LDOS dates all files with the date they were created. Furthermore, any time a disk file is modified (i.e., written to), a "modifier flag" is set which indicates the file has been changed since the last BACKUP. This flag appears as a plus sign ("+") next to the file name when a directory is done. This allows you to quickly determine which files need to be archived with a BACKUP. Another feature of interest is that when LDOS displays a directory, it is sorted into alphabetical order. This alone really speeds up finding a particular file on a disk.

The reason DIR, PURGE and BACKUP naturally go together is that they have been enhanced to handle files "by class." As we will see, this allows the user to selectively pick the files on which these three commands operate. One other thing — LDOS treats all disk sizes, types and formats the same way as far as the user is concerned. Once the proper device drivers are loaded into the system, it makes no difference if the file is on a single density, double density, single-sided, double-sided, 5-inch, 8-inch, 5-meg hard drive, 8-meg hard drive... well, you get the idea. All of this hardware is "transparent" to the user.

Now then, what is a "by class" file handling procedure? Well, the basic idea is that a DOS command, or utility, is forced to operate on only a select file, or group of files, in the system. This "class" of files may be determined in several ways. You might want to specify all of the files ending with the extension /CMD. Or, perhaps, you would like to deal only with files created before April 26, 1982. Another possiblility would be to work only with files whose modifier flag is set. DIR, PURGE and BACKUP have certain class handling in common. Each also has unique file handling features which help it do its particular task in the grand scheme of LDOS.

To begin with, all of the three commands allow you to specify a partial filespec (abbreviated as "partspec") in issuing the command. For example, DIR /CMD will show you a directory of all the files on every disk with the extension /CMD, while DIR L will show every file whose filespec begins with "L."

An enhancement of this concept is the idea of a "wildcard" character. The wildcard character is used in a partspec to indicate a "don't care" position in the filespec. For example, PURGE donuts/$$$:1 will purge (if you choose) all files whose names are "DONUTS" regardless of the extension (whose characters are wildcarded). By the way, notice that LDOS doesn't care if the command is in upper or lower case.

Another handy class operation is that of date. LDOS permits DIR, PURGE and BACKUP on the basis of date of file creation. The date may be specified one of several ways. A specific date, a range of dates, everything up to a specific date, or everything after a specific date may be used to define which files are to be operated on. A related procedure is

found in BACKUP which allows selection on the basis of whether the modifier flag is set. This makes archiving a snap! You just type in BACKUP :0 :1 (mod), and all files on drive 0 (zero) that have been modified will be backed up to drive 1. Similarly, BACKUP allows you to specify whether all files, only old (i.e., existing) files, or only new files are to be backed up from the source disk to the destination disk.

While this is only a brief and incomplete view of LDOS file handling, it should be clear that the system goes to great lengths to simplify user/computer interaction. This makes LDOS ideal for the business environment in which the nontechnical user is the rule, not the exception.

JCL: The LDOS Executive Language

A final major concept found in LDOS is its JCL (Job Control Language). This is *not* simply another version of DO files. The LDOS JCL is indeed a true "executive language" as found on minicomputers and mainframes. First, we'll take a quick look at the idea of an executive language, then we'll examine a practical JCL or two.

An executive language is a computer language whose instructions (or "syntax") are made up of DOS commands. It is also often called a "Job Control Language," hence the name "JCL." The latter is really a more descriptive name, because it hints at what JCL is used for: the control and management of different jobs the computer is to do. The idea is to pre-plan all of the different programs you would like to run in a given session. Determine what you would type in to run those programs. For example, to run an executable file, you just type in its name as in FILENAME/CMD. On the other hand, if it's a BASIC program, you'd have to first type in LBASIC and then RUN "FILE/ NAME/BAS."

Now, instead of actually running each program separately, you simply create an ASCII file with a wordprocessor (or the LDOS BUILD command) of all the commands necessary to run your programs. Then, you tell LDOS to DO that ASCII file. From then on, it's a hands-off operation! JCL reads the ASCII file when it's ready for another command instead of going to the keyboard and waiting for you to type it in.

"So what," you say, "lots of other DOS products can deal with DO files." Well, in the following section, we'll see what makes JCL stand out in a DO crowd! For now though, I'll throw in a simple example of a JCL file which might be used in a small business. Notice that all lines beginning with a period are comment lines and are ignored by LDOS.

```
. DEMO/JCL by T.A. Daneliuk
. Creation Date 03/25/82
.
. First we'll do the bookkeeping
PAYABLES/CMD
RCVABLES/CMD
. Probably should pay everyone too
. But we'll need BASIC for this one
LBASIC
RUN"PAYROLL/BAS"
. Now let's go back to LDOS
CMD"S"
```

Now, let's look at some of JCL's advanced features. To begin with, JCL allows execution "Labels" to be placed in a JCL file. These always start with the AT symbol ("@") and are used to divide one large JCL file into many small procedures. This allows you to create a huge file with every JCL operation you ever want to use in it, and call just the one procedure you need at the moment. For example, if we had started the JCL procedure above with the label "@BOOKS" we could have included it in a library of JCL procedures called PROCLIB/JCL. Whenever we want to do bookkeeping, we would just key in DO PROCLIB/ JCL (@BOOKS), and the bookkeeping JCL procedure would be invoked.

Another JCL feature is the TOKEN substitution field. This allows you to put a dummy name (or variable) in the JCL procedure, and define it when you actually DO the procedure. For example, let's say you wrote a general purpose JCL procedure to document your BASIC programs:

```
@DOC
. First load disk BASIC
lbasic
. Then load the program
load "#NAME#/BAS:#S#
. Make a program listing
llist
. Go back to LDOS
cmd "s"
. And make a copy of the file
copy #NAME#/BAS:#S# :#D#
```


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There are three TOKENs used in this JCL. #NAME# is the filename, #S# is the source drive on which the file presently exists, and #D# is the destination drive to which you'd like to copy the file. So, to document the file DONUTS/BAS, you key in:

```
DO PROCLIB (@DOC,NAME=
DONUTS, S=0,D=2)
```

This would look for the file on drive 0 (zero) and then later copy it to drive 2 after the listing was made.

JCL also supports certain control features called "MACROS." These are commands which are not part of the DOS Library and are used to control the execution of a JCL procedure. Space does not permit a complete description of each macro, so we'll just touch on a few of them.

First, there are conditional macros. These are similar to the BASIC IF-THEN-ELSE programming constructs. You can make decisions within the JCL as to how it is to execute. A practical application of this is in the use of a JCL to load and assemble an assembly language program which has to run on both a Model I and III. By using if-else JCL macros, you can assemble the program several different ways for the different machines. JCL also supports "OR" and "AND" type logical statements which can be used along with the conditionals to make decisions.

There are also a set of macros used to alert the user in some way. A tone may be generated (via the cassette port) or a message may be flashed on screen to alert the user. JCL has a set of macros which act to delay program execution. You can force a specific time delay anywhere in the program. This would be useful if you used a JCL procedure to arm a burglar alarm. Enough delay would be set at the beginning of the program to allow you to get out of the building before it armed the alarm.

Another macro can cause the JCL to wait for a specific time on the real time clock before continuing. This is handy if you have jobs to schedule which need to be run at a specific time. For example, how about a JCL that turned your furnace off at night after you went to sleep, and on again in the morning an hour before you got up.

There is also a pause macro which will wait until you press ENTER before continuing. This might be used to temporarily halt JCL execution to give the user a chance to put in a new disk, check to see if the printer is on line, etc.

Finally, there are a set of macros used to accept keyboard input in the middle of a JCL procedure. This gives the user the best of both worlds, hands-off operation with the option of keyboard entry when needed.

In summary, JCL provides a way for very complex computer jobs to be scheduled and executed with a minimum of effort on the part of the operator. Again, one of the best applications of JCL will be in small business. The programmer can write a JCL procedure which makes business programs easy to run for the non-technical user.

and Finally . . .

As of this writing, LDOS is the least expensive of all the TRS-80 operating systems available ($129). If you are looking for unparalleled performance and ease of use, this is the system for you! ■

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ZBASIC 2.0 Compiler

Model I/III

Jim Klaproth, Associate editor

BASIC compilers seem to be a popular project of many software houses of late, Microsoft introduced theirs first, followed by several others, including Radio Shack's version. ZBASIC 2.0 is the latest offering from Simutek Computer Products. It has many features not found in any of the other compilers; however, it also lacks many features that make a compiler such a useful programming tool.

The main advantage of any compiler over the interpreter BASIC, is its ability to generate code that executes several times faster. While some compilers generate a pseudo-code (p-code) that requires a run-time program, ZBASIC generates pure Z-80 machine code that can be executed as a SYSTEM tape file or a CMD disk file. Chalk up one plus for ZBASIC.

One of my first ideas was to load ZBASIC, then load and compile some of my existing programs. Unlike Radio Shack's compiler, you can load an existing BASIC program into memory and then compile it. However, due to the many syntax differences between Level II BASIC and ZBASIC, only one of my existing programs would compile without substantial modification. Even some of the simple programs would not work because there is no TAB function, which is used in most programs for screen formatting. ZBASIC substitutes the STRING$ function for TAB in Level II. I did convert some programs by changing all TABS to the STRING$ function. Chalk up one plus and one minus.

Ease of use must rate high in program development. ZBASIC really shines in this area. From DOS, simply load the proper version of ZBASIC, enter BASIC, set memory size, type in or load a BASIC program, run and debug it using the Level II interpreter, then press ","+"."+"/" simultaneously to compile the program. Most programs compile as fast as you can press the keys—it is truly amazing!

After compilation, a menu allows you to run the program, save the program, or return to BASIC. To run the program, simply hit "R" and the program immediately begins execution. To save the program, hit "S" and then respond to the query with the file name. In the disk version, which was the one being evaluated, using the /CMD extension will automatically load and execute the program from DOS. To return to Level II BASIC, hit the "B" key and you will be back in the interpreter. Chalk up another plus for ZBASIC.

Speed is probably the most easily quantifiable attribute of any compiler. ZBASIC claims an increase of 10 to 100 times in operating speed. The one program that did compile successfully, was an animated graphics program that would draw the Space Needle and other prominent Seattle skyline features, run an elevator up and down the Space Needle, and a monorail train back and forth across the skyline.

In BASIC, the scene would take 3.25 minutes to complete five cycles. After compiling, the same five cycles took 3.8 *seconds*, and several loops had to be added to slow down the action. This represents an increase of 51 times the normal speed.

To give the reader another indication of the tremendous speed of ZBASIC, a simple pong game was entered from the ZBASIC manual. In normal BASIC, the ball took forever to travel across the screen. After compiling, the game was as fast as any machine language program. The compiler is not fast enough, however, to draw a complete screen instantaneously, as machine language can. Speed of compilation and execution get another plus.

There are six disk versions, and six cassette versions, of ZBASIC. The cassette versions are for 16K, 32K, and 48K memory sizes, each with the option of having high precision @ math or not. The disk versions are for 32K or 48K memory sizes, with the options being disk

I/O, no disk I/O, or disk I/O and high precision @ math. "@ math" allows up to 62 digits of precision in all calculations.

There are some limitations to using @ math—namely, all variables are stored as a string variable, and only one operation per statement is allowed. For example, the statement @ A$ = A$/B$+C$ is not allowed. The "@" sign must preceed each @ math operation. Integer math can be converted to @ math, and vice versa, using the STR$ and VAL functions. High precision math is a definite plus for ZBASIC.

The only disk I/O allowed is sequential; no random access is supported. Only one file can be opened at any particular time and end-of-file indicators are handled a little differently. There are several special functions that are not implemented in BASIC. However, keep in mind that the normal functions in BASIC are lost in ZBASIC, although there are substitute routines for the math functions.

The SIN and COS functions are now block move commands that move memory at the rate of 100000 bytes per second. CINT and CDBL are high speed memory searches that can find a single character anywhere in memory. FIX inverts memory for special effects, such as reversing the video display. Tone generation is done using the CVD command. ATN is a high speed multiply and LOG is a high speed divide, while EXP accomplishes high speed multiply by 10. Cassette I/O is done using CVS and CVI, and PUT and GET allow single byte disk I/O. TAN calls a machine language subroutine. LOC reads the stack pointer or disables interrupts. CSNG is a 16-bit PEEK or enable interrupts, while MKI$, and MKD$ all pass arguments to a machine language routine.

In addition to the above functions that are lost, the following commands are not implemented: CMD, DEF, FN, ERR, ERROR, ERL, RESUME, USING, FRE, INSTR, TAB, and TIME$. One of the biggest limitations is the memory space limitation. Because the BASIC program, the ZBASIC compiler, and the compiled ZBASIC program all reside in memory at the same time, space is at a premium. Using NEWDOS/80 version 2.0 in a 48K system, yields a memory size of 13976 after clearing all variables. This severely limits the overall size of the compiled program; although, programs can be chained together to create a larger one.

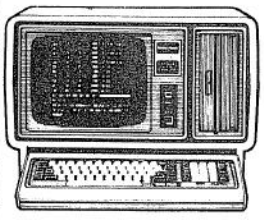
ZBASIC is useful mostly for developing new programs that need the speed of machine language, or for protecting a program from tampering. We suspect that several new programs are going to surface that have been built using this compiler. That is another plus, since Simutek does not require any royalties, as do Microsoft and Radio Shack. ■

ZBASIC 2.0 Compiler is available from Simutek Computer Products, 4877 E. Speedway Blvd., Tucson, AZ 85712, (800) 528-1149, cassette (16K, 32K, 48K) $79.95, disk (32K, 48K) $89.95.

Ed. Note— Simutek has informed us that they have released a newer version of ZBASIC, entitled ZBASIC 2.2. This newer release contains many features and enhancements that were missing from the earlier version. As thrilled as he was with ZBASIC 2.0, I'm sure Mr. Klaproth would be delighted with the new options. I'm also told that there will be absolutely no difference in price between the earlier 2.0, and newer 2.2, versions. If you have purchased the 2.0 version and wish to upgrade, Simutek will provide the service for the cost of shipping and handling. Now, there's a company who supports their software!

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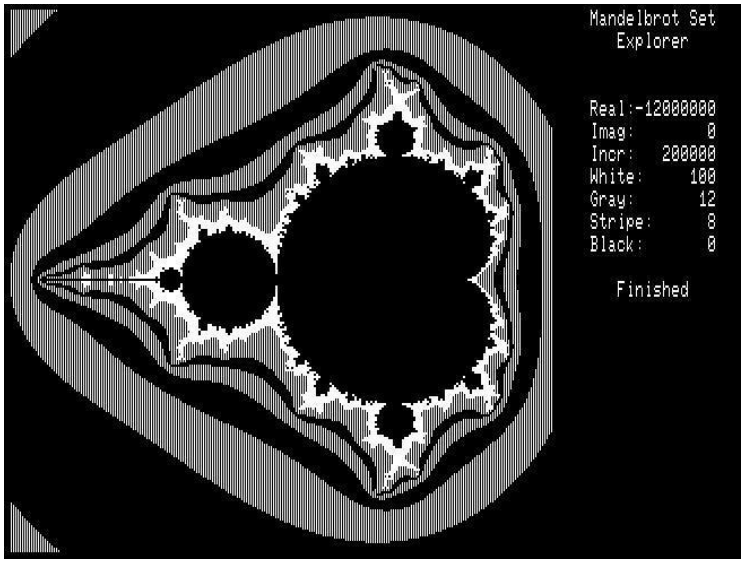
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IN MAV'S WORKSHOP

by Ian Mavric

EXTENDER CARDS MAKE REPAIRS TO THE MODELS II/12/16/16B/6000 LOGIC BOARDS EASIER

There is one thing which makes working on multi-card systems difficult to work on, its the cards themselves. This has been a problem since the early days of the S-100 system.

Physically large cards plugged into a backplane close together makes getting to the components on the card for testing purposes really difficult. You'd need to hook up the test clip from your logic probe or CRO, carefully insert the card so that the test clips don't come off, power the computer and take your reading, then remove the card and move the test clips to other positions to try to isolate the fault.

Card systems are popular even to this day, the motherboard, video card and high-end sound card you buy to build your current Intel i7 PC are a legacy of this design, however these days when a card dies you just toss it and install a new one.
The card system was adopted by the Apple II computer and also the IBM PC, among others. Access to the components on their cards was not as bad as the aforementioned S-100 cards, but still less than perfect. Radio Shack, when designing the Model II, settled on a card system as well, with cards smaller than S-100 but larger than Apple's an IBM's.

Being a powerful family of computers the cards used in the Model II and its relatives the Model 12, 16, 16B and 6000, with few exceptions, have a large number of densely populated components.
What we need when working on one of these is a way to get the cards out into the open where you can easily get to all the parts for testing, but while still electronically connected to the rest of the computer.

EXTENDER CARDS WERE USED BY RADIO SHACK TECHS

The way the Radio Shack Computer Service Centres repaired these computers were with a special card which I call an Extender card, and quite simply it just puts the card you are repairing out of the cage but still connected to the computer. That way you can probe the card to determine what is wrong with it, usually by the multitude of TPs (test points) scattered around the cards.

Radio Shack didn't make these extender cards available to the public, however photos over the years proved their existence. Once examples of originals from back in the day were finally obtained the design for reproduction could commence, knowing they would function as expected once in use.

TWO DIFFERENT EXTENDER CARDS

Those familiar with the 8in TRS-80s will know that the Model II and 16 have vertically mounted cards and on the Model 12/16B/6000 they have horizontally mounted cards. Anyone familiar with the layout inside the computer would quickly understand that there can't be a one-size-fits-all answer to making an extender card, and in fact the RSCC used two different types: an L-shaped one for the Model II/16 and a straight one for the Model 12/16B/6000. They look like this:



Photo: Model II/16 L-shaped Extender card



Photo: Model 12/16B/6000 straight Extender card

Once installed in the computer, as you would imagine the card you wish to work on hangs outside the back of the computer, or above it in the case of the II/16:



Photo: Model II with extender card and Z80 CPU card up in the air



Photo: Tandy 6000 with extender card and Bernoulli controller

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Thanks to P. Cetinski for the photos.

Ian Mavric

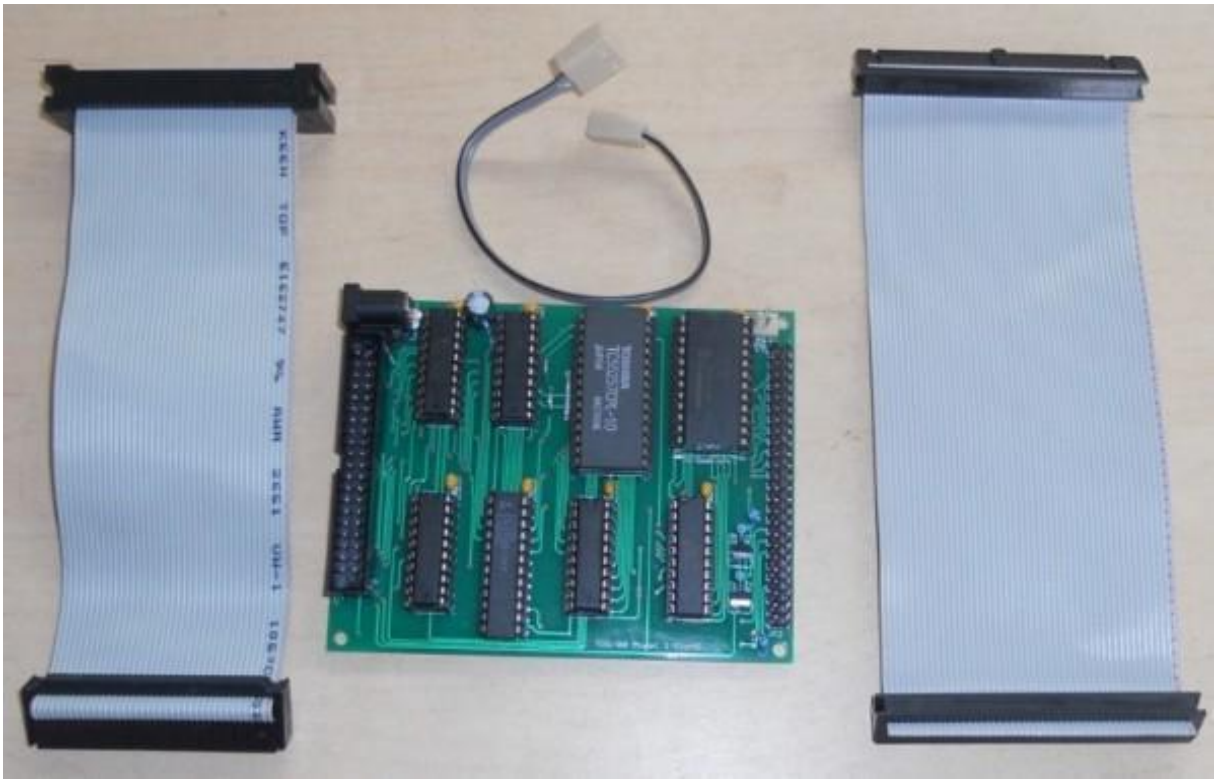
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Ian Mavric is an IT Specialist who also restores and collects TRS-80's and classic cars. He live with his wife and kids in Melbourne, Australia.

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IN MAV'S WORKSHOP

by Ian Mavric

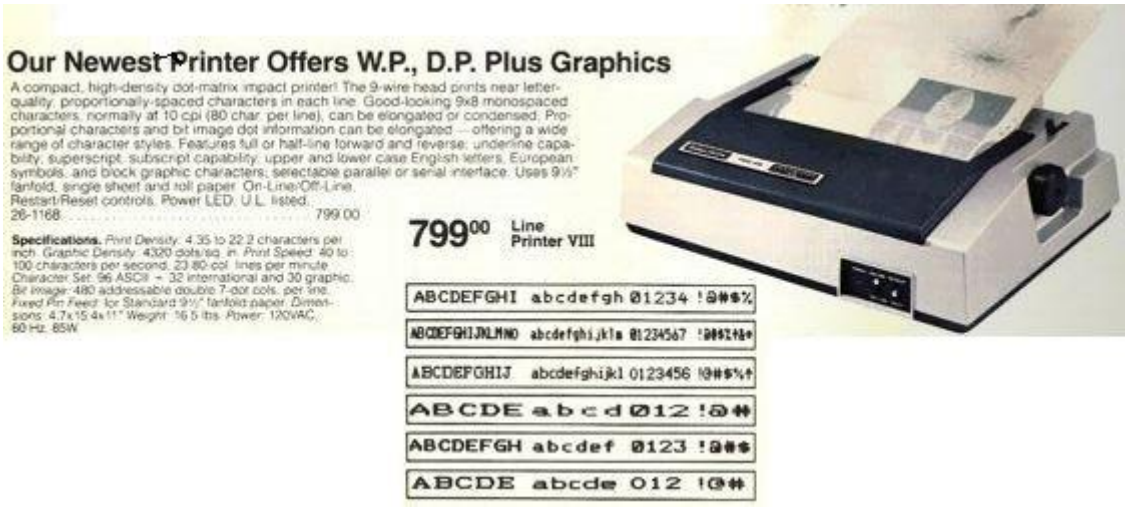
TRS-80 PRINTERS FROM THE BEGINNING SERIES
PART 6: LINE PRINTER VIII, DMP-200, DMP-120



Last time I talked about the Line Printer VII, DMP-100 and DMP-110, Tandy's answer to those looking for a printer capable of dot-matrix printing on a budget of less than $400.
For many people these were their first printer and did well considering the low price. The uni-hammer design of those printers had very obvious limitations in terms of print quality and speed and so Tandy looked into a way of providing better quality and speedier printing for those who had a little more money to spend.

The solution turned out to be a 9-pin dot-matrix printer using the latest print engine technology (in 1982) and comprised of an 80-column version of the TRS-80 Line Printer VI with a few of the features removed. It even used the same printer ribbon as the LP6.
Coming in at under $800 it was a neat little printer which had some nice features and, standard for the time, has connections for both the Parallel printing connection on the TRS-80 Model I/II/III and 16, as well as a Serial printing connection for the Coco users.

In step with their naming convention up until this point, this printer was called the Line Printer VIII and will be referred to as the LP8 for the rest of this article. This was also the last of the original name for Tandy dot matrix printers, after this they changed the names to DMP (dot matrix printers) and DWP (daisy wheel printers).



DESIGNED FOR HEAVY DUTY

The LP8 is what came to be known as a triple mode printer, the modes are Data Printing (fastest), Word Processing (slower, with sharper print), and graphics mode for dot addressable graphics. The graphics mode is rather slow but can print high-density output easily from the Coco but in fact any TRS-80 could use the graphics mode.

Up to 100cps could be achieved in data printing which was pretty decent for a mono-directional non-logic seeking print head. In word processing mode the printer came into its own with higher density character formation – basically additional columns of dots achieved by slowing the speed of the print head moving from left to right) and also proportional character size printing which was a first for a TRS-80 printer and supported by quality WP programs like SuperScripsit, Allwrite and LeScript.

SPECIFICATIONS - LP 8 WAS AN INTERMEDIATE LEVEL PRINTER

Controls on the front of LP8 consisted of an ONLINE/OFFLINE switch and a RESET/RESTART switch. The usual red LED power indicator completes the front panel. One the side is a paper advance knob, and above it a friction/tractor lever. In what appears to be a step backwards the tractor on the LP8 is not adjustable making using single width mailing labels difficult (though double-wide labels are not a problem). Paper handling was a reasonable – the LP8 can use tractor feed "computer paper" with removable perforations, in either A4 or US Letter sizes.

For data processing use a roll of paper could be hung on a special holder behind the printer. Finally, you could use standard A4 or Letter cut sheets of plain paper, however this was very awkward as no cut-sheet feeder was ever made for the LP8 so if you wanted to use paper this way you needed to insert and align each sheet before pressing the RESTART button on the front. After doing this with five or six sheets this would get really annoying...

The lid was removable and not hinged, however it did do a good job of keeping the printing quiet. The LP8 was no noisier than a regular dot-matrix, which is to say that by today's standards it's still pretty noisy. On the back was a power switch on one side and a standard Centronics parallel interface and a Coco compatible serial interface.

COMPACT BUT HEAVY

The LP8 measures 15.4in wide, 4.7in tall and 11in deep. Yes, you read that right, its more compact than the LP7. In contrast to the LP7 though, it weighs in at 16.5lb (7.5kg) it weighs basically double the LP7. At least there is no chance of accidentally pulling it off the table if your shoe gets hooked on the power cord (don't ask me why I know this).

The size of the LP8 meant it looked right at home next to the Model III, since 1982 was they heyday of Model III sales it made sense that Radio Shack had lots of photos of small offices with Model IIIs connected to LP8s, a couple are below:

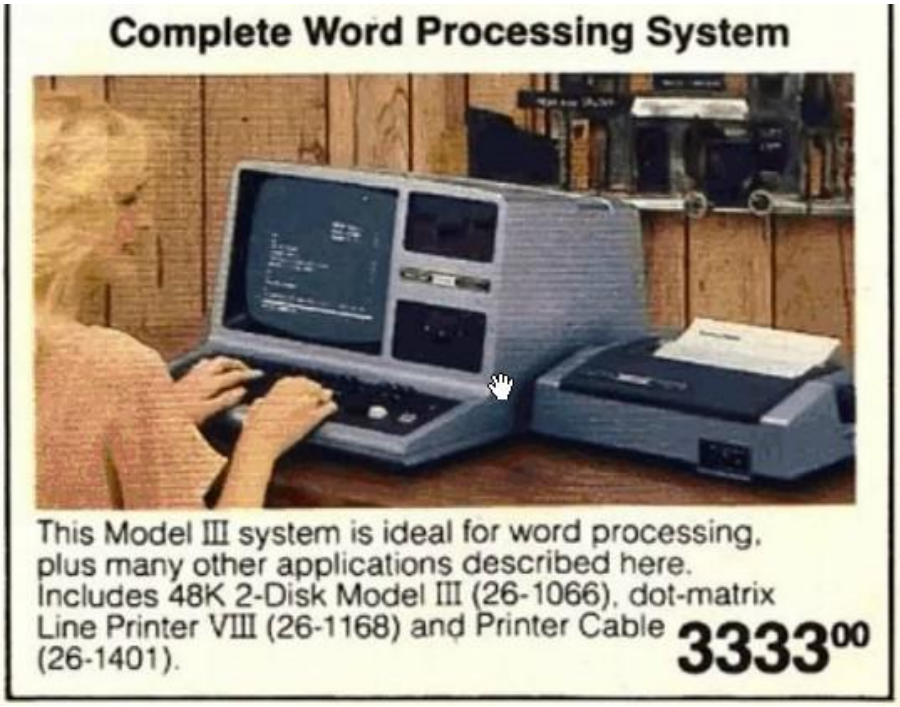
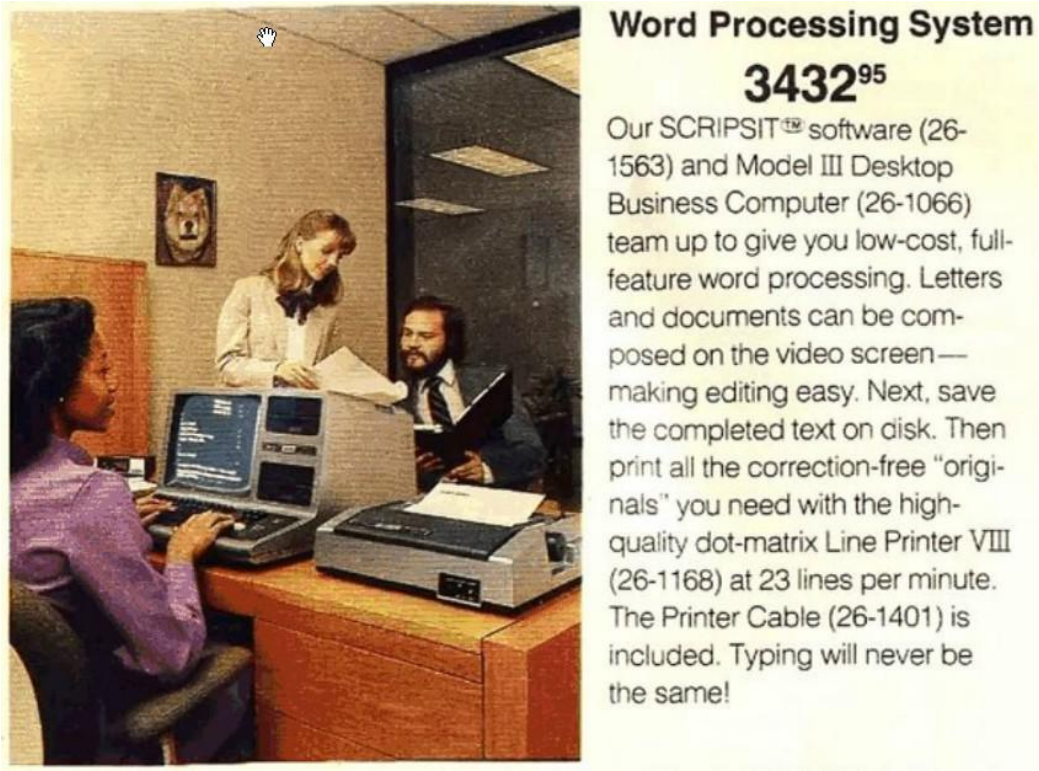


Photo: the LP8 in a home with the dual drive 48K Model III (interesting thing to note about this advert is that it is NOT a complete WP system as for $3333 it doesn't include software).

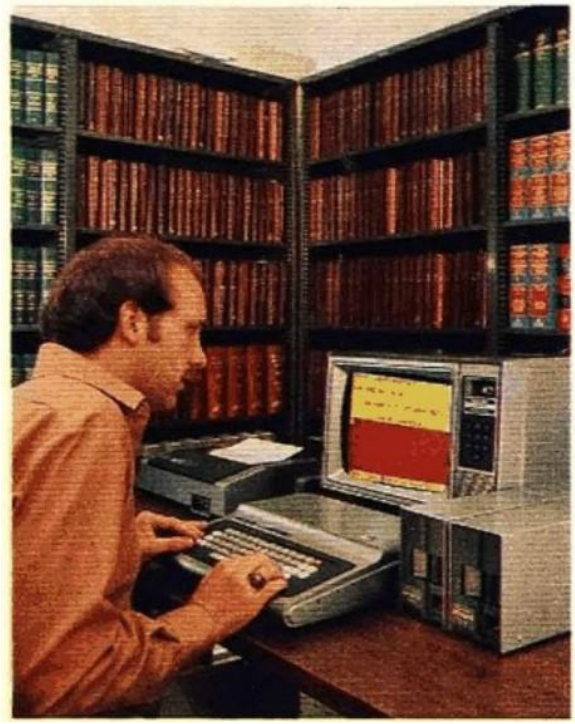


Word Processing System

3432.95

Our SCRIPSIT™ software (26-1563) and Model III Desktop Business Computer (26-1066) team up to give you low-cost, full-feature word processing. Letters and documents can be composed on the video screen—making editing easy. Next, save the completed text on disk. Then print all the correction-free "originals" you need with the high-quality dot-matrix Line Printer VIII (26-1168) at 23 lines per minute. The Printer Cable (26-1401) is included. Typing will never be the same!

Photo: In the office - it's the same system as above this time with Scripsit included.



32K 2-Disk Professional Color System

2550.95

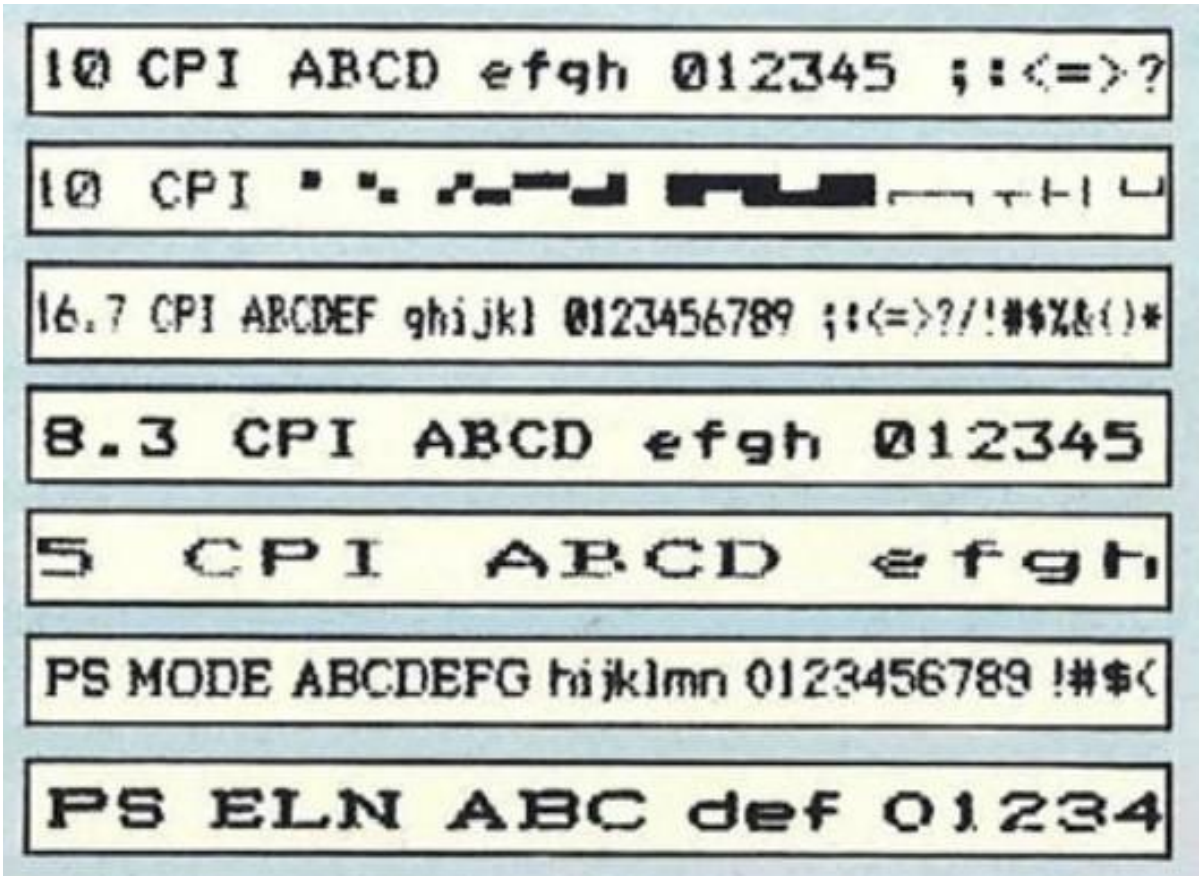
Without TV

A system that does it all—demanding technical programs, home and family financial planning, sophisticated color graphics. Included are a 32K Extended BASIC Color Computer (26-3003), two Color Disks (26-3022 and 26-3023), Line Printer VIII (26-1168) and Cable (26-3020). (Above System with 13" Color TV Receiver #26-3010, Only $2949.95)

Photo: Of course a fair number of well-heeled Coco owners bought the LP8 as well.

PRINT SAMPLE

After the rather ordinary - some may say barely passable - print quality of the LP7, the LP8 delivered a high quality 9-pin dot matrix up with the Epson competition of the time.
In the samples below you can see the 2nd 10 CPI which is the fastest data printing mode, and the 2nd last is the WP mode font. The WP font was clearer than it appears in the scan below and was the best that could be achieved in a 9-pin printer until 24-pin printers came along a few years later.



MANUALS SUPPLIED

The typical manual was included so the end user could get their printer up and running quickly. For those with a more technical side to them there was also a Service Manual available at an extra cost.

Line Printer VIII

Radio Shack
TRS-80
MICRO
COMPUTER
SYSTEM

HARDWARE

Catalog Number 26-1168



CUSTOM MANUFACTURED FOR RADIO SHACK A DIVISION OF TANDY CORPORATION

PRICING and CONSUMABLES

As you would expect from Tandy at the time, as well as replacement printer ribbons and tractor feed "computer paper", they also offered a vinyl cover for the LP8. The printer hit the market in 1982 at a price of $799. Listed below are prices and catalog numbers related to the LP8, remembering the prices are listed in 1982 US dollars: (Source: Tim Mann's Radio Shack Catalog Number compilation)

```
26-1168 Line Printer VIII $799
26-0514 Line Printer VIII vinyl Cover $4.95
26-1418 LP-6/8 Ribbon $14.95
26-1401 Printer Cable (Model I/III/4) $39
26-4401 Printer Cable (Model II/16) $39
26-3020 Coco serial printer cable $4.95
26-1456 Mailing labels (2400) $9.95
26-1403 Fanfold Paper 9.5x11 3100 sheets $37.95
```

DERIVATIVES

The LP8 was popular enough that moving forward Tandy decided to keep the good elements of the printer but fix some of it's drawbacks. Rather than enhance the printer as they did with the LP7->DMP-100 product, they designed a new printer from the ground up, incorporating elements from printers by manufacturers such as Epson and Oki.

Thus was born the DMP-200 (cat. no. 26-1254), and among it's improvements was a pull-tractor feed, adjustable down to 4in so single column mailing labels could be used.
The biggest area of improvement however was the print speed. The DMP -200 now had a bi-directional logic seeking head (the 2nd Radio Shack printer to get one after the $1999 LP V) enabled the printer to print the same quality as the LP8 but at 120cps and the price remained unchanged at $799.00

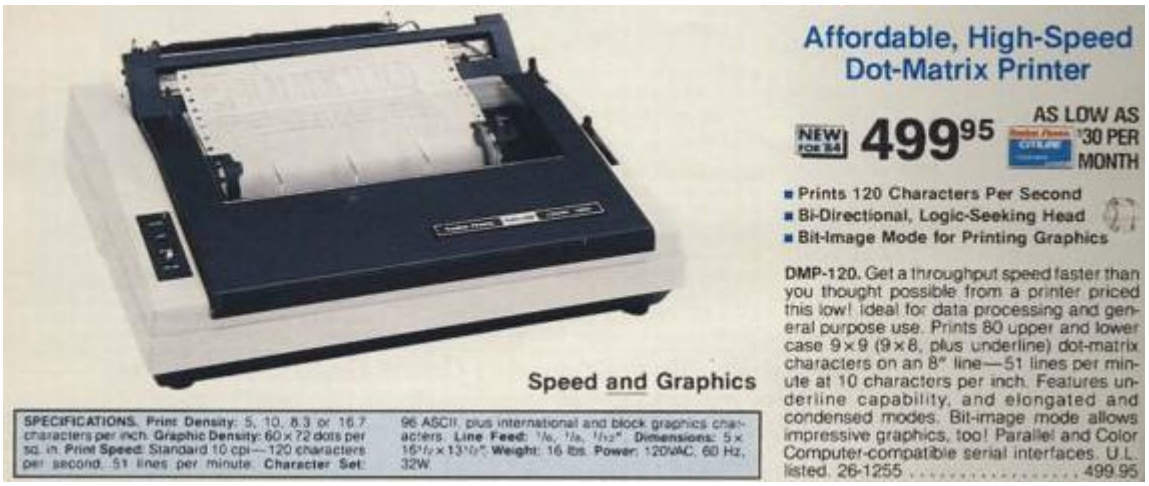
The DMP-200 was released in 1983 and became one of Tandy's most popular printers with a long sales life. For 1984 the printer was dropped in price to $699.00 and in 1985 the colour scheme was changed to white to match the colour change of every other items in the TRS-80 line-up.





With the R&D of the DMP-200 behind them and the product a huge success, Tandy was looking long and hard at the toy-like DMP-110 which was a slow uni-hammer derivative of the LP7/DMP-100.

By 1984 it was looking dated and steps were taken to look into a cut-priced DMP-200 that would be in the same price bracket as the DMP-110 they wanted to replace.
Enter the DMP-120 (cat. no. 26-1255) which used the same print engine and ink cartridge as the DMP-200, but in a sleeker package with fewer controls.



The DMP-120 sold for $499 and for a while until the old DMP-110 sold out of the remaining stock they had three printers between $399 and $699 all vying for buyer's attention.
The decision was made not to sell the DMP-120 outside of the USA/ Canada and it wasn't long before this confusing line of 80-column printers would be simplified.

As printers became more cheaper to design, for 1986 some new designs from Seikosha gave us the DMP-130 (to replace the DMP-200/120 line) and the DMP-105 (to replace the old LP7/DMP-100/DMP-110 line) and both were much MUCH cheaper than all the printers which came before them, with the same quality you came to expect from Radio Shack.

CONCLUSION

With all the features of Epson printers and at the same price or only slightly higher (and clearly many people didn't mind paying a few bucks more if the computer properly matched the computer you were connecting it to) the LP8 and its derivatives continued to be money printing machines for Tandy.
If you get to see and use one of these printers you will see that everything is engineered to a very high standard or, often, over engineered. So much so that today when I find a DMP-200 it often still works perfectly well, even if it has sat idle for decades.

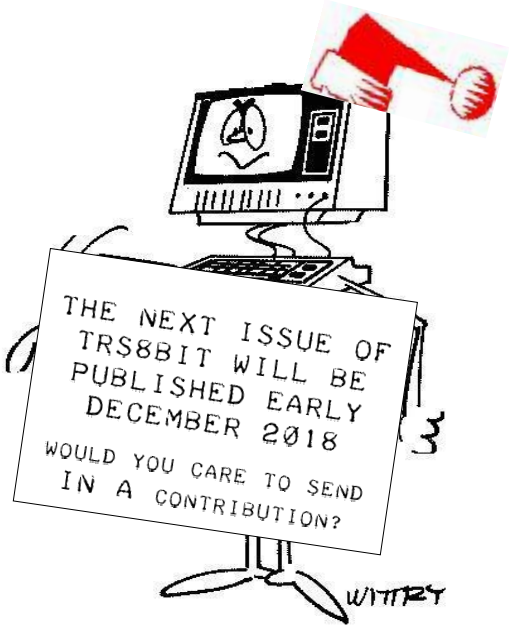
If you are after a LP8 or DMP-200 one they come up regularly on eBay, as do the ribbons. Low-use DMP-200s and 120s are quite sought after. I rate the LP8 printer a 4 out of 5, and the DMP-200/120 a 5 out of 5.

Whenever I need to print from a TRS-80, my DMP-200 is the one I reach for and it never lets me down. My pick of the three is the DMP-200 and because they come in two paint schemes they nicely match any TRS-80 you wish to connect it to.

NEXT TIME:
TRS-80 Daisy Wheel Printers:
DW-II, DWP-410, DWP-210

Ian Mavric

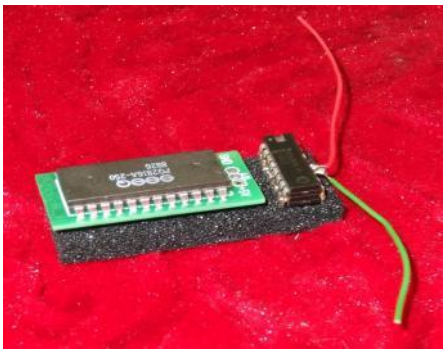
ianm@trs-80.com

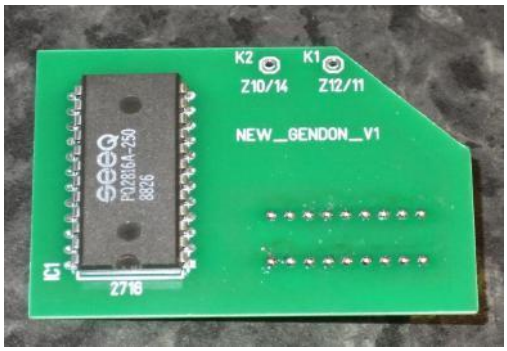


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Single line descenders



3-line descenders



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And he's in Melbourne



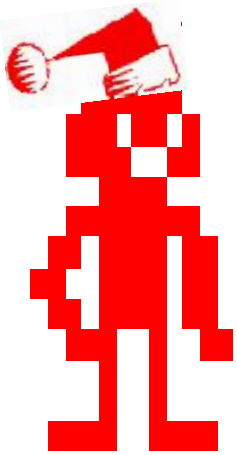




http://members.iinet.net.au/~ianmav/trs80/

TRS8BIT

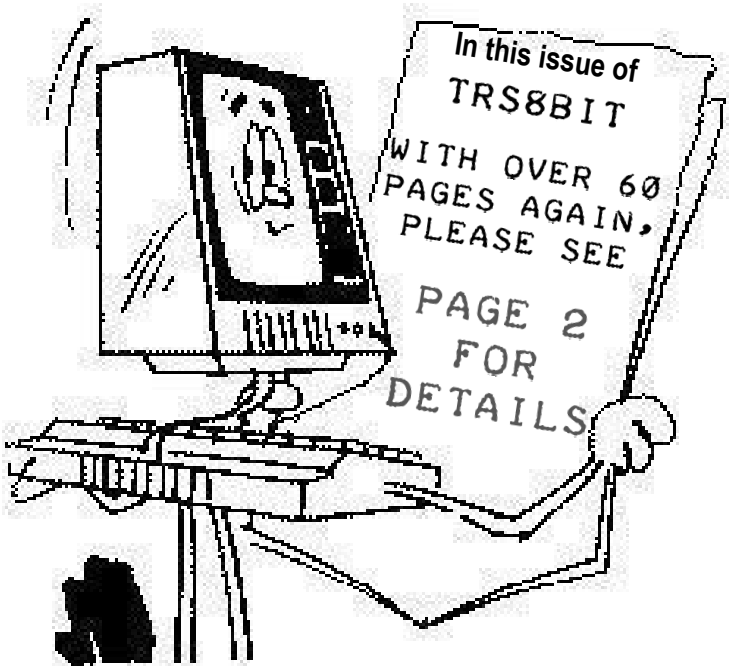
PRODUCED AT TRS-80.ORG.UK



HI EVERYONE AND WELCOME TO THE 2018 CHRISTMAS EDITION. FIRST OFF, THOUGH, DEE AND I WISH YOU ALL A VERY MERRY CHRISTMAS AND A HAPPY NEW YEAR. THANKS ALSO FOR YOUR SUPPORT THROUGHOUT ALL OF 2017. NOT FORGETTING A SPECIAL 'BIG' THANK YOU TO MAV, E.T AND, OF COURSE, EVERYONE ELSE WHO HAVE KEPT UP THE SUPPLY OF ARTICLES FOR US ALL TO ENJOY.

¯_(ツ)_/¯

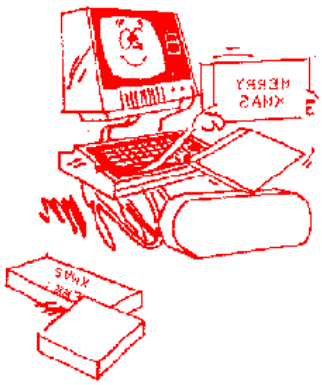
THANKS TO EVERYONE WHO GAVE THEIR TIME, EFFORT AND SUPPORT, MY WONDERFUL M2 IS UP AND RUNNING, JUST LIKE NEW. I'M HOPING TO HAVE A 'GOOD PLAY' WITH IT OVER THE XMAS BREAK. WELL, THAT'S THE PLAN ANYWAY! HOWEVER, NOW THAT GEORGE AND PETER'S M2 EMULATOR IS UP, RUNNING AND WORKING SO WELL, I ASSUME THAT THE 'REAL' COMPUTER WILL BE USED FOR 'SUNDAY BEST' SO TO SPEAK, JUST LIKE MY M1 AND GENERALLY, PLAYING ABOUT WILL BE DONE ON THE EMULATOR. I'M ALSO HOPING TO PURCHASE ONE OF MAV'S DOM CARD ADD-ONS TOO.



I HOPE, LIKE ME, YOU MANAGE TO KEEP TRACK OF THE TOPICS ON THE TRS-80 FORUM. THERE HAS BEEN SOME VERY INTERESTING BITS, RECENTLY. I PARTICULARLY LIKED THE ONE ABOUT THE DIFFERENT VERSION OF THE M1 AND I'VE JUST NOTICED THAT GAZZA HAS BEEN SENT SOME COPIES OF THE "STRINGY FLOPPY NEWSLETTER". I DON'T THINK THERE WAS A SIMILAR PUBLICATION FOR THE ACULAB FLOPPY TAPE, IN THE U.K. BUT IT MAKES FOR INTERESTING READING NEVERTHELESS. IF, BY CHANCE, YOU COME ACROSS ANY BITS OF INFORMATION REGARDING THE ACULAB, PLEASE LET ME KNOW. I WONDER IF THE FLOPPY TAPE WOULD WORK WITH GEORGE AND PETER PHILLIP'S M1 EMULATOR? NOW THERE'S AN EXCITING THOUGHT!

PETER CETINSKI MUST BE VERY BUSY AT THE MOMENT, PRODUCING, EDITING AND DOWNLOADING, TO YOUTUBE, VIDEOS OF THE 2018 TANDY ASSEMBLY. IT LOOKS TO HAVE BEEN QUITE A FANTASTIC WEEKEND, I'M ONLY SORRY THAT I COULDN'T MAKE IT MYSELF. MAV HAS SENT IN A REVIEW FOR US ALL TO SEE, WHICH IS ON PAGE 7 OF THE NEWSLETTER.

(CONTINUED ON PAGE 8)



CONTENTS

PAGE Ø3 TRS-IMAGE
KYLE WADSTEN
KYLE SHOW US HOW HE CREATED HIS 2Ø18 COMPETITION WINNING ENTRY

PAGE Ø7 TRAVELLING MAV
IAN MAVRIC
MAV HAS SENT IN A REVIEW OF THE TA 2Ø18, FOR THE REST OF US WHO WERE UNABLE TO ATTEND

PAGE 16 CHRISTMAS WISHES FROM DEE AND MYSELF
WITH A STRONG NEW ZEALAND FLAVOUR!

PAGE 18 IN MAV'S WORKSHOP
MAV DETAILS THE CHANGES TO THE UPGRADED M1 POWER SUPPLY

PAGE 24 OBIT. PAUL ALLEN

PAGE 27 PICK 2
E.T. FONEHUME
ET SENDS US A CHRISTMAS PRESENT WHICH IS AVAILABLE FROM THE DOWNLOADS PAGE TO AVOID ALL THAT TEDIOUS TYPING.

PAGE 29 THE WAY WE WERE
A LOOK-BACK AT THE NEWS 'FROM THE DAY'

PAGE 39 FOR SALE AND WANTED ITEMS

PAGE 42 'THE GREAT SNAIL RACE'.
E.T. FONEHUME
ET WONDERS IF THIS ONE-LINER IS A FIRST FOR A M2

PAGE 47 EBAY REVIEW

PAGE 49 IN MAV'S WORKSHOP
IAN MAVRIC
MAV CHECKS-OUT TANDY'S DAISY WHEEL PRINTERS

PAGE 59 'FLOWER POWER'
GEORGE PHILLIPS
GEORGE SENDS US A BASIC PROGRAM INSPIRED BY AN ARTICLE ON NUMBERPHILE

PAGE 6Ø IN MAV'S WORKSHOP
IAN MAVRIC
HERE'S A TASTE OF WHAT MAV HAS UNDER DEVELOPMENT FOR US IN 2Ø19

PAGE 66 SOFTWARE REVIEW
'TBA' - THE BASIC ANSWER

TRS Image

Kyle Wadsten

TRS Image was created as part of my entry into the TRS8BIT 2018 Competition: HI-RES-LO.

My initial exposure to the TRS80 was in 1980 when my brother bought a Model I. I knew immediately that this was to be my future. And so it was. I have been a professional programmer for 30 years (recently retired). My passion for computers and programming has remained strong ever since that Model I.

A few years back I acquired a Model 4 and more recently, a 4P. Having actual hardware is a little more work (and space) than using an emulator but provides for a much better experience.

TRS Image will convert a modern image (jpg, png, etc.) into a BASIC program that will re-create the image on a TRS80. TRS Image is written in Python and runs on a Mac or PC (and possibly Linux/Unix).

With TRS Image you can zoom, pan, and adjust the contrast of an image while it shows in real-time how this image will look on a TRS80. Once you are satisfied with your adjustments, a quick press of the "G" (Generate) key will output a TRS80 BASIC program as a text file.

After the BASIC program is generated you need to transfer it to an actual (or emulated) TRS80. I use Matthew Reed's TRS32 emulator and TRS Tools utility to simplify this process.

Regardless of how you get the BASIC program onto a TRS80 you can then RUN it. The first time you run the program it will build "packed strings" from the DATA statements before displaying the image.

After the program runs the first time it will delete the DATA statements and logic used to build the packed strings*. This leaves a much smaller program behind. Instructions are displayed describing how to re-save the BASIC program back to diskette in order to run faster and save disk space (7.5K vs. 3K).

Running this smaller program significantly speeds up the image display (as you might expect) because it doesn't have to rebuild the packed strings before displaying the image.

The current version of TRS Image targets a Model III with LDOS 5.3.1 and MISOSYS LBASIC. I plan on adding the ability to support different versions of BASIC and TRS80 models in a future update.

I have uploaded the python source code and setup instructions for TRS Image to GitHub (https://github.com/kwadsten/trs-image)

Kyle Wadsten (kwadsten@comcast.net)

*String Packing in TRS80 Basic

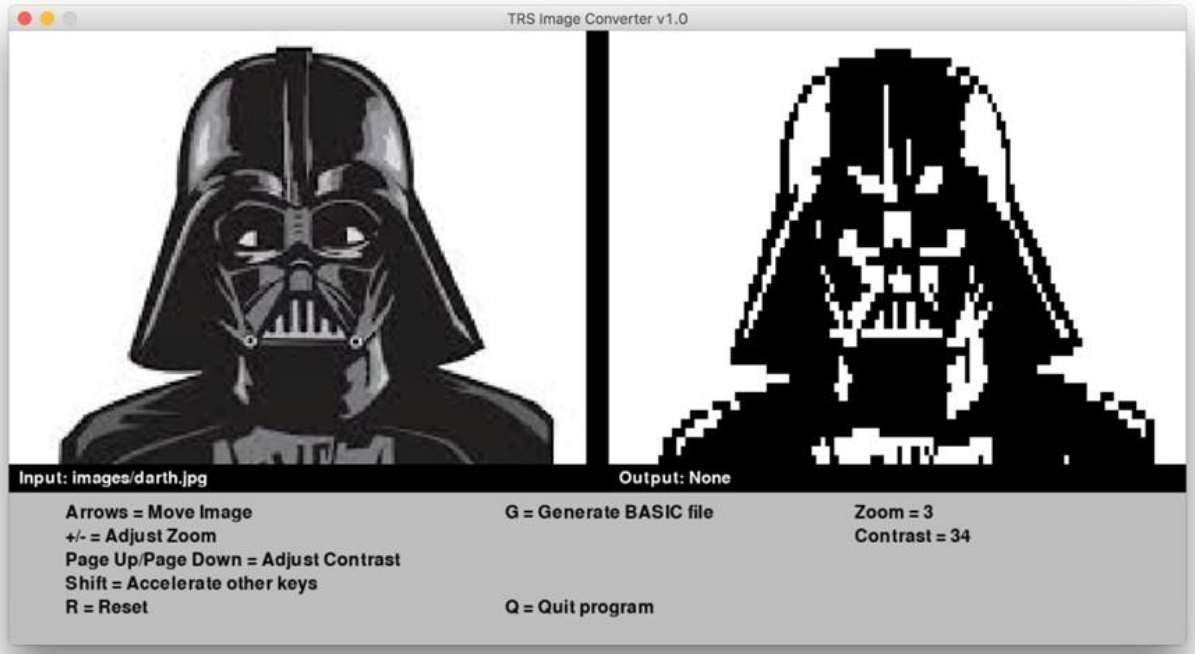
One method of drawing images in BASIC on the TRS80 is to use SET/RESET to plot each pixel in the 128x46 screen area. As you might expect, this is extremely slow.

However, the TRS80 character set also contains a set of graphic characters that allow you to plot a 2x3 matrix of pixels at once. These special characters have values between 128-191. The binary representation of these characters are a 8 bit value with the high-order bits set to 10: "10xxxxxx". The remaining bits represent the 2x3 matrix of pixels in reverse order. 0 = off, 1 = on. For example to set the top two pixels of the character to white you would use an ASCII value of 10000011 (131 in decimal, 0x83). Printing this to the screen in basic would be a simple: PRINT (or PRINT@) CHR$(131).

```
# TRS80 String Packing
#
# 2x3 "text semigraphics"
#
# b0 b1
# b2 b3
# b4 b5
#
# 1 0 b5 b4 b3 b2 b1 b0 = character value
#
# 0 = off (black)
# 1 = on (white)
#
```

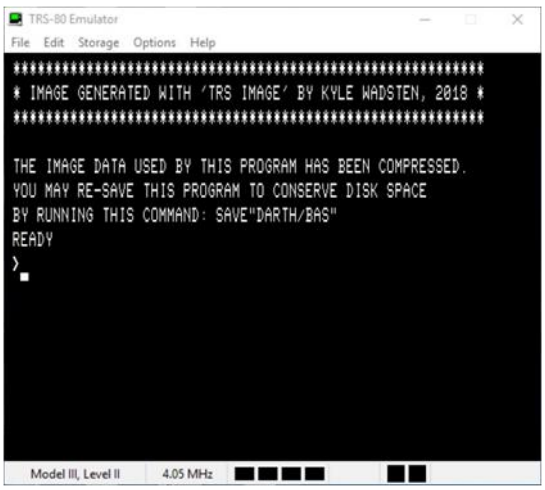
See http://www.trs-80.com/wordpress/zaps-patches-pokes-tips/graphics/ for more information.

There are some screen shots on the next page.


TRS Image Converter v1.0
Input: images/darth.jpg
Output: None
Arrows = Move Image
+/- = Adjust Zoom
Page Up/Page Down = Adjust Contrast
Shift = Accelerate other keys
R = Reset
G = Generate BASIC file
Q = Quit program
Zoom = 3
Contrast = 34


TRS-80 Emulator
File Edit Storage Options Help
2018 HI-RES-LO COMPETITION
LOADING DARTH... (20%)
Model III, Level II
4.05 MHz


TRS-80 Emulator
File Edit Storage Options Help
Model III, Level II
2.02 MHz


TRS-80 Emulator
File Edit Storage Options Help
IMAGE GENERATED WITH 'TRS IMAGE' BY KYLE WADSTEN, 2018
THE IMAGE DATA USED BY THIS PROGRAM HAS BEEN COMPRESSED.
YOU MAY RE-SAVE THIS PROGRAM TO CONSERVE DISK SPACE
BY RUNNING THIS COMMAND: SAVE"DARTH/BAS"
READY
Model III, Level II
4.05 MHz

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TRAVELLING MAV:

TA18: Tandy Assembly 2018

- My visit to Springfield, Ohio -

by Ian Mavric

Introduction: After the success of the first Tandy Assembly in October 2017 the organisers were keen to have another event a year later in 2018. Plans were put in place again for October in 2018, but a clerical mistake at the hotel/conference rooms set that back to November. A nicer place was chosen this time, the Marriott Courtyard Hotel at Springfield, Ohio. I planned to make the trek again, this time my son Jordy joined me, and that would be his first trip to the USA, and in fact his first trip outside of Australia.

November 2018: United Airlines did a good job last year so again I chose to fly with United which followed the now familiar route from Melbourne to Los Angeles, then Los Angeles to Chicago. The third leg this time took me to Dayton International Airport which was around 25 min from Springfield. With my flight arriving around 5:50pm I met up again with George Phillips who was this time travelling with his brother Peter, and headed to the Marriott. We unpacked and went downstairs to the bistro where we met up with another Tandy Assembly attendee Eric Dittman. We all were tired so had a light dinner and called it a night.

Friday 9th November: With a whole day to kill a group of us comprising of George, Peter, Eric, Jay Newirth, Jordy and myself headed out the USAF Museum at Dayton Ohio. It's free entry and enormous. It's not just war planes which is what comes to mind when I think of the USAF, but also presidential planes, rockets and space shuttle museums, as well as planes collected from enemies at the time like the Japanese, Germans and Russians. Jordy was particularly taken by the presidential planes and took this photo of JFK's Boeing 707:



Photo: The original Air Force One VC-137C SAM 26000, a customised 1962 Boeing 707

(CONTINUED FROM PAGE 1)

AND TALKING ABOUT THE NEWSLETTER, ONCE AGAIN, I THINK WE'VE PRODUCED QUITE A SPECTACULAR ISSUE, WHICH I HOPE YOU WILL ALL ENJOY OVER THE CHRISTMAS PERIOD. MAV HAS DONE US PROUD AGAIN, NOT JUST WITH HIS T.A. 2018 REVIEW BUT WITH A VERY INFORMATIVE ARTICLE REVIEWING THE TANDY DAISY WHEEL PRINTERS. HE ALSO REVIEWS THE UPGRADES TO THE M1 POWER SUPPLY AND SETS OUT, IN DETAIL, SOME OF THE DEVELOPMENTS BOTH HE AND KYLE WADSTEN ARE WORKING ON FOR NEXT YEAR.
E.T. FONEHUME AND GEORGE PHILLIPS HAVE SENT IN SOME ORIGINAL (AND FUN) BASIC PROGRAMS, *(WHICH ARE AVAILABLE FROM THE DOWNLOADS PAGE ED.)*.
THERE'S A FOR SALE/WANTED PAGE AND THE USUAL REVIEW OF THE U.K.'S EBAY SALES.
ALSO, I CAME ACROSS A REVIEW OF THE 'TBA - THE BASIC ANSWER' FROM 1983. HAS ANYONE USED THE SOFTWARE? I SEE IT'S FOR A M4 AND LDOS USERS ONLY.
WELL, I THINK THAT ABOUT WRAPS UP THIS ISSUE.
SO, HAVE A WONDERFUL CHRISTMAS AND A BRILLIANT NEW YEAR, EVERYONE OF YOU.
SO, UNTIL MARCH



TAKE CARE - DUSTY





Photos: A couple of photos I took of Jordy at the NASA part of the USAF Museum

After spending a few hours at the museum we headed out to Hooters for late lunch. It was one of Jordy's bucket-list items for this trip and I was glad we went... the food was nice and well priced, and the waitresses friendly. By the time we got back to the Marriott the room was open so all of us set up our Tandy Assembly stands which was completed by about 6pm, when the free dinner was delivered for stallholders. Jordy went upstairs to refresh at 5pm and I didn't see him again that night... jetlag has finally caught up with him.

Saturday 10th November: Day 1 was the busiest and longest of the two days. We start out at 9am when the public comes and I get to meet the numerous people who had bought things from me over the year and were keen to meet me. It's always great to put faces to names and everyone seemed to be eager to tell me how their system is going and how the item or items they'd bought from me got their hitherto non-working system back up and running.

Speakers: No sooner had I gotten into my stride when the first of the speakers, and keynote speaker, Stewart Cheifet talked about his ground-breaking TV show Computer Chronicles. As an early adopter and enthusiast he also talked about his vintage computer collection which naturally started out when he bought a Model I in 1978. At 1pm Arthur Gleckler gave an interesting talk about his game Weerd which he wrote for the Model I and sold through Big 5. It was a good talk because while it could have been overly technical, Arthur gave a great overview of the state of the gaming world at the time which was far more entertaining that in otherwise could have been. As an interesting side note Arthur did all his work on a cassette-based 16K Model I, so seeing present-day enhancements like the FreHD load his very large program in a matter of seconds really blew his mind.

At 2:30pm Arno Puder and Sascha Haeberling gave a great talk about their little project called a RetroStore card. It's a very interesting and inexpensive way to achieve its goal and I'm looking into it further to produce some of the cards if the demand for them is there. The final speaker for the day was Mike Yetsko, a former engineer from Radio Shack during the TRS-80 years, and he had many interesting stories and anecdotes from his time at the Tandy Towers. By the time you read this article, most, if not all presentations should be available for viewing on YouTube.

Auction and Trivia Contest: Like last years event, some fun is added to the Tandy Assembly in the form of an auction and then a Tandy trivia contest. It's amazing the weird and rare items up for auction, this year included a DT-1 dumb terminal, a working daisy wheel printer, no less than five Coco 2s, and the usual boxes of software, magazines, catalogs and manuals. Some of the weirder items were the IBM Aptiva system from 1995 complete with Windows 95, and the packet of Arnott's Tim Tam biscuits which I supplied - they'd accompanied me all the way from Australia. Fearing it would be a struggle to get anything large home I only bought a Coco disk controller and some old computer magazines.

A lot was riding on the trivia contest for me. Long time readers would recall that I won the competition last year and this year I was back to defend my title. This year I was up against Mike Yetsko and after a little encouragement, Ruud Broers joined in as well. It looked like I was going to have my work cut our for me as Mike is very cluey, having worked in engineering at Tandy. The first five questions were quickly answered by Mike and it felt like we would really have a competition going on here. However, after a little while I got into my stride and eventually won. Ruud even contributed with a couple of answers so I was glad everyone got at least a couple of points.

People sometimes ask me how I know so much and while admittedly I have a good memory for these systems, everything I know about them comes from Radio Shack Computer Catalogs and TRS-80 related magazines, which is to say there is no advantage I have over anyone else who has studied a favourite subject.
Malcolm Gladwell famously stated that it takes 10,000 hours to become world-class in any field, and the TA Trivia Contest win is the result.



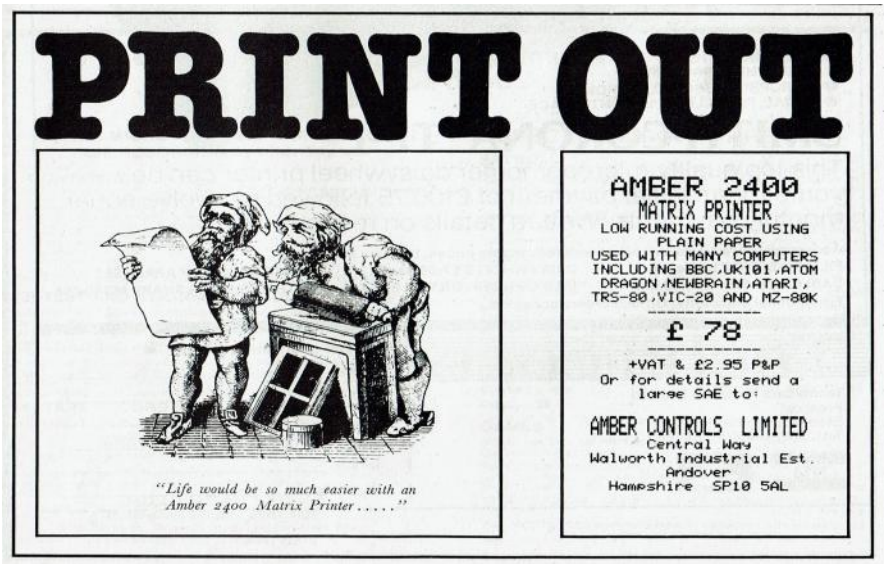
Photo: me, Mike Yetsko, Ruud Broers at the trivia contest

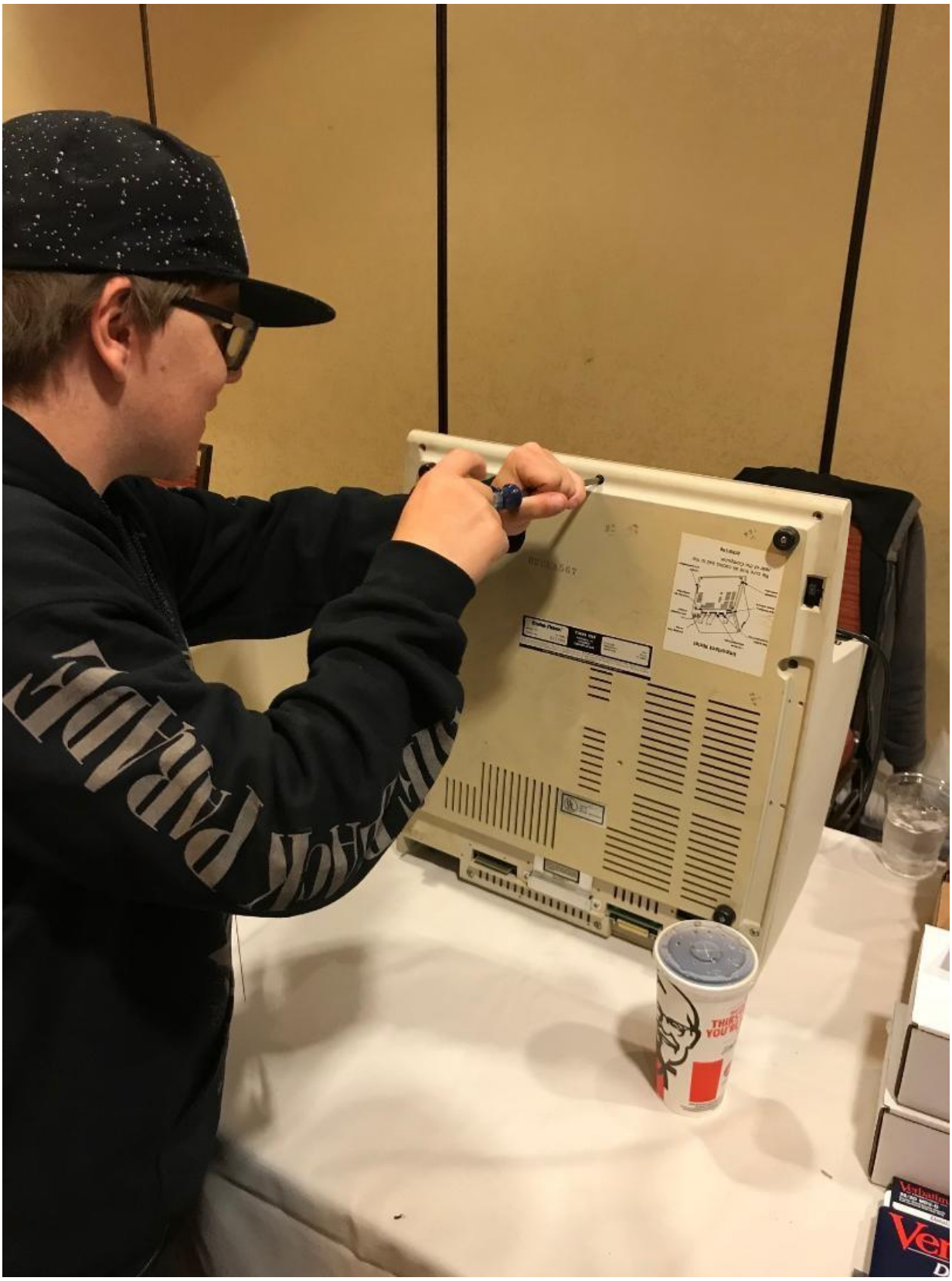
Sunday 11th November: The second day of TA is usually busier for me than Saturday because while lots of people introduce themselves and ask me things on the first day, on the Sunday they come back with questions they forgot the previous day. A lot also complete purchases having had the night to convince themselves, or run it by their minister for war and finance and get the green light.



Photo: Jay and I never had less than three people wanting to talk to us - it was great!

Jordy was getting into the show by now as well, helping out other vendors where he could, in particular helping Jay to upgrade a Model 4, overleaf is a photo of him putting the old girl back together:





Speakers: On Sunday we have the last of the speakers, at 10am Thomas McLaren did a talk about the ill-fated Tandy 600 laptop computer. I found the talk really enjoyable and shows the high calibre of the speakers when the enthusiasm for the machine by the speaker more than makes up for what I thought would be a little dull topic (Tandy 600 - not a machine I know or cared much about). Thanks Thomas it was really good. The last speaker for the show was Jim McGinley who had in recent years presented two ground breaking lectures about TRS-80 games at large GDC (Game Developer Community) events. It was great to see him in person presenting highlights of his lectures.

Monday 12th November: Last year I booked a very early flight out of Columbus at 9:30am and I was keen to allow myself more time so this year my flight out of Dayton was at 11:50am, allowing us (George, Peter, Jordy and myself) to have a normal breakfast and spend an hour packing our bags. An extended brunch at Wendy's restaurant before heading off the to airport. Like my flights to Tandy Assembly there was no airline delays and by 10pm (California time) we were on the 787 Dreamliner back to Australia. Jordy had already told most of my friends at TA he was keen to go again to TA-19 so has started making plans and saving already.

Notable mentions: I know I'm going to miss out on a few people here and I'm sorry if I forgot to mention you but where are some of the people who took time to talk with me, buy me lunch or dinner, drinks, and bought some of my items I was selling, which made my trip to the USA so successful:

Eric Dittman - loaned me his Model 12, bought us dinner Thursday night
Peter Cetinski - loaned me his Model I, bought me dinner Day 1
Randall Kindig - loaned me his Model 4P
Jay Newirth - was set up alongside me, by all accounts had a successful TA, minded my table while I was away
Bill Bright - came from Kentucky and donated to me a CCR-81 cassette player
George Phillips - transit to and from Dayton to Springfield and back which saved me a small fortune
Ruud Broers - visitor from The Netherlands made the long journey from Europe

Again, sorry if I missed anyone out.



Photo: me and Jay Newirth at TA18 (photo courtesy of J. Newirth)

TA19: Working on the assumption that TA18 was a great success I'm preparing to do it all again next year, for the even bigger and better TA19. Keep your eyes on this publication for news on the Tandy Assembly 2019 as it comes to hand.

Ian Mavric

ianm@trs-80.com



Ian Mavric is an IT Specialist who also restores and collects TRS-80's and classic cars. He live with his wife and kids in Melbourne, Australia.



DEE & I WISH YOU ALL A VERY MERRY CHRISTMAS AND A TRULY HAPPY NEW YEAR.

NOW I KNOW WHAT YOU'RE THINKING, IT WOULDN'T BE A PROPER CHRISTMAS WITHOUT THE USUAL CHRISTMAS CARD FROM US BOTH. AFTER ALL, IT IS A TRADITION EH!

SO, HAVING HAD AN AMERICAN EAGLE AND AN AUSTRALIAN KOALA, THIS YEAR, FOR ALL YOU TRS8BIT FANS OUT THERE, WE HAVE THE ORIGINAL 'SANTA KIWI' GIVING A REAL NEW ZEALAND FLAVOUR TO THE FESTIVITIES.

THANKS FOR ALL YOUR SUPPORT OVER THE YEAR

PS - DON'T FORGET TO SQUINT (ED.)

```
                    RRYXMASMERRY
                  ASMERRYXMASMERRYXMAS
          MASMERRYXMASMERRYXMASMERRYXMASM
         XMASMERRYXMASMERRYXMASMERRYXMASMER
       YXMASMERRYXMASMERRYXMASMERRYXMASMER
       YXMASMERRYXMASMERRYXMASMERRYXMASMER
       YXMASMERRYXMASMERRYXMASMERRYXMASMER
     RYXMASM    XMASMERRYXMASMERRYXMASMER
   RRY           MASMERRYXMASMERRYXMASMER
  ER               MERRYXMASMERRYXMASMER
ME                     XMASMERRYXMASM
ME                      MAS  RRYXM
M                       MA    RYX
                      RRYXMA   RRY
                           ASMERRYX
```

```
10 REM XMAS1204/BAS
20 CLEAR500
30
M$="MERRYXMASMERRYXMASMERRYXMASMERRYXMASMERRYXMASMERR
YXMASMERRYXMASMERRYXMAS"
40 GOSUB 220
50 READ S
60 IF S=0 GOSUB 160
70 READ L
80 T$=MID$(M$,S,L)
90     X=PEEK(VARPTR(P$)+1)+PEEK(VARPTR(P$)+2)*256
100 REM THIS AND THE NEXT LINE ARE NOT NEEDED ON 16K
SYSTEMS
110     IF X>32767 THEN X=X-65536
120         FOR Y=1TOL
130         POKE X+S+Y,ASC(MID$(T$,Y,1))
140         NEXT Y
150 GOTO 50
160 LPRINT P$
170 GOSUB220
180 READ S
190 IFS=0THENLPRINTP$:READS
200 IF S=99 THEN END
210 RETURN
220 P$=STRING$(81,32)
230 RETURN
240
996 DATA
21,12,0,17,20,0,7,31,0,6,34,0,5,35,0,5,35,0,5,35,0
997 DATA
4,7,15,25,0,3,3,16,24,0,2,2,19,21,0,1,2,24,14,0
998 DATA
1,2,25,3,30,5,0,1,1,25,2,31,3,0,21,6,30,3,0,26,8,0
999 DATA 99
```

SYDTRUG NEWS
Newsletter of Sydtrug Inc.
Sydney TRS-80/MS-DOS Users' Group
C/- Peter Wignell PO Box 95 NARWEE NSW 2209
AUSTRALIA
Website : www.sydtrug.org

IN MAV'S WORKSHOP

Words: Ian Mavric
Design: Dean Bear; updated by David Mutimer

MODEL I POWER SUPPLY 2018 UPDATE

AN UPDATE ON A WINNER

Back in the September 2013 issue of TRS8Bit I presented an article for a power supply unit (PSU) for the Model I computer. Without going into too much detail, there seemed to be the need for a replacement PSU for the Model I which met the following requirements: it needed to have enough power for both the Model I and an Expansion Interface, and it had to be small enough to fit inside the Expansion Interface. Old mate Dean Bear came up with a simple design which could be made out of off-the-shelf components. I built one and it has been in use non-stop since 2013 in my Model I system. Based around toroid transformers it generates low heat and low noise as compared to original TRS-80 PSUs, making it ideal to install into the Expansion Interface.

David Mutimer from Melbourne needed a power supply for his Model I and turned up references to Dean's PSU via Google search, which eventually led him to me. Originally Dean's PSU boards were home-etched via ferric chloride method, but David thought a more modern approach was needed and so set about updating and re-designing the PSU for 2018.





Photos: Original design (2013) M1 Power Supply.

PCB DESIGN

Printed circuit board (PCB) manufacture has changed a lot in the last 40 years. These days most first world countries have companies in place to make PCBs. 40 years ago the designs were laid out using tape and marker on clear film - a time consuming process - which was then subjected to a photo resist process to result in a finished PCB.

While the second half of the process has been relatively unchanged, the first part of the process has benefited from modernisation, so people now design and lay out the PCB on their PC using any of a number of CAD packages with names such as Altium, Eagle, and KiCad. Making a change is as easy as editing a word document. Changing the shape or layout of your PCB is no more difficult that photo shopping a jpeg. Once you are happy you email your design files (called Gerber files) to a PCB manufacturer, pay for the job and a week later your PCBs arrive.

This is exactly what David did. By using the schematic diagram, one of the original home etched PCBs, and 35+ years of accumulated electronics knowledge, David designed a PCB which paid homage to Dean's original design, and improved it to fit inside the Expansion Interface.

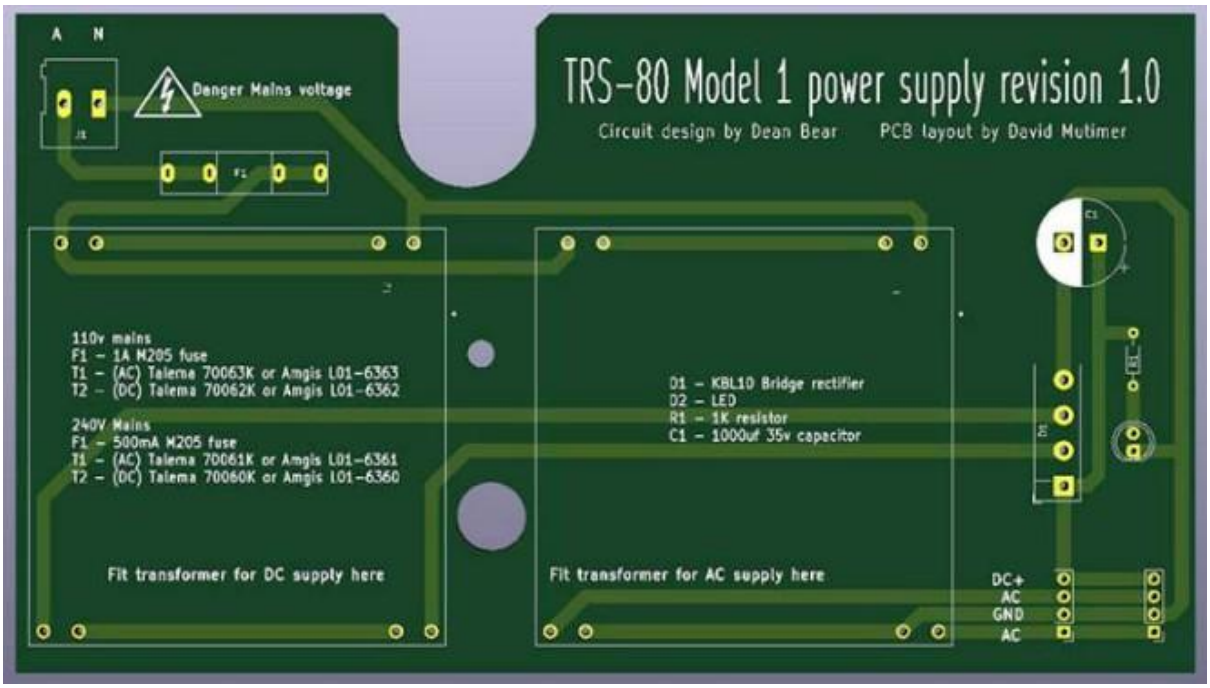


Photo: David's revised Model I power supply 1.0

IMPROVEMENTS

Yes, there are a couple. The number of fuses has been cut in half from two to one. The bridge rectifier has been changed for one which is slimmer in design and also cheaper and easier to find than the original, and the toroid transformers specified are less expensive than the previous Altronics PowerTran units. (The Altronics units are now over $A50.00ea but the specified ones from Talema or Amgis can often be found online for less than $A40.00ea.) Finally, the BOM is silk-screened right onto the PCB. Just remember not to mount your transformers before buying and installing everything else.



Photo: Component placement on Model I PSU

INSTALLATION

These design is geared toward users who want to install the PSU in an Expansion Interface. As

previously mentioned the PSUs supplied with the Model I and Expansion Interface in Australia are oversized 240V units which do not fit inside the EI, making for a very messy setup.

Conversely, in the USA the small 120V PSUs supplied to owners generate considerable heat which can impact the performance of your Model I system so many people remove them from the EI for that reason. David's design solves this problem in both countries.

In the base of the EI is a black plastic tray designed to hold the two original US 120V PSUs. It's held in by one screw, so just undo that and remove the plastic tray, and install the new PSU like so:



Photo: PSU installed in the Expansion Interface

A single screw holds the PSU in place, and it's sturdy enough for moving your EI around your computer lab or to the cupboard if you pack the computer away while it's not in use.

NOTE FOR SHIPPING YOUR EXPANSION INTERFACE

As with the original PSUs, this one should be removed from the EI if you are packing and shipping it anywhere, as rough handling is likely to dislodge the PSU and break the plastic of the EI. The same would also happen if you left the original PSUs in place... I have had a few damaged in transit because the PSUs flopped around inside while the EI was in transit to me. Play it safe, remove your PSU before shipping and wrap it in lots of bubble-wrap for shipping.

CONCLUSION

As the supply (pardon the pun) of original TRS-80 Power Supplies dries up and a replacement becomes necessary, the Dean Bear PSU updated by David Mutimer becomes a viable solution. Built with quality components this PSU will likely be the last you ever have to buy for your TRS-80 Model I.

Ian Mavric

ianm@trs-80.com

CO-FOUNDER OF MICROSOFT, PAUL ALLEN, DIES.



PAUL G. ALLEN, THE CO-FOUNDER OF MICROSOFT WHO HELPED USHER IN THE PERSONAL COMPUTING REVOLUTION AND THEN CHANNELLED HIS ENORMOUS FORTUNE INTO TRANSFORMING SEATTLE INTO A CULTURAL DESTINATION, DIED IN SEATTLE. HE WAS ONLY 65.

PAUL ALLEN WAS A FORCE AT MICROSOFT DURING ITS FIRST SEVEN YEARS, ALONG WITH ITS CO-FOUNDER, BILL GATES, AS THE PERSONAL COMPUTER WAS MOVING FROM A HOBBYIST CURIOSITY TO A MAINSTREAM TECHNOLOGY, USED BY BOTH BUSINESSES AND CONSUMERS.

PAUL ALLEN'S PARTNERSHIP WITH BILL GATES BEGAN WHEN THEY WERE TEENAGERS ATTENDING THE PRIVATE LAKESIDE SCHOOL IN SEATTLE. IT WAS THERE THAT THEY GOT THEIR START IN COMPUTING, WORKING FROM A SCHOOL TELETYPE TERMINAL THAT WAS LINKED TO A FAR-AWAY MAINFRAME COMPUTER UNDER A SO-CALLED TIME-SHARING COMPUTER SYSTEM, IN WHICH OPERATORS PAID FOR THE COMPUTING TIME THEY USED. FUNDS FOR THE SYSTEM WERE ORIGINALLY SUPPLIED BY PROCEEDS FROM A SCHOOL BAKE SALE.

WHEN COMMEMORATING MICROSOFT'S 40TH ANNIVERSARY, PAUL POSTED ON TWITTER A BIT OF THE CODE FROM THE COMPANY'S FIRST SOFTWARE PRODUCT. AT THE TOP, IT READ, "COPYRIGHT 1975 BY BILL GATES AND PAUL ALLEN."

"IT'S WEIRD TO LOOK AT BITS OF CODE YOU WROTE 40 YEARS AGO AND THINK, 'THAT LED TO WHERE MICROSOFT IS TODAY,' BILL SAID AT THE TIME. IT WAS REPORTED THAT HE SOUNDED GENUINELY AMAZED.

Continuing our tradition of more computer for less money

THE NEW TRS-80™ SURPRISE

Meet Model II — not an update but a whole new ballgame!

Designed and built by **Radio Shack®**



While the legendary, best selling TRS-80 (Model I) continues, we've added a bigger, more powerful brother — the TRS-80 Model II — to answer your needs for more data storage, greater versatility, and higher computing speed, all at the lower cost you've learned to expect from Radio Shack.

There are fine business computers from Digital, Hewlett-Packard, IBM and others priced in the low five figures, but TRS-80 Model II — without sacrificing quality — brings you five-figure computing power at a four-figure price!

Manage a five to ten-thousand item inventory, prepare a payroll for hundreds, get timely and accurate management reports, and perform countless other tasks at twice the speed of TRS-80 Model I. Yet Model II won't fence you in or become obsolete. Like its little brother, it expands easily to meet growing needs.

TRS-80 Model II highlights

- **Fast and powerful**
- **Systems grow with your needs**
- **Easy to operate**
- **Affordable**

George and Peter Phillips have release trs80gp version 2.0.4.

It features
* **Model II emulation** (and Model I, III and 4 as previously) *
* Hires graphics support *
* Floppy and Cassette emulation *
* Copy/Paste *
* Software Keyboard *
* Automatic keyboard input *
* Turbo Mode *
* Source-level debugging and many other programming features *

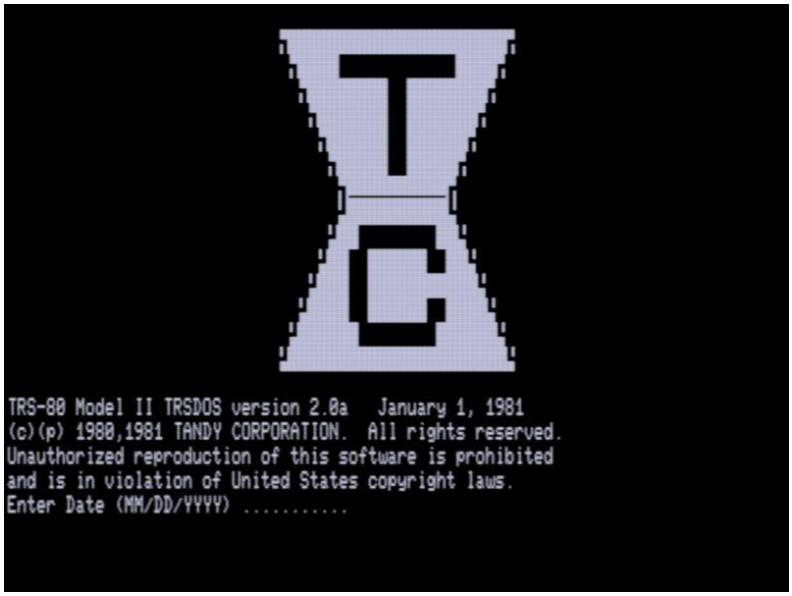
It runs on Windows 10, 8, 7 and maybe even XP and Vista. Runs well under Wine on Mac and Linux.

Learn more and get it at http://48k.ca/trs80gp.html

George has also updated his Z-80 cross assembler zmac and executable conversion utility trld. They both now feature .wav audio file output that can be loaded onto a real TRS-80. 250, 500, 1000 and 1500 baud are all supported.

zmac has a new import statement that is like include but only brings in each file once. There are -o, --oo, --xo and --od options to choose a particular output format. Common blocks can be put in .rel files for the Z-80 FORTRAN programmers out there. And finally there's a new .mds output format that can be fed to the MAME debugger giving an easy way to load Z-80 programs into MAME.

They can be found here:
http://48k.ca/zmac.html
http://48k.ca/trld.html





HI DUSTY,
I THOUGHT I'D SEND EVERYONE AN XMAS PRESENT. JUST FOR A CHANGE, IT'S NOT A ONE-LINER, OR EVEN TWO COME TO THAT!
THE IDEA IS TO TRY AND PICK 2 IDENTICAL NUMBERS WHEN YOU ONLY HAVE A LIMITED NUMBER OF TIME TO SEE EXACTLY WHERE THEY ARE HIDDEN. INITIALLY, YOU SEE THE FIRST LINE WITH NUMBERS AND LETTERS, THEN IT CHANGES TO '?'S. JUST KEEP ENTERING LETTERS TO MATCH THE NUMBER ABOVE IT, TRYING TO REMEMBER JUST WHERE YOU'VE SEEN IT. TO REDUCE THE NUMBER OF CHOICES, JUST EDIT THE VARIABLE N1 IN LINE 20 TO A SMALLER NUMBER.

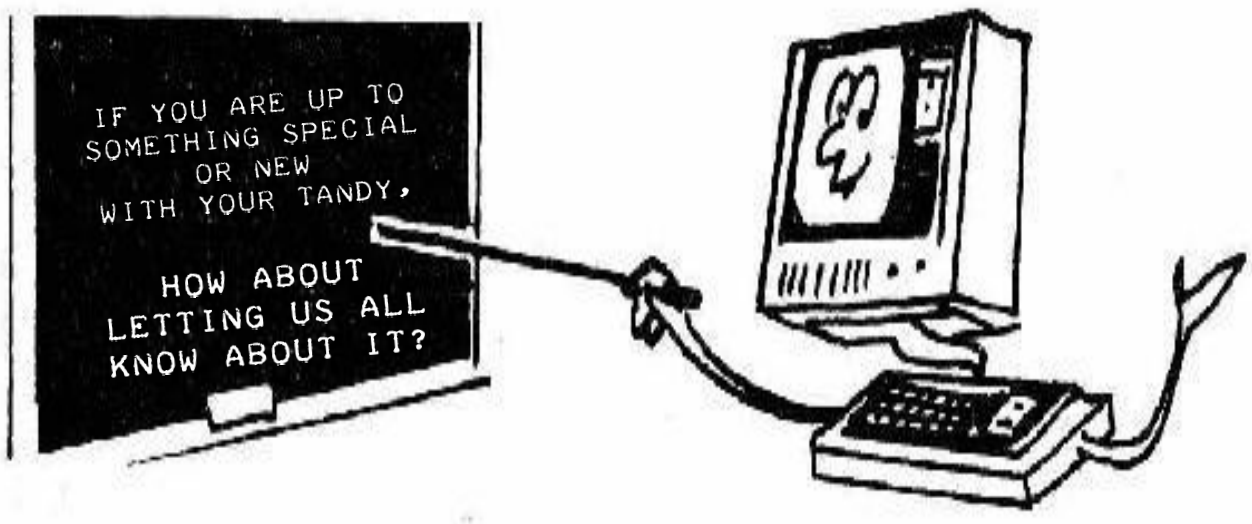
(IF YOU GET STUCK - TYPE A '' WHEN ASKED FOR THE FIRST NUMBER AND HAVE ANOTHER PREVIEW, BUT DON'T TELL EVERYONE ED.!)*

```
ENTER A LETTER TO REVEAL YOUR 1ST CHOICE ?

 9  1  3  9  6  8  8  1  1  1  9  1  8  1  1  8  6  1  3  9
 A  B  C  D  E  F  G  H  I  J  K  L  M  N  O  P  Q  R  S  T

 ?  ?  ?  ?  ?  ?  ?  ?  ?  ?  ?  ?  ?  ?  ?  ?  ?  ?  ?  ?
 A  B  C  D  E  F  G  H  I  J  K  L  M  N  O  P  Q  R  S  T
```

```
00 REM PICKTWO/BAS
10 CLS:RANDOM:CLEAR500:CL$=CHR$(30)
20 N1=10:N2=N1+N1:DIMA(N2):DIMB(N1):C$="  ":Q1$="  ?"
30 FORX=1TON1:Y=RND(10)-1:A(X)=Y:A(X+N1)=Y:NEXT
40 FORX=1TON1:B(X)=A(X):A(X)=-1:NEXT
50 FORX=1TON1
60 Y=RND(N1):IFA(Y)=-1THENA(Y)=B(X)ELSE60
70 NEXT
80 FORX=1TON2:A$=A$+" "+STR$(A(X)):NEXT
90 FORX=65TO65+(N2-1):C$=C$+CHR$(X)+"  ":NEXTX
100 FORX=1TON2:Q$=Q1$+Q$:NEXT
110 REM MAIN ROUTINE
120 PRINT@192,"HERE IS A LIST OF NUMBERS TO REMEMBER":PRINTCL$
130 GOSUB330:GOSUB270:GOSUB300
140 PRINT@192,CL$;:INPUT"ENTER A LETTER TO REVEAL YOUR 1ST CHOICE ";T1$
150 IFT1$="*"GOSUB270:GOSUB300
160 IF ASC(T1$)<65 OR ASC(T1$)>64+N2 THEN 140
170 T1=(ASC(T1$)-64)*3
180 MID$(Q$,T1,1)=MID$(A$,T1,1)
190 GOSUB300
200 PRINT@192,CL$;:INPUT"USING A LETTER, CAN YOU MATCH THE NUMBER";T2$
210 IF ASC(T2$)<65 OR ASC(T2$)>64+N2 THEN 200
220 T2=(ASC(T2$)-64)*3
230 MID$(Q$,T2,1)=MID$(A$,T2,1)
240 GOSUB300
250 IFMID$(Q$,T1,1)=MID$(Q$,T2,1) GOSUB360 ELSE GOSUB420
260 GOTO140
270 REM DISPLAY NUMBERS FOR 10 SECONDS
280 PRINT@448,A$;:FORX=1TO1500:NEXT
290 RETURN
300 REM DISPLAY ?'S
310 PRINT@448,"";:PRINTQ$;
320 RETURN
330 REM DISPLAY LETTERS
340 PRINT@512,"";:PRINTC$;
350 RETURN
360 REM 2 CORRECT NUMBERS FOUND
370 PRINT@192,CL$;"WELL DONE! 2 IDENTICAL NUMBERS FOUND"
380 FORX=1TO1500:NEXT
390 CA=CA+2
400 IFCA=N2THENPRINT@192,CL$;"W E L L  D O N E  ALL NUMBERS FOUND":END
410 RETURN
420 REM NON-MATCHING PAIRS
430 PRINT@192,CL$;"NO, SORRY THE NUMBERS ARE DIFFERENT"
440 FORX=1TO1500:NEXT
450 MID$(Q$,T1,1)="?":MID$(Q$,T2,1)="?":GOSUB300
460 RETURN
```



HANDS-OFF KEYBOARD INPUT



For TRS-80 Model I, Level II or DOS

Phil Pilgrim
Discovery Bay Software Co.
Port Townsend, Washington

The 16th in a series.

Sometimes I wonder if I should retitle this column, "Fancy Things You Can Do with the TRS-80 Keyboard." You'd think everything has been said on that subject by now, though. But consider the fact that almost everything that the TRS-80 does results from something that someone, somewhere, typed in on a keyboard. In that light, a keyboard interface can have a universal and far-reaching effect. So if none of you are tired of keyboard routines, I'm not either. And here is yet another one.

The impetus for this routine (PRKEY, for Model I only) is the fact that you can do nearly anything from the keyboard, but not from a Basic program. A Basic program, for example, can't modify itself. (Not that that's always such a good idea, but there are times it would be nice.) PRKEY removes those limitations by allowing you to PRINT things you would otherwise type in by hand, and to interpret the printed material as keyboard input. You could, for example, print a series of DATA statements whose values depend on computational results. When the program terminates and user input is expected, these DATA statements will be entered into the program. (See Example 1.) This can be handy for setting up arrays for functions like SIN and COS which take a while to compute. You could also use PRKEY in conjunction with the INPUT statement to prompt the user with the default value of an input variable. He could backspace and change it or hit ENTER to accept it. (Example 2).

PRKEY works with the display and keyboard drivers and uses a circular (wraparound) buffer. Characters printed following a CHR$(1) and terminated with either a CHR$(0), a carriage return, or a computer request for keyboard input, are entered into the buffer and not displayed. Subsequent calls to the keyboard cause these characters to be removed one at a time from the buffer and returned, until the buffer is empty or until the BREAK key is struck. To the computer, it looks as if the characters were entered from the keyboard. There is one restriction, however. The routine only works for line input, that is, input prompted by the X, ?, etc. It was not designed for use with INKEY$. The reason is that some method must be used to tell whether the computer really wants a character or whether it's just looking for a BREAK or SHIFT@. Unfortunately, the keyboard driver is called for both purposes (in my mind a shocking oversight on the part of the Level II authors). With unrestricted use, BREAK key checking alone could empty the buffer completely.

By limiting use to line input, a hook in Level II RAM can be used to flag a legitimate keyboard call. This hook is at address 41AF and contains either a RET or a JP into DOS. It is called just before the computer requests a line of input. By putting a JP here to some code in PRKEY, we can set a flag saying it's okay to send characters out of the buffer. At the next carriage return, this flag is reset.

PRKEY is divided into four main sections: 1) The START block, which does the linking, 2) PRINT which directs printed output to either the screen or the keyboard buffer, 3) KEYBUF, which flags imminent line input, and 4) KEYBD, which transmits characters from either the buffer or the keyboard.

To use PRKEY, key it as shown into EDTASM, make an object tape or file, and load it via SYSTEM or from disk. (Don't forget to set memory size equal to your origin.) Execute the START block, and you're ready to go. PRKEY is a program that invites experimenting. Just be sure to use an expendable disk, though, because you might PRINT a command you don't want and won't be fast enough to stop.

```
7E45            00090           ORG     07E45H          ;OR 0BE45H OR 0FE45H
7E45 2A1640     00100 START     LD      HL,(4016H)      ;LINK IN KEYBOARD
7E48 22DB7E     00110           LD      (REGKEY+1),HL   ;       .
7E4B 21B37E     00120           LD      HL,KEYBD        ;       .
7E4E 221640     00130           LD      (4016H),HL      ;       .
7E51 2A1E40     00140           LD      HL,(401EH)      ;LINK IN DISPLAY
7E54 22A27E     00150           LD      (OLDPR+1),HL    ;       .
7E57 21777E     00160           LD      HL,PRINT        ;       .
7E5A 221E40     00170           LD      (401EH),HL      ;       .
7E5D 3AAF41     00180           LD      A,(41AFH)       ;XFER BUFF'D INPUT HOOK
7E60 32B07E     00190           LD      (KLINK),A       ;       .
7E63 2AB041     00200           LD      HL,(41B0H)      ;       .
7E66 22B17E     00210           LD      (KLINK+1),HL    ;       .
7E69 3EC3       00220           LD      A,0C3H          ;REPLACE W/ JP KEYBUF
7E6B 32AF41     00230           LD      (41AFH),A       ;       .
7E6E 21A87E     00240           LD      HL,KEYBUF       ;       .
7E71 22B041     00250           LD      (41B0H),HL      ;       .
7E74 C3CC06     00260           JP      06CCH           ;OR JP 402DH FOR DOS
7E77 3AF97E     00270 PRINT     LD      A,(MODE)        ;GOES IN BUFFER?
7E7A B7         00280           OR      A               ;       .
7E7B 2821       00290           JR      Z,REGPR         ;  NO: DISPLAY
7E7D 79         00300           LD      A,C             ;  YES: ALL DONE?
7E7E B7         00310           OR      A               ;       .
7E7F 2823       00320           JR      Z,NEWMD         ;  YES: RESET MODE
7E81 2AFD7E     00330           LD      HL,(BUFPP)      ;  NO:  GET BUFFER PTR
7E84 71         00340           LD      (HL),C          ;PUT CHAR IN BUFFER
7E85 E5         00350           PUSH    HL              ;SAVE OLD PTR
7E86 CDEF7E     00360           CALL    INCHL           ;INC PTR
7E89 22FD7E     00362           LD      (BUFPP),HL      ;AND SAVE
7E8C ED5BFB7E   00370           LD      DE,(BUFPI)      ;GET KEYBD PTR
7E90 DF         00380           RST     18H             ;BUFPP=BUFPI?
7E91 E1         00390           POP     HL              ;(RESTORE OLD BUFPP)
7E92 2003       00400           JR      NZ,HLOK         ;  NO: BUFFER NOT FULL
7E94 22FD7E     00410           LD      (BUFPP),HL      ;  YES: FULL; RESAVE OLD BUFPP
7E97 79         00420 HLOK      LD      A,C             ;A CARRIAGE RETURN?
7E98 FE0D       00422           CP      13              ;       .
7E9A C0         00424           RET     NZ              ;  NO: STILL BUFFERING
7E9B AF         00426           XOR     A               ;  YES: DONE BUFFERING
7E9C 1806       00428           JR      NEWMD           ;       .
7E9E 79         00430 REGPR     LD      A,C             ;START BUFFERING?
7E9F FE01       00440           CP      1               ;       .
7EA1 C20000     00450 OLDPR     JP      NZ,$-$          ;  NO: JUST DISPLAY
7EA4 32F97E     00460 NEWMD     LD      (MODE),A        ;  YES: SET MODE
7EA7 C9         00470           RET                     ;       AND THAT'S ALL
7EA8 AF         00480 KEYBUF    XOR     A               ;TERMINATE BUFFERING
7EA9 32F97E     00490           LD      (MODE),A        ;       .
7EAC 3C         00500           INC     A               ;FLAG BUFFERED INPUT
7EAD 32FA7E     00510           LD      (KMODE),A       ;       .
7EB0 C9         00520 KLINK     RET                     ;AND RETURN
0002            00530           DEFS    2               ;ROOM FOR ADDR IF RET IS JP
7EB3 3AFA7E     00540 KEYBD     LD      A,(KMODE)       ;BUFFERED INPUT?
7EB6 B7         00550           OR      A               ;       .
7EB7 2821       00560           JR      Z,REGKEY        ;  NO: CALL FROM SOMEWHERE ELSE
7EB9 2AFB7E     00570           LD      HL,(BUFPI)      ;GET INPUT PTR
7EBC ED5BFD7E   00580           LD      DE,(BUFPP)      ;AND PRINT PTR
```

```
7EC0 DF       00590          RST     18H             ;ARE THEY THE SAME?
7EC1 280A     00600          JR      Z,EMPTY         ;  YES: BUFFER IS EMPTY
7EC3 4E       00610          LD      C,(HL)          ;  NO: GET NEXT CHAR
7EC4 CDEF7E   00620          CALL    INCHL           ;INC PTR
7EC7 22FB7E   00622          LD      (BUFPI),HL      ;AND SAVE
7ECA 79       00630          LD      A,C             ;GET CHAR IN A
7ECB 1803     00640          JR      CRCHEK          ;CHECK FOR CARRIAGE RET
7ECD CDDA7E   00650 EMPTY    CALL    REGKEY          ;CALL KEYBOARD
7ED0 FE0D     00660 CRCHEK   CP      13              ;A CR?
7ED2 C0       00670          RET     NZ              ;  NO: NORMAL RETURN
7ED3 4F       00680          LD      C,A             ;  YES: SAVE IT
7ED4 AF       00690          XOR     A               ;END OF BUFFERED INPUT
7ED5 32FA7E   00700          LD      (KMODE),A       ;       .
7ED8 79       00710          LD      A,C             ;GET CR BACK
7ED9 C9       00720          RET                     ;AND RETURN
7EDA CD0000   00730 REGKEY   CALL    $-$             ;CALL KEYBOARD
7EDD FE01     00740          CP      1               ;BREAK KEY HIT?
7EDF C0       00750          RET     NZ              ;  NO: OKAY
7EE0 2AFB7E   00760          LD      HL,(BUFPI)      ;  YES: EMPTY BUFFER
7EE3 22FD7E   00770          LD      (BUFPP),HL      ;       .
7EE6 AF       00780          XOR     A               ;TERMINATE BUFFERED INPUT
7EE7 32F97E   00790          LD      (MODE),A        ;       .
7EEA 32FA7E   00800          LD      (KMODE),A       ;       .
7EED 3C       00810          INC     A               ;GET BREAK BACK
7EEE C9       00820          RET                     ;AND RETURN
7EEF 23       00830 INCHL    INC     HL              ;INCREMENT POINTER
7EF0 11FF7F   00840          LD      DE,BUFEND       ;PAST END OF BUFFER?
7EF3 DF       00850          RST     18H             ;       .
7EF4 C0       00860          RET     NZ              ;  NO: OKAY
7EF5 21FF7E   00870          LD      HL,BUFFER       ;  YES: LOOP BACK TO START
7EF8 C9       00880          RET                     ;AND RETURN
7EF9 00       00882 MODE     DEFB    0               ;DISPLAY MODE
7EFA 00       00884 KMODE    DEFB    0               ;INPUT MODE
7EFB FF7E     00890 BUFPI    DEFW    BUFFER          ;INPUT BUFFER PTR
7EFD FF7E     00900 BUFPP    DEFW    BUFFER          ;DISPLAY BUFFER PTR
0100          00910 BUFFER   DEFS    256             ;BUFFER (ANY SIZE OKAY)
7FFF          00920 BUFEND   EQU     $               ;END OF BUFFER
7E45          00930          END     START           ;AUTOSTARTS @ START
00000 TOTAL ERRORS
```

```
BUFEND 7FFF 00920   00840
BUFFER 7EFF 00910   00870 00890 00900
BUFPI  7EFB 00890   00370 00570 00622 00760
BUFPP  7EFD 00900   00330 00362 00410 00580 00770
CRCHEK 7ED0 00660   00640
EMPTY  7ECD 00650   00600
HLOK   7E97 00420   00400
INCHL  7EEF 00830   00360 00620
KEYBD  7EB3 00540   00120
KEYBUF 7EA8 00480   00240
KLINK  7EB0 00520   00190 00210
KMODE  7EFA 00884   00510 00540 00700 00800
MODE   7EF9 00882   00270 00460 00490 00790
NEWMD  7EA4 00460   00320 00428
```

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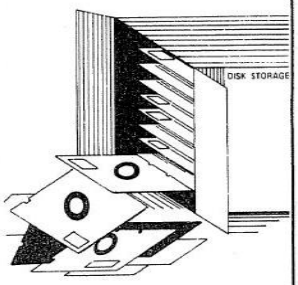
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Circle 42


```
OLDPR   7EA1  00450    00150
PRINT   7E77  00270    00160
REGKEY  7EDA  00730    00110  00560  00650
REGPR   7E9E  00430    00290
START   7E45  00100    00930
```

```
10 PRINT CHR$(1);"100 DATA";
20 FOR I=0 TO 15
30 PRINT SIN(I*6.2831854/16);",";
40 NEXT
50 PRINT CHR$(8):REM THIS BACKSPACE
   REMOVES THE LAST COMMA.
```

Example 1

How to create a 16-value DATA statement from a Basic Program.

```
.
.
.
250 PRINT CHR$(1);A;CHR$(0)
260 INPUT "WHAT IS THE AMOUNT";A
.
.
.
```

Example 2

A section of code in which the current value of A is assumed as input unless the user backspaces over it and types something else.

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FILESHEET 3 Z80

WHEN the Z80 8 bit NMOS device was introduced by Zilog in 1977 it immediately set the microprocessor world buzzing because it offered so many powerful new features in such an easy to use package. When I first read the specification of the chip early in the launch year I remember thinking "The Z80 is great, but Zilog won't be able to manufacture and sell it at a reasonable price for years!" I was wrong. By the end of 1977 the Z80 was a practical reality and sales were starting to take off like a sky-rocket.

There was plenty for everyone to get excited about, because the Z80 was designed from the outset to be bigger and better than anything else but especially the Intel 8080A which was the market leader at that time. The Zilog Corporation was actually founded on the Z80 project by a group of ex-Intel engineers who *knew* they could produce a super-micro if *only* someone would let them. Intel wouldn't, perhaps because of their 8080A sales success and their own rather tame 8085A plans, and so Zilog and the Z80 were born.

To guarantee their fledgling a good start, they decided that it had to be compatible with the 8080A to gain a ready acceptance by those who had already become 8080A orientated, and to ensure success they decided that the Z80 would have to be able to do everything that anyone could wish from an 8 bit device. It had to run from a single 5V supply (like the 6800), it had to use only one chip for the CPU group (as opposed to three and two for the 8080A and 6800 respectively), it had to be faster than its competitors, offer sophisticated, mini-computer style I/O and interrupts, and above all it had to have a large instruction set with facilities for indexed addressing, relative jumps, bit manipulation, 4 bit nibble manipulation, extended 16 bit arithmetic, and "macro" instructions for the manipulation of whole blocks of data. A recipe which made the new chip equally at home in data processing or controller applications and with a competitive edge which left the opposition standing!

Despite this blockbuster approach to excellence, the Z80 did have its critics almost from the beginning, especially those who thought that the price paid for 8080A compatibility was too high, and that a fresh architecture and instruction set which was less complicated and "messy" would have been better. With the benefit of hindsight it is probably correct to say that its 8080A compatibility won the Z80 a bigger following than a new architecture might have done, but it is also certainly true that many designers have thrown up their hands in despair at some of the more illogical idiosyncrasies resulting from that compatibility! For my part, I consider the Z80 much easier to use and to program when its ancestry is properly understood, and for this reason all readers are urged to study the 8080A/8085A Microfile article before attempting to come to grips with the mighty Z80!

Since 1977 the Z80 has remained virtually unchallenged as king of the 8 bit chips except for a creditable (but late) contender from Motorola in the shape of their classy 6809. Of course there are many more powerful 16 bit devices on the market today, but the Z80 is by no means obsolete since it will have a large price advantage over these newer chips for the foreseeable future. Even when the Z80 *does* become a geriatric micro, it seems that some of its idiosyncrasies will live on. Zilog have recently announced the compatible Z800, launched *after* their all new Z8000 "16 bitter" which is not itself Z80 compatible this new entry is aimed at correcting the swing away from Zilog caused by that omission. The Z800 will execute Z80 code while offering extra goodies such as an on-chip multiply/divide unit and lots of extra 16 bit facilities and Zilog hope that it will woo Z80 users into the Zilog 16 bit fold!

Also interesting is the NSC 800 from National which will be covered later in this series. The NSC 800 is a new CMOS low power device which executes Z80 code on the *inside* and yet looks like an 8085 (with a multiplexed bus) on the *outside*.

REGISTERS

The Z80 has the most complete set of registers of any 8 bit microprocessor and an instruction set which makes very good use of them. All the traditional 8080A registers are available, in fact there are *two* complete sets of data registers AF, BC, DE and HL and two instructions EX and EXX which allow the programmer to switch between the two banks. EX switches between AF and AF' and EXX switches between BC, DE, HL, and BC', DE', HL'. This facility is especially useful during interrupt routines since it allows the registers used by the main program to be saved by simply switching to the alternate bank, avoiding the usual chore of pushing the registers onto the stack to prevent their contents being destroyed by the interrupt routine. Very rapid response to interrupts is therefore possible, and this is important in real-time controller applications.

The Z80 has a single 16 bit Program Counter (PC) and a single 16 bit Stack Pointer (SP) and these are identical to their 8080 counterparts in all respects. There are however, four important new registers in the Z80 set which cannot be accessed by traditional 8080 instructions, and these are responsible for some of the more advanced features of Z80 operation.

You may remember that I criticised the 8080A/8085A for having no Index registers, and the 6800/6802 for having only one. Well the Z80 puts this right by having two full 16 bit Index registers IX and IY, making all the data processing fans deliriously happy, and making the task of compiler and interpreter writers much easier. Like the 6800 Index Register, the Z80 IX and IY are used as memory pointers with the special feature that the Register Indirect instructions which utilise them have a facility for specifying a one byte offset value providing easy access to tables of data stored in memory.

The two remaining Z80 registers have special significance and are not generally found in other microprocessors. The I register forms an important part of the special Z80 Mode 3 interrupt mechanism which is described later, and is used to hold the eight most significant bits of the Pointer to the interrupt vector table. During an interrupt the interrupting device provides the lower bits which when combined with the I register form a unique memory address for that particular device. Stored at that address will be the interrupt vector, or in other words the start address of the related interrupt routine. Normally the I register is set up by the programmer as part of the initialisation routine.

The R register is basically a seven bit counter used as a refresh address for Dynamic RAM memory. With other microprocessors special external hardware is used to carry out DRAM refresh, but the Z80 does the job itself by generating a refresh control signal and sending the contents of the R register out on the lower half of the address bus while the CPU is busy decoding and executing a previously fetched instruction. This technique saves external hardware and does not interfere with normal processor activity since it only uses the bus when it would otherwise be idle.

INSTRUCTION SET

If you already have a working familiarity with the 8080A instruction set then you are half way to knowing the Z80. *Only* half way though, because there are two snags: The Z80 has 158 instructions to the 78 of the 8080A, and even those instructions which are shared have had their names changed at the mnemonic level.

Perhaps the most important change of title concerns the data movement instructions which have various names (MOV, LXI, STAX, SHLD, MVI, LDAX, LDA, STA) on the 8080A, but which all form part of the load group using the LD mnemonic on the Z80. With the Z80 it is the source and destination parameters given

Z80 REFERENCE FILE SHEET

GENERAL

The Z80 was developed by a splinter group of Intel designers who saw the opportunity of developing a 'Super 8080'. Despite having many powerful new instructions and using different mnemonics, the Z80 is compatible with the 8080A and 8085A at the object code level, allowing existing 8080 software such as the CP/M operating system to run without modification. The Z80 has been enormously popular for both controller and data processing applications thanks to the useful blend of 8080 compatibility and a set of powerful new features such as extra registers, automatic refresh for dynamic RAMs, 5V single chip operation, and an enhanced instruction set.

REGISTERS

The Z80 has two banks of 8 general purpose 8bit registers although only one bank may be accessed without a bank switch instruction. In addition to the usual stack pointer and program counter the Z80 has two 16bit index registers and the dedicated I and R regs.

A	F	A'	F'
B	C	B'	C'
D	E	D'	E'
H	L	H'	L'

ALTERNATE REGISTER SET

INTERRUPT VECTOR I	MEMORY REFRESH R
INDEX REGISTER IX	
INDEX REGISTER IY	
STACK POINTER SP	
PROGRAM COUNTER PC	

NOTES:
1) EXX instruction used to switch between banks. Especially useful for fast interrupt context switch.
2) I register points to interrupt vector page in main memory
3) R register is counter for 16K DRAM refresh.

FLAGS:

D7	D6	D5	D4	D3	D2	D1	D0
SIGN	ZERO		AUX CARRY		PARITY & OVERFLOW	SUBTRACT	CARRY

INSTRUCTION SET AND SOFTWARE

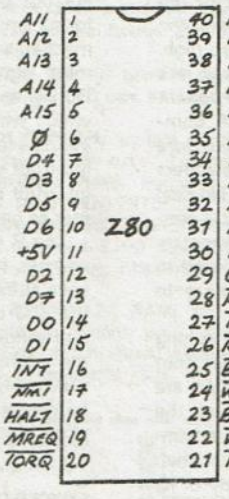
Zilog have taken advantage of the 12 unused opcodes in the 8080A instruction set to add many new instructions to the Z80 set. Some of these spare codes are used directly, others are used as windows to extra opcode tables each of which provide 256 extra opcode possibilities. This technique makes it necessary to use two opcode bytes instead of one and results in the use of one, two, three and four byte instructions whereas most 8 bit devices have only one, two, or three byte types. The Z80 has 158 different instruction types compared with 78 for the 8080A and has many new capabilities, such as relative jumps, bit set, reset and test, nibble shiffs and block transfer and search. Because of its ancestry the Z80 instruction set is rather messy and more difficult to learn than that of say, the 6809 its main rival. It will execute 8080 object code and therefore has access to the CP/M operating system.

PERFORMANCE DATA

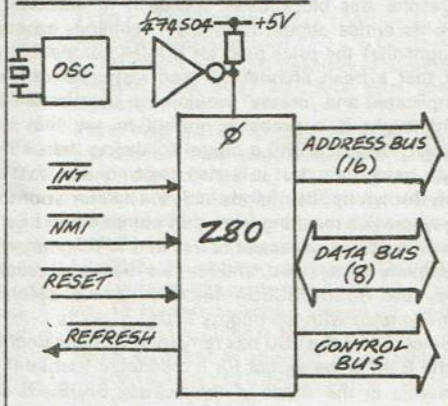
	Z80
MEMORY ADDRESS RANGE	64K
I/O ADDRESS RANGE	256
CLOCK FREQUENCY *	2.5MHz
POWER SUPPLIES	+5V
INTERRUPTS (3 MODES)	INT NMI

*NOTE: 4MHz VERSION (Z80A) ALSO AVAILABLE

BENCHMARKS	Z80
ADD REGISTER TO ACCUM	1·6μs
OUTPUT ACCUM TO PORT	4·8μs
MOVE FROM MEMORY TO MEMORY	6·4μs



BASIC Z80 CPU CIRCUIT



NOTE: Clock circuit simplified for clarity.

MANUFACTURERS

ORIGINATOR — ZILOG

2ND. SOURCE — MOSTEK, NEC, SHARP, SGS.

SUPPORT CHIPS

Z80 needs an external clock generator (Shottky T.T.L.) and has a family of powerful peripheral chips with built-in interrupt controllers as follows:- Z80 PIO (parallel ports), Z80 CTC (timers), Z80 DMA (direct memory access controller) and Z80 SIO (dual USART)

after the LD mnemonic which specify just *what* is to be moved to *where,* a feature which makes life easier for the programmer but more difficult for those who have to write assemblers! The LD group has also been greatly extended by new instructions which provide access to the additional registers and new operations which use the existing 8080A style registers.

Apart from the LD group, there are several other groups which provide powerful new facilities which 8080A users could only dream of. Some of these new instructions plug directly into vacant spaces in the 8080A opcode byte table which of course provides 256 possibilities of which the 8080A uses only 242. Eight of these unused positions are filled with the six new relative jump instructions plus the two register bank exchange instructions already mentioned, but the remaining four opcodes are used to gain access to *all* the other new Z80 instructions by acting as "trap-door" exits to four additional 256 entry opcode tables. This is the only way in which an 8 bit processor can increase the range of opcodes available but of course it does mean that all the instructions in these new tables need a two byte, rather than a single byte, opcode.

The trapdoor provided by the CB(Hex) opcode is used to gain access to a table giving 248 new instructions which provide individual bit set, test, and reset, functions and an extended set of shift and rotate instructions which confers the ability to shift or rotate data in any general purpose register or any memory location.

The DDH and FDH trapdoor opcodes provide access to tables containing the many new instructions which act on, or use, the two Index registers IX and IY, and the EDH opcode invokes a table which accommodates all the miscellaneous instructions which do not logically belong in the other three. Whereas the first three tables mentioned contained variations on a simple theme, the table prefixed by the EDH opcode byte contains an interesting assortment of new features which would, by themselves, considerably boost the power of the 8080A had Intel seen fit to include them! In this table we find, for example, instructions to extend the 16 bit register arithmetic capability, to provide control of the enhanced Z80 interrupt technique, to allow the right and left rotation of BCD numbers in memory with the accumulator, and the powerful new feature of macro instructions which will operate repetitively on whole *blocks* of data.

To go with the extended instruction set of the Z80 there is an extended set of addressing modes, with Zilog claiming ten to Intel's four. All is not what it appears, however, since most manufacturers seem to have their own ideas (and names!) for what constitutes an addressing mode, with seven of the ten claimed by Zilog actually available on the 8080A anyway! The three real additions, are, however, very useful.

Zilog have corrected the omission by Intel of the Relative addressing mode. You may remember from the 6800 (which does have it) that this mode is used exclusively with jump instructions to move backwards and forwards in memory *relative* to the current program counter value, as distinct from direct or absolute jump instructions which must be provided with the address of a specific destination location in memory. The main advantage of the relative jump is that it uses only two bytes (Opcode + displacement) as opposed to the three bytes (Opcode + 2 byte address) required for an absolute jump, although it does also make possible the creation of small program segments which will execute *wherever* they are placed in memory. Like the 6800 the Z80 has a relative jump range of +127 to −129 locations.

Also available, thanks to the new index registers IX and IY, is Indexed Addressing which uses the registers as pointers to which a single byte offset is added to form an address. Once again this facility corrects an 8080A defect not shared by the 6800.

Finally, the Z80 offers the Bit Addressing mode, which, in combination with one of the other addressing modes, is used with the bit set, test, and reset instructions to act on a particular bit in any general purpose register or memory location. This facility is particularly useful in controller applications where a single byte can be used to provide eight separate "flag" bits to indicate status.

SOFTWARE

The Z80 has become extremely popular and is used in many well known microcomputers. Notable among these are the NASCOM, The ZX80 and 81, the TRS80, the Video Genie, the Sharp MZ80K, and the Superbrain. Since the Z80 uses a super-set of the 8080A opcodes it can utilise nearly all existing 8080A code including of course, the ubiquitous CP/M disc operating system. Despite the attraction of access to the vast range of CP/M compatible software there is the annoying limitation that CP/M does not take full advantage of the extended Z80 instruction set and this has prompted many microcomputer manufacturers to develop their own disc operating systems using all the new Z80 features to increase the speed and capability of their systems. Zilog themselves have a powerful DOS called RIO which is used on their own development systems, and the popular TRS80 has, in addition to the Tandy TRSDOS, other operating systems such as NEWDOS, NEWDOS +, and LDOS, all of which vie with each other to provide bigger and better features. For "home-brew" systems without discs there have been a number of books published which include stand-alone software in the form of Monitors, Editors and Assemblers. One which I can recommend is "Practical Microcomputer Programming: The Z80" by W. J. Weller.

INTERFACING

As you may expect with a powerful chip like the Z80 there is quite a lot to learn about interfacing it to the outside world, more, in fact, than I can hope to cover in detail here. Those planning a "homebrew" system should obtain one of the many useful books written about the Z80 which provide more detail than the rather skimpy Zilog technical manual.

Anyone contemplating the direct substitution of a Z80 for an 8080A to increase performance will be rather put off at first by the pin-out differences between the two chips. Not only are the pin assignments themselves quite different, but so too are the names and functions of several of the control lines. For this reason it is necessary to carefully consider and understand the relationships between the two processors before a substitution is attempted. For example, the 8080A in combination with the necessary 8228 system controller chip generates four lines to control bus transactions, namely $\overline{\text{MEMR}}$, $\overline{\text{MEMW}}$, $\overline{\text{I/OR}}$ and $\overline{\text{I/OW}}$ the functions of which are self explanatory. The Z80 also uses four lines, but in its case the names are $\overline{\text{RD}}$, $\overline{\text{WR}}$, $\overline{\text{IOREQ}}$, and $\overline{\text{MREQ}}$, which are also self explanatory but *different* to those of the 8080A. Once these differences are appreciated it is quite easy to generate the 8080A equivalents by simple gating. The 8080A $\overline{\text{MEMR}}$ can be obtained by ANDing together $\overline{\text{RD}}$ and $\overline{\text{MREQ}}$ and the other signals can be generated in a similar fashion.

One aspect of the Z80 which needs careful attention is the clock input Ø. In my original data sheet Zilog make the naughty claim that this single phase TTL level clock "requires only a 330 ohm pull-up resistor to +5 Volts to meet all clock requirements." Unfortunately, this simple expedient of adding a pull-up resistor to a TTL clock oscillator cannot be guaranteed at the higher clock frequencies. What you have to do in practice is to use a Shottkey TTL driver such as 1/6 of a 74SO4 to which you add a *pnp* transistor, three resistors and a capacitor. This may explain why many Z80 users (e.g. Tandy with their TRS80) do not run their processors at the data-sheet maximum of 2.5MHz. It also dilutes somewhat the Zilog claim that the Z80 provided the first one-chip processor group, since a 74S package and several discretes must take up at least as much room as the special clock generators used by the 8080A and the 6800!

Another couple of problems which were not at first acknowledged by the manufacturers concern the operation of the processor with dynamic RAM. If the contents of DRAM memory must survive a Z80 RESET, then a hardware "fix" consisting of several TTL packages and assorted discretes must be added. Also, correct operation with DRAMs cannot be guaranteed anyway unless the upper four bits of the Z80 address bus are latched externally in a 74LS75 or similar register to prevent random data loss. It seems that there is no escape from the second problem, even though it may not occur in all systems, but the best approach to the first problem is to avoid the use of RESET except at power-on time and to use the NMI interrupt for all warm-starts when memory data must be conserved. Don't let these DRAM problems put you off the Z80 too much though, since the remedies are fairly painless, and in all other respects the Z80 is an ideal processor for DRAM systems thanks to its on-board refresh system.

One of the neatest innovations provided by the Z80 is a really powerful and versatile interrupt structure which has three separate

Z80
INSTRUCTION SET SUMMARY

8-BIT LOADS

Mnemonic	Symbolic Operation	Comments
LD r, s	r ← s	s ≡ r, n, (HL), (IX+e), (IY+e)
LD d, r	d ← r	d ≡ (HL), r (IX+e), (IY+e)
LD d, n	d ← n	d ≡ (HL), (IX+e), (IY+e)
LD A, s	A ← s	s ≡ (BC), (DE), (nn), I, R
LD d, A	d ← A	d ≡ (BC), (DE), (nn), I, R

16-BIT LOADS

Mnemonic	Symbolic Operation	Comments
LD dd, nn	dd ← nn	dd ≡ BC, DE, HL, SP, IX, IY
LD dd, (nn)	dd ← (nn)	dd ≡ BC, DE, HL, SP, IX, IY
LD (nn), ss	(nn) ← ss	ss ≡ BC, DE, HL, SP, IX, IY
LD SP, ss	SP ← ss	ss ≡ HL, IX, IY
PUSH ss	$(SP-1) \leftarrow ss_H$; $(SP-2) \leftarrow ss_L$	ss ≡ BC, DE, HL, AF, IX, IY
POP dd	$dd_L \leftarrow (SP)$; $dd_H \leftarrow (SP+1)$	dd ≡ BC, DE, HL, AF, IX, IY

EXCHANGES

Mnemonic	Symbolic Operation	Comments
EX DE, HL	DE ↔ HL	
EX-AF, AF'	AF ↔ AF'	
EXX	$\begin{pmatrix} BC \\ DE \\ HL \end{pmatrix} \leftrightarrow \begin{pmatrix} BC' \\ DE' \\ HL' \end{pmatrix}$	
EX (SP), ss	$(SP) \leftrightarrow ss_L$, $(SP+1) \leftrightarrow ss_H$	ss ≡ HL, IX, IY

MEMORY BLOCK MOVES

Mnemonic	Symbolic Operation	Comments
LD1	(DE) ← (HL), DE ← DE+1 HL ← HL+1, BC ← BC−1	
LDIR	(DE) ← (HL), DE ← DE+1 HL ← HL+1, BC ← BC−1 Repeat until BC = 0	
LDD	(DE) ← (HL), DE ← DE−1 HL ← HL−1, BC ← BC−1	
LDDR	(DE) ← (HL), DE ← DE−1 HL ← HL−1, BC ← BC−1 Repeat until BC = 0	

MEMORY BLOCK SEARCHES

Mnemonic	Symbolic Operation	Comments
CP1	A−(HL), HL ← HL+1 BC ← BC−1	
CPIR	A−(HL), HL ← HL+1 BC ← BC−1, Repeat until BC = 0 or A = (HL)	A−(HL) sets the flags only. A is not affected
CPD	A−(HL), HL ← HL−1 BC ← BC−1	
CPDR	A−(HL), HL ← HL−1 BC ← BC−1, Repeat until BC=0 or A=(HL)	

8-BIT ALU

Mnemonic	Symbolic Operation	Comments
ADD s	A ← A + s	
ADC s	A ← A + s + CY	CY is the carry flag
SUB s	A ← A − s	
SBC s	A ← A − s − CY	s ≡ r, n, (HL) (IX+e), (IY+e)
AND s	A ← A ∧ s	
OR s	A ← A ∨ s	
XOR s	A ← A ⊕ s	
CP s	A − s	s = r, n (HL) (IX+e), (IY+e)
INC d	d ← d + 1	d = r, (HL) (IX+e), (IY+e)
DEC d	d ← d − 1	

Mnemonic	Symbolic Operation	Comments
ADD HL, ss	HL ← HL + ss	ss ≡ BC, DE HL, SP
ADC HL, ss	HL ← HL + ss + CY	
SBC HL, ss	HL ← HL − ss − CY	
ADD IX, ss	IX ← IX + ss	ss ≡ BC, DE, IX, SP

16-BIT ARITHMETIC

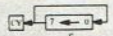
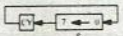
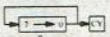
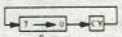
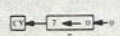
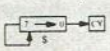
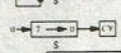
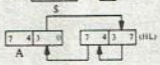
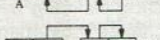
Mnemonic	Symbolic Operation	Comments
ADD IY, ss	IY ← IY + ss	ss ≡ BC, DE, IY, SP
INC dd	dd ← dd + 1	dd ≡ BC, DE, HL, SP, IX, IY
DEC dd	dd ← dd − 1	dd ≡ BC, DE, HL, SP, IX, IY

MISCELLANEOUS GP ACC. & FLAG

Mnemonic	Symbolic Operation	Comments
DAA	Converts A contents into packed BCD following add or subtract.	Operands must be in packed BCD format
CPL	$A \leftarrow \overline{A}$	
NEG	A ← 00 − A	
CCF	$CY \leftarrow \overline{CY}$	
SCF	CY ← 1	

Mnemonic	Symbolic Operation	Comments
NOP	No operation	
HALT	Halt CPU	
DI	Disable Interrupts	
EI	Enable Interrupts	
IM 0	Set interrupt mode 0	8080A mode
IM 1	Set interrupt mode 1	Call to 0038_H
IM 2	Set interrupt mode 2	Indirect Call

ROTATES AND SHIFTS

Mnemonic	Symbolic Operation	Comments
RLC s		s ≡ r, (HL) (IX+e), (IY+e)
RL s		
RRC s		
RR s		
SLA s		
SRA s		
SRL s		
RLD		
RRD		

BIT S, R, & T

Mnemonic	Symbolic Operation	Comments
BIT b, s	$Z \leftarrow \overline{s_b}$	Z is zero flag
SET b, s	$s_b \leftarrow 1$	s ≡ r, (HL)
RES b, s	$s_b \leftarrow 0$	(IX+e), (IY+e)

INPUT AND OUTPUT

Mnemonic	Symbolic Operation	Comments
IN A, (n)	A ← (n)	
IN r, (C)	r ← (C)	Set flags
INI	(HL) ← (C), HL ← HL + 1 B ← B − 1	
INIR	(HL) ← (C), HL ← HL + 1 B ← B − 1 Repeat until B = 0	
IND	(HL) ← (C), HL ← HL − 1 B ← B − 1	
INDR	(HL) ← (C), HL ← HL − 1 B ← B − 1 Repeat until B = 0	
OUT(n), A	(n) ← A	
OUT(C), r	(C) ← r	
OUTI	(C) ← (HL), HL ← HL + 1 B ← B − 1	
OTIR	(C) ← (HL), HL ← HL + 1 B ← B − 1 Repeat until B = 0	
OUTD	(C) ← (HL), HL ← HL − 1 B ← B − 1	
OTDR	(C) ← (HL), HL ← HL − 1 B ← B − 1 Repeat until B = 0	

PE Micro-file

JUMPS	JP nn	PC ← nn	
	JP cc, nn	If condition cc is true PC ← nn, else continue	cc = NZ PO, Z PE, NC P, C M
	JR e	PC ← PC + e	
	JR kk, e	If condition kk is true PC ← PC + e, else continue	kk = NZ NC, Z C
	JP (ss)	PC ← ss	ss = HL, IX, IY
	DJNZ e	B ← B − 1, if B = 0 continue, else PC ← PC + e	
CALLS	CALL nn	$(SP-1) \leftarrow PC_H$ $(SP-2) \leftarrow PC_L$, PC ← nn	
	CALL cc, nn	If condition cc is false continue, else same as CALL nn	cc = NZ PO, Z PE, NC P, C M
RESTARTS	RST L	$(SP-1) \leftarrow PC_H$ $(SP-2) \leftarrow PC_L$, $PC_H \leftarrow 0$ $PC_L \leftarrow L$	
RETURNS	RET	$PC_L \leftarrow (SP)$, $PC_H \leftarrow (SP+1)$	
	RET cc	If condition cc is false continue, else same as RET	cc = NZ PO, Z PE, NC P, C M
	RETI	Return from interrupt, same as RET	
	RETN	Return from non-maskable interrupt	

In the table the following abbreviations are used.

b ≡ a bit number in any 8-bit register or memory location
cc ≡ flag condition code

NZ ≡ non zero
Z ≡ zero
NC ≡ non carry
C ≡ carry
PO ≡ Parity odd or no over flow
PE ≡ Parity even or over flow
P ≡ Positive
M ≡ Negative (minus)

d ≡ any 8-bit destination register or memory location
dd ≡ any 16-bit destination register or memory location
e ≡ 8-bit signed 2's complement displacement used in relative jumps and indexed addressing
L ≡ 8 special call locations in page zero. In decimal notation these are 0, 8, 16, 24, 32, 40, 48 and 56
n ≡ any 8-bit binary number
nn ≡ any 16-bit binary number
r ≡ any 8-bit general purpose register (A, B, C, D, E, H, or L)
s ≡ any 8-bit source register or memory location
s_b ≡ a bit in a specific 8-bit register or memory location
ss ≡ any 16-bit source register or memory location
subscript "L" ≡ the low order 8 bits of a 16-bit register
subscript "H" ≡ the high order 8 bits of a 16-bit register
( ) ≡ the contents within the ( ) are to be used as a pointer to a memory location or I/O port number
8-bit registers are A, B, C, D, E, H, L, I and R
16-bit register pairs are AF, BC, DE and HL
16-bit registers are SP, PC, IX and IY

modes of operation, one of which must be selected by the programmer during initialisation.

During system reset the processor is forced into Interrupt Mode 0, which is identical to the interrupt scheme of the 8080A in which external hardware provides a single byte Restart or a three byte Call instruction following interrupt acknowledge. This mode is ideal for use with an external interrupt controller chip such as the Intel 8259. The other modes are selected by issuing an IM 1 or IM 2.

Mode 1 is a scheme for simple systems which have only one interrupt source, and consequently needs no external interrupt controller. When in this mode, an interrupt on the Z80 INT line causes an immediate restart to location 0038H where the interrupt routine itself may be positioned, or, more likely, a Jump instruction to a routine elsewhere in memory.

Mode 3 is the most powerful interrupt response mode since it provides fast vectoring to up to 128 separate interrupt routines which may be located anywhere in memory. A practical restriction to this mode is that it is really only useful for systems using Zilog peripheral chips which all have the necessary control logic built in. Using this mode, when an interrupt is accepted the interrupting device supplies a single byte which is combined with the contents of the I register to give a 16 bit address which is used as a pointer to a unique entry in a table containing up to 128 possible interrupt vectors. This table can be located on any page boundary, as determined by the programmer when he loads the I register. Both the I register and the contents of the vector table must be set up during the initialisation routine.

In Mode 3 the 128 possible interrupting "devices" each get a very rapid response from the Z80, but what if one device is already being serviced when another generates an interrupt of its own? This problem is solved by the so-called daisy-chain priority scheme which is built into all Zilog peripheral devices along with registers to supply the single byte needed to form the vector table address. There are only four basic peripheral devices in the Zilog family, but these cater for most requirements, as follows:

The Z80 PIO provides two parallel 8 bit I/O ports with "handshake" lines and each port may be separately programmed into the byte output, byte input, or individual bit I/O mode with Port A also offering a bidirectional "bus" mode.

The Z80 CTC provides four independent channels for counting and timing applications with each channel having an 8 bit prescaler which can be set to divide by 16 or 256, and an 8 bit down counter which counts down to zero after being preset from an 8 bit time constant register loaded by the programmer.

The Z80 DMA chip can take control of the system bus to transfer data to and from memory directly without Z80 processor participation. A wide variety of DMA transfers are programmable with data moved a byte at a time or in blocks, and with address registers and block counters automatically incrementing or decrementing.

The Z80 SIO provides the USART function for the Z80 but unlike the Intel 8251 the SIO is a dual channel device containing two complete serial I/O channels capable of operating at up to 550K bits per second in synchronous or asynchronous mode.

All four of the Z80 peripherals are fully compatible with Mode 3 interrupt operation and utilise a unique daisy-chain priority scheme. Each device has an Interrupt Enable In (IEI) and Interrupt Enable Out (IEO) in addition to its conventional interrupt output. While the interrupt outputs from several devices are connected in parallel to the Z80 INT pin, the IEI/IEO lines of the various devices are connected in series to form the daisy-chain. The devices electrically "closer" to the CPU in the chain have a higher priority than those "further away", since when a device requests an interrupt, it no longer gives an IEO output to devices further down the chain. Only the device with its IEI line high (= enabled) and its IEO line low (= requesting) can respond to the interrupt acknowledge signal from the processor by sending its pre-programmed interrupt vector byte on to the bus. Devices already being serviced can be interrupted themselves, but only by devices with a higher priority.

The special interrupt capability built into the Z80 peripherals can be used to advantage in many systems, although it does have its penalties since the complex Z80 devices are generally more expensive than the simpler 8080A and 6800 family chips, and many would argue that the SIO is much *too* clever for most applications.

APPLICATIONS

There can be no doubt that the Z80 is one of the most powerful 8 bit devices ever developed with sufficient flexibility to be used in both controller and data processing applications, and with a very broad user software base. These convincing advantages must be weighed very carefully against its rather less desirable features like the confusing instruction set and the hardware problems, before any potential user takes the plunge. I certainly feel that those without previous 8080A experience or those who wish to learn about microprocessors from scratch should take a careful look at the 6809 or even the 6502 before deciding. Readers who already have a Z80 tucked away in a BASIC orientated home computer can take comfort in the fact that they can take full advantage of Z80 power *without* worrying about the problems.

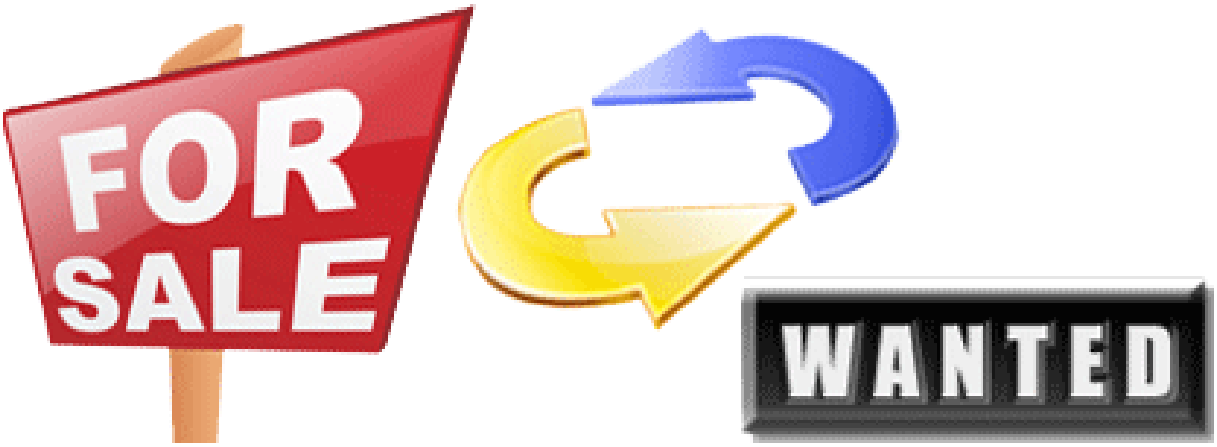
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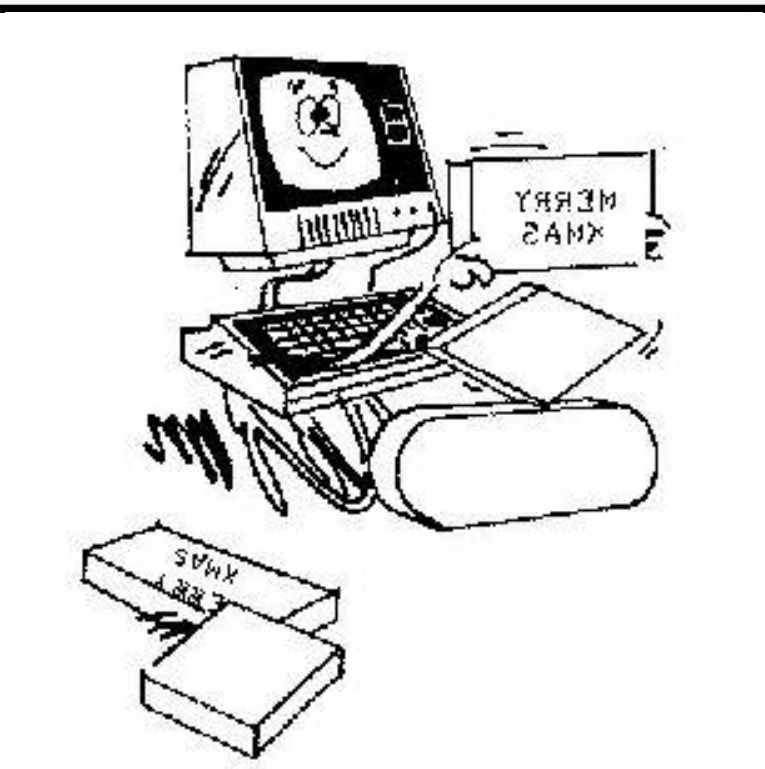


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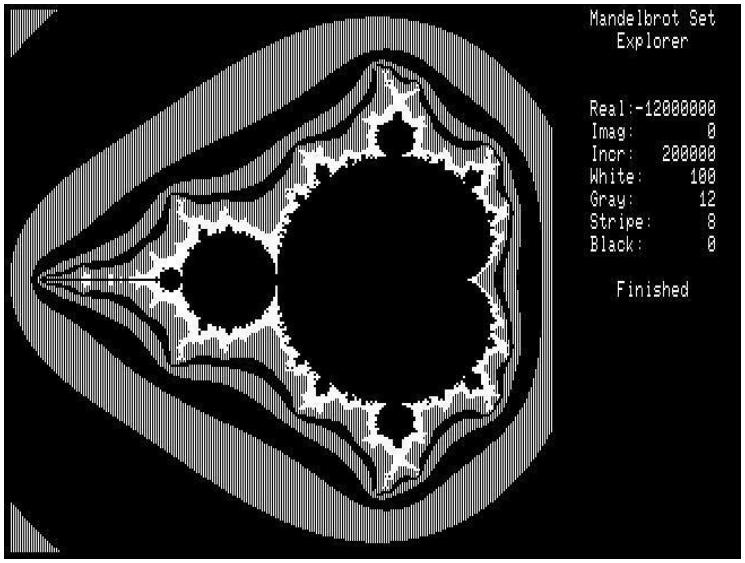


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IS THIS A WORLDS FIRST?

ET FONEHUME

HI DUSTY. I THOUGHT WE COULD CELEBRATE THE ARRIVAL OF YOUR 'REAL' MODEL 2 AND RE-CREATE, SPECIFICALLY FOR THE M2, MY ONE-LINER BASIC GAME, 'THE GREAT SNAIL RACE'. I CAN'T EVER REMEMBER SEEING A ONE-LINER, FOR THE M2, BEFORE, SO I HOPE YOU LIKE IT AND THAT IT MAKES YOU SMILE.




```
1                                   @                                  *
2                                       @                              *
3                                     @                                *
4                                   @                                  *
5                                                 @                    *
6                                                                      @*
7                                                   @                  *
8                                                   @                  *

WINNER IS NO. 6
```

```
10 RANDOM:CLS:S$="  @":FORX=1TO8:PRINT@X*80,X;S$;:PRINT@X*80+79,"*";:SP(X)=X*80+
4:SC(X)=5:NEXT:PRINTCHR$(2):FORZ=0TO1STEP0:A=RND(8):SP(A)=SP(A)+1:SC(A)=SC(A)+1:
PRINT@SP(A),S$;:IFSC(A)=77THENPRINT@880,"WINNER IS NO.";A:PRINTELSENEXTZ
```

THINKING ABOUT IT, PERHAPS THE 8" MACHINE OWNERS AREN'T TOO KEEN PLAYING GAMES, SO I THOUGHT IT'S UP TO US, IN OUR TRUE FASHION, TO 'LIGHTEN THINGS UP' (AS I THINK WE TWO HAVE MANAGED TO DO WITH VARIOUS OTHER PROJECTS OVER THE YEARS!).

ANYWAY, DOWN TO THE NITTY-GRITTY. THERE WAS JUST ONE MAIN PROBLEM I ENCOUNTERED WHEN I SET ABOUT RE-CREATING MY FAVOURITE ONE-LINER, 'SNAIL RACE'.

I DON'T KNOW IF YOU WERE AWARE, BUT THE M2 BASIC DOES NOT, IN ITS INITIAL FORM, SUPPORT THE VERBS 'PEEK' AND/OR 'POKE'. HOWEVER, THIS CAN BE EASILY OVERCOME THANKS TO LEWIS ROSENFELDER'S FANTASTIC BOOK, 'BASIC, FASTER & BETTER'. (*SEE ADVERT. ON NEXT PAGE - ED.*).

LEWIS HAS WRITTEN A SHORT PROGRAM ('POKEMOD/BAS'), TO OVERCOME THIS PROBLEM WHICH TAKES OVER, AND VERY CLEVERLY, USES THE VERBS 'NAME' AND 'OCT&'.

HOWEVER, I KNOW THE ONE-LINER 'RULES' PRECLUDES THE RUNNING OF ADDITIONAL PROGRAMS BEFORE RUNNING A ONE-LINER, SO I DECIDED TO COUNT THE SNAIL POSITIONS ON THE SCREEN (WITHIN THE 'Z' LOOP), TO AVOID PEEKING THEIR SCREEN POSITION.

OTHER THAN THAT AND THE EXTRA WIDTH OF THE SCREEN DISPLAY OF COURSE, (GREAT TO HAVE 80 COLUMNS THOUGH EH!) THAT WAS ALL THE CHANGES REQUIRED FOR THE PROGRAM TO RUN ON A M2. NOT HAVING A M2 OF MY OWN THOUGH, I'VE USED GEORGE AND PETER PHILLIPS'S M2 EMULATOR, ON YOUR RECOMMENDATION. I ENCOUNTERED NO PROBLEMS WHATSOEVER, IT TRULY IS, AS YOU SAID, AN AMAZING PIECE OF SOFTWARE.

HERE'S A COPY OF LEWIS'S PROGRAM FROM HIS BOOK.

```
0 'POKEMOD/BAS
10 DEFINTA-Z
20 DIMUS(46)
30 FORX=0TO46:READUS(X):NEXT
40 J=0:DEFUSR=VARPTR(US(0)):J=USR(0)
50 END

80 DATA-13023,8925,26611,15393,8917,26613,-6367,8748,26615,-13023,8938,26617,153
93,8913,26619,4641,8905,26621

81 DATA-13023,8797,26623,17441,8830,26625,-15583,8955,26627,14910,1330,8552,2043
2,-1246,15912,12875,10493,-12255

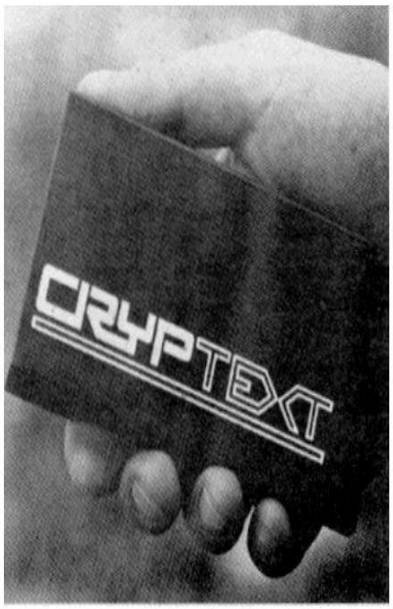
82 DATA8773,10757,17697,8779,10759,-15583,8959,23259,26430,-8910,-13990
```

Plug in CRYPTEXT

CRYPTEXT, a hardware encryption device, plugs into the back of the TRS-80 or into the expansion interface via an optional cable.

The pocket-size device allows you to secure inventory and financial data, technical and proprietary information, graphics, programs or text. The encrypted information can be stored on cassettes or disks.

Used with a modem, CRYPTEXT transmits data or messages by telephone or other communication channels. Other uses include generating pseudorandom numbers for games or scientific programs.

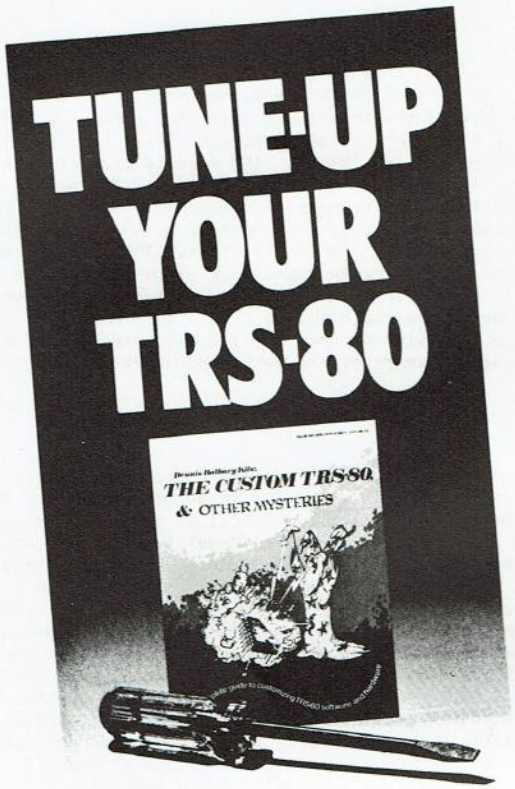


CRYPTEXT Device.

Data throughput is greater than 15K bytes/second and power consumption is low at less than 100 milliwatts.

The CRYPTEXT is available for under $300 each.

Write: CRYPTEXT Corporation, P.O. Box 425, Northgate Station, Seattle, WA 98125.





You may have seen the two advertisements above in the American magazines. They are, of course, the next two books in the "Other Mysteries" series. The first two were "TRS-80 Basic and Other Mysteries" and "Microsoft Basic Decoded and Other Mysteries" which are shown elsewhere in this catalogue. In typical American fashion the Custom TRS-80 book was advertised first, but will not be available until late November. The "Basic Faster and Better" is now in stock. Although we have only had the book in stock a few days as this listing is being prepared, we have found it to be one of the most informative books on the "non-standard" use of Basic that we have seen. The book is made up of hundreds of hints and tips, the majority of which are supported by short subroutines. The majority of these subroutines are in Basic, but some are in assembly code. It is really rather hard to describe the book because what it sets out to do, and succeeds in doing, is to enable an average user to get far better application out of his Basic Interpreter. If you are curious about all those little known facts of Basic and in particular the Basic Interpreter utilised in the TRS-80 and Video Genie, then Basic Faster and Better will prove to be a veritable goldmine to you. As a matter of fact the subroutines listed in the book are so good that they have been amalgamated onto two disks. At the moment we are not stocking these because they are moderately expensive with the dollar as high as it is at the moment and we feel that customers may prefer to enter them direct from the book. If, however, we get enough call, we will stock them. Although the book is arranged in chapters, of course, it tends to cover quite a lot of area and it is literally impossible to describe its contents completely. If one had to sum it up, then, I suppose, the best way to describe it is that it is 288 pages of Hints and Tips. An extract from the contents pages is shown below which should give some indication.

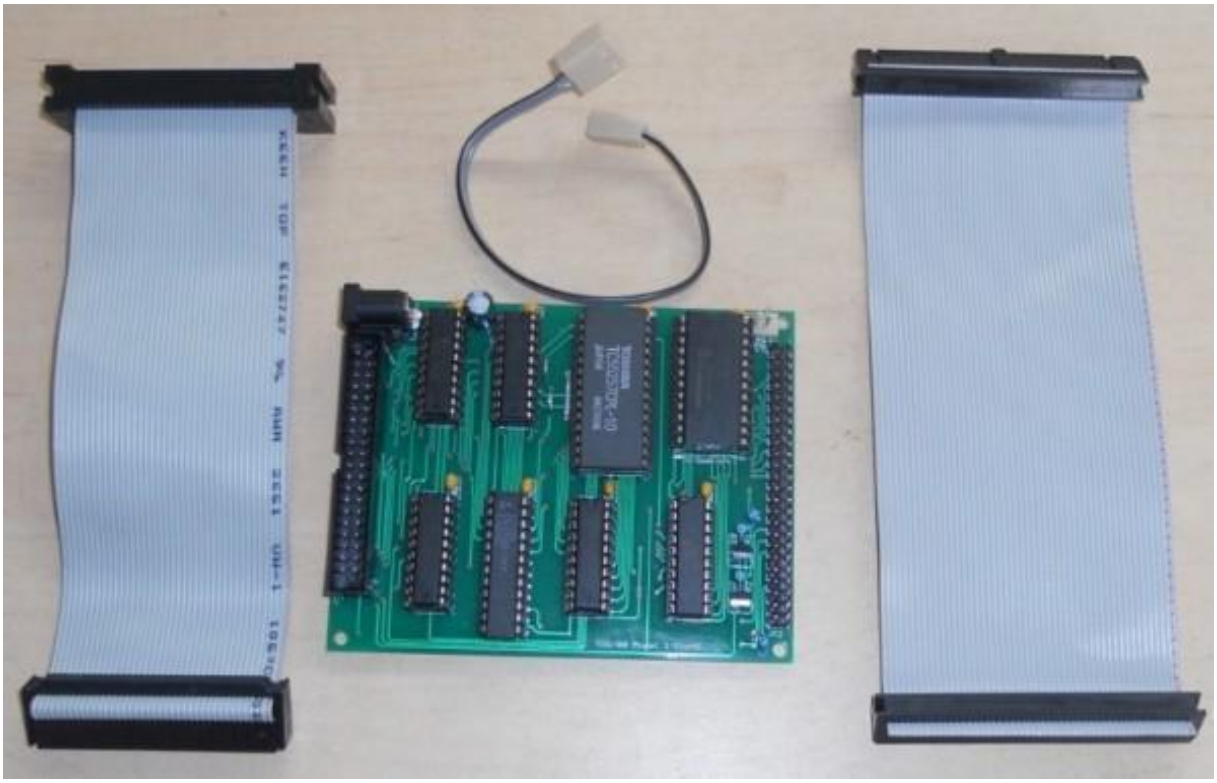
Chapter 12 165
Keyboard & Video Trickery 165
Video Display = Visible Memory 165
Video Display POKEs 165
Video Display PEEKs 166
Pointing Strings at the Screen 168
LPRINT the Video Display 169
Storing Displays on Disk 169
Reading a Display from Disk 170
LSET & RSET the Screen 170
Pointing Disk Buffers to the Screen 171
Video Displays to Random Files 171
The Single-Key Subroutine 172
Quick, & Easy, Menu Routines 173
Finding the Cursor Position 174
Flashing Cursors 174
Locking Out the 'BREAK' Key 175
Repeating Keys & Combinations 175
Free-Form Video Displays 176
Computing Video Display Positions 178
An Easy Way to Plan Video Displays 179
Special Keys & Their Codes 180
Video Display Planning Sheets 180
String Graphics 180
Alphanumeric Inkey Routine 181
Alphanumeric Inkey Modifications 183
Numeric Inkey Subroutine 184
Numeric Inkey Modifications 186
Formatted Inkey Subroutine 187
Formatted Inkey Modifications 187
A Dollar Inkey Subroutine 188
Dollar Inkey Modifications 191
Poking Graphics Into Program Text 192

Chapter 4 38
Magic Memory Techniques 38
How Much Memory Do You Really Have? 38
Peek & Poke Above Byte 32767 39
Adding & Subtracting Integer Addresses 39
Peeking 2 Bytes 40
Poking a 2-Byte Integer into Memory 41
How to Change 'Memory Size' from BASIC 41
Reserving Memory Below Program Text 42
Partially Restore Data Statements 43
The Active Variable Analyzer 44
Active Variable Analyzer Comments 47
The 'Move-Data' Magic Array 48
A Deluxe Move-Data USR Subroutine 52
Passing Variables Between Programs 56

Chapter 3 22
USR Routines – For Speed & Flexibility 22
Writing USR Routines with an Editor/Assembler 23
Load & Execute USR Routines from Disk 24
Poking USR Routines into Memory 25
Saving USR Routines to Disk 26
Magic Strings 27
Loading USR Subroutine into Strings 27
Magic Arrays 29
Loading & Executing 'Magic Arrays' 30
Writing 'Magic Array' USR Routines 31
Putting 'Magic Arrays' in Random Disk Files 32
Passing USR Arguments with Control Arrays 33
Multiple-Argument Handler for USR Calls 35

“Quinnterface” Mini Expansion Interface for 16K Model 1 FreHD users.

- COMPLETLY ASSEMBLED AND TESTED -



This is THE perfect device for all Model 1 users who own a 16K Level II unit, (which is most of us!), but no Expansion Interface or disk drives, especially if you don't want to modify your M1 with upgraded boot ROM or memory upgrade.

The ‘Quinnterface’, developed by J. Andrew Quinn from New Zealand, adds 32K RAM and auto-boot functionality to you FreHD.

U.K. And Europe, contact Bas. at BetaGamma Computing.
U.S.A. And rest of the world, contact Mav. At “The Right Stuff”

LOOKING FOR FAST, INEXPENSIVE, UNLIMITED MASS STORAGE FOR YOUR TRS-80 MODEL I/III/4/4P/4D?

The amazing

"FreHD"



-Emulates a TRS-80 hard drive, but faster than any hard drive!
-Works with your favourite DOS (LS-DOS, LDOS, CP/M, Newdos/80 2.5)
-Uses SD card for storage medium
-Bonus free Real Time Clock function!
-Designed in Belgium and proudly built and shipped from Australia
-Kit form or fully assembled

Order yours today:
http://ianmav.customer.netspace.net.au/trs80/emulator

EBAY.CO.UK BARGAINS

HERE ARE JUST SOME OF THE TANDY EBAY LISTINGS SINCE OUR LAST ISSUE



£4.99



£40



£22



£43

NOT QUITE SO MANY ITEMS THIS TIME, BUT A MODEL 200 AT ONLY £43 WAS QUITE A BARGAIN. THE PRINTER WAS NICE BUY TOO.

HERE'S AN ADVERT FROM 1981 (ISH). BRIAN WAS VERY DISAPPOINTED AT THE TAKE-UP OF INTEREST. IT SEEMED THAT USERS WERE EMBARRASSED BECAUSE THERE WAS NOTHING TO 'SAY' WHEN THEY VISITED THE BB.
TO GET OVER THE PROBLEM INITIALLY, I REMEMBER, HE SUGGESTED LEAVING YOUR ELECTRIC METER READING AND IT SEEMED TO DO THE TRICK. SO DIFFERENT FROM TODAY EH?

80 - NET

ELECTRONIC NETWORK

* ***FOUNDED NOVEMBER 1980*** *

Chairman:- **LEON HELLER**
Secretary:- **BRIAN PAIN**

ADMINISTRATIVE OFFICES:-
40A HIGH STREET,
STONY STRATFORD,
MILTON KEYNES.

Tel: Milton Keynes 0908 - 566660

* **THE NOTICEBOARD FOR ALL MICRO COMPUTER ENTHUSIASTS** *

TRS-80 Emulators . com

TRS32: A Model I/III/4/4P Emulator For Windows

written by Matthew Reed

Unregistered Shareware Version:

- Works under all current versions of Windows
- Full Windows application — no low-level hardware conflicts!
- Model I, Model III, Model 4, and Model 4P emulation
- Four floppy disk drives (with optional realistic disk drive sound)
- Cassette tape drive with graphical on-screen controls
- Exatron Stringy Floppy emulation
- Printer support
- Serial port for RS-232 communications
- Joystick support (using a Windows joystick — TRISSTICK and Alpha Products joysticks are emulated)

Registered Version:

- All features included in the shareware version
- Built-in emulation of an Epson FX-80 dot matrix printer (including graphics and control codes)
- High resolution graphics (Radio Shack and Micro-Labs)
- Up to 1 megabyte of additional memory in Model 4 and 4P modes
- Hard disk support
- Orchestra 85/90 music generation



Actual Dotwriter output — emulated FX-80
click for larger sample

Interested?

- Read the TRS32 emulator documentation
- Download the shareware version
- Register online

MATTHEW'S EMULATOR IS QUITE ASTOUNDING.
IT'S MY FIRST CHOICE WHEN DEVELOPING IDEAS FOR TRS8BIT.
HE OFFERS FULL SUPPORT AND IT IS STILL UNDERGOING ENHANCEMENT.
IF YOU HAVEN'T REGISTERED YOUR SHAREWARE VERSION YET, PLEASE DO SO AND ENCOURAGE
AND SUPPORT MATTHEW'S ENTHUSIASM TO CONTINUE WITH HIS WORK.

ED.

IN MAV'S WORKSHOP

by Ian Mavric

TRS-80 PRINTERS FROM THE BEGINNING SERIES

PART 7: TRS-80 DAISY WHEEL PRINTERS



In all the previous articles in this series I have written about Tandy's dot matrix printer offerings to TRS-80 users Dot matrix has been the entry-level printing system and by the mid 1980s advanced to become a fast reliable system which scaled up and down well (meaning low-end sub-$300 printers all the way up to $2000 speedy workhorses). The one area they fell short in for a long time was in print quality, and that is where the daisy wheel printer (DWP) comes in. In this article I'll talk about Tandy's DWP offerings and their pros and cons.

DAISY WHEEL OUTPUT - LIKE AN ELECTRIC TYPEWRITER

By the mid 1970s (and in fact earlier, more like the early 60s) the electric typewriter was a standard office feature. Several designs existed but IBM's Selectric "golfball" was the king of the mountain and was mainly used (but not limited to) by secretaries all over the world. Typists and typing pools within organisations ensured correspondence was clear and uniform, which is to say easy to read and error free. Dedicated "word processor" machines came along which were essentially the guts of a computer limited to one function added the ability to save regularly used documents to print without needed to type them each time from scratch.

For a long time printers connected to mainframe computers, mini computers and micros were all about speed of output taking preference over print quality. As computers got faster printers needed to get faster, and so we ended up with what we know as line and barrel printers, as well as high speed dot-matrix types. Around the time that the concept of word processing as one of an infinite number of applications which could be written for a microcomputer, the search of clarity of printed output became important. And for a yardstick for comparison, the printed result should look as good as, or better than, the office IBM Selectric. Daisy Wheel printing held the best promise, here is an excerpt from Wikipedia about them:

"Daisy wheel printing is an impact printing technology invented in 1969 by David S. Lee at Diablo Data Systems. It uses interchangeable pre-formed type elements, each with typically 96 glyphs, to generate high-quality output comparable to premium typewriters such as the IBM Selectric, but two to three times faster. Daisy wheel printing was used in electronic typewriters, word processors and computers from 1972. The daisy wheel is considered to be so named because of its resemblance to the daisy flower. By 1980 daisy wheel printers had become the dominant technology for high-quality text printing."

THE FIRST TRS-80 DAISY WHEEL PRINTER WAS A DISASTER

In 1980 Tandy decided it was time to release their first DWP and, like the original TRS-80 Line Printer, this one was labelled TRS-80 Daisy Wheel Printer and carried the catalog number 26-1157. Known as the WP-50 it was made for Radio Shack by Qume and cost an eye-watering $US2,950 which was actually more than an expanded Model I dual-drive system.

There's a reason you never see the WP-50 on eBay or even in any Radio Shack catalogues, and that is the printer caused no end of problems for the company. Information is hard to find but hearsay about delivery delays, high failure rate and even the odd fire lead RS to stop deliveries until the DW-II was ready and take back those which had been delivered.



Photo: one of the few photos of the WP-50 Daisy Wheel Printer

DAISY WHEEL II - ALL CLASS

After the WP-50 fiasco the DW-II was released in 1981 and this printer was superior in all areas and to boot, was only $USD1,960. This was a thoroughbred, capable of 43cps which sounds slow however the performance of the printer was more than acceptable. A dot matrix printer running in WP mode (as opposed to draft mode) rarely reaches 43cps. The DW-II had a large number of optional print wheels (fonts) available, as well as tractor feed and cut sheet feeder accessories available.



TRS-80 Printers for Word Processing

New Daisy-Wheel II for Superb Quality

High-speed interchangeable character wheel and carbon ribbon give you the electric typewriter quality you need for your important word-processing jobs! A friction-feed roller takes paper up to 16-1/2" wide and up to 6 copies. 124 characters including underline plus reverse tab/line feed. Built-in self test. U.L. listed. 26-1156

D.W. II Dust Cover. 26-508

Accessories	Cat. No.
Ribbon Cartridge, Pack of 3	26-1419
Courier Print Wheel, 10 char/inch	26-1420
Prestige Elite Wheel, 12 char/inch	26-1421
Madelene Proportional Space Print Wheel	26-1422
Tractor Assembly. Snaps into Place. Allows Use of Fan-Fold Forms	26-1446

The DW-II had a long run from 1981 to 1986 and was available initially in silver then changed to white at the same time as the rest of the TRS-80 line in 1984.



Photo: a Model II with a Daisy Wheel II was de rigueur for well-heeled teenagers in 1981

Thanks to the recent release of Scripsit then Super Scripsit word processing software for the Model I/II/III/4/12/16 Tandy found the rather expensive DW-II sold as quickly as they could manufacture them during the first few years. The only criticisms of the printer, other than price, was that it weighed a ton and only had a parallel printer interface.

As with anything to do with Radio Shack, if it was successful they planned to sell a cost-reduced version which was almost as good, for those who didn't want to spring the two grand for the DW-II. It was known as the DWP-410 and came out in 1983.

DWP-410 - COST REDUCED DAISY WHEEL PRINTING

By going for a slower print engine (25cps vs. 43cps) and a cabinet with more plastic (the DW-II is all metal) Tandy was able to produce a DW printer under the psychological $1,500 mark and looks more streamlined/ weigh less but still print 132 columns. Many DWP-410s found their ways into homes, and this did sell well.



The DWP-410 was available from 1983-1984 in both silver and white, and in 1984 the price was dropped from $1,495 to $1,295. Again, this printer only had a parallel printer port because up until this time, Tandy didn't take the Colour Computer seriously enough to think it needed a Daisy Wheel printer it could connect to. That was something Tandy was keen to correct at the end of 1984.



DWP-210 - BUDGET DAISY WHEEL PRINTING

The DWP-210 appeared in the RSC-10 catalog for $799 and at that price you knew some corners were going to be cut. It was the slowest Daisy Wheel at 10cps, but that was really the only bad news, and if you didn't have mountains of work to print 10cps was liveable with, as long as you planned out your time to print things.



It's all-plastic cabinet made it lightweight and it now had both parallel and Coco-compatible serial interfaces. It still printed 132 columns. At $799 (dropped to $599 at the end of 1985) it was going to appeal to all segments of recent TRS-80 buyers. With Disk Scripsit on a Coco or single-drive Model 4 you could have a full WP set up for less than the cost of a single DW-II. You could even get a tractor feed for the DWP-210 which made it a serious printer, much more so than, say, the DW printer included with the Coleco Adam.

1986 - TIME TO UPDATE THE LINE-UP

Having three DWPs on the market at the same time was going to show where people's preferences lie, and in fact the DWP-410 fell out of favour first. It appeared people either went the cheap route and bought the DWP-210, or invested heavily in the DW-II. An update to the DWP-210 came along in 1986 in the form of the DWP-220 and its speed doubled to 20cps. This was pretty close to the DWP-410 so it made sense to drop the mid-range DWP-410.



Photo: DWP-220... a more stylish, faster DWP-210 for only $599

As for the DW-II, it had a new paint job and a price reduction to $1,495 and was re-born as the DWP-510.

1987 - MORE PRICE REDUCTIONS

By 1987 the cost to produce DWPs had been steadily lowering and Tandy still felt there was some life left in the DW marketplace to keep two printers available for purchase. The DWP-510 finally had a cosmetic makeover to become the DWP-520 and below the new sleek exterior was pretty much the same 43cps engine which powered the DW-II to successfully for so long. The price of the new DWP-520 was also aimed at a very broad audience at $995.00



The star of the show was the new low-cost version of the DWP-220 now called the DWP-230 and came in at under four hundred bucks! Compatible with the Coco, as well as traditional TRS-80s and the IBM compatible Tandy's, this bi-directional 20cps printer had better quality print than dot matrix printers three times it's price.

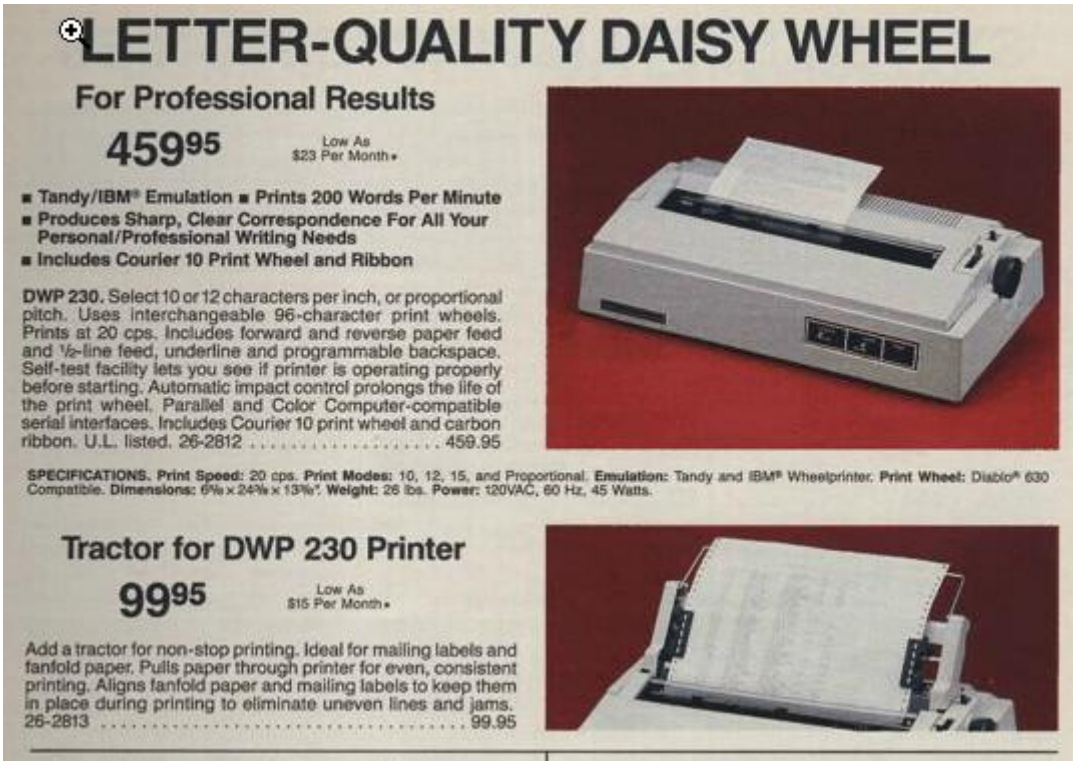
While all might sound good, the beginning of the end was on the horizon which would render the DWP obsolete by the end of the 80s.

1988 - THE WRITING IS ON THE WALL

For a few years Tandy had been selling a series of 24-pin dot matrix printers which started with the DMP-2100 and indeed most of the dot matrix world had moved that way including Epson with its LQ series and NEC with the Pinwriter. These Near Letter Quality (NLQ) printers steadily got better through the years to make a passable correspondence quality hard copy (though if you had a copy of a document both from a NLQ printer and a DWP you could tell the easily difference).

Once they dropped in price people just went for the speed an versatility of the NLQ, hence the consistent price drops on the DWPs. In 1988 a game changer came along in the guise of the LP-1000 Laser printer which, although expensive, could deliver the quality of a DWP at a speed ranging up to 6 ppm.

An indication that Tandy (and the world at large) had lost interest in DWPs was that the 1988 RSCC catalog had the same two DWPs as the previous year. Some may recall that in late 1987 there was a pretty major stock market crash and the result of this was raising of some computer and peripheral prices, and in this case the DWP-230 went up to $459.95



1989 and 1990 - THE DWP ERA DRAWS TO A CLOSE

I wish I could say Tandy pulled out all stops with a final DWP which was faster and cheaper than all previous DWPs and outsold every other printer.. Unfortunately, in reality after around 10 years of peddling DWPs, Radio Shack just quietly let the remaining DWP-230s sell out at $459.95 until they were all gone.

CONCLUSION

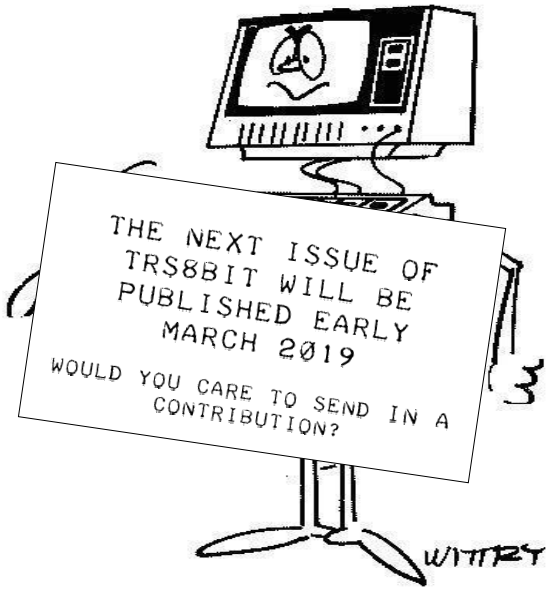
It's easy to think that the laser printer came along and swept away all before it, but in truth during these early years most laser printers were incredibly expensive. The LP-1000 was $2,199 and it's successor the LP-950 was $1,599. These high prices were going to keep dot matrix printers and to a lesser extent DWPs viable for a few more years. By the mid-1990s the inkjet printer was perfected and *that* was what eventually killed the 24-pin dot matrix and nearly killed to small home laser printer at the same time.

For those looking for a DWP to connect to their TRS-80, if you can find a DWP-410 in good condition its a nice match for your silver TRS-80, and likewise the DWP-210 makes a nice addition to your white TRS-80. If speed is really an issue, look for a DW-II in either white or silver, or if you have a Coco, sport for a DWP230.

NEXT TIME: Early Colour printers for the TRS-80

Ian Mavric

ianm@trs-80.com

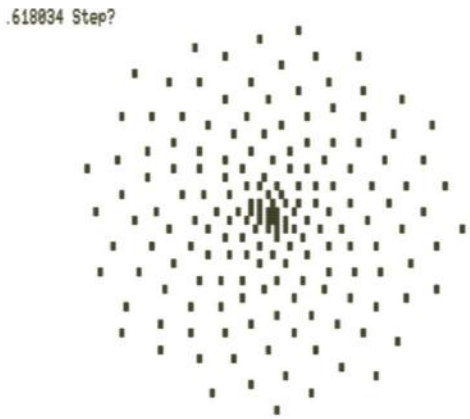


FLOWER POWER

GEORGE PHILLIPS

INSPIRED BY A NUMBERPHILE VIDEO THIS PROGRAM ASKS FOR A STEP VALUE BETWEEN Ø AND 1. THAT TELLS IS HOW FAR AROUND THE CIRCLE IT SHOULD GO BEFORE PLOTTING A POINT EVER FATHER OUT FROM THE CENTRE. A VERY SMALL STEP LIKE Ø.Ø1 WILL PLOT A SPIRAL. NUMBERS CLOSE TO 1/N WILL SHOW N "ARMS". FOR INSTANCE, Ø.333333 GIVES 3 ARMS AND Ø.111111 GIVES 9.
IF THE STEP IS NOT CLOSE TO A RATIONAL VALUE THEN THE DOTS TEND TO SPREAD OUT RANDOMLY GIVING A PLEASING FLOWER-LIKE PATTERN.

```
1 'NUMBERPHILE: HTTPS://WWW.YOUTUBE.COM/WATCH?V=SJ8SG8QNJOG
2 'IT EXPLAINS WHY PHI 1.6180339887 IS THE BEST STEP VALUE.
10 INPUT "STEP";S
20 CLS:PRINT @0,S;
30 S=S*2*ATN(1)*4
31 REM 3.14159265359
40 FORI=0TO90*2
50 SET(64+COS(I*S)*I/2/2,24+SIN(I*S)*I/4/2)
70 NEXT:GOTO10
```



IN MAV'S WORKSHOP

NEW RELEASES FOR 2019

by
Ian Mavric

I always am on the lookout for new and interesting hardware to make available for TRS-80 enthusiasts. I get lots of emails from people asking about this or that gadget from back in the day, and I do take note when people who say that are after one.

When there is sufficient interest I look into making products which I hope people will be interested in to continue to derive enjoyment from their TRS-80 hobby. Here are some of the things I am working on to release in the first half of 2019.

FOR THE MODEL III/4 OWNER: ORCHESTRA 90 REPRO

Unavailable since the late 1980s, the Orchestra 90 was a stereo music synthesiser which connected to the expansion bus of a Model III or 4, and to a hi-fi system. Sound production was excellent and the music reproduction quite sophisticated with up to six octaves, 5 simultaneous notes (or voices), each of which can be assigned any of five instrumental choices (tone colour registers).

Orchestra 90 was an evolution of the previous Orchestra 80 (mono) and 85 (stereo) systems for the Model I, so a lot of music had been composed for the Orchestra system, and they were popular downloads in the early days of the BBSs and the internet. CompuServe even had an Orchestra 90 SIG. Files created for the Orchestra series ended with the /ORC extension.

Pictured overleaf, is the New_Orchestra_90 kit which comes with some programs on floppy disk and a CD with information and some /ORC files. It will be $US55.00 + shipping.



Photo: Orchestra-90 with Symphony 90 software

FOR THE MODEL I OWNER: SERIAL BOARD REPRO SET

An option for the Model I was the RS232C serial interface board. It installed inside the Expansion Interface and allowed you to connect serial devices like modems and serial printers.

In the real world people mainly used the serial port to connect to 300 and 1200 baud telephone modems, and to connect to other computers using a null-modem adapter. They used to be fairly easy to obtain however in the last couple of years they have been few and far between, and people are buying non-working ones in the hope they will be able to repair them...a precarious and potentially costly way to get a serial board. I was keen to provide a solution to these enthusiasts.

My NEW_RS232_M1 kit includes the special cable, a floppy disk with MAL/CMD terminal program with Xmodem transfer capability, COMMBAT/CMD game program, and a CD with other relevant information.

By leaving out things not needed like the dip switches and COMM/TERM switch the cost could be kept down to only $US99.00 + shipping. Naturally, its constructed from new parts and the PCB has gold plated connectors for extra reliability. Speaking of the PCB, it's 1.6mm thick to prevent the flexing problem the original Radio Shack RS232 used to have in hot environments.



Photo: Model I RS232C serial board kit includes cable and software

FOR THE COCO 3 EXPERIMENTER: HARD DISK ADAPTER

This is a real odd one... it's what I would call "speculative" interest-wise... Hidden away, barely in view in the 1987 Radio Shack Computer catalog (RSC-17. page 38) listed is a Hard Disk Adapter for the Coco 3, which carried catalog number 26-3145.

A simple device, it connected a TRS-80 primary hard drive (like a 15Mb 26-4155 hard drive) to a Coco 3 via the Multi-Pak Interface. Software drivers in OS/9 Level II apparently performed the magic to make it all work, but the harsh comment at the time went along the lines of "Who would want to connect a $2000 hard drive to a $200 computer?". There was some truth to this statement, as in addition to the Coco 3, you needed a Multi-Pak Interface, disk drive and controller, and OS/9 Level II operating system. While the HDA was available for the next few years, information about it or indeed user feedback from anyone who used it was never forthcoming. Clearly only a handful of people used it.

Since a FreHD is very similar to a primary hard drive (even to the extent that a Model I, III or 4 can't tell it's not a real hard drive) I thought it might be interesting to try to connect one and see if the Coco 3 can control a FreHD. Sourcing a HDA was easier than expected, thanks to J. Benson in northern NSW, and while I had it I organised a repro job and now have them available for anyone interested. What I lack, is the OS/9 hard disk driver software to make the HDA work. Anyone who thinks they can help me with this should contact me. In the meantime the CC3 HDA is available for only $US35.00 + shipping. Remember though, I don't know enough about it to make it usable... when someone works it out, I'll spread the news!



Photo: CC3 HDA. Why is it red? I just felt like it...

REVIEW: PLAID VEST'S NEWKEY/80 PS/2 KEYBOARD ADAPTER

It's not often I get the chance to review new hardware from other makers, but this year at TA-18 I picked up a Newkey/80 from Kyle Wadsten and have been giving it a workout. Here are my impressions.

The Newkey/80 comes with everything you need to set it up and use it on a TRS-80 Model III, 4 or 4D. This includes power splicers (Newkey/80 requires 5VDC which can be taken from anywhere convenient on the internal power distribution cable assembly) and power extension cable, and a new keyboard cable.

I ran into a problem when I first set it up when I had the keyboard cable plugged in upside down, but a quick email to Kyle sorted out the problem and I was up and running. For those who make the same mistake I should point out that there is no harm that can be done to the TRS-80 or Newkey/80 if the cable is plugged in upside down, so if it happens just re-check your connections and try again.

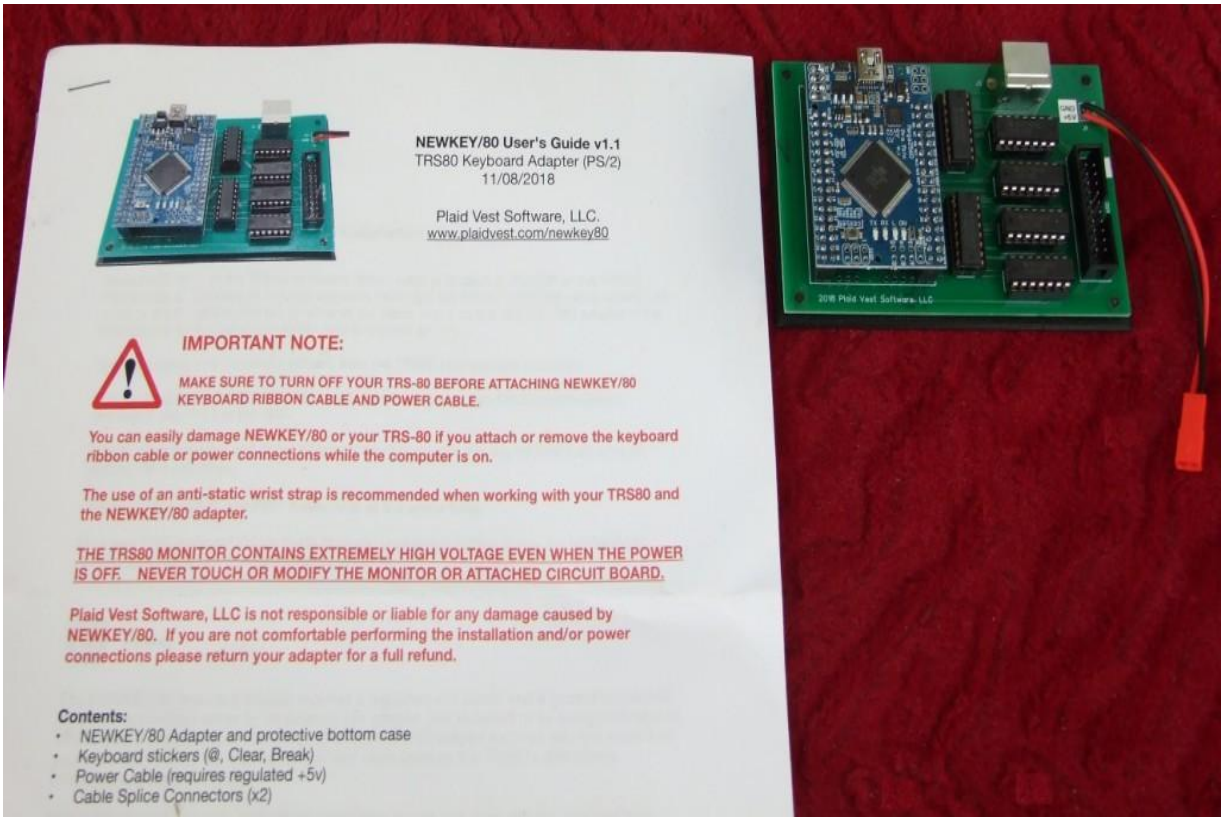
When the Newkey/80 powers on it initialises the PS/2 keyboard and to let you know it's ready the CAPS LOCK and NUM LOCK LEDs on the keyboard are illuminated. The keyboard works normally on your TRS-80, and you can switch between Model III mode and Model 4 mode by typing CTRL-ALT-3 or CTRL-ALT-4 respectively. A nice touch is that you press CTRL-ALT-DELETE to do a Reset since a PS/2 keyboard doesn't have a TRS-80 style orange reset button.

Compatibility is quite good, and if you have a relatively late PS/2 keyboard you should have no problems. I tried with a variety of PS/2 keyboards and the only one I had an issue with was the original IBM Model M 'clicky' keyboard which did not properly initialise on power-up, however if you pressed the reset button on the Newkey/80 the Model M was then recognised and worked well.

This is handy to know because for many retro-computerists the IBM Model M is simply the finest keyboard ever produced, and may in fact be the only PS/2 style keyboard they own.







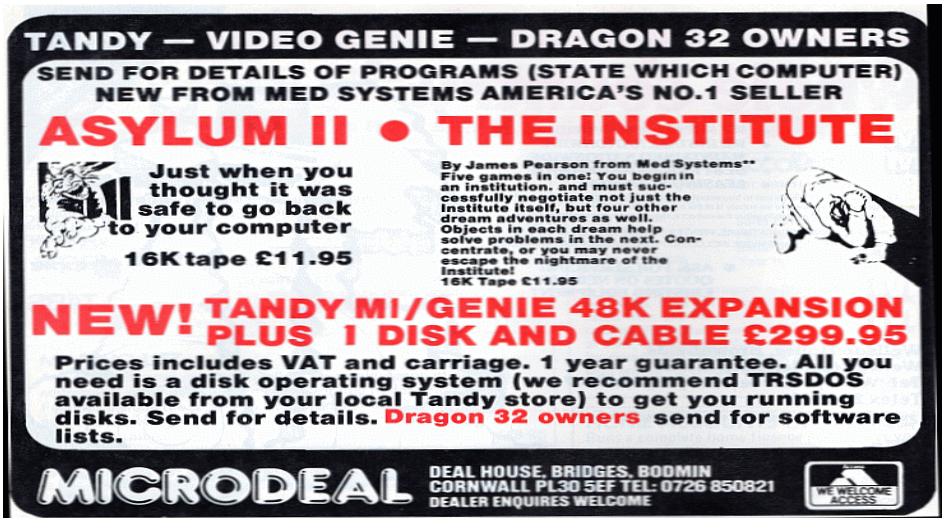
Plans are in place for a USB keyboard version in the 2nd half of 2019. Stay tuned for news about this and usage on the Model 4P. If you wish to order one from Kyle they are $US55.00 and his web site is www.plaidvest.com/newkey80

READY >_

My 2019 products are ready for pre-order now, and Newkey/80 will be available early in 2019, if you want to go on the waiting list you would be best to email Kyle to-day!

Ian Mavric

ianm@trs-80.com



TBA — AN ACRONYM FOR THE BASIC ANSWER

For some considerable time people have been trying to convince authors who use the Basic language that they should write their programs in a structured and organised manner. In reply the authors have been saying that they cannot do that because, like it or not, they are constrained by the use of line numbers. In other words, if one writes a structured program and at line 10 needs to branch into a subroutine which is going to be written later, then to say the least it is difficult to structure unless one leaves that GOSUB statement blank, because at that stage the author is not aware of the line number to branch to. Which is a very clumsy way of doing things and in fact can be positively dangerous because inevitably the author forgets to go back and fill the line number in.

In order to write structured programs the Basic programmer must be able to address lines by way of labels rather than line numbers. There have been a number of programs which have set out to do this. 3 of which, currently are, - SBT, SBASIC and Labeller. The latter restricts itself simply to the function of adding labels, the two others are fuller programs, but perhaps somewhat elementary. The Basic Answer sets out and succeeds in being the definitive answer to this vexed subject. Most important of all, it comes with a very explicit manual numbering some 75 pages.

The procedure for using TBA is that the program is constructed or written without line numbers. It is then run through a processor which converts that source code into normal Basic code. In other words, although one writes with the ease of TBA one finishes up with a normal Basic program containing line numbers.
Although we have emphasized the use of labels in TBA and thereby the extreme ease of writing a structured, organised and sensible Basic program, this is not the only advantage that accrues from using TBA.

The next most important feature to our mind is the fact that one can use 14 significant character variable names. At first sight this may not sound too important, but when you add to it the fact that
the variable name can contain both a hyphen or a full stop, then this feature becomes very important. For either of these, punctuation marks can be used to separate two words; thus in a mailing list one can entitle a variable as SUR-NAMES; in an accounting program such variables as TOTAL.DUE has a great deal more meaning than the more common TD. When the feature of meaningful labels and essentially English language variables are added together one comes up with a program that is almost entirely pure English.

The advantages of this to program maintenance, particularly future program maintenance, is quite amazing. The Basic interpreter in your machine, of course, can only accept two character variables. The 14 character variables are converted by the processor into two characters. Although one is, therefore, getting the advantage of the line variable name, TBA does not give the user any additional number of variables to use. We have never run out of variables using the Tandy interpreter, so this is purely an academic point.

So far we have pointed out the advantages of using labels in a Basic program and line character names and without doubt these are the two prime advantages of using TBA, bearing in mind that when they are used together they result in a highly logical and very under-standable program. There are many other advantages however. In particular conditional processing, global and/or local variables plus full cross referencing during processor run. Conditional processing means that processing of the source code is made conditional upon a particular parameter being true or false. If a condition is false then a certain section of the code will be ignored, if it is true then it will be processed. During processing a prompt will appear on the screen, the conditional may be entered at that time or alternatively it may be included in the source code prior to the conditional block of code.

Global or local variables are fairly self explanatory. A global variable is one that is effective throughout the program, a local variable, however, is a new concept and is extremely powerful in TBA. Essentially what it means is that you can use a variable only in a sub-routine. Its value or purpose is only relative to that procedure and upon leaving the subroutine the value or purpose is no longer of use. Although this feature is of particular importance again in making the program more readable, it does have additional advantages in that a local variable name can also be used as a global variable name and thus the number of variables is to some extent increased. Such a course is not particularly recommended though because it would probably depreciate the readability of the code rather than increase it. The point to remember is that local variables cannot be used to pass information to and from the main body of a program.

Before we describe the cross referencing feature mentioned above, we should lead you through the procedure of using TBA to process source files. The source file is what the user writes and contains all of the advantages mentioned above, the ability to use labels, no line numbers, and so on and so forth. When this code (source) has been composed it is processed by TBA. This is called as a normal CMD file and its first prompt is to ask the user to enter filespec of the source code program. When this has been done the user is asked to enter a name for the object file which will be the executable Basic program. After that the user is required to enter any switches or parameters that he requires during processing. There are a number of these by which the generation of the object code and its handling and listing, either on the VDU or the printer, can be controlled. For instance, a listing of the processed code and cross reference may be displayed on the screen. The cross reference is a reference between the label and its ultimate Basic line number.

In addition the line numbers in which that label is actually referenced are stated. In addition to this switch, however, switches enable the user to send a listing of the processed code and cross reference to the line printer, or to send no source code but only the object lines to either the printer or the display. Further alternatives allow the user to direct that no cross reference be done or that only the cross reference be shown.
Finally the user may define whether he requires full compression of the object code and whether or not he requires conversion of variable labels and directions to upper case.

It will be seen, therefore, that not only is TBA a structured language processor it is also one which allows the user the most easy and convenient method of use. TBA is available for LDOS systems only, as it uses some of the advanced features of LDOS in its compilation process.

This article first appeared in the MOLIMERX Software catalogue.



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