TRS8BIT

PRODUCED AT WWW.TRS-80.ORG.UK



HI EVERYONE, AND WELCOME TO THE START OF OUR 16TH YEAR OF PUBLICATION FOR ALL THINGS 'TANDY'.

AS THE CV-19 THREAT IS DIMINISHING, WE CAN HOPEFULLY LOOK FORWARD TO SOME FORM OF NORMALITY AND OF COURSE, THE 'TANDY ASSEMBLY' TO BE HELD IN SPRINGFIELD, OHIO, IN OCTOBER, THIS YEAR. FULL DETAILS ARE ON THE T.A. WEBSITE.

FIRST OFF, I'M PLEASED TO ANNOUNCE DETAILS OF THE **2022 COMPETITION**. ONCE AGAIN, THERE'S A CHOICE OF SOME FABULOUS PRIZES BEING OFFERED BY IAN MAVRIC. A FREHD OR HRG BOARD OR ANY OTHER ONE OF HIS PRODUCTS FOR THE MODEL I/III/4 (KYLE ACTUALLY TOOK A MODEL 3/4 RS232C SERIAL BOARD AS HIS PRIZE LAST YEAR), OR A COCO RE-FD502 FDC FOR COCO FANS IF THEY WIN.



ONCE AGAIN, I CAME ACROSS AN INTERESTING VIDEO ON YOUTUBE'S, NOELS RETRO LAB. IT'S A GIZMO, 'SVI-CAS'. IT'S FOR LOADING VIRTUAL CASSETTE FILES, VIA SD CARDS, ONTO CLASSIC COMPUTERS. IT'S NOT SPECIFICALLY FOR TRS-80 SYSTEMS, CURRENTLY, BUT DEVELOPMENT IS ON-GOING. FURTHER DETAILS ARE AVAILABLE AT -

https://www.youtube.com/c/NoelsRetroLab

I BELIEVE THERE ARE SUPPLY PROBLEMS OBTAINING PARTS AT THE MOMENT THOUGH.



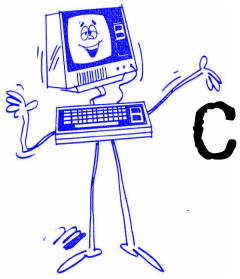
BY COINCIDENCE, THIS ISSUE HAS VARIOUS ARTICLE WHICH ARE CASSETTE RELATED.
IT'S NICE TO WELCOME THE RETURN OF KEVIN PARKER WITH HIS 'BIG TANDY' SERIES AND OF COURSE, MANY ARTICLES WITH A REAL ECLECTIC MIX OF ALL THINGS TANDY.

FULL DETAILS, AS ALWAYS, APPEAR ON PAGE 2

SO, UNTIL JUNE, PLEASE TAKE CARE AND STAY SAFE.

DUSTY





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VERSION 2.4.6 JUST RELEASED

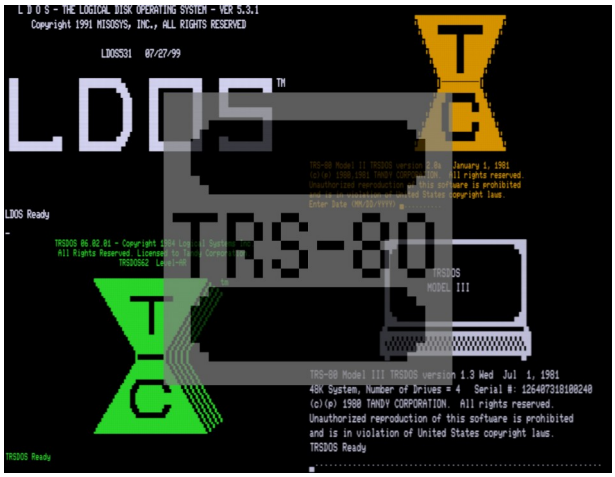
Don't have a TRS-80?

Crazy prices on eBay?

Tired of RIFA caps blowing?

Of floppies shedding oxide?

Or just plain dead chips?



Then what YOU need is trs80gp

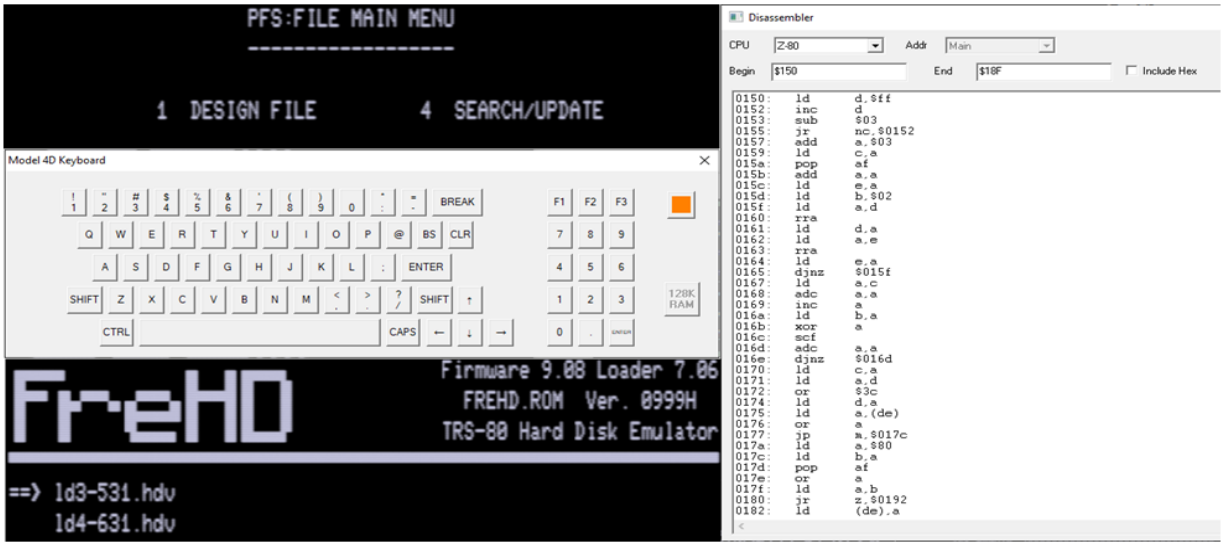
Runs on Windows, macOS, Linux & Raspberry Pi.
Emulates Model 1, 2, 3, 4, 12, 16, 6000,
DT-1 and Videotex.

Just like a real TRS-80 with NONE of the hassles. Built-in debugger and other features great for programmers.

Get it now at http://48k.ca/trs80gp.html

New version 2.4.6 just released featuring

FreHD autoboot and menu emulation for testing FreHD images
Model II TRSDOS-II RESTORE command works
PFS:File for Model 3 boots and can format diskettes
Disassembler window added



Bootstrap -
From cassette to disk

Jurgen Bussert

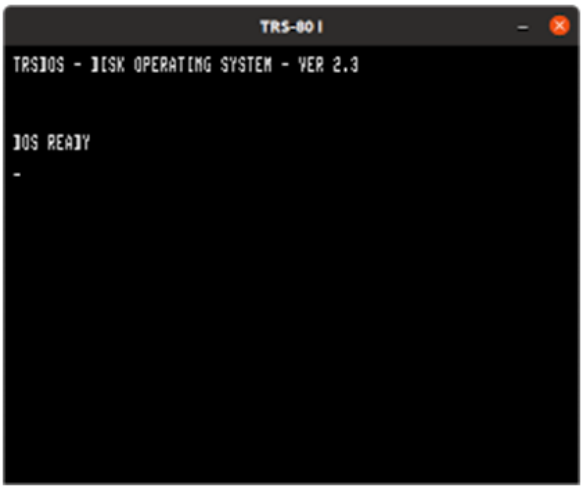


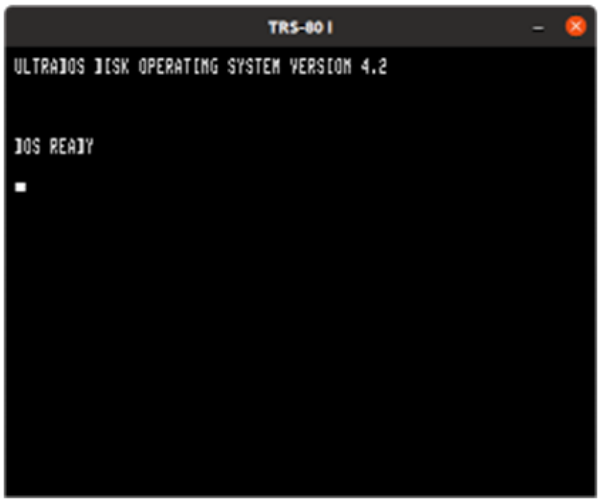











TRS-80 I
ULTRADOS DISK OPERATING SYSTEM VERSION 4.2
DOS READY


TRS-80 III
DOSPLUS - Model III Disk Operating System - 3.5B
(c)(p) Copyright 1983, Micro-Systems Software Inc.
DOSPLUS
Date: 85/89/21
DOS PLUS

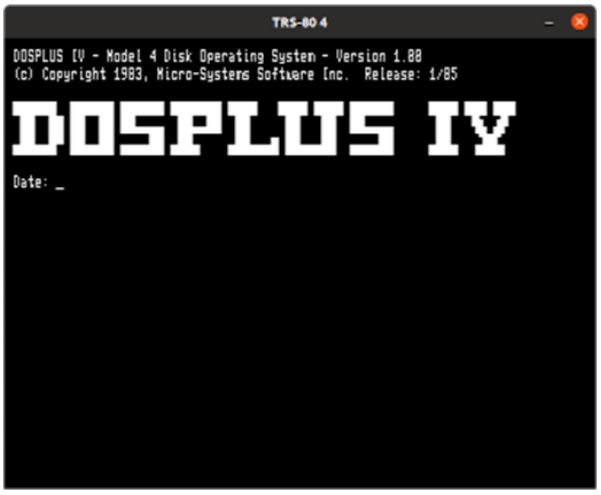

TRS-80 III
L D O S - The Logical Disk Operating System - Ver 5.3.1
Copyright 1991 MISOSYS, Inc., All rights reserved
LDOS-531 88/89/91
LDOS
Mon, May 10, 2021
Time ? 22:51:28
LDOS Ready


TRS-80 III
MULTIDOS tm Model III, Version 1.7
(c)(p) C.E.C. 1984
Cosmopolitan Elec. Corp.
Date - 85/89/21
MULTIDOS


TRS-80 III
NEWDOS/80 APPARAT, INC.
VERSION 2.8
MODEL III
85/88/21 18:35:54
NEWDOS/88 READY


TRS-80 III
NEWDOS/80 APPARAT, INC.
VERSION 2.5
MODEL III
85/89/21 87:17:14
NEWDOS/88 READY


TRS-80 III
TRSDOS
MODEL III
TRS-80 Model III TRSDOS version 1.3[Wed Sept 9, 1982
48K System, Number of Drives = 4 Serial #: 6
(c)(p) 1980 TANDY CORPORATION. All rights reserved.
Unauthorized reproduction of this software is prohibited
and is in violation of United States copyright laws.
Enter Date (MM/DD/YY)?


TRS-80 4
DOSPLUS IV - Model 4 Disk Operating System - Version 1.00
(c) Copyright 1983, Micro-Systems Software Inc. Release: 1/85
DOSPLUS IV
Date: _







This project was based on my need for a Model I NEWDOS/80 v2.0 Boot Disk. Since a Model I uses a data address mark (DAM) that regular floppy disk controllers on a PC cannot create, I wouldn't be able to use an old PC to make the disk from an image.

Today I know that 'SYSTEM 0 BN=Y' is enough to create such a floppy on a PC with a 5¼" drive, but that is a different story.

For those who need boot disks, but do not want to use this instruction, Ira Goldklang is offering a diskette request service on his TRS-80 site.

I began to think about whether it would be possible to create on a Model I using data from a cassette. As I got more experienced with the cassette functions I realized that the answer to that question is YES (for those with a minimum of 32K RAM)!

With intensive help of Amardeep Chana (Indiana / USA), I was able to extend my program to support Model III & 4 too.

The complete process to create the disk takes about 35 minutes. This <ZIP archive> contains WAV files to permit you to create a Model I, III & 4 boot disk from cassette! The first WAV file is the bootstrap program and the other WAV files are different DOS's which are available for use with the bootstrap program. Since an entire floppy disk cannot fit into the 32K of RAM present in a Model I, the floppy disk was divided into tracks.

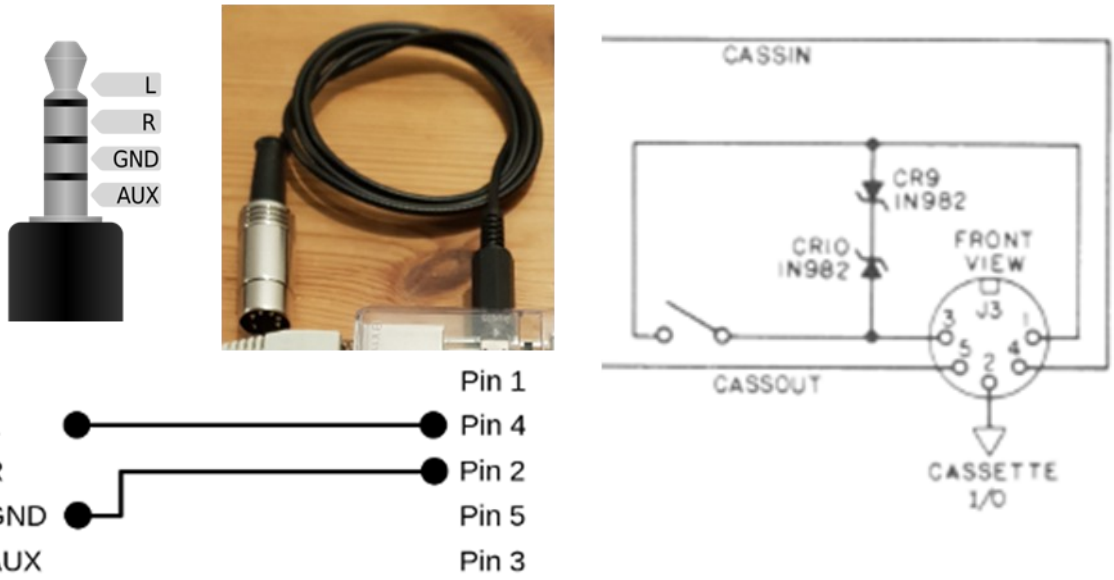
The first step is to protect the RAM which will hold the track data. To do so, set the MEMORY SIZE to 40000.

The next step is to set up the TRS-80 so that it can load data from a WAV file. There are a number of ways to this.

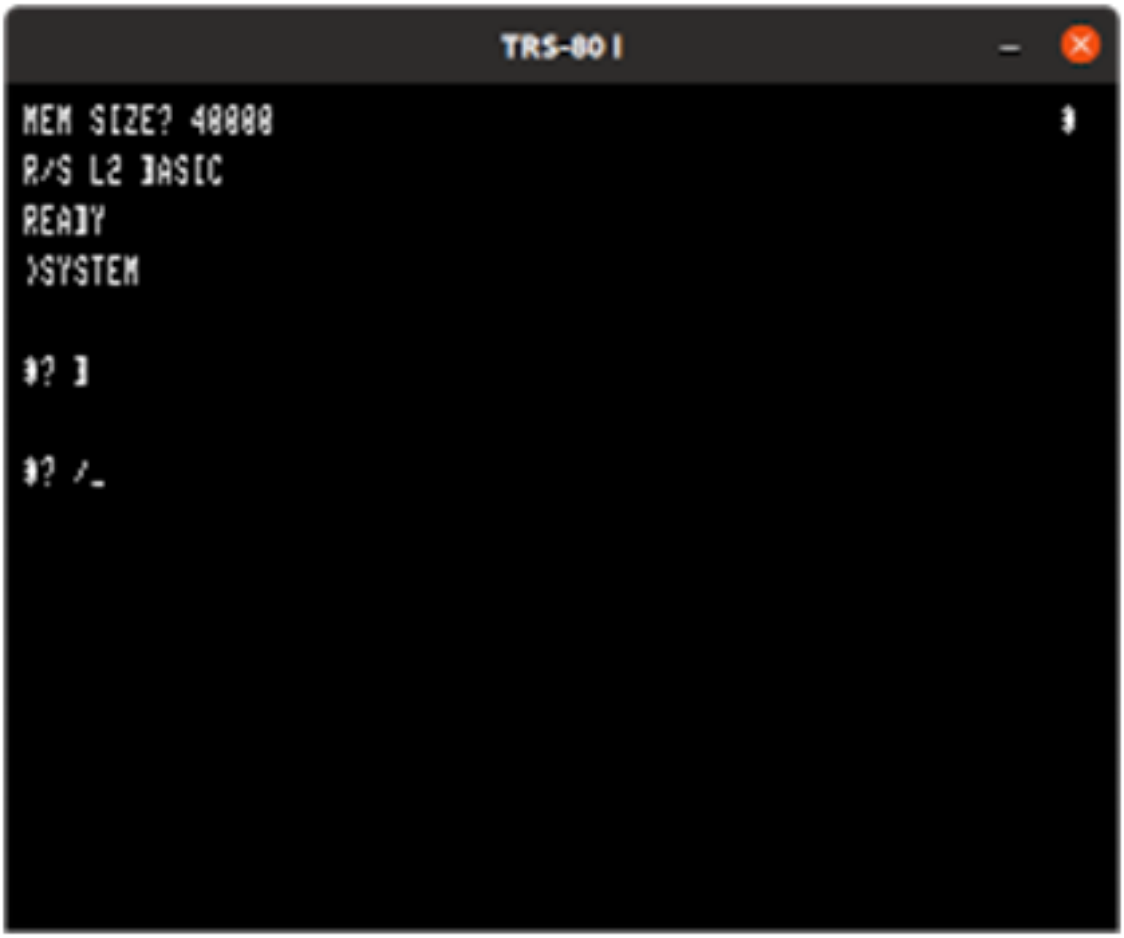
1.
You could plug a cassette recorder (make sure it is mono and not stereo) LINE IN into your PC's LINE OUT and use any WAV playing program to send the two WAV files through the LINE OUT to the tape player. Volume is key and it may take many tries to get everything correct.

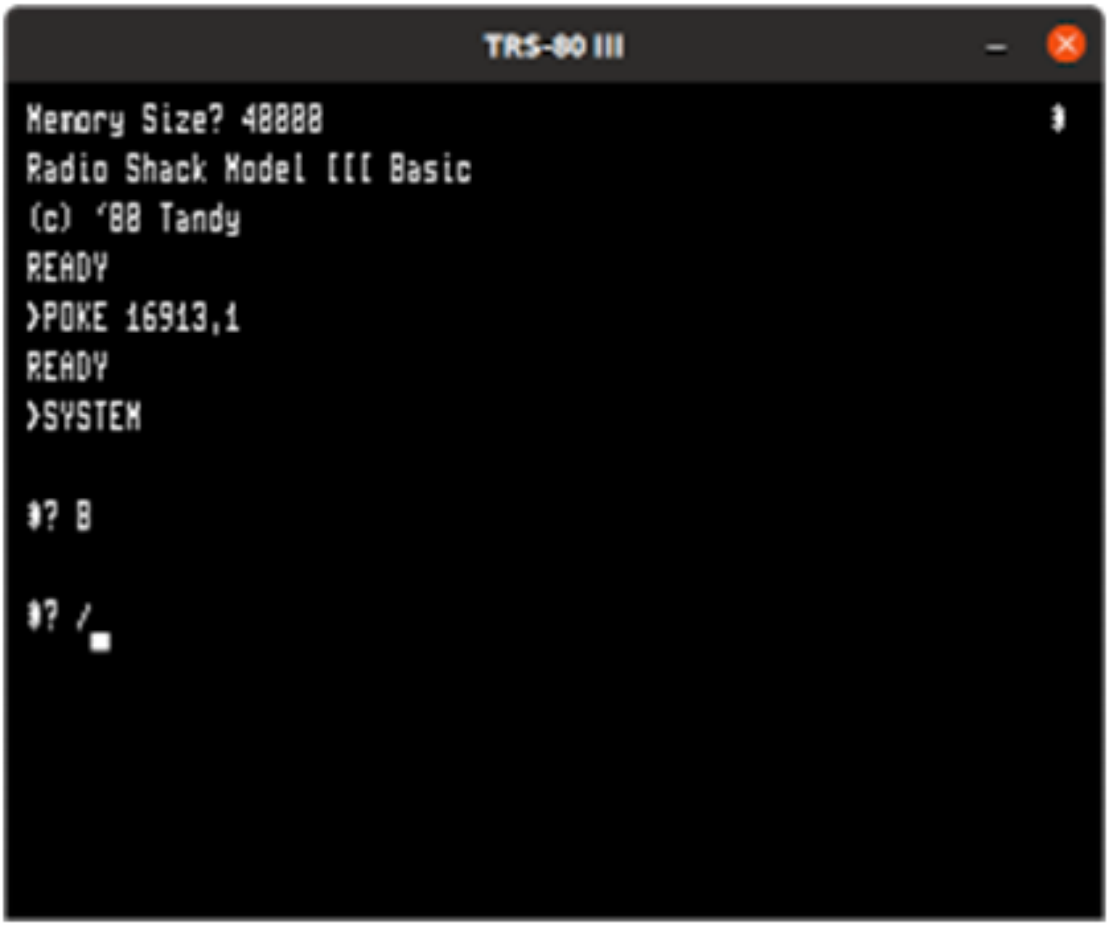
2.
Use a utility called PLAYCAS. PLAYCAS (http://knut.one/PlayCAS.htm) allows you to use your PC as a cassette player for your TRS-80 by connecting your TRS-80 cassette input ('Ear' Output) into the PC's headphones output. This <ZIP archive> contains several CAS files. One is the bootstrap program and the others are some DOS versions.

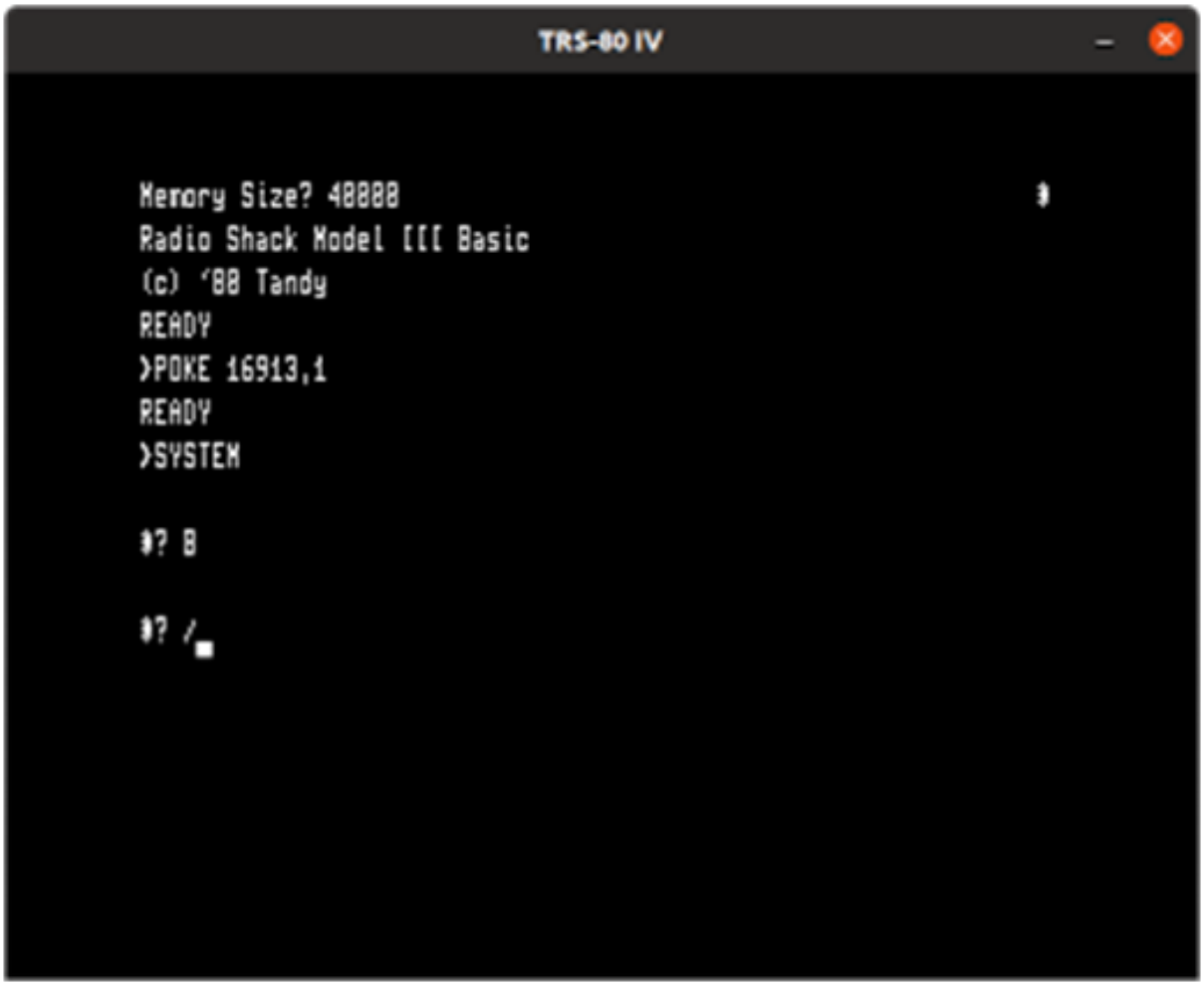
3.
use a Linux system like a Raspberry Pi
You need one cable and three commands.




```
amixer sset Headphone 100% aplay bootstrap.v7.5.500.wav
aplay "Model I - LDOS 5.3.1 (2012).500.wav"
```


TRS-80 I
MEM SIZE? 40000
R/S L2 BASIC
READY
>SYSTEM
*? B
*? /_


TRS-80 III
Memory Size? 48000
Radio Shack Model III Basic
(c) '80 Tandy
READY
>POKE 16913,1
READY
>SYSTEM
*? B
*? /



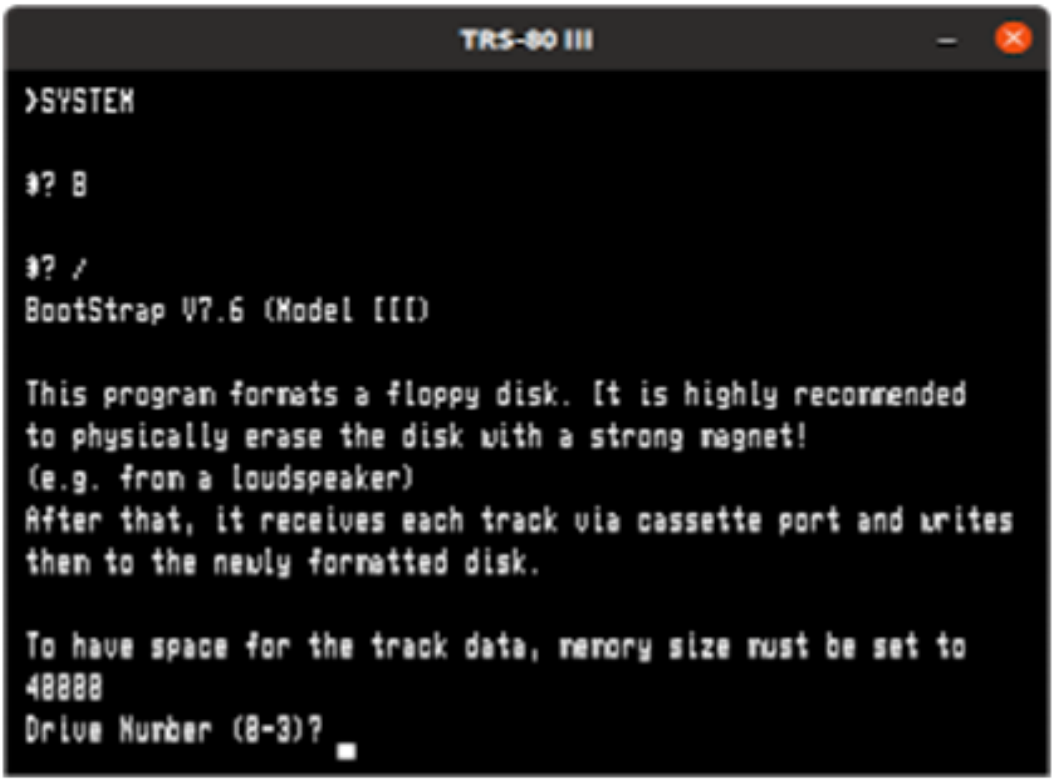
Once you have set the MEMORY SIZE and set up your Model I so that it can load the WAV file. For those using a Model III & 4, the data-rate should be set to high (1500 Baud). One can use this command 'POKE 16913,1' The next step is to type in SYSTEM from the READY prompt. At the first '*?' prompt, type 'B' and hit enter. There should be 2 stars in the upper right hand corner of the screen, with one of the two flashing periodically. If one of the stars changes to 'C', there was an error and you will need to try again.

If you do not get a 'C' and then another '*?' prompt shows up, you need to prepare the system for the next WAV file. If you put them back to back on the same cassette, then it is all ready. If you are using PlayCAS or an emulator such as XTRS, you need to load the second CAS file so it is ready to go.

Once the data WAV file is ready, respond to the second '*?' prompt by typing type / and hitting enter. You should see 'Bootstrap v7.5' appearing on the screen.

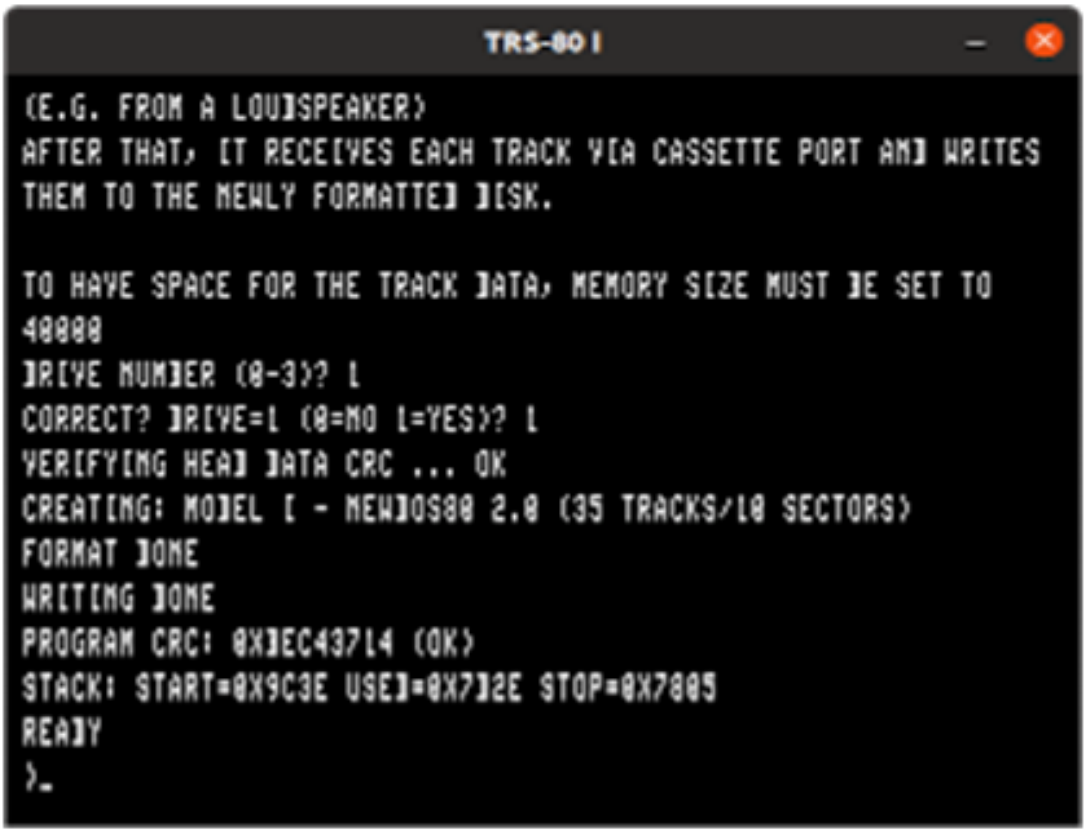
As the Model 4 starts with the Model III BASIC ROM, the screen is identical.

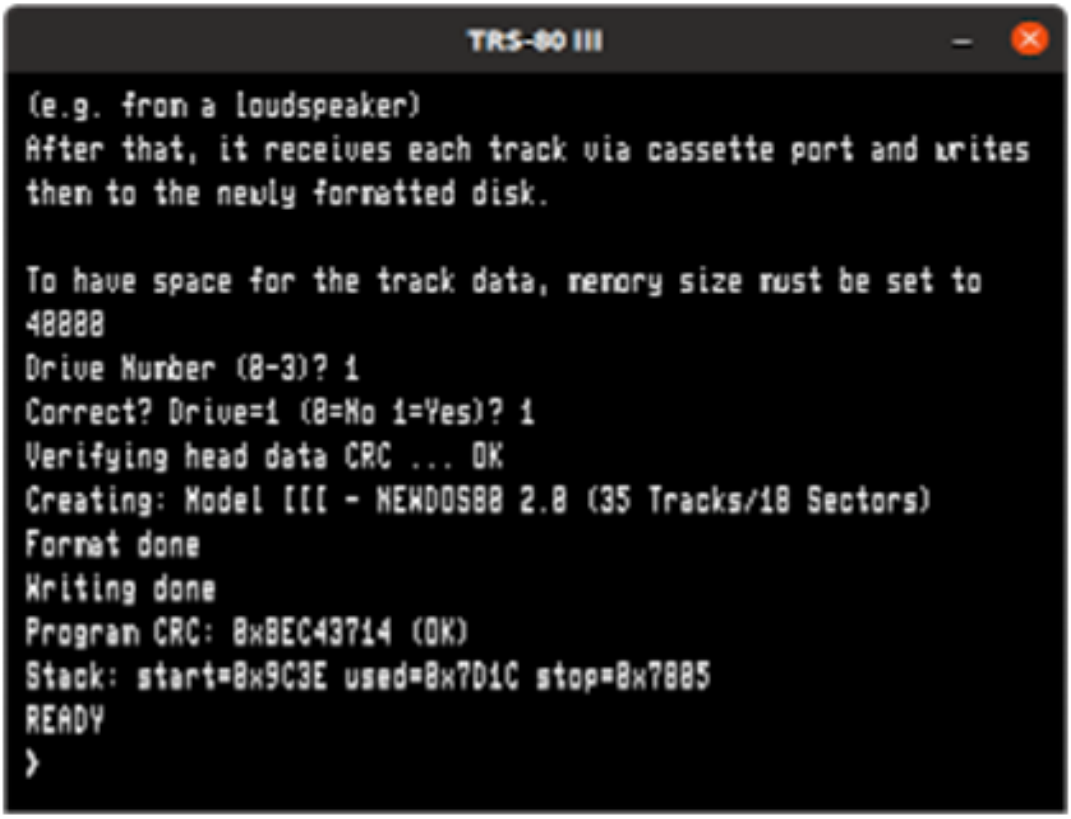




Now is the time to be very patient ... for about 35 minutes ... with a Model III & 4 even more, as the floppies contain more data.

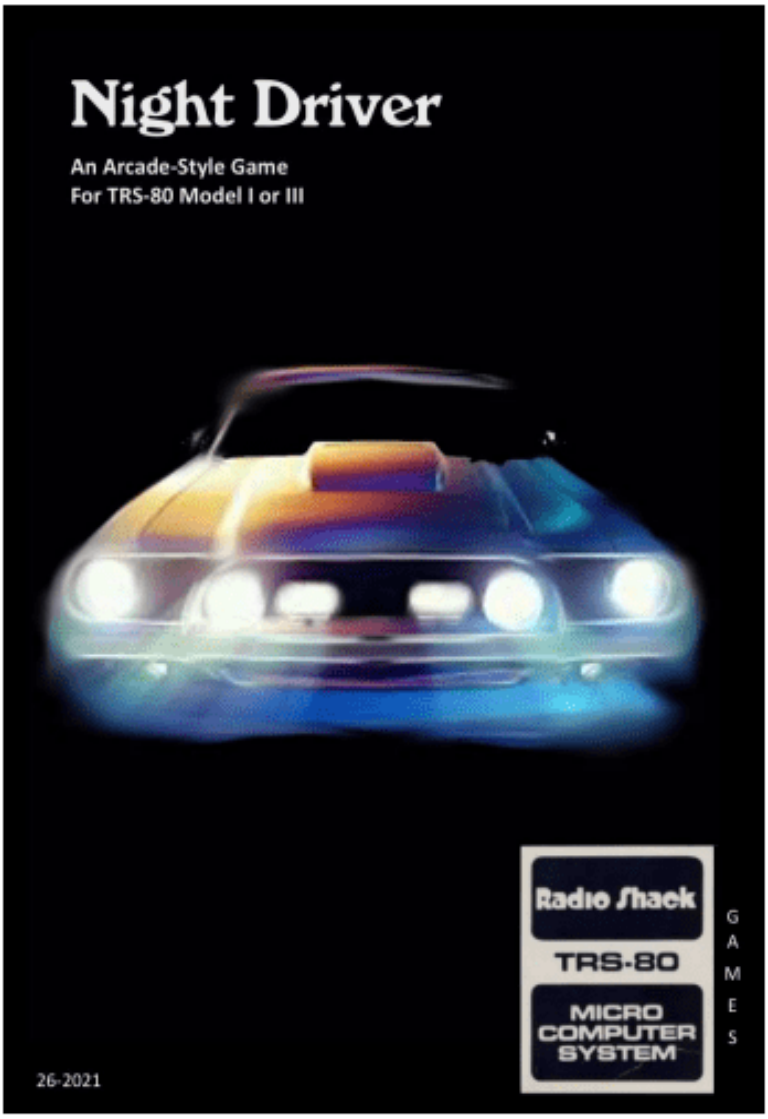
If all goes well, you will have a boot disk.



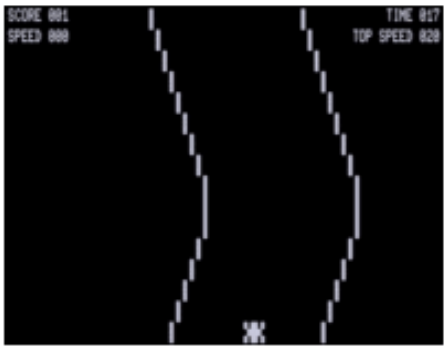


This is what the screen will show when everything went well. Now just reboot the system, this time from the new floppy disk.

Have fun!











Winner of the 2021 TRS8BIT Programming Competition



Night Driver is a fast-action arcade style game for the TRS-80 Model I, III, or 4

The road stretches before you like a black ribbon. You are relieved that the sun's angry face has given way to the welcome darkness. Tonight's mission is simple: Prove that you have what it takes to drive with speed and accuracy.

Features include:

- 100% assembly language for fast-action and graphics
- Sound effects
- Runs on real or emulated hardware (trs80gp recommended)
- Joystick support (NEWKEY/80 recommended)
- Available for **free** at www.plaidvest.com

Brought to you by: Kyle Wadsten www.plaidvest.com
Home of NEWKEY/80
and NEWPRINT/Multi

Character 'Toggle Boggle'

George Phillips

40 years ago I'd just got a brand new Model III home. Having skimmed the manual what caught my eye were the new characters available at positions 192 through 255. So many possibilities! I immediately wrote a test program to look at them myself:

```
10 FOR I=192 TO 255:PRINT CHR$(I);:NEXT
```

To my surprise nothing was printed out. In fact, the screen just scrolled away. Glancing back at the manual I discovered that by default characters 192 through 255 are "space compression codes" in BASIC. Each one prints X – 192 spaces. But you can turn them off by printing character 21. Adding a single line fixed my program:

```
5 PRINT CHR$(21)
10 FOR I=192 TO 255:PRINT CHR$(I);:NEXT
```

And I saw:



I was suitably impressed but then I ran the program again and got nothing but spaces. Reading more closely it turns out that character 21 toggles between the space compression codes and the special characters.

That wouldn't have been so bad, but there's no way to tell what mode BASIC is in. How could you guarantee your program will output card suits, Greek and space ships? The manual suggested calling a machine language routine called $INITIO. Messy. I later learned of a location to POKE to set the mode. Inelegant. Yet I never found a better way … until now.

Contemplating the problem recently I realized that BASIC could indirectly detect whether space compression codes are on or off. Printing an ordinary character will move the cursor one position and, except for character 193, a space compression code will move the cursor differently.

Thus by checking the cursor column with POS(0) before and after printing one of the special graphics characters we can decide whether or not to toggle space compression codes.

```
10 A=POS(0):PRINT CHR$(192);:IF A<>POS(0) THEN PRINT CHR$(21);
```

There's a more clever solution:

```
10 CLS:PRINT CHR$(213)CHR$(POS(0))CHR$(8)
```

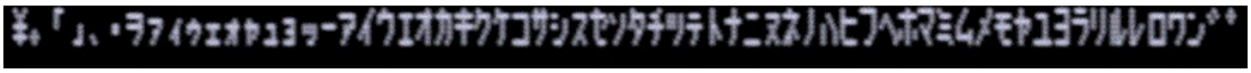
The CLS is needed to ensure we're in column 0. If space compression codes are on then character 213 will print 21 spaces and so POS(0) will be 21 and thus character 21 is printed switching off space compression.

If space compression is off a ξ is printed, character 1 is printed (no output) and the backspace at the end erases it. Either way BASIC ends up with space compression turned off.

In these extravagant modern times I even have a Model 4 and its disk BASIC has the same problem. The second solution doesn't work there because POS(0) in the first column returns 1 instead of 0. Fortunately it's easy to change the code to be portable across both versions of BASIC (and serve as an example of BASIC's fixed evaluation order):

```
10 CLS:PRINT CHR$(213-POS(0))CHR$(POS(0))CHR$(8)
```

And while we're at it there is another character set toggle. Character 22 will switch between the default characters for 192 to 255 and the Japanese character set.



Without resorting to PEEK's, BASIC has no way of detecting this mode. As luck would have it, the hardware can be queried. Here's how to ensure the default character set on a Model III and Model 4:

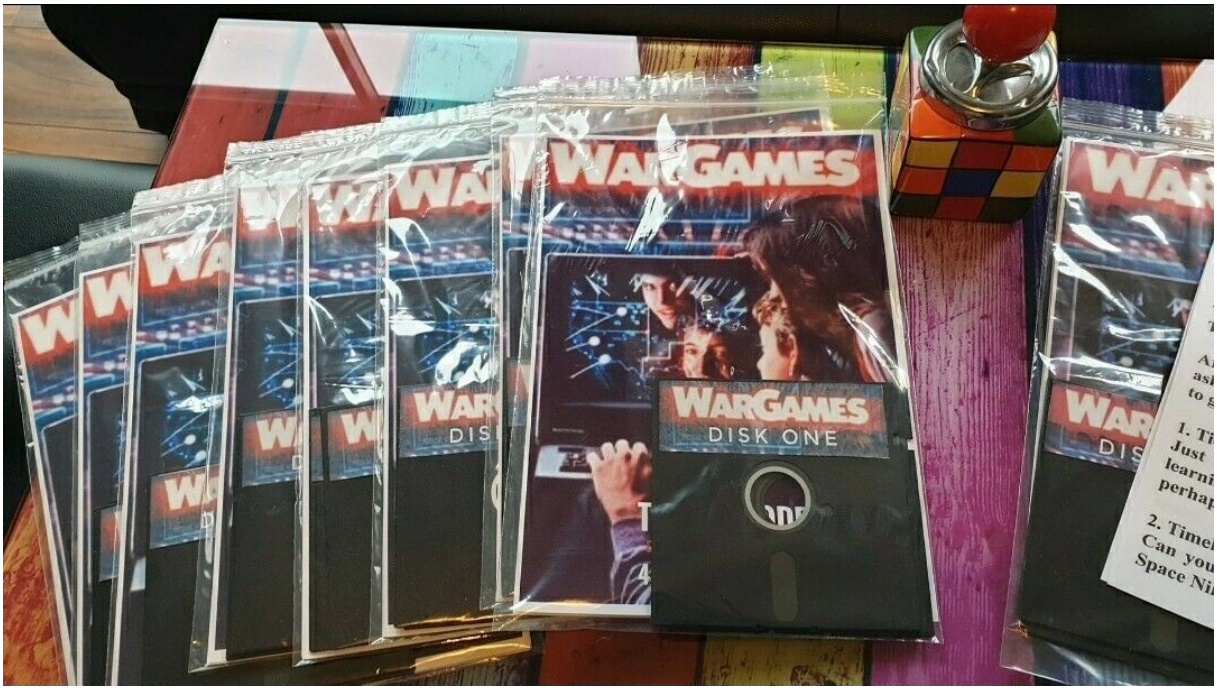
```
10 PRINT CHR$(22+(INP(255) AND 8))
```

And to ensure the Japanese character set:

```
10 PRINT CHR$(30-(INP(255) AND 8))
```

It could be argued that reading from an I/O port is just as intrusive as a PEEK or POKE. I still think it is better as the peek addresses would be different between Model III and Model 4 disk BASIC.
Also, I have no idea what the relevant memory location is for Model 4 disk BASIC.

While solving 40 year old problems is a reward in itself, I do hope this little trick finds some use in modern programs. Keep on BASICing.



All new from Dreamland Software for 2021.

This two disk package comprises what is in effect the FULL Dreamland Software collection.

Based on the classic 80's film 'Wargames', your entire experience is controlled by the W.O.P.R computer from the aforementioned movie.

Greetings Professor Falken.

New titles including (of course) Global Thermonuclear War. (Ouch.)
Retro Football Manager. (Based on the ORIGINAL 80's classic, a full soccer management simulation.)
The Battle of the Mutara Nebula. (If you are a Star Trek fan, then you know FULL WELL what this is.)
And the Kobayashi Maru Scenario. (Another one for the Trekkers.)

Also included, are **ALL** games released by Dreamland Software since inception four years ago.

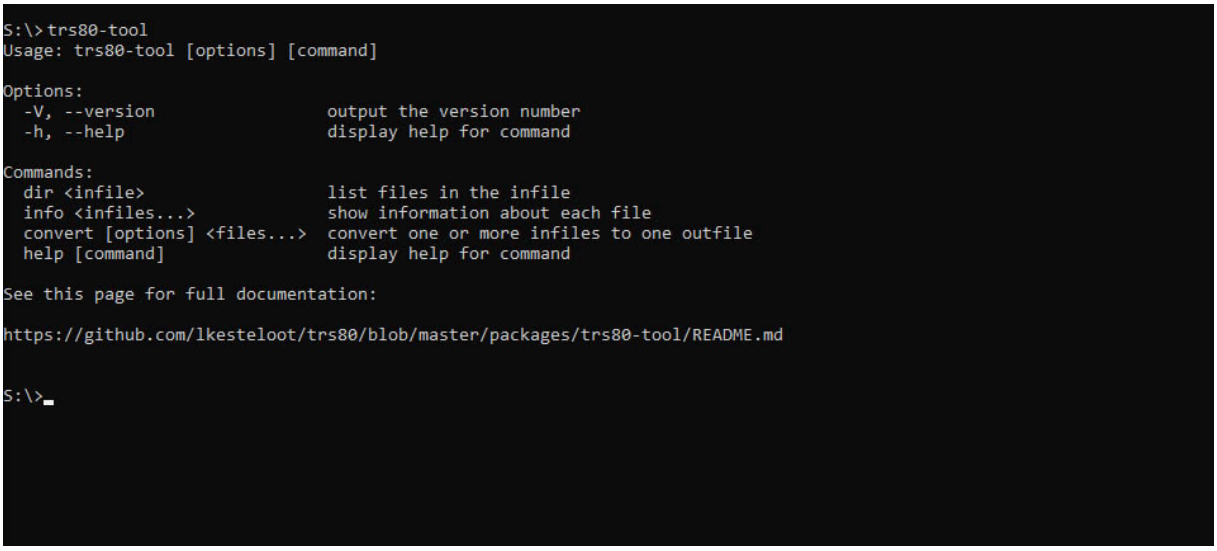
The hugely successful Actual Reality. It's sequel Actual Reality II - Battlestar Raven And RockStar.

14 Programs in total (Including the W.O.P.R Master Program.)
Both disks full to capacity whilst remaining bootable.

Full video preview available here:
https://youtu.be/XXD1IG8-CO0

Please note that this item is currently available for Model One ONLY.
Model Three/Four will be available soon. (Watch for update.)

Lawrence Kesteloot has rewritten, his TRS-80 Cassette command line tool to support many new functions. Called "TRS80-TOOL" it is a command-line tool for manipulating TRS-80 files.



Lawrence Kesteloot has updated his "TRS80-TOOL" to v2.3.1

It runs under NODEJ, Linux, macOS, and Windows. It can be downloaded from Lawrence's site or locally from the The Virtual Tape Utilities page on this site.

The new version adds support for multi-file CAS files (such as CLOAD Magazine or Temple of Apshai) and will try to guess (and set, if you want) the starting address of a SYSTEM file.

The main page for TRS80-TOOL can be found at

https://github.com/lkesteloot/trs80/tree/master/packages/trs80-tool

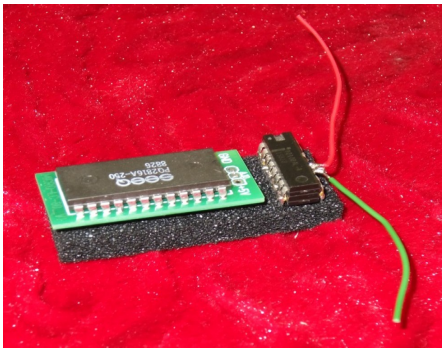
along with instructions.

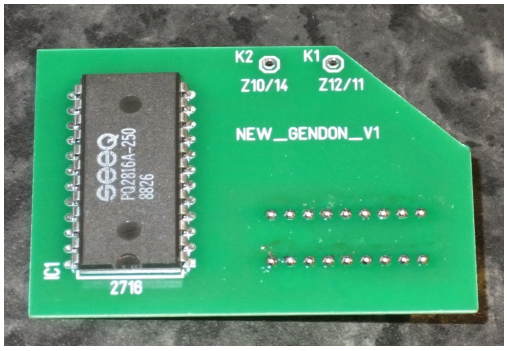
It runs under NODEJ, Linux, macOS, and Windows. It can be downloaded from Lawrence's site, the The Virtual Tape Utilities page on this site or right here for Windows / Linux / Mac.

ADVERTISEMENT

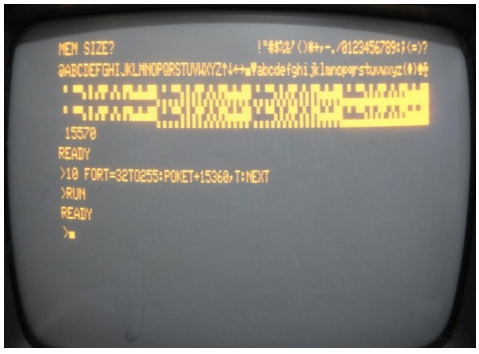
WANT LOWERCASE?
got lowercase!

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

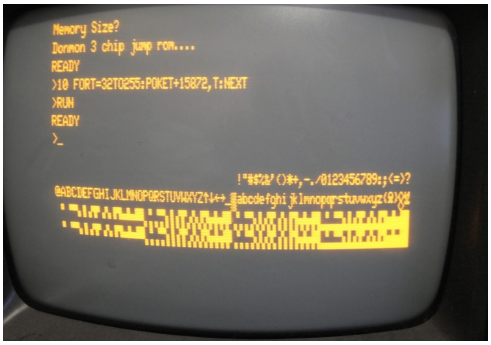




Single line descenders



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



HI DUSTY.
I HOPE YOUR CHRISTMAS WENT OK! WHILE WE WERE SAT AT HOME BEING ATTACKED BY CV-19 OVER THE HOLIDAY, I THOUGHT, FOR A CHANGE I STARTED THINKING ABOUT PLAYING CARD SHUFFLING. WE HAD PLAYED '21' OR PONTOON (BLACKJACK IN THE STATES), OVER THE XMAS BREAK AND THAT SORT OF SET ME THINKING. JUST HOW EASY WOULD IT BE ON A STANDARD M1, 16K LEVEL 2 MACHINE TO SHUFFLE A DECK OF 52 PLAYING CARDS USING BASIC, **QUICKLY**. (OR REASONABLY QUICKLY FOR A M1).

TO SPEED THINGS UP, AS BASIC CAN BE A LIMITING FACTOR, I STARTED WITH A SORTED SEQUENCE OF 52 NUMBERS IN AN ARRAY AND LITERALLY SHUFFLED IT. THIS WAS DONE BY GENERATING A RANDOM NUMBER BETWEEN 1 AND THE TOTAL NUMBER OF OBJECTS TO BE SHUFFLED (I.E. 52 IN THIS CASE). THEN COMES THE KEY STEP IN THIS ALGORITHM WHICH, ORIGINALLY, DAVID BORGER PLAYED WITH, IN ONE OF THE PUBLICATIONS, BACK IN THE EARLY 1980'S.

```
0 RANDOM:CLS:DEFINTA-Z:N=52:DIMA(N):FORI=1TON:A(I)=I:NEXT:FORI=N
TO2STEP-1:R=RND(I):T=A(I):A(I)=A(R):A(R)=T:NEXT:FORI=1TON:PRINTA
(I);:NEXT:PRINT
```

```
 6  47  3  5  23  30  15  18  7  19  37  8  51  29  38  42  28
 45  22  32  50  52  36  11  40  43  13  9  46  2  31  48  33
 41  17  49  14  35  24  26  10  1  20  39  34  12  25  16  44
 4  27  21
```

THE VALUE IN THE ARRAY POSITION GIVEN BY THAT RANDOM NUMBER IS EXCHANGED WITH THE VALUE IN THE LAST POSITION. NEXT, THE MAXIMUM NUMBER OF 'CARDS' IS DECREMENTED BY 1 AND THE PROCESS IS REPEATED UNTIL THIS MAXIMUM EQUALS 1.

I WAS QUITE SURPRISED WITH THE SPEED OF THE PROGRAM. HAVING IT AS A ONE-LINER MUST HAVE HELPED SOMEWHAT, BUT THE AVERAGE TIME REQUIRED TO SHUFFLE 52 NUMBERS, RANDOMLY, WAS, USUALLY, LESS THAN 3 SECONDS. NOT TOO BAD FOR A M1 16K WITH L2 BASIC.

ANYWAY, AS PER USUAL, I GOT TO THINKING AND .....



REMEMBER, WHEN WE WERE AT SCHOOL, YOU WERE WORKING IN 'NELLY'S ORIGINAL BINGO' (IN MABO.) DURING THE SCHOOL HOLIDAYS? WELL, I JUST COULDN'T RESIST TURNING THE 'SHUFFLE' PROGRAM IN TO A BINGO CALLERS' BEST FRIEND! (AND STILL MANAGING TO KEEP IT AS A ONE-LINER TOO!)

SO, DUSTY, AS TRS8BIT STARTS ITS 16TH YEAR, JUST FOR YOU, HERE IT IS ...

```
0 RANDOM:CLS:DEFINTA-Y:Z$="RYBWG":N=75:DIMA(N):FORI=1TON:A(I)=I:
NEXT:FORI=NTO2STEP-1:R=RND(I):T=A(I):A(I)=A(R):A(R)=T:NEXT:FORI=
1TON:B=-(A(I)>=1)*-((A(I)>=1)+(A(I)>=16)+(A(I)>=31)+(A(I)>=46)+(
A(I)>=61)):PRINTMID$(Z$,B,1);A(I);:INPUTA$:NEXT
```

```
G 63 ?
W 53 ?
B 37 ?
R 6 ?
Y 25 ? _
```

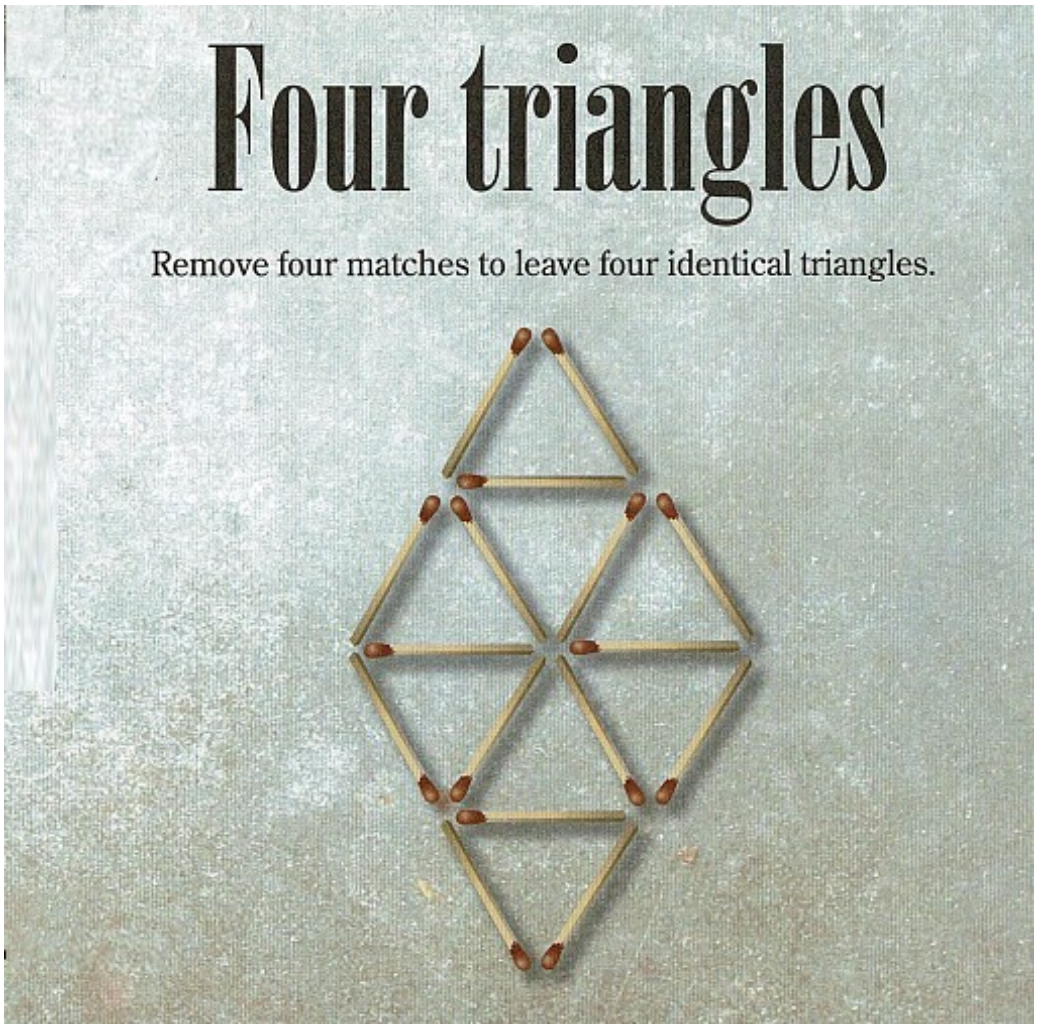
JUST IN CASE YOU'RE NEW TO 'PRIZE BINGO'. THERE WERE 15 NUMBERS IN EACH OF 5 COLOURS, RED, YELLOW, BLUE, WHITE & GREEN. (RED 1-15, YELLOW 16-30 ETC.) YOU PAID YOUR 6D FOR 1 OR 9D FOR 2 SQUARE CARDS WITH 25 NUMBERS ON (5X5), THE CENTRE NUMBER BEING 'FREE'. WHEN A NUMBER WAS CALLED OUT, EXAMPLE, GREEN 63, YOU COVERED THAT NUMBER, WITH A COUNTER, IF IT WAS ON YOUR CARD. TO WIN YOU NEEDED ANY STRAIGHT LINE OF 5, IN ANY DIRECTION, OR THE 4 CORNER NUMBERS!



HTTPS://WWW.YOUTUBE.COM/WATCH?V=ZE3NMXTLGJK

STRETCH YOUR MIND

HAROLD FINCH



THE ANSWER IS ON PAGE 71

Thirsting for adventure?
Brass lantern getting dusty?



Take your Model 4/4p* on exciting new adventures never available until now....

M4ZVM enables your TRS-80 Model 4 to play Infocom and post-Infocom adventures, taking full avdantage of your hardware. Supports old favourites like Zork and Seastalker (including Sonarscope), as well as new-to-Model-4 games including Trinity, Border Zone and Sherlock, plus hundreds more available in the Interactive Fiction archive.



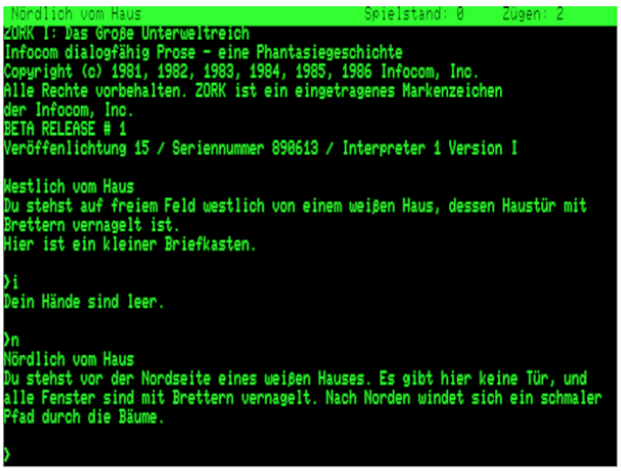
M4ZVM is available for download from https://gitlab.com/sijnstral/m4zvm (includes feature details and source)

*128K minimum

Actual Screenshots of games new to the model 4, running M4ZVM (on trs80gp)



Beyond Zork



Zork 1 (German)

M4ZVM features include:
* z1-z8 game execution (z6 support is experimental)
* named game save/load
* accented characters
* 128K memory or more
* Optionaly set the infamous "Tandy bit"

The Quest for more Adventure:
A TRS-80 Model 4 Infocom Interpreter porting project

Shawn Sijnstra

This is the story of how I handcrafted 16K of compiled z80 assembler into something that adds many hundreds of games to the TRS-80 Model 4 Library. I'll set off with some context of the what - the range of games called text adventures and their history, then the why - as a TRS-80 enthusiast are they important, and finally the how - the journey to get from zero to working. The story of getting the code from working to optimised and full featured is for another time.

I will assume you are somewhat familiar with text adventures - those games where you type in the instructions for what you as the lead character would do in the current situations. These instructions would typically include things such as "lift box" "close trapdoor" "take inventory" or "go north". Two of the major players in adventures - Scott Adams as well as Infocom, got their personal computing commercial start on the TRS-80 Model 1. Scott Adams is credited as writing the first text adventure for personal computers ever on the humble Model 1, founding Adventure International and releasing numerous adventures structured in the <verb> <noun> format described above.

Infocom took a different approach. Inspired by Colossal Cave Adventure, they took it to the next level and became famous for their highly polished adventures, including large vocabularies and natural language interaction, atmospheric descriptions, and more detailed interactions with other in-game characters. This took the adventure world from puzzle solving text adventures into a much more immersive experience, allowing a mixture of puzzles alongside a narrative driven approach. This lead to them preferring the more emotive terminology: Interactive Fiction, which incidentally was coined earlier by Robert Lafore for his choose-your-own-adventure style games published under Adventure International. See below for a brief example of the flexibility in how Infocom games can be played. Further examples of the language processing ability can be found at https://www.ifwiki.org/Infocom-type_parser

```
On the Ramp                                                    0/6
Zaphod Beeblebrox is admiring himself.
Trillian is looking at you with pity.

You see a green frob and a red frob here.

>get frob then give it to trillian
[Which frob do you mean, the green frob or the red frob?]

>red
You are now holding the red frob.

Politely, Trillian refuses your offer.

>i then remove dressing gown. i
You are holding the red frob, a babel fish (actually, wearing it), your gown
(actually, wearing it), a toothbrush and a flathead screwdriver.

Okay, you are no longer wearing it.

You are holding your gown, the red frob, the babel fish (actually, wearing it),
the toothbrush and the flathead screwdriver.

>
```

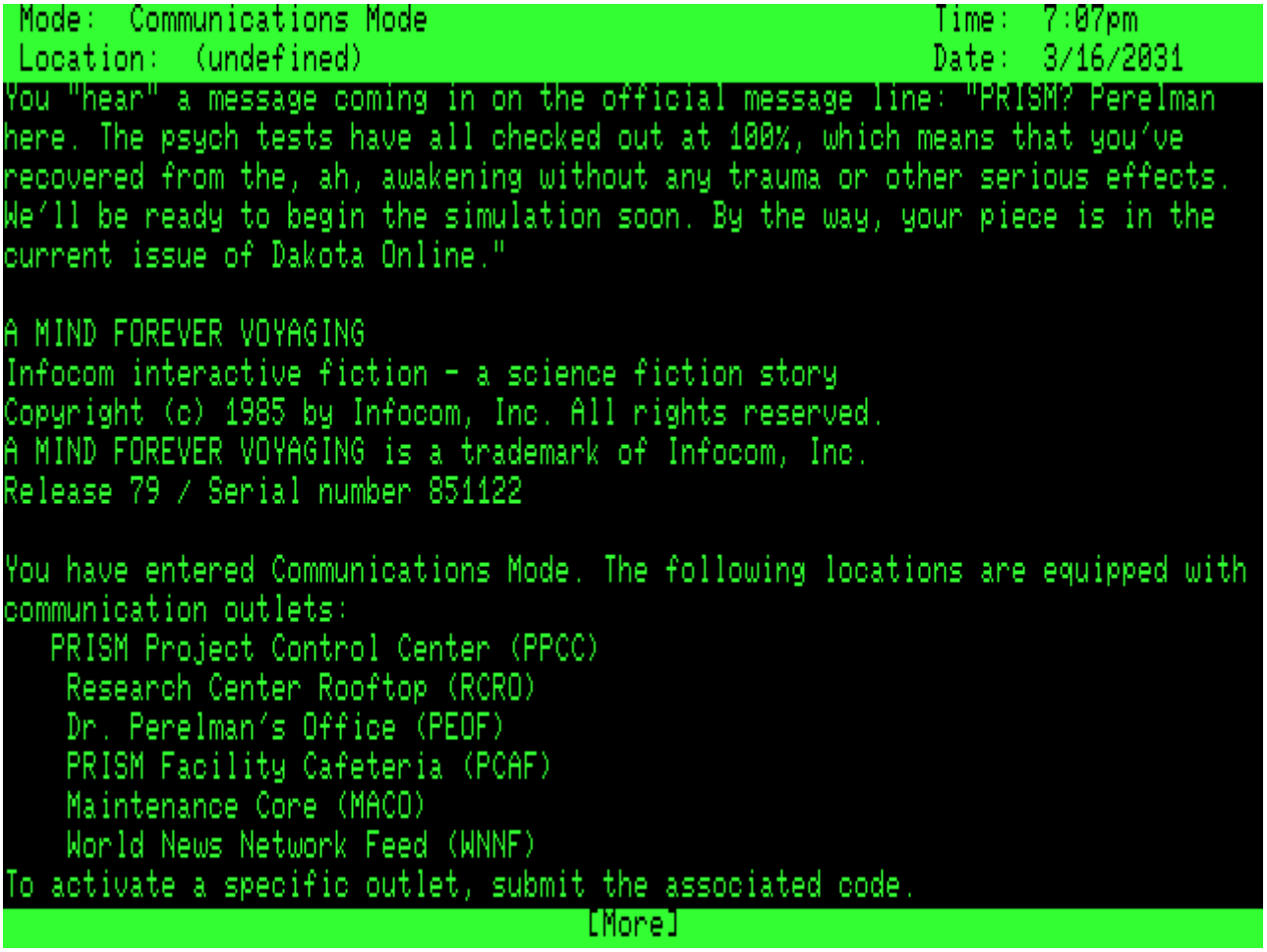
How are the TRS-80 and Infocom related?

The Model 1 was the first release of infocom adventures outside of the PDP10 & PDP11. Instead of using Fortran like Colossal Caves, or BASIC or Assembler like so many other adventure makers, they opted for a purpose designed language that could be compiled and stored in a story file as "byte code". This compiled format enabled portability across a range of machines. For each platform, the interpreter was built specifically for that platform to execute the common compiled story file from a combination of memory and disk paging of the story file instructions; defining a form of virtual machine to run the bytecode. The TRS-80 model 1 was the first personal computer release of Zork 1, an 81KB story file requiring only a 32KB machine, proving their concept worked well. Their next stop was the Apple II, taking advantage of the already written story, with more games and interpreters multiplying the benefits of their approach. It worked so well that by their peak, they were the biggest publisher of adventure games and dominated the overall game sales market.

The first autoboot model 1 disk was built in the first iteration of their compiled language, which is now referred to as a "z1" story file. By the time Infocom were commercially successful with games like Zork I/II/III, Wishbringer, Sorcerer, Enchanter and others, they were using the 3rd version of their data file format, which you will see called z3. As z3 was the most dominant across the predominant 8 bit computer scene, you'll see a lot of z3 interpreters for many platforms, including for the model I, III and 4. Particularly for model I and III users, this particular set of games are the ones that spring to mind when people say Infocom. Note that the model 4 interpreter at the time was a 3rd party product, and didn't quite support the full screen width - only 79 characters across which is close enough and simplified the coding to work around unwanted scrolling. You can see a lot of story files available in z3 format in the Interactive Fiction archive https://www.ifarchive.org/, including new ones fuelled by the rise in retro computing and availability of modern interpreter libraries like PunyInform that are designed for efficiency on 8 bit systems.

One particular quirk that ties in Tandy and Infocom history is that you'll notice if you ask for the version of a game on the official model 4 or CoCo interpreter, part of the copyright block will (usually) say "Licensed to Tandy Corporation". Further to this, one particular game "Witness" toned down a lot of language on the Tandy version - an interesting example of censorship. As it turns out, the exact same story file was used on all platforms, but a feature was built into the Tandy interpreters to enable the copyright text and change messages. The Tandy interpreter would set a data bit in the header of the z3 story file that was loaded in memory only (leaving the game file unaltered), which would have been checked by the running story file within it's code. As the game ran, it could query the bit and adjust the text accordingly. This controversial feature is often referred to as the infamous Tandy bit.

So what happened next? Well, Infocom wanted to make larger and richer games, and to do so had to make a few changes. z3 files were limited to 128K in size -and even though the format includes a small amount of text compression - this was still too small for more ambitious games they wanted to produce. On top of wanting more space, they needed more flexibility in how routines worked, how input and output worked, as well as more flexibility allowing the game itself to control the status line. For story files up to z3, the interpreter had 2 fixed options on how to handle the status line - either a score and moves based status line or a time based status line, implemented by the interpreter. This change was made in z4, allowing for new concepts in game play. As an example, you can see in the screenshot for A Mind Forever Voyaging that the game has moved away from the standard format.



With these extensive changes to the story file format, it follows that the interpreter also needed changing. All of the z4 games that came next - Trinity, Nord and Bert, Bureaucracy, and A Mind Forever Voyaging, were in need of a new interpreter to support the new opcodes.
That product never eventuated for the Model 4 - let alone I or III. At the time I found this to be both surprising and disappointing. I was wondering why couldn't a text adventure just run on a predominantly text computer? Surely it couldn't be that hard? Fast forward some decades and I can see why they would have chosen to give it a miss, but that wasn't going to stop me.

As Infocom's success grew, so did their desire for introducing further features for improving text and quasi-graphics (line/box drawing), making the changes into their z5 ZIL specifications requiring another interpreter change. Next stop after that was z6 which continued the quest for new features on newer computers by adding graphics and mouse interactions.
From here, Activision took over, and at this point very few games were written for the platform under the Infocom banner. The brand was retired after text struggled to compete with the new world of graphics.

The quality of their Interactive Fiction games across a wide range of platforms lead to a considerable fan base. Once the multi-platform Interactive Fiction system was abandoned by Activision, it was thoroughly dissected and reconstructed. Most famously Graham Nelson created the new design system for creating new games on the same platform, known as "Inform", with a great development environment and excellent documentation. This "post-infocom era" also included extending the available standards. Widely adopted new standards include the z7 and z8 formats, which take the z5 specifications with expanded addressing to allow for larger games (up to 512K), along with a few other tweaks. Platforms for playing these story files are known as "z-machine interpreters", continuing the nod to Zork and ZIL. Beyond z8 it gets a little too intensive for 8 bits, but with all of these tools available, many hundreds of new games have been authored in z2-z8.

That's enough history and context for now. So the next question - why did I do this project now? As it happens, high quality commercial and free new games are still being written in these formats, making this a great way to keep the TRS-80s topped up with new software. One particular recent game, Office Goose, brought back all the memories about how I thought Infocom should have kept going with TRS-80s, and that I really wanted these to work on my old 8 bit systems. To make it real, this time for sure, I set about creating the environment to be able to do the development. There were a couple of things I needed to do this - some actual hardware to legitimately play the games, a development environment and design principles.

I had remembered that someone had done a port to a z80 machine some time ago. It didn't take me long to rediscover John Elliott's zxzvm - a system for running z3, z4, z5 and z8 z-machine story files. I was glad it was still easy to find, and that there had even been a couple of recent updates to the code. As I really didn't know much about how z-machines worked, I wanted to stick as closely as possible to his code to get something to work on a TRS-80. His approach required 128K, which locked in the Model 4 as the target system. He has multiple versions, for the ZX Spectrum as well as various Amstrad CPC and PCW implementations. After a lot of trawling archive.org and a few other retro computing sites, I ended up choosing the PCW "Joyce" version as the base as it felt as close as possible to the model 4 in terms of hardware capabilities.

Pulling together a working Model 4, with some extra modern convenience, was another parallel project. I was able to acquire a model 4P (thanks dad!), and the first project was to replace a RIFA after that exploded. The machine itself is in good condition, so I thought the next little luxury would be virtual floppy disks. I settled on the HxC2001 as it seemed to be the most complete solution. With some extension cables, an old 3.5" -> 5.25" adapter tray, and some testing of switches, I could set up the HxC2001 to be drive 0 and drive 2, with the other internal floppy drive as drive 1. Luxury! I also thought that I could use a hi-res option to bring more font options and maybe find a way to get even more memory in the model 4P, and Ian Mavric had The Right Stuff to really soup up my machine. The last stop was me wondering what would be an even easier way than the HxC for transferring data. The answer popped up when Arno asked if anyone wanted any of his last run of TRS-io cards. Of course I did! Now I can easily copy files from a network share without even having to eject my SD-Card from the HxC. Extra luxury and a convenience to take away any excuses! Here's the machine in all it's glory running Office Goose (a humorous game that provided me the inspiration to write the software, even though in the end it plays too slowly and has too large a memory footprint to play through).



While working through building the right hardware combination, I also wanted a slick and convenient development environment including a testing platform. The tools available these days are amazing. On my host machine, running Windows, I can edit in Sublime text editor including z80 highlighting, and when I'm done editing run a script to use zmac to compile to a TRS-80 CMD file target, import into a virtual image using trswrite.exe, and then mount it on a drive in trs80gp. Rapid prototyping is so easy this way, and there are so many people to thank. The last big z80 related assembly language project required compiling on a z280 CP/M machine (CPU280) and then burning eproms, so maybe my idea of a z80 based development cycle is a little skewed. Thank you so much to George and Peter for trs80gp, and the other members of the TRS-80 community for other hints and tricks along the way.

So down to the design principles. I wanted this platform to be able to be as compatible as possible with as many of the games as possible. As I learned more about the z-machine architecture I understood more about the options for compromises that would need to be made, depending on the desired outcome. While Zork I booted happily on a TRS-80 Model I with only a 32K requirement, I wondered why would ZXZVM want 128K minimum? This is where the memory map impacts the virtual machine design. The story file memory map starts out with "Dynamic" and "Static" memory, followed by "High" memory. There's some overlap allowed with Static but that's not important for now, I'll keep the focus on where it gets interesting as a design question - the Dynamic memory.

The memory architecture of the virtual machine, and the file format, allows for up to 64K of dynamic memory. Its called dynamic because it's used dynamically in the game to keep track of objects, their location, status, scratch space, and other variables. Zork 1 had less than

12K of dynamic memory required, which would have fit easily. If you're curious and you have a story file and hex editor, the size of Dynamic Memory located in the game header, taking 16 bits at 0x0000E, stored as a word in big endian format. If you wonder how complex a game can get, Trinity - a highly regarded z4 game, weighs in with 37K of Dynamic memory. Raising the stakes in the epic post-infocom era, Anchorhead which uses z8 format requires 40K of dynamic memory. Between having an 80x24 screen, and 128K of memory, it seemed that maximum compatibility with as many story titles was the way to go, so I stuck to the script on using a similar memory model as the ZXZVM. There are also multiple stacks required by the virtual machine outside of the Dynamic memory/game space, which is a story for another time.

From here, I built M4ZVM. The first step of porting from ZXZVM was to convert the CP/M built code to run on LS-DOS. I had to refresh my memory on BDOS calls, on terminal codes for the Joyce (Thanks archive.org!), and dive head first into the LS-DOS programming guide (Thanks to Tim Mann's amazing repository and of course Roy Soltoff's generosity). Delightfully, John Elliots's source code was not only freely available, but clearly written and structured so that the front end for all I/O (keyboard, disk, extended memory R/W, screen) was structured as a completely separate set of files that plugged into a common core (the ZVM, which in turn was based on a C-based terp called JZIP). There was quite a bit of work in converting each of these code areas. As an example, screen routine conversion included setting and querying the current cursor position, and scroll protection for an arbitrary number of lines - the Model 4 video hardware only protects up to 7 lines so some workarounds were required. Memory bank selection is also done very differently, in 32K blocks instead of 16K on the PCW, along with the resident DOS being larger than CP/M, leading to some tweaks in memory mapping. Overall, it was around half of the codebase that needed rewriting to get it off the ground.

The two most fun parts of the conversion that spring to mind were firstly that the sector size for ZXZVM was 128 bytes instead of 256, and secondly that LS-DOS (and pretty much all TRS-80 native DOSes) was way more advanced in handling machine code files as they support a load file format structure. The load file format means that I can load any code or data anywhere into memory, which in turn means that the source code structure of non-contiguous memory blocks could be loaded as a single CMD file, rather than bootstrapped and loading in the core and I/O segments as it is in ZXZVM.

The difference in sector size turned out to be largely a boon. I could heavily simplify the initial loading of the first 64K, but more importantly, when I needed to random access seek a byte out of a potential 512K file, this was a little easier. Internally in M4ZVM, the current program counter of the z-machine, referred to as ZPC, is kept across three registers - E, H and L (from high to low). This means that if I need to read a byte at address EHL, if it's above the 64K already loaded, I can seek to sector EH in the file, and fetch byte L. No further translation necessary. It did get a little more challenging to change sector size when doing a game save/restore, so I set the LRL to 128 and used largely the original code. As an added bonus, this means game save files are transferable between the platforms so long as when you import a ZXZVM save file, you remember to set the LRL after copying a file to your LS-DOS disk.

Finally, to get version 1 off the ground I needed help testing. While I didn't get much help hands-on, I got some great advice from John Elliott (the ZXZVM author), as well as Garry Lancaster who took ZXZVM to Spectrum Next, on their testing methods. Last but certainly

not least, I got some great ideas from Fredrik Ramsberg, one of the major forces behind both Ozmoo, a modern Commodore 64/128/+4 Z-interpreter, and also PunyInform, a library designed for creating fast and responsive games for 8 bit Infocom/Inform/Z-machine interpreters.

Once the testing was done and dusted I released.... version 1! M4ZVM Release 1, supporting z3,z4,z5 and z8 games was alive! From here of course, I needed to add a lot more features, make it run more versions of different games, squash bugs, and make the game execution much faster, but that's a story for another day. To get the latest version, including source code and more information on all the extra features now available, head over to https://gitlab.com/sijnstra1/m4zvm - dust off that brass lantern and start adventuring!

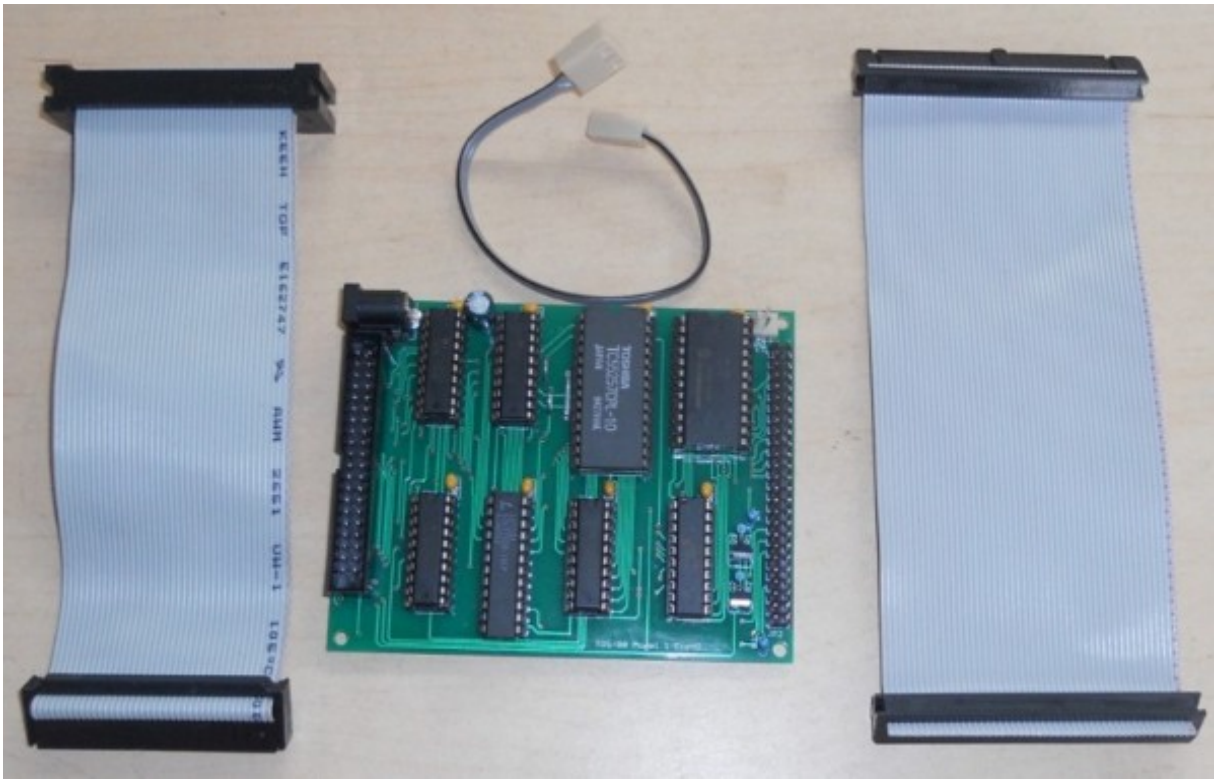
As a parting thought, here's some screenshots of other games using the same z-machine engine in a novel way. Andrew Plotkin started something big by realising that if you have full screen control plus a timer, you can run turn based and even real-time games with some examples below. And of course, feel free to contact me with any questions or comments.





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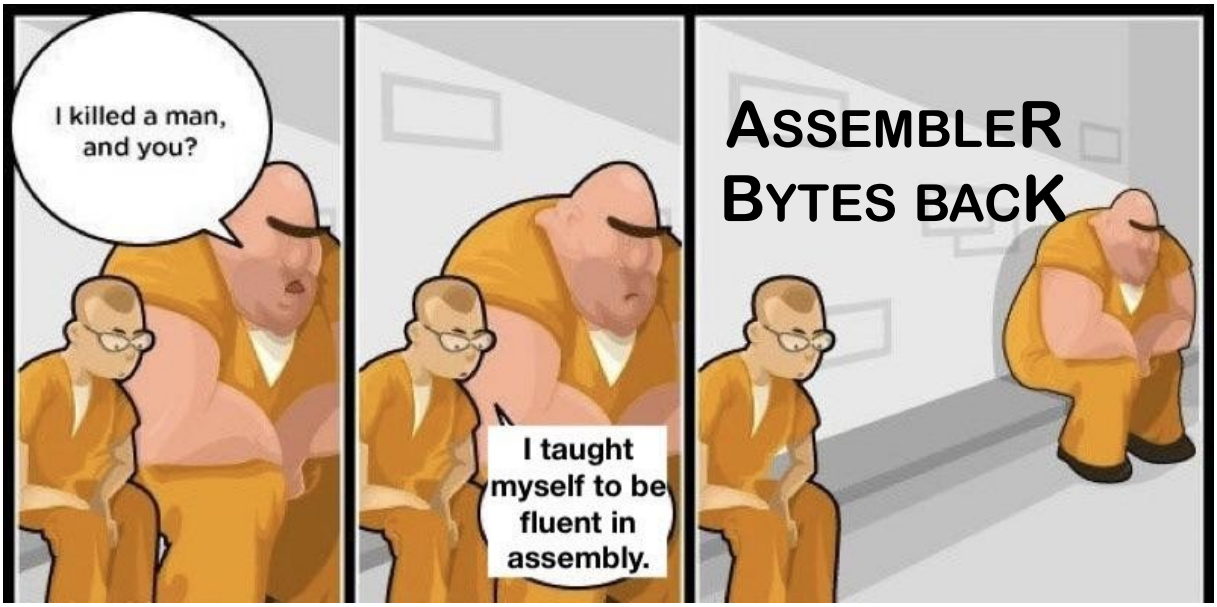
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IN MANY CASES, IT'S JUST A FEW LINE OF CODING IN BASIC, ASSEMBLER AND JUST MANY OTHER, GENERAL LITTLE 'GOOD IDEAS' WHICH I CAME ACROSS AT VARIOUS POINTS IN NEARLY 50 YEARS OF COMPUTING.

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Data Compression

A 40 track floppy disk will hold about 100 KBytes. This might appear to be an adequate capacity for almost any purpose but it is soon used up. One disk will hold only the same amount of information as about 40 of the pages in this book.

Although memory is becoming cheaper, the RAM available in most personal computers in present use is still probably in the range 16K to 32K. With a program, or suite of programs, loaded in to deal with the processing, you will be lucky to have 10 book pages worth of immediately accessible data.

Transmitting data by modem is not particularly fast, as you will know if you make extensive use of the telephone for inter-computer communication. Time is money – with a vengeance on long distance calls.

These are all good reasons for compacting data into as few bytes as possible. In this chapter you will find routines to deal with various ways of compressing and expanding both numerical and textual data.

UPPER-CASE ASCII

Upper-case ASCII consists of a group of 64 characters using the codes 20H to 5FH. With minimal processing these can be accommodated in only six bits and packed together with four characters to every three bytes. This will give you a 25% space saving.

PAC and UNPAC are two routines which will compress and expand upper-case ASCII text. Since much of the code is identical in both routines, they have been welded together by Dave Yeomans and myself into a single routine with two entry points.

DATA COMPRESSION

```
:============================================================
:= PAC       Pack (compress) upper-case ASCII.
:> UNPAC     Unpack compressed upper-case ASCII.
:============================================================
:JOB         PAC: To convert a string of 8-bit upper-case
:            ASCII characters (20H to 5FH) from 8-bit to a
:            string of packed 6-bit characters.
:            UNPAC: Inverse process to PAC.
:ACTION      PAC: Clear Byte Sequence count.
:            FOR character count:
:            [ Next Byte Sequence count.
:              Get Source character - 20H.
:              Left shift char. by twice Byte Sequence.
:              Merge result hi-byte with Destination - 1.
:              Store result lo-byte to Destination.
:              Next Source. Next Destination.
:              Adjust Byte Sequence count by mod 4. ]
:            UNPAC: Clear Byte sequence count.
:            FOR character count:
:            [ Next Byte Sequence count.
:              Get Source - 1 and Source bytes.
:              Right shift bytes by twice Byte Sequence.
:              Isolate Character as bits 5 to 0 + 20H.
:              Store Character to Destination.
:              IF Byte Sequence < 4 THEN [ Next Source ].
:              Next Destination.
:              Adjust Byte Sequence count by mod 4. ]
:------------------------------------------------------------
:CPU         Z80
:HARDWARE    Memory containing source file.
:            RAM to contain destination file.
:SOFTWARE    None.
:------------------------------------------------------------
:INPUT       HL addresses source file.
:            DE addresses destination file.
:            BC = No. of characters to be packed/unpacked.
:OUTPUT      HL addresses source file + 1.
:            DE addresses destination file + 1.
:            BC = 0.
:ERRORS      No check for destination overwrite of source.
:            No check for out of range characters in PAC.
:REG USE     AF BC DE HL
:STACK USE   4
:RAM USE     None.
:LENGTH      64
:CYCLES      Not given.
:------------------------------------------------------------
:CLASS 2     -discreet  *interruptable  *promable
:-****-      *reentrant  *relocatable  -robust
:============================================================
:
PAC     LD   A,80H    :Clear byte count, set PAC flag    3E 80
        JR   BINC     :in bit 7,A. Skip UNPAC entry.     18 01
:
UNPAC   XOR  A        :Clear byte count.                 AF
:
```

```
BINC    INC  B         :Pre-increment char count hi-byte  04
                       :for nested hi & lo byte decs.
LOOP    PUSH BC        :Save character count.             C5
        PUSH HL        :Save source point.                E5
        INC  A         :Mark next byte in group of 4,     3C
        LD   C,A       :and save in C during conversion.  4F
        ADD  A,A       :Move PAC/UNPAC flag to Cy,        87
        LD   B,A       :with shift magnitude to B.        47
        LD   A,(HL)    :Get next source byte              7E
        JR   C,DOPAC   :and skip if PAC.                  38 0D
:
        DEC  HL        :Else UNPAC so get possible other  2B
        LD   H,(HL)    :other part of packed char in H.   66
RISH    RR   H         :Shift right by twice byte count   CB 1C
        RRA            :until bits 5 to 0 of A contain    1F
        DJNZ RISH      :current character.                10 FB
        AND  3FH       :Mask out unwanted bits and        E6 3F
        ADD  A,20H     :convert to range 20H to 5FH.      C6 20
        JR   LODE      :Go store to destination.          18 0C
:
DOPAC   SUB  20H       :PAC so convert range 20H to 5FH   D6 20
        LD   L,A       :to range 0000H to 003FH           6F
        LD   H,+0      :in HL and                         26 00
LESH    ADD  HL,HL     :shift left by twice byte count    29
        DJNZ LESH      :until bits in packed position.    10 FD
        LD   B,L       :Save any lowest bits in B while   45
        DEC  DE        :indexing possibly incomplete      1B
        LD   A,(DE)    :destination byte and merging it   1A
        OR   H         :with bits from current source.    B4
:
LODE    LD   (DE),A    :Store converted byte to dest.     12
        POP  HL        :Restore source pointer.           E1
        LD   A,C       :Restore byte count,               79
        AND  83H       :mod 4 for correct sequencing.     E6 83
        JR   Z,DINC    :Skip if UNPAC 4th byte.           28 09
:
        CP   81H       :Test & skip if PAC 4th byte       FE 81
        JR   C,HINC    :or UNPAC bytes 1 to 3.            38 04
:
        INC  DE        :PAC bytes 1 to 3 only have        13
        EX   DE,HL     :lowest bits after LESH to go      EB
        LD   (HL),B    :into next empty destination       70
        EX   DE,HL     :byte.                             EB
:
HINC    INC  HL        :New source for all but UNPAC 4.   23
:
DINC    INC  DE        :New destination for all.          13
        POP  BC        :Restore character count and       C1
        DEC  C         :loop for up to                    0D
        JR   NZ,LOOP   :256 bytes,                        20 C9
        DJNZ LOOP      :then for each 256-byte block      10 C7
        RET            :until conversion complete.        C9
:============================================================
```

Much of the text used in ordinary computing activities can be limited to the characters and symbols of the upper-case ASCII set. Indeed, the character sets of some home computers do not even

include lower-case letters. For many that do, the poor definition afforded by the television display makes satisfactory use of lower-case almost impossible.

Even where use of lower-case is essential, the full ASCII codes need not be used. All text, including control codes, can be stored in packed 6-bit form with any rarely used character acting as a 'switch' code and preceding a change from lower to upper, or vice versa. A good candidate for this task is the backslash character (ASCII 5CH) and its upper-case equivalent, the vertical bar (ASCII 7CH). Neither one of these characters is overworked.

After being expanded by UNPAC, the text can be output via a short routine which corrects upper-case to lower if necessary, as does the following code. On input A contains the uncorrected character, B contains the conversion bit (either 00H or 20H).

```
UCLC    CP   '\'       :Test for uc/lc switch code   FE 5C
        JR   Z,SWITCH  :and skip if it is, else      28 04
        XOR  B         :possibly convert uc to lc    A8
        JP   OUTCH     :and exit via output routine. C3 lo hi
:
SWITCH  LD   A,B       :Change switch mask so if it  78
        XOR  20H       :previously converted it now  EE 20
        LD   B,A       :doesn't - or vice versa.     47
        RET            :Don't output switch code.    C9
```

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Still more goodies in the program, for Mike has devised it so that it prints out the name, the entry, start and end addresses in the bargain. And there's a facility to jump to any address during the procedure.

It's a Basic program which can therefore be loaded from any source and it creates a machine language program to do the work. It's even useful for the TRS-80 too!

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DISASSEMBLER

This program is the ideal introduction to machine language, for it allows you to 'list' system tapes and even the resident Microsoft Basic in ROM, allowing the start and stop addresses to be specified with each line displayed slowly and a facility to halt the display.

There is the option to either disassemble parts or whole machine language programs from memory, or strings of machine code can be types which will be translated into standard assembly language.

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IN MAV'S WORKSHOP

Model III & 4 Power Supplies Explained

by Ian Mavric



Photo: Model III 35W Astec PSU

Recently replacement power supplies (PSUs) for the Model III, 4, 4D and 4P have come onto the market based around the modern Meanwell switching power supply. These can be obtained from Jay at NewSoft (https://plaidvest.com/newsoft). It's worth putting it on the record some details of the PSUs originally supplied with the Model III and 4, to clear up any ideas that opening up a machine may have something different to what is expected. That is the purpose of this article.

1980: THE TRS-80 MODEL III

The Model III was sold in both diskless and disk-based configurations. The lightweight (relatively speaking) diskless machines had a single 35W Astec PSU mounted on the aluminium motherboard chassis. This one powers the motherboard, monitor, and RS232C serial board (if fitted). Disk systems got a second PSU mounted on the disk drive tower, and this one was identical to the 35W Astec motherboard PSU, and powered the disk drives and disk controller.
These PSUs are generally very rugged and long lasting, save for the Rifa mains filter capacitors on them, which should be replaced if the originals are still fitted. A lot of large electrolytic capacitors can be seen on each PSU and while they are of good quality, they are now over 40 years old so should be tested with an ESR meter and replaced if their values have changed by more than 10%.
Comments: This system of dual small PSUs was good as it meant Radio Shack only needed to stock one supply for the computer. The motherboard PSU can be tricky to service due to it's placement behind the disk drive tower.

EARLY 1983: THE LAST OF THE MODEL IIIs AND THE TANDY 3.

After about three years of Model III production Radio Shack was getting ready for the Model 4 change over. An important change was a new larger 65W Astec PSU, but more on that later in the article. A cost improvement for the new Model 4 was to have a single large PSU rather than two smaller ones on disk-based systems.
This appears to have been put into practice on the very last batch of Model III disk systems produced, and also in the white-painted Tandy 3 (a computer sold to 3rd parties and not generally available through Radio Shack stores). In my travels I have seen a few of these late-production Model IIIs with the single 65W PSU, and every Tandy 3 I have seen also has the single 65W PSU. It's basically a Model 4 PSU so I'll talk about it more in the Model 4 section.

This Astec 65W PSU was also used in TRS-80 primary hard drives, so a NewSoft PSU can also be used to replace a failed PSU in a primary hard drive.

MID-1983: MODEL 4 NON-GATE ARRAY VERSION

When the Model 4 was released it was available in three versions: 16K diskless (26-1067), 64K 1-drive (26-1068) and 64K 2-drives (26-1069). Putting the 65W Astec into a diskless system would be overkill so the diskless Model 4 has the same 35W PSU as the Model III. When you took your diskless Model 4 to Radio Shack to upgrade it with disk drives they installed a 2nd 35W PSU in the same arrangement as the Model III. This is why we sometimes see Model 4s for sale on eBay or CraigsList or FB marketplace and when you open it up you see the dual 35W PSUs instead of the single 65W. People occasionally email me suspecting something isn't quite right, especially if they have a disk based Model 4 with the single 65W, so I ask them if the computer is a 26-1067. If it is then I explain that was originally a 16K diskless machine and the dual 35W PSUs is perfectly normal.

As mentioned before Radio Shack changed to a 65W Astec PSU for the Model 4 disk systems; one larger PSU being cheaper than two smaller PSUs. The Astec was great because it was voltage jumper changeable between 120V and 240V, so it could be sold in Model 4s around the world. All export Model 4s have the Astec PSU. Always hoping to save a penny, Radio Shack had a cheaper version of the 65W PSU developed in house which only ran at 120V so could only be sold in the USA and Canada. Both these and the Astec had Rifa mains filter caps which need to be replaced now. Like the Model III PSU the Astec has pretty good electrolytic capacitors which should be checked with an ESR meter, but the PSU is pretty robust. A problem they all seem to suffer is cold and cracked solder joins on the A/C input connector and the large power output connector. Always inspect this when working on the PSU and re-flow the solder if needed.

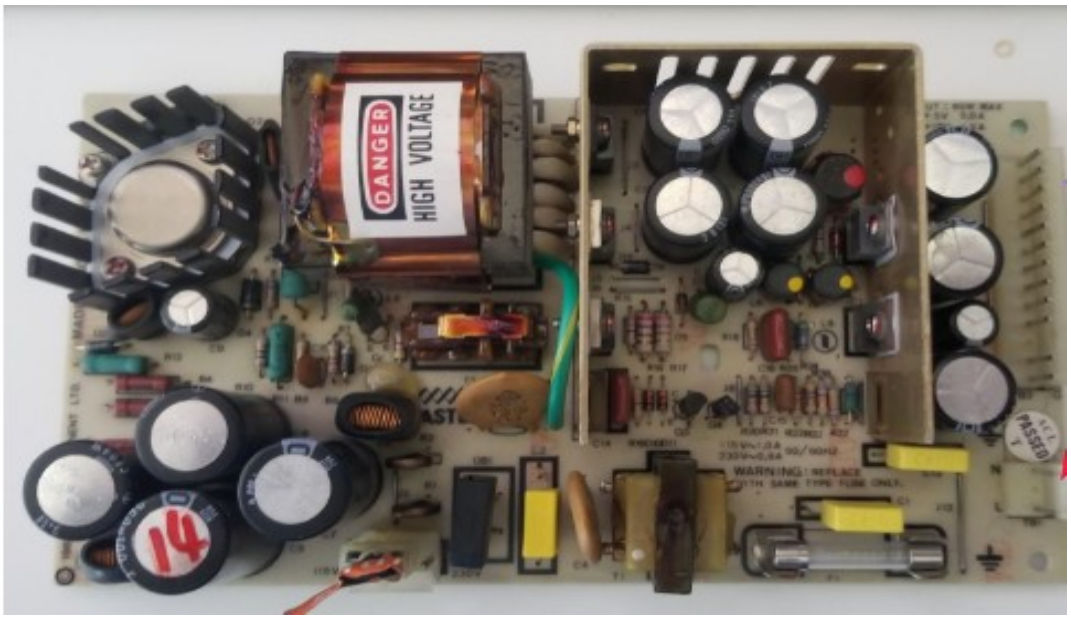


Photo: Astec 65W PSU - it was pretty good

By contrast the Tandy in-house PSU had many problems over it's life mainly due to it being made too cheaply. A Radio Shack Service Bulletin states it should not even be used in the TRS-80 Primary hard drive as the output is not stable enough for reliable hard drive operation.

Check it's Rifa mains filter caps, check the ESR of it's electrolytics and check the outputs, if the ESRs are OK but the outputs are off, throw away the PSU and replace it with one of NewSoft's.



Photo: Radio Shack's Tandy Corp. low-cost 120V-only 65W PSU

1985-86: MODEL 4 GATE-ARRAY AND 4D

Since there was no diskless version of the Gate Array Model 4 (or the 4D, which is just a slightly warmed over 4GA with better disk drives) the whole range had only one PSU installed, which is the 65W.
By this time Radio Shack had got the Tandy low-cost 65W PSU working dependably enough that most 4GA and all 4Ds come with them. The 4D, being a USA- and Canada-only release only needed a 120V PSU.
It's still not the last word in design or engineering but held up for the anticipated service life of the Model4/4D (about 10 years max). All export 4GAs came with the Astec 120V/240V PSU.

It's interesting to note that in the 1985 Radio Shack Computer Catalog (RSC-12) on page 23 is the Model 4 64K Gate-Array disk-based computer, and on page 30 is the Model 4 16K Non Gate-Array diskless computer. This was because the warehouse was overstocked with unsold diskless NGA machines even though the 4GA had been on the market for some time. The last of the diskless Model 4s would eventually be discounted to a few hundred dollars to clear the inventory in early 1986. The dual-drive 64K version of the Model 4/4D (26-1069, 1069A and 1070) were always the top selling configuration of the Model 4.

1984-6: MODEL 4P PORTABLE COMPUTER

Economies of scale mean that when computer components are used in multiple devices deals can be made with suppliers to buy larger quantities as lower per-unit cost. This is especially the case with the 65W PSU which was also used in the Model 4P, both the NGA and GA versions. Again most US 4Ps got the cheap Tandy PSU and export 4Ps got the Astec. The 4P was on the market for barely 2 years and so finding an Astec in one is quite common as Radio Shack hadn't fully committed to the cheap Tandy PSU yet.

OTHER INTERESTING PSU INFORMATION

The design of the computers and usage of the PSUs did give rise to an interesting effect where the screen image would momentarily shrink when the disk drive was first spun up. This was because the 35W and 65W PSUs both did not have much reserve in the 12V supply to adequately power the CRT and spin up the disk drives without dipping for around 0.1-0.2sec. On a disk drive the logic board is 5V (like the computer motherboard and FDC) but the motor which turns the disk is 12V, and quite a substantial motor at that, engineered to accurately turn the diskette at 300rpm. Some people see this as a fault in the system but I can tell you as a user from when these computers were new they all did it to some extent. For some systems it was barely noticeable while on others it was quite annoying. Even contemporary computer reviews at the time in 80micro magazine noted brand new computers exhibited the problem. This is one of the problems fixed with the NewSoft PSUs, no more momentary screen shrinking when accessing disk drives.

35W Astec PSUs were also used in other applications besides the Model III. You find them in Secondary TRS-80 hard drives but they were also used to power the hard drive in a Tandy TRS-80 Model 2000 HD Personal computer, and finally the power the hard drive in a Model 16B or Tandy 6000 with the internal 15Mb hard drive. I have also seen a Model 12 with the rare Model 12-16B HD upgrade kit and this computer used the 35W Astec too.

FINISHING UP

Hopefully understand which PSU is in your TRS-80 and why will help people make an informed decision about what to do when their current PSUs fail or start running erratically. Some are with fixing and will give good service for another bunch of decades, others are worth little attention and should be discarded if any doubt about their viability exists. When upgrading your PSU I heartily suggest you check Jay's website and when you order tell him you want the Genuine Mav Edition. :-)

Ian Mavric

ianm@trs-80.com



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

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"Beast" entrants will tackle the problem of squeezing all 12960 words of the dictionary into a TRS-80. This is for assembly language programmers only. The smallest blob of program and data will win.

Download the contest.zip file for the full details **(available from the downloads page at www.trs-80.org.uk).** It has the word lists and specific requirements for "Beast" entries, details on how Wordle works for "Beauty" entries and even a bare-bones example program in Z-80 assembly to get you started.

We'd be tickled pink if we get a Beast so small it'll work on a 16K machine. Are you up for the challenge?

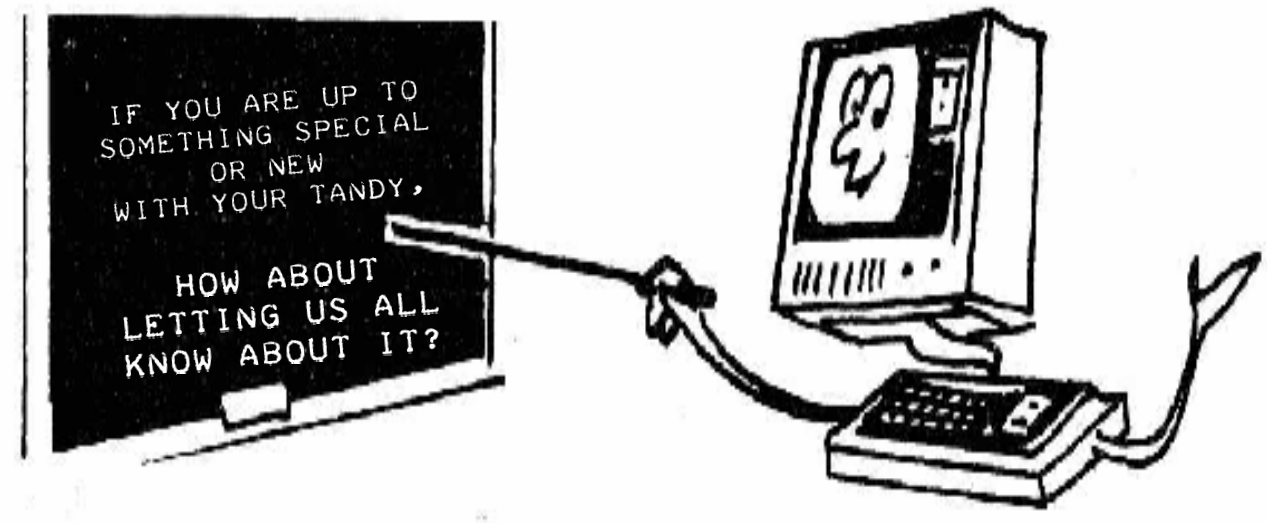
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THE WAY WE WERE

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Charles C. Edwards, Jacksonville, FL

Faster than a speeding GOSUB, more powerful than a Shell sort, able to leap through K of RAM in a single JP. Is it BASIC? Is it TRSDOS? No, it's assembly language. However, those of us who have tried to merge machine code with our BASIC programs have had to face the annoyance of having only one USR call available in Level II BASIC. Have you long envied those disk owners with their ten USR calls? Well, this article will describe an extremely small (twelve bytes) enhancement to Level II which will provide an unlimited number of USR calls. As a bonus, you will no longer have to POKE the address of your subroutine into memory before calling it.

First, let's examine how disk systems manage to implement their ten USR calls, and we will see how we can use the same method to our advantage. When the Level II interpreter encounters the token "USR," it branches to ROM address 27FEH to begin processing the statement. Once there, the first thing it does is call address 41A9H. Under Level II, this location contains a RET instruction, so we simply return to the caller and continue processing. Most DOSs alter this into a jump instruction, which transfers control to a piece of code in the DOS, which implements the multiple USR calls.

For this reason, 41A9H is called a "DOS." That is just a fancy way of saying that this is a point at which ROM processing can be intercepted in order to change the normal flow of logic. Well, if a DOS can intercept the interpreter at this point, so can we! Listing 1 is the complete patch which will implement infinite USR calls.

Listing 1

```
41A9        JP    USR         ;BRANCH TO THE PATCH
      USR   CALL  1E5BH       ;GET THE ADDRESS, IF ANY
            DEC   HL          ;BACK UP POINTER
            LD    A,D         ;SEE IF ADDRESS IS ZERO
            OR    E
            RET   Z           ;USR CALL WITH NO ADDRESS
            LD    (408EH),DE  ;STORE THE ADDRESS
            RET               ;BACK TO BASIC
```

You will notice that, with the exception of address 41A9, I have not provided any addresses with the listing. I did this to emphasize the fact that this code is completely relocatable. You can put it at the top of memory, or after any other routines (printer driver, etc.) which you normally load. After loading this, you can invoke a machine language subroutine by entering, in BASIC: X=USRn(Y), where n is the address (in decimal) of the routine. For example, a common BASIC subroutine suspends processing until a key is depressed.

Listing 2 shows two methods of doing this. The first example is the typical BASIC coding. The second uses a ROM routine at decimal 73 (hex 49) to wait for a key to be hit. Of course, we don't know which key was pressed, as we do with INKEY$. For the purposes of the example, we are assuming that we don't care.

Listing 2

```
1   REM THIS IS HOW WE WOULD NORMALLY DELAY IN BASIC

10  PRINT "HIT ANY KEY TO CONTINUE" :GOSUB 200

200 I$=INKEY$:IF I$="" THEN 200 ELSE RETURN

1   REM THIS IS HOW TO DO IT USING A ROM ROUTINE

10  PRINT "HIT ANY KEY TO CONTINUE" :X=USR73(Y)
```

Let's look at Listing 1 in detail. After intercepting the interpreter at the beginning of USR processing, the HL register points at the byte OC1H, which is the internal representation of the token "USR" in Level II. We call the ROM routine at 1E5BH, which will convert the ASCII number following the USR command into the binary equivalent and return the result in the DE register. If the number is omitted, the DE register will contain zero. A side effect of this routine is that HL will now point to the character following the address, which should be the "(." So, the next thing we must do is back up HL to the preceding character.

We must check if the result in DE is zero. If so, we will return to USR processing and resume the normal program flow. Otherwise, we load 408EH with the address specified and return to the ROM routine. 408EH is the location where the address of the USR routine is normally POKEd. This will cause us to branch to that

location.

The beauty of this routine is that it retains the ability to pass a parameter to the subroutine. Other published methods to implement multiple USR calls usually use the parameter to pass the address of the routine to be called, whereas, my method is much easier to implement. I am surprised that it is not standard practice in most DOSs. For those of you without assembler, Listing 3 is a short BASIC program which will POKE this routine into memory for you. Simply change the value of "I" in line 10 to point to the address at which you want the code to begin.

Listing 3

```
10 I=65524:I1%=I/256:I2%=I-I1%*256

20 POKE 16809,195:POKE 16810,I2%:POKE 16811,I1%

30 FOR J=I TO I+11:READ X:POKE J+65536*(J>327
67),X:NEXT

40 DATA 205,91,30,43,122,179,200,237,83,142,64,201
```

The next time your friend with his fancy-schmancy disk drive brags about all of the great features his DOS gives him, you can knock his socks off with more USR calls than he can shake a diskette at! ■

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Interfacing A Numerical Processor Chip to the TRS-80

By James E. Randall

The advantage of numerical processing chips is that they can perform number crunching rapidly using minimal memory. Such a feature may not seem important to many TRS-80 users because this microcomputer comes with software math routines in the Level II BASIC on a ROM and these operate at speeds sufficient for most games and business applications. However, the widespread availability of this micro and the expected operating system support for more sophisticated applications suggests that there may be a significant number of scientific computations which could benefit from this numerical enhancement in a low-cost system.

The concept presented here is to retain the ROM BASIC for I/O and formatting and then use the USR, PEEK and POKE commands to communicate with machine language routines which utilize the features of the numerical processor. As an example, the author uses microcomputers for teaching-exercises in physiology, including graphic simulations of the nerve action potential. To do this in high-level language required about two minutes for 256 computed points on the graph, a time so long that it discouraged student participation. However, this time was reduced to a very reasonable ten seconds by using BASIC to ask for stimulus parameters such as amplitude and duration, then transferring these values to a machine language routine which did the computations and plotting. This latter routine called the arithmetic processor functions from a set of short servicing subroutines in a logical sequence that paralleled what would have been written in BASIC commands.

The AM-9511, made by Advanced Micro Devices, interfaces easily with the Z-80 through the TRS-80 expansion-port edge connector and requires only a power supply, 2-MHz clock, and one decoding circuit to be implemented. In addition, this arithmetic processing unit (APU) uses a binary 4-byte floating point format that is very similar to that used in Level II BASIC, making it particularly easy to pass arguments between the two kinds of programs. This article describes the interfacing circuit, compares the two floating point formats involved, and gives a representative APU routine. For simplicity and clarity the treatment will not include the error flags nor will it discuss interrupt information which is available from the APU. The reader should acquire detailed specifications and algorithm details from the manufacturer. This chip currently costs $200 in unit quantities but it approaches the speed and accuracy of $10,000 floating-point processors used with minicomputers a decade ago.

THE AM-9511 NUMERICAL PROCESSOR CHIP

This 24-pin chip requires +5 and +12 volts at about 100 ma each and communicates with the TRS-80 through 8 bi-directional data bus pins. The remaining pins accept control signals to determine the direction of information transfer and also provide signals which could activate an interrupt when a computation has been completed. Data, commands, and error information are transferred in 8-bit bytes between the data bus lines available on the TRS-80 rear connector and the data pins of the APU chips. I/O port commands from the Z-80 microprocessor in the TRS-80 can be used to execute these transfers. When a data output command is issued, the byte in the accumulator is pushed onto the top of a stack of 16 8-bit registers within the APU. Conversely, a data input command pops the top byte from the stack and transfers it to the accumulator. An appropriate output command from the Z-80 initiates the math operation coded in the accumulator using the stack bytes as operands.

The arithmetic operations treat the bytes on the stack in one of three different ways: single precision integer math involves two successive bytes as a 16-bit integer; double precision using four bytes as a 32-bit integer; and floating point using four bytes, one for the exponent and the signs of exponent and of mantissa, the remaining three bytes form a 24-bit mantissa normalized for a minimum value of 0.5. The operations themselves include the four functions, a wide range of transcendental functions, and also means for conversion between the three different forms. In use, the computer would push the bytes for operand(s) onto the stack; give the code for the desired math operation; test the status bit until the computation is completed; and then pop the result from the stack for use by the computer itself. The overall efficiency is increased if the operands for successive math operations can be left on the APU stack thus reducing the time required for pushing and popping and memory transfers.

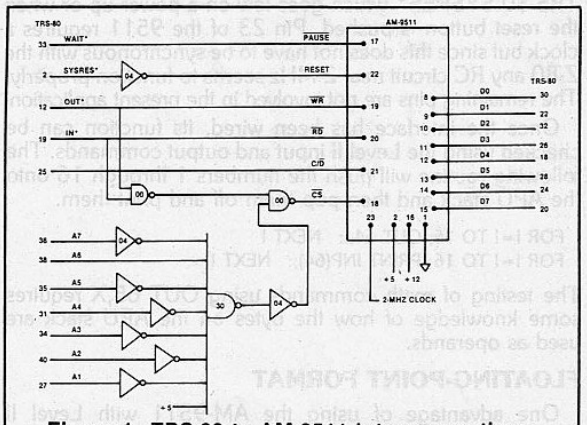


Figure 1. TRS-80 to AM-9511 Interconnections.

Figure 1 gives the decoding circuit and interconnections required to connect the AM-9511 to the TRS-80 interface connector. The APU CHIP SELECT (pin 18) is enabled by decoding seven of the address lines (A1-A7) according to the port number being used, and also by either a Z-80 INPUT or OUTPUT command as signaled by the TRS-80 IN* or OUT* going low. The port number which would be selected in the schematic would enable the APU chip for the Z-80 commands:

IN A,(64) IN A,(65) OUT (64),A OUT (65),A

Note that for testing purposes these could be implemented by BASIC commands, though the overhead would defeat any timing advantages.

The A0 line, connected directly to the APU pin 21, determines whether the byte transferred on the data bus is a command or data. Odd port numbers (65 in this case) have this

pin high for Z-80 input and output commands and the data bus is treated as either an opcode or status information. Even port numbers, such as 64, indicate that data is to be either pushed onto or popped off of the APU internal stack. Two other pins determine the direction of these command/data transfers. When the Z-80 issues an output the connector pin OUT* goes low which places the APU WRITE (pin 19) low and the computer accumulator goes to the APU, either to start a specific math operation or to push the byte onto the stack. When an input command is issued the TRS-80 IN* signal brings the APU READ (pin 20) low and this sees that the byte transfer is from the APU to accumulator, either status and error information or a data byte popped from the stack. Table 1 outlines the different possible combinations of these signals. The author found that data, address, and control lines were sufficiently buffered internally in the TRS-80 for direct connection to the APU and also to a UART used to drive a printer.

FUNCTION	LEVELS			ACTIVATED BY	
	AM-9511 C/D	READ	WRITE		
	TRS-80 A0	IN*	OUT*	Z-80	BASIC
COMMAND	HI	HI	LO	OUT (65),A	OUT 65,C
STATUS, ERRORS	HI	LO	HI	IN A,(65)	S = INP(65)
PUSH DATA	LO	HI	LO	OUT (64),A	OUT 64,D
POP DATA	LO	LO	HI	IN A,(64)	D = INP(64)

Table 1. Numerical Processor Control Signals

Another signal, PAUSE on APU pin 17, is connected directly to the TRS-80 WAIT* terminal. This allows the APU to place the Z-80 in a wait state until information has been transferred from the internal registers to the data pins; when the pause goes high the Z-80 continues and places the byte into the accumulator. The APU RESET (pin 22) should be pulled high to initialize that chip. This can be done by inverting the TRS-80 SYSRES* which goes low on a power up or when the reset button is pushed. Pin 23 of the 9511 requires a clock but since this does not have to be synchronous with the Z-80 any RC circuit near 2 MHz seems to function properly. The remaining pins are not involved in the present application.

Once the interface has been wired, its function can be checked using the Level II input and output commands. The following routine will push the numbers 1 through 16 onto the APU stack and then pop them off and print them.

```
FOR I=1 TO 16; OUT 64,I:  NEXT I
FOR I=1 TO 16; PRINT INP(64);:  NEXT I.
```

The testing of math commands using OUT 65,X requires some knowledge of how the bytes on the APU stack are used as operands.

FLOATING-POINT FORMAT

One advantage of using the AM-9511 with Level II BASIC is that the two use very similar 4-byte formats for binary floating-point computations. Two of the bytes are identical for the two systems and the other two require a reordering of those bits which indicate the signs of the mantissa and exponents. The author found the most expedient method of communication between BASIC and APU routines was to poke the four bytes located by VARPTR(X) into available memory where a machine language subroutine could reshuffle them into the format for the APU computations. The final result of floating-point computations could then be placed in BASIC format where PEEK and POKE commands could move them into previously located BASIC variables.

Table 2 illustrates the two floating point formats. In both cases one byte conveys the exponent (power of two) and three bytes represent a 24-bit mantissa with the most significant bit representing decimal 0.5 and always being considered as set unless the variable's value is zero. For the BASIC case this most significant bit is implied and the explicit bit position determines the sign of the mantissa; the remaining 23 bits tell the value of the fraction to be added to 0.5. If the BASIC variable is X, the contents of VARPTR(X) gives the least significant byte of the mantissa; those of location VARPTR(X)+1 give the middle byte.

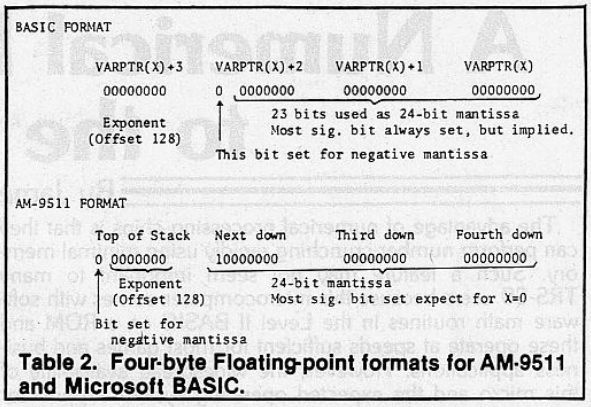


Table 2. Four-byte Floating-point formats for AM-9511 and Microsoft BASIC.

The next location contains the most significant mantissa byte except that bit 7 in the byte is set for a negative mantissa and there is no explicit bit for the 0.5 part of the mantissa. If location VARPTR(X)+3 has a value of 0, the variable is 0; otherwise the byte tells the exponent of two to be applied to the fractional mantissa. Positive and negative exponents in the range −127 to +127 are covered by having this fourth byte expressed with an offset of 128; values greater than this being considered positive, values less than this being negative exponents.

Execution of the following routine can offer insight to this format:

```
10 INPUT "X = "; X
20 FOR I = 0 TO 3: PRINT PEEK(VARPTR(X)+I):  NEXT I
30 GOTO 10
```

When running this exercise, note how the third and fourth bytes respond to changes in sign of the exponent and of the mantissa.

When a four-byte floating-point operand is pushed onto the AM-9511 stack, the first byte pushed is the least significant one (the same as that at VARPTR(X) in BASIC); the second one pushed is the middle byte from VARPTR(X)+1. The third one pushed is the most significant mantissa byte except that the convention used always has bit 7 set explicitly unless the variable is a 0. In the APU convention the mantissa sign appears as bit 7 on the fourth byte to be pushed onto the stack. The other bits (0-6) of this last byte give the exponent expressed as an offset of 128 except that positive exponents are in only the low 6 bit locations. For example, if the byte were equal to 1, this would represent a positive mantissa to be multiplied by +2; if the byte were 129, a negative mantissa multiplied by +2; if 127, a positive mantissa multiplied by 2^{-1}; if 255, a negative mantissa times 2^{-1}.

The following BASIC routine can be used to generate floating-point numbers on the AM-9511 stack from which they can be read as an illustrative exercise.

```
10 INPUT "POSITIVE INTEGER = "; X
20 OUT 64,(XAND255): OUT 64,INT(X/256)
30 OUT 65,29          'FLOATS INTEGER
40 IF (INP(65)AND128)=128 THEN GOTO 40
50 FOR I=0 TO 3: PRINT INP(64): NEXT I
60 GOTO 10
```

Line 20 pushes a positive integer onto the APU stack as two 8-bit bytes; Line 30 commands the APU to convert these to floating point format; line 40 is repeated until the APU status bit goes low; and then the stack is popped off and printed. Negative integers can be acquired by adding the APU operation of changing the floating point operand's sign (OUT 65,21); fractional values can be formed from division of inte-

gers to generate negative exponents.

Conversion between the two floating-point formats can most quickly be done in machine language but the general principle can be illustrated by the following BASIC routine which pushes a BASIC variable onto the APU stack in correct 4-byte format and then pops and prints them for examination.

```
10 INPUT "ANY VARIABLE = "; X
20 IF PEEK(VARPTR(X)+3)=0 THEN
     FOR I=0to3: OUT 64,0:NEXT I: GOTO 100
30 OUT 64, PEEK(VARPTR(X))          'PUSH LEAST
40 OUT 64, PEEK(VARPTR(X)+1)        'PUSH MID
50 OUT 64,(PEEK(VARPTR(X)+2)OR128)  'MOST
60 'IF LAST BYTE => 128 THEN POSITIVE EXP
70 Z=PEEK(VARPTR(X)+3): IF Z=>128 THEN
     OUT 64,(ZAND 63)+(PEEK(VARPTR(X)+2)AND128):
     GOTO 100
80 'IF LAST BYTE <128 THEN NEG EXP; USE 7 BITS
90 OUT 64,Z+(PEEK(VARPTR(X)+2)AND128)
100 FOR I=0 TO 3: PRINT INP(64): NEXT I
```

Lines 30 and 40 push the least and middle significant bytes without modification. The APU format requires that the most significant byte of the mantissa always have the high bit set, this is done in line 50. Line 70 tests the BASIC exponent byte, if the high bit is set it keeps the mantissa sign and the low 6 bits of the exponent. The negative exponent, handled by line 90, keeps the low 7 bits and picks up the mantissa sign.

MACHINE-LANGUAGE PROGRAMMING

The format conversion subroutines written in machine language occupy about 30 bytes each and are entered with one register pair (HL) set to the memory location of the source format and another pair (DE) set to the location of the designation format. These subroutines will not be given here but they involve transferring the two least significant bytes unchanged and setting the correct sign bits in the other two.

The following machine-language routine could be called by the BASIC USR(0) function with the BASIC variable X already poked in the four locations starting at 32256. This routine converts the variable into APU format, pushed it onto the stack, does a sequence of math operations, pops the result, converts it to BASIC format, then returns to BASIC. The BASIC routine would pick up the results and, perhaps, print them. The greatest advantage of the numerical processor chip is realized when the math operations are extensive and the shuffling to BASIC is minimal.

```
100 ;Z-80 MACHINE LANGUAGE
110 BASVAR  EQU   32256          ;BASIC FORM
120 APUVAR  EQU   32260          ;APU VARIABLE
130 ;CONVERT BASIC TO APU FORMAT
140         LD    (HL),BASVAR    ;FROM
150         LD    (DE),APUVAR    ;INTO
160         CALL  BASAPU         ;CONVERT
170 ;PUSH         ONTO           APU
180         LD    (HL),APUVAR    ;POINTER
190         CALL  PSHFLT         ;PUSH
200 ;DO MATH OPERATIONS AS REQUIRED
210         CALL  EXP            ;EXP(X)
...
400 ;NOW POP OFF STACK INTO MEMORY
410         LD    (HL),APUVAR    ;POINTER
420         CALL  POPFLT         ;POP TO MEM
430 ;CONVERT TO BASIC FORMAT
440         LD    (HL),APUVAR    ;FROM
450         LD    (DE),BASVAR    ;INTO
460         CALL  APUBAS         ;CONVERT
470 ;RETURN TO BASIC
480         RET
490 ;MATH SERVICING ROUTINE EXAMPLE
500 EXP     CALL  BUSY           ;APU DONE?
510         LD    A,16           ;OP CODE
520         OUT   (65),A         ;EXP(X)
530         RET
540 ;CHECKS APU STATUS BIT
550 BUSY    IN    A,(65)         ;STATUS,ERRORS
560         AND   128            ;HI BIT
570         JR    NZ,BUSY        ;LOOP TILL LOW
580         RET
590         END
```

Figure 2.

Such machine language programming is tedious to write and debug when there is only cassette tape for mass storage but no doubt disk editors and assemblers are in the offing for the TRS-80. In any case, if rapid number crunching is required, the hardware effort is minimal and the software development is a good investment. No doubt future versions of high-level languages will be designed to take full advantage of numerical processing chips.□

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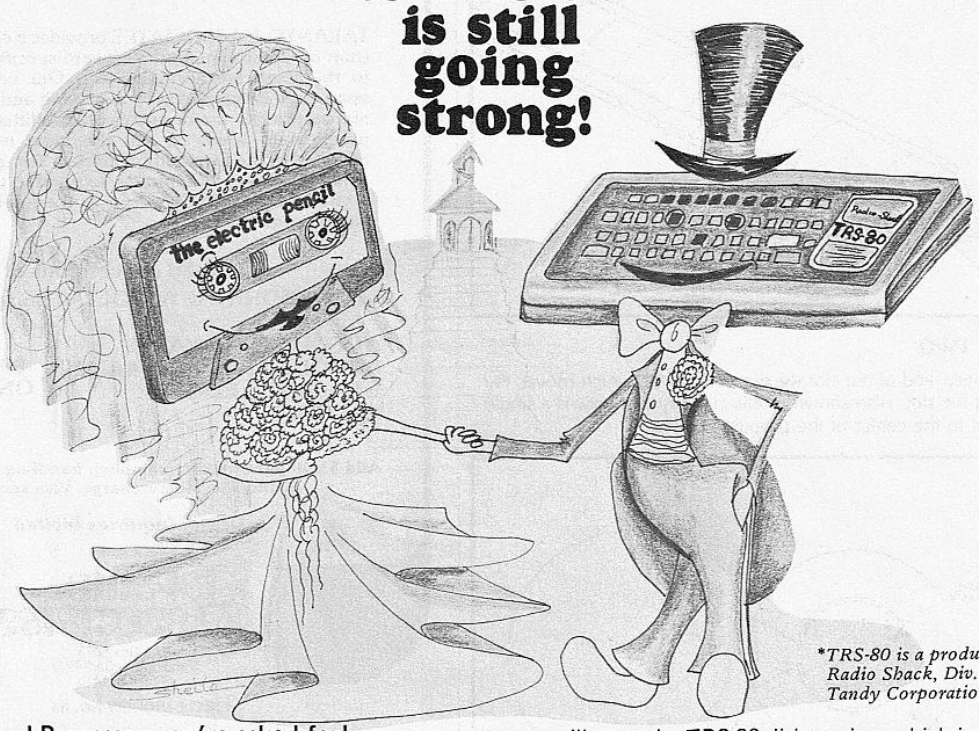
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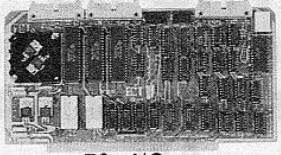
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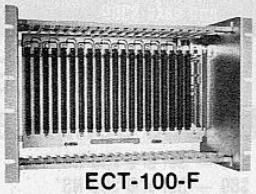
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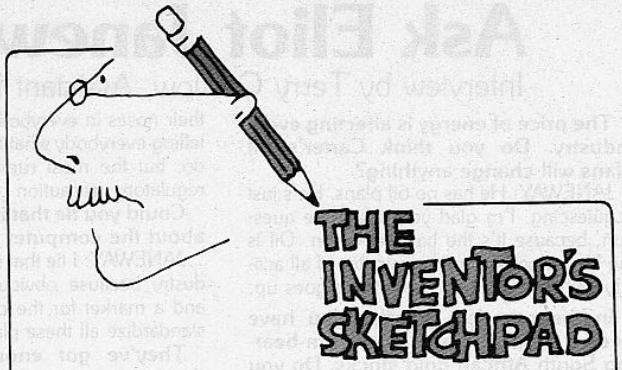
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CIRCLE INQUIRY NO. 50



By Roger Garrett
Northeastern Regional Editor

A PROPELLED DROPLET PRINTER

Ink-jet printing, as seen in IBM's TV commercials, is a relatively new form of printing in which tiny droplets of ink are 'fired' at the paper to form dots which, when fired at the appropriate positions, form the desired characters. One of the many advantages of this form of printing is that with simple changes in the character-generating ROM any form or styles of characters may be produced at camera-ready quality. This means the quality of type that you normally see in magazines.

I do see a problem with the current state of ink-jet printing, however. Of the two currently available forms, that of 'ink-on-demand' and what can best be described as 'steady stream,' both require that the printing element be moved back and forth across the page, just like conventional dot matrix printers. The 'ink-on-demand' form fires the droplets only when needed to produce a dot. The 'steady stream' approach fires droplets continuously but deflects into an ink reservoir those droplets which are not needed.

Wouldn't it be nice if the printing element could be held stationary so that the only part that moved would be the ink droplet itself. Such a device would print faster and require less maintenance. . .

This latter form, which was the first to be developed, has the added problem that the unused ink must be cleaned by a special filter and recycled by a special pump back to the ink-jet stream. The major problem, however, with each of these methods is that the printing element, the device that actually shoots the ink at the paper, must be moved back and forth across the paper.

Wouldn't it be nice if the printing element could be held stationary so that the only part that moved (other than the normal movement of the paper) would be the ink droplet itself. Such a device would print faster and require less maintenance due to fewer moving parts. And here is how I believe it could be done.

FIGURE ONE

We take a piece of tubing cut to the width of a piece of paper. A slot is cut the entire length of the tube. Inside the tube we position a metal plate opposite the slot. This plate we will call the *electrostatic*

deflection plate. Around the outside of the tube we position individually addressable electro-magnetic coils, each of which has a slot cut into it to correspond to the slot in the tube. We will call these *propulsion coils.*

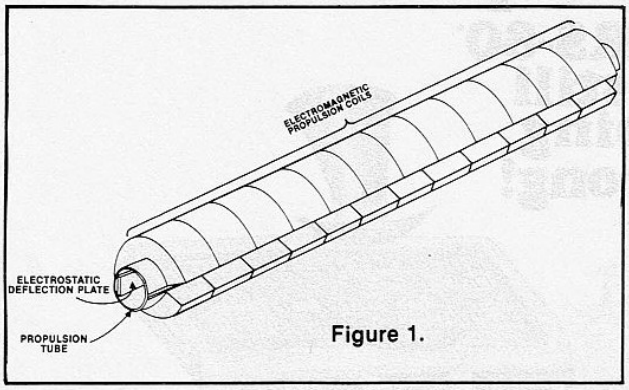


Figure 1.

FIGURE TWO

At the open end of the slot we mount a platen which moves the paper past the slot. Also shown in this cutaway end view is a single ink droplet in the center of the propulsion tube.

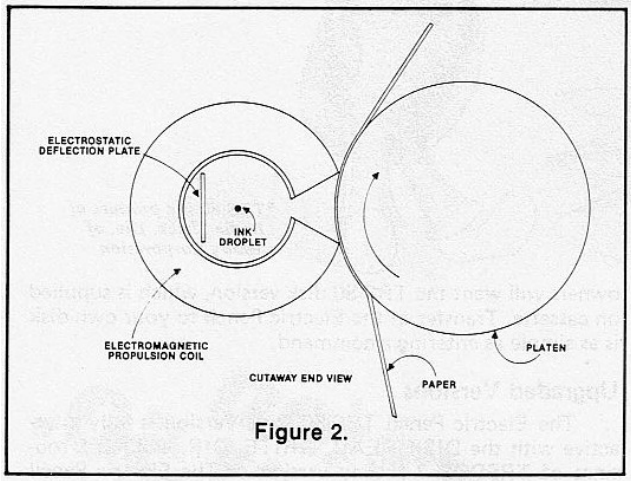


Figure 2.

FIGURE THREE

Now we are looking at an overhead cutaway view with the platen removed. The cutaway portion of the propulsion coils are shown cross-hatched. The open slot in the propulsion tube and coils faces downward.

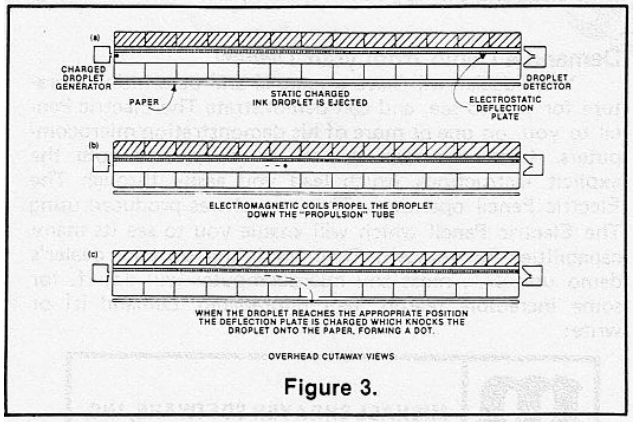


Figure 3.

In Figure 3a we see that a *charged droplet generator* has been added at the left side of the propulsion tube. This device is very much like the steady stream ink-jet printer in that it 'fires out' electrostatically charged ink droplets, yet it is also like the ink-on-demand

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CIRCLE INQUIRY NO. 13

printer in that it fires droplets only when instructed to by the controlling hardware (or software).

At the right-hand side of the propulsion tube there is a *droplet detector.* This is *not* a droplet recycler. When an ink droplet reaches the detector its presence may be detected (probably by a simple LED/light sensor arrangement), but it is not recycled. In its simplest form it would be a sponge which would be discarded when full. But that is quite all right because very few droplets ever reach the detector.

Let's start at the top with these drawings (Figure 3a). At this point an electrostatically charged ink droplet has been 'fired' out of the droplet generator.

The controlling software now takes over (3b) by sequentially energizing and de-energizing the individually addressable propulsion coils. It is similar to a linear accelerator which is used in atomic research to move electrons and other charged particles. The ink droplet moves down the propulsion tube through the properly controlled magnetic fields of the propulsion coils.

In Figure 3c the droplet has reached the position where we want a dot placed on the paper. The propulsion coils are turned off and the deflection plate is immediately charged with a strong electrostatic charge of the same type as the droplet. This deflects the ink droplet towards the paper and a dot is accurately positioned on the paper.

FIGURE FOUR

Here is a perspective view of a typical setup for this system. Notice that the paper is printed one line at a time. This is similar to the way in which a CRT monitor works. Assuming that each character to be printed is actually made up of a series of dots, the top row for all characters on a given line is printed first. The paper is then rolled up one dot's height and the second row of dots for all characters on the line are printed.

It might even be possible to have more than one ink droplet traveling down the propulsion tube at the same time simply by dividing the deflection plate into several individually addressable sections.

Continued below

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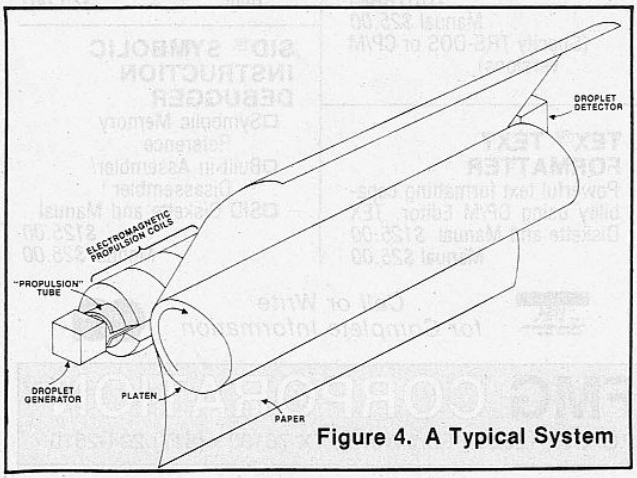


Figure 4. A Typical System

The function of the droplet detector is to periodically check to ensure that droplets are properly traveling down the propulsion tube and at the correct velocity. Every once in a while the controlling software will fire a droplet down the entire length of the tube and test to make sure that it gets there in the expected amount of time. If it doesn't get there, then it knows that it is out of ink or there is a fault with the droplet generator. If the drop is too slow or too fast, it will know to compensate by charging the deflection plate appropriately.

The final result, then, is a printer with only two moving parts: the platen and the ink droplets. There may, of course, be problems with propelling the droplets for any great distance. The width of normal computer print-out paper (14") might be too much. A possible solution might be to have a propelled droplet printer for each half of the paper width which, of course, would double the printing speed.

Such a device might also be utilized on hand-held calculators, providing them with simple printing capabilities and replacing the thermal printers which require special paper.□

The author can be contacted at: Inventor's Sketchpad, 16 Grinnell Street, Jamestown, RI 02835.


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FROM :- PETER HOWARD

TRS-80 Cassette Waveforms - an Introduction

A few years ago I had a look at the waveforms used for Model 1 (500 baud) and III (1500 baud) cassette programs[1]. At the time my work involved DSP-based RF processing, for both both analog and digital radio signals. I am *not* a DSP expert, and going back to the way the programs of my youth were encoded was, for me, another way to approach this area. As part of this I wrote my own WAV-CAS conversion programs in Python, extending on an existing CAS to WAV python program I found on github. Knut's utilities were already available, but I was approaching the whole thing as a learning exercise and "rolling your own" is a good way of confirming that you *really* understand things. Having done that, I parked things and moved on. In the last year or so I've noticed more references to cassette programs with some new (at least to me) utilities around for converting WAV recordings (Lawrence Kestleloot's trs80-tool being the most comprehensive), along with the "SAVING TO CASSETTES" article in the December '21 issue. All of which makes me think others might be interested in what I found. Nothing in here is even vaguely "new" but when I was first looking at this, I would have found it helpful to have all of the information in one place. For example: while there is a lot of documentation on the Model I 500 baud waveforms, there seems to be a lot less on the Model III 1500 baud waveforms, and while there is mention of the Model I cassette images being "unreliable", I didn't see much detail on the "why" or why the Model III images were better[2].

Something to note while looking at the waveforms as WAV files - from an *audio* perspective they are centred around 0.0, that's not how they are treated by a computer. Internally they are an electrical signal from 0V to 4V, with "zero" being 2V. Keep this in mind in terms of "threshold" values.

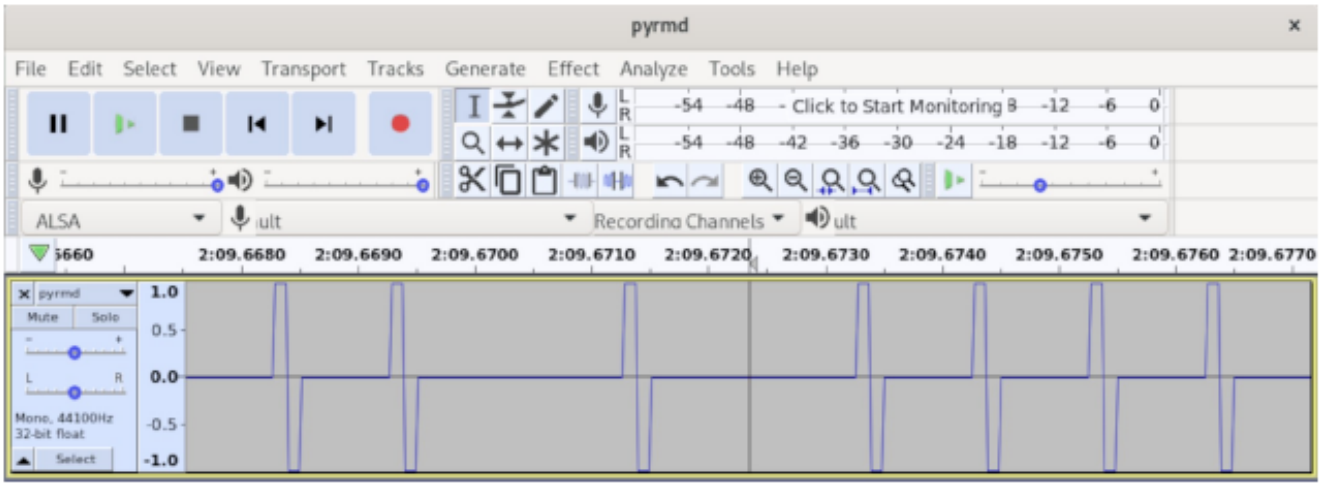
All of the captured WAV files I show below were created using the same CCR81 to play the tapes, and the same PC to record them via Audacity (a different version for the CoCo Bedlam image and the Model III generated WAV from the others, and different versions used in the screen shots - I took the first ones some time back).

Model I 500 Baud

The waveform used for the Model 1 500 baud is described, and drawn, in multiple locations. I'll start with the Model 1 Technical Reference Manual. Refer to figure 10 "Idealized CASOUT" The data is a serial stream. There is a synchronization pulse every 2ms. For a bit value of 1 there is a pulse 1ms after the synchronization pulse. For a bit value of 0 there is nothing. Here is a Python-generated waveform - exactly to theory.

1 I've never actually had a Level 1 machine, so I've never had any 250 baud tapes.

2 OK, there was one bit, but when I came to write this I couldn't find the information again – I'll highlight the point when I come to the MIII tapes.



Note that this is *not* the form that gets processed by the loading code. Figure 11 in the Model I Technical Reference Manual shows how the up/down pulse gets processed to a single *down* pulse with "no pulse" being 4.9V and a "threshold" value of 1.6V. For the above signal, 0.0 would become 4.9V and both the up and down pulses would be a pulse down to 0V. Capacitor smoothing means that transition, which is now effectively a jump back to 4.9V shouldn't rise above the 1.6V threshold so it is really is a single pulse. When the signal drops below the threshold, a hardware latch is set; it is the latch value (rather than the signal itself) that the Z80 code will check. When I found, and extended, the Python code to convert from WAV to CAS I wasn't aware of this transform, so I wrote it to explicitly look for a "high side" pulse and a "low side" pulse. I also coded it to look for both sides to be 125us long. Interestingly the Model I Technical Reference Manual, for example, shows the high and low pulses being of equal width but doesn't specify a value for the width. I am aware of two sources which *do* specify the pulse width:

- The authors of the original Python cas2wav quoted a French text - "*La pratique du TRS-80 Volume III*" from "*Edition du PSI*" By Pierre Giraud and Alain Pinaud - for those values.
- Tandy's "More TRS80 Assembly Language Programming" also specifies the time (Figure 10-9 and supporting text).

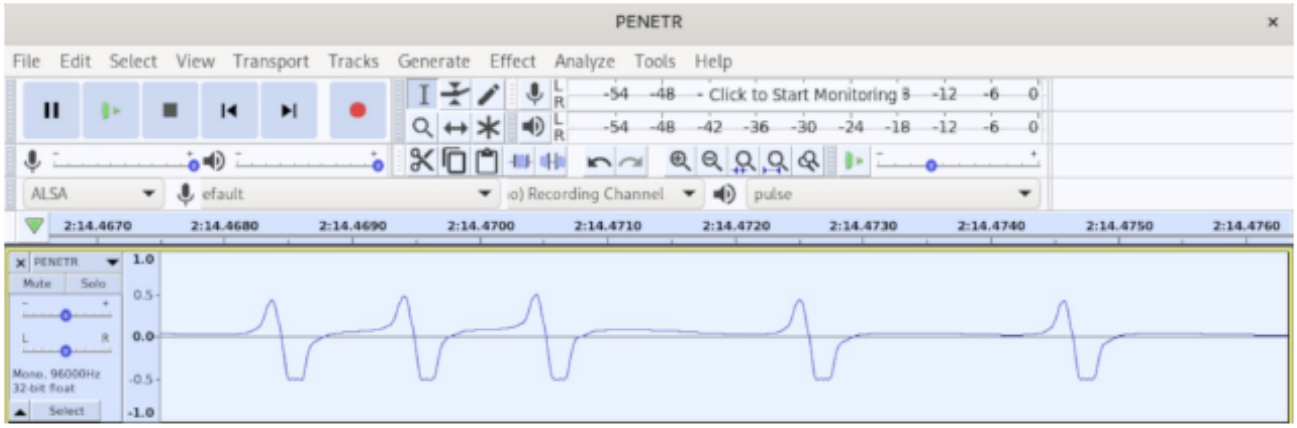
Presumably you can derive the values from the assembly for the cassette writing logic in the Model I ROM.

One key point about the logic of the actual Z80 code reading the data: it is extremely forgiving. Once it has found an initial pulse it basically wants a pulse within the range of ~500-1900uS (0.5-1.9ms). And it pretty much ignores the concept of "pulse width" because it only cares about the latch value (which stays set until explicitly cleared). Two places which describe this in more detail are:

1. "The Custom TRS-80" in the "Supplement to Chapter 3"
2. "More TRS80 Assembly Language Programming" in Figure 10-10.

An aside here (and back to part of the reason I wrote this) - it was only *after* reading the relevant sections in the Model 1 Technical Reference Manual *and* "The Custom TRS80" *and* "More TRS80 Assembly Language Programming" that I actually had the full story (or something close to it).

Back to the signal on the tape. Now as anyone who has ever used an Oscilloscope knows, you *never* get signals like the one in the first picture; things are always messier. So how much messier? Again Figure 11 gives you an idea of the expectations from the designers of the Model 1. And in reality? First let's look at a WAV file captured from a "good" tape - "Penetrator" by Melbourne House.

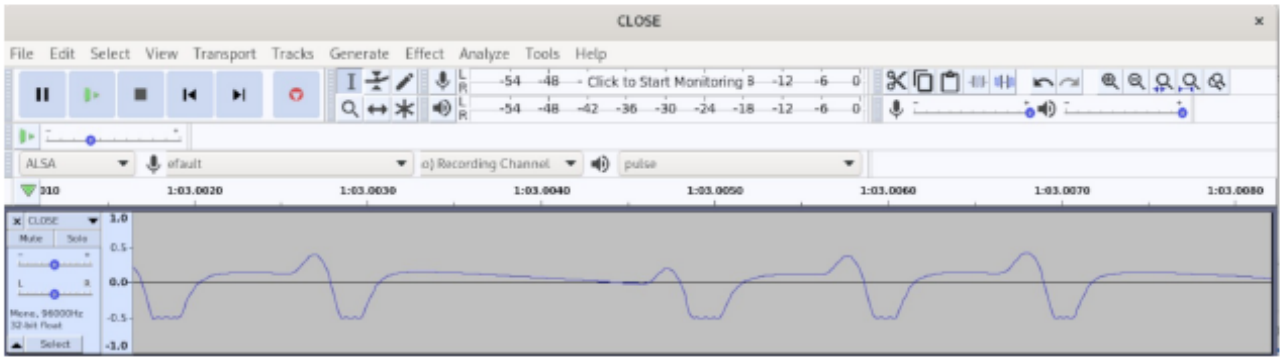


When I looked at this the first thing I notice is that the "high side" is weaker than the "low side". Which, if you think in terms of 0V-9V instead of -1.0 to +1.0, and the fact that the "high side" is a transition from 2V to 9V whereas the "low side" is a transition from 9V to 0V, makes sense

Now look at a section of a "less good" tape - "Close Assault" from Avalon Hill. For this to read properly, I had to disable "high side" checking in my code, otherwise the result was completely wrong.



I am showing a larger section here to highlight how awful the "high side" pluses are. Lots of pre-drift from 0 before the pulse, and the return to 0 after the "low side" pulse overshoots. Also, note how much the high side pulses vary in amplitude. Now to a smaller section as before.



Take a look at the synchronization pulse finishing at 1.03.030 There is no pulse for data, so it should be read as a 0. However look how low the high-side of the next synchronization pulse is. It is not going to get over the threshold without a reasonable boost to volume. But if you do that, the floating value after the previous pulse will be high enough, late enough, to register as a

false trigger. The irony is that the code processing this in the Model 1 works by effectively doing the same thing I had to do in my code; throw away the "high side" altogether. The low side is consistent in amplitude and because the code pretty much ignores the concept of "pulse width" it can cope with loosing half the pulse. However, this is going to be *very* sensitive to the volume going too high. Also, this assumes the "low side" is always strong. It is on the tapes I have checked, but that is a relatively small sample size.

Also think about the poor first generation "System 80" / "Video Genie" / "PCM80" which had *no* volume control. It should be pretty clear why they had such a hard time of things. If you are going to have *just* a default gain with these waveforms . . .

Model III 1500 Baud

With the Model III the logic changed from "sync pulse + data pulse" to "Frequency Shift Keying" - a form I'd consider more "standard" - it's used in Modems, other cassette tape encodings (including the CoCo, which I come back to later), and Digital Radio at least. FSK is simple to understand - each value gets a different frequency. In the Model III it is the basic 2FSK - i.e. two values (0 and 1) each with a different frequency. In the radio world (at least) 4FSK is more common now (4 values and 4 frequencies). The two frequencies are:

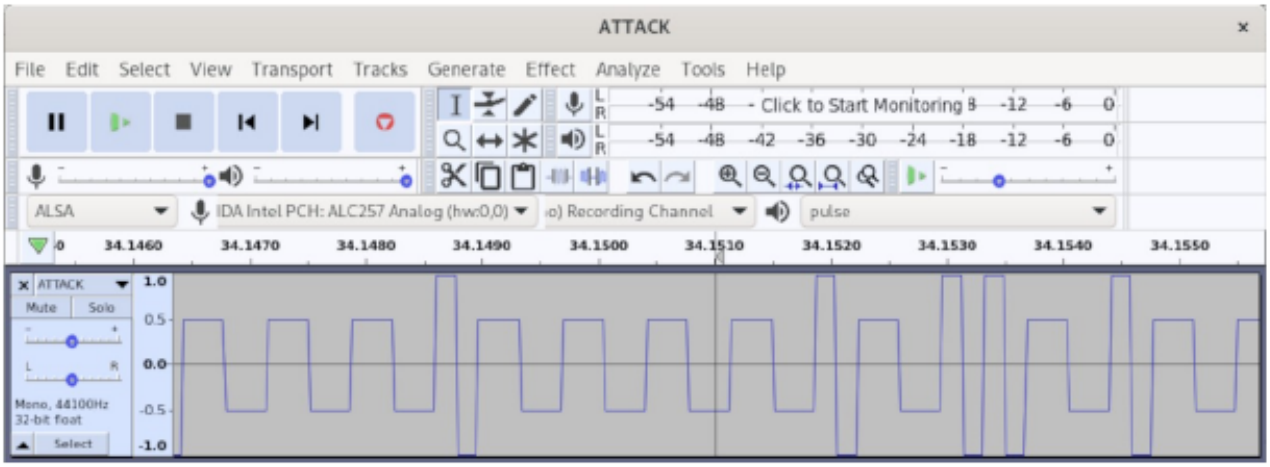
- 2680Hz for a 1 and
- 1320Hz for a 0.

Normally you would expect the two to be exact multiples of each other. I queried why they weren't in the VCFed TRS80 forum and the answer that came back was that the frequencies chosen made the pulses exact multiples of the Model III clock speed. A further question was why there was only one cycle of each frequency; in other applications you'd expect (at least) 2 cycles to be used for reliability. This would give you (again with exact multiples) 4 cycles of the higher frequency and 2 cycles of the lower frequency, which would also mean a constant rate rather than a faster rate for 1 then for 0 (note the "1500 baud" is achieved by averaging the speed for 1 and 0). There was no real answer for that, but I think it comes down to two factors, which really come down to the same thing - in this context they could get away with it. Firstly, FSK is mostly used in conjunction with modulation / de-modulation and a more hostile environment. So a Modem over the phone lines or a digital radio over the air, there is much more scope for distortion and interference, so you need the extra cycles, especially as throughput goes up. Secondly, this isn't *quite* FSK in that the logic in the Model III ROM code is "zero crossing + time": There are a pair of interrupts available and the logic is:

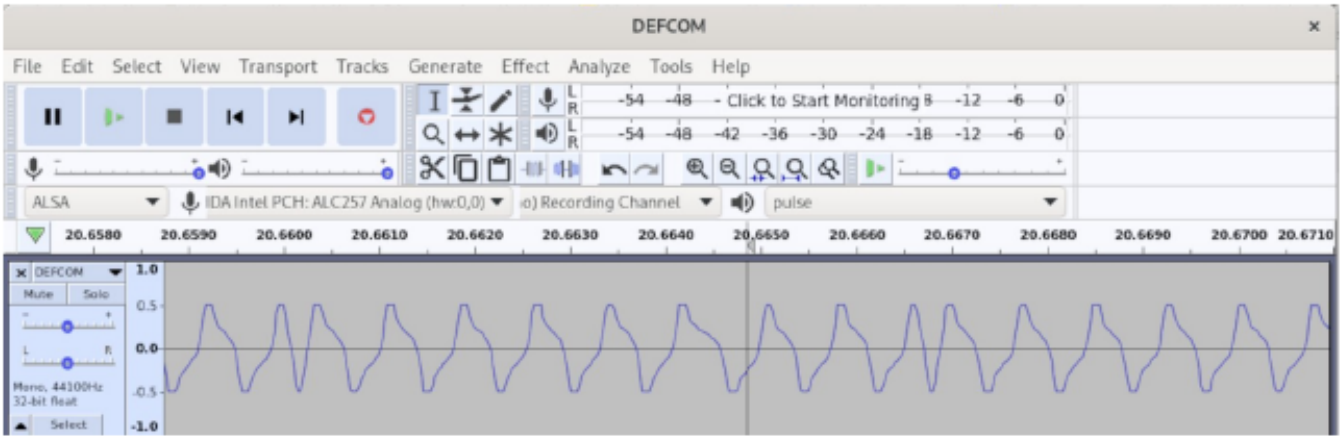
- Start with the interrupt on for "going up"
- Interrupt triggers, note time.
- Set interrupt for "going down"
- Interrupt triggers, note time differential, it's either a 1 or 0 (with latitude)
- Set interrupt for "going up" again, and back to top.

As with the Model I logic, it's reasonably "forgiving" of variance. And because you are now dealing with "full deflection" in both directions, you don't get the "high side" weakness you got in the Model I waveform[3]. So let's look at the Python generated waveform, exactly describing the theoretical waveform.

3 OK, so this is the point I *did* read somewhere a few years back. Now if only I could find where that was . . .



Note here that I have given each frequency a different amplitude. This is simply to make it easier to see the difference (When I read the Model III or 4 Technical Reference Manual - exactly the same text in each - I really struggled to visualise this based on the description and they didn't include a diagram as they did for the Model I). Also, because the logic is now "zero crossing" rather than "negative amplitude greater than a threshold" it makes no difference to the processing of the waveform. So let's compare *this* form to a generated file:



So again, the waveform is quite distorted from the "perfect" square wave. But the high and low sides of the waveform are consistent, and the distortion doesn't really matter, because the frequency, and specifically the "zero crossing" is spot on. And that's all that matters.

And the CoCo

So what inspired the change? In the first instance I would assume the issues with the Model I tapes in the real world. But why the exact form they chose? It was some years after I had been playing with this that I finally read the same section of the Color Computer Technical Reference manual. The CoCo has an ADC. And - unsurprisingly - it's used in reading tapes to convert them to digital. And if you look at the section in there on cassette input - specifically Figure 12 - the final square wave - "Input to the PIA" looks *exactly* the same. The only difference is that the two frequencies are exact multiples - 1200 and 2400Hz. I haven't written a WAV generator for the CoCo, but here is an image from a CoCo tape:



Here we have a sine wave as per the Technical Reference Manual. Clipped, but that isn't going to be a significant issue. My *guess* here is that :

- The team doing the cassette logic for the CoCo approached it from the FSK side, and worked out they could get away with a single period wave for each value.
- The Model III came out after the CoCo so the team had the CoCo cassette work to refer to, including (presumably) data confirming that the single-period approach worked adequately.
- The team for the Model III then reworked it in the context of having no ADC, and simplifying it to "zero crossing with interrupts".

Given that the two "Data Synchronization Apparatus" patents granted to Tandy - one for the CoCo and one for the Model III - open with *exactly* the same sentences in the Abstract (with a touch more detail in the Model III one) I would be confident my guess is roughly correct. Anyway that covers what I learned from playing with tape conversion. Hopefully someone else out there will find this interesting and helpful.

The discussion thread on VCFed about the exact frequencies for 1500 baud is: https://forum.vcfed.org/index.php?threads/story-behind-1500-baud-decisions.57910/ (the links to the two patents are in there)

If anyone is interested in the Python I wrote - please contact me directly. At time of writing the 500 baud conversion code is still Python 2 and needs conversion to Python 3, and the CAS → WAV conversion code works but hasn't been validated by feeding into a real Model III; I had left it previously and quickly finished it just to generate the waveform shown here. Though if you know JavaScript I'd expect trs80-tool (https://github.com/lkesteloot/trs80/tree/master/packages/trs80-tool) to be more complete.

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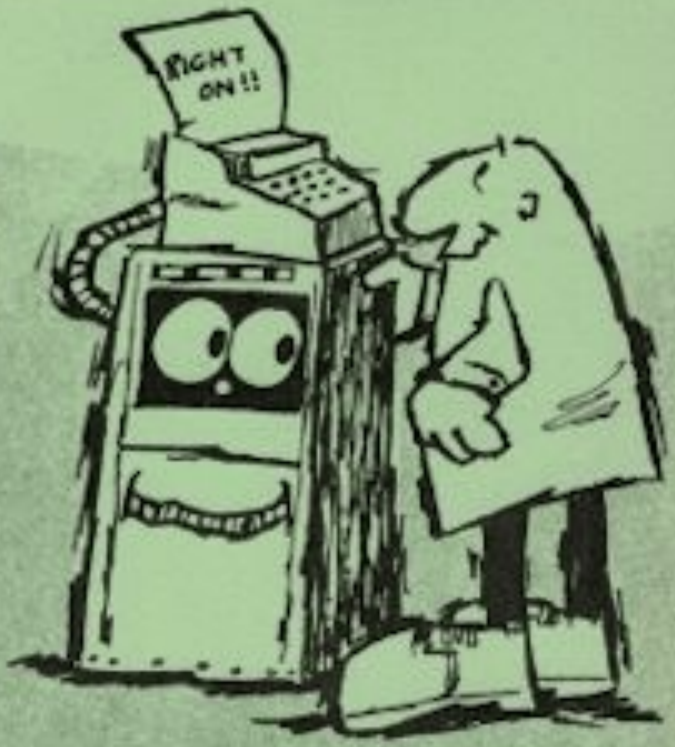


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MY COMPUTER LIKES ME*

by BOB ALBRECHT



*when i speak in BASIC

The Big Tandys

(formerly Business Time with Kev)

Well I'm back. I can't believe how long it's been since my last article for TRS8BIT. I got a bit busy with things and those around me have heard the story a thousand times but I decided to go back to work part time and its been anything but part time and at all hours of the day and night. At the same time that's been a good thing because its funded the hobby. In particular its funded my most recent acquisition which is the subject of this article. When I advised Dusty (who I might add does a fantastic job of putting TRS8BIT together) of my latest acquisition he suggested an article for TRS8BIT.

A quick recap - the idea was that as an owner of a couple (well at that stage two) 8" TRS-80's, the Big Tandys, a spot in TRS8BIT with a business machine focus might be a great idea. I agree but I became a victim of overwhelming and very poor time economics and regrettably doing fun stuff like this fell by the wayside. Hopefully the tide is turning!

Up until recently I had two 8" machines, a Model 12 (upgraded to a Model 16) and a Model 16B. You might recall the story - coincidentally or otherwise they both came from bakeries in South Australia. They live with a lot of their cousins such as a Model 1, Model III, Model 4, Model 4P, CoCo (in fact I have several of each) and a Model 1000 (along with a range of other eclectic machines such as C64 (I count these by the dozen sometimes), VIC 20, TI/994A, Sinclair ZX, Amiga, MicroBee, Dick Smith VZ300, Osborne, a couple of genuine IBM XTs, a few Macs and a couple of AS/400's). The subject of this article aside, my most recent acquisition (i.e. prior to the Model II) was a Model 4P that I rescued from a chicken coop out in the middle of nowhere. I don't mean the shed alongside or the egg sorting room or the staff room or some other reasonably sanitary place, I mean the chicken coop. In fact it was in an old caravan being used as a chicken coop - needless to say the machine was a rats nest but it is complete and with a HAZMAT team and a good clean we'll see what comes of it.

To the matter at hand! You will note from my list of TRS-80 machines that there is a gap early in the list, a Model II. Up until very recently I had only ever seen one in the flesh in my life, it was in Adelaide (South Australia) 20+ years ago. I ummed and aarhed a few times and said no. Well ever since then I'd wished that I had said yes. I really like those TV shows where pickers go through old sheds and home and shops and farms and factories etc looking for "stuff". In particular I was watching American Pickers one day and Frank Fritz said in one or maybe more episodes, "Buy it when you see it!" I wish he'd been there 20 odd years ago! Given my earlier lapse in judgement and the apparent rarity of the machine a Model II became the holy grail for my collection.



So for years I scoured the four corners of the earth, well more accurately I had a saved search running on eBay, and it finally paid off. Now I recognize that buying via eBay can be risky but this one seemed to tick all the boxes including a Disk Expansion Unit with a full set of three 8" floppy drives. Yes, I paid a premium but this one was not going to get away this time and the risk paid off!

Now first order of business was to get the machine here. It was in Queensland about 2,000km from where I live and COVID-19 restrictions between here and there were a minefield. So I looked to a freight company for a solution. Now I'd say that most of us have or have seen a horror story about moving classic computers via freight or post. If you want to see what happens to a Model II in transit when not well handled have a look at Lee Adamson's Old Computer Fun YouTube channel https://www.youtube.com/watch?v=9QhZCnPjIgE "My Model II Didn't Make It". He dissects this Model II in other videos and when he opens it, while the CRT miraculously survived, it was displaced from its mounting and the machine's internal metal frame was bent out of shape, apart from the obvious case damage of course. I also have here a Model I Expansion Interface which I bought for parts from an unhappy buyer who received it like this .....



So understandably I'm quite nervous about getting this shipped. Official Radio Shack weight of just the computer was 44lbs or 20kg. Given the find I would have been happy to drive to Queensland to pick it up but COVID-19 restrictions were a hoop-jumping nightmare when crossing state borders (I would have had to cross two) so I consulted a local mover who had done jobs for me in the past and done a great job. I needed someone to collect the machine, pack it and ship it to me. I explained the situation and my fears to them and the machine arrived in about two weeks with the computer, the Disk Expansion Unit and keyboard individually wrapped in blankets - they took really good care of it. For Australian readers of TRS8BIT the mover deserves a plug for listening to their customer and taking really good care of this old gentle giant for us - thank you to Thompson Removals and Storage at Warrnambool.

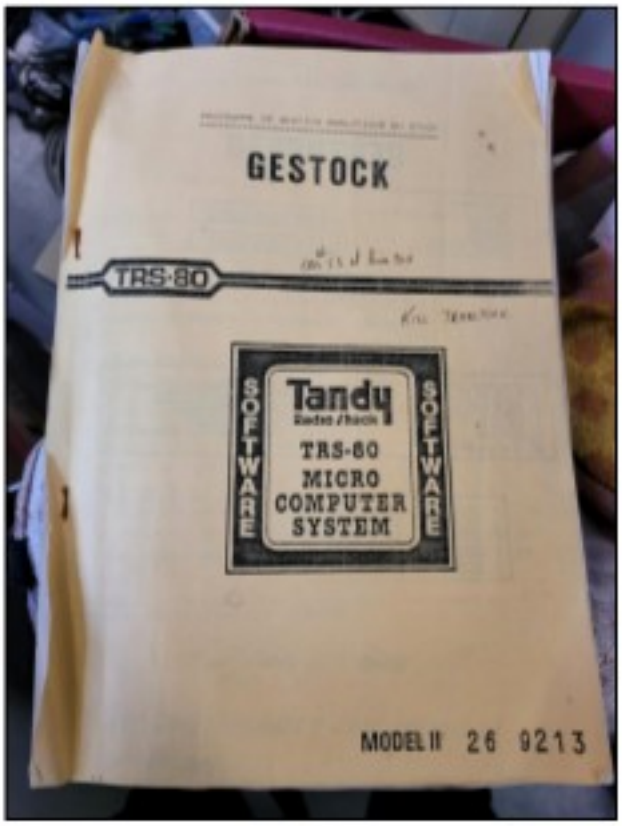
The really exciting part about this acquisition, apart from the fact that its a TRS-80 and its a Model II, is that I was able to ascertain some of the history of the machine and this is where it gets interesting. The machine was originally purchased in Belgium and arguably the machine has had only one owner. Yes, Radio Shack had a presence in Belgium. The address was Parc Industriel, 5140 Nanine (Namur) Belgium. Now I got talking to fellow columnist Pascal Holdry about this because of a French connection here (a little more on this later). Pascal advised me that large TRS-80s are very rare in France but they are found especially in Belgium and in the north of France.

Now I know you're going to ask what's this Model II doing in Australia? I also got with the machine a lot of the original owner's documentation. As best I can ascertain it was purchased around October 1982 - the purchaser lived or worked in Verviers (about 120km east of Brussels). He bought the machine to run a business acquiring the stock of liquidated or failed businesses and then reselling it. Ironically his own business failed but he retained the machine. I also got all of the software he had with the machine and, consistent with running a business like his, it included:

- Scripsit
- Mailing List II
- Profile II
- Profile Plus
- Job Costing
- GESTOCK

GESTOCK was interesting because the manual is in French, consistent with the machine coming from Belgium of course, and has a RS Cat Number of 26 9213. Pascal tells me that "The title of your program is very French, it is

only the contraction in 8 bits of GESTION DE STOCK. " or in English, Stock Management, again consistent with the business the machine was originally acquired for. I did some searching on this catalogue number but could not find a reference. I consulted Big Tandy guru, Aaron Brockbank, who thought it was a UK catalogue number so I reached out to Dusty which in turn lead me to Pascal. I will in due course scan in the GESTOCK manual and send it to Pascal to add to his web site if anyone is interested in looking at it. In the mean time if anyone has any information on this software or catalogue number I'd be most grateful if they could contact me.



Eventually the owner moved to Australia and remarkably brought this big heavy machine with him where he continued to use it for a while. The mind boggles as to how he got this big thing shipped out here all those years ago. He subsequently upgraded and put the Model II away His son, from whom I acquired it, tells me that his father passed away in the mid 90's and the machine remained in storage until now. What's truly striking about the machine is that its in remarkably good condition with only a few very minor blemishes on the computer case. The Disk Expansion Unit case is pristine. The keyboard is very grubby but I'm quite optimistic that it will clean up OK.



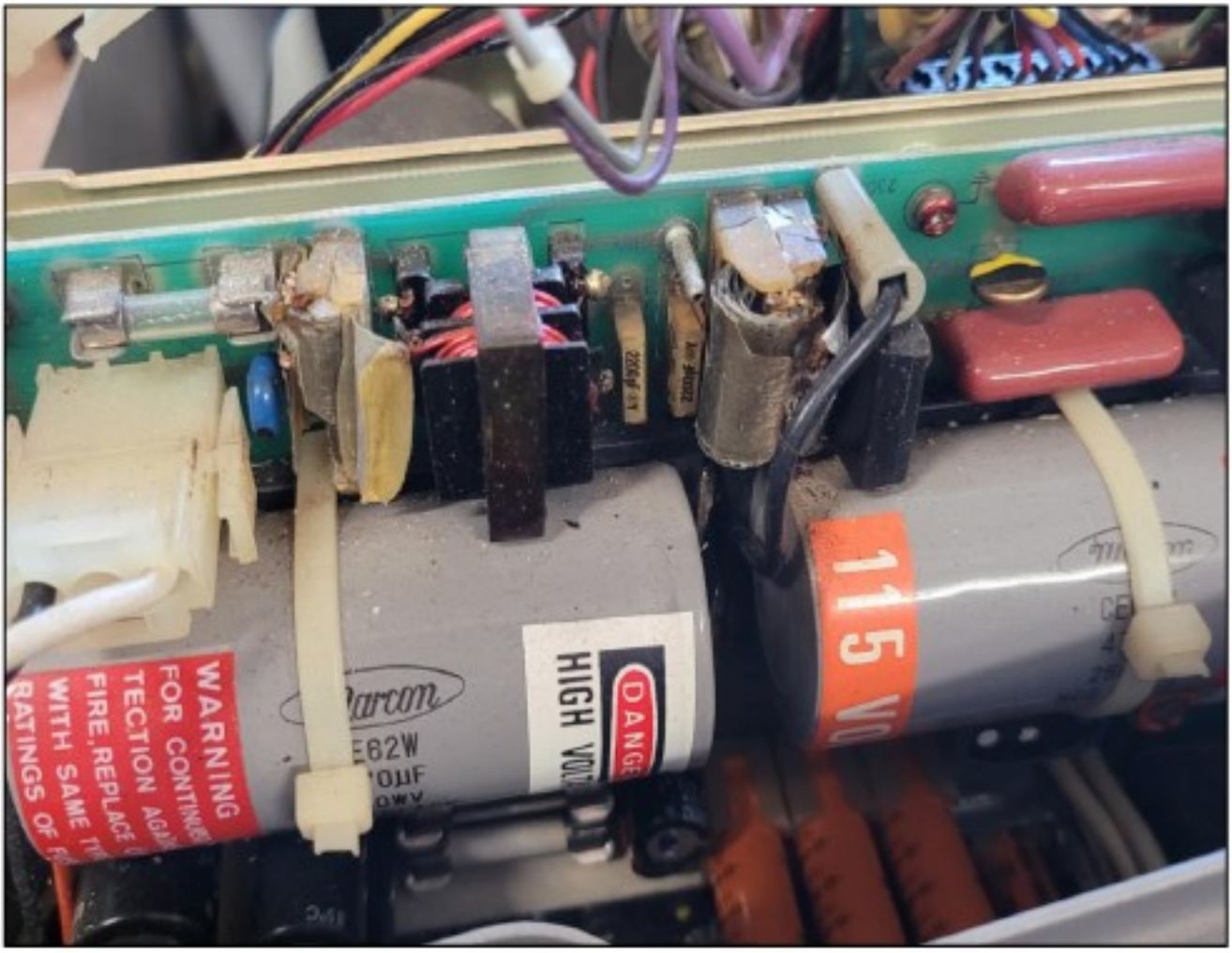
So as you might expect it was very tempting to power it up to engulf myself in some serious TRS-80 excitement here but of course we all know better.

I'm assuming that it was last powered up well before the mid 90's so next step was off with the lid. I seem to recall someone saying to me that internally Radio Shack carried out some major engineering but case wise they weren't so generous.

I must admit I did find the rear lid a bit flimsy but it appeared to be entirely intact I.e. no lugs or guides appeared to be broken consistent with its extremely good condition so I took some appropriate care. Now the keen eyed amongst us may spot something here which will be a bit more prominent in the next photo but generally the machine was quite clean and tidy inside.

I was hoping for the best but I wasn't surprised when I was greeted with that all too familiar TRS-80 affliction so that's a job for the new soldering iron on order.

So the plan is to fix the caps and then try for a power on. I'll try to get that done before the next issue of TRS8BIT and we'll see what this old girl can do.



Kevin Parker

kevin.parker@trs-80.computer

Kevin is a web specialist, ColdFusion developer and SharePoint specialist who is very eclectic in his interests in classic computers but has a particularly large weakness for TRS-80's and black IBM business grade machines. He lives in Victoria (Australia) with his collection! His TRS-80 widow lives in the house.





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- Deluxe keyboard and joystick adapter
- Supports PS/2 and USB keyboards



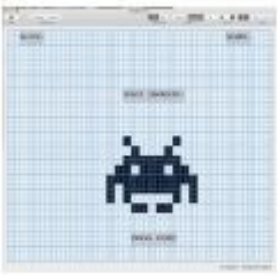
NEWKEY/80 (Lite)

- USB keyboard adapter
- A low-cost way to replace your keyboard



Vicious Vipers **$ Free $**

- Fast-action arcade style game
- 1st place winner of the 2020 TRS8BIT "Double Do" contest



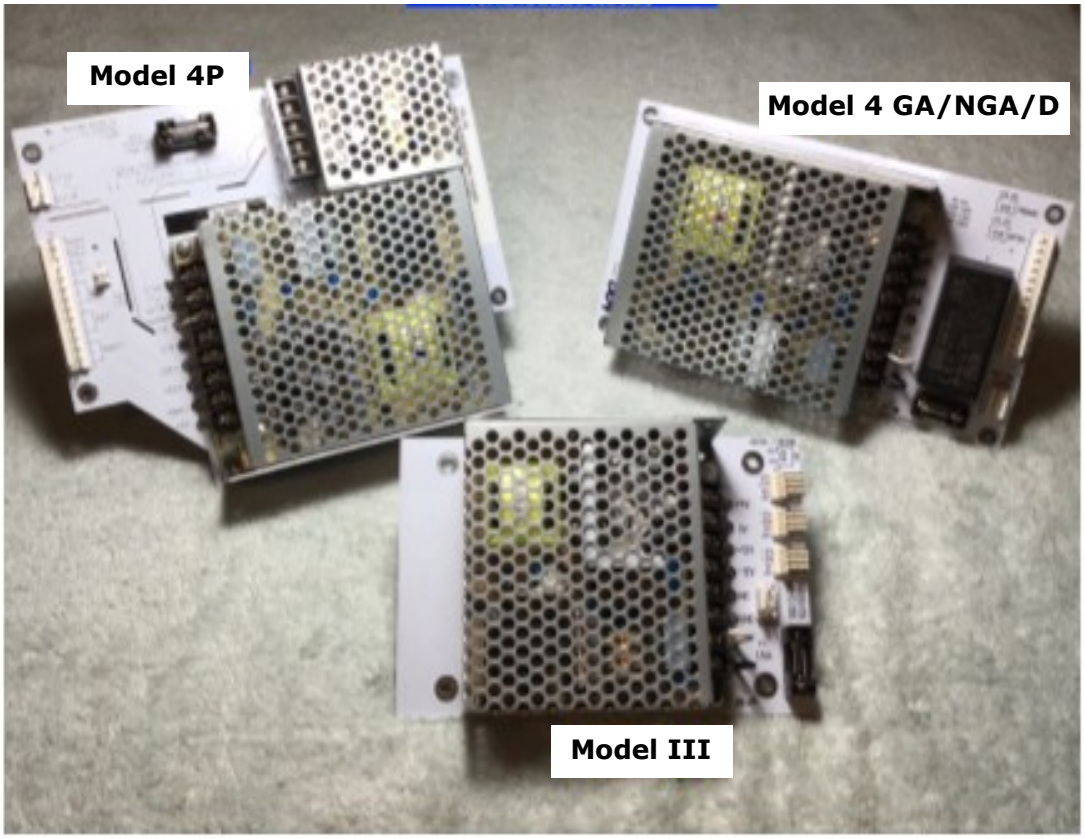
TRS-80 Screen Designer **$ Free $**

- Screen design tool for macOS
- No more paper screen design forms!

Visit www.plaidvest.com for more information

2022 POWER SUPPLIES
FOR THE TRS-80 MODELS 3, 4, 4D AND 4P

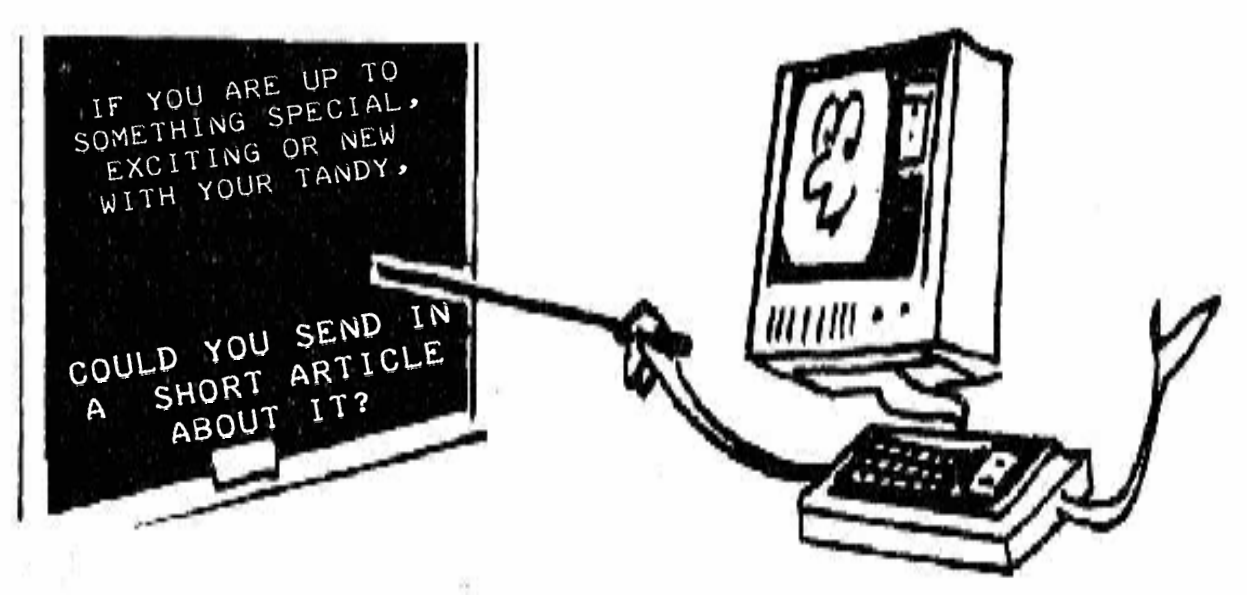
2022 upgraded power supplies For TRS-80 computers



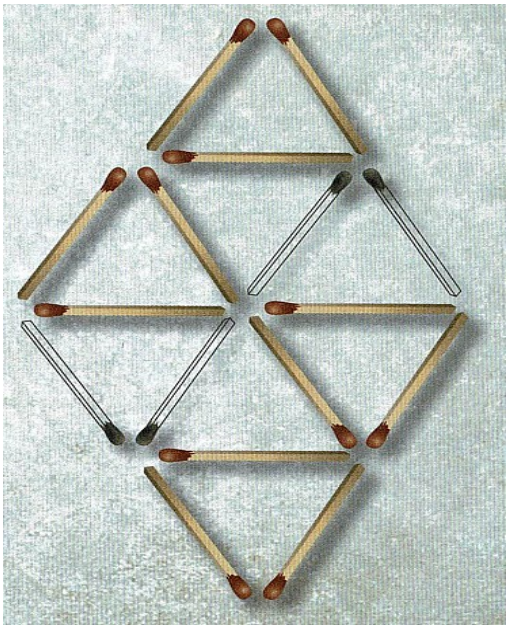
* Uses modern day MEAN WELL power supply units
* 50w for Model 3 version and 65w for the Model 4 version
* The Model 4 version uses a SEPARATE +12V POWER SUPPLY (prevents video "spasm")
* No more RIFA CAP explosions
* No more COLD solder joints
* Units are DIRECT REPLACEMENTS for the original power supplies in all models
* Extra +5V output connectors (1 on Model 3 and 2 on Model 4) for Gotek/freHD boards^
* For more information and pricing contact

^ Model 4P board does not have this

newSOFT
www.plaidvest.com/newsoft
jaynewirth@verizon.net



HERE'S THE ANSWER TO THE QUIZ ON PAGE 21



TRS-80

Repairs & Upgrades

HNC qualified electronics engineer
with 40 years TRS-80 experience.
Enquiries to: trs80@shanefoster.co.uk



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/

TRS8BIT

PRODUCED AT WWW.TRS-80.ORG.UK



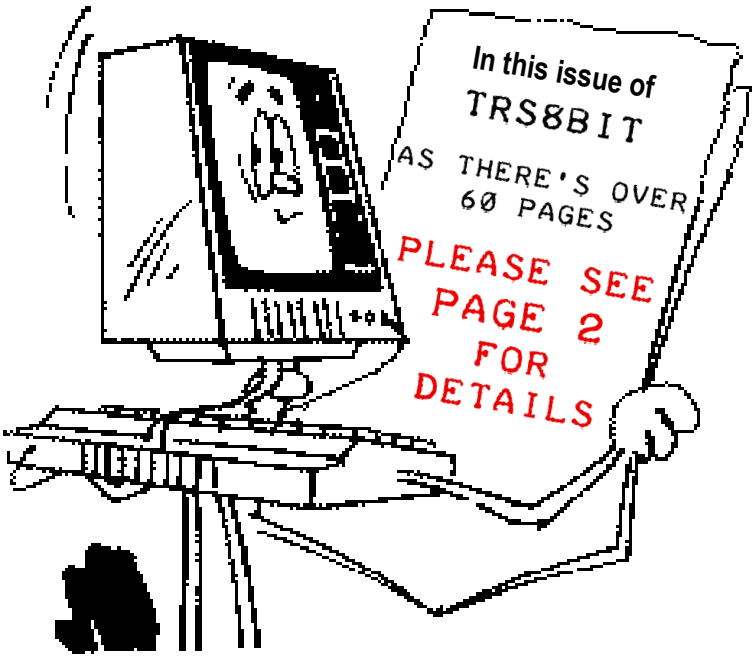
HI EVERYONE AND WELCOME TO THE JUNE 2022 EDITION. HOPE YOU ARE ALL ABLE TO STEER CLEAR OF THE 'MONKEY-POX'



HERE'S A LITTLE SOMETHING I CAME ACROSS ON YOUTUBE. DAN BRICKLIN, THE GUY WHO CAME UP WITH THE THEN 'NEW' IDEA OF A SPREADSHEET, WAY BACK IN THE DAY, FEATURED IN A SHORT VIDEO FROM THE 'TED' WEBSITE. WELL WORTH A COUPLE OF MINUTES OF YOUR TIME. HERE'S THE LINK FOR YOU

https://www.youtube.com/watch?v=YDvbDiJZpyQ

MANY OF US HAVE BEEN ENJOYING THE REGULAR TRASHTALK LIVE EVENTS OVER THE RECENT MONTHS. A BIG THANK YOU TO PETE, GEORGE AND MAV FOR ORGANISING AND RUNNING THEM. KEEP IT UP GUYS!



I'VE JUST NOTICED ON THE TANDY FORUM, KEHVARL IS USING A MODEL 102 AS A TERMINAL TO A PDP8. THAT'S A FIRST! SOMETHING I'VE NOT SEEN BEFORE.

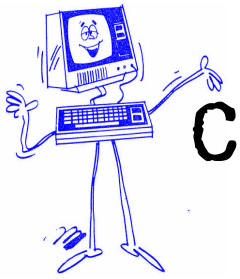
SO, DOWN TO THIS ISSUE. AS USUAL, THERE'S A FANTASTIC SELECTION OF ARTICLES RANGING FROM REPORTS OF THE LATEST CO-CO TOURNAMENT, A TEENAGER AND HER DAD REMIND US OF COMPUTER STORAGE FROM THE VERY EARLY DAYS. MAV GOES INTO GREAT DETAIL OF THE NOTORIOUS M1 CASSETTE I/F AND IF YOU NEED AN EPROM PROGRAMMER FOR YOUR M1/GENIE, WE CAN HELP YOU OUT! DON'T FORGET, ALSO, THERE ARE TWO ONE-LINER PROGRAMS FOR YOU TO BE AMAZED BY. GEORGE PHILLIPS TRY TO DAZZLE OUR EYES AND E.T. FONEHUME SUPPLIES A VERY ADDICTIVE 'DROP TYPE' GAME.

JUST A COUPLE OF QUICK REMINDERS, FIRST ABOUT THE 2022 COMPETITION. THERE'S A FABULOUS PRIZE ON OFFER, THANKS TO MAV, SO DON'T MISS OUT. IF YOU HAVEN'T ALREADY STARTED, NOW IS THE TIME TO GET YOUR PROGRAMING IDEAS IN TO GEAR! FOR FULL DETAILS, PLEASE CHECK OUT THE WEB SITE, TRS-80.ORG.UK FOR FULL DETAILS.
AND SECONDLY, TANDY ASSEMBLY IS BACK, STILL IN SPRINGFIELD AND RUNS FROM THE 30SEP22 UNTIL 02OCT22. I'M LOOKING FORWARD TO SEEING THE WHOLE EVENT VIA YOUTUBE. I JUST WISH I COULD BE THERE AMONGST YOU ALL. A WEEKEND OF NOTHING BUT TANDYS.
I WISH!



SO, UNTIL THE SEPTEMBER EDITION TAKE CARE

DUSTY



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VERSION 2.4.8 JUST RELEASED

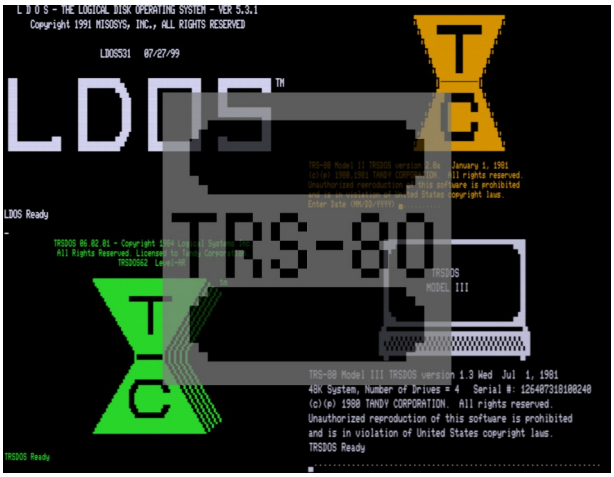
Don't have a TRS-80?

Crazy prices on eBay?

Tired of RIFA caps blowing?

Of floppies shedding oxide?

Or just plain dead chips?



Then what YOU need is trs80gp

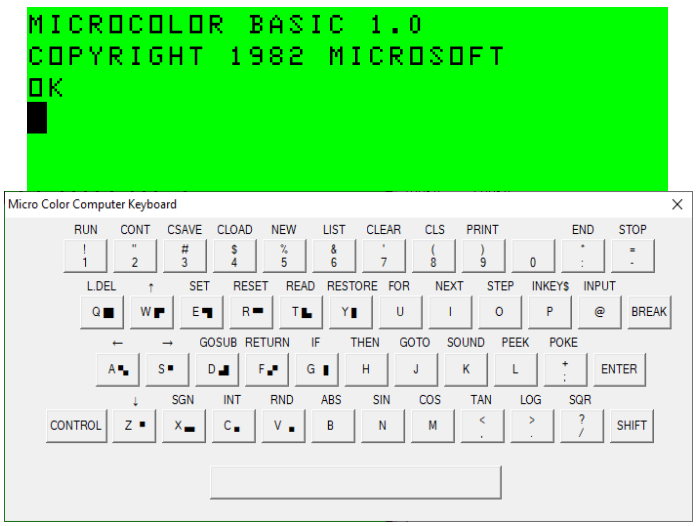
Runs on Windows, macOS, Linux & Raspberry Pi.
Emulates Models 1, 2, 3, 4, 12, 16, 6000,
DT-1, Videotex and Micro Co-Co.

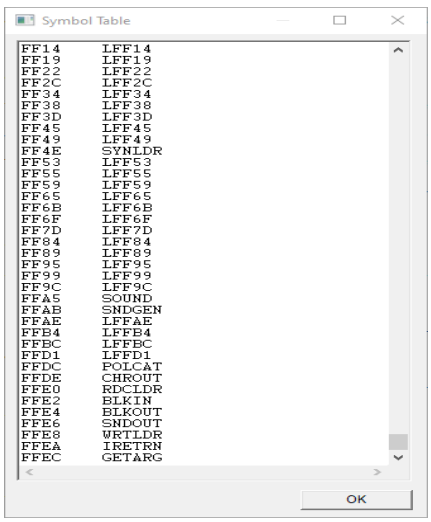
Just like a real TRS-80 with **NONE** of the hassle.
Built-in debugger and other features great for programmers.

Get it now at http://48k.ca/trs80gp.html

New version 2.4.8 just released featuring:

- TRS-80 Micro Color Computer Model MC-10 emulation.
  (The littlest computer with the biggest name from the biggest name in little computers)
- Symbol table view (Debug → Symbol Table for .bds files)





III. Basque Tournament of TRS-80

EGOITZ CAMPO

In april, 1st and 8th april 23, we played in Derio (at my home) the 1st and Bilbao (in Santutxu, in Jofer bar) the 8th the III. Basque Tournament of TRS-80, a beutifull and retro microcomputer from the 80s. In Derio we met 5 players (Lander, Bryan, Daniel, Unai and Egoitz) and a week later on Bilbao 6 players gathered (Daniel, Unai and Egoitz again and Mikel, Joseba and Alvaro also). There was a big participation; 8 players in total.

We played to 4 games in total: Canyon Climber, Clowns & Ballons, Demolition Derby, and Monster Maze. Taking into accounts both days the winner of the tournament was Egoitz, but Unai played very well, especially in Bilbao where he played even better than Egoitz. Once again we had a great time playing the TRS-80 games. Although lately we played the same games there was a lot of competition.

Now my intention is to organize another tournament in october and encourage more people. On the other hand, I will try to buy on "Ebay" some other TRS-80 games, for example Dragonfire, to be able to play it at home and to play it also in our tournaments.

Here we leave the results:

Demolition Derbi

1-Unai Pérez 7 poins (2.800)
2-Egoitz Campo 6 points (2.200)
3-Alvaro Alonso 5 points (1.900)
4-Bryan Casas 4 point (1.700)
5-Mikel Maletxeberria 3 points (1.600)
6-Daniel Barrientos 2 points (1.200)
7-Lander Campo 1 point (800)

Canyon Climber

1-Egoitz Campo 6 points (12.400)
2-Bryan Casas 5 points (10.600)
3-Unai Pérez 4 point (3.000)
4-Daniel Barrientos 3 points (2.400)
5-Joseba Nieto 2 points (2.200)
6-Mikel Maletxeberria 1 point (1600)

Monster Mazer

1-Alvaro Alonso 8 points (1.340)
2-Egoitz Campo 7 points (1.200)
3-Unai Pérez 6 points (800)
4-Bryan Casas 5 points (650)
5-Mikel Maletxeberria 4 points (650)
6-Daniel Barrientos 3 points (120)
7-Joseba Nieto 2 points (40)
8-Lander Campo 1 point (10)

Clown and Ballons

1-Unai Pérez 8 points (1.740))
2-Egoitz Campo 7 points (1.200)
3-Daniel Barrientos 6 point (710)
4-Bryan Casas 5 points (600)
5-Alvaro Alonso 4 points (590)
6-Mikel Maletxeberria 3 points (530)
7-Joseba Nieto 2 points (180)
8-Lander Campo 1 point (70)

Classification

1-Egoitz Campo 26 points (Basque Country)

2-Unai Pérez 25 points (Basque Country)

3-Bryan Casas 19 points (Spain)

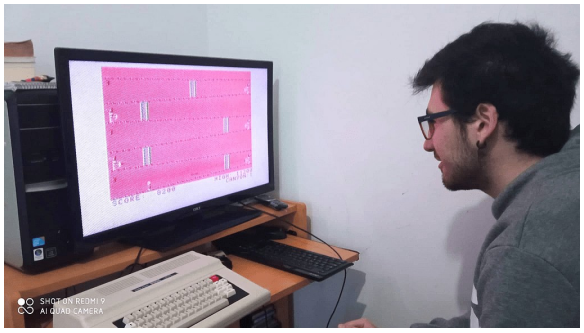
4-Alvaro Alonso 17 points (Basque Country)

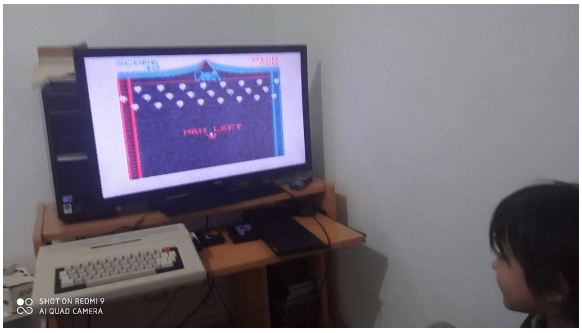
5-Daniel Barrientos 14 points (Basque Country)

6-Mikel Maletxeberria 11 points (Basque Country)

7-Joseba Nieto 6 points (Basque Country)

8-Lander Campo 3 points (Basque Country)



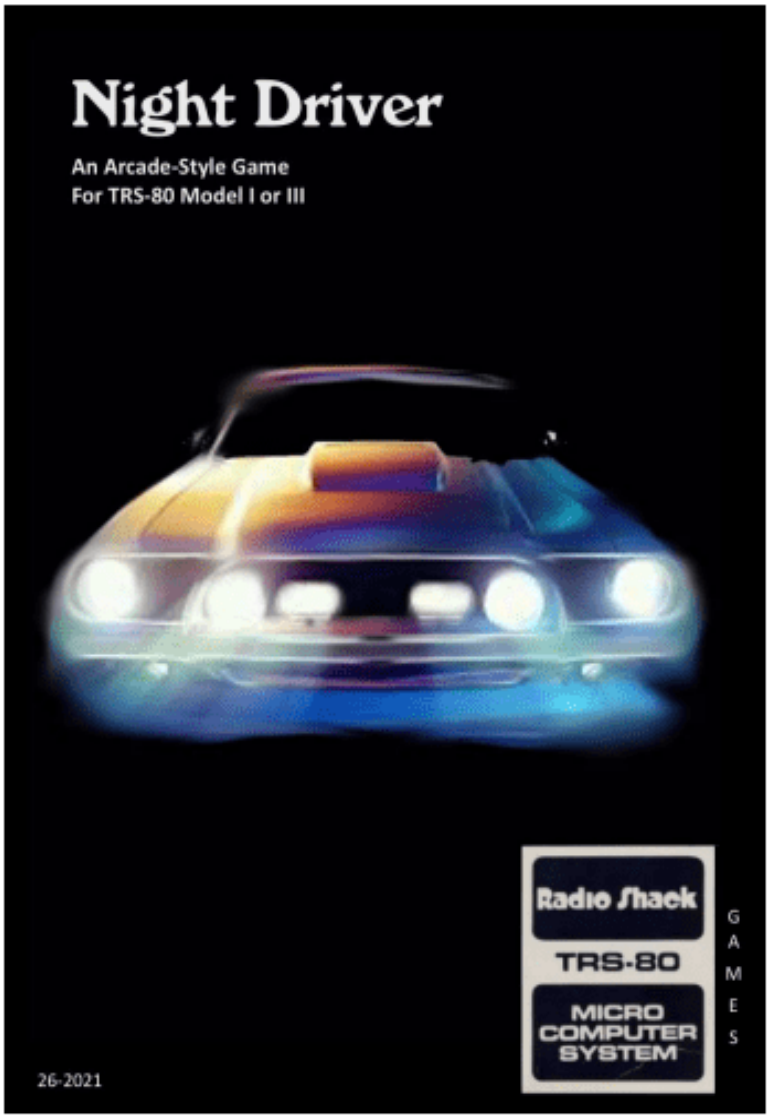




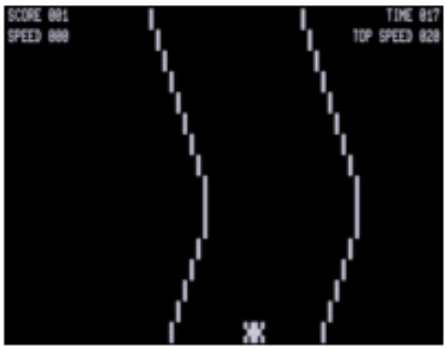
















Winner of the 2021 TRS8BIT Programming Competition



Night Driver is a fast-action arcade style game for the TRS-80 Model I, III, or 4

The road stretches before you like a black ribbon. You are relieved that the sun's angry face has given way to the welcome darkness. Tonight's mission is simple: Prove that you have what it takes to drive with speed and accuracy.

Features include:

- 100% assembly language for fast-action and graphics
- Sound effects
- Runs on real or emulated hardware (trs80gp recommended)
- Joystick support (NEWKEY/80 recommended)
- Available for **free** at www.plaidvest.com

Brought to you by: Kyle Wadsten www.plaidvest.com
Home of NEWKEY/80
and NEWPRINT/Multi

Brief History of Computing Storage

Supplied by Kelly Ackford - sourced by Anna and Dad



1928: Magnetic Tape: German engineer Fritz Pfleumer invented this method of storing information based on Valdemar Poulsen's invention of the magnetic wire. However, it was not actively used to record data until 1951 on the Mauchly-Eckert UNIVAC 1.
Magnetic tape was used primarily by IBM computers in the 1950s. It was half an inch wide and wound on removable reels, usually between 2,400 feet and 4,800 feet per reel.

1932: Magnetic Drum: Gustav Tauschek built on Pfleumer's invention of magnetic tape and created the magnetic drum. It uses a ferromagnetic strip outside of the drum; as it rotates, it records data using electricity.
Up until the 1960s, magnetic drums were used as the primary form of computer memory. This ended when core memory was invented for computers instead, as it was smaller and had no moving parts.

1946: Williams Tube: Professor Frederick C. Williams and fellow researchers at Manchester University created the Williams Tube, the first random-access computer memory. This tube used electrostatic cathode-ray display tubes to hold up to 2,048 bits.
The largest advantage of the Williams tube was that it allowed for fast random access, so the memory location was read and addressed directly.

1946: Selectron Tube: This was an early form of computer memory from the Radio Corporation of America. It suffered from production issues, so for the most part, the Selectron tube was not available until mid-1948.
It cost about $500 to build a Selectron tube, which hindered how many could be made, even though they were faster and more reliable than a Williams tube.

1949: Delay Line Memory: Delay line memory used inserted information patterns to create a delay path connected back to the beginning through a timed amplified closed-circuit loop to allow for recirculation of information.

Delay line memory used mercury because of its acoustic impedance and high speed of sound transmission (1,450 m/s), which allowed for a faster pulse than other media, like air, but limited the amount of pulses that could be sent at once.

1949: Magnetic Core: American physicist An Wang created this pulse transfer controlling device. It was named after the way it used the magnetic field of the cores to control the current-switching in electromagnetic systems.
This type of memory became popular in the early 1960s as a great replacement for both low-cost/low-performance drum memory and high-cost/high-performance vacuum tubes.

1956: Hard Disk: This type of memory uses rigid platters that store and retrieve digital data as they rotate. The information is written to the disk through an antenna or write head that receives transmitted electromagnetic flux.
The hard disk was first sold as standard in 1956 with the IBM 305 computer.

1963: Music Tape: This cassette storage medium for audio was introduced by Phillips. It was originally intended for dictation machines, but it became popular for distributing pre-recorded music.
The cassette offered great convenience over reel-to-reel audio recordings, even though it did not have the same quality.

1966: DRAM: Robert H. Dennard invented Dynamic Random Access Memory, used to store every bit of information as an electrical charge in a circuit.
The capacitor determines whether the electrons stored in the DRAM capacitor are considered a 1 bit or 0 bit.

1968: Twistor Memory: Twistor memory was created by Bell Labs and was similar to core memory. It was made by wrapping magnetic tape around a wire carrying a current.
Twistor memory was only used for a brief time between 1968 and the mid-1970s before it was replaced by RAM.

1970: Bubble Memory: Andrew Bobeck invented bubble memory by using a thin film of magnetic material to hold little magnetized areas called bubbles that each stored one bit of data.
Bubble memory had a slow access speed due to large required loops that must be cycled through when it is being accessed.



1971: 8" Floppy: IBM created this data storage device that consists of a thin piece of magnetic storage medium encased within a square plastic wallet.

The 8" floppy disk was initially created to load microcode into IBM mainframes, but it turned out to be faster than other drives, so they started selling them for $5.

1976: 5.25" Floppy: Alan Shugart developed a newer version of the floppy disk that could be used in desktop computers. Since it had a larger storage capacity and was cheaper to make, it quickly became the standard.
At first, only one side of a floppy disk was used, but in 1978, double-sided reading was introduced, which greatly increased storage capabilities.

1980: CD: This optical disc was used for digital data storage. It was initially created for storing digital audio and could hold up to 74 minutes of audio.
The idea of the audio CD came in the 1960s from James T. Russell, but it wasn't until it was presented to Sony in 1980 that the idea took off.

1981: 3.5" Floppy: The floppy disk was once again upgraded to be smaller, and instead of an open window through which the storage medium could be read circular, it had a movable metal cover designed for better protection.
IBM used the 3.5" floppy disk on their PS/2 series computers.



1984: CD-ROM: Short for compact disk read-only-memory, the CD-ROM is a data storage medium that uses the same format as audio CDs.
The standard CD-ROM can hold approximately 650 to 700 megabytes of data.

1987: DAT: Digital audio tape is a signal recording and playback medium Sony introduced to the public in 1987. It's similar in appearance to a compact audio cassette, but it's half the size and the recording is digital instead of analogue.
DAT's technology prevents the data from being physically edited.

1989: DDS: A digital data storage cassette is a format that enables storing and backing up computer data using magnetic tape. It evolved from digital audio tape technology.
The DDS format was modified later that year, and any tapes in the initial DDS format cannot be used by either DAT or DDS machines.

1990: MOD: Magneto-optical discs use a combination of optical and magnetic technologies. To store data on the disc, the disc must be heated in regions with a laser to a temperature above the Curie point.
When data is written on the MOD, the data needs to be erased, written, and then verified. Eventually, technology was created to directly overwrite old data.

1992: MiniDisc: A disc-based storage device used for data, specifically audio data. MD Data, the computer storage version of the MiniDisc, was announced in 1993 but never gained the traction that the MiniDisc had.
The MiniDisc was initially announced by Sony in 1991 and was introduced to the public on Jan. 12, 1992.

1993: DLT: Digital Linear Tape is a standard for magnetic tape computer storage technology invented by the Digital Equipment Corporation.
DLT was purchased by the Quantum Corporation in 1994.



1994: CompactFlash: A data storage device using flash memory in a standard enclosure. On a CompactFlash card, there is memory and the controller, so it can also be read by older devices.
CompactFlash cards can cope with rapid temperature changes and can be swapped from system to system.

1994: Zip: A Zip drive is a removable disk storage system from Iomega that has a set of read/write heads mounted in a sturdy cartridge. The disk holds more data with faster performance than a standard floppy drive.
The Zip system introduced access protection by implementing a password to keep data safe.

1995: DVD: A DVD is a type of modern optical disc storage. Broken down to its essentials, it's a faster CD that can hold video, higher-quality audio, photos, and computer data. It can encompass home entertainment, computer, and business information in a single format.
DVDs became a successful consumer electronics product within three years of their introduction. By 2003, more than 250 million DVD players existed in homes all over the world.

1995: SmartMedia: Toshiba introduced SmartMedia, a flash memory card, in the summer of 1995 to compete with the MiniCard and CompactFlash formats. It was pitched as a successor to the floppy disk.
SmartMedia cards come in two formats, 5V and 3.3V, which are named for their main supply voltages.

1995: Phasewriter Dual: This type of device is part of the first generation of optical storage systems. There is no one right way to write data onto a PD.
The Phasewriter Dual was introduced by Panasonic in 1995, but it was replaced quickly by the CD-ROM and DVD.

1996: AIT: Advanced Intelligent Tape is a computer storage device using the magnetic tape format based on the earlier DAT format. It has four times the capacity of the DAT and can only be used as a backup system.
The AIT was developed by Sony.

1996: CD-RW: A CD-RW is the rewritable version of a CD-ROM. Initial CD-ROMs had the data storage permanently stamped into the aluminium, but CD-RW discs have a phase-change recording layer and an additional layer of aluminium.
A CD-RW disc can be rewritten multiple times, depending on the quality of the disc and the production techniques employed.

1997: Multimedia Card: A flash memory card unveiled by SanDisk and Siemens, it was initially based on Toshiba's NAND-based flash memory, so it is much smaller than other systems.
Multimedia cards have been superseded by SD cards but can also be used by devices that support SD cards, so they are still used today.

1998: Memory Stick: This is a removable memory card format that Sony launched in October 1998 to store media for a portable device. It is

designed to be moved from one device to another, usually a PC, so that the other device can receive the data from the initial device.
Initially, the memory stick came in sizes up to 128 MB, but the size limitation became a hindrance quickly.

1999: Microdrive: Originally, the microdrive was a miniaturized hard disk in the form of a CompactFlash card that IBM developed. Later generations created more memory and were found primarily in PDAs and digital cameras.
Microdrives were small, hard disks that could be easily destroyed by vibrations and low air pressure.

2001: USB Key: A USB flash drive is a NAND-type flash memory device that uses small, lightweight, removable storage to transfer data from one device to another.
USB flash drives are also known by a variety of different names, such as "thumb drives" and "pen drives."

2001: SD Card: A Secure Digital card is a flash memory card format based on Toshiba's older Multimedia Card format except with DRM encryption features for faster file transfers.
SD cards are available in multiple different storage sizes and can be used in a variety of different devices.

2003: Blu-Ray: This next-generation optical disc was designed for high-definition video and high-density data storage. It gets its name from the shorter blue laser wavelength it uses, which allows more data than a DVD.
A single-layer Blu-ray disc can hold more than 2 hours of HD video plus audio, and a dual-layer disc can hold twice that.

2003: xD Picture Card: A flash memory card format used exclusively by Fujifilm and Olympus digital cameras. They come in a variety of sizes.
The "xD" in xD Picture Card stands for "extreme digital."

2004: WMV-HD: The Windows Media High Definition Video format encodes high-definition videos using Microsoft Windows Media Video 9.
You can do professional-grade professional video editing in Windows with the WMV-HD format.

2004: HD-DVD: The High-Density Digital Versatile Disc was a digital optical format for media developed to be a competitor for Blu-ray. It was the same size as a Blu-ray disc and was promoted by Toshiba, NEC, Sanyo, and four major film studios.
Toshiba developed both a single-layer and dual-layer capacity HD-DVD as well as a triple-layer disc that could offer 45GB of storage. However, they abandoned the format in 2008.



All new from Dreamland Software for 2021.

This two disk package comprises what is in effect the FULL Dreamland Software collection.

Based on the classic 80's film 'Wargames', your entire experience is controlled by the W.O.P.R computer from the aforementioned movie.

Greetings Professor Falken.

New titles including (of course) Global Thermonuclear War. (Ouch.)
Retro Football Manager. (Based on the ORIGINAL 80's classic, a full soccer management simulation.)
The Battle of the Mutara Nebula. (If you are a Star Trek fan, then you know FULL WELL what this is.)
And the Kobayashi Maru Scenario. (Another one for the Trekkers.)

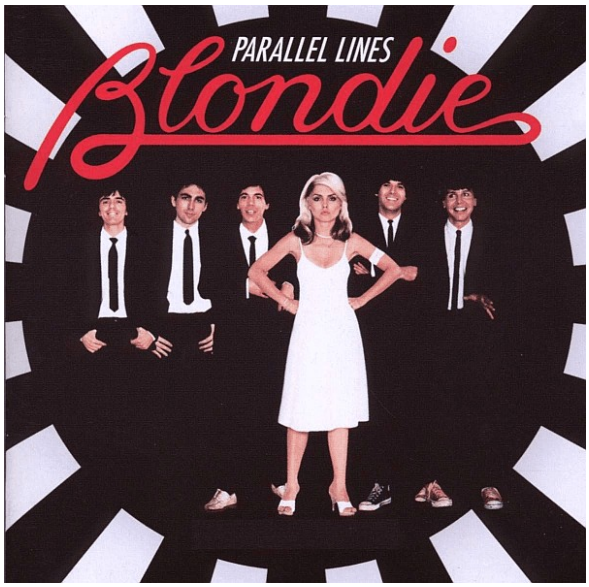
Also included, are **ALL** games released by Dreamland Software since inception four years ago.

The hugely successful Actual Reality. It's sequel Actual Reality II - Battlestar Raven And RockStar.

14 Programs in total (Including the W.O.P.R Master Program.)
Both disks full to capacity whilst remaining bootable.

Full video preview available here:
https://youtu.be/XXD1IG8-CO0

Please note that this item is currently available for Model One ONLY.
Model Three/Four will be available soon. (Watch for update.)



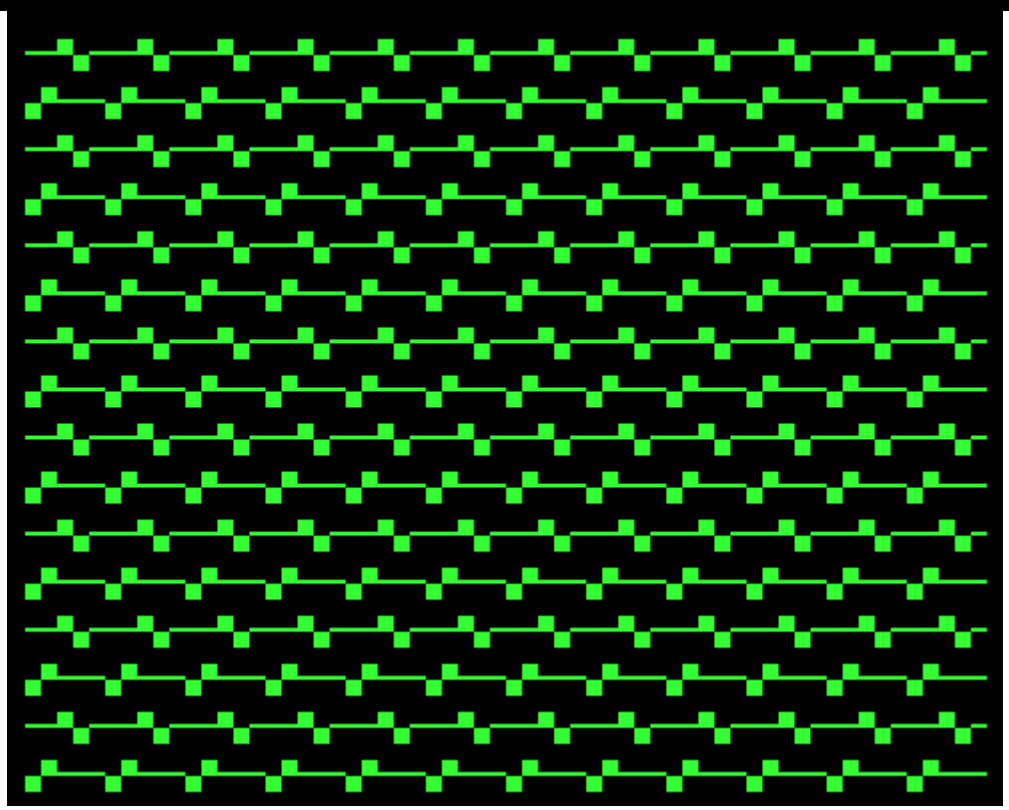
PARALLEL LINES

GEORGE PHILLIPS

A LITTLE PROGRAM FOR THE MODEL III. DRAWS AN OPTICAL ILLUSION WHERE THE LINES GOING ACROSS THE SCREEN DON'T APPEAR PARALLEL. THE EFFECT ISN'T STRONG BUT IS THERE. BETTER IF YOU STAND BACK FROM THE SCREEN.

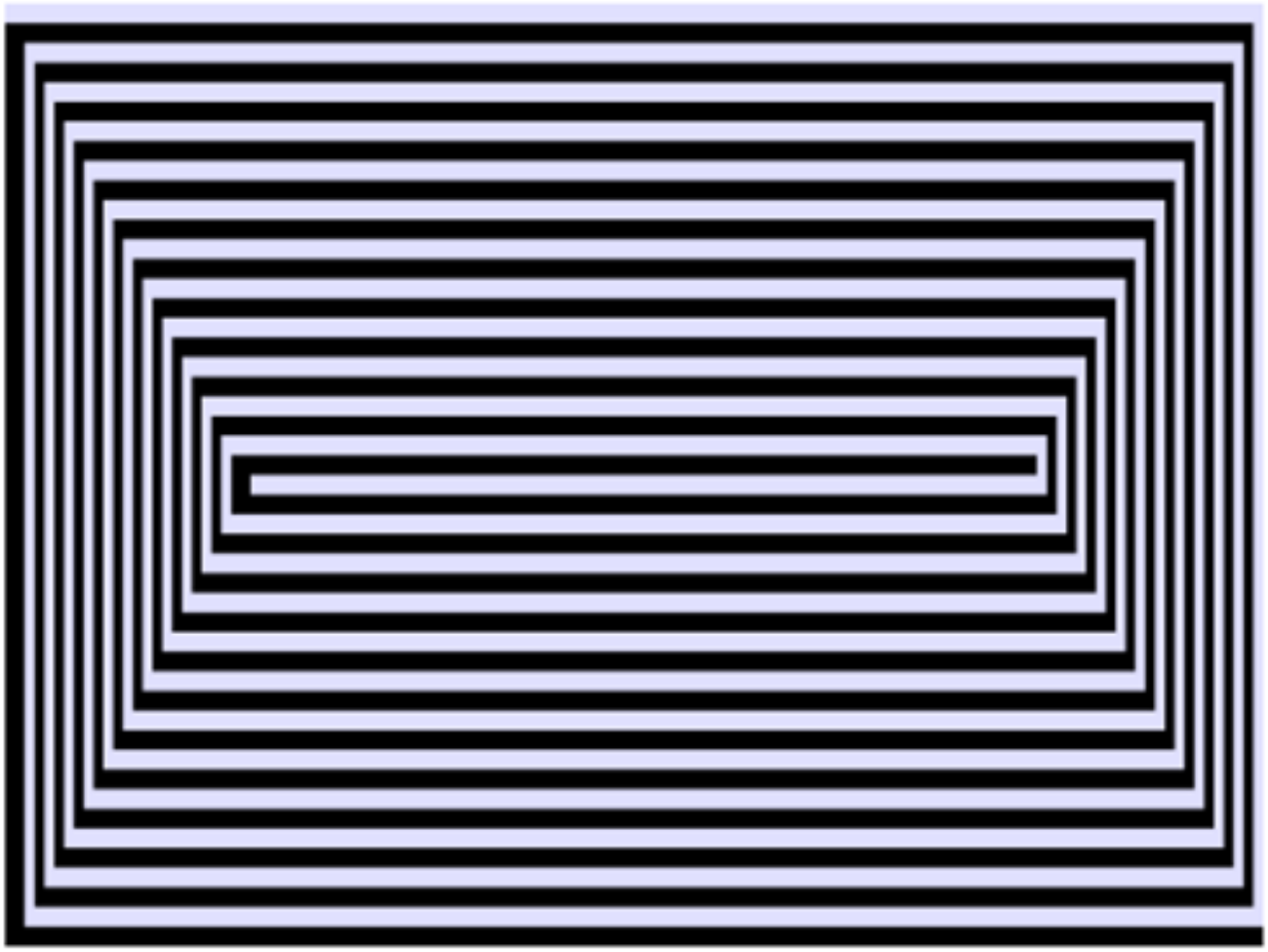
ON THE MODEL 1 THE UNDERSCORES DON'T JOIN UP SO IT DOESN'T HAVE QUITE THE SAME EFFECT.

```
0 'Slight illusion that the lines are not parallel.
Helps to stand back.
1 B$=CHR$(176):U$=CHR$(95):M$=CHR$(140):D$=U$+U$:P$(0)=D$+M$+B$+
U$:P$(1)=B$+M$+U$+D$:IFY=16,1ELSEPRINT:FORJ=1TO12:PRINTP$(YAND1)
;:NEXT:Y=Y+1:GOTO1
```



```
100 X=0:Y=0:W=127:H=46:U=1:V=1
110 FOR B=1 TO W:SET(X,Y):X=X+U:NEXT:W=W-2:U=-U
120 IF H=0 RETURN
130 FOR B=1 TO H:SET(X,Y):Y=Y+V:NEXT:H=H-2:V=-V
140 GOTO 110
```

That draws a square spiral like this:

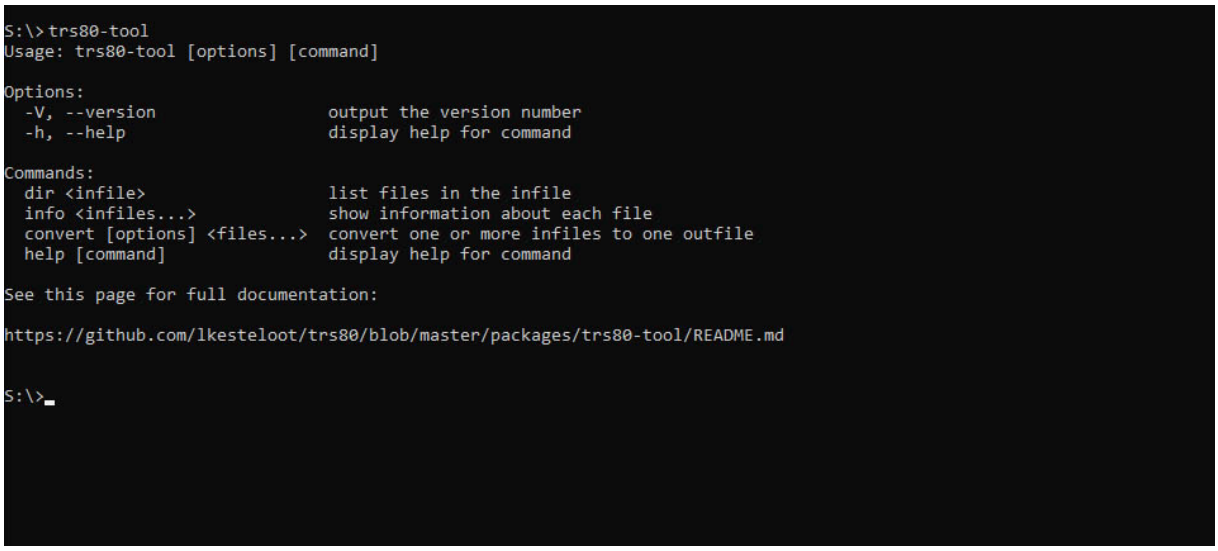


WHILE THE TRASHTALKERS WERE PONDERING OVER THIS YEARS COMPETITION, GEORGE KINDLY SENT ME ANOTHER PROGRAM.

NOT A ONE-LINER THIS TIME, HOWEVER, IT CREATES A SUPER OPTICAL ILLUSION, (THIS IMAGE IS PRODUCED ON A MODEL 1, BY THE WAY).

NOW, ARE YOU LOOKING AT THE TOP OF A PYRAMID, WITH THE LEFT AND RIGHT SIDES GOING DOWN OR IS IT A LONG TUNNEL WITH THE SIDES GETTING FARTHER AWAY?

Lawrence Kesteloot has rewritten, his TRS-80 Cassette command line tool to support many new functions. Called "TRS80-TOOL" it is a command-line tool for manipulating TRS-80 files.



Lawrence Kesteloot has updated his "TRS80-TOOL" to v2.3.1

It runs under NODEJ, Linux, macOS, and Windows. It can be downloaded from Lawrence's site or locally from the The Virtual Tape Utilities page on this site.

The new version adds support for multi-file CAS files (such as CLOAD Magazine or Temple of Apshai) and will try to guess (and set, if you want) the starting address of a SYSTEM file.

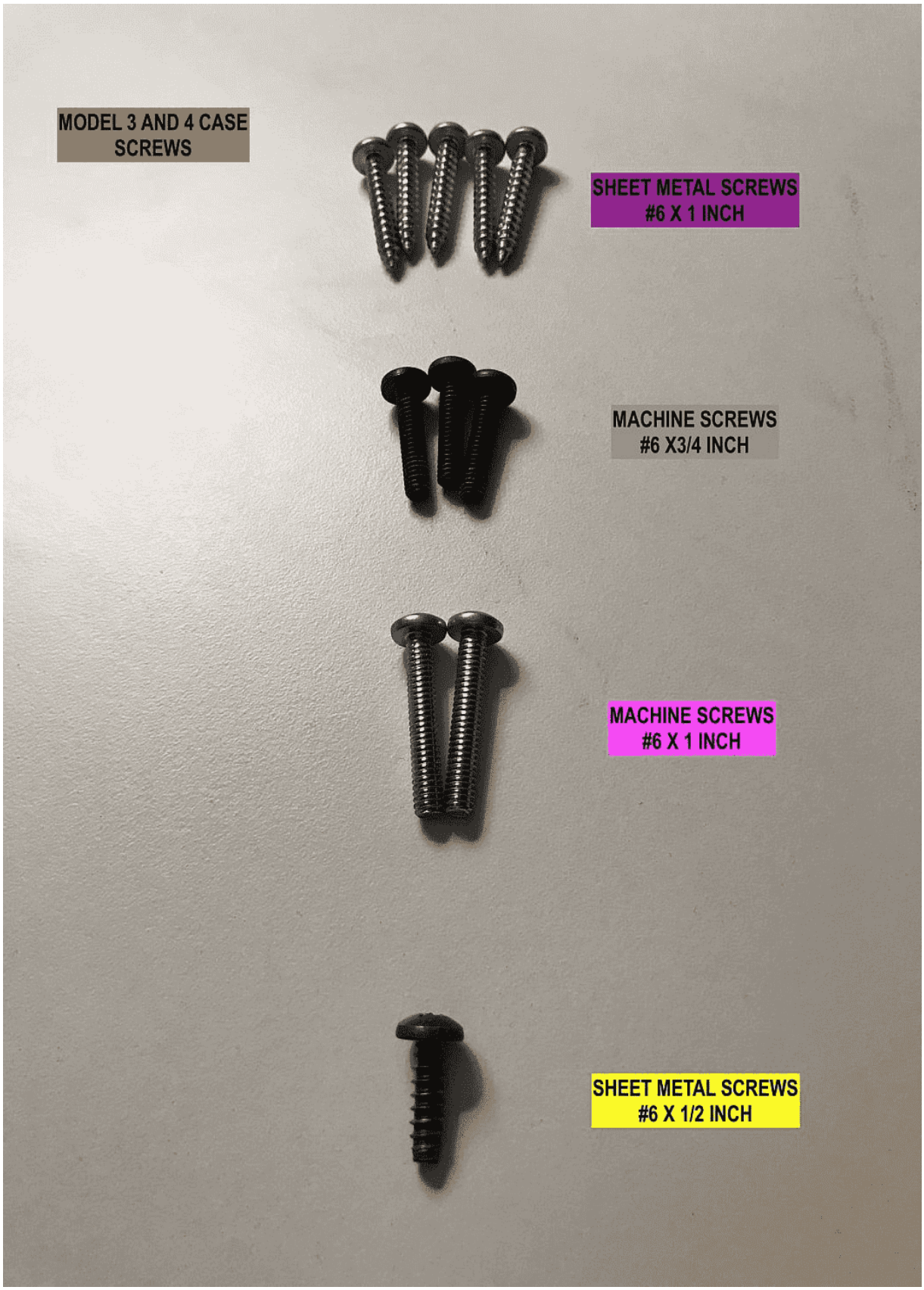
The main page for TRS80-TOOL can be found at

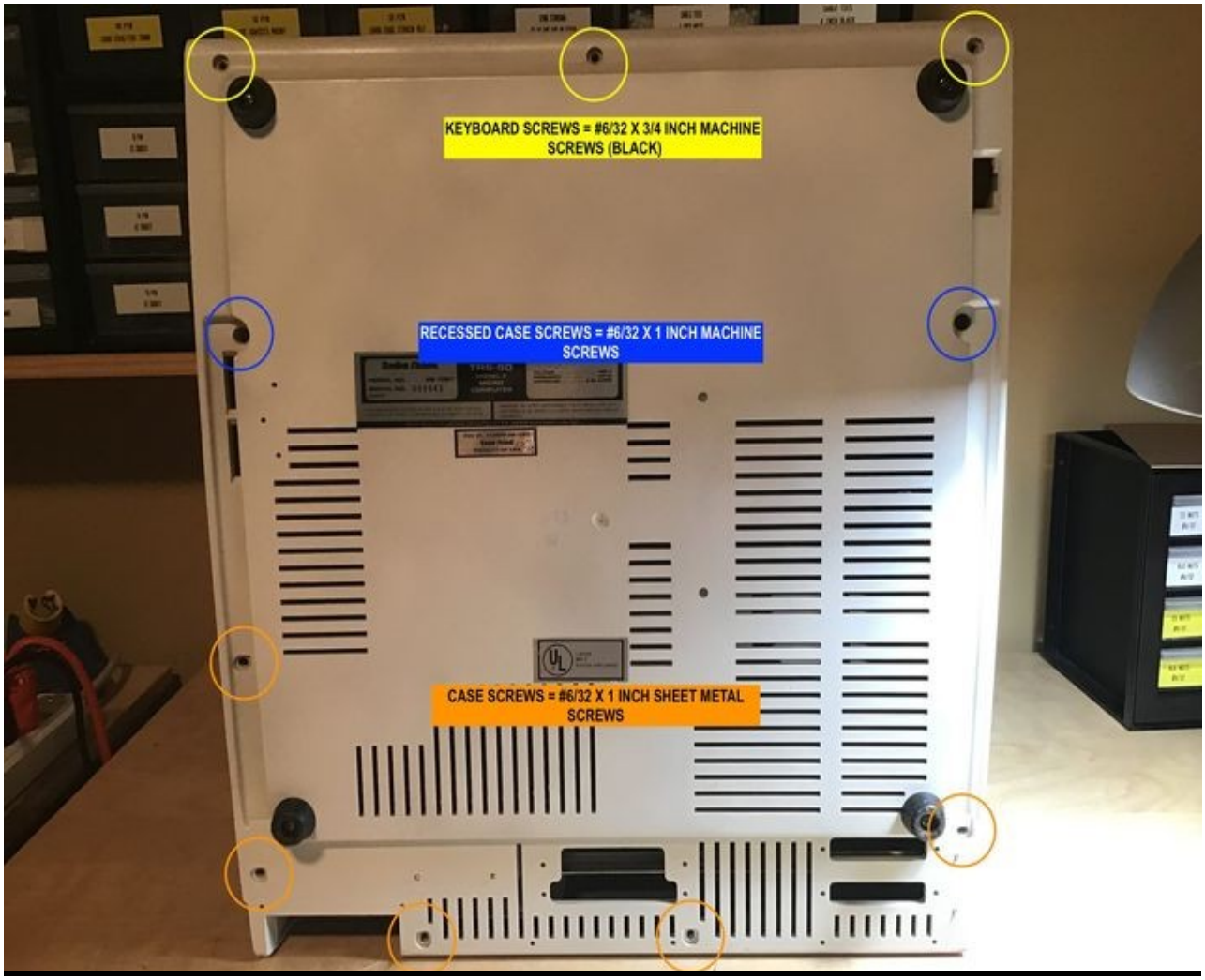
https://github.com/lkesteloot/trs80/tree/master/packages/trs80-tool

along with instructions.

It runs under NODEJ, Linux, macOS, and Windows. It can be downloaded from Lawrence's site, the The Virtual Tape Utilities page on this site or right here for Windows / Linux / Mac.

HERE'S A NEAT IDEA FROM **JAY NEWIRTH.** JUST THE NECESSARY SCREWS FOR A M3 & M4 CASE





Scan Me !

MARC CASTELLA

BRINGS US ALL INTO THE 'QCODE' WORLD USING HIS MODEL 1.

MCLZ8 - ZILOG Z80 EMULATOR IN TRS-80 MODEL III

May 11, 2022 MicroCore Labs

Update: Preliminary results indicate that the MCLZ8 is more than 15 times faster than the stock Z80 in the TRS-80 Model III. Stay tuned...

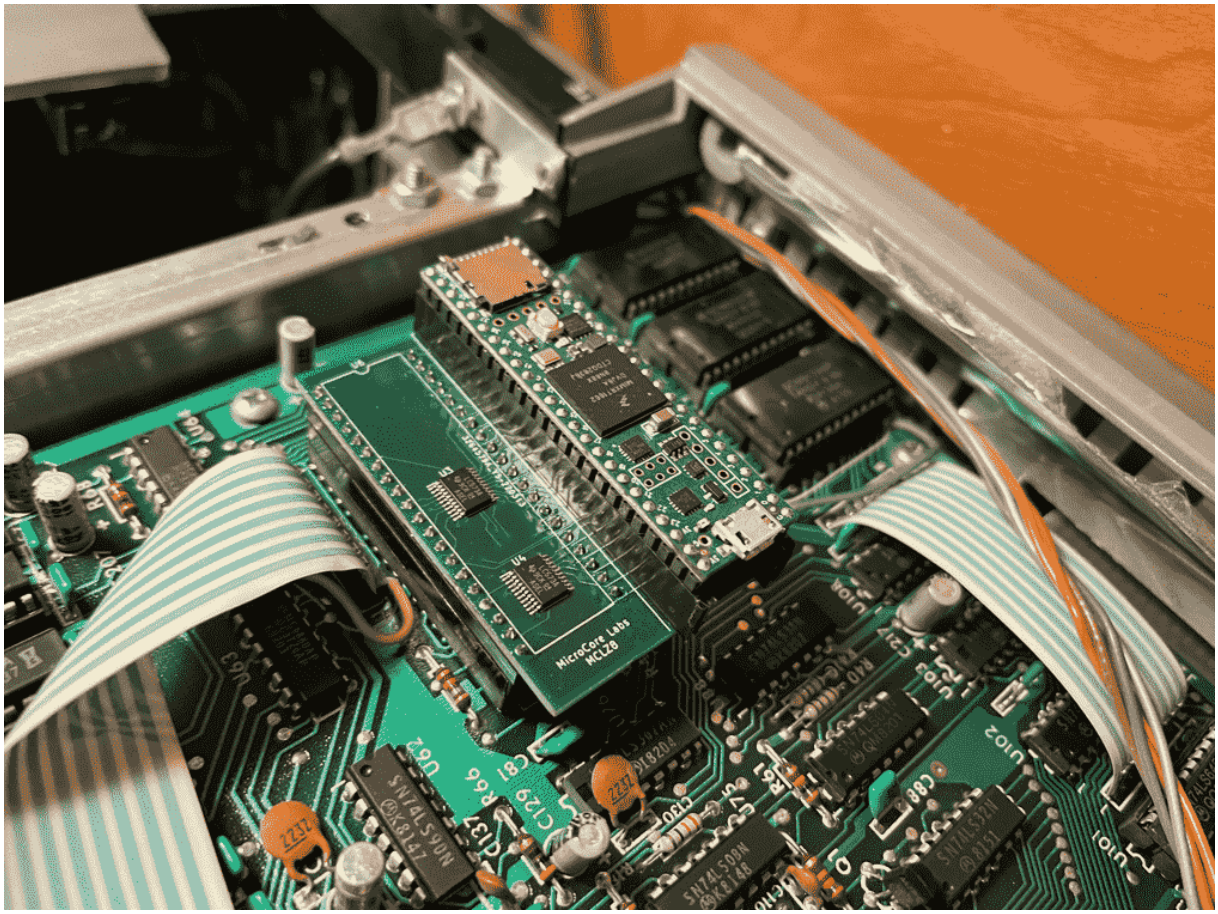
My latest project, the MCLZ8, is a Zilog Z80 emulator which can be used as a drop-in replacement for the original Z80. It uses a Teensy 4.1 microcontroller board which contains an 800Mhz microcontroller and a small PCB to perform the voltage translation between the motherboard and the microcontroller. The MCLZ8's Z80 emulation passes the exhaustive ZEXALL opcode test suite and the speedy microcontroller allows the ability to simultaneously mimic the Z80's local bus interface.

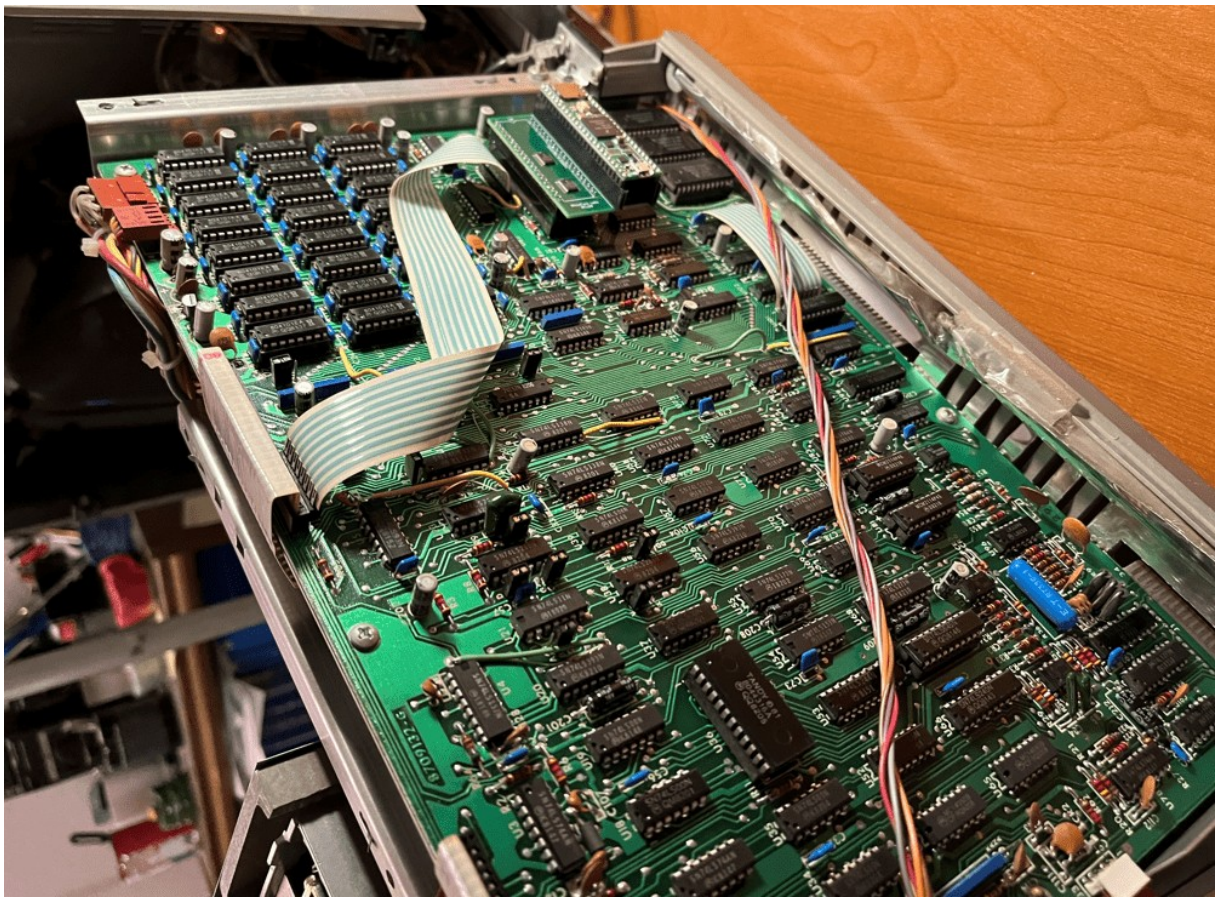
The MCLZ8 seems to work quite well as a Z80 replacement in a TRS-80 Model III where it runs BASIC and is able to boot from the diskette drive. I have tried NEWDOS and a number of games and I will test more applications in the near future.

Of course the next step will be to see how much acceleration we can achieve! If we eliminate cycle-accuracy, locate the RAM and ROM into the MCLZ8's internal RAM and access them at the top speed of the microcontroller we should get some very interesting results! There have been a number of TRS-80 accelerators over its history, so it will be interesting to see where the MCLZ8 ranks!

But for now I am happy to see the MCLZ8 working inside of this legendary computer!




MicroCore Labs
MCLZ8



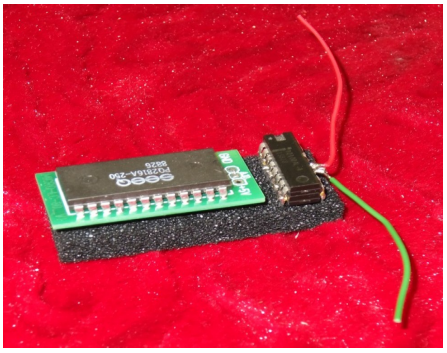

Radio Shack
TRS-80
MODEL III
MICROCOMPUTER

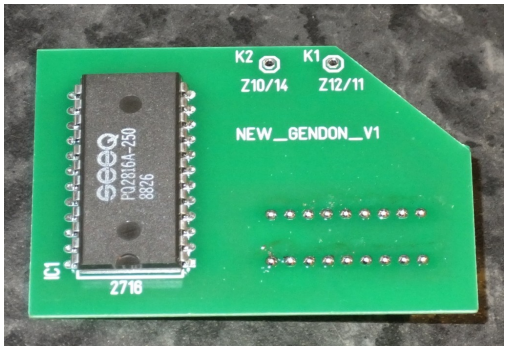

Radio Shack
TRS-80

ADVERTISEMENT

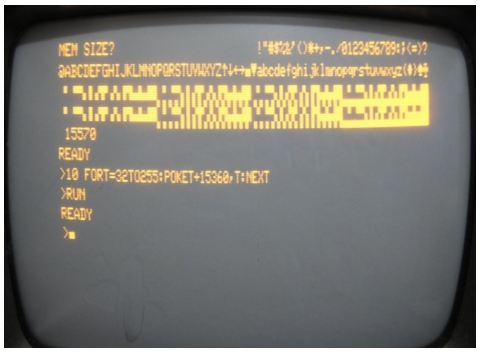
WANT LOWERCASE?
got lowercase!

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

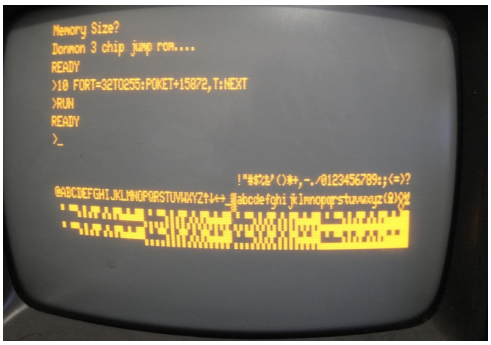




Single line descenders



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

Model I Cassette Interface Repair

by Ian Mavric



The much maligned cassette interface doesn't get much space here devoted to it these days mainly because nearly everyone using a Model I has disk drives or a hard drive emulator, or most people are put off by the cassette system as it was historically seen as a weak point of the computer. This article sets out to explain in simple terms the history of the cassette interface, how to repair it if it refuses to function, and how to make it as reliable/painless to use as possible.
Everyone remembers that the Model I came out in 1977 with Level I Basic and about 9 months later was joined by Level II Basic. For many people their first computer was a 16K Level II unit with monitor and a Realistic cassette player for storage. Let's look at how we got here.

1977: TRS-80 WITH LEVEL I BASIC LOADS AT 250 BAUD

Not many people realise this these days but the original Model I loads tapes at 250 baud, which is even slower than one of those old-school dial -up acoustic coupler modems. When the Model I was designed this was considered an acceptable load speed, and since 4K was a typical memory size for the time most programs could be loaded in under 4 minutes. Interestingly a 16K Level I (which RS sold, but it was not very popular) still loads at 250 baud so very large programs could take an extremely long time to load, 10 minutes or more.. which is getting into C64 territory.

Having said that, Level I cassette loading and saving was pretty reliable. Like all TRS-80 cassette systems once you got the volume set properly Level I owners found their systems worked well as long as they were patient with the load times.

1978: LEVEL II COMES ALONG AND LOADS AT 500 BAUD

Among the many improvements with Level II was the doubling of the speed of cassette loading. 16K Level II being the 'standard' system it was seen as important to reduce cassette load times but still utilise the same cassette loading circuit inside the Model I. A firmware problem (hard to say if its a bug per se, as it didn't stop the computer from loading) made Level II computers extremely sensitive to volume, so whereas in Level I it was fairly insensitive (anywhere from volume 6-8 on the CTR-41 and it would load) on Level II even being off volume by a tiny fraction could cause a failed load.
To try to fix this Radio Shack devised a small circuit called XRX-III which took the incoming signal, and shaped it a little so the computer would accept it more readily. It was a free modification and it worked pretty well. Volume range between 4-5 on a CTR-80A loads most tapes successfully.

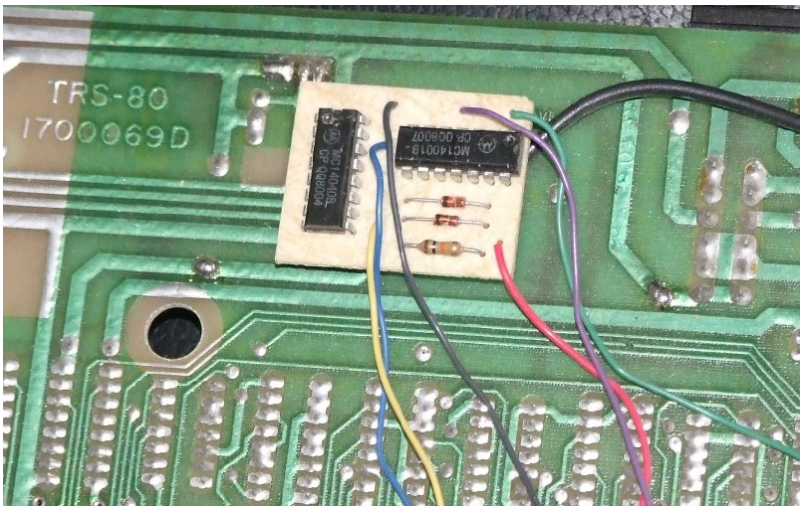


Photo: XRX-III modification fitted to an early D version Model I

Around mid-1979 the firmware was finally examined and fixed to allow for easier cassette loading so the XRX-III was dropped. The computers with the fixed firmware asks MEM SIZE? instead of MEMORY SIZE? and reports R/S L2 BASIC instead of RADIO SHACK LEVEL II BASIC.

These updates made cassette loading mostly reliable on Level II computers and so that was how the Model I was sold until it's end in 1980.

42 YEARS LATER: IT'S 2022 AND MY MODEL I STILL WON'T LOAD TAPES

In my capacity as a repairer of TRS-80s I have seen quite a few Model I systems and have to say that rarely does the cassette interface fail altogether.
People have contacted me to say their system won't load a tape and in the majority of cases it has been due to worn out or stretched tapes, or a worn-out tape deck playing tapes slightly faster or slow, or with varying speed. Even the earliest systems with no XRX-III mod I can usually get to load my own test tapes from my known-good CCR-81 tape deck once I get the volume exactly right (usually 4.5 is a good starting point in this case).

However these are computers which are now at least 42 years old and parts do fail internally. The easy one to fix is the cassette relay which is a barrel made by Meko and on the board is part K1. It's responsible for turning the cassette player on and off. If it fails open then the cassette player is never turned on and if it fails closed the cassette player is never turned off.
The quick-and-dirty way to fix this problem is just unplug the Remote jack from the cassette player which will allow it to run freely. Type CLOAD or SYSTEM to initiate loading and press the Play button. The Meko part is decades obsolete and almost impossible to find, however this will fix your cassette motor control problem.

THE most common problem relates to the analogue audio to digital conversion needed to take the sound from the tape and translate that into 0s and 1s and place them in the computer's memory. This is accomplished by Z4 which is typically a Motorola MC3401 but is better known by it's industry part number LM3900. In conjunction with some diodes this Op Amp crudely results in successful loads. Fortunately it's a readily available chip that is very inexpensive.

To test it I connect a tape deck and start a long tape playing in. From here I connect a logic probe and can actually hear the incoming tape data while checking diodes CR3,4,5,6,7. I then check the inputs of Z4 and if they are beeping away check the output. No output or a signal stuck high indicates a bad LM3900. The diodes are also common 1N4148 and cheap to replace. These are the only parts I've ever seen fail in the cassette interface.

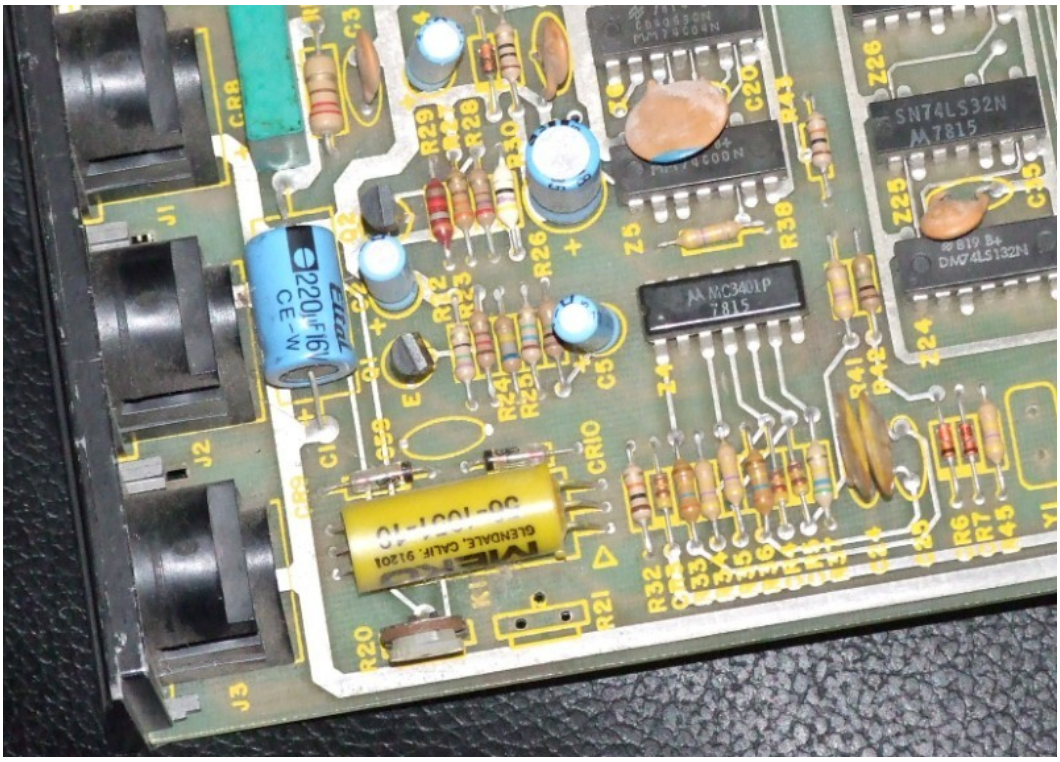


Photo: Cassette Interface parts. Yellow relay, Z4 MC3401 (LM3900), and diodes CR3,4,5,6,7

WATCH OUT FOR SLOPPY WORKMANSHIP AT TCA

While I am sure it's an irregularity I did recently have an interesting time diagnosing a Model I which had the XRX-III modification and a functioning MC3401 however would simply not load a tape for love nor money. The logic probe test made the right beeps and sounds and the whole thing was starting to annoy me. No matter what I did I could not get ** in the top right corner. I even upgraded the Roms to the latest version (R/S L2 BASIC) but still nada. Could it be the XRX-III? I've never seen one of those fail... Part of the installation of the XRX-III is to cut one trace to route the sound signal through the XRX-III board, and on this computer the trace *had not been cut*. I cut the trace, grabbed my favourite test tape, double checked the volume was bang-on 4.5 and it loaded first try. How could this happen?

Everyone laughs at the joke about the last car built at the car factory on a Friday afternoon has the least care taken during assembly? I can only assume someone forgot to cut the trace while building the computer at TCA. How it got through QA testing is something I can't answer, but how the original owner never noticed or cared that their computer didn't like tapes is easier to explain. A lot of Model I systems were sold with the EI and drives as a disk system. It's quite probable the original owner never used tapes, only disk apps.

I can only theorise that with the trace not cut the sound signal goes both directly and through the XRX-III board causing a delay or echo microseconds after each bit which confuses the cassette interface and it doesn't know what it is hearing, or what to do with it.

WHAT ELSE CAN BE DONE TO MAKE TAPE LOADING EASIER?

The same things which made using tapes less stressful back in the day still apply today. A good quality cassette recorder will help immensely, and believe it or not some of the Radio Shack computer cassette recorders were better than others. I'll go through each of them but for those who don't want to read all the details, stick with a CCR-81 or CCR-83.

1977-78: Realistic CTR-41: Was actually Radio Shack's top of the line desktop portable tape recorder at the time. Those that I find these days have problems ranging from scratchy volume control to stretchy belts, both of which are not conducive to reliable tape loading. It also has a tone switch (HI/LO), which needs to be set to HI, and if saving a dummy plug (which was supplied but often lost) needs to be put into the MIC socket so outside noise doesn't creep in with each CSAVE. Also the cassette cable which came with these has a fat 'boss' where it plugs into the Model I which means it only works on the Model I, it doesn't fit the Model III or Coco etc. The CTR-41 is best appreciated by purists who want everything period correct and with new belts, new volume control, demagnetised playback/record heads, it can still be a decent tape deck. Just don't think a cruddy looking $20 one from eBay is going to be anything but trouble.



Photo: CTR-41 cassette player from 1978

1979-80: Realistic CTR-80: Another of Radio Shack's tape decks, it's a little smaller and less featured. The most annoying thing about it is the lack of a Pause button. It's better with it's belts and scratchy volume control than the CTR-41 but most of these I see are still too far gone for regular use. Bear in mind, these had a problem which manifested itself as sometimes sending a pop through the record head which would leave a pop on the tape. If the pop happened to be in the middle of a program loading it would regularly make it difficult to load. Radio Shack offered a fix, and most of the CTR-80s I see have had it, but people should beware.



Photo: Realistic CTR-80

1980-81: TRS-80 CTR-80A COMPUTER CASSETTE RECORDER: The first official TRS-80 branded computer cassette recorder was the CTR-80A, which is basically a Realistic CTR-80 with the above pop glitch fixed and a shiny new Radio Shack TRS-80 nameplate on it. These were commonly sold with the Model III and Coco.



Photo: CTR-80A

1982-1986: TRS-80 CCR-81 COMPUTER CASSETTE RECORDER: My favourite because it just works. I have been using the original that I bought back in 1984, still on it's original belts, no scratchy from the volume control, and it's not just mine. CCR-81s I have acquired over the years all exhibit the same robustness. Some look downright terrible, poorly stored or treated, yet they still work fine. They came in both silver and white so are a good choice for any TRS-80, even looking period correct when connected to a Model I or III. The eBay prices on them reflect their good reputation as they commonly sell for $50 or more for low-use units.



Photo: CCR-81 Computer Cassette Recorder

1984-6: TANDY CCR-82 COMPUTER CASSETTE RECORDER

A small and popular tape deck because it was cheap and didn't take up much desk space. My experience with it at the time was good and with the ability to flick a switch and listen to the tape load (monitor mode), I considered replacing my CCR-81 with one for a while. However time has not been kind to these and I have a pile of them and none of them work. Main problem seems to be perished belt drives though I have seen other problems due to the cheaply-made nature of the CCR-82. It's a shame because of the small footprint of the unit it lends itself to putting away in a drawer until you need it. People will say you can still buy a working CCR-82 on eBay and while that may be the case for some lucky people, most will find a CCR-82 either non-working or not working well enough to reliably load a tape.



Photo: CCR-82

1988-1991: TANDY CCR-83 COMPUTER CASSETTE RECORDER

The last computer cassette recorder. Many people didn't even know these existed because they were sold during a period after which most people had moved over to disk drives, and so the CCR-83 was mainly sold to people who needed to replace a failed earlier model computer cassette recorder. I have never seen one of these failed or even act even remotely funny. It's smaller and lighter than the CCR-81 but given the huge technology leaps through the 1980s it's not surprising that the CCR-83 was cheaper for Radio Shack to manufacture, and cheaper for the end-user to buy, while being as robust or more-so than the CCR-81. Another plus is that they don't come up very often on eBay but when they do they regularly have had very little use and even NOS (New/Old Stock unused) from time to time.

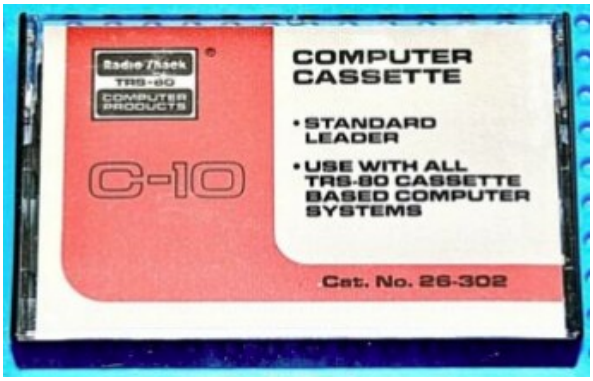


Photo: CCR-83

TAPES: DON'T SKIMP BUT KEEP IT UNDER 60 MINUTES

Even back in the 1980s it was well known if you wanted to record music with best fidelity (playback quality) and longevity, it was a poor choice to go with cheap tapes. And there was any number of brands of cheap tapes out at the time. The benchmarks for cassette tape quality in the 80s were TDK, Sony, Maxell and BASF. If you can still find NOS tapes under 60 minutes in length from those brands they are still worthwhile using. When I need to do stuff with tapes I still reach for a TDK. I say under 60min as in theory the thinner tape used to make C90 and C120 tapes can lend itself to stretching or fidelity loss over time. They also take forever to rewind or fast forward the whole way through.

What about Radio Shack's own lines of computer cassettes? Sold as C10 and C20 I found them to be perfectly adequate back in the day. I can't speak for current day usage but if you have access to NOS tapes they should be good. Being leaderless and only short they are well suited to computer use. I still would roll the tape on 5 seconds from the beginning before CSAVEing something, which is an old carry-over from audio tapes.





CONCLUSION

The cassette system on the Model I can be a handful but set up properly with XRX-III modification or Level II ROM upgrade, and a good cassette recorder and quality tapes, it can be made to be reliable. Frustration is part of the experience on all early cassette based computers, not just the Model I.

Ian Mavric - ianm@trs-80.com



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


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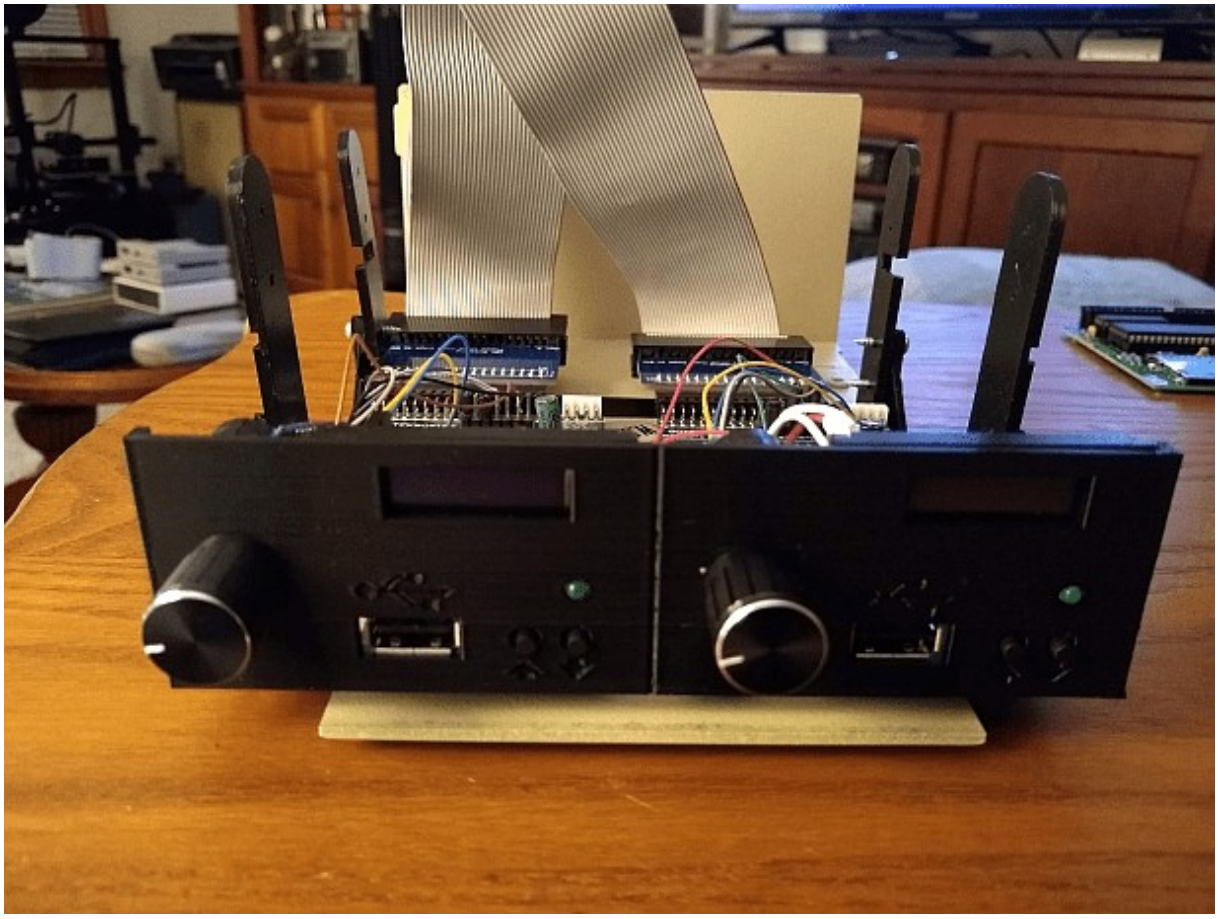
GOTEK UPGRADE - PAUL THOMAS METCALF III

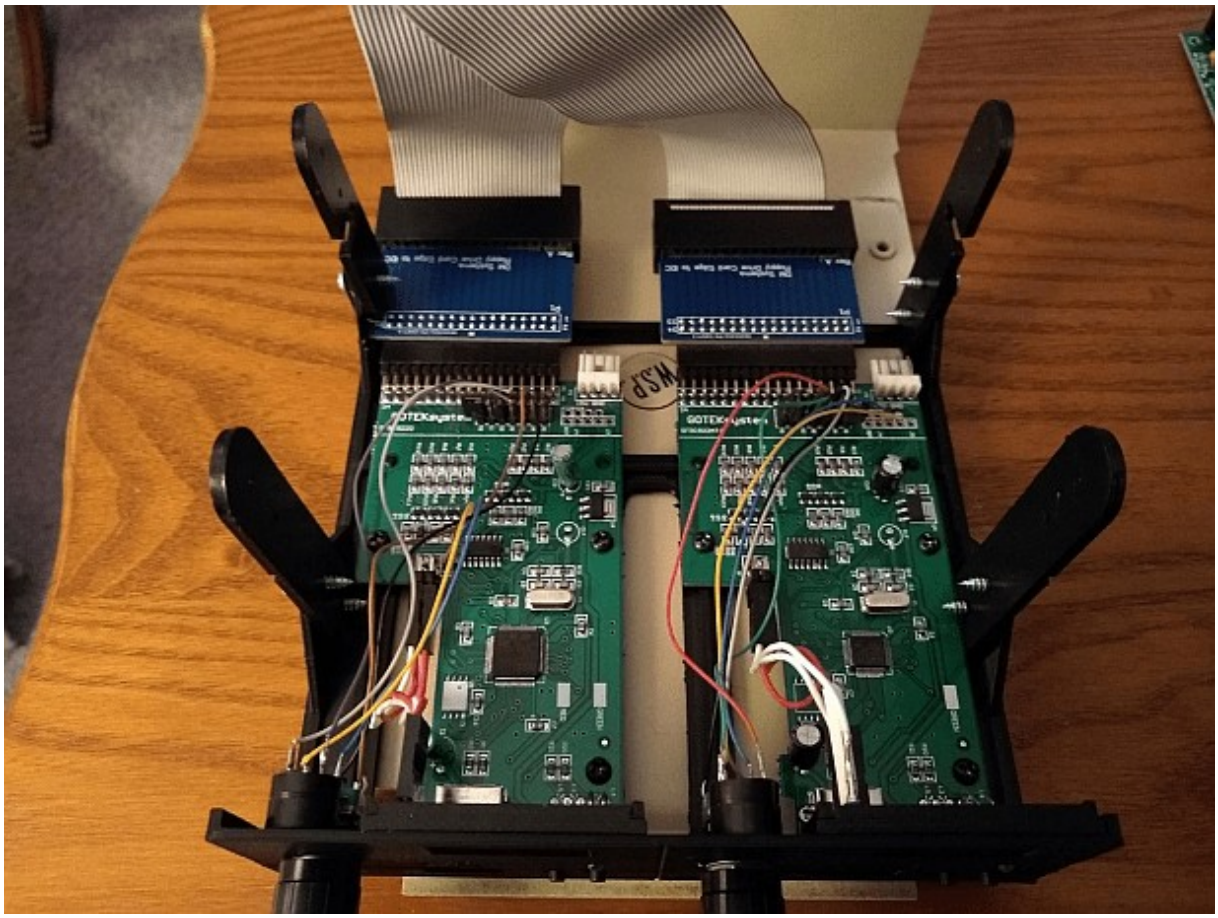
One of my latest projects for my Model 1.....combining the two Gotek drives I have and the FreHD into one case. Shown is the before (what I started with) and the results of a couple of days of 3D printing, and some re-appropriation of old equipment. Yes, I repurposed an old Apple II Disk II drive case. Now, before all you Apple II guys that are lurking around here in TRS8BIT have a fit, let me just say that the drive was purchased from eBay as non-working and they did make a ton of these things, so its not like its super rare or anything.

Two Goteks in one sled, and the FreHD in another to make a "full height drive". I'm planning on mounting a small 5V Meanwell power supply inside the case and mounting a combo line-in/fused/lighted power switch on the back to make it self contained, while routing the ribbon cables out the back to connect up to my EI. While it does take up a slightly larger footprint than the original cases, I think it makes for a cleaner look.

Some of you may ask, why not use a Model 1 drive case? Well, I wanted to be able to read the OLEDs on the Goteks without learning to read sideways or turning my head 90 degrees!













HTTPS://WWW.YOUTUBE.COM/WATCH?V=ZE3NMXTLGJK

STRETCH YOUR MIND

HAROLD FINCH



THE ANSWER IS ON PAGE 67

WHILE YOU'RE IN THE 'MIND-STRETCHING' MOOD, HERE'S A LITTLE PROBLEM. WHAT IS THE LEAST NUMBER OF 'DOTS' YOU NEED TO MOVE TO MAKE THE EQUATION TRUE? I'M AFRAID THIS ONE HAD ME REALLY PUZZLED. IT'S A BIT OBTUSE IN ALL HONESTY THOUGH!

THE ANSWER IS ON PAGE 67



SVI-CAS addresses this short-fall by providing SVI-318 / 328 owner with a fully self-contained SD card based cassette image playback and recording system for the very first time. In addition, the author has included features and operational capabilities to support additional computers that can't be found in any of the existing known image players at time of writing.



HELLO DUSTY,

I USE SVI-CAS WITH MY OWN MODEL 3 AND MODEL 4 MACHINES, IN GENERIC MODE YOU CAN RECORD FROM THESE MACHINES AND LOAD SAID RECORDINGS BACK IN AGAIN - I'VE BEEN INFORMED BY ANOTHER OWNER THAT THE MODEL 1 ALSO WORKS WITH THE SAME SETTINGS (SEE THE TABLE IN APPENDIX C OF THE MANUAL).

I DON'T PROVIDE A SPECIFIC "OFFICIAL" MENU ENTRY FOR TANDY MACHINES AS THERE IS SO LITTLE SOFTWARE ARCHIVED IN CASSETTE FORM, OF THAT WHICH I HAVE FOUND, ONLY SIX PROGRAMS WERE SAVED AS A CAS FORMAT AND ALL THE REST WERE WAVE RECORDINGS.

REGARDS,
DUNCAN

Thirsting for adventure?
Brass lantern getting dusty?



Take your Model 1, 3 or 4 on exciting new adventures never available until now....

M4ZVM enables your TRS-80 Model 1,3 or 4 to play Infocom and post-Infocom adventures, taking full avdantage of your hardware. Supports old favourites like Zork and Seastalker (including Sonarscope), as well as new-to-Model-4 games including Trinity, Border Zone and Sherlock, plus hundreds more available in the Interactive Fiction archive.



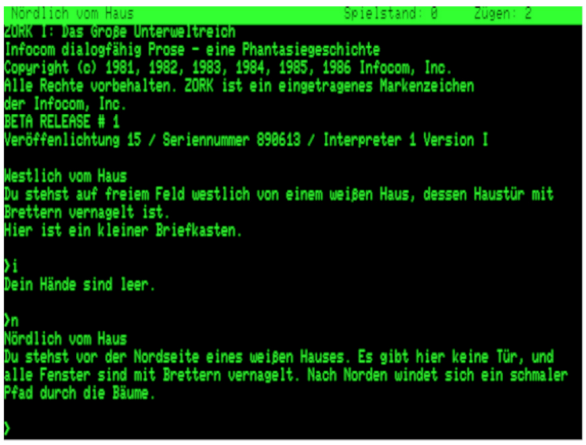
M4ZVM is available for download from https://gitlab.com/sijnstral/m4zvm (includes feature details and source)
Enhanced versions ready for download!

*128K recommended

Actual Screenshots of games new to the model 4, running M4ZVM (on trs80gp)



Beyond Zork

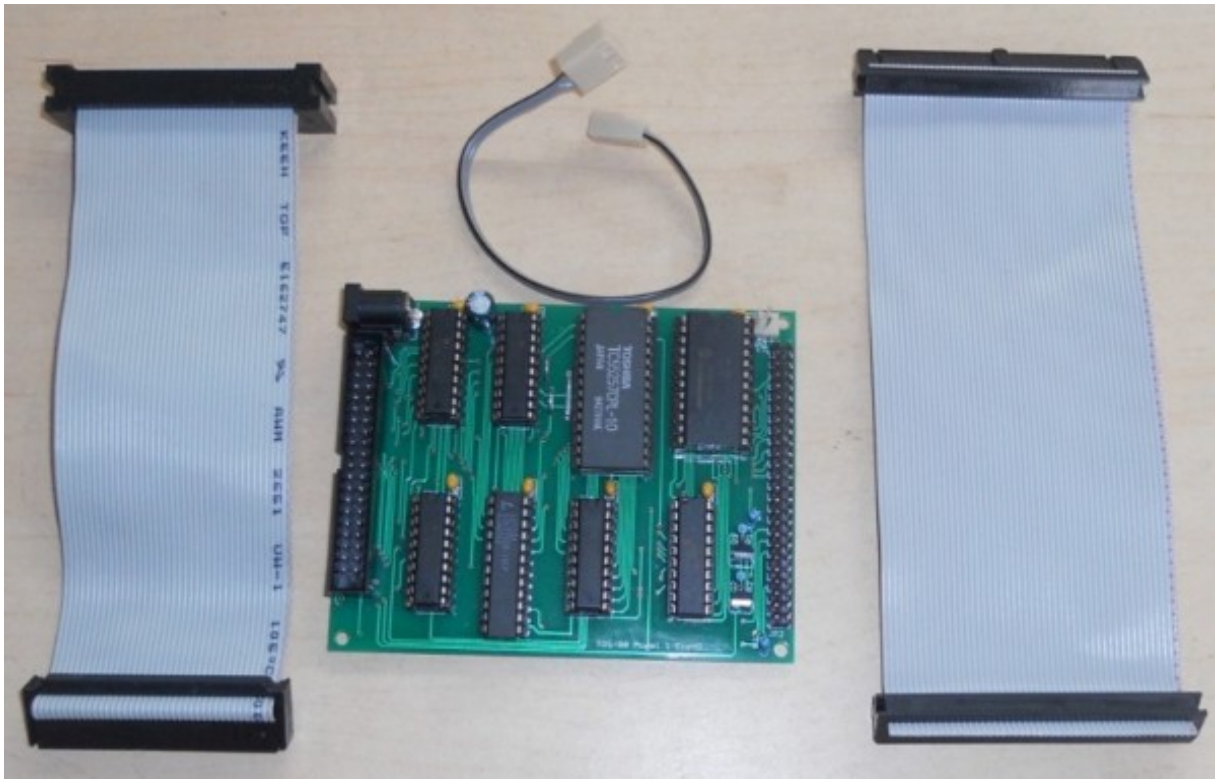


Zork 1 (German)

M4ZVM features include:
* z1-z8 game execution (z6 support is experimental)
* named game save/load
* accented characters
* 128K recommended - NEW Minimised 64K version
* Optionaly set the infamous "Tandy bit"
* NEW Model 1 and Model 3 versions

“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”

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DROP ON TOP

E.T. FONEHUME

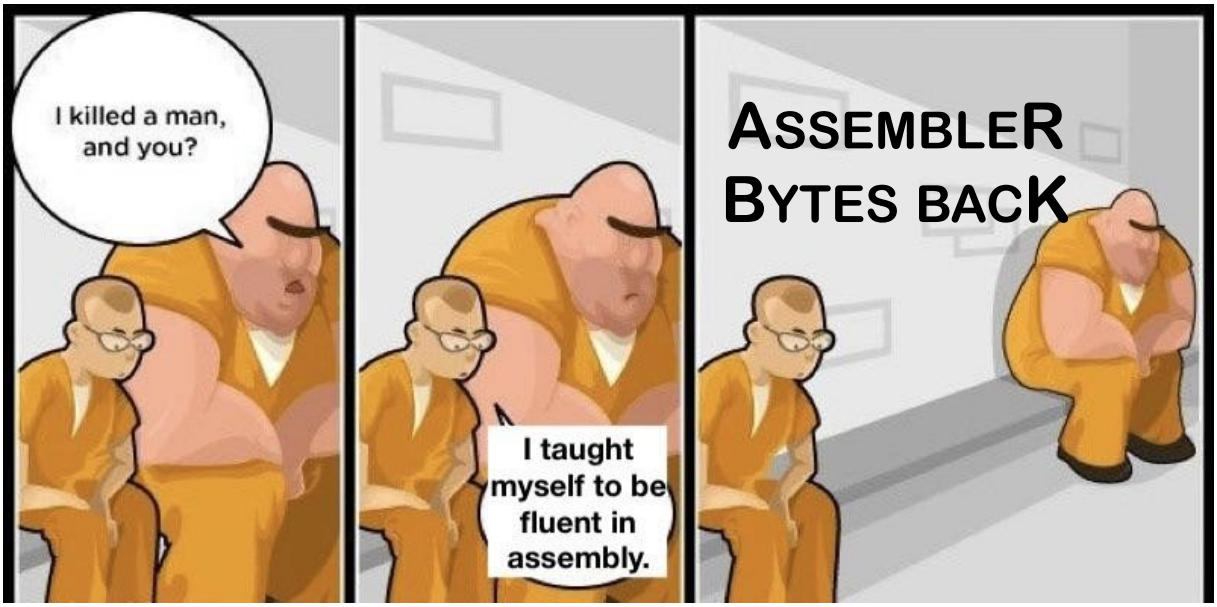
HI DUSTY. HERE'S ANOTHER ONE-LINER WHICH TURNED OUT TO BE QUITE ADDICTIVE! A "*" RUNS ACROSS THE TOP OF THE SCREEN. THE IDEA IS TO STOP THE "*" BY PRESSING THE SPACE BAR AND A POINTER IS THEN DROPPED UNTIL IT REACHES A NUMBER. THIS BECOMES YOUR SCORE AND YOU CAN GO AGAIN BY PRESSING <ENTER>. IF YOU MISS ALL OF THE NUMBERS, YOUR TURN ENDS AND THE NEXT PERSON CAN HAVE A GO JUST BY TYPING, RUN.

YOU NEED TO MANUALLY ACCUMULATE ANY SCORES THAT YOU WIN, AS THE PROGRAM LINE IS RATHER TOO FULL TO ACCOMMODATE SUCH A LUXURY AS AN OPTION LIKE THAT! YOU COULD, OF COURSE, JUST COUNT THE NUMBER OF GOES YOU MANAGE, THE HIGHEST NUMBER COLLECTED OR EVEN THE NUMBER OF 9'S YOU MANAGE TO DROP UPON. IT'S JUST FOR A BIT OF FUN AFTER ALL!

```
0 CLS:FORX=1TO60:PRINT@RND(600)+256,RND(9);:NEXT:FORQ=0TO1STEP0:
FORX=0TO63:PRINT@X," *":IFPEEK(14400)=0 THEN NEXTX:NEXTQ ELSE S=
0:X=X+1:FORY=1TO13:X=X+64:S=PEEK(15424+X):PRINT@X,"V";:IFS=32THE
NNEXTY ELSE PRINT@960,"SCORE";S-48;:INPUT",AGAIN";A:RUN
```

```
                              *
                              V
                              V
                              V
                              V
          1     9   5   V 8      5       7 9
                  9     V            7      8
                        3 4          3
       9          6                              8
  5
     2      1                        3 6           5
       5     4                      2 9  6
           4 2   2 9      6        4       1
         3     1    3    5     9 9      2 4       5
    2            4 3

SCORE 3 ,AGAIN? _
```



ASSEMBLER BYTES BACK WAS A FEATURE TO CELEBRATE THE START OF OUT 15TH YEAR. I'VE FOUND THAT, OVER THE YEARS, I ACCUMULATED VARIOUS (WELL HUNDREDS!) OF LITTLE SNIPPETS OF INFORMATION TO MAKE LIFE EASY WHEN USING MY TRS-80 M1 L2 MACHINE, ESPECIALLY IN A WORK ENVIRONMENT.

IN MANY CASES, IT'S JUST A FEW LINE OF CODING IN BASIC, ASSEMBLER AND JUST MANY OTHER, GENERAL LITTLE 'GOOD IDEAS' WHICH I CAME ACROSS AT VARIOUS POINTS IN NEARLY 50 YEARS OF COMPUTING.

I'M HOPING THIS WILL ENCOURAGE YOU, THE READER, TO SEND IN ANY ASSEMBLER CODING TIPS AND TRICKS FOR EVERYONE TO SEE AND USE. IN FACT, ANY HINTS, TIPS AND HELP LINES WOULD ALWAYS BE APPRECIATED.

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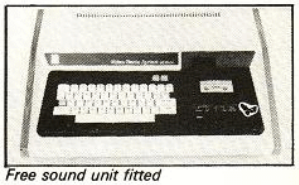
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HERE'S A VERY USEFUL ROUTINE WHICH I HAVE USED A NUMBER OF TIMES IN THE PAST. UPPERCASE CONVERSION COULD WELL BE USEFUL IN THIS YEARS COMPETITION. IT'S TAKEN FROM LEWIS ROSENFELDER'S WONDERFUL BOOK 'BASIC FASTER AND BETTER' WHICH TURNED OUT TO BE A REAL GAME-CHANGER FOR ME, BACK IN THE DAY.

Upper Case Conversions

The UPPERCON USR routine scans a string for lower case characters and converts them to upper case. This can be important to you when you are doing string compression and when you are doing alphabetical sorts of string data.

To use UPPERCON, simply load it and define it as a USR subroutine. Then call the routine, using the VARPTR of the string you want converted as your argument.

Let's assume, for example, that you've poked the 28 required bytes into protected memory, starting at F000. You can convert any string entered by the operator with the following logic:

```
10 DEFUSR=&HF000
20 LINEINPUT "ENTER A STRING:   ";A$
30 J=USR(VARPTR(A$))
40 PRINT "CONVERTED STRING IS:  ";A$
50 GOTO 20
```

```
Magic Array Format, 14 elements:

  32717  17930  24099  22051   1259 -14331   -386  14433   -505
  12411  -6653  30559   4131 -13839

Poke Format, 28 bytes:

  205 127  10  70  35  94  35  86 235   4   5 200 126 254  97  56
    7 254 123  48   3 230  95 119  35  16 241 201
```

```
            00000 ;UPPERCON
            00001 ;
F000        00060          ORG     0F000H          ;ORIGIN - RELOCATABLE
F000 CD7F0A 00070          CALL    0A7FH           ;HL HAS STRING VARPTR
F003 46     00080          LD      B,(HL)          ;B HAS STRING LENGTH
F004 23     00090          INC     HL              ;
F005 5E     00100          LD      E,(HL)          ;
F006 23     00110          INC     HL              ;
F007 56     00120          LD      D,(HL)          ;DE POINTS TO STRING
F008 EB     00130          EX      DE,HL           ;HL POINTS TO STRING
F009 04     00140          INC     B               ;
F00A 05     00150          DEC     B               ;INC & DEC B TO TEST IF ZERO
F00B C8     00160          RET     Z               ;RETURN IF ZERO LENGTH
F00C 7E     00170 LOOP     LD      A,(HL)          ;PUT BYTE IN ACCUM
F00D FE61   00180          CP      61H             ;COMPARE TO LOWER CASE A
F00F 3807   00190          JR      C,OK            ;JUMP IF LOWER
F011 FE7B   00200          CP      7BH             ;IS IT ABOVE LOWER CASE Z?
F013 3003   00210          JR      NC,OK           ;JUMP IF IT IS
F015 E65F   00220          AND     5FH             ;CONVERT TO UPPER CASE
F017 77     00230          LD      (HL),A          ;PUT IT BACK
F018 23     00240 OK       INC     HL              ;POINT TO NEXT BYTE
F019 10F1   00250          DJNZ    LOOP            ;DECREMENT COUNT & REPEAT
F01B C9     00260          RET                     ;RETURN TO BASIC
F00C        00270          END                     ;
00000 TOTAL ERRORS
```

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2022 COMPETITION

Wordle is everywhere, except on TRS-80's. The TRS8BIT 2022 competition aims to change that. It has two tracks we call **"Beauty and the Beast".**

"Beauty" entrants will make their own version of Wordle for the TRS-80. They'll be judged on how fun and pretty they are. It doesn't need to support the full dictionary so you can concentrate on looks. Use whatever language you like for the job: BASIC, assembly, C, COBOL

"Beast" entrants will tackle the problem of squeezing all 12960 words of the dictionary into a TRS-80. This is for assembly language programmers only. The smallest blob of program and data will win.

Download the contest.zip file for the full details **(available from the downloads page at www.trs-80.org.uk).** It has the word lists and specific requirements for "Beast" entries, details on how Wordle works for "Beauty" entries and even a bare-bones example program in Z-80 assembly to get you started.

We'd be tickled pink if we get a Beast so small it'll work on a 16K machine. Are you up for the challenge?

Fire up the Model 1, 3 or 4. Bring forth the awesome power of a Model II, 12 or 16. Dazzle us with CoCo 1, 2 or 3 graphics. Make it portable on a Model 100 or affordable on an MC-10. Heck, if you write it for a Model 2000 we'll figure out how to run it.

All entries will be judged by the 'TrashTalkers'
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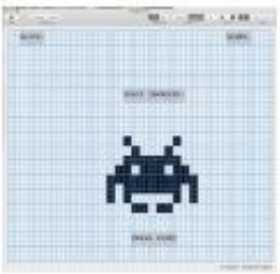
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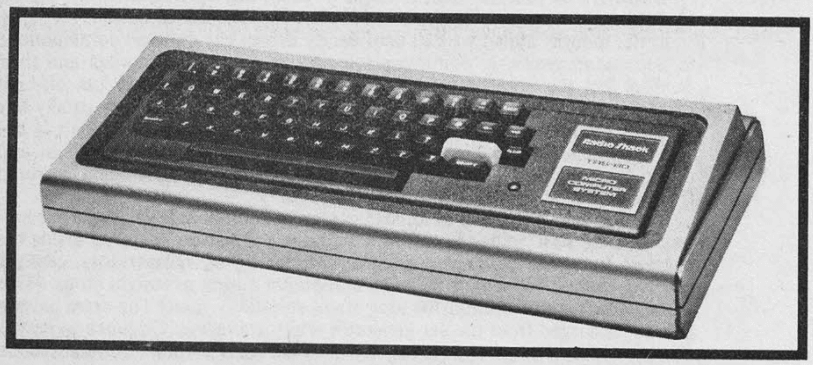
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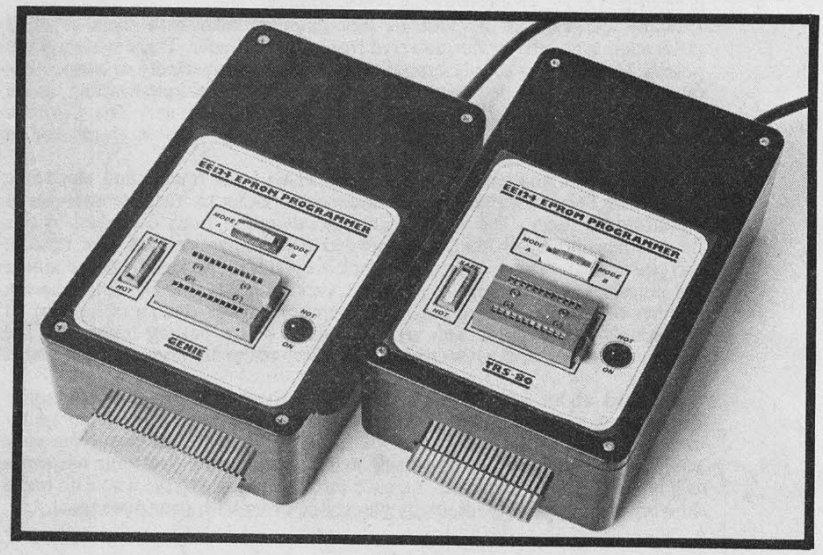
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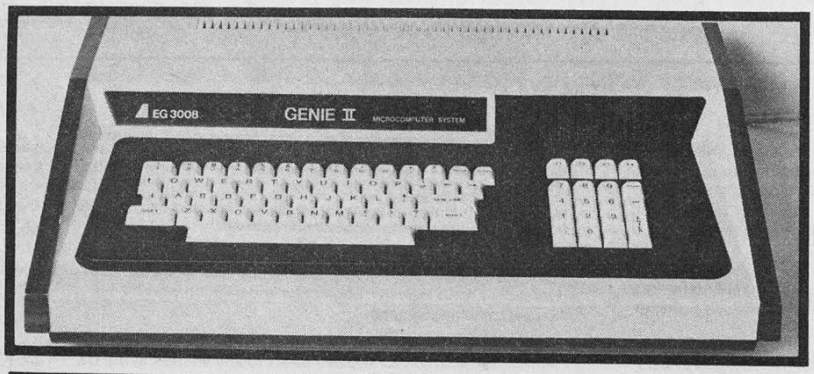
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EPROM PROGRAMMER TRS-80 & GENIE

A PORT-BASED SYSTEM DESIGNED FOR USE WITH A HOST COMPUTER TO PROGRAM +5V RAIL 1K, 2K AND 4K BYTE EPROMS







BY B.W.TERRELL B.S.c. & J.W.TERRELL M.S.c.

THE EE124 Eprom Programmer has been designed to be used with a host computer to program single supply rail EPROMS. Two versions are described in this article (i) for use with the TRS-80 Model 1 Level II microcomputer (ii) for use with the Video Genie, Genie I and II microcomputers. The construction of the units has been tailored to allow them to be easily connected to the computer using the system bus expansion cable. The prepared software is suitable only for these machines.

Although specifically designed for use with these models, the hardware may be used with other computers providing certain system signals are accessible and that suitable software is developed. It is expected that the only hardware modification needed for use with other Z80 based computers is to configure the finger sets, by means of an adaptor or a custom built cable/connector to align with the configuration of the system bus of the chosen computer. The signals that need to be accessible are: D0 to D7, A0 to A7, 0V, $\overline{IN}$, $\overline{OUT}$ for use with the TRS-80 version. If $\overline{IN}$ and $\overline{OUT}$ are not available, but $\overline{IORQ}$, $\overline{RD}$, $\overline{WR}$ are, then the Genie version can be used. Users will of course have to develop their own software.

The EE124 plus TRS-80 or Genie can program the EPROMS listed in Table 1 which also gives the required setting of the MODE switch.

The pinning details for the EPROMS in Table 1 are given in Fig. 1.

SYSTEM DESCRIPTION

The EE Eprom Programmer comprises:

(i) Programmer Logic Unit (PLU)
(ii) EE124 Software cassette (T004)

Programmer Logic Unit

Access to the PLU is through a double sided p.c.b. connector set projecting through a slot in the front panel. The 20 + 20 (TRS-80) and 25 + 25 (Genie) fingers allow direct connection to these computers using the system bus expansion cable.

The PLU is equipped with the following facilities:

(a) A 24-pin Zero Insertion Force socket. This allows an EPROM to be inserted or removed from the socket without applying any pressure to the pins. The EPROM should be placed in the socket with the lever in the vertical position. Moving the lever to the horizontal position causes the socket contacts to securely grip the EPROM pins and make good electrical contact with all pins. To remove an EPROM, return the lever to the vertical position. It may then be easily lifted out of the socket.

(b) An EPROM power supply isolating switch. This is labelled HOT-SAFE. When in the SAFE position the 0V, +5V and +25V supply lines to the socket are interrupted to allow the EPROM to be safely removed or inserted. If an EPROM is removed from, or inserted into, a HOT

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socket, it may become permanently damaged.

(c) A two position MODE switch. When programming or reading EPROMS, the MODE switch must be set to A or B according to the EPROM type, see Table 1.

SOFTWARE

The EE124 Software is written in Z80 machine code and is suitable for use on the TRS-80 Model 1 Level II and Video Genie, Genie I and II microcomputers. It has many powerful features. Editing is particularly easy, with 256-byte page display, single interpage keystroke and full cursor control. The software is compatible with EDTASM so that object code prepared by EDTASM can be loaded and programmed quickly.

The commands provided are:

BURN COPY EXIT FILL LOAD MEMORY NEW PAGE READ SAVE TEST ZERO

PRINCIPLE OF OPERATION

A block diagram illustrating the principle of operation of the EE124 Eprom Programmer is shown in Fig. 2.

It can be seen that the system is port based and has three latched $\overline{OUT}$ ports (252, 253 and 254) and one $\overline{IN}$ port (253). Once the MODE has been manually selected, the system is completely under software control. The mode referred to above has no connection with the two EPROM modes of operation described below.

Read Mode

In the read mode, the address and control data are clocked into the appropriate latches via the host computer data bus. Latch 253 output is dis-enabled by a control line from latch 252.

When an $\overline{IN}$ signal is generated (active low), the IN port is enabled and the corresponding EPROM data read into the host computer. Successive EPROM locations are read until halted by software.

Program Mode

In the program mode, both the EPROM address and the data to be programmed reach the EE124 via the host computer data bus. The low order address, high order address plus control data, and program data are sequentially clocked into the port latches.

A number of control cycles are then executed in which control data is sequentially clocked into port latch 252 to produce the following order of events:

(1) +25V to V_{pp}
(2) PGM pin to appropriate program level
(3) maintain this level for 50ms
(4) return PGM pin to previous level
(5) remove +25V from V_{pp}
(6) read and verify

The above steps are repeated until either the last location is programmed or a verification error occurs, whereupon the system returns to command mode.

The assignment of the bits for each port are detailed in Table 2.

CIRCUIT DESCRIPTION

The complete circuit diagram of the Programmer for use with the TRS-80 computer is shown in Fig. 3b. The signals from the computer expansion slot reach the circuitry via the 40-way expansion cable.

The TRS-80 (and Genie) employs the Z80 microprocessor. Besides being able to address up to 64K memory locations, the Z80 also produces control signals and addresses to service up to 256 8-bit wide I/O ports.

The four Z80 signals for providing these and other control signals are $\overline{MREQ}$ (memory request), $\overline{IORQ}$ (input/output request), $\overline{RD}$ (read) and $\overline{WR}$ (write). Only four combinations of these outputs are allowed:

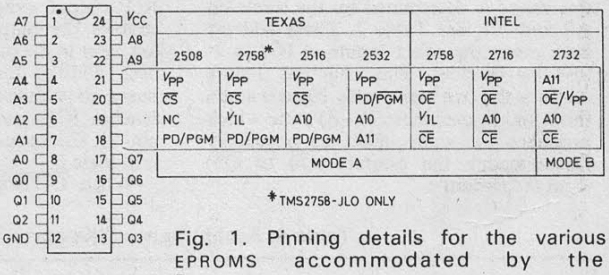
$\overline{RD}$, $\overline{MREQ}$, $\overline{WR}$ — **READ** from memory; **WRITE** to memory

$\overline{RD}$, $\overline{IORQ}$, $\overline{WR}$ — read from port **$\overline{IN}$**; write to port **$\overline{OUT}$**

It is the latter, $\overline{IN}$ and $\overline{OUT}$ which are used in this design. In the TRS-80, these two signals are generated on board and made available at the expansion slot. These signals are active low (indicated by

Table 1. Eproms accommodated by the EE124 Eprom Programmer

Type No.	Manufacturer	Organisation	Mode
TMS2758–0	Texas	1K x 8	A
TMS2508	Texas		A
2758	Intel		A
TMS2516	Texas	2K x 8	A
2716	Intel		A
S4716	AMI		A
2716	AMD		A
MB8516	Fujitsu		A
HN462716	Hitachi		A
MK2716	Mostek		A
MCM2716	Motorola		A
MM2716	National		A
uPD2716	NEC		A
2716	Signetics		A
SY2716	Synertek		A
TMM323	Toshiba		A
M5L2716	Mitsubishi		A
TMS2532	Texas	4K x 8	A
TMS25L32	Texas		A
HN462532	Hitachi		A
MCM2532	Motorola		A
2732	Intel	4K x 8	B
HN462732	Hitachi		B
M5L2732	Mitsubishi		B
MB8532	Fujitsu		B



	TEXAS				INTEL		
	2508	2758*	2516	2532	2758	2716	2732
	V_{PP}	V_{PP}	V_{PP}	V_{PP}	V_{PP}	V_{PP}	A11
	$\overline{CS}$	$\overline{CS}$	$\overline{CS}$	PD/$\overline{PGM}$	$\overline{OE}$	$\overline{OE}$	$\overline{OE}/V_{PP}$
	NC	V_{IL}	A10	A10	V_{IL}	A10	A10
	PD/PGM	PD/PGM	PD/PGM	A11	$\overline{CE}$	$\overline{CE}$	$\overline{CE}$
	MODE A						MODE B

*TMS2758-JLO ONLY

Fig. 1. Pinning details for the various EPROMS accommodated by the Programmer.

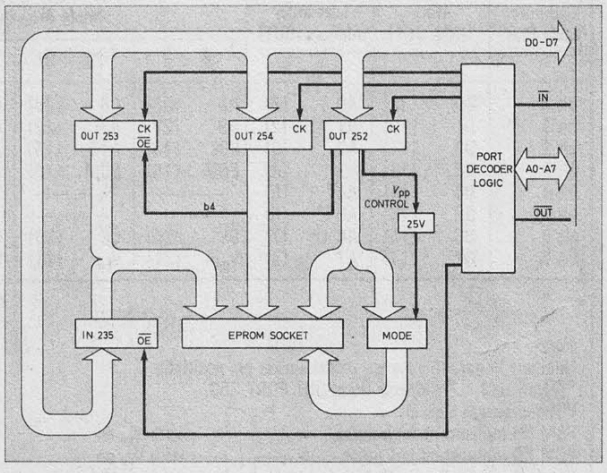


Fig. 2. Block diagram showing system operation.

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Table 2. Selecting ports

Address bus during I/O cycle			Port Selected
A0	A1	A2 to A7	
0	0	All logic 1	252
0	1		253
1	0		254
1	1		255

Table 3. Truth table for 74LS139 (IC2)

Select inputs A	B	Output control (OE)	Q0	Outputs Q1	Q2	Q3
X	X	1		Hi–Z		
0	0	0	0	1	1	1
0	1	0	1	0	1	1
1	0	0	1	1	0	1
1	1	0	1	1	1	0

X means don't care.

the "bar"), which means that when they are selected they are set to logic 0. Every time a port is selected, either $\overline{IN}$ or $\overline{OUT}$ goes to logic 0 (depending on direction of data transfer). At all other times they are at logic 1.

During an $\overline{IN}$ and $\overline{OUT}$, the port address is placed on the lower half of the address bus (A0 to A7) and data read from or written to the port via the data bus in the usual way.

The ports chosen for this design are 252, 253 and 254 which allows a very simple and unique decoding to be implemented, and these are of course not in use by the TRS-80 or Genie systems.

When ports 252 to 255 are addressed, bits A2 to A7 are at logic 1. These six signals reach the inputs of IC1, an 8-input NAND gate. Only when all inputs are at logic 1 does the output go to logic 0. For all other combinations the output remains at logic 1. IC1 output is used as a control signal for IC2.

The precise port being addressed in this range is determined by the levels on A0 and A1, see Table 2. These address lines reach the select inputs of IC2, a 2-to-4-line decoder. This chip has 3-state outputs: the two logic levels 1 and 0 and a third high impedance (Hi–Z) state which produces the same effect as physically disconnecting the outputs ($\overline{Q0}$ to $\overline{Q3}$) from the circuitry.

IC2 outputs are in the Hi–Z state when its $\overline{OE}$ control is at logic 1. Taking this pin to logic 0 allows the outputs to assume the logic levels selected by A0 and A1. The truth table for IC2 is given in Table 3. Port 255 ($\overline{Q3}$) is not used.

The three outputs from IC2 reach inputs of NOR gates (IC3); $\overline{IN}$ and $\overline{OUT}$ also reach the appropriate IC3 gates. The outputs from IC3 provide the control signals for the following latches and buffer (IC5 to IC7 and IC8).

IC5, 6 and 7 are octal D-type latches. The information reaching the eight inputs is transferred and latched into the eight outputs by a positive going (low-to-high) pulse edge to the clock (CK) input. All inputs receive information from the data bus.

Suppose for example the CPU is OUTputting to port 252. The port address appears on the lower half of the address bus with data to be sent out on the data bus. As A0 and A1 are at logic 0, output $\overline{Q0}$ is selected. A2 to A7 are all at logic 1 so IC1 output drops to logic 0 and this enables the outputs of IC2. $\overline{OUT}$ goes low later in the output cycle after time has been allowed for the data and address buses to stabilise. So initially a logic 0 reaches IC3a pin 12 and a logic 1 is on pin 11. Consequently the output of IC3a is at logic 0.

When $\overline{OUT}$ goes low, the output of IC3a then goes high. This reaches the CK input of IC5 and the data bus information is clocked through and latched into the outputs of IC5. IC6 and IC7 operate in a similar manner.

Port 253 is wired as a bi-directional port, that is to say the CPU is able to read from ($\overline{IN}$) and write to ($\overline{OUT}$) this port address. The $\overline{OUT}$ section is IC7 with decoded control, and IC8 provides the $\overline{IN}$. IC7 and IC8 are wired in anti-parallel.

Fig. 3a. Expansion bus contacts and additional circuitry (IC10) required by the Genie microcomputer.

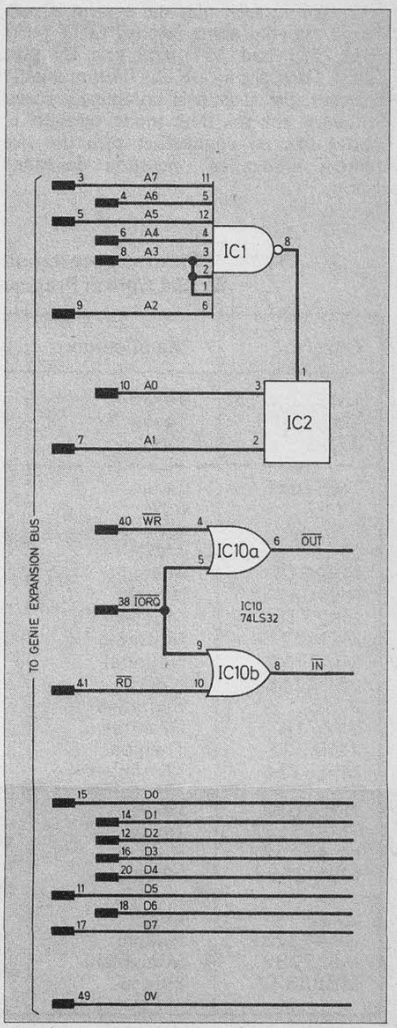


Table 4. Assignment of the ports

Host Computer Data Bus	Port 253 Data (IN & OUT)	Port 254 Low order address (OUT)	Port 252 (OUT) High order address and control			
			Mode A			Mode B
			1K × 8	2K × 8	4K × 8	4K × 8
bit 0	D0 (9)	A0 (1)	A8 (23)	A8 (23)	A8 (23)	A8 (23)
bit 1	D1 (10)	A1 (2)	A9 (22)	A9 (22)	A9 (22)	A9 (22)
bit 2	D2 (11)	A2 (3)	VOL (19)	A10 (19)	A10 (19)	A10 (19)
bit 3	D3 (13)	A3 (4)	PGM (18)	PGM (18)	A11 (18)	A11 (21)
bit 4	D4 (14)	A4* (5)	———	———	———	———
bit 5	D5 (15)	A5** (6)	———	———	———	———
bit 6	D6 (16)	A6 (7)	$\overline{CS}$ (20)	$\overline{CS}$ (20)	$\overline{PGM}$ (20)	$\overline{CE}$ (18)
bit 7	D7 (17)	A7 (8)	V_{pp} (21)	V_{pp} (21)	V_{pp} (21)	$V_{pp}/\overline{OE}$ (20)
					Texas 2532	Intel 2732

Notes
Numbers in parentheses are EPROM socket pin positions.
** Not used * Controls $\overline{OE}$ of OUT PORT 253.
VOL represents logic 0.
$\overline{PGM}$ 50 millisecond high pulse, 5V / 0V — with V_{pp} on
$\overline{PGM}$ 50 millisecond low pulse, 5V / A0 — with V_{pp} on
V_{pp} 25V supply: 0 — off, 1 — on

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IC8 is connected as an octal buffer with tri-state outputs. Its outputs are enabled by providing a logic 0 to its $\overline{OE}$ pins (1 and 19). Similar circuitry to the $\overline{OUT}$ ports is employed but here the decoded address signal and $\overline{IN}$ reach NOR gate IC3d. What is really required here is an OR gate to give a logic 0 to pins 1 and 19 when IN253 is requested. To make convenient use of the local "spare" NOR gate in the IC3 package, an inverter is used to follow IC3d to construct the required OR function. Thus when the decoded address control signal goes to logic 0 and $\overline{IN}$ falls to logic 0, IC8 is enabled and connects the EPROM data outputs to the computer data bus.

To program (burn) an EPROM location, the address of the location and the data to be burned must be presented to the appropriate EPROM address and data pins. Next +25V needs to be connected to the V_{pp} pin and then a 50 millisecond pulse of the correct polarity fed to the programming pin.

Bit 7 of port 252 controls the +25V supply line, a logic 1 turns it on, a logic 0 turns it off. The address is sent to the EPROM via IC6 (A0 to A7), and IC5 (A8 to A11). The data is sent via IC7. Control signals to present the 25V and programming pulse are sent via IC5 upper half.

The control signals for the EPROMS listed in Table 1 vary in several respects as can be seen in Fig. 1. To accommodate the different organisations and memory size it was found necessary to include a manually operated MODE switch, S1, in the design. The position of S1 in conjunction with software produces the required result.

To read an EPROM location, IC6 and IC5 provide the address and control information and IC8 provides the link to the data bus.

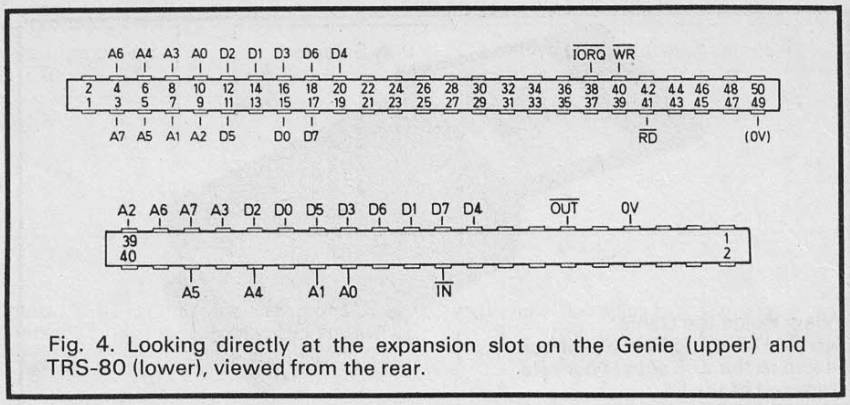
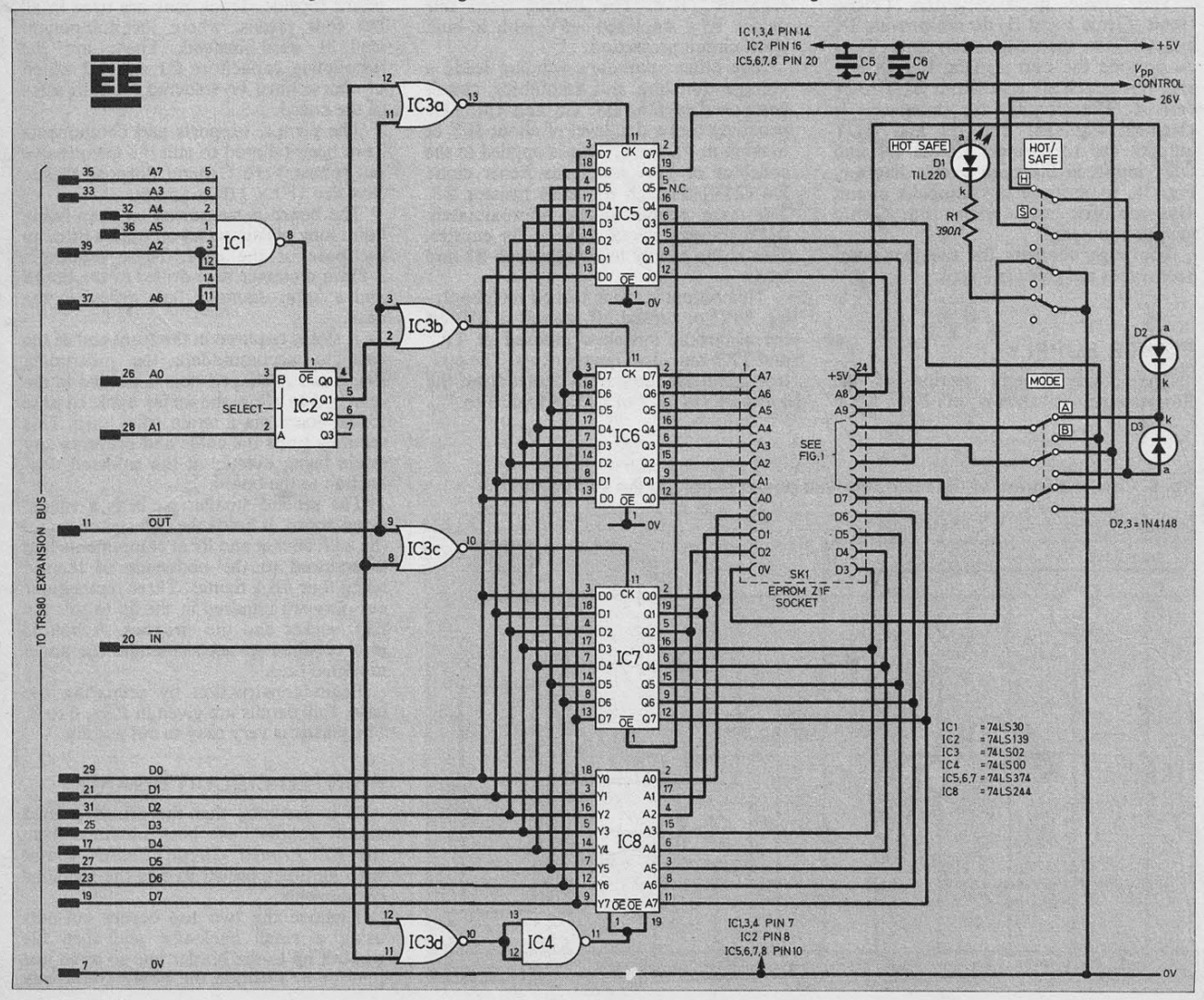
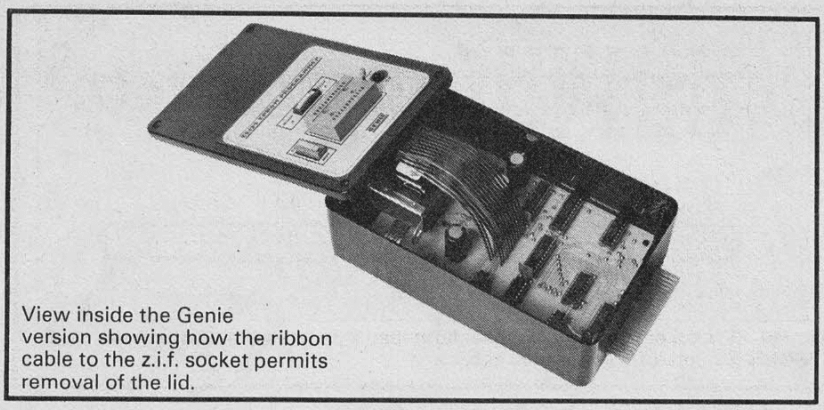


Fig. 4. Looking directly at the expansion slot on the Genie (upper) and TRS-80 (lower), viewed from the rear.

Fig. 3b. Circuit diagram of the TRS-80 version of the Programmer.



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View inside the Genie version showing how the ribbon cable to the z.i.f. socket permits removal of the lid.

An EPROM should not be removed from or inserted into a powered up socket (hot socket). S2 functions as a HOT-SAFE switch. In the SAFE position the 0V, 5V and 25V supply lines to the socket are interrupted. Light emitting diode D3, lit when the socket is HOT, provides an immediate visual indication of the switch position.

The Genie microcomputers (Video Genie, Genie I and II) do not provide IN and OUT at their expansion slots. They do provide the CPU signals, IORQ, RD and WR which allows IN and OUT to be derived. The circuitry for doing this is given in Fig. 3a. The IN and OUT outputs are to connect to the IN and OUT inputs in the main circuit diagram, Fig. 3a, to produce the complete circuit diagram for use with the Genie microcomputers.

The edge contacts for the two computer types are given in Fig. 4.

POWER SUPPLY

The power supply section of the Programmer is shown in Fig. 5. It produces +5V and +26V and is mains powered.

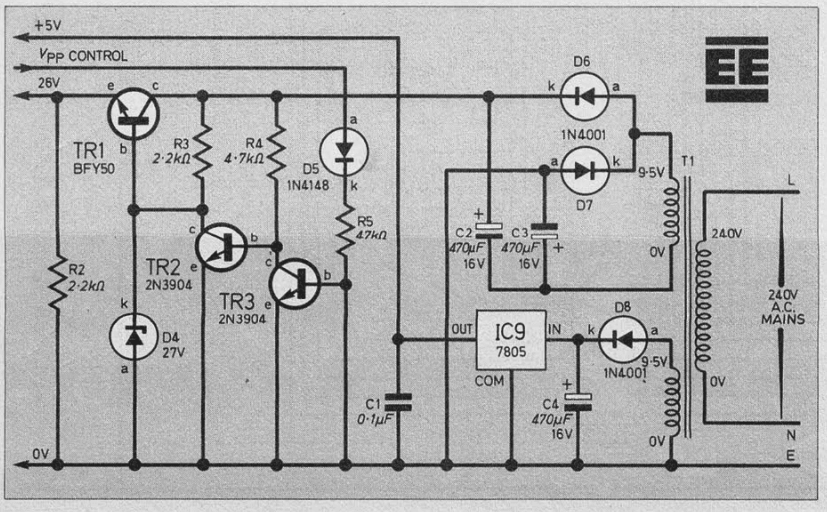
The 240V a.c. mains voltage enters the unit and appears across T1 primary. There are two secondary windings, each rated at 9·5V 320mA. One voltage winding is half-wave rectified by D8 and then smoothed by C5. This provides a raw d.c. input to monolithic voltage regulator, IC9. The output from this device is a stabilised +5V with in-built short circuit protection.

The other secondary winding feeds a voltage doubling and smoothing circuit composed of D6, D7, C3 and C4. This produces a raw d.c. level of about 30V at maximum V_{pp} load. This is applied to the collector of TR1 and feeds Zener diode D4 (27V) through its series resistor R3. The base emitter drops approximately 0·7V to give about 26V at its emitter. This is the supply to V_{pp} through S2 and S1.

This output stage is turned on (supplying 26V) or turned off (output is 0V) by the electronic switch composed of TR2 and TR3 and local components. The control signal for the switch comes from the software via bit 7 of IC5. A logic 1 to V_{pp} CONTROL turns on TR3 and its collector drops to near 0V. TR2 is therefore off and is effectively disconnected from D4.

If now a logic 0 is presented, then TR3 is turned off. TR2 is now free to turn on via base bias resistor R4 and TR2 collector falls to near 0V. D4 is thus shunted and TR1 is held off so there is no voltage at TR1 emitter. R2 straps TR1 emitter to 0V in this condition.

Fig. 5. Circuit diagram of the mains derived power supply of the Programmer.



HARDWARE

Both versions of the Programmer described here are constructed using two printed circuit boards. The larger board in each case is a double-sided type, that is to say, there is a track pattern on each side of the board. Interconnections are required between the two sides at numerous places. Track pins are made specially for such a connection and their use is strongly recommended for this project. These pins are tapered with heads. The board should be drilled 1mm diameter at these positions for the specified pin.

The through-the-board connections are at each of the pad positions seen on the board topside. Track pins are used in all but four places, where the component lead is used instead. These are the decoupling capacitors C1 and C2 which of course must be soldered on both sides of the board.

The p.c.b.s, supports and components have been tailored to suit the inexpensive but robust Vero General Purpose Plastic Box size 180 × 110 × 55mm.

The board is supported on snap-fixing 6mm long plastic stand-off pillars fitted to the base of the case. These require a 3·8mm diameter hole drilled in the board and a 5mm diameter hole drilled in the case.

A slot is required in the front end of the case to accommodate the protruding finger set. A shaped hole is needed in the rear end to allow the mains cable to pass to the board via a strain relief bush. This securely grips the cable and prevents any strain being exerted at the soldered connection to the board.

The second smaller p.c.b. is a single-sided board. It holds the two switches and the z.i.f. socket and local components and is screwed to the underside of the lid using four 6BA fixings. Three rectangular cut-outs are required in the lid to suit the z.i.f. socket and the switches. A hole is also required to accommodate the panel mounted l.e.d.

Begin construction by preparing the case. Full details are given in Figs. 6 to 8. The plastic is very easy to cut and file.

PRINTED CIRCUIT BOARDS

It is assumed that the drilled printed circuit boards have been obtained from the *EE Printed Circuit Board Service* with all holes drilled to suit the specified components.

Remove the two top corner cut-outs using a small hack-saw and then file smooth up to the border line so as to just remove it. Position the board (right-way

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up) on the underside of the case and use the four board fixing holes to drill pilot holes in the case for the corresponding base fixing holes. Enlarge the case holes to 5mm diameter. Slightly countersink both sides of these four holes.

Push the plastic pillars into the case holes and then check that the board fits onto the pillars and the finger set protrudes through and clears the slot. If all is well remove the board and make ready for assembly.

ASSEMBLY

All components are fitted to the board topside as can be seen in the layout diagrams, Fig. 9 (for TRS-80 version) and Fig. 10 (for Genie version). Begin by inserting all the track pins. You will find it easier to push these in from the topside as all topside pad positions are through-the-board interconnection points.

Remember to leave the four holes for C1 and C2, to be fitted later. Push the pins firmly into the board. Solder all pin topsides, turn over and solder all pin undersides. A small diameter bit is recommended for most of the soldering on this board, about 1·5mm diameter.

Next insert the i.c. sockets and solder. Check for solder bridges as you proceed. An eye glass will be especially useful for this purpose.

Now position and solder all other low profile components: resistors, diodes and IC9 followed by the transistors and decoupling capacitors, C1, C2 and C6. Remember to solder C1 and C2 to top and underside. The electrolytic capacitors may next be inserted paying attention to polarity and finally fit and solder in T1. Prepare a length of mains cable 3-core and connect to the board according to layout diagram.

POWER SUPPLY CHECK

The assembly should now be thoroughly inspected, checking for possible solder bridges, unsoldered pins, correct orientation of diodes, transistors and capacitors. When you are satisfied, the power supply section should be checked. It is a good idea while testing to sit the board in its case with finger set protruding through the slot. This lessens the possibility of inadvertently touching the p.c.b. underside tracks carrying mains voltage.

Plug in and switch on at the mains. Identify the 0V and +5V rails and check that the voltage is at or very close to +5V.

Attach a short length of fine wire to your voltmeter probes and check that there is 5V between each V_{cc} and GND pin position at each socket. Too stout a wire has been found to excessively open the socket contact such that it is unable to make contact with the i.c. pin when inserted.

You should measure about 30V or more between 0V and TR1 collector. There should be no output at TR1 emitter. A lead connected between the free

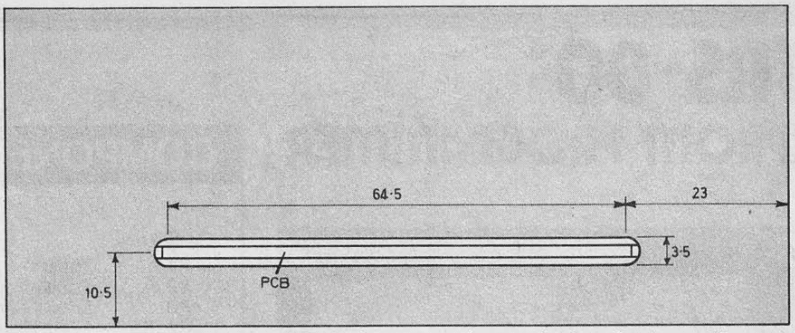


Fig. 6. Slot to be cut in the case front panel to suit the Genie version p.c.b. (830602).

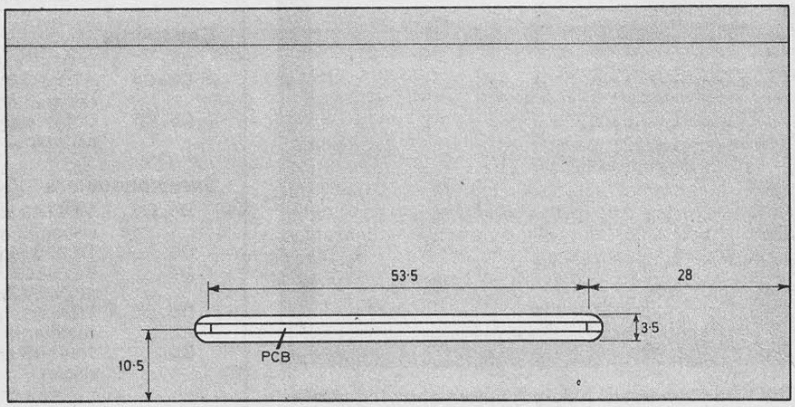


Fig. 7. Slot to be cut in the case front panel to suit the TRS-80 version p.c.b. (830601).

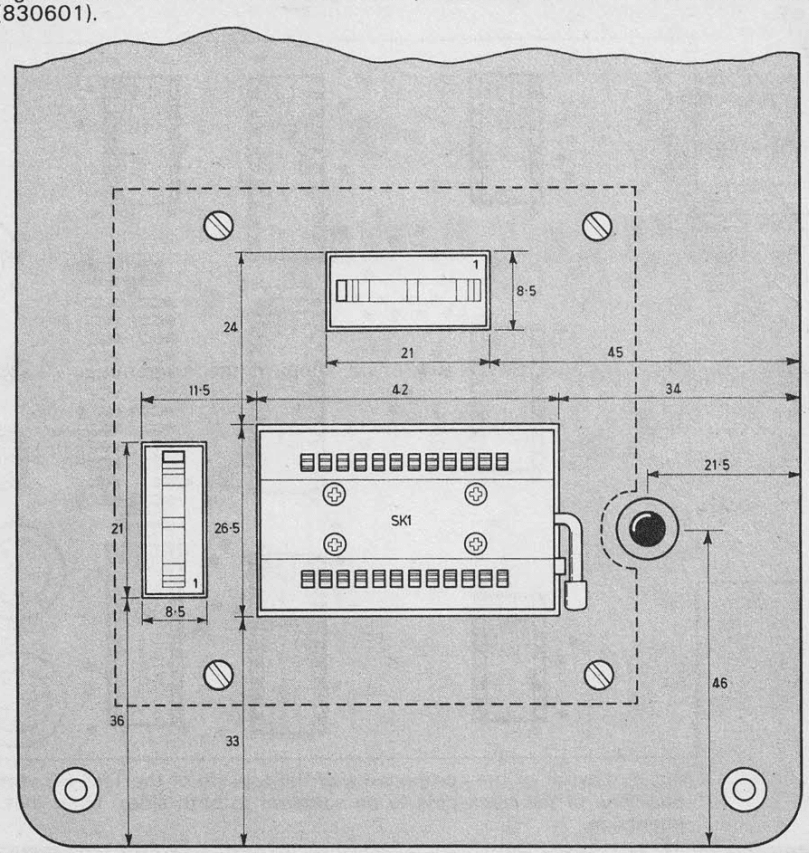
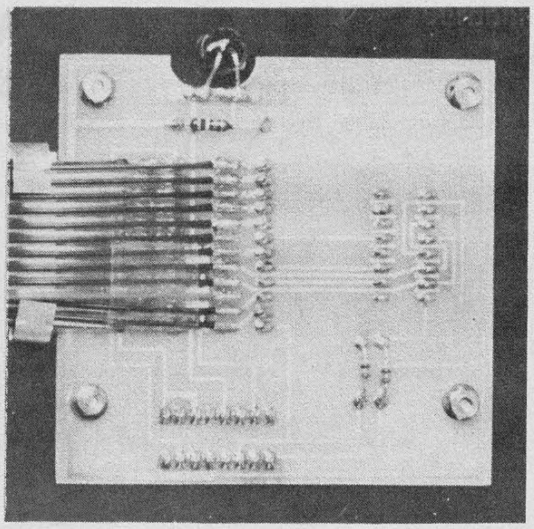


Fig. 8. Cut-out dimensions of the case lid to suit the p.c.b. (830603) and specified components. Note the orientation of the switches.

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TRS-80
EPROM PROGRAMMER



The fitted top board fully populated showing ribbon cable running to lower board through a cable gripper.

COMPONENTS

Resistors

R1	390Ω
R2	2·2kΩ
R3	2·2kΩ ½W
R4, R5	47kΩ (2 off)

All ¼W carbon ±5% except where stated otherwise

Capacitors

C1	0·01µF ceramic
C2–C4	470µF 16V elect. radial (3 off)
C5, C6	0·1µF plastic or ceramic (2 off)

Semiconductors

D1, D2	1N4148 small signal silicon (2 off)
D3	TIL220 red l.e.d.
D4	BZY88C27 27V 400mW Zener diode
D6–D8	1N4001 1A 50V rectifier (3 off)
D5	1N4148 small signal silicon
TR2, TR3	2N3904 silicon *npn* (2 off)
TR1	BFY50 silicon *npn*
IC1	74LS30 TTL 8-input NAND gate
IC2	74LS139 TTL Dual 2-to-4 line decoder (3-state)
IC3	74LS02 TTL Quad 2-input NOR gates
IC4	74LS00 TTL Quad 2-input NAND gates
IC5–IC7	74LS374 TTL Octal D-type flip-flops (3-state) (3 off)
IC8	74LS244 TTL Octal buffers (3-state)
IC9	7805 5V 1A monolithic voltage regulator TO-220 package
IC10	74LS32 TTL Quad 2-input OR gates (Genie only)

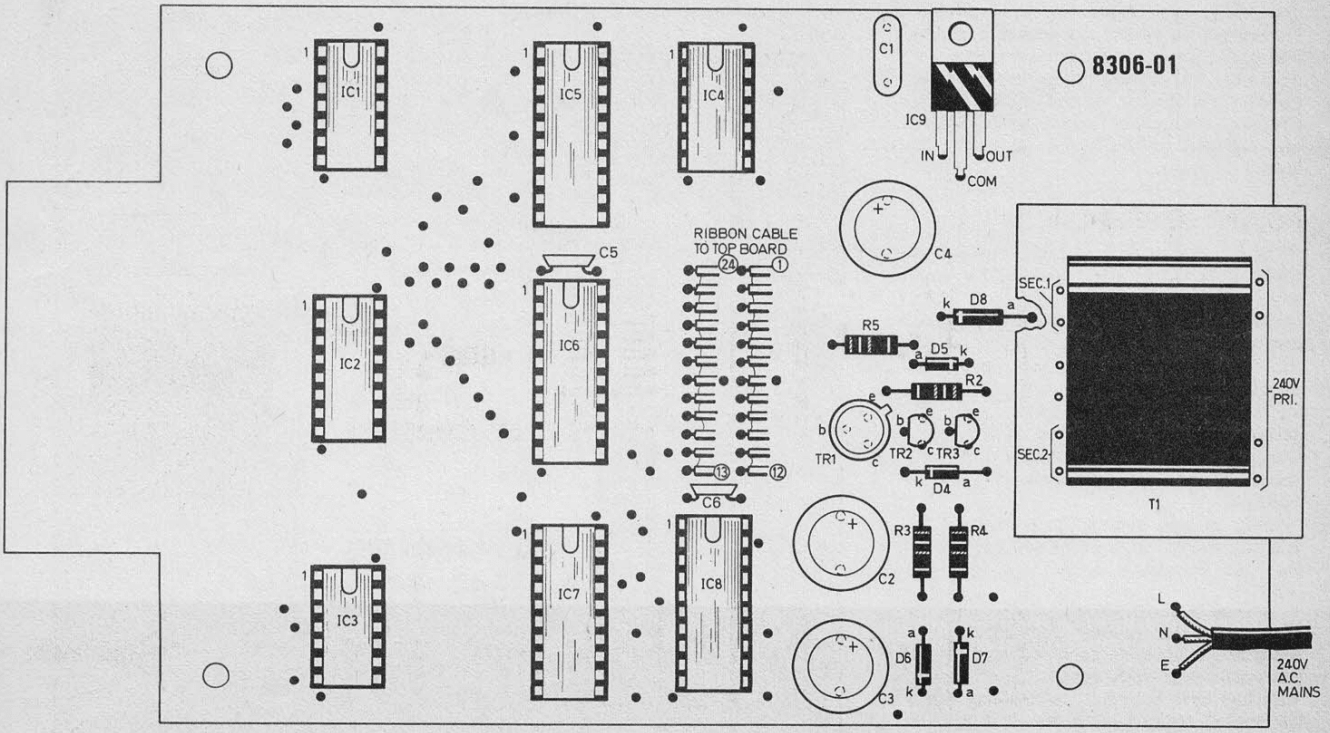


Fig. 9. Layout of the components of the topside of the TRS-80 version p.c.b. The black "dots" indicate the positions of the track pins to be soldered to both sides. Note that C5 and C6 are to be soldered top and underside.

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GENIE
EPROM PROGRAMMER

Miscellaneous

S1, S2	4-pole 2-way d.i.l. switches (type DS16A 4–2) (2 off)
SK1	24-pin d.i.l. Zero Insertion Force Socket (type W3924–10)
T1	Mains primary/0–9·5V, 0–9·5V 320mA secondaries (type P0609)

Printed circuit boards: double-sided size 180 x 104mm Order Code: 8306-01 (TRS-80), 8306-02 (Genie); single-sided size 89 x 89mm Order Code: 8306-03; d.i.l. sockets: 20-pin (4 off), 16-pin (1 off), 14-pin (3 off, TRS-80), (4 off, Genie); plastics case Vero type 202-21391A; 1mm track pins (66 off, TRS-80), (79 off, Genie); 6mm long plastic stand-off pillars (Verospeed type 226-22549H) (4 off); self-adhesive rubber feet (4 off); mains cable strain relief bush; 6BA countersunk screws and nuts, washers (4 sets); 3-core mains cable, 1m; 10-way flexible jumper link cable, 3 x 6 inch lengths (Verospeed type 226-22549H).

Software

T004 cassette: EE124 Eprom Programmer (TRS-80 & Genie)

COMPONENTS approximate cost £35 excluding software

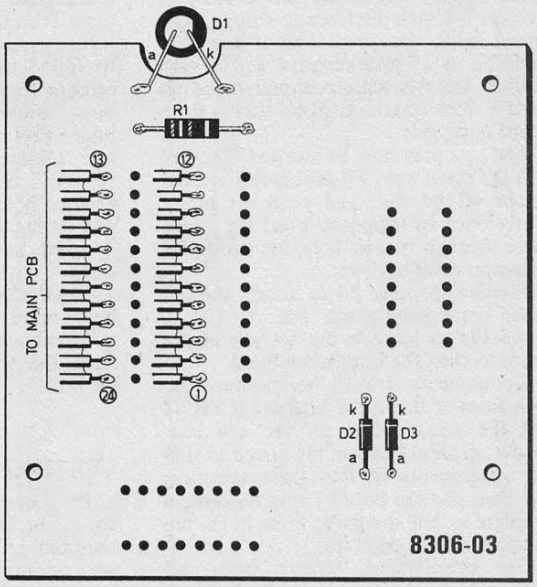


Fig. 11. Shows the components soldered to the "underside" of the top p.c.b. and ribbon cable connection points. For TRS-80 and Genie versions.

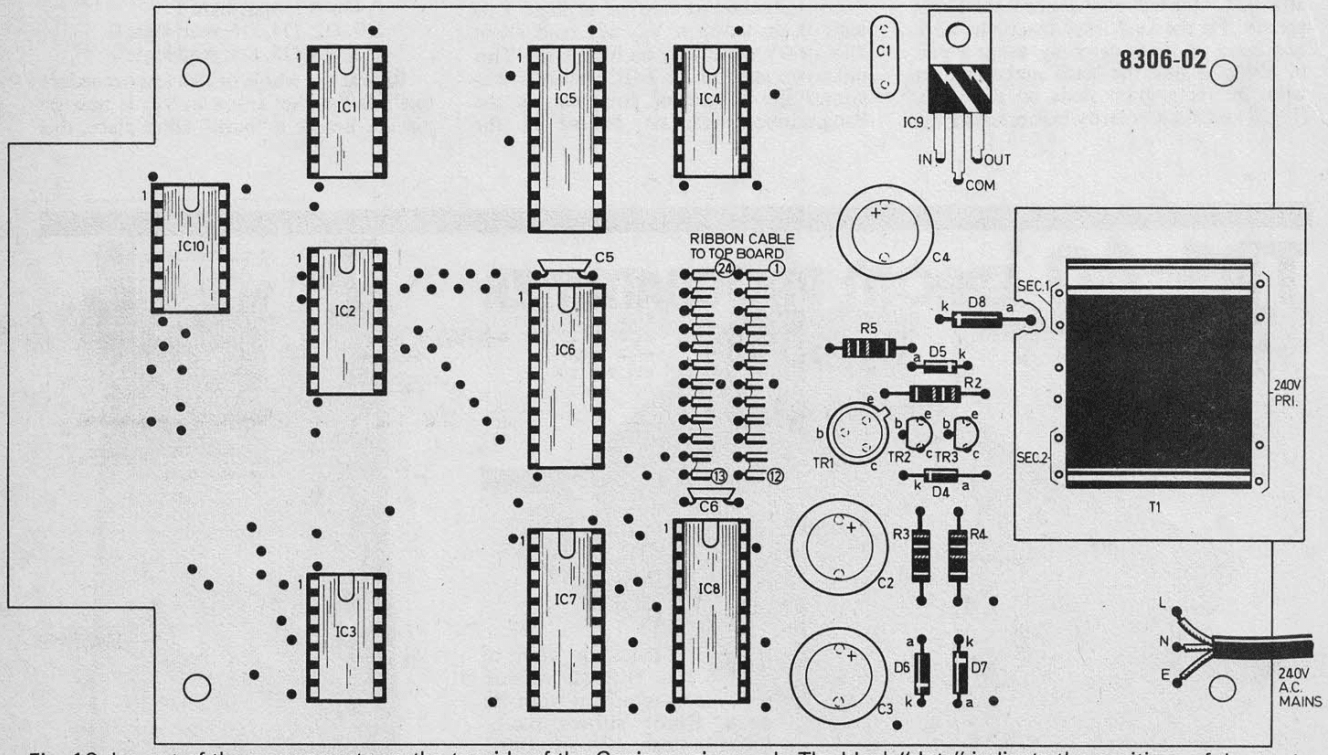


Fig. 10. Layout of the components on the topside of the Genie version p.c.b. The black "dots" indicate the positions of the track pins to be soldered to both sides. Note that C5 and C6 are to be soldered top and underside.

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end of R5 and +5V should cause TR1 emitter voltage to become about 26V. If the above results are not obtained, switch off, investigate and remedy before proceeding.

If all is satisfactory, unplug the unit from the mains and connect the inter-board wiring cable. In the prototype, webbed 0·1 inch pitch ready-stripped and tinned cable was used. This is normally available in 10-wide lengths, and is very flexible. The two additional pairs were cut from a third length. Trim off excess from board underside.

The i.c.s may now be inserted. They all face the same way. Fit rubber feet at each corner of the case and push the board firmly onto its supports. Feed the mains cable through its exit hole, but do not fit the strain relief bush yet.

Prepare the case lid to accept the top panel components, see Fig. 8. Use a round file to remove the section of the board to clear the l.e.d. when fitted.

Components are to be mounted on both sides of the upper board. Fit S1, S2 and the z.i.f. socket on the top (un-coppered) side. Position the board so that the components fit into their apertures and then use the board fixing holes as a template to drill the fixing holes in the lid. Countersink the lid holes.

Use countersunk screws, nuts and washers to fix the board secure. A dab of paint on the thread of the screw will prevent the fixing working loose in use. A label to identify the functions may now be attached. This will also conceal the fixing screws. Fit the l.e.d. clip. Insert the l.e.d. and bend its leads carefully using a pair of pliers so that the leads make contact with the rectangular pads on the p.c.b. (Fig. 11). Check polarity before soldering. Solder D1, D2 and R1 to the board, feeding the shortened leads into the pad holes. Attach the self-adhesive flat cable gripper to the lid immediately in front of the board as seen in the photograph.

It only remains for the 2 × 12-way flat cables to be soldered to the appropriate rectangular pads adjacent to the z.i.f. pins. Trim the tinned leads to about 3mm before soldering. Double-sided tape will be found useful when carrying out this. Stick a short length of the tape onto the board immediately in front of each line of pads. Press each 12-wide cable in turn and solder. Ensure that there are no "shorts". A small screwdriver blade was used to hold the wire in contact with its pad during soldering to give a good joint. A third hand would be useful at this stage. When both cables have been soldered close the cable-gripper arms to hold secure.

Manipulate the cables to run away from the transformer and screw down the lid.

TESTING

Plug into the mains. The panel l.e.d. should be lit when S2 is in the HOT position and go out when set to SAFE. Set in HOT position. Check that the voltage between pin 12 of the socket (GND) and pin 24 (V_{cc}) is +5V. With S1 set to MODE A, pin 21 (V_{pp}) will read either 4·5V or about 25V depending on whether IC5 bit 7 has initialised at turn on to logic 1 or logic 0. In MODE B V_{pp} will read about 26V or 0V depending on bit 7 state. This unknown state of bit 7 (IC5) clearly illustrates the danger of powering up the Programmer with an EPROM in the socket. When certain conditions exist with 25V applied to V_{pp} the EPROM will be destroyed.

In normal use, this condition will not exist since the software correctly initialises the system before instructing the user to insert the EPROM. Full details later.

Connect the Programmer to the computer using the appropriate expansion cable. Do not apply power to the Programmer. Turn on the computer. It should function normally. Turn off the computer. Turn on the Programmer and then the computer. Again the computer should function normally. If not turn off both units, investigate and remedy.

If results are satisfactory, run through the "Setting-Up Procedure" but do not insert an EPROM when instructed to. Set to MODE A and type 4 in response to the prompt at instruction No. 9. You are now at No. 12.

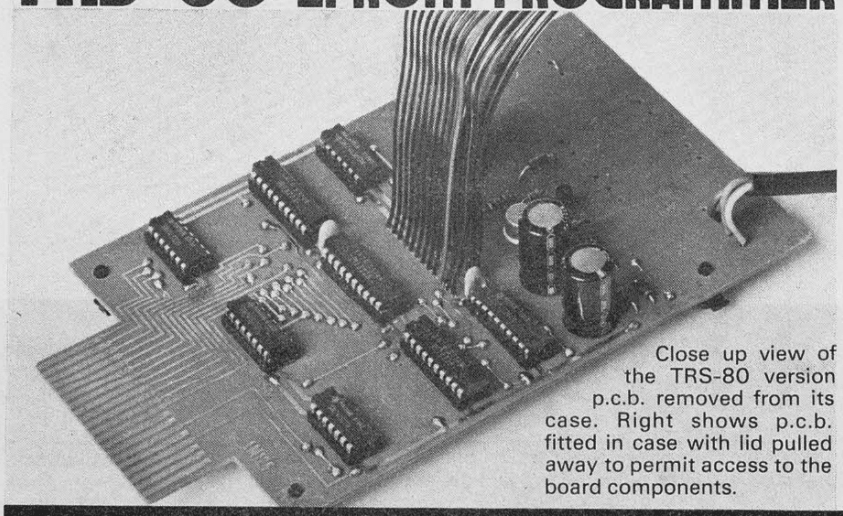
Type P# <ENTER>
Move the cursor to 00F0 and type in AA
Press <BREAK>
Type B0000:00FF <ENTER>

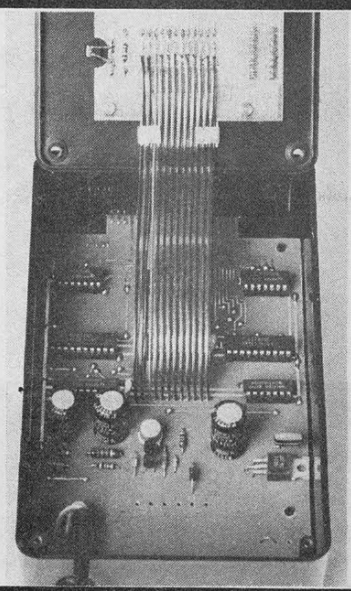
Check that the voltage at pin 21 is approximately 5V. Set your voltmeter to read 30V d.c. f.s.d. and connect across pin 12 and 21. Observe the meter and type <ENTER>. The needle should deflect to 25V for about 12 seconds and then fall back to its previous reading.

Check now that:
A0 to A3, A8 to A11, read logic 0
A4 to A7, read logic 1
D0, D2, D4, D6, read logic 0
D1, D3, D5, D7, read logic 1

Repeat the whole of this test procedure but this time set MODE B. V_{pp} is now on pin 20. Before a "burn" takes place, this

TRS-80 EPROM PROGRAMMER





Close up view of the TRS-80 version p.c.b. removed from its case. Right shows p.c.b. fitted in case with lid pulled away to permit access to the board components.

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pin should read 0V, and during the burn it should read 26V approx. and return to 0V after about 12 seconds. Check all data and address pins to read the same logic levels as before. If so the unit is functioning normally and is ready for use.

SETTING-UP PROCEDURE

Users are advised to read all of this section before attempting to use the system.

The EPROM socket should be empty and all equipment should be "off" before commencing the setting-up procedure which should then be carried out in the following sequence.

1. Connect the PLU to the computer using the system bus expansion cable.
2. Set the HOT-SAFE switch to SAFE.
3. Connect the PLU to a 240V a.c. mains supply and switch on.
4. Switch on the TRS-80/Genie and enter BASIC in the usual way by pressing the <ENTER> key.
5. EE124 is a machine code program which can only be loaded via the SYSTEM command. Type
   SYSTEM <ENTER>
   and the SYSTEM prompt [*?_] will be displayed.
6. Depress the play button on the cassette recorder and check that the volume control is set between 5 and 6. Type the filename
   EE124 <ENTER>
   The cassette motor will start and the program will load in the usual way.
7. Once the load is complete, the SYSTEM command prompt will again be displayed. This time type
   /<ENTER>
   The following message will be displayed

   EE124 SOFTWARE 1·1
   COPYRIGHT EVERYDAY
   ELECTRONICS 1983

   SELECT MODE SWITCH_
8. Refer to Table 1 and identify the MODE (A or B) for the EPROM which is to be programmed. Set the MODE switch accordingly and type
   <ENTER>
   The following message will be displayed
   [SELECT 1, 2 OR 4 ?_]
9. The same EPROM socket is used to program three different sizes of EPROM. They are 1K × 8, 2K × 8 and 4K × 8. Thus, type
   1 <ENTER> for 1K × 8
   2 <ENTER> for 2K × 8
   4 <ENTER> for 4K × 8
   The following message will be displayed
   [INSERT EPROM_]
10. Move the socket lever to the vertical position and insert the EPROM paying particular attention to polarity. Lock the EPROM into position.
11. Set the HOT-SAFE switch to HOT.
12. Type
    <ENTER>
    and the system is ready for use. The command prompt [+] will be displayed and any of the commands on page 348 will be accepted.



The Eprom Programmer in use with the Genie II microcomputer. The screen shows that a 4K-byte EPROM has just been successfully "burned".

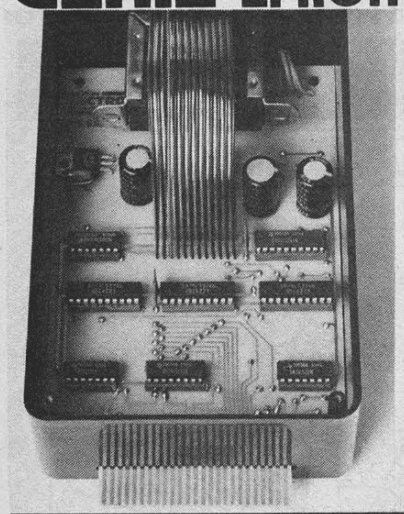
To remove an EPROM from a powered up Programmer

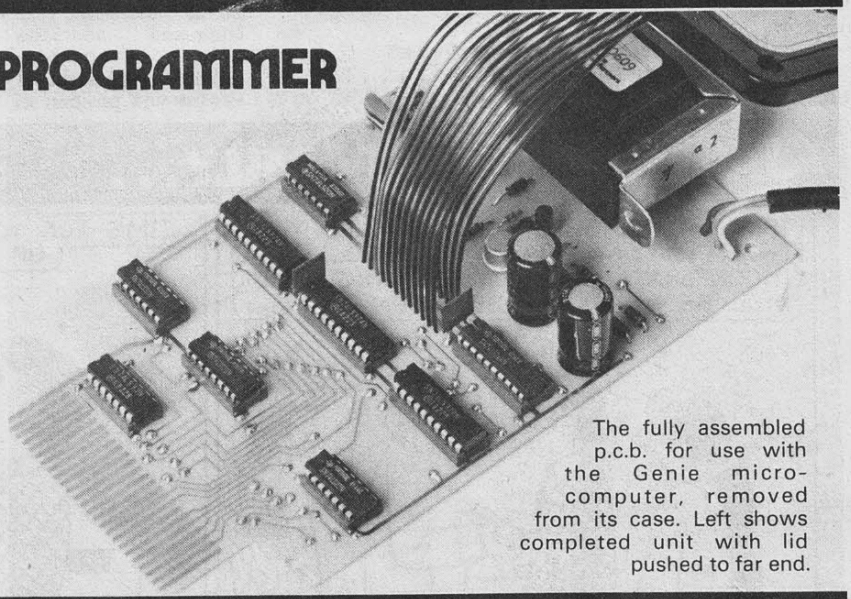
A. Set the HOT-SAFE switch to SAFE.
B. Move the socket lever to the vertical position and lift out the EPROM.

At the end of a programming session, do not turn off any mains supply without having first removed the EPROM. Follow steps A and B with:

C. Switch off Programmer.
D. Switch off computer.

GENIE EPROM PROGRAMMER





The fully assembled p.c.b. for use with the Genie micro-computer, removed from its case. Left shows completed unit with lid pushed to far end.

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COMMANDS

All items appearing in ruled boxes are automatically displayed on the screen.

All commands are vetted by the syntax analyser. This is a routine which checks the structure of commands. If the structure of a command is incorrect, a SYNTAX ERROR message will be displayed.

Commands are of a particularly simple form and are checked against the following production rules:

<Command> <Command letter> <Parameters>
<Command letter> B|C|F|L|M|N|P|R|S|T|X|Z
<Parameters> <Address>|<Address>:<Address>|<Null string>
<Address> #|*|.|<HHHH>
<H> 0|1|2|3|4|5|6|7|8|9|A|B|C|D|E|F

* and . are shorthand notations for first, last and current address, respectively. Spaces are ignored by the syntax analyser.

Example

(a) #:* (b) * (c) . (d) 2410:* (e) .:* (f) 2410:2490

The above parameters are not considered by the analyser to be syntactically incorrect but may be described as BAD PARAMETERS when used with certain commands. The following *are* considered to be syntactically incorrect:

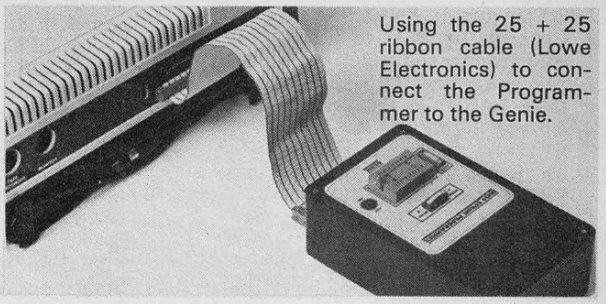
(a) #* (b) 2410.2490 (c) :2490 (d) 2410. (e) .:

All commands must start with a bona fide command letter otherwise an ILLEGAL COMMAND message will be displayed. If the syntax of a command is correct, the legality of any parameters will be determined by the nature of the command.

A complete explanation of the commands and examples of their use will accompany the T004 software cassette available from the EE Software Service.

Table 5. Summary of commands

Command	Description
B	*Burns* bytes from the buffer to the EPROM
C	*Copies* bytes from the EPROM to the buffer
F	*Fills* buffer locations with FF
L	*Loads* SYSTEM tape into the buffer
M	*Memory* sets origin
N	*New* executes a cold restart
P	*Page* displays 256 bytes from the buffer
R	*Read* displays 256 bytes from the EPROM
S	*Saves* contents of buffer locations
T	*Tests* EPROM locations for FF
X	*Exits* to Basic
Z	*Zeros* buffer locations



Using the 25 + 25 ribbon cable (Lowe Electronics) to connect the Programmer to the Genie.

ENHANCING THE SOFTWARE

The authors feel that the set of 12 commands is sufficient for most needs but that there may be some users who wish to enhance the software by adding extra commands. This can easily be done.

The command table is situated from 5318 to 533B; each command cell of 3 bytes consists of

COMMAND LETTER	LSB	MSB

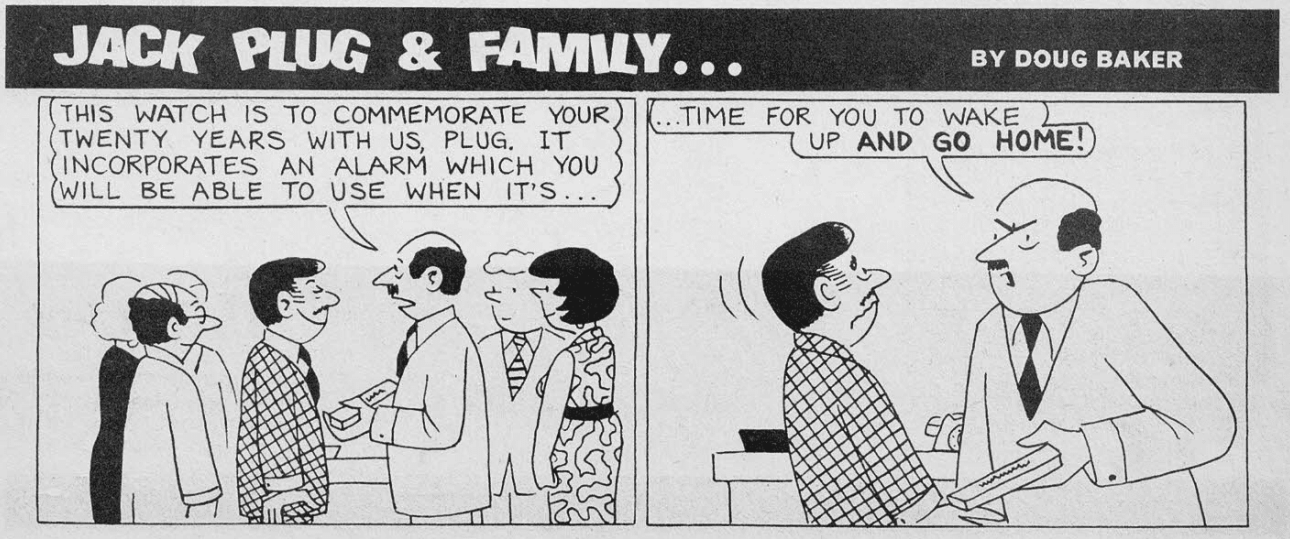
Space for four extra commands has been left from 533C to 5347. Simply type in the three elements of a new command cell. The syntax of the new command will automatically be checked and on jumping to the command address, the top of the stack will hold the BAD PARAMETER(S) address.

CALL 58DO returns HL, DE with command parameters.

CALL 5A1C returns HL, DE with buffer addresses, i.e. command addresses which have been adjusted for origin of EPROM and position of buffer. (4300≤HL & DL≤52FF.)

COPYING SYSTEM TAPES

SYSTEM tapes can be easily *copied, edited* and *created* using the M, L, P and S commands. However, it must be remembered that although programs appear to be in main memory, they are actually stored in the buffer. They can only be run by first saving them onto cassette using the S command and then by loading them into main store from Basic using the SYSTEM command. □



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£143



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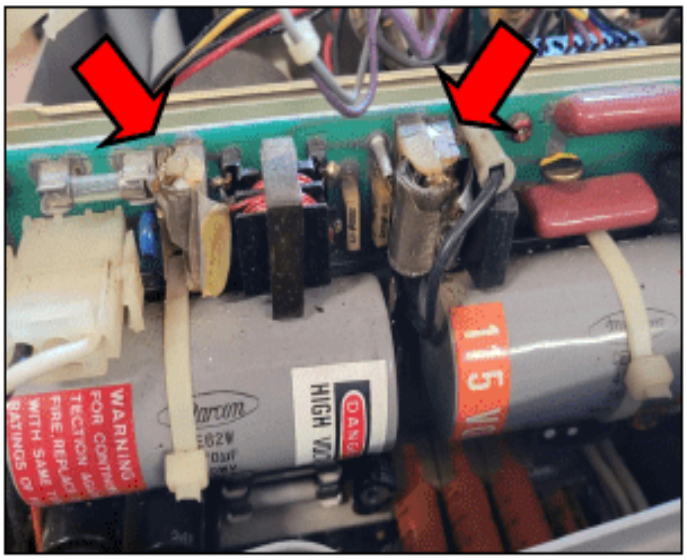
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The Big Tandys

(formerly Business Time with Kev)

Thanks to everyone for the fabulous feedback I go from my re-emergence in TRS8BIT in the last issue. I think Dusty's right in that the Big Tandys don't get enough air time so hopefully we can generate some more interest and keep these gentle giants alive and well.

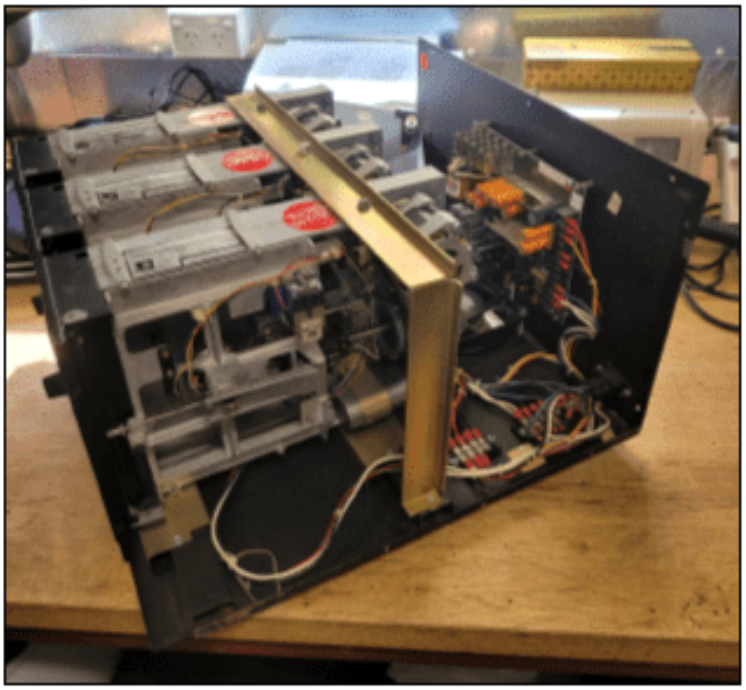


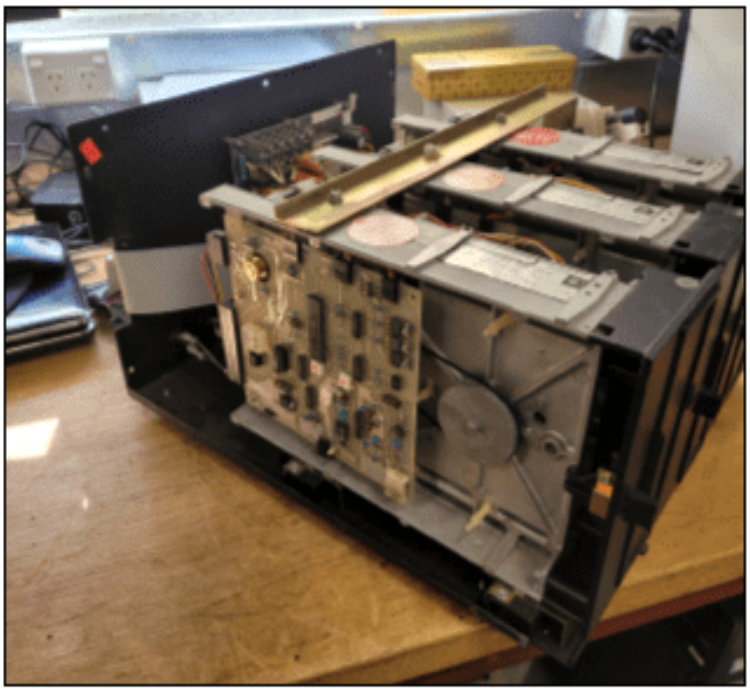
As you might recall from my last article I found that my recently acquired Model II, on removing the cover of the machine, had suffered that well known TRS-80 affliction of blown power supply caps. Now on talking to 8" TRS-80 guru, Aaron Brockbank, he pointed out to me that RIFA caps in the power supply were not the only place to find them on the Model II, in fact the power supply in the external drive unit also used RIFA caps so my attention first turned there.



A closer examination of the drive enclosure showed that on the back it had three fuses, one for each drive. This isolation of each drive is refreshing but makes me wonder why such granularity is required. Looking at the 1979 Radio Shack Computer Catalogue the external drive system with three drives was $2,360 USD - in today's world that's about $8,420 USD but I couldn't ascertain what the cost of a single replacement drive might be. The cost of a single drive expansion unit was $1,153 USD which is about $4,110 USD today and I suspect that the actual drive made up a significant portion of that cost so it probably follows that you'd want to provide some quite granular protection for your investment. Remember, unlike floppy drives as we generally know them, these floppy drives run constantly and do so at full mains voltage. One of the fuse enclosures was broken - I can't say whether it was sold like that or this happened in transit but given how far its travelled and the videos I've seen of other vintage computers that didn't survive transit too well, I'm not complaining at all - its a very straightforward repair.







So an investigation was required to see what was inside the mysterious large grey box with three very serious floppy drives. I must admit I had never seen the inner workings of the expansion system and it was quite a surprise. Surgically it was a bit difficult to get open due to its weight and size. I had to tilt it up on its edge a couple of times and I was afraid that the weight might crack or break the plastic front but with the right degree of care all was well.

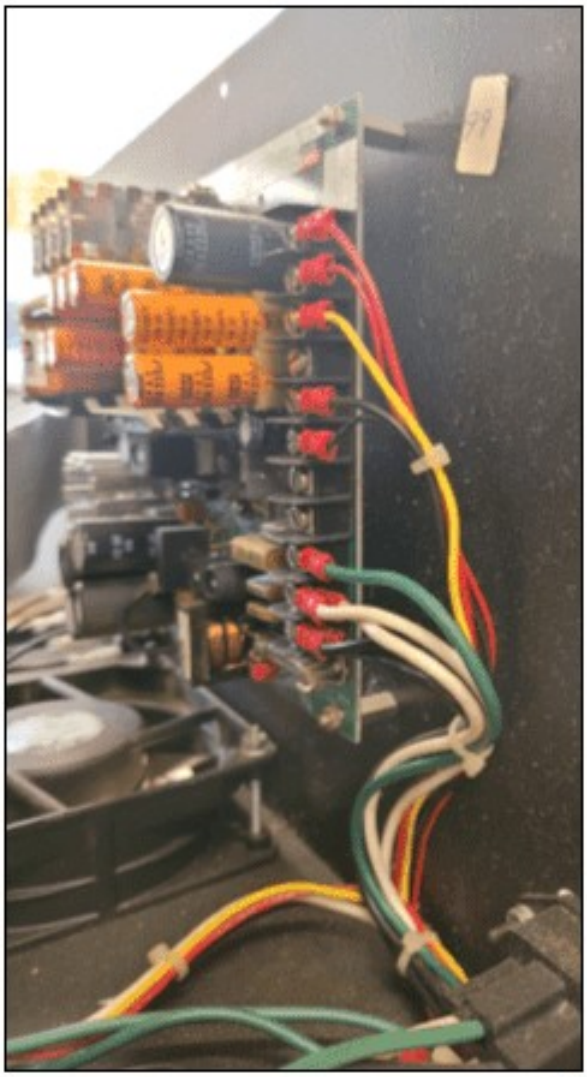
My immediate impression when I finally got it open was that it had some impressive build quality - neatly laid out and it had a certain degree of robustness about it. There was some serious stuff going on in this box. In fact you could feel it when you lifted it - it was markedly heavier than the computer itself. There's some serious drives in there with motors, including the stepping motors, that would pull a car out of a bog or run an industrial air conditioning system. I found that the drive belts were a bit sticky on the pulleys, no doubt a function of how long its been sitting, but with some very careful encouragement they freed up. The pulleys will need a clean as part of the repairs but all things considered, like the computer itself, its been stored well over the years so internally its in remarkably good condition as can be seen from the photos - no rats nests in here. Yes I have, as I suspect others have, opened older machines with rodent nests in them.

It was a bit hard to get a camera in there to get a good shot but sure enough there were several RIFA caps on the external unit's Astec power supply. On closer examination it was clear that the lacquer had fractured on them but the caps had not exploded. At this stage I haven't removed the external system power supply as there are a huge number of wires (as you can see in the photos) so I need to make a record of it before I do so that I can put it back the right way.

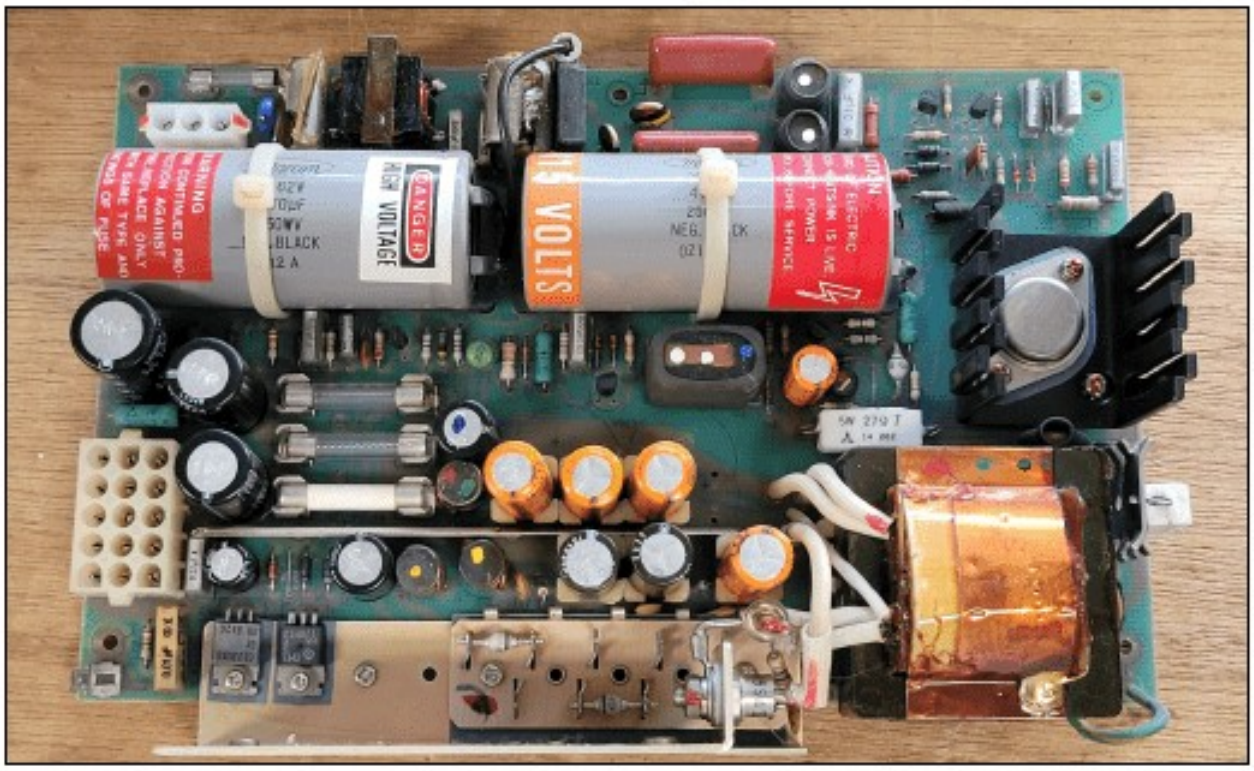
So now my attention turned to what work was needed on the Model II itself. Getting the top off was quite easy, although the cover was a bit flimsy so some care was needed not to crack or break the tabs etc (see my article in the previous issue of TRS8BIT).

Like the external drive system it also had a fuse just for the floppy drive. This was broken as well so that will need to be repaired but its right down on the bowels of the case so this is a time where I need smaller hands.





I already knew to some degree what caps were gone on the power supply (see picture at the start of this article) so the next challenge was to get the power supply out to have closer look. Quite frankly, its a pig of job. I did invest in some long shanked magnetic screwdrivers and that helped tremendously. One of the screws holding the power supply in is only accessible by sliding a screwdriver down between the power supply mounting plate and the monitor display printed circuit board (both these components share this mounting plate so you can't just extract the power supply). On top of that there are plenty of wires getting in your way and the monitor display board is right next to the neck of the picture tube so extra care was needed not to damage any components there.





With a lot of patience, careful examination of what was there before doing anything and watching heaps of You Tube videos of what others have done I finally got the power board out. With the two larger caps definitely gone it looks like there's about three others to replace.

So the new soldering/desoldering station has arrived and hopefully by the next issue of TRS8BIT I've got the caps done, put it back together and fired it up. I used to jokingly say that when you fire up a Model II with an expansion system you watch the lights in your house dim - I'll let you know how that goes.

Now an issue aside, in talking to Aaron Brockbank further we got a bit interested in the serial number for this machine 6403623B, in particular the B at the end. Aaron seemed to think that this was market specific i.e. it was destined or made for either the British or Belgian market. Given that the machine was originally purchased in Belgium and that Radio Shack had a presence in Belgium I'm inclined to think its related to Belgium. If anyone is more familiar with Radio Shack serial numbers we'd be most interested in the significance of the B or maybe its not significant at all or maybe its related to machine versioning in some way, so please contact me. I must admit I can't recall seeing a suffix on any other Radio Shack serial number that I've seen.

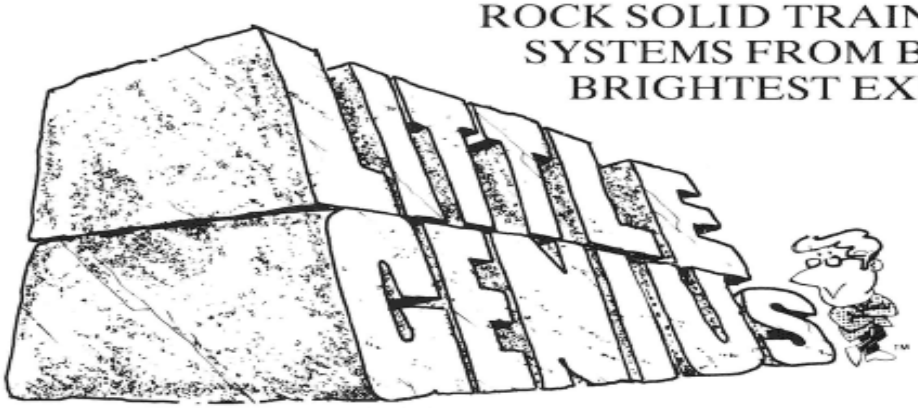
Kevin Parker

kevin.parker@trs-80.computer

Kevin is a web specialist, ColdFusion developer and SharePoint specialist who is very eclectic in his interests in classic computers but has a particularly large weakness for TRS-80's and black IBM business grade machines. He lives in Victoria (Australia) with his collection! His TRS-80 widow lives in the house.



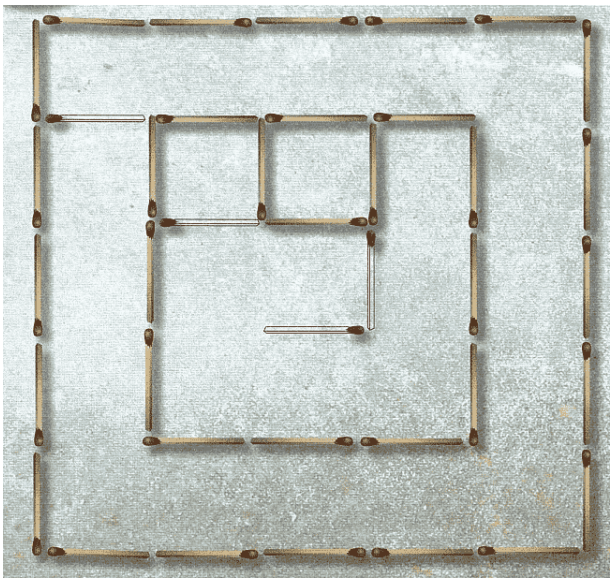
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HERE'S THE ANSWERS TO THE DOUBLE QUIZ ON PAGES 38 & 39



I COULD, JUST ABOUT, COPE WITH THIS ONE, BUT THE SECOND HAS ME SCRATCHING MY HEAD. PLEASED I HAD THE ANSWER!

6171=101

6!7! = 10!

720 × 5040 = 3,628,800

HOW DO YOU DO IT?

YOU HAVE TO BE CREATIVE TO PUT IT MILDLY. HERE ARE THE ONLY THREE DOTS THAT YOU NEED TO REMOVE. THIS TURNS THE ONES INTO EXCLAMATION MARKS. SO THE EQUATION IS THEN SIX FACTORIAL MULTIPLIED BY SEVEN FACTORIAL IS EQUAL TO 10 FACTORIAL. AND AMAZINGLY, THIS IS A TRUE EQUATION.

I DID SAY IT WAS A BIT, ERM.. WELL, ANYWAY, I CAME ACROSS IT ON YOUTUBE!

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HI EVERYONE AND WELCOME TO THE SEPTEMBER 2022 EDITION

NOW, HAVE YOU MADE YOUR TANDY ASSEMBLY RESERVATION YET? THERE'S JUST UNDER A MONTH TO GO, AS AT PUBLICATION DATE, SO NOW'S THE TIME TO MAKE YOUR PLANS AND 'GET IN THERE'. FULL DETAILS AND FURTHER INFORMATION ON PAGES 5-9 IN THIS ISSUE OR OF COURSE THE TA WEBSITE.

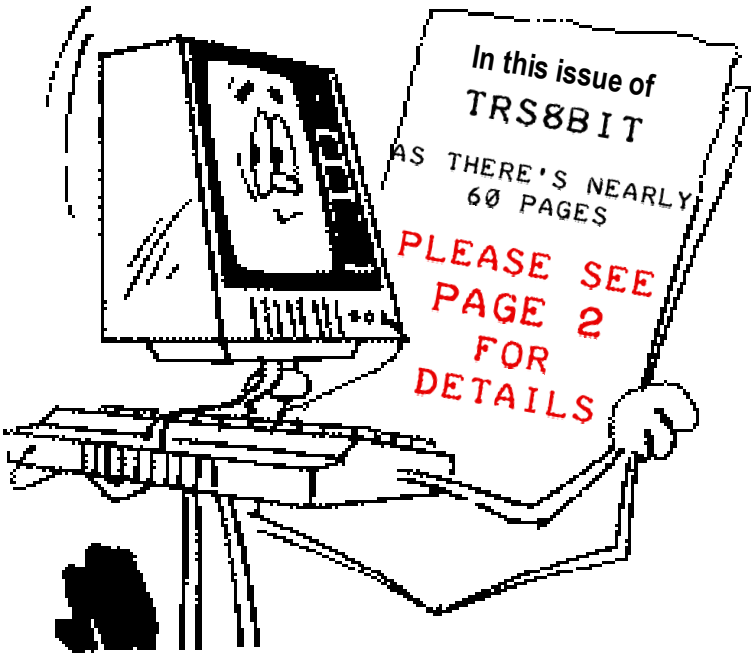
WWW.TANDYASSEMBLY.COM

A LITTLE BIRD HAS TOLD ME THAT MAV WILL BE RUNNING THE QUIZ THIS YEAR AND I BELIEVE THERE MIGHT WELL BE A 'ZOOM' MEETING AT SOME POINT IN THE PROCEEDINGS.
I SHALL BE THERE IN SPIRIT WITH YOU, LOOKING FORWARD TO ANY LIVE BROADCASTS AND FACEBOOK VIDEOS!!

HOW'S YOUR 'BEAUTY AND THE BEAST' COMPETITION ENTRY COMING ALONG? THERE'S STILL THE BEST PART OF THREE MONTHS BEFORE THE CLOSING DATE BUT TIME DOES SEEM TO RUN QUICKER, THE NEARER TO CHRISTMAS WE GET. ENTRIES CAN BE SUBMITTED ANYTIME BEFORE THE CLOSING DATE, WHICH IS THE 24NOV22. PLEASE DON'T LEAVE IT UNTIL THE LAST MINUTE AS THERE'S A FANTASTIC PRIZE, JUST WAITING TO BE WON.

JUST A QUICK REQUEST FOR HELP. IF ANYONE OUT THERE HAS ANY NEW INFORMATION ABOUT THE ACULAB FLOPPY TAPE, PLEASE CONTACT ME. I HAVE, ONCE AGAIN TRIED TO ACCESS THE DATA ON A WAFER, BUT TO NO AVAIL. IT IS STARTING TO LOOK AS THOUGH THE SPECIFIC SOFTWARE WRITTEN FOR THE ACULAB, SUCH AS XBAS, @PENCIL, @SCRIPT AND @ZEN ARE LOST TO HISTORY. SAD, BUT THERE WE GO.

ANYWAY, ON A MORE CHEERFUL NOTE, ONCE AGAIN THERE A REAL ECLECTIC SELECTION OF TANDY RELATED ARTICLES WHICH I HOPE YOU WILL ALL FIND INTERESTING AND ENJOYABLE.

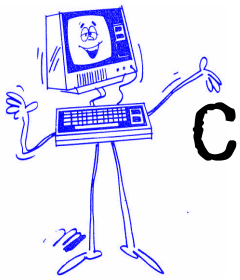


ARTICLES RANGING FROM OBTAINING TANDY SERVICE MANUALS, TO RESULTS OF THE LATEST TANDY COMPETITION HELD IN SPAIN. THERE'S EVEN A ONE LINER BASIC PROGRAM WHICH, WHEN A WORD IS TYPED IN, SOUNDS IT OFF IN MORSE CODE!

DON'T FORGET, THE NEXT ISSUE WILL BE THE CHRISTMAS ONE, SO I'LL TRY AND GET SOME FESTIVE SPIRIT SORTED OUT. UNTIL THEN, PLEASE TAKE CARE



DUSTY



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DON BANNISTER & DERRICK ROWE

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GEORGE PHILLIPS

VERSION 2.4.9

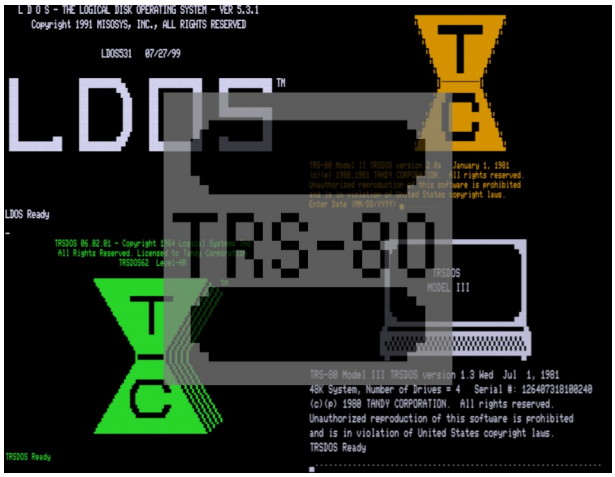
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Of floppies shedding oxide?

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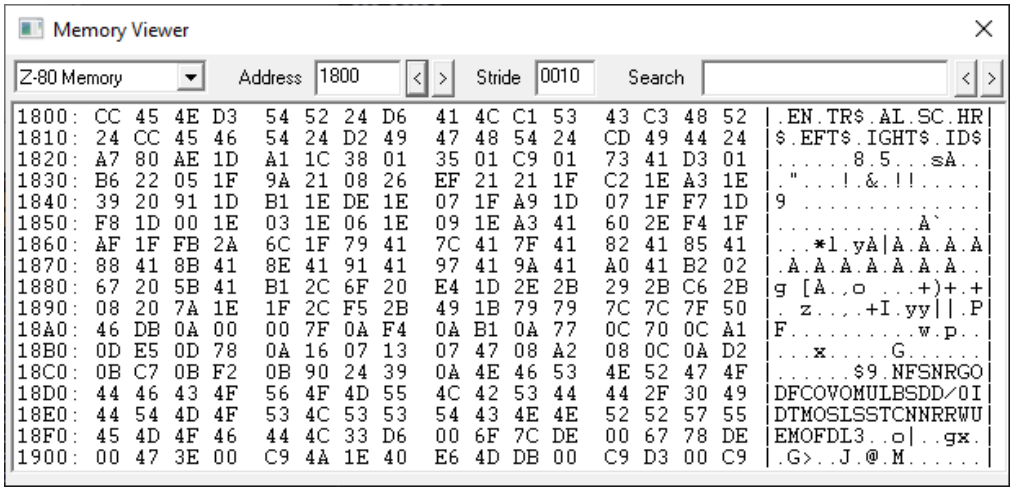
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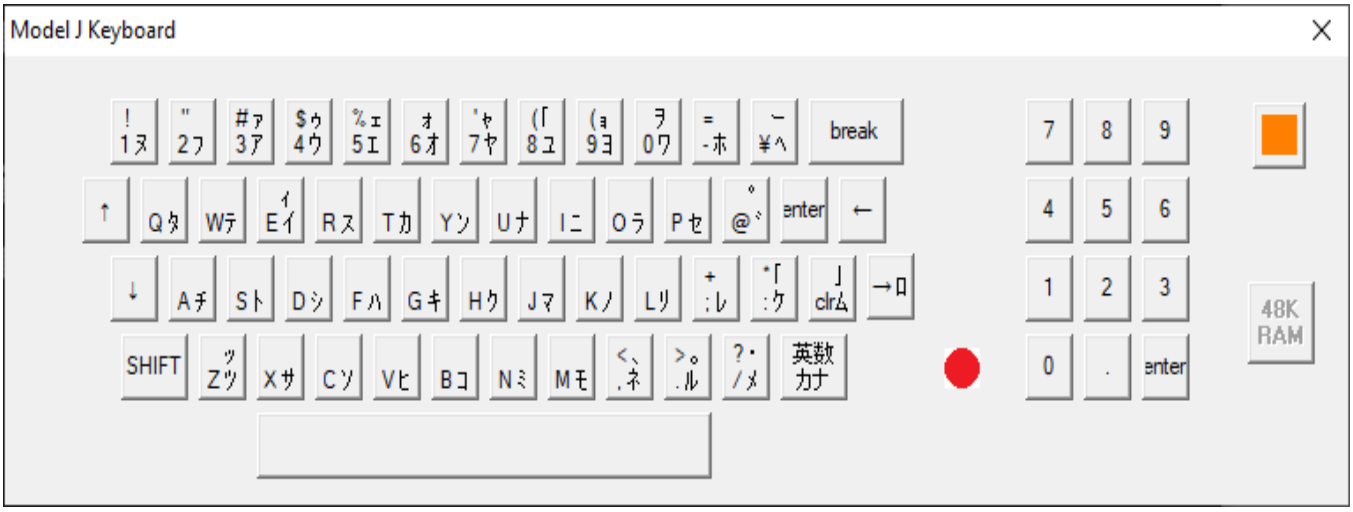
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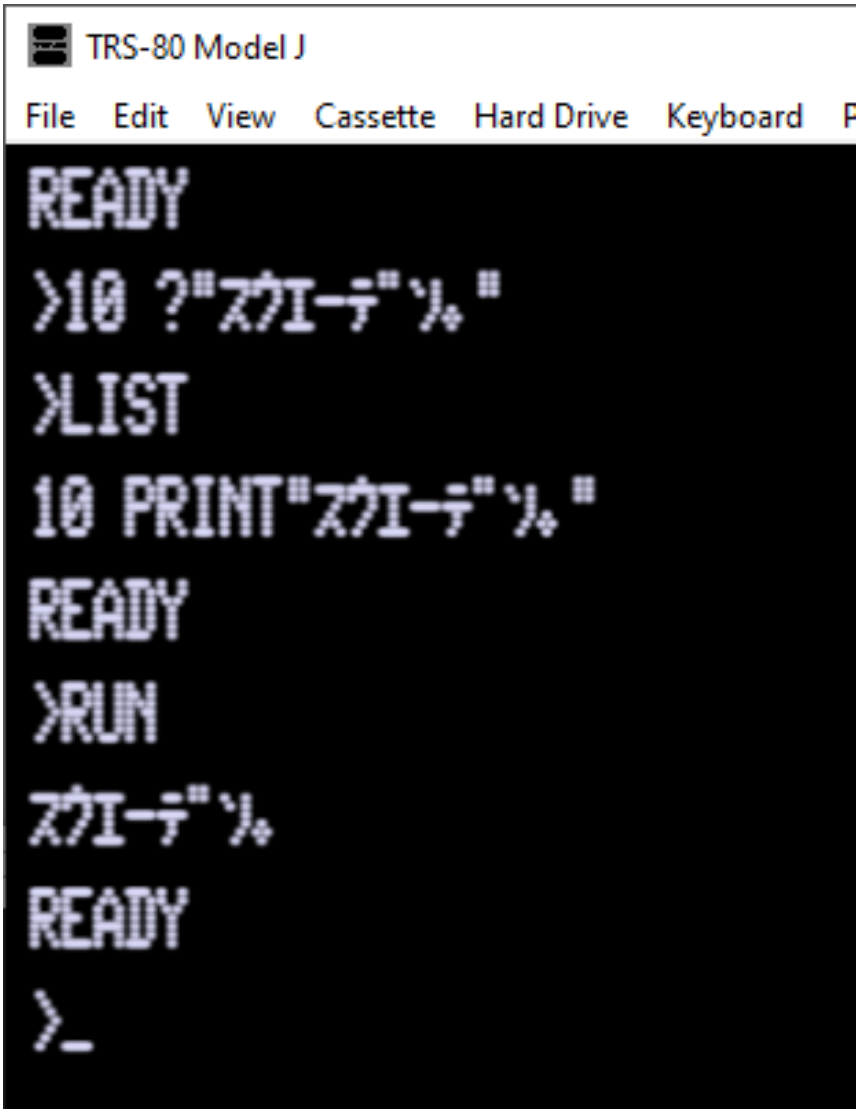
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- Disk drive and other sound effects




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enter
SHIFT
7
8
9
4
5
6
1
2
3
0
.
enter
48K
RAM


TRS-80 Model J
File
Edit
View
Cassette
Hard Drive
Keyboard
READY
>10 ?"ｽｸｴｰﾃﾞｽ"
>LIST
10 PRINT"ｽｸｴｰﾃﾞｽ"
READY
>RUN
ｽｸｴｰﾃﾞｽ
READY
>_

What to expect at Tandy Assembly 2022

SEPTEMBER IS TANDY ASSEMBLY TIME!

by Ian Mavric



It's easy for people like myself to think that everyone everywhere who is involved with TRS-80 computers and the retrocomputing hobby in general knows of Tandy Assembly (TA), but that turned out be a gross overestimation on my part. In my capacity as a resource of support and hardware for the TRS-80 I answer hundreds of emails a month, and often I ask if the people who seem so interested in the computers, and live within reasonable distance of Ohio, if they will be attending? It surprises me still when I get an email back saying No, they'd never heard of TA, and now that they had they would be attending. Even more surprising when they are only a matter of miles from Springfield, where TA is held.

WHAT IS TANDY ASSEMBLY 2022?

It's the yearly get-together of Tandy and TRS-80 enthusiasts, which is held each year in Springfield, Ohio, typically in September. All Radio Shack computers and even compatibles are represented, which makes for a larger gathering than a get-together oriented around one specific Tandy computer model or other.

You don't even need to be a TRS-80 fan or own one; if you like the hobby of retrocomputing there is more than enough to pique the interest of everyone. This year's event runs for three days from September 30 to October 2.

The show comprises of many fun and interesting segments including tutorial sessions, keynote speakers, an auction, a trivia game, sales and demonstrations of new hardware and software, demonstrations of vintage hardware, all based around a friendly atmosphere of like-minded enthusiasts. TA encourages international visitors such as myself but also you will find Canadian and European fans also.

TANDY ASSEMBLY RETURNS TO IT'S FORMER GLORY IN 2022

Like everywhere else in the world the pandemic and travel restrictions took their toll on TA which resulted in 2019 "The best TA so far!" being followed by 2020 being cancelled in the planning stages, and 2021 being smaller than previous years. Those lucky enough to attend TA21 had great feedback about the event and will be pleased to know that the international contingent will be back this year, is will many of the locals who were locked-down last year.

WHAT'S PLANNED FOR TA22

Although the show starts properly on Friday, a lot of people arrive in Wednesday night and make a day of Thursday, doing something non-computer related with other attendees before three days of non-stop retrocomputing begins. Previously we have gone to the USAF National Air Museum in Dayton, and in 2019 a visit to Mendelsons Surplus Store (which had an enormous electronics department which even had some old TRS-80 parts) which sadly closed its doors in 2020.

If interested in being involved in whatever Thursday activity is planned this year reach our to me or Peter Cetinski. The Thursday activity has the more-the-merrier vibe to it.

THURSDAY is the Tandy Tech Track day which comprises of five 1hr classes on specialised areas of interest. Attend one or attend all five, it's only 30 bucks. The classes at the time of writing include Oscilloscope Trouble Shooting 101, Modern Hardware for 8in TRS-80s, Vintage Computer Repair 201, and I give a talk about the Dick Smith System 80, a TRS-80 Model I compatible competitor.



SATURDAY is the main day and starts with breakfast, and exhibits, as well as the keynote speaker. At 4pm is the auction and after dinner the Trivia competition.



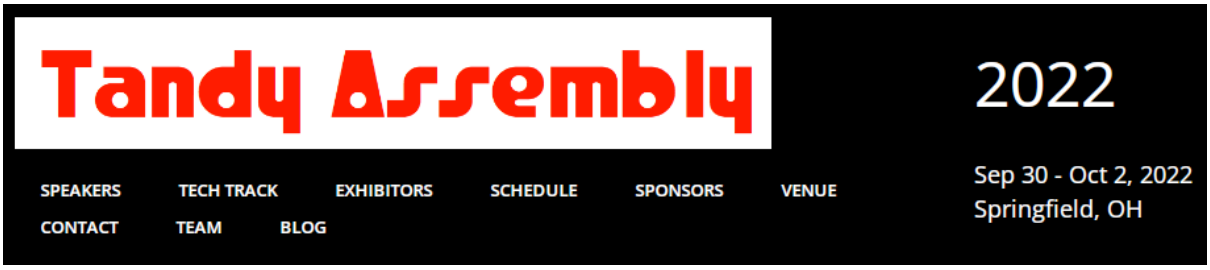
SUNDAY has a slightly more laid back feel to it, the last of the speakers give their talks and we start packing up around 3pm.

NEED MORE REASONS TO COME TO TA22?

Though not often mentioned it's worth pointing out that one of reasons we keep going back to the same venue is that the Marriott Courtyard at Springfield looks after us really well. The rooms for the show are spacious, and for those staying at the hotel the guest rooms are also nicely sized and most importantly, clean. The place has a big car park as well, and it's needed as some people have been known to bring a moving van full of TRS-80s to the show! The food in the bistro at the Marriott is good, as is the morning buffet breakfast, and for those who like a drink the friendly bar is open until late.

TA22 WEBSITE

Like all good events Tandy Assembly has a web site with more information and archived previous TAs are all available at:
http://www.tandyassembly.com/



See you all at Tandy Assembly 2022, and remember if you can't make it this year there's always next year, and with this pandemic finally behind us and travel restrictions receding into the past, time to start saving to attend the next one. You won't regret it.

Ian Mavric

ianm@trs-80.com



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



IT'S NOT TOO LATE!

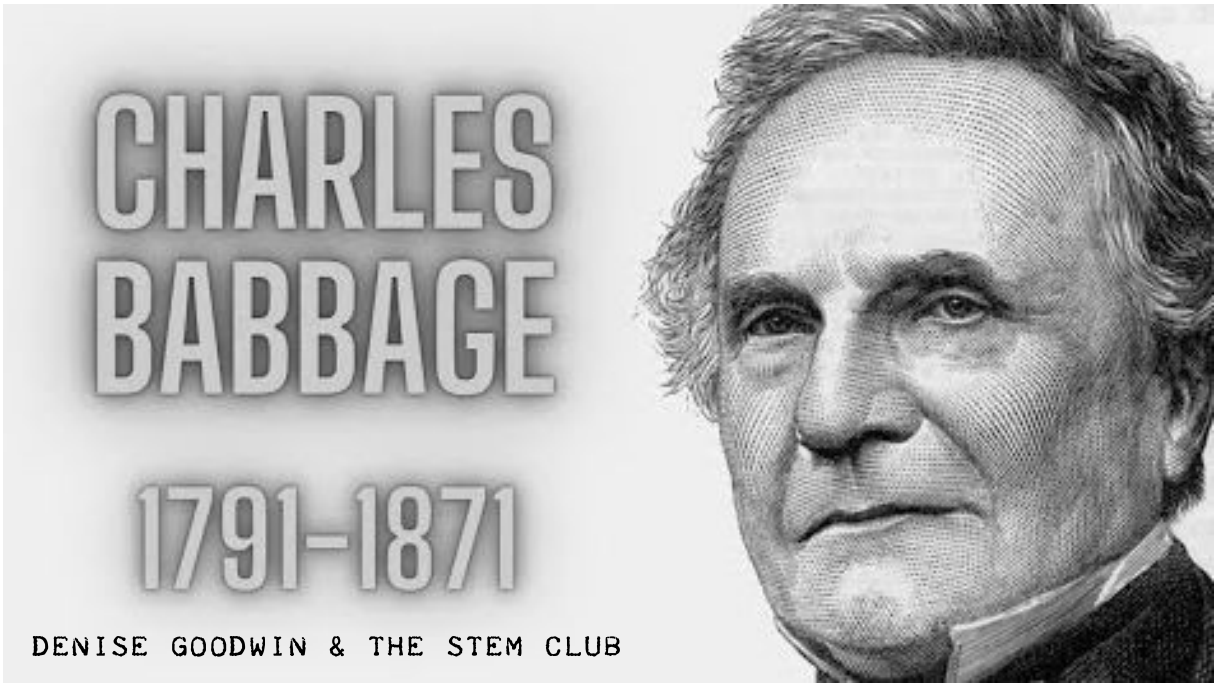
TO PRE-ORDER ITEMS TO PICK UP FROM ME AT TA22



There's always a queue and my stuff sells out fast! FreHDs, F48s, HRG boards, kits, white cables, Coco carts...
Don't miss out, I'm taking orders until September 10th ianm@trs-80.com

IT'S NOT TOO LATE!

IT'S NOT!... (just do it by 10/09/22)



The history of computing is filled with influential men and women, all of whom contributed to the state of technology today. However, it's hard to dispute Charles Babbage's nickname, "the father of the computer." Babbage's accomplishments, both practical and theoretical, established some of the standards and processes that influenced the advancement of (computer) technology for decades to come.

Early Life
From an early age, Charles Babbage was a dedicated scholar. An inquisitive youngster, Babbage would reportedly disassemble his toys to learn about their inner workings. A childhood plagued by illness afforded Babbage plenty of opportunity to indulge his love of literature and mathematics. Most of his education came from private tutors, again owing to his poor health. With the personal attention of a tutor, Babbage pursued algebra, language, and science with vigor. As Babbage grew older and healthier, he attended conventional school long enough to secure admission to Trinity College, part of the University of Cambridge.

At the University of Cambridge
Babbage looked forward to attending Cambridge, but unfortunately, he found himself disappointed upon arrival. Instead of a wealth of challenging new knowledge, Babbage found a traditional approach deeply rooted in Newton's discoveries from more than a hundred years earlier. Desperate to push forward the bounds of his own knowledge and possibly even mathematics standards, Babbage formed the Analytical Society with another student. Inspired by religious groups at

Cambridge that sought to bring a modern approach to theology, Babbage and his friends promoted European mathematical developments and proposed incorporating these new ideas into the mainstream. While he was a serious student, Babbage wasn't without a more whimsical side. He and a group of like-minded students started the Ghost Club, a group devoted to the exploration of paranormal phenomena. Always up for a challenge, Babbage set about testing whether supernatural elements could be detected and proven via the scientific method.

After Cambridge

Babbage excelled in mathematical studies at Cambridge, graduating in 1814, but found the going a bit tougher in the job market. Financially supported by his father's wealth, he repeatedly struggled to find fulfilling work. Babbage sporadically wrote and published works on mathematics, electromagnetism, and actuarial science. He also helped to found the Royal Astronomical Society, an assembly devoted to the study of astronomy and related sciences. His father's death in 1827 left Babbage wealthy and disinterested in earning a steady wage. He was made Lucasian Professor of Mathematics at Cambridge in 1828, but he used his position to research and publish his own material, rather than to instruct students.

Computer Pioneer

The term "computer" was known in Babbage's time, but it referred exclusively to human computers, people who calculated numbers for a living. Babbage named his first mechanical computer the Difference Engine, after the method of finite differences, a mathematical concept that allowed him to constrain this early machine to addition only. Several factors prevented the construction of Babbage's designs during his lifetime. With its thousands of gears, wheels, and spindles, construction would be complex and expensive, even for the best engineers of the time. Perhaps more problematic was Babbage himself: He held his ideas very close and often clashed with engineers who tried to modify his design or cut corners to save costs. His rivalry with George Biddell Airy over the usefulness of computing engines potentially distracted both men from their otherwise bright careers. And further preventing his ideas from becoming reality, Babbage constantly modified his designs, seeking perfection before ever producing a working proof of concept.

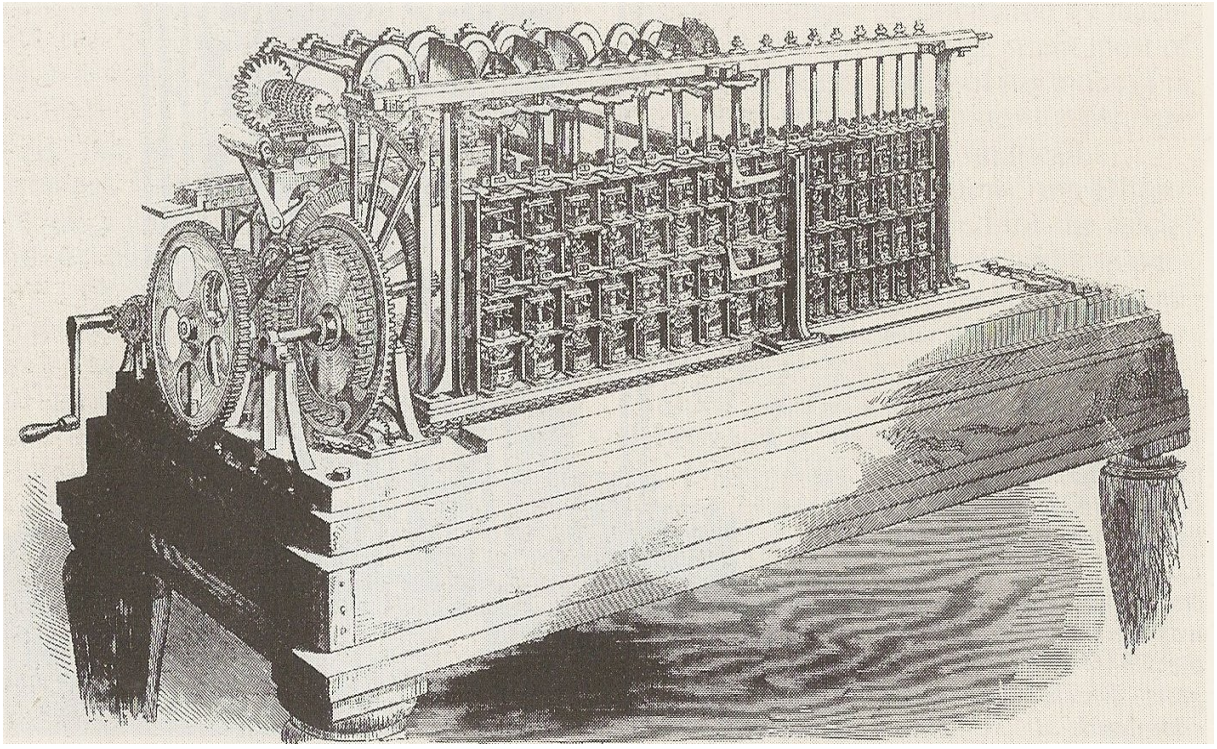
Background on Mathematical Tables

Part of Babbage's inspiration for his ideas on computing derived from mathematical tables. In the time before convenient access to calculators and computers, printed

mathematical tables were frequently used. Sailors, scientists, and engineers used tables to complete calculations that were too difficult or time-consuming for them to work out. The source of these tables, however, was human computers: The answers given on the tables had been calculated manually. As a result, many of these tables were known to contain errors. These inaccuracies frustrated Babbage. The French government sought to work around this problem by breaking down the calculations into their components and assigning portions to different human computers. This assembly line approach kept each mathematical calculation simpler, decreasing the chance of error. Babbage hit upon the notion of going a step further by replacing the human computers with machinery that could replicate these simple tasks.

Difference Engine

After presenting his idea and securing government funding in 1822, Babbage began work on his first Difference Engine. He intended this new machine to solve simple algebraic equations to replace some of the calculations used to produce mathematical tables. By automating the addition of numbers and allowing the results to be printed in real time, Babbage felt confident that his machine could produce more accurate mathematical tables. Consisting of more than 25,000 parts, Difference Engine No. 1 would be an engineering marvel. Unfortunately, the project went ten times over budget, and after 20 years, he had failed to produce a real working prototype. Always on the lookout for his next interesting problem, Babbage seemingly lost interest and moved on.



Analytical Engine

In 1839, Babbage observed a Jacquard loom and was quite taken by the machine's capabilities. The first automated loom, Joseph-Marie Jacquard's device could replicate patterns and pictures on silk without direct guidance from its operator. The patterns were pre-selected and printed on punched cards. Inspired by this, Babbage began work on his Analytical Engine. Instead of a real-time calculator, the Analytical Engine could be rightly called a computer. It separated memory functions (the "store") from processing (the "mill"). Each column in the store could hold a single integer, entered via punched cards. The mill had indicators for the current operation (such as addition or subtraction) and the integers currently being manipulated. The results could be printed on paper or punched cards. In short, Babbage's Analytical Engine offered functions for input, output, storage, and processing. In many respects, it was the first true predecessor of the modern computer.

Ada Lovelace and Italian Followers



Ada Lovelace

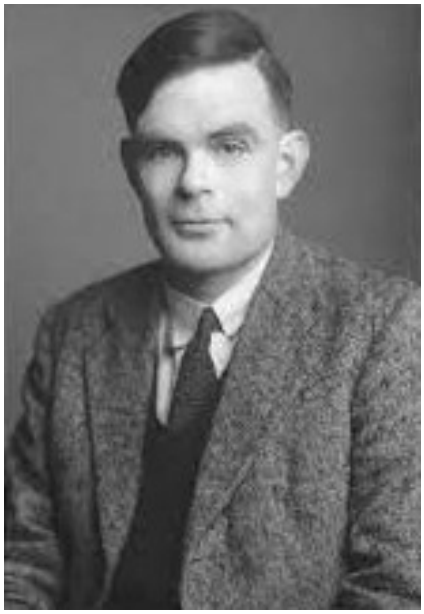
Babbage is variously called the father of the computer, the inventor of the computer, and the first computer scientist. But one of his correspondents and associates, Ada Lovelace, was the first computer programmer. There is handwritten evidence that she wrote at least one computer program that could be used on the Analytical Engine. Her program, detailed in her copious notes, contains an algorithm for generating part of the sequence known as Bernoulli numbers.

Lovelace was the only child of the poet Lord Byron and Lady Byron, a mathematician, and her thoughts went beyond computer programming. As one of Babbage's greatest supporters, she wrote more on the subject of his engines than perhaps anyone else. Her notes could be considered the first computer documentation. The concept of object-oriented computing did not escape her, as she supposed computing engines could go beyond numbers and manipulate any object that could be defined by its rules. She even seems to have considered the topic of artificial intelligence, as she opines in one of her notes that the Analytical Engine is capable of extraordinary feats but cannot be said to think.

In 1840, Babbage gave perhaps his only public lectures about the Analytical Engine. The talks were attended by prominent Italian scientists of the time, such as Giovanna Plana, inventor of an analogue perpetual calendar. Mathematician Luigi Menabrea transcribed Babbage's words for publication. Lovelace translated his work into English and appended her own notes, which were actually longer than the original text and included the first published algorithm.

Legacy

Babbage's life story is one of great plans left unfulfilled. His constant need to search for new and interesting problems caused several of his inventions to wither away prior to their completion. His legacy, however, is one of unbridled success. His ideas were so revolutionary that modern teams have sought to bring them to fruition. The Science Museum in London completed his Difference Engine in 1985 and added its associated printer (possibly the world's first computer peripheral) in 2000. His Analytical Engine was never even completed at the design phase, as Babbage constantly tinkered with it, but even so, the Plan 28 project intends to build a working replica based on his notes.

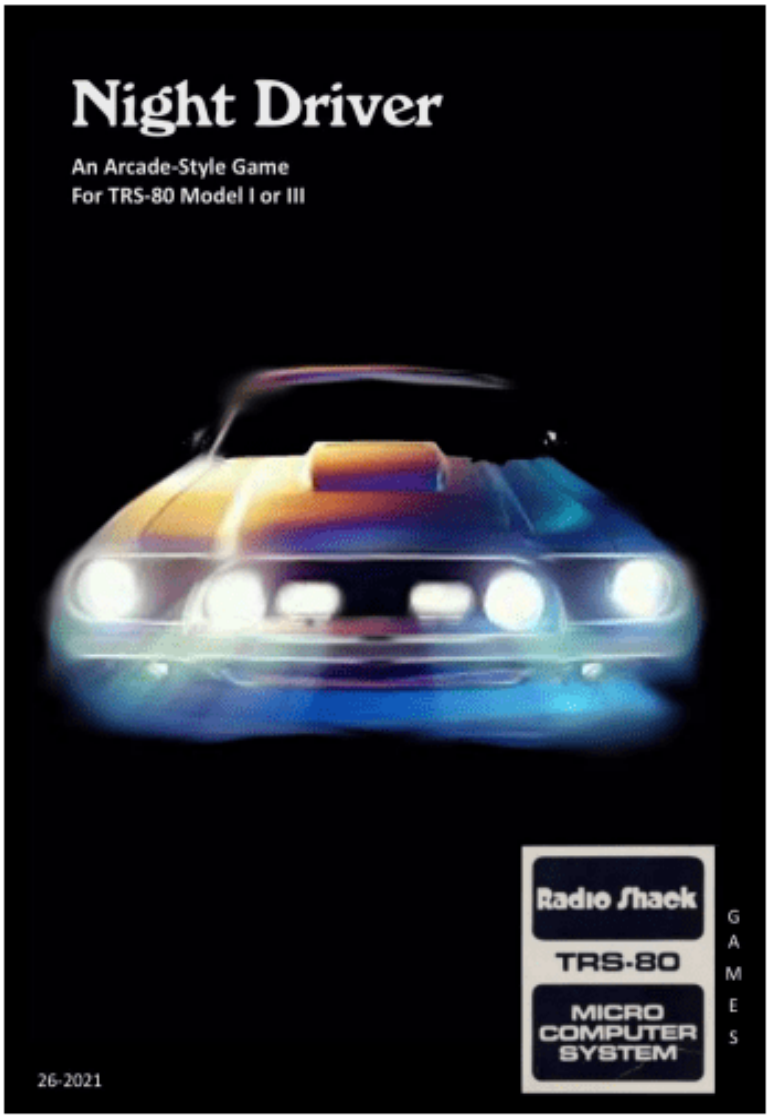


Alan Turing

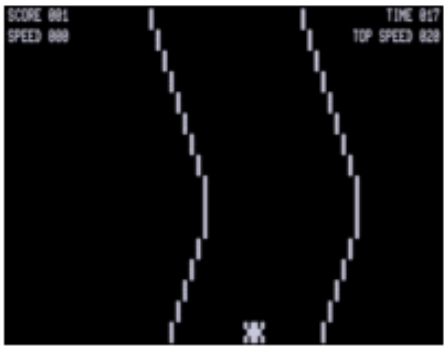


Tim Berners-Lee

Babbage's legacy also goes far beyond the engines he designed to encompass the people and achievements his ideas inspired. From Alan Turing's work to crack the Enigma code in World War II to the invention of ENIAC, the first general-purpose digital computer, to Tim Berners-Lee's invention of the World Wide Web in 1989, computer scientists have drawn inspiration from Babbage's revolutionary ideas. We can only hope that in the years to come, more visionary thinkers will follow in his footsteps and continue to move computer technology forward.











Winner of the 2021 TRS8BIT Programming Competition



Night Driver is a fast-action arcade style game for the TRS-80 Model I, III, or 4

The road stretches before you like a black ribbon. You are relieved that the sun's angry face has given way to the welcome darkness. Tonight's mission is simple: Prove that you have what it takes to drive with speed and accuracy.

Features include:
- 100% assembly language for fast-action and graphics
- Sound effects
- Runs on real or emulated hardware (trs80gp recommended)
- Joystick support (NEWKEY/80 recommended)
- Available for **free** at www.plaidvest.com

IV. Basque Tournament of TRS-80

Egoitz Campo

The last 4th of July, the Euskal Retro Group organized the IV. Basque Tournament of TRS-80, in Bilbao (in the Bar Azteka). It was a great afternoon really, because before playing this beautiful microcomputer we played Atari 2600 and Radofin 1292, two old consoles. After playing them, we put the TRS-80 in front of our TV and we played to some videogames: Clowns & Balloons, Skiing, Monster Maze, Canyon Climber and Don Pan. We gathered 5 players (Daniel, Mikel, Ivan, Lander and Egoitz) to play the 5 videogames mentioned above.

Finally, the winner of the tournament was Egoitz, but Ivan, Daniel and also Mikel did a good job. Lander, my son of 5 years old enjoyed a lot. This makes me happy and proud. Once again we had a great time playing the TRS-80 games.

Now my idea is to organize another tournament in April of 2023, the V.Basque Tournament of TRS-80 and encourage more people. On the other hand, I will try to buy on "Ebay" some other TRS-80 games, for example "Dragonfire", to be able to play it at home and to play it also in our tournaments. I wanted to buy this game since last year. This year I must buy it.

Here we leave the results:

Clowns & Balloons

1-Mikel Maletxeberrria 5 points (1,160)
2-Daniel Barrientos 4 points (1,120)
3-Egoitz Campo 3 points (440)
4-Ivan Cuende 2 point (150)
5-Lander Campo 1 point (50)

Skiing *

1-Egoitz Campo 4 points (1.24)
2-Daniel Barrientos 3 points (1.33)
3-Ivan Cuende 2 points (1.46)
4-Lander Campo 1 point (1.47)

Monster Mazer

1-Egoitz Campo 4 points (1,290)
2-Ivan Cuende 3 points (450)
3-Lander Campo 2 points (30)
4-Daniel Barrientos 1 point (30)

Climber Canyon

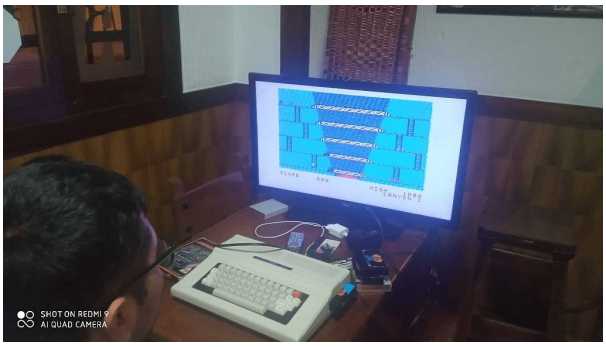
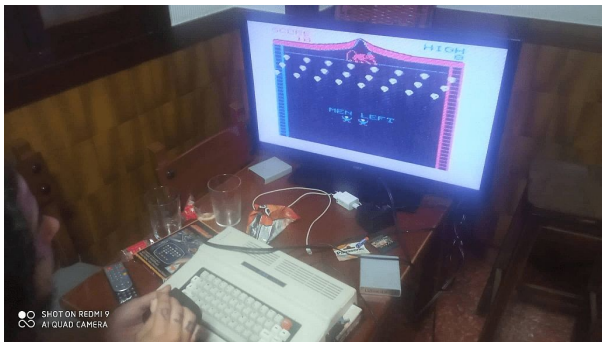
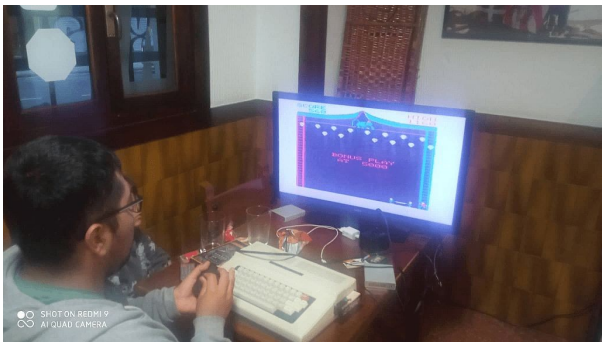
1-Egoitz Campo 4 points (18,000)
2-Ivan Cuende 3 points (3,300)
3-Daniel Barrientos 1 point (1,400)

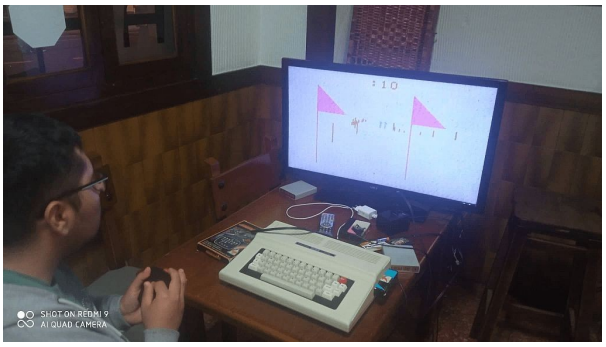
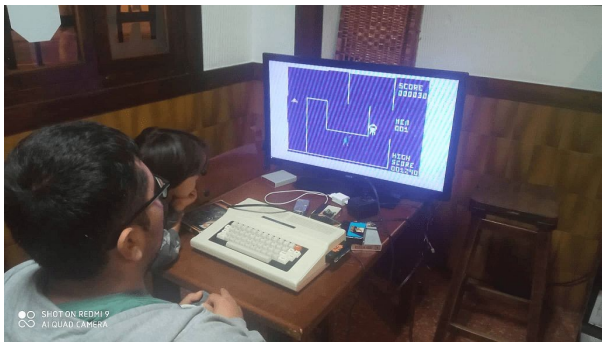
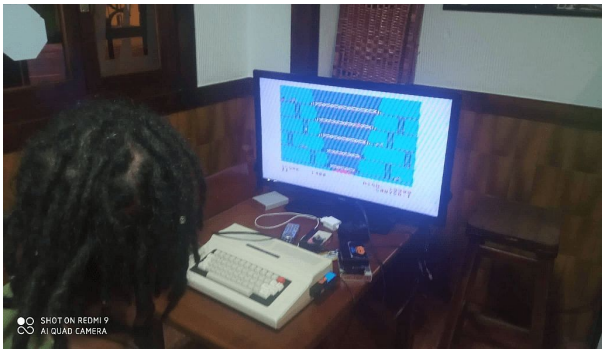
Don Pan
1-Egoitz Campo 4 points (2,200)
2-Daniel Barrientos 3 points (2,100)
3-Lander Campo 2 points (1,500)
4-Ivan Cuende 1 point (400)

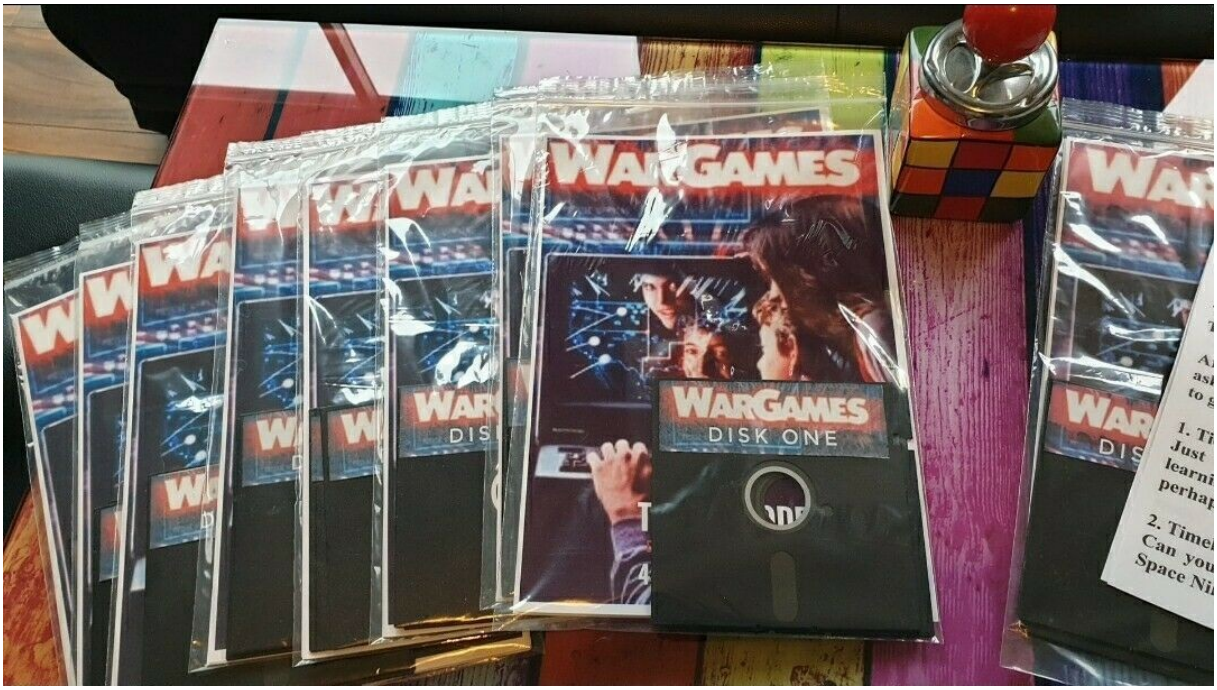
- time but taking into account the doors throught which we did not pass, in that case there was a penalty of one second for each door we did not pass.

Final Classification

1-Egoitz Campo 19 points (Basque Country)
2-Daniel Barrientos 12 points (Basque Country)
3-Ivan Cuende 11 points (Basque Country)
4-Lander Campo 6 points (Basque Country)
5-Mikel Maletxeberria 5 points (Basque Country)

All new from Dreamland Software for 2021.

This two disk package comprises what is in effect the FULL Dreamland Software collection.

Based on the classic 80's film 'Wargames', your entire experience is controlled by the W.O.P.R computer from the aforementioned movie.

Greetings Professor Falken.

New titles including (of course) Global Thermonuclear War. (Ouch.)
Retro Football Manager. (Based on the ORIGINAL 80's classic, a full soccer management simulation.)
The Battle of the Mutara Nebula. (If you are a Star Trek fan, then you know FULL WELL what this is.)
And the Kobayashi Maru Scenario. (Another one for the Trekkers.)

Also included, are **ALL** games released by Dreamland Software since inception four years ago.

The hugely successful Actual Reality. It's sequel Actual Reality II - Battlestar Raven And RockStar.

14 Programs in total (Including the W.O.P.R Master Program.)
Both disks full to capacity whilst remaining bootable.

Full video preview available here:
https://youtu.be/XXD1IG8-CO0

Please note that this item is currently available for Model One ONLY.
Model Three/Four will be available soon. (Watch for update.)

IN MAV'S WORKSHOP

Restoration of the 'TEC' Model I Service Manual

by Ian Mavric



This article is a follow-up to an article I wrote years ago about the little-known "Made In Japan" (by TEC - Tokyo Electronics Co.) Model I which was never sold in the USA, and only in relatively small numbers in the rest of the world. The article was published in TRS8Bit June 2016 edition, and explains why this computer exists in both Western language and Japanese Kana versions. It's a good read, I thoroughly recommend it. This article talks about the service manual for that computer.

SERVICE MANUALS: A NECESSITY TO FIX THINGS

To the uninformed, Service Manuals (SMs) may seem like these mysterious volumes of sacred information only available to the chosen few. The reality is that they contain the information a qualified technician or electronic engineer will need to service and repair a device. Radio Shack not only made SMs for computer equipment but for almost everything they made ranging from radios and hi-fi equipment. I even have an SM for the Realistic MG-1 synthesiser. SMs are generally not written to a hobbyist level of comprehension, which is why Radio Shack and other companies make them slightly difficult to obtain. In Radio Shack's instance they were easy to obtain, and relatively inexpensive, once you knew the procedure.

Most Tandy Electronics store managers knew the procedure but lower level staff often didn't so the first thing to do was find someone in the place who knew what you were asking. In my case I would just go directly to the Radio Shack Computer Centre.

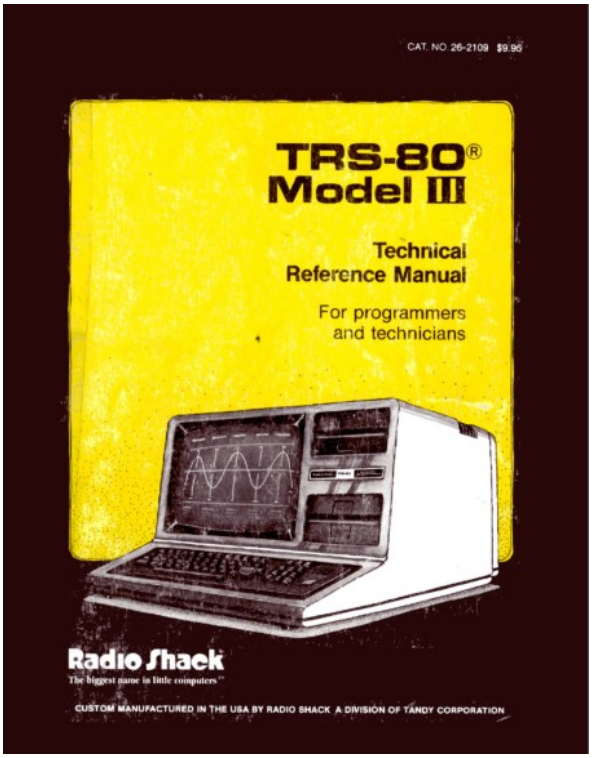
You'd then asked to special order the SM for whichever device you were after, or if you knew the special part number for it (say, someone you knew had ordered it before and you had the part number) the team member would call RS to place the order for the SM, payment was needed up-front and expected delivery time was not given. If a particular SM was in stock in Australia I'd often get it under a week, if it had to come from the USA sometimes it took up to 3 months to land. This is how most SMs in private hands which show up on eBay from time to time were procured in the first place.

You'd then asked to special order the SM...

BUT RADIO SHACK STORES SOLD TECHNICAL MANUALS - ARE THEY DIFFERENT?

This is where it gets interesting and slightly confusing. Radio Shack did make technical data available about some of their computers and the books were available in all stores and were quite popular. They were also written with more information aimed at a different reader base than the SMs were designed for, so included expanded sections on theory of operation and trouble-shooting. These Technical Manuals include (but are not limited to):

- TRS-80 Technical Reference Handbook (1978) cat. no. 26-2103 (its about the Model I and was revised in 1982)
- TRS-80 Model III Technical Reference Manual (1981) cat. no. 26-2109
- TRS-80 Model 4 Technical Reference Manual (1983) cat. no. 26-2110
- Tandy Model 4/4P Technical Reference Manual (1985) cat. no. 26-2119
- TRS-80 Color Computer Technical Reference Manual (1981) cat. no. 26-3193





These are easily identifiable as they have coloured covers and/or in the case of the Model I Tech Ref Handbook, black and white design which is completely different to SMs. While some of the information is the same (schematics, parts lists, basic theories of operation) the SM is different to their Tech Ref counterparts.

Photos: Technical Reference and Service Manuals are different

SERVICE MANUALS AND INFLATION

A curious thing I have noted over the last five years or so is that when these SMs appear on eBay they are selling for increasingly higher amounts of money. This is especially the case if the manual is rare or in particularly good condition. On occasions some which are even not in great condition sell for considerable coin if they are super rare, as in only sighted once in a decade or two.

Some SMs sell for almost as much as the computer or peripheral they are published to repair which is astonishing. I should point out that most SMs don't need to be purchased anymore unless you specifically are after one on your shelf, they can mostly be downloaded in PDF form from places like archive.org or www.trs-80.com, and as rare ones are found and scanned they usually make their way to these sites as well.

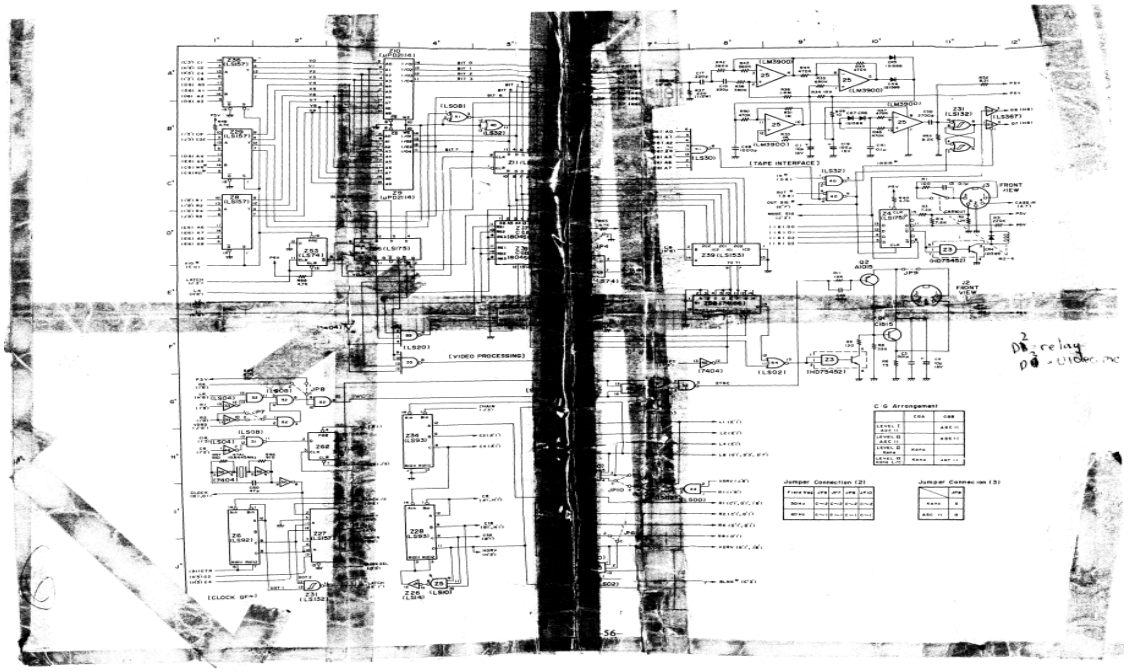
THE RARE SERVICE MANUAL FOR THE TEC MODEL I

For many years most TRS-80 Model I enthusiasts in the USA and Canada didn't even know of the existence of the Japanese (TEC) Model I. As far as they were concerned all Model Is were made in Texas and repair duties were covered in the Technical Reference Handbook.

In Australia we are more aware of the TEC M1 but also that it's completely re-designed board means using the handbook for the US machine is not much use. It turns out that Radio Shack did produce a SM for the TEC M1, and unlike the Technical Reference Handbook (but just like every other SM) you had to go to Tandy and special order it. So there aren't many around.

Brett Paulin was an enthusiast with one of the most modified Model Is in Australia, based around a TEC M1. When I was part of the team who were beta testing the FreHD hard drive emulator in 2013 I approached Brett for guidance in getting it working on the Model I.

In conversation he mentioned he had the TEC M1 SM however it was in really poor condition but was happy to loan it to me to scan. It was complete but rough, with notes and doodling in places. I scanned it and this was the raw version which appeared on the TRS-80 Newsletters+Information CD I used to sell, and I also submitted it to Ira which cleaned it up the best he could and archived it.



The biggest problem was that it has four fold-out schematic pages which are A3 size each, and Brett had removed and cut them up, and then taped them together with clear tape to make one large schematic which proceeded to work from. This was in the 80s and in the time since the ability to scan pages bigger than A4 became easier, and the clear tape went brown with age. :-(I did manage to pick up an A3 scanner about five years ago and since have had no problems scanning big fold out schematics anymore... All we need now was a clean clear copy of the TEC M1 SM to scan those schems in clearly once and for all...

Picture: The best scans of the TEC M1 schematics (better than nothing, but not much use either)

2020: ANOTHER COPY OF THE TEC M1 SM SURFACES IN MELBOURNE

A gentleman called Doug Merrett contacted me in 2020 about repairing his Model I system. A time was lined up and he brought his computer around for me to check out, along with all his books and manuals. The repair was straightforward (bad Z29 character generator ROM) but what was most interesting was that he had a copy of the perfect unused TEC M1 SM, even though his M1 was a US version and he had never owned a TEC M1. Since I had my A3 scanner I jumped at the opportunity to scan the four large fold-out schematics and also scan a pristine unmarked front cover. These, along with the 2013 scans, would restore the SM to full usefulness to TEC M1 repairers.

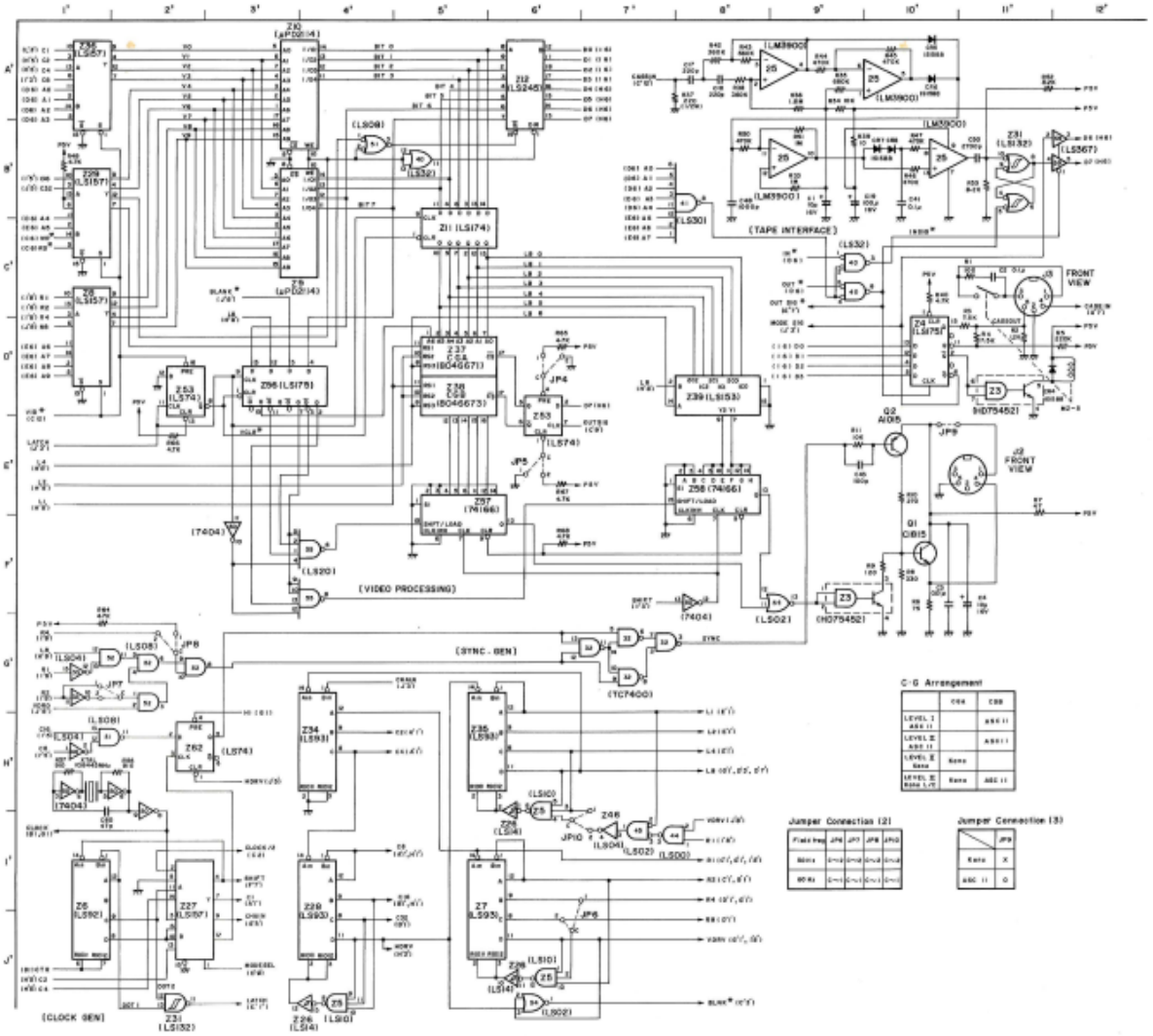
RESTORATION OF THE 'TEC' MODEL I SERVICE MANUAL





The cover was tatty and most affected in the original 2013 scan, you can see the difference in the 2020 scans here. Sometimes colouring in helps to clear ones mind (hence the popularity of colouring books) so I can only speculate Brett was working on a problem and colouring in the M, N and A would allow him to get his thoughts in order. Also the background of the illustration is actually grey, and the scanner I used at the time did not really handle grey scales well...

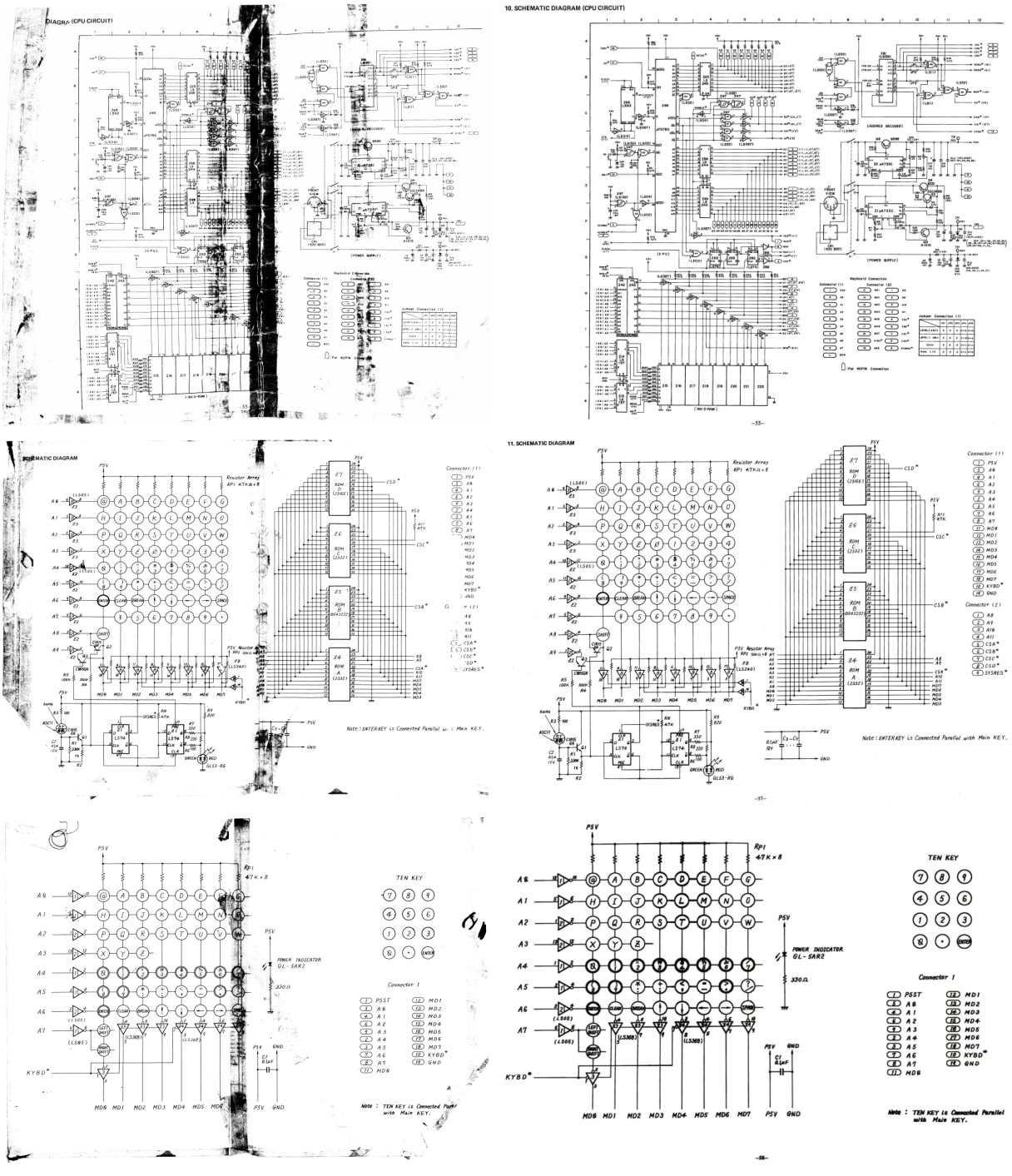
The biggest problem was that it has four fold-out schematic pages which are A3 size.



Covers: 2013 scan vs. 2020 scan. My newer scanner better handles greyscale.

Now with the ability to scan larger fold-out schematics typically found in Radio Shack's SMs I turned to getting the highest resolution scan possible with my unit (a HP 7740), and you can immediately see the difference of the 2013 'browned tape' scan (page 22) and the 2020 scan below:

Scan: TEC M1 SM schematic page 56.



Similar good results were obtained for the other three fold-out pages as shown on page 25.

Scans: Page 55 from 2013 and 2020

More scans: Page 57

Last scans: Page 58.... 2013 on the left, 2020 on the right.

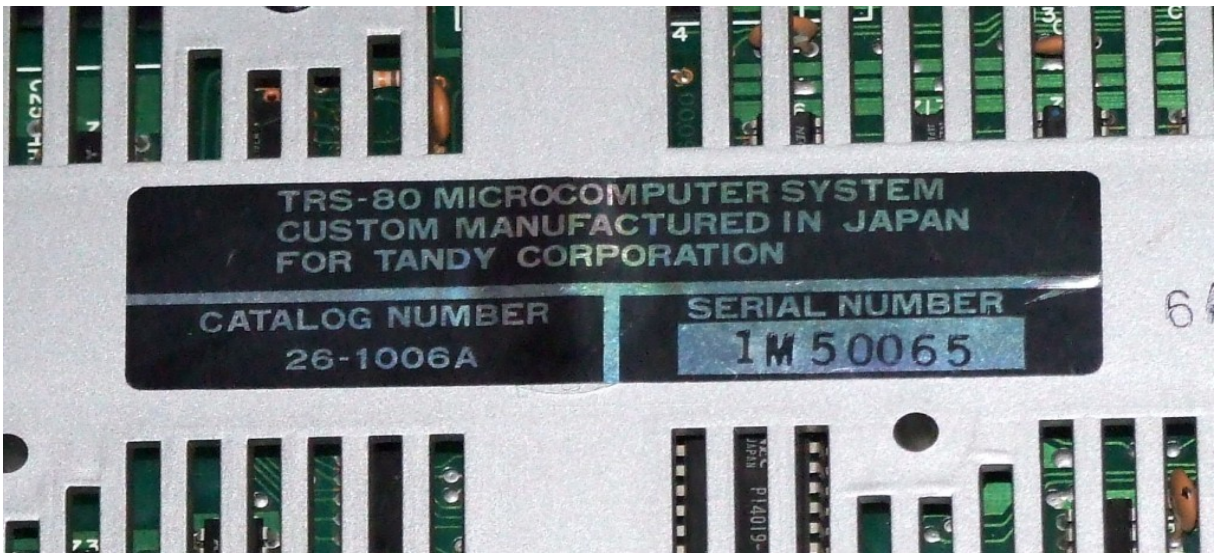
In 2013 I sent the initial scans to my good friend Ira from www.trs-80.com who cleaned them up as much as possible, sharpened and straightened the images, and archived the PDF. Once I had the new scans of the cover and schematics pages I also forwarded them to Ira to finally fix the PDF into the one we have today. I'm always grateful for his work, as this is one of the areas in scanning and archiving I don't have the patience for (the post production work, if needed). You can download the current PDF for yourself from here from the SMs page on www.trs-80.com

HOW TO IDENTIFY A TEC MODEL I

In this business I am asked all manner of questions so nothing surprises me anymore. Without opening the machine there are some giveaways... on the top, if the expansion door flap is in situ or even if it's been removed and there is a black warning label then that is a TEC M1. (US computers had burgundy coloured warning label and once you remove the expansion cover flap the original spec of the machine is usually shown... I have seen 4K LEVEL II and 16K LEVEL II stickers.) TEC M1s all have the nicer ALPS keyboard and number pad.



Photo: Black sticker usually denotes TEC M1.



The other way is to just turn it upside down and it will state Made In Japan on the information decal. People have commented to me they've owned and used their computer for decades never having examined the information decal and always thought they had an American computer.



Photo: Information decal from the TEC M1 26-1006A
"Standard 16K Level II"

If you open it up it's even easier to tell as it says it right there on the motherboard:

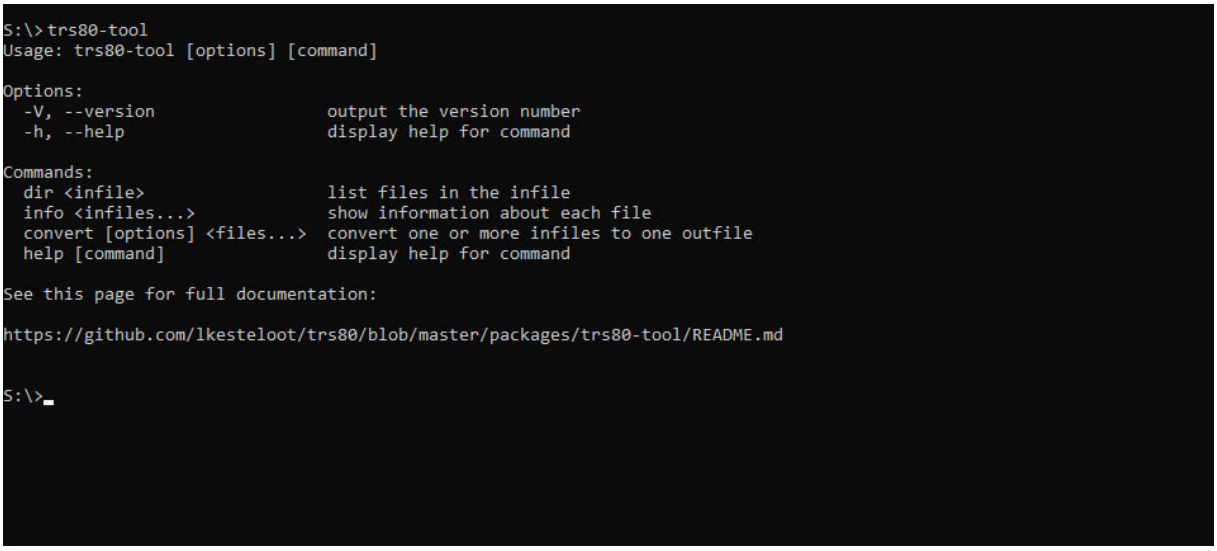
CONCLUSION

Service Manuals are a little like old lost Dr Who episodes. Just when you think every SM has been discovered, another rare or unknown one turns up in a stranger or more unlikely place.

Scanning them and uploading them to archive sites is like slowly completing a jigsaw puzzle where we don't know when the last piece is finally found. Like a jigsaw puzzle it's still fun and enjoyable to watch the SM landscape grow and improve.

Ian Mavric - ianm@trs-80.com

Lawrence Kesteloot has rewritten, his TRS-80 Cassette command line tool to support many new functions. Called "TRS80-TOOL" it is a command-line tool for manipulating TRS-80 files.



Lawrence Kesteloot has updated his "TRS80-TOOL" to v2.3.1

It runs under NODEJ, Linux, macOS, and Windows. It can be downloaded from Lawrence's site or locally from the The Virtual Tape Utilities page on this site.

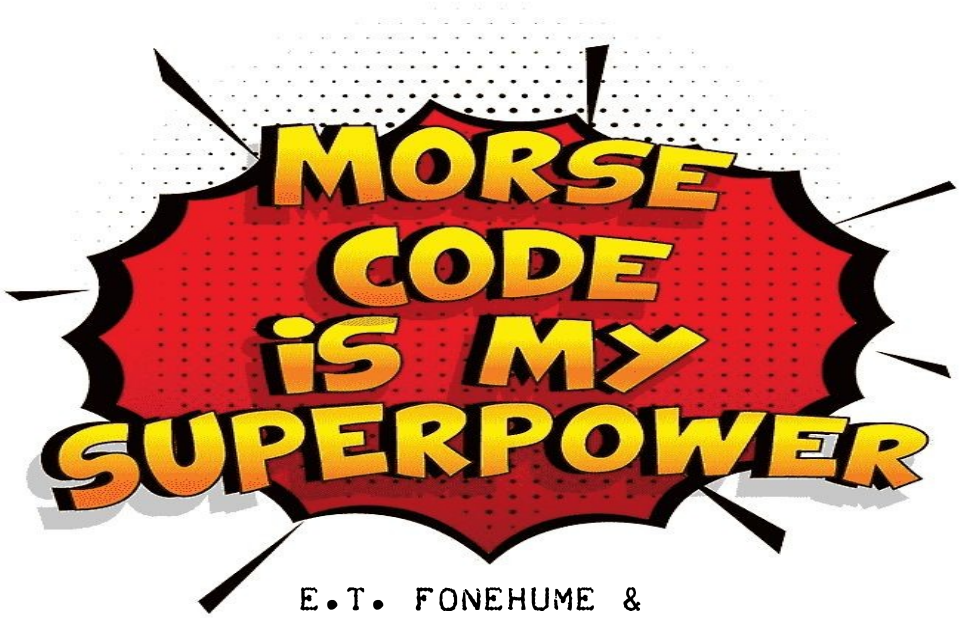
The new version adds support for multi-file CAS files (such as CLOAD Magazine or Temple of Apshai) and will try to guess (and set, if you want) the starting address of a SYSTEM file.

The main page for TRS80-TOOL can be found at

https://github.com/lkesteloot/trs80/tree/master/packages/trs80-tool

along with instructions.

It runs under NODEJ, Linux, macOS, and Windows. It can be downloaded from Lawrence's site, the The Virtual Tape Utilities page on this site or right here for Windows / Linux / Mac.



E.T. FONEHUME &
GEORGE PHILLIPS

HI DUSTY. FIRST LET ME SAY THANKS TO YOU AND GEORGE FOR THE HELP WITH THIS ONE-LINER. AS YOU CAN SEE, BELOW, THE PROGRAM HAS 2 LINES, SO I'LL EXPLAIN.

AS PER USUAL, SOMETHING ON THE TELEVISION SET MY MIND OFF THINKING AT A TANGENT AND I REMEMBERED, AT SCHOOL, BEING OFFERED A CHANCE TO LEARN MORSE. AND, ONCE AGAIN, THE IDEA OF A ONE-LINER KICKED-IN. COULD I PRODUCE A ONE-LINER WHICH WOULD GENERATE MORSE?

INITIALLY, I THOUGH THE BIGGEST PROBLEM WOULD BE THE FITTING IN A 'SOUND ROUTINE', BUT THANKS TO YOU, IT WAS EASILY SORTED, EVEN IF, AS YOU SAY, IT'S A LITTLE BIT 'OFF KEY'. (ACTUALLY, IF I REMEMBER CORRECTLY, YOU SAID IT SOUNDED LIKE A GNAT-FART).

THINGS WERE PROGRESSING WELL, AND I WAS SO, SO CLOSE TO SQUEEZING IT ALL IN, BUT I JUST COULDN'T MANAGE IT. THEN GEORGE CAME TO THE RESCUE WITH A TRULY INGENIOUS IDEA, AND SENT YOU AN EMAIL, AS SHOWN ON BELOW.

DUSTY,
HERE'S A LITTLE BASIC PROGRAM WHICH DELETES ITS FIRST LINE:

```
10 PRINT"GO AWAY":L1=PEEK(16548)+PEEK(16549)*256:POKE 16548,PEEK
(L1):POKE 16549,PEEK(L1+1)
20 PRINT"I LIVE!"
```

THE IDEA IS THAT BASIC HAS A POINTER TO THE FIRST LINE IN THE PROGRAM.
THIS TAKES THAT POINTER AND POINTS IT TO THE SECOND LINE.
RUN THE PROGRAM AND IT WILL SAY:

```
GO AWAY
I LIVE
```

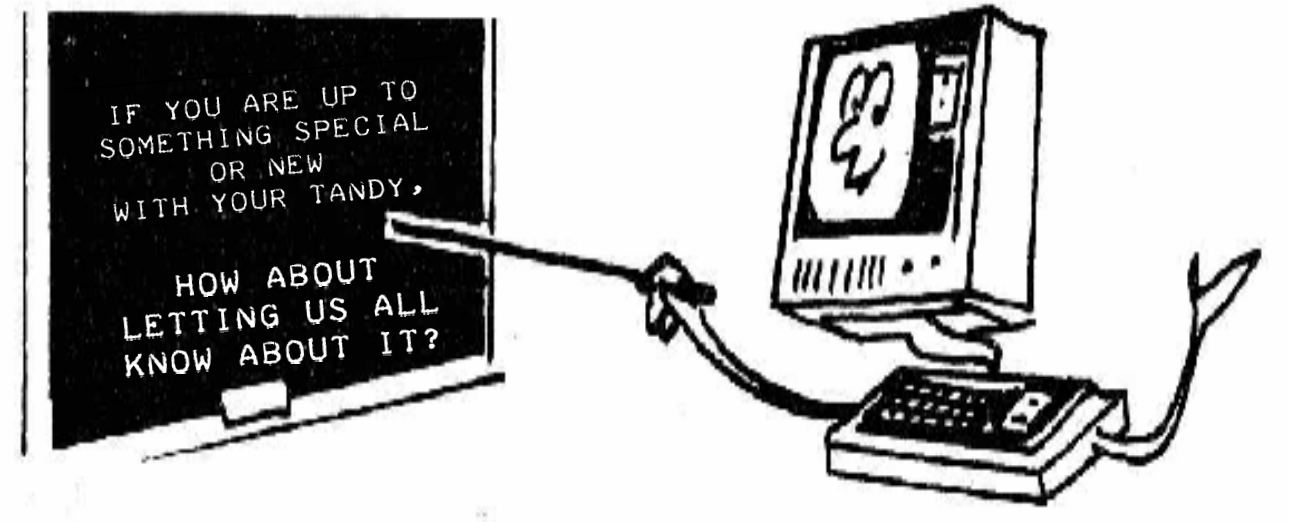
THEN WHEN YOU LIST YOU'LL ONLY SEE LINE 20.
AND WHEN YOU RUN IT, ONLY LINE 20 IS SHOWN.

GEORGE

AS YOU CAN SEE BELOW, WHEN YOU RUN THE PROGRAM, PRESS THE 'BREAK' KEY AND TYPE 'LIST'. LINE Ø HAS DISAPPEARED THOUGH THE VARIABLE, A$, IS STILL IN MEMORY! IF YOU WISH TO CONTINUE USING THE PROGRAM YOU NEED TO TYPE 'CONT' AND NOT RUN.
IS IT TRULY A ONE-LINER, WELL I'LL LET YOU ALL DECIDE, BUT WITH THE EXTRA SPACE GAINED, I WAS ABLE TO ADD ONE OR TWO EXTRAS WHICH MADE IT MORE USABLE, EVEN GOOD ENOUGH, I THINK, TO MAKE IT POSSIBLE TO USE AS A MORSE TRAINER.

```
0 A$="120021112121211010001121221011111100122221201211220021002220122122121211010200011201112122021122122221
1":L1=PEEK(16548)+PEEK(16549)*256:POKE16548,PEEK(L1):POKE16549,PEEK(L1+1)
1 INPUT"WORD";B$:FORY=1TOLEN(B$):X$=MID$(B$,Y,1):IFX$<"A"ORX$>"Z"THEN1ELSEX=(ASC(X$)-64)*4-3:FORK=1TO200:NEXT:PRINTX$:FORZ=0TO3:D=VAL(MID$(A$,X+Z,1)):IFD=0THENNEXTZ:NEXTY:GOTO1ELSEFORG=1TOD*2:OUT255,2:OUT255,1:NEXTG:FORK=1TO99:NEXTK:NEXTZ:NEXTY:GOTO1
```

```
1 INPUT"WORD";B$:FORY=1TOLEN(B$):X$=MID$(B$,Y,1):IFX$<"A"ORX$>"Z"THEN1ELSEX=(ASC(X$)-64)*4-3:FORK=1TO200:NEXT:PRINTX$:FORZ=0TO3:D=VAL(MID$(A$,X+Z,1)):IFD=0THENNEXTZ:NEXTY:GOTO1ELSEFORG=1TOD*2:OUT255,2:OUT255,1:NEXTG:FORK=1TO99:NEXTK:NEXTZ:NEXTY:GOTO1
READY
>_
```



JUST A FEW WORDS AND A COUPLE OF PHOTO'S -
THAT'S ALL WE NEED


Joe Kay
Director
NORTH COMPUTER WEST MUSEUM
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joe@nwcomputermuseum.org.uk
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Leigh Spinners Mills, Park Lane, Leigh, WN7 2LB

2022 POWER SUPPLIES
FOR THE TRS-80 MODEL 3 / MODEL 4/4D/4P



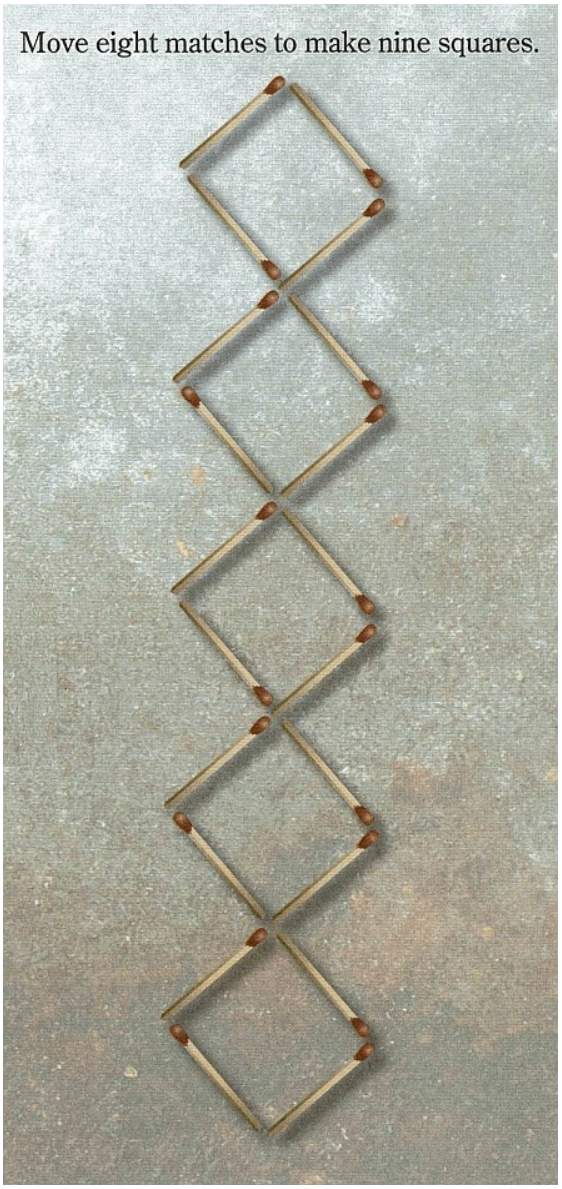
* Uses modern day MEAN WELL power supply units
* 50w for Model 3 version and 65w for the Model 4 version
* The Model 4 version uses a SEPARATE +12V POWER SUPPLY (prevents video "spasm")
* No more RIFA CAP explosions
* No more COLD solder joints
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* Extra +5V output connectors (1 on Model 3 and 2 on Model 4) for Gotek/freHD boards
* For more information and pricing contact

newSOFT

https://jaynewirth.wixsite.com/newsoft (website)
jaynewirth@verizon.net (email)

STRETCH YOUR MIND

HAROLD FINCH



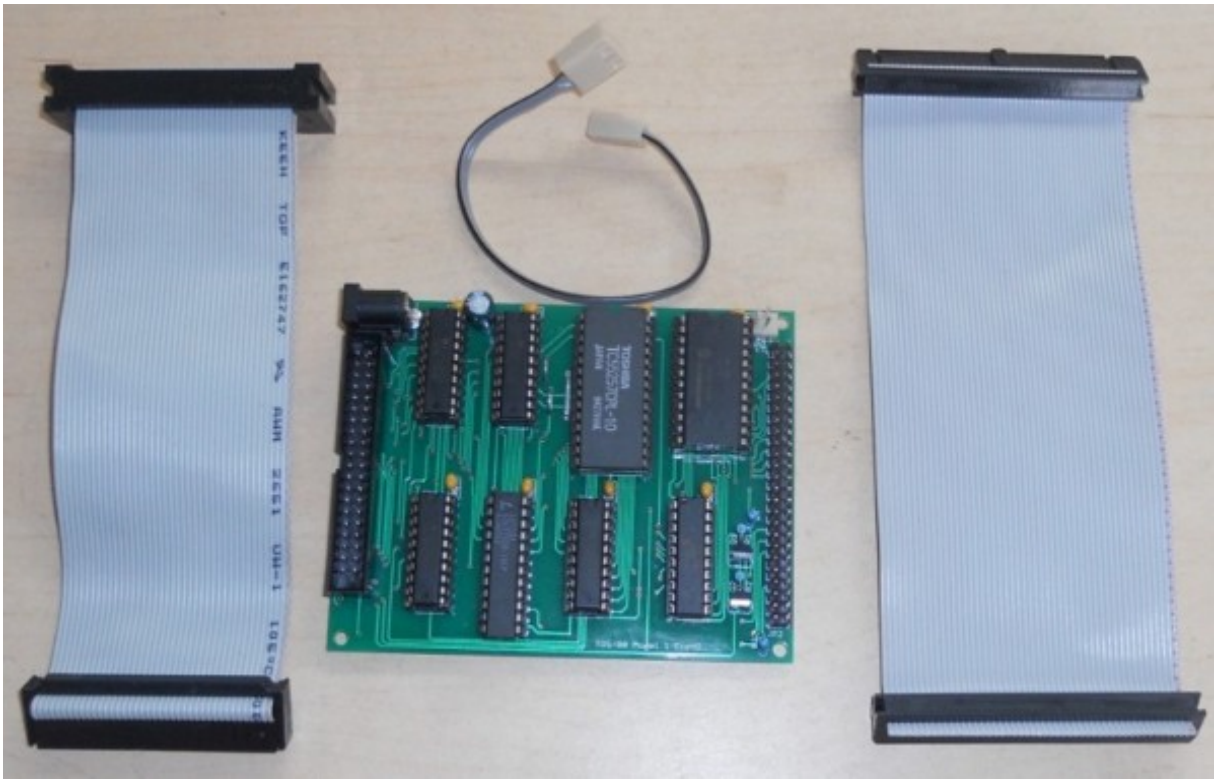
NOW, THIS ONE IS A BIT ON THE TRICKY SIDE, I THINK IT HELPS IF YOU TRY WITH REAL MATCHES!

THIS IS THE PENULTIMATE ONE IN HAROLD'S SERIES. HE DID SAY THAT THEY BECAME MORE DIFFICULT AS THEY PROGRESSED!

THE ANSWER IS ON PAGE 55

“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”

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Thirsting for adventure?
Brass lantern getting dusty?



Take your Model 1, 3 or 4 on exciting new adventures never available until now....

M4ZVM enables your TRS-80 Model 1,3 or 4 to play Infocom and post-Infocom adventures, taking full avdantage of your hardware. Supports old favourites like Zork and Seastalker (including Sonarscope), as well as new-to-Model-4 games including Trinity, Border Zone and Sherlock, plus hundreds more available in the Interactive Fiction archive.



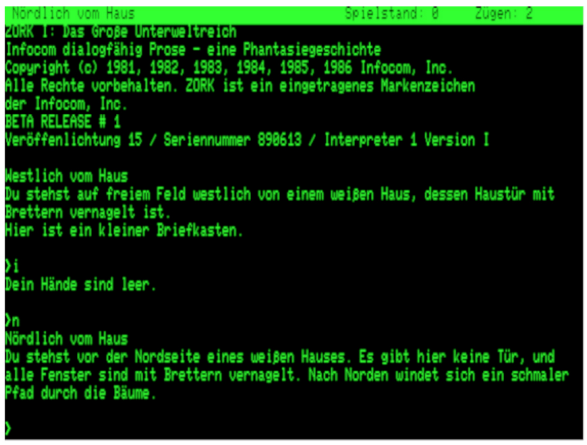
M4ZVM is available for download from https://gitlab.com/sijnstral/m4zvm (includes feature details and source)
Enhanced versions ready for download!

*128K recommended

Actual Screenshots of games new to the model 4, running M4ZVM (on trs80gp)

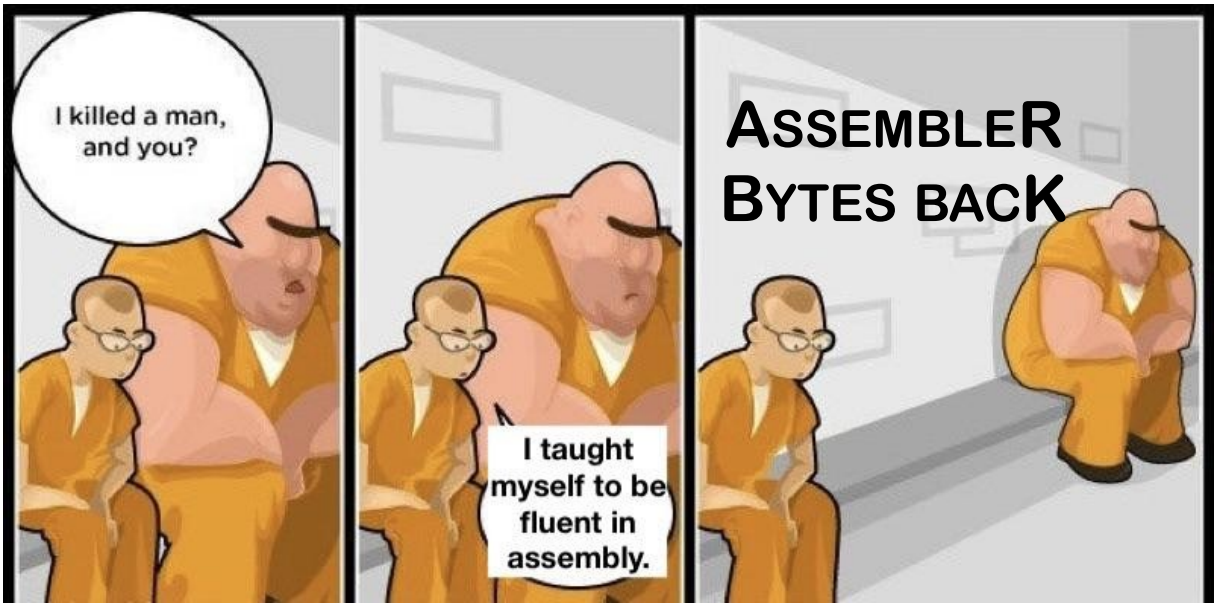


Beyond Zork



Zork 1 (German)

M4ZVM features include:
* z1-z8 game execution (z6 support is experimental)
* named game save/load
* accented characters
* 128K recommended - NEW Minimised 64K version
* Optionaly set the infamous "Tandy bit"
* NEW Model 1 and Model 3 versions



ASSEMBLER BYTES BACK WAS A FEATURE TO CELEBRATE THE START OF OUT 15TH YEAR. I'VE FOUND THAT, OVER THE YEARS, I ACCUMULATED VARIOUS (WELL HUNDREDS!) OF LITTLE SNIPPETS OF INFORMATION TO MAKE LIFE EASY WHEN USING MY TRS-80 M1 L2 MACHINE, ESPECIALLY IN A WORK ENVIRONMENT.

IN MANY CASES, IT'S JUST A FEW LINE OF CODING IN BASIC, ASSEMBLER AND JUST MANY OTHER, GENERAL LITTLE 'GOOD IDEAS' WHICH I CAME ACROSS AT VARIOUS POINTS IN NEARLY 50 YEARS OF COMPUTING.

I'M HOPING THIS WILL ENCOURAGE YOU, THE READER, TO SEND IN ANY ASSEMBLER CODING TIPS AND TRICKS FOR EVERYONE TO SEE AND USE. IN FACT, ANY HINTS, TIPS AND HELP LINES WOULD ALWAYS BE APPRECIATED.

---

80 - NET

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* THE NOTICEBOARD FOR ALL MICRO COMPUTER ENTHUSIASTS *

```
100           ORG     7000H
110   ;
120   ;*************************************************************
130   ;*
140   ;*      LE-18 HIRES SCREEN DUMP TO AN
150   ;*
160   ;*              EG 3085  PRINTTER
170   ;*
180   ;*      BY  KEITH BEDFORD.
190   ;*
200   ;*              LOWE ELECTRONICS.
210   ;*
220   ;*************************************************************
230   ;
240   ;       LABEL ASSIGNMENTS
250   ;
260   CR      EQU     13              ;CARAGE RETURN
270   ESC     EQU     27              ;PRINTER ESCAPE CODE
280   PDATA   EQU     236             ;HIRES DATA PORT
290   PPOS    EQU     237             ;HIRES POSITION PORT
300   PLINE   EQU     238             ;HIRES LINE PORT
310   POUT    EQU     253             ;PRINTER PORT
320   ;
330   ;
340   INIT    EXX                     ;SAVE ALL REGISTERS
350           CALL    SETUP           ;SET UP EG3085 PRINTER
360           LD      A,1
370           LD      (BITMSK),A      ;SET BIT MASK TO 1ST POS
380           LD      A,0F8H
390           LD      (ROW),A         ;SET ROW TO 1 LINE BACK
400   ;*************************************************************
410   ;*
420   ;*      MAIN PROGRAM LOOP
430   ;*
440   ;*************************************************************
450   ;
460   MPLOOP  LD      A,(ROW)
470           ADD     A,8             ;SET ROW TO TOP OF SCREEN
480           LD      (ROW),A
490           CP      192
500           JR      C,MORE
510                                   ;HURRAY° WE'VE FINISHED.
520           CALL    DESET           ;RESET PRINTER
530           EXX                     ;GET ALL REG'S BACK
540           RET
550   ;
560   ;
570   MORE    CALL    SETHRS          ;SET PRINTER = HIRES MODE
580           LD      A,255
590           LD      (COL),A         ;SET TO -1
600   ;
```

```
610  ;*************************************************************
620  ;*
630  ;*              COLUMN SET UP LOOP
640  ;*
650  ;*************************************************************
660  ;
670  CLOOP   LD      A,(COL)
680          INC     A
690          CP      64
700          LD      (COL),A
710          JR      NZ,DOROW        ;NOT LAST ROW, CARRY ON
720          LD      A,CR
730          CALL    PRINT           ;PRINT CARRIGE RETURN
740          JR      MPLOOP          ;DO NEXT 8 LINES
750  ;
760  DOROW   OUT     (PPOS),A        ;SET ROW IN HIRES
770          LD      B,6             ;6 BITS WIDE
780  R6LOOP  PUSH    BC              ;SAVE IT
790  ;
800          LD      D,0             ;FORM HIRES BYTE
810          LD      A,(ROW)
820          LD      C,A
830          LD      B,8
840  BLOOP   LD      A,C
850          ADD     A,B
860          DEC     A
870          OUT     (PLINE),A
880          OR      A
890          RL      D               ;SHIFT BIT LEFT
900          LD      A,(BITMSK)
910          LD      E,A
920          IN      A,(PDATA)       ;GET 6 BITS FROM SCREEN
930          AND     E
940          JR      Z,SKIP          ;CHANGE TO NZ IF YOU WISH
950                                  ;TO REVERSE PRINTOUT.
960          INC     D               ;MAKE IT A DOT
970  SKIP    DJNZ    BLOOP           ;DO 8 BITS
980          LD      A,D             ;HIRES BYTE
990          CALL    PRINT           ;SEND IT
1000         LD      A,(BITMSK)
1010         ADD     A,A             ; A = A * 2
1020         LD      (BITMSK),A
1030         POP     BC              ;RESTORE COUNT
1040         DJNZ    R6LOOP
1050         LD      A,1
1060         LD      (BITMSK),A
1070         JP      CLOOP
1080 ;
```

```
1090    ;*************************************************************
1100    ;*
1110    ;*       PRINTER OUTPUT ROUTINE
1120    ;*
1130    ;*************************************************************
1140    ;
1150    PRINT   PUSH    AF              ;SAVE DATA
1160    PSTAT   IN      A,(POUT)        ;GET PRINTER STATUS
1170            XOR     3FH             ;INVERT MAIN BITS
1180            JR      NZ,PSTAT        ;0 = OK
1190            POP     AF
1200            OUT     (POUT),A        ;SEND IT
1210            RET
1220    ;
1230    ;*************************************************************
1240    ;*
1250    ;*       ROUTINE TO SET UP EG 3085 PRINTER
1260    ;*
1270    ;*               SO THAT IT LOOKS NICE
1280    ;*
1290    ;*************************************************************
1300    ;
1310    SETUP   LD      HL,SUMES        ;SETUP MESSAGE
1320    SELP    LD      A,(HL)
1330            OR      A
1340            RET     Z               ;END OF MESSAGE
1350            CALL    PRINT
1360            INC     HL
1370            JR      SELP
1380    ;
1390    ;*************************************************************
1400    ;*
1410    ;*       ROUTINE TO SET UP EG3085 PRINTER
1420    ;*
1430    ;*               INTO HIRES MODE
1440    ;*
1450    ;*************************************************************
1460    ;
1470    SETHRS  LD      HL,SHMES
1480    SHLP    LD      A,(HL)
1490            OR      A
1500            RET     Z               ;END OF MESSAGE
1510            CALL    PRINT
1520            INC     HL
1530            JR      SHLP
1540    ;
1550    ;*************************************************************
1560    ;*
1570    ;*       SET PRINTER BACK TO NORMAL
1580    ;*
1590    ;*               BEFORE GOING BACK
1600    ;*
1610    ;*************************************************************
1620    ;
1630    DESET   LD      HL,DSMES
1640    DSLP    LD      A,(HL)
1650            OR      A
1660            RET     Z
1670            CALL    PRINT
1680            INC     HL
1690            JR      DSLP
1700    ;
```

```
1710   ;*************************************************************
1720   ;*
1730   ;*       PRINTER OUTPUTS FOR EG3085
1740   ;*
1750   ;*************************************************************
1760   ;
1770   SUMES   DEFB    ESC
1780           DEFM    'T17'           ;SET VERTICAL SPACING
1790           DEFB    ESC
1800           DEFM    'N'             ;10 CPI
1810           DEFB    ESC
1820           DEFM    '>'             ;UNIDIRECTIONAL
1830                                   ;MAKE SURE ITS IN LINE
1840           DEFB    13
1850           DEFB    0
1860   ;
1870   SHMES   DEFM    '             ' ;A MARGIN
1880           DEFB    ESC
1890           DEFM    'S0384'         ;WE ARE GOING TO SEND
1900                                   ;384 BYTES OF HIRES.
1910           DEFB    0
1920   ;
1930   DSMES   DEFB    ESC
1940           DEFM    '<'
1950           DEFB    ESC
1960           DEFM    'A'
1970           DEFB    ESC
1980           DEFB    'E'
1990           DEFB    CR
2000           DEFB    CR
2010           DEFB    CR
2020           DEFB    CR
2030           DEFB    0
2040   ;
2050   ;*************************************************************
2060   ;*
2070   ;*       STORAGE AREA
2080   ;*
2090   ;*************************************************************
2100   ;
2110   COL     DEFB    0               ;STORE COLUMN NUMBER
2120   ROW     DEFB    0               ;STORE ROW NUMBER
2130   BITMSK  DEFB    0               ;STORE  BIT MASK
2140   ;
2150   ;
2160   ;
2170           END     INIT
```

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2022 COMPETITION

Wordle is everywhere, except on TRS-80's. The TRS8BIT 2022 competition aims to change that. It has two tracks we call **"Beauty and the Beast".**

"Beauty" entrants will make their own version of Wordle for the TRS-80. They'll be judged on how fun and pretty they are. It doesn't need to support the full dictionary so you can concentrate on looks. Use whatever language you like for the job: BASIC, assembly, C, COBOL

"Beast" entrants will tackle the problem of squeezing all 12960 words of the dictionary into a TRS-80. This is for assembly language programmers only. The smallest blob of program and data will win.

Download the contest.zip file for the full details **(available from the downloads page at www.trs-80.org.uk).** It has the word lists and specific requirements for "Beast" entries, details on how Wordle works for "Beauty" entries and even a bare-bones example program in Z-80 assembly to get you started.

We'd be tickled pink if we get a Beast so small it'll work on a 16K machine. Are you up for the challenge?

Fire up the Model 1, 3 or 4. Bring forth the awesome power of a Model II, 12 or 16. Dazzle us with CoCo 1, 2 or 3 graphics. Make it portable on a Model 100 or affordable on an MC-10. Heck, if you write it for a Model 2000 we'll figure out how to run it.

All entries will be judged by the 'TrashTalkers'
and should be sent to Mav at **ianm@trs-80.com**

Competition closing date is 21:00 hrs GMT, 24NOV22

SEE PAGE 53 FOR AN UPDATE OF ENTRIES RECEIVED SO FAR - ED



Plaid Vest Software

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Vicious Vipers **$ Free $**

- Fast-action arcade style game
- 1st place winner of the 2020 TRS8BIT "Double Do" contest



TRS-80 Screen Designer **$ Free $**

- Screen design tool for macOS
- No more paper screen design forms!

Visit www.plaidvest.com for more information

THE WAY WE WERE

1985 1982 1977 1979 1978 1984 1976 1983 1980 1981





ZAP FOR NEWDOS/80 TO ALLOW NULL REPLY TO TIME? WHEN BOOTING

I use NEWDOS/80 exclusively as my pet DOS, as it seems very reliable, supports double density, and has most of the facilities I currently need. One little thing started to niggle me a bit however.

I like to put a valid date on any of my disk backups and therefore use SYSTEM option AY=Y to get the computer to ask for the date when first booting. Nine times out of ten, however, I'm not interested in the time but NEWDOS/80 insists that a valid time is entered, even if it is 00:00:00. The idea for the following patch came when I saw someone using MULTIDOS (thanks Don H), which quite happily took <ENTER> as an answer to its TIME? prompt, taking it to mean 00:00:00

Although the memory resident part of NEWDOS/80 SYS0/SYS has virtually no space left for patching (see end of Zap 060), there is plenty of room left in the initialising code which is only executed while booting. As the DATE? & TIME? dialogue is part of this latter code, a zap is easily installed and it doesn't matter that it is subsequently overwritten in RAM.

As it says in the book, no responsibility is taken if a later official Apparat Zap uses the space taken up by this patch. Additionally, DON'T, DON'T modify your original, valuable or only copy of NEWDOS/80. Zap as follows -

```
SYS0/SYS,12,6BH
      from  50 CD 64 4F 01     to  50 C3 B0 50 01

SYS0/SYS,13,CDH
      from                                                  00 00 00
           00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
           00 00
        to                                                  CD 64 4F
           3A 18 43 FE 0D C2 56 4F 21 43 40 97 77 2B 77 2B
           77 C9
```

Now hopefully when you do a cold boot, you should be able to answer the TIME? prompt with <ENTER>, and get 00:00:00. You can still put in the actual time if your use requires it, of course.

Don Bannister

COMPILERS

Recently one of the computer rags published a review of compilers for the Apple. After great effort a speed-up in run time of 1-2 could be obtained (sometimes!). TRS-80 users are more fortunate in that the benefits of using a compiler is slightly improved:-

Consider the following benchmark:-

```
100 DEFINT A-Z
110 CLS
120 INPUT"START";A$
130 GOSUB 230
140 ST=S
150 FOR N=1 TO 10
160 FOR A=1 TO 10000
170 B=B+1:IFB=1000 THEN PRINTA:B=0
180 NEXT A
190 NEXT N
200 GOSUB 230
210 PRINT"ELAPSED TIME ";(S-ST)
220 STOP
230 '
240 S=PEEK(16449):M=PEEK(16450):H=PEEK(16451)
250 S=S+M*60:S=S+H*360
260 RETURN
270 END
```

Results are as follows:-

BASIC interpreter	147 secs
ZBASIC Compiler	1.9 *x
Microsoft compiler	1.4 *x

x- Times as above divided by 10. Interpreter did not have outer loop - not enough time! - lines 150 & 190.

The results are somewhat stunning and show that with the use of a compiler the clock speed of your CPU becomes less relevant to program running time. For example, the BBC micro will perform the above in 30secs - faster than a model 2 (under the interpreter) but without a compiler or skill with machine code it is no contest.

How useful

The benchmark was selected to provide the best example and it is no example for the typical business system although it is probably still relevant to most game programs. However the constraints not considered with the example are those of size and compatibility. The hard facts of life are that almost all interpreted software will require some conversion and for large systems the work may be impossible.

Complex systems have to be specifically 'bent' to use the compiler and this requires a good knowledge of BASIC before you start. The Microsoft compiler is much better than the ZBASIC compiler and in particular ZBASIC is greatly inferior on disc input/output. (Although the latest version of ZfASIC provides disc input/output facilities the use is very different to standard Microsoft.)

However the benefits of speed justify some perseverance. The speed gain is most noticeable with integer operations (as in the benchmark) and also with string handling. Although direct disc input/output is no faster there are usually FOR/NEXT loops and strings involved with GET's and PUT's so the speed gains are still present.

The speed up on string handling is to the extent that BASIC programming can be used for sorting large amounts of string data - tasks over which the interpreter can take all day or even due to the 'garbage collection' delay may never be able to finish. Users of the compiled DMS80 data management system will notice that the data entry screens operate as fast as any of the machine code word processors such as Scripsit or the Electric Pencil.

These machine code speed gains do require sacrifice of the flexibility provided by the friendly interpreter. Arrays have to be dimensioned as fixed values and can not be re-dimensioned after initialisation. Even worse ZBASIC requires that all strings are given a fixed length and regardless of what you actually need this space is reserved. Thus for 100 strings with 50 characters reserved you will lose 5000 bytes. Microsoft provides the flexibility of still allowing up to 255 bytes for each string and apart from array pointers no space is lost until you need it. Until 256k RAM is available, many applications will not function under the ZBASIC approach because of this limitation.

The other constraint is that of disc space. Compiled programs will occupy more disc space that the compressed code used by the interpreter. Apart from the obvious problems caused by size with standard Tandy 67 granules/disc there are also longer delays before the program starts. The interpreter may be a better solution if a number of different procedures are required without any significant processing within each, especially if you can master NEWDOS80's overlay feature.

In order to create the compiled programs there is a time requirement and this is significant for the Microsoft compiler where:-

1) The interpretive code has to be saved to an ',A' file.
2) The /REL code has to be produced by BASCOM
3) the /CHN code has to be produced by L80

Typical compilation times are upwards of five minutes.

In this respect ZBASIC is tremendous especially for small programs. The interpreter can still be used for development with ZBASIC called Just by depressing 'ZXC' for an instant (1-2 secs) compilation. If there is an error the program can be corrected before another 'ZXC'. ZBASIC has a further advantage in that the compiled program operates as a normal /CMD file ie. no need for the BRUN/CMD of Microsoft.

A further gain with ZBASIC is the ability to write machine code within BASIC. ZBASIC is weak on error trapping but any DOS errors can be located by a nifty read on register A after any DOS function e.g. MERGE X32,A in ZBASIC and BASIC's variable A will have the value of the Z80 A register.

Scope

Both compilers will operate far short of that possible under the BASIC interpreter. ZBASIC would seem highly suitable for generating small DOS type routines or sub-routines which could be called from a BASIC program. The sub-routine facility could be extremely useful. Microsoft Basic interpreted and compiled is very! slow for double precision arithmetic but ZBASIC is much faster. I could envisage a ZBASIC USR even within a Microsoft compiled program ... perhaps?

ZBASIC would work well for most game type programs and for those areas where machine code is the only option ie. a ZBASIC Scripsit would be possible. However I would not recommend using ZBASIC for most business systems. Even if achieved the very fact that ZBASIC is not standard Microsoft creates the real danger of writing systems with no forward growth prospects.

Within its limits, Microsoft Basic with the BRUN module works well on the Model 1. Although the BRUN module takes up 12 granules of disc space the BRUN concept reduces compilation time and increases compile capacity. As a result the model 1 can compile larger programs than a model 2 (where each module carries its own BRUN). Remember that only one BRUN module is required for any number of compiled programs the disc space requirement is a fixed overhead. This ability to share BRUN among different procedures is usually ignored by most

reviews. In addition some software e.g. DMSBO does not require the BRUN/CMD or program file to be permanently on line which means that use of the Microsoft compiler is possible even with the standard disc drives.

Conclusions

Business applications have no real choice except Microsoft. Other routes could be the Tandy Basic compiler or even the Tandy Cobol compiler about which there have been rave reviews. But be warned all of this will require dedication to achieve useful results.

However, if you just require to use short programs or link to ROM calls then ZBASIC would be more useful. I have not used ACCEL3 but I understand from reviews that it is similar to ZBASIC but lacks the capability to create stand alone /CMD files and I fear that this could be a severe limitation.

My final warning is to give deep consideration before leaving the straight and narrow of pure standard Microsoft. The special facility of today can easily be transformed into tomorrow's conversion disaster! - Take note all you out there with NEWDOS80 FF files.

Footnote

The August newsletter contained the usual and entertaining duel between Laurie and Leon on the appropriate solution for the Scripsit word count problem. As a complete failure in m/c code it must provide devastating evidence for ZBASIC in that Laurie's BASIC code can be compiled by ZBASIC almost unchanged but provide the m/c code speed required by Leon but without half an hour of Leon's expertise (for most of us read never or close to!). Use of ZBASIC provided sufficient time to correct the deliberate (?) error of the end of text marker - CHR$(0) counting as a further word. As evidence I have sent WC/CMD to Leon for distribution to all other claimants of the fastest m/c code writer in the west award.

Scripsit Word Count code as originally written by Laurie Shields but altered (slightly) By Derrick Rowe to be compiled by ZBASIC. (Use after exit from Scripsit)

```
1 PRINT"COUNTING ":N=32610
2 CH=PEEK(N):CH=CH AND 127 :IF N=32767 THEN N=-32768
ELSE N=N+1
3 IF CH=32 OR CH=13  OR CH =0 THEN WO=0  ELSE IF WO=0
THEN WO=1:CN=CN+1:PRINT CHR$(29)CHR$(30)CN;
4 IF CH<>0 THEN 2 ELSE PRINT" WORDS IN TEXT"
5 END
```

Derrick Rowe

EBAY.CO.UK 'BARGAINS'

HERE ARE JUST SOME OF THE MORE INTERESTING TANDY EBAY LISTINGS, SINCE OUR LAST ISSUE. WERE YOU ONE OF LUCKY ONES? HOW ABOUT LETTING US ALL KNOW HOW YOU'RE GETTING ON?



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GEORGE PHILLIPS

HI DUSTY, HERE'S A LITTLE UPDATE ON THE COMPETITION:

THE COMPETITION FOR 2022, "BEAUTY AND THE BEAST" IS GOING ALONG WELL. SO FAR THERE HAVE BEEN 6 ENTRIES. ONE "BEAUTY" (WORDLE GAME) ENTRY FOR THE COLOR COMPUTER AND 5 "BEAST" ENTRIES WHICH ATTEMPT TO COMPRESS THE FULL WORDLE DICTIONARY TO AS SMALL A SIZE AS POSSIBLE.

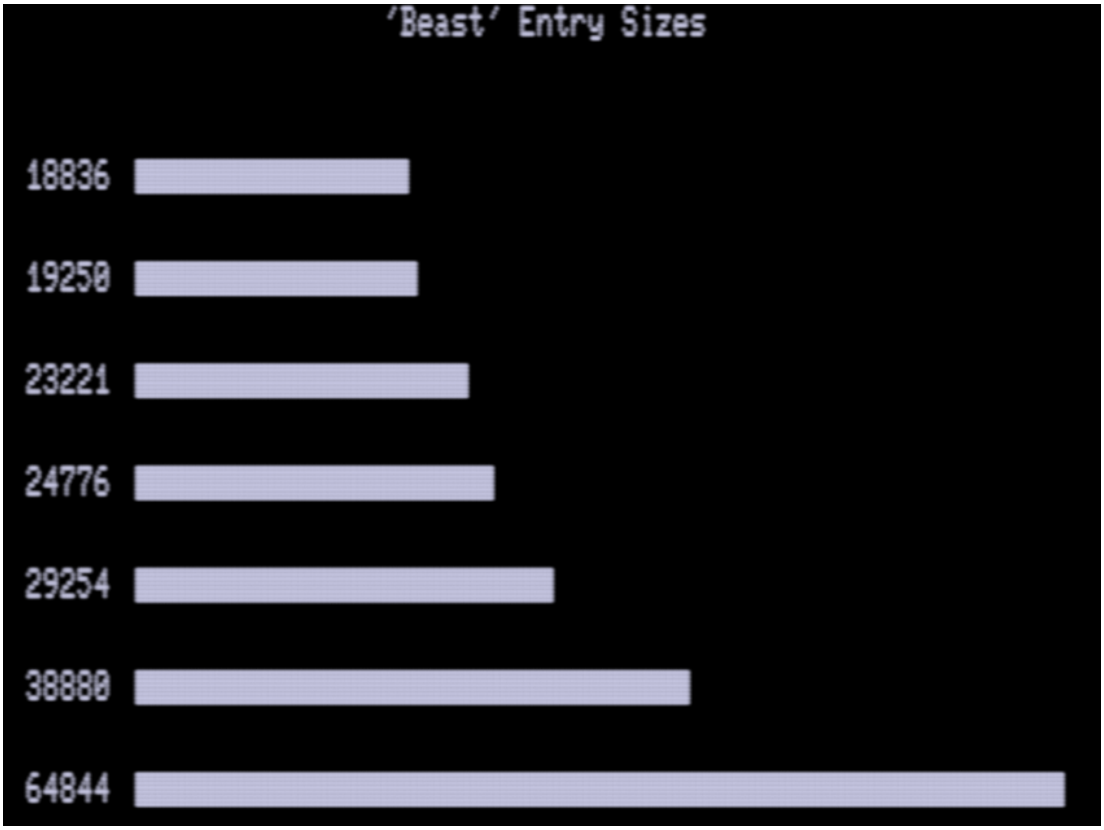
THE "BEAST" ENTRIES ARE EASY TO JUDGE. THERE'S A TEST PROGRAM TO QUERY THEIR TWO SUBROUTINES AND CHECK ALL POSSIBLE 5 LETTER WORDS. AT ABOUT 11,000,000 MILLION OF THEM IT CAN TAKE A WHILE. NOT TOO LONG, AS IT TURNS OUT, SINCE AN EMULATED Z-80 CAN BE COAXED TO RUN AT NEARLY 3 GHZ ON A DECENT MACHINE. WITH 4 OR 6 OF THOSE RUNNING IN PARALLEL ALL THE WORDS CAN BE CHECKED IN A FEW HOURS. THAT SEEMS LIKE A LONG TIME BUT IS A LOT FASTER THAN THE LITERAL YEARS IT WOULD TAKE A SINGLE MODEL III TO DO THE JOB!

THE "BEAST" WINNER WILL BE THE SMALLEST ONE. I'VE MADE A LITTLE GRAPH SHOWING THE RELATIVE SIZES OF THE 5 ENTRIES ALONG WITH MY EXAMPLE PROGRAM AT 38880 BYTES AND ANOTHER ONE I DID THAT STORES THE 12960 WORDS COMPLETELY UNCOMPRESSED WITH 43 BYTES OF CODE TO IMPLEMENT THE 2 SUBROUTINES. IT'S AMAZING HOW MUCH PROGRESS HAS BEEN MADE WITH THE SMALLEST ENTRY A MERE 18,836 BYTES OF CODE AND DATA.

THE COMPETITION GOES UNTIL NOVEMBER 24TH SO THERE'S STILL LOTS OF TIME TO TRY YOUR HAND AT A "BEAUTY" OR "BEAST" ENTRY.
GET THE FULL DETAILS HERE: HTTP://TRS-80.ORG.UK/PAGE5.HTML




```
10 CLS:T$="'BEAST' ENTRY SIZES":PRINT@(64-LEN(T$))/2,T$;
20 DEFINT I,L,X,Y,Z:FORI=1TO7:READS(I):NEXT
30 Y=46:FOR I=7TO1STEP-1
40 L=S(I)/600
50 FORX=15TOL+15:SET(X,Y):SET(X,Y-1):Z=NOTZAND1:NEXT
60 PRINT@INT(Y/3)*64,S(I);
70 Y=Y-6:NEXT
80 GOTO 80
1000 DATA 18836
1010 DATA 19250
1020 DATA 23221
1030 DATA 24776
1040 DATA 29254
1050 DATA 38880
1060 DATA 64844
```



HERE'S THE ANSWERS TO THE QUIZ ON PAGE 33



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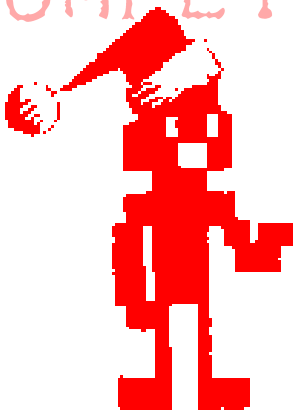




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COMPETITION RESULTS ISSUE



TRS8BIT

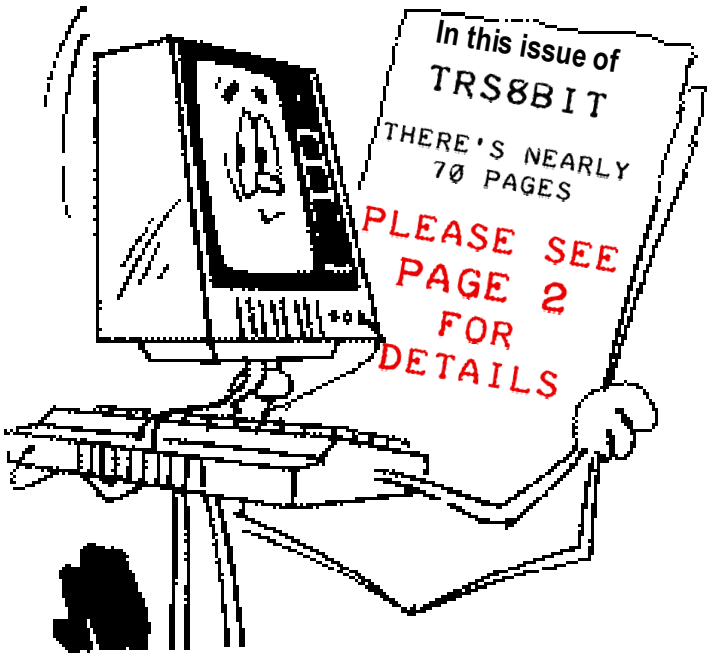
PRODUCED AT WWW.TRS-80.ORG.UK

HI EVERYONE AND WELCOME TO THIS XMAS 2022 EDITION! DEE AND I WISH EVERYONE OUT THERE IN THE TRS-80 WORLD A VERY MERRY CHRISTMAS AND A HAPPY NEW YEAR.

I WOULD JUST LIKE TO THANK EVERYONE FOR THE ARTICLES AND SUPPORT THAT HAS BEEN GIVEN, OVER THE LAST 16 YEARS! I COULDN'T HAVE DONE IT WITHOUT YOU, OBVIOUSLY! I'M STILL ENAMOURED WITH MY MODEL 1, JUST AS MUCH AS IN 1979! SO ALL BEING WELL, THE FIRST EDITION OF YEAR 17, WILL BE WITH YOU IN EARLY IN MARCH 2023!

SO, DOWN TO BUSINESS, THE TWO, 2022 COMPETITION WINNERS ARE :-

ROWLAND ARCHER
AND
ALAN PETROFSKY



WELL DONE YOU GUYS, A TRULY AMAZING ACHIEVEMENT. I'M LOOKING FORWARD TO HAVING A PLAY.
PLEASE EMAIL MAV WITH YOUR CHOICE AND CONTACT DETAILS AS SOON AS YOU CAN.
THERE ARE FULL DETAILS AND SCREEN SHOTS IN AN ARTICLE BY GEORGE PHILLIPS ON PAGE 4.
IT SOUNDS AS THOUGH GEORGE ALREADY HAS AN IDEA FOR THE 2023 COMPETITION.

AS USUAL, THERE IS A SUPER SELECTION OF ARTICLES FOR YOU TO ENJOY, FOR YOUR XMAS READING, ESPECIALLY WHEN YOU'VE HAD ENOUGH EATING AND DRINKING!

THE NEW FEATURE, 'WHAT'S NEW' ARE BITS OF INTEREST THAT HAVE CAUGHT MY EYE FROM THE INTERNET.
E.T.'S 'MERRY CHRISTMAS' ONE-LINER IS AVAILABLE TO WATCH RUNNING, LIVE, ON THE WEBSITE WWW.TRS-80.ORG.UK. THANKS TO GEORGE & PETER'S TRS80GP EMULATOR WHICH CREATES ANIMATED .GIF FILES FOR YOU!

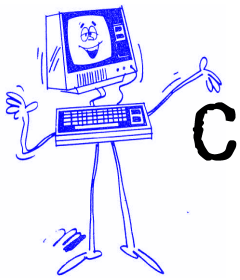
TALKING OF GEORGE & PETER, GEORGE BROUGHT BACK TO LIFE THE 'AT THE READY PROMPT' SERIES WITH A LITTLE BUGLETT HE'D FOUND, WHILE PETER PRESENTS A BASIC PROGRAM TO DIVIDE CIRCLES USING CURVES AND NOT STRAIGHT LINES. SOMETHING, I MUST CONFESS, HAD NEVER OCCURRED TO ME!

THAT'S ABOUT ALL FROM ME UNTIL MARCH 23.



TAKE CARE EVERYONE, STAY SAFE & KEEP WARM.

DUSTY



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PETER PHILLIPS

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BITS OF NEWS I'VE FOUND ON THE NET

NEW VERSION 2.4.10

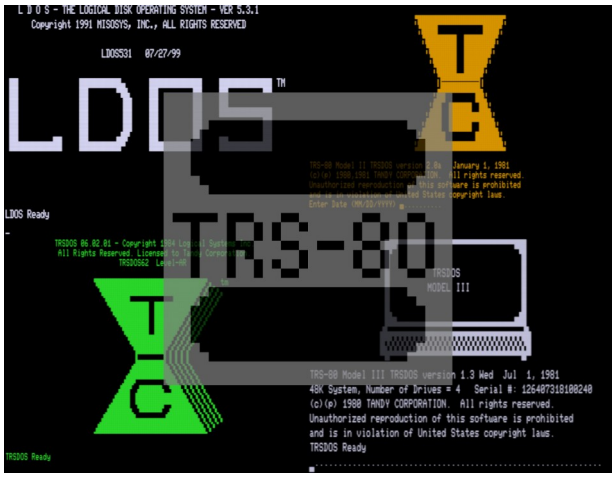
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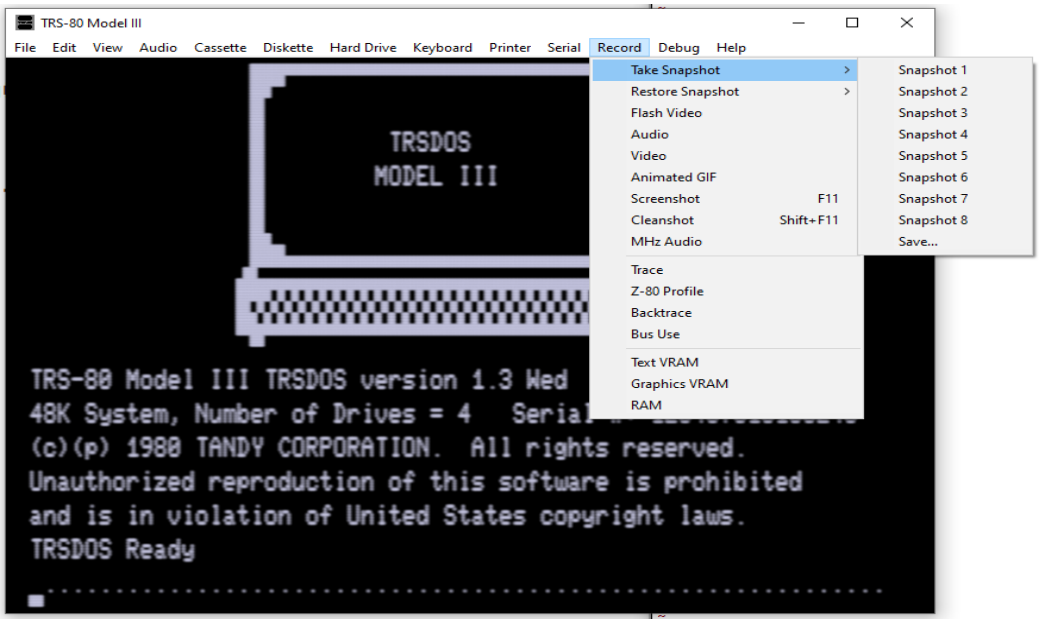
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2022 Competition Results



This year's competition was centered around the popular Wordle 5 letter word guessing game. There were two ways to enter: write a version of Wordle for your favorite TRS-80 (the “Beauty” section) or show us how well the Wordle dictionary and answer list can be compressed (“Beast” section).

Before getting into the winners I'd like to thank all the participants for their efforts and taking the time to enter. There were two “Beauty” entrants, Rick Adams with COCOdle for the Color Computer 3 and Rowland Archer with Word80 for the Model 4. Both were very well done and made it hard for the panel of TRS-80 trashtalkers to decide between them.

There were no less than 6 “Beast” entries. Matt Boytim, Kyle Wadsten, Peter Phillips, Shawn Sijnstra, Bill Kewley and Alan Petrofsky all tried their hand at the task wielding Z-80 assembler as their language of choice. Compression ratios ranged from an impressive reduction to 45% the original size all the way up to an astonishing 23% of the original size. All entries were exhaustively tested here at trs8bit labs. In a credit to the programming skill on display it was completely unnecessary. No bugs were found in any of the entries! They just don't write programs like that any more, do they? Well, I guess the programs were for old hardware but were just written so maybe they do.

And the winners are...

Beauty: Rowland Archer for Word80

Beast: Alan Petrofsky at 14976 bytes

Congratulations to both and thanks again for entering the competition. While the “Beast” entries were easily judged by size, picking a winner on the “Beauty” side was difficult. Rowland's entry ultimately won out as it keeps extensive statistics and scoreboards for each player.

Here are some pictures of the “Beauty” entries in action: -

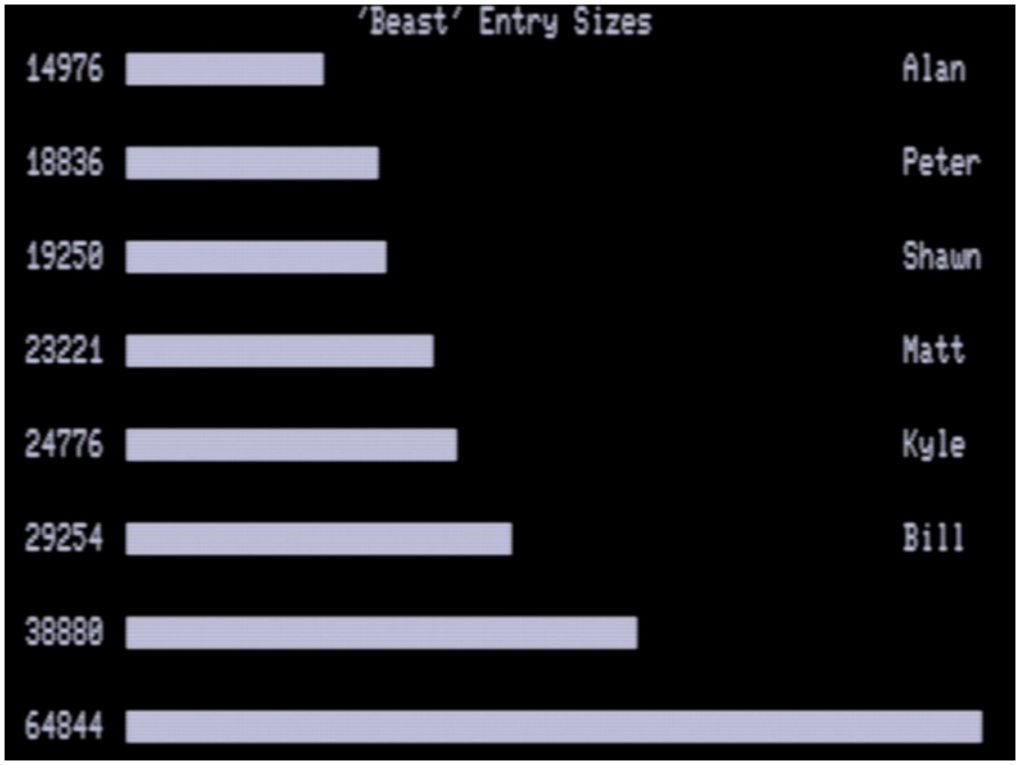
Word80



COCOdle:



Here are the sizes, in bytes, of each “Beast” entry. The size includes both the compressed Wordle dictionary data and answer list along with the subroutines to access the data. One to determine if any particular 4 letter word is valid and another to choose one of the 2313 common 5 letter words for the player to guess. The bottom two entries are the dictionary and answers stored in uncompressed form and an example Z-80 program that achieved modest compression by storing the words in base 26.



Each entry was verified to be completely correct by checking it against all possible 5 letter words. While 11,881,376 possibilities seems like a lot, it isn't so big as to make the idea infeasible what with emulated Z-80s running at hundreds of MHz. On top of that the testing can be done in parallel. For instance, 26 different computers could do the testing which each handling all possible 5 letter words that start with a particular letter of the alphabet. Even trs8bit labs with a few computers with several cores each can achieve that kind of speed up.

Things were looking bad when the first entry came in and it took several days finish the test. And each entry that came along too longer than the last. In hindsight this was no surprise. The competition was about size, not speed. Programmers were wisely trading size for speed and the trade was booming.

It worked out in the end. The rz80 stand-alone Z-80 emulator (http://48k.ca/rz80.html) was boosted up into the 3 GHz range. It still took nearly two full days to get through the 1.5 **quadrillion** cycles needed to process Alan's final entry. A single Model 3 would have taken 24 years to do that job.

If you didn't get a chance to enter this year don't fret. There will be a brand new competition announced in the next issue of trs8bit in March. Here's looking forward to a new year and another batch of amazing programs.

#TTR – TIP #103122 – Convert a TRS-80 printer cable, for multiple computers use.

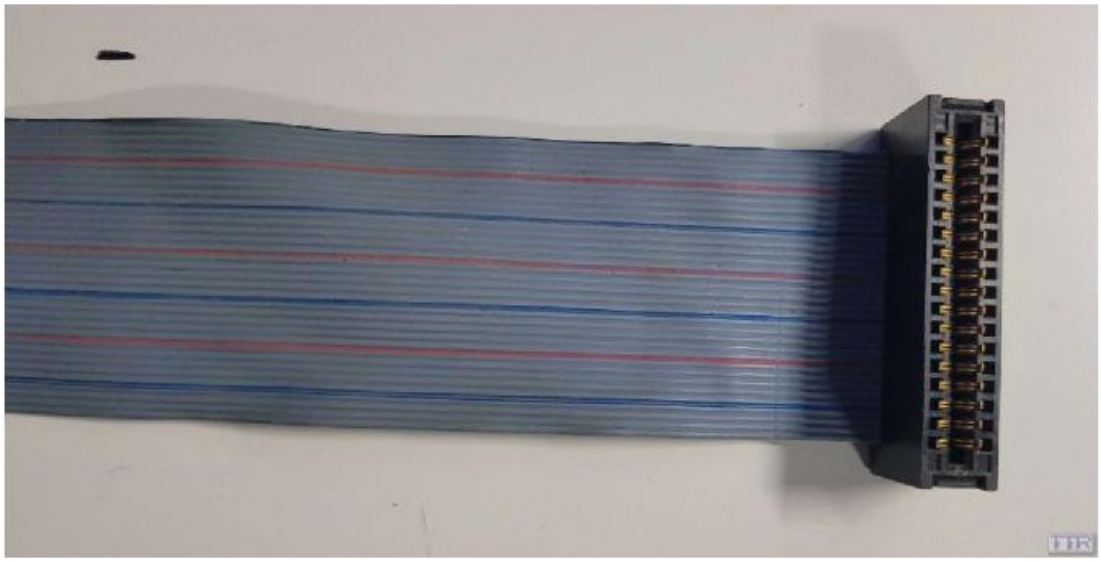
You have a TRS-80 model 3/4/4D/4P and a model 100/102/60 but only 1 trs-80 printer cable? You want to be able to print from your TRS-80 Laptop on that same printer?

Don't buy a model 100 specific cable, I will be explaining how to make a cheap cable that can be used for Model 3/4/4p and model 100/102/600 series computers from a single parallel cable for a few dollars.

Items needed:
1x Trs-80 Centronics Printer cable with a 34 Pin edge connector on one end.
1x 26 pin IDC female flat ribbon connector (search Amazon they come in packs of 5 for 5$)
1x razor blade
1x electronics clippers/cutters
1x table or hand vise

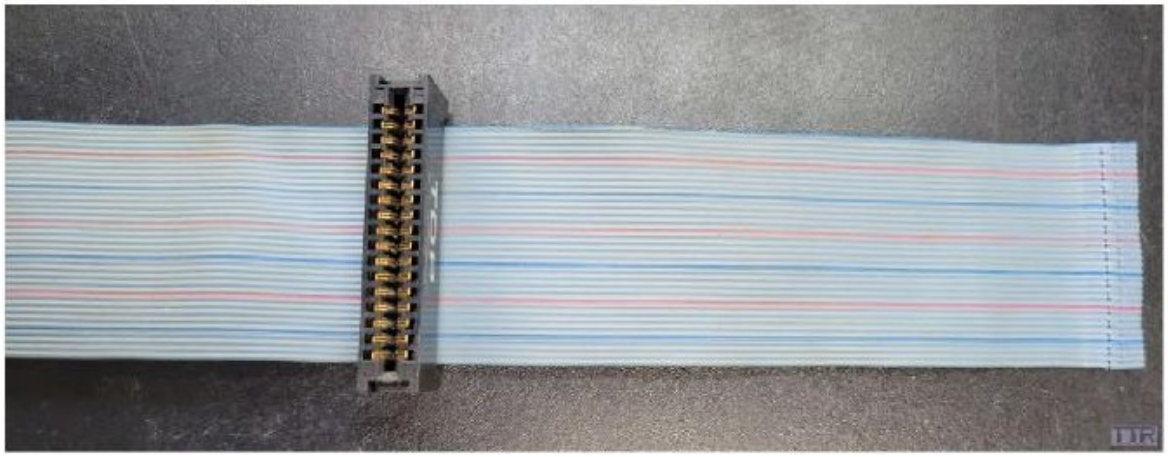
Optional:
1x 34 EDGE flat ribbon connector (if the one you have is difficult to remove from cable)
1x sharp scissors

Basically, I take the original cable that looks like this at the edge connector, where the mod will be done.



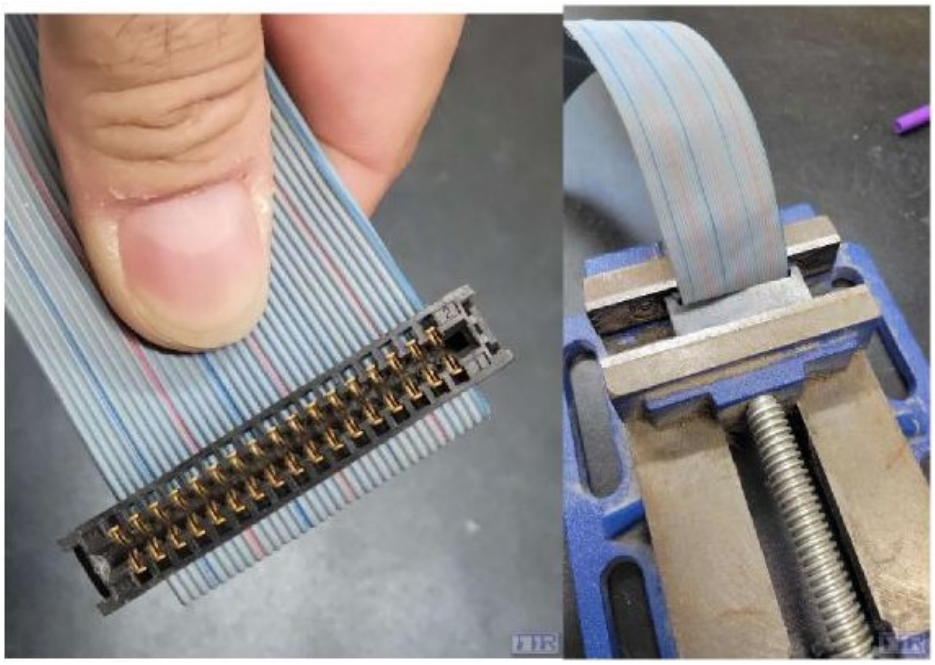
Now in my case, the connector is easy to remove from the cable and reuse, but some of the older blue connectors can be brittle and break, so having a spare on hand would be wise. I remove this one and re-attach it 6 inches prior to where it was before.

Note: if you are replacing the connector with a fresh one, please make sure that the connector has no key (as the model 3/4/d/4p does have a slot in their printer port)



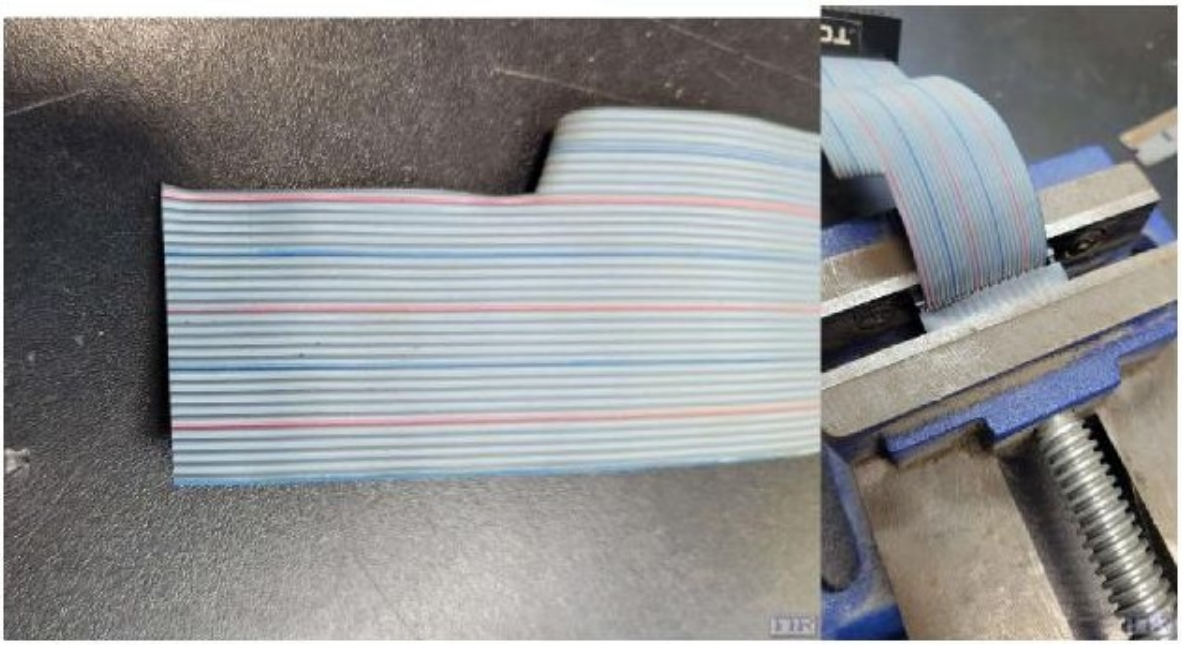
Once perpendicular to the cable, I fold the cable to slip it into the press and close the connector once again on the cable

Important: just one word of advice when you press the connector, a firm hand but not a death grip is required to make full closure on the connector you will hear the "click" of the clamp closing in place stop. You are done.

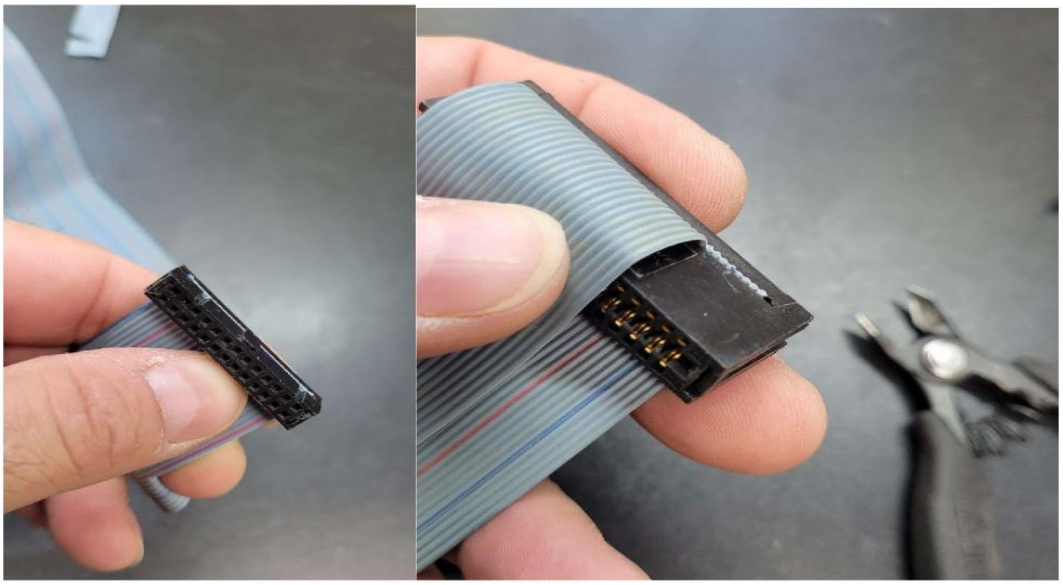


Next, if you did not know this about the grey cables each red line from pin 1 is 5 count, so red blue red blue red (counting across the cable lines) is 25, then 1 more grey line and there you have it 26 lines for the model 100 series 26 pins connector.

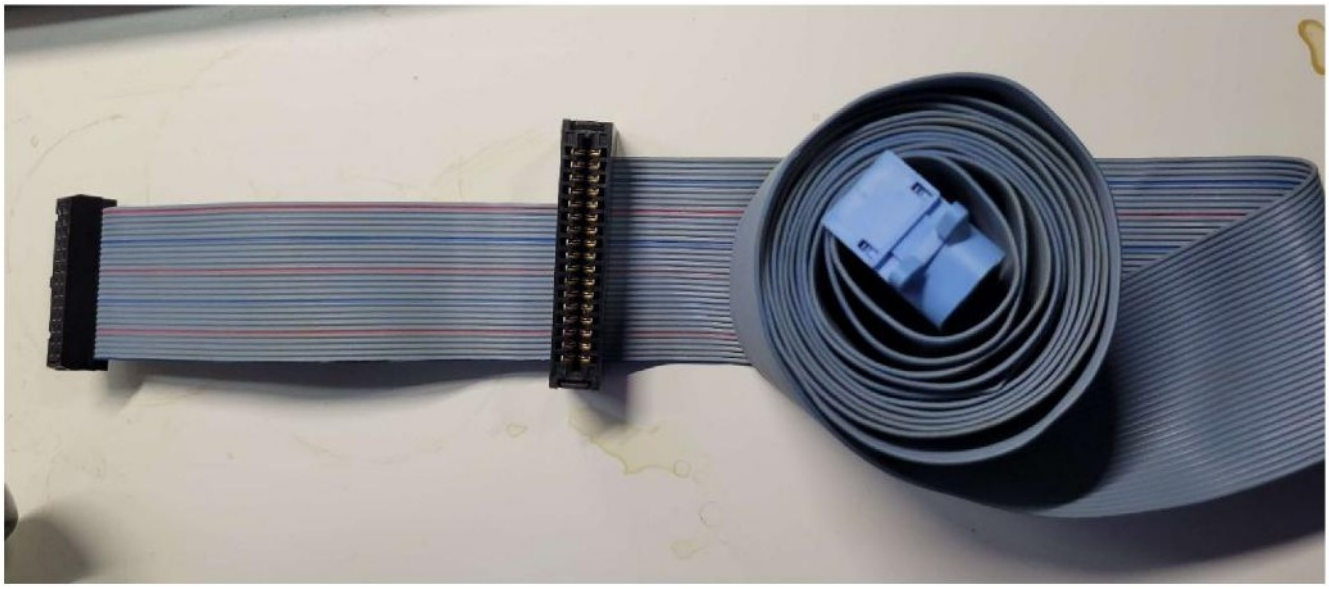
I use my fingernail to split the end and draw it down, slip the connector remembering pin 1 position in this case is the first blue line (connector has a notch, check your final orientation), then slip it as well into the vise to close it



Trim the excess with a razor blade at the 26 pin idc connector as well as being careful clip the excess wires at the 34pin edge connector



And as we say it in France, Voila! You are done ... now you can use it on a regular trs-80 model 3, 4, 5D, 4P as well as the laptop models 100, 102, and 600.



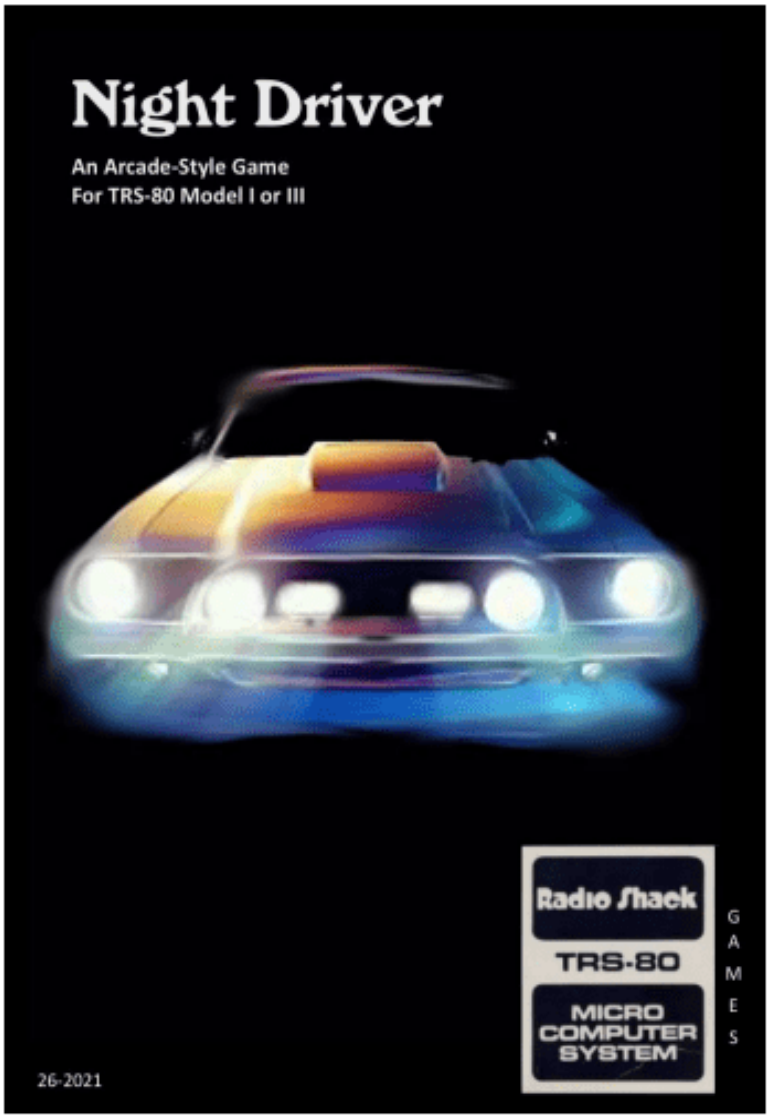
Best part? You saved $27.99 buying from people selling you just a model 100 series printer cable

Any question: email me [at TexasTandyRestorations@gmail.com](mailto:TexasTandyRestorations@gmail.com) or visit on my web site located at [https://texastandyrestorations.org/ ,](https://texastandyrestorations.org/)

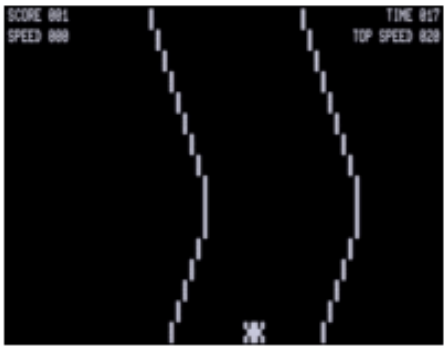
See you all next time with another tip.

© TTR (2022)













Winner of the 2021 TRS8BIT Programming Competition



Night Driver is a fast-action arcade style game for the TRS-80 Model I, III, or 4

The road stretches before you like a black ribbon. You are relieved that the sun's angry face has given way to the welcome darkness. Tonight's mission is simple: Prove that you have what it takes to drive with speed and accuracy.

Features include:
- 100% assembly language for fast-action and graphics
- Sound effects
- Runs on real or emulated hardware (trs80gp recommended)
- Joystick support (NEWKEY/80 recommended)
- Available for **free** at www.plaidvest.com

IN MAV'S WORKSHOP
My Visit to TA22

Tandy Assembly

by Ian Mavric

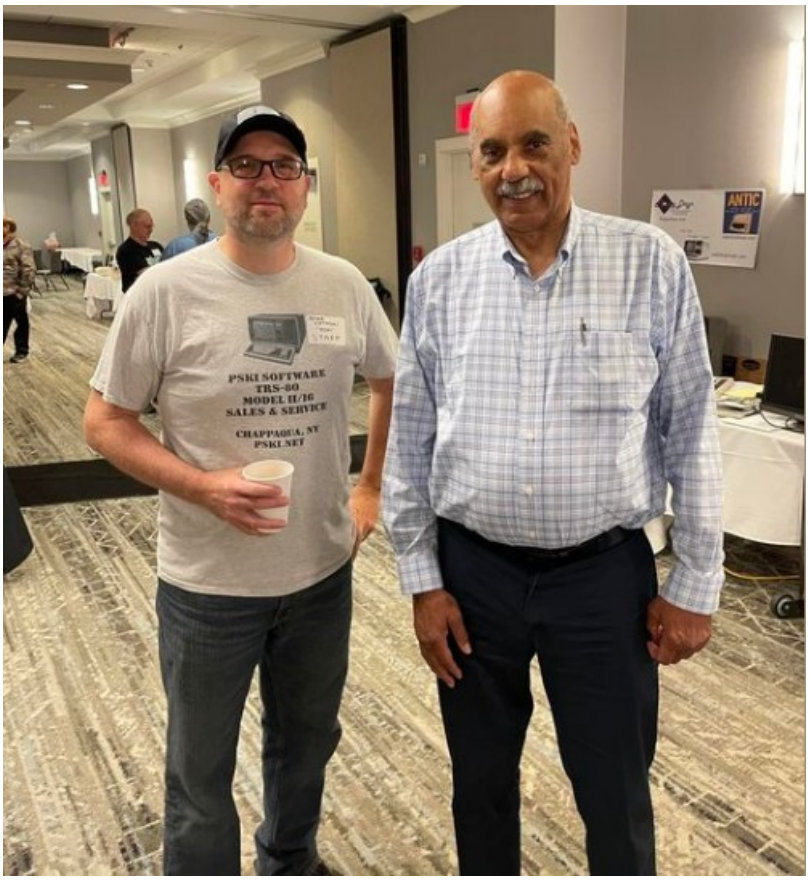


Photo: Pete with Keynote speaker Vernon Hester

As mentioned last month I headed to Tandy Assembly for the first time since 2019 and the first technically post-pandemic TA. The show was great, almost back to it's pre-pandemic best and looks like it has a bright future. It's hard to believe there have been five shows in six years; time has gone by so fast. I implemented some changes mainly in the area of the trivia game which will be discussed later. Tandy Assembly is growing in size and relevance, so much so that to me, if you can only afford to go to one computer convention a year, this is the one you should be attending.

BOOK YOUR FLIGHTS EARLY - I CAN'T STRESS THAT ENOUGH

Tandy Assembly is blessed by having a number of regular fly-ins from all over the world and even within the USA. Canadians a-plenty, as well as Europeans and of course myself from Australia, in addition to the odd Mexican. With the airlines of the world scrambling their way back into profits after 2.5 years of limited ability to fly, airline ticket prices were rather higher than when I last attended in 2019. Couple that with high jet-fuel prices and general inflation around the world the best advice I can give you is don't wait until the last moment to book your flights. For TA23 I'll be starting to look at flights around 6-7 months before flying, I suggest you do the same.

The good news was that once I got on the plane things were pretty much back to normal and none of the seven flights (4 to get to TA and 3 to get home) were delayed. We (I travelled with my son, Jordy, again to TA) were worried as the amusingly-named Hurricane Ian was just beginning to bear down on Florida. Although unlikely to have any impact on Springfield Ohio, where TA22 is held, the knock-on effect of regional flight delays was potentially real.

COMMON COLD STRIKES ONE WEEK OUT

Two weeks out from flying Jordy caught the common cold, and so I avoided him as much as possible but everyone else in the familial household contracted it as well. I guess I should be thankful for small mercies that it wasn't the 'rona but I know that getting the cold 7 days out from flying was going to be a tall order to get over. From experience I know it takes me about a week to get over the cold and recover my energy levels to normal, but my voice remains hoarse for a couple of weeks, during which I also randomly cough, and other symptoms like a sore throat and running nose persist.

It was around two weeks out from TA that I was approached to run the auction at the event, as the usual auctioneer, John Linville, was recovering from an illness and was unable to do it. At first I thought doing three speaking functions at the show was going to be too taxing on my voicebox, but after thinking about it I thought I could bring a much-needed invigoration to the auction. I readily accepted. Getting the cold made me question this decision especially if I lost my voice. Fortunately I didn't.

We managed to fly and although both Jordy and I sounded terrible but no one asked us to do a random C-19 test so they either didn't think we had the 'rona or didn't care.

TANDY ASSEMBLY 2022 - DAY 1

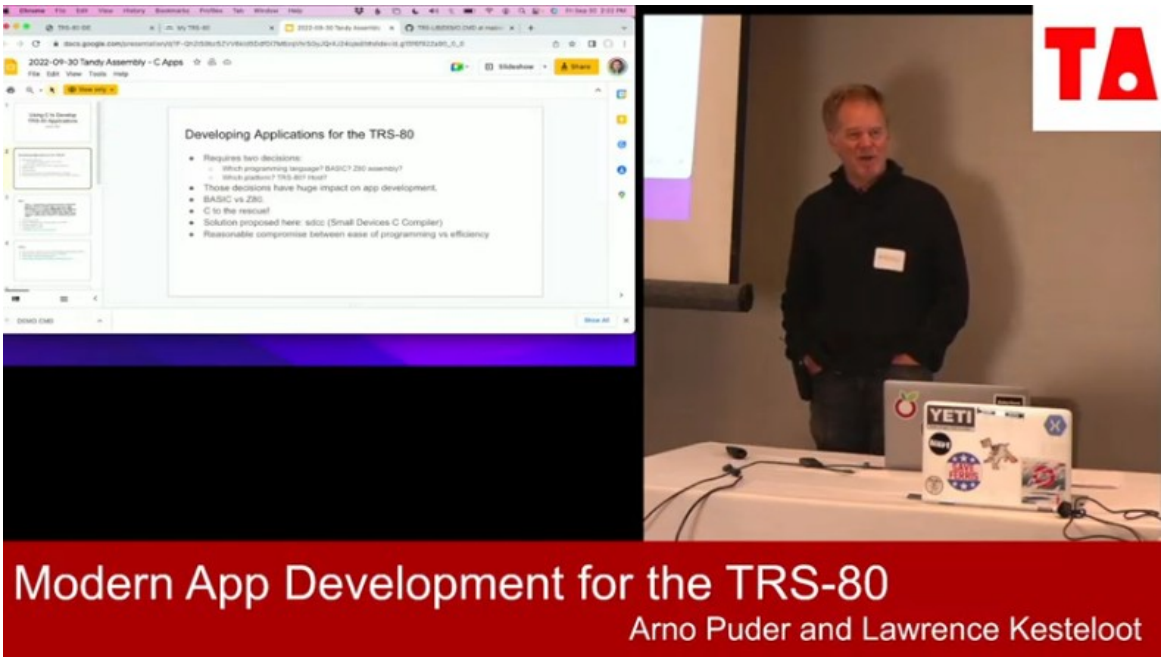
Friday September 30th was the Tech Talk day and a good day it was with 5 speakers including myself. Since TRS8bit newsletter is an electronic medium, and the smart people at TA recorded everything at put it up on their YouTube page for posterity, the hyperlinks will connect you up to watch each session:

TTT101: Jeff 'Hey' Birt:



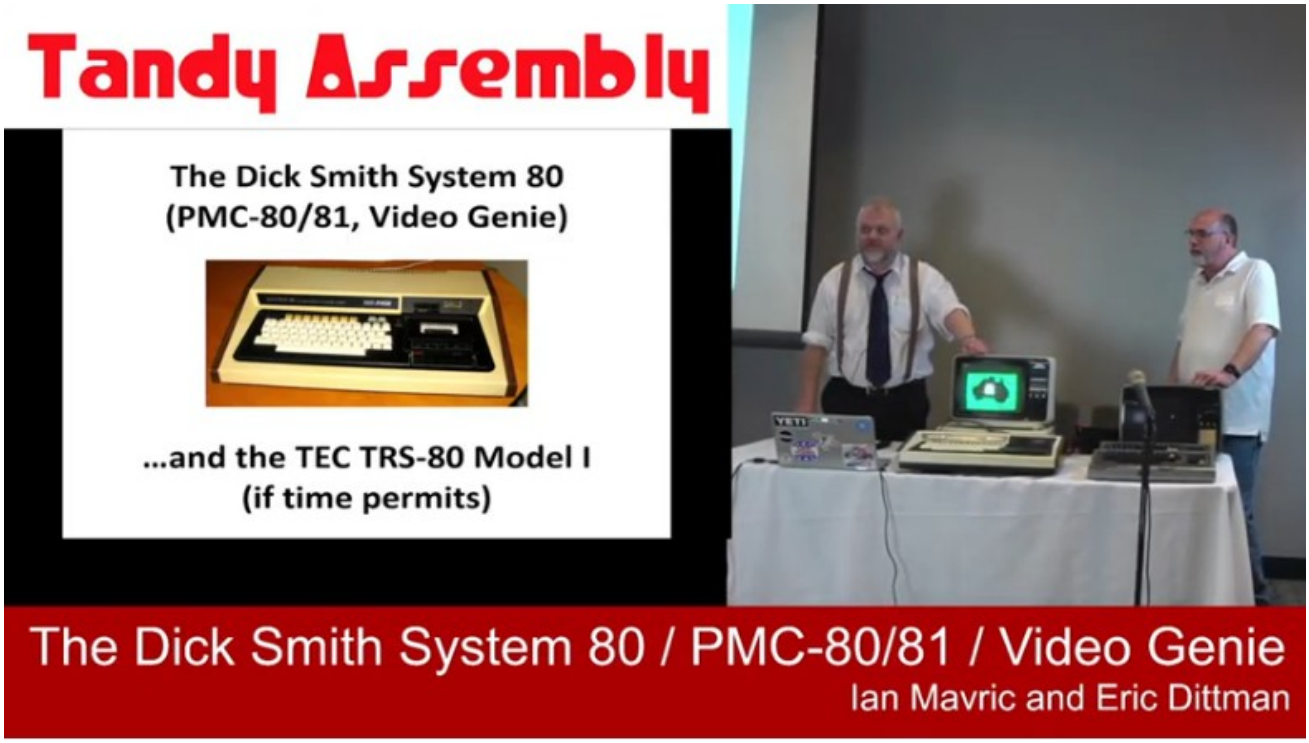
https://www.youtube.com/watch?v=GXDmCx187c0

TTT102: Arno Puder and Lawrence Kesteloot



https://www.youtube.com/watch?v=EIIJU-ZYL_M

TTT103: Myself with Eric Dittman
https://www.youtube.com/watch?v=UODEGV8IorM

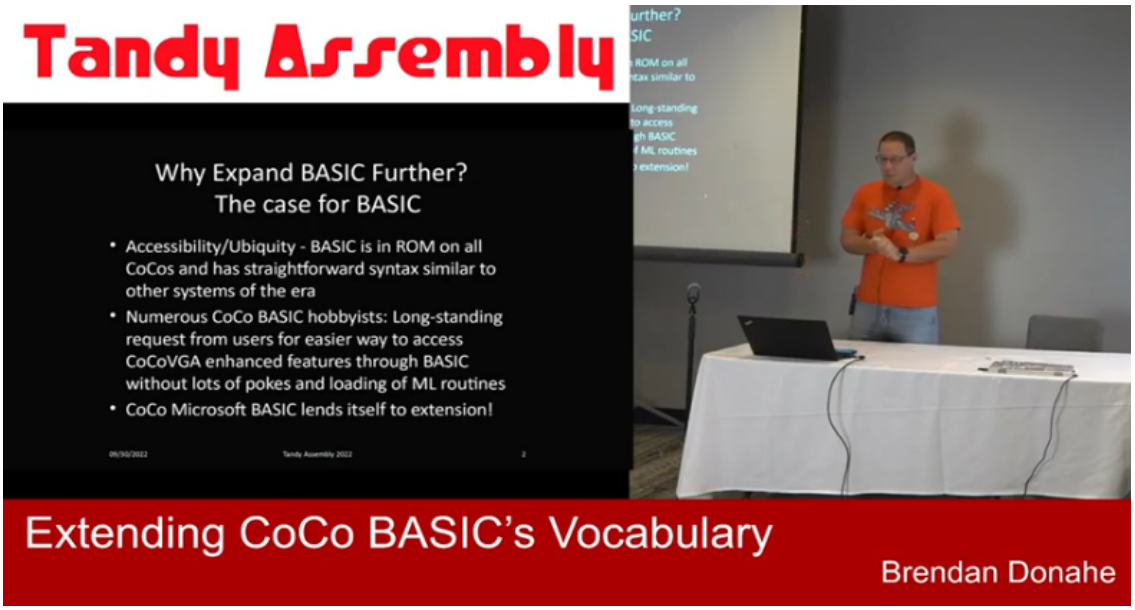


TTT104: Tim Halloran



https://www.youtube.com/watch?v=l8FbDMca7As

TT105: Brendan Donahe

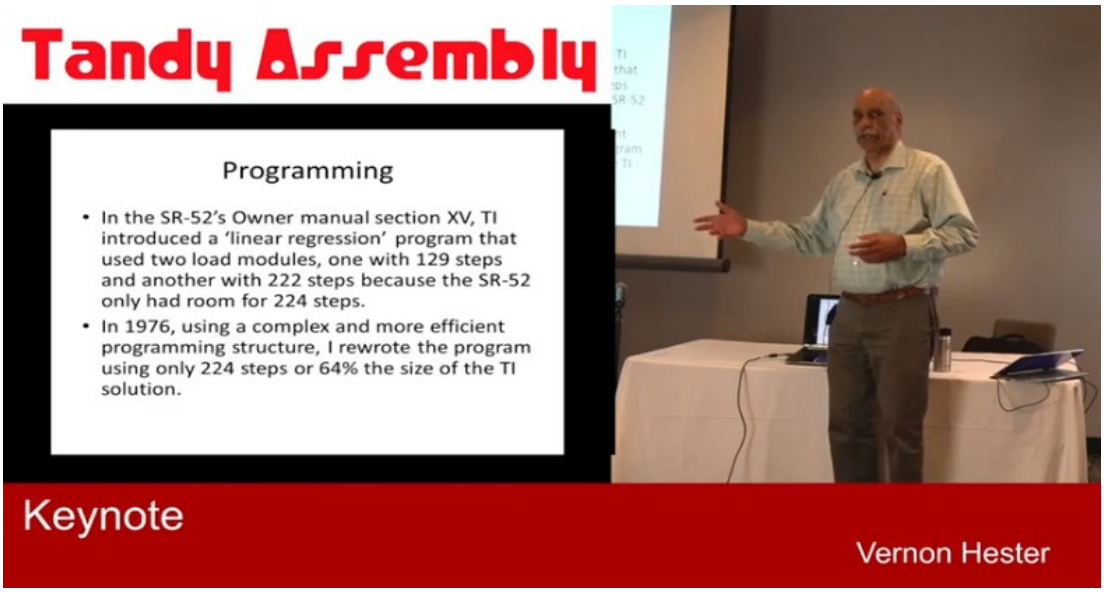


https://www.youtube.com/watch?v=IYCY5NO-gmM

TANDY ASSEMBLY 2022 - DAY 2

Saturday the 1st of October is the first public day and the day where Tandy Assembly really comes into its own. If you are planning to visit TA and are not coming to Friday's Tech Talks, then Saturday is the day to be here. A full day of activities culminating in evening socialising makes for a long fun day. Again, most of it was recorded by the TA official videographer Randy Weaver. In order:

Keynote Speaker: Vernon Hester of MultiDOS fame:



https://www.youtube.com/watch?v=2qv8BfdOLog

The History of Pocket Computers: Jeff 'Hey' Birt



https://www.youtube.com/watch?v=-hE_GLstWXI

RetroStore, TRS-IO, & Other Mysteries with Arno, Sacha Haeberling, and Matt Boytim



https://www.youtube.com/watch?v=5uA0PuDqGxM

I then ran the Auction at 4pm:



https://www.youtube.com/watch?v=mFAzedIOzBc

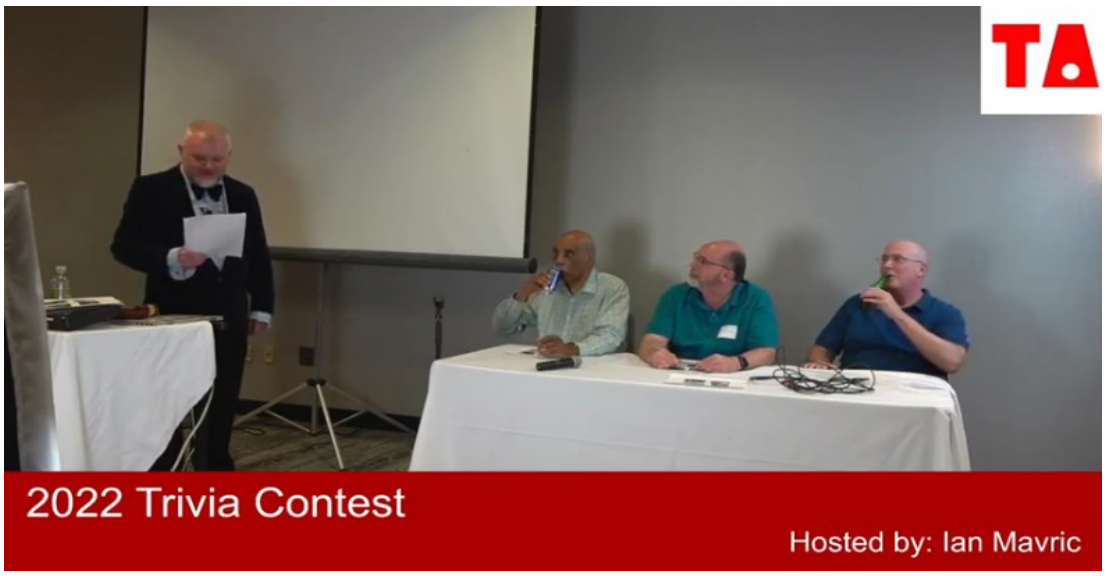
One stipulation I made if I was to be auctioneer was that I needed a proper gavel, and Peter Cetinski came through with a brand new one bought on Amazon at short notice.

On a more serious note I decided to improve the auction by adding a little more pace and whilst I'm not a professional auctioneer, I have been to enough auctions in my long career of flipping computers so be able to pull off a passable auctioneer.

Feedback from those who attended was favourable who liked my auctioneering style. My aim was to try to get through items at a rate of about one per minute (30 seconds for description and 30 seconds for the actual auctioning of the item), which would mean starting each item at a price closer to it's value, and for the most part it worked.

Some of my commentary brought smiles to peoples faces such as "Box of random crapola", "No fun software consignment of business apps, no fun to be had here", "Broken computer guaranteed not to work" and "Mad Men era Oscilloscope".... Mad Men era being my description for anything from the 1960s.

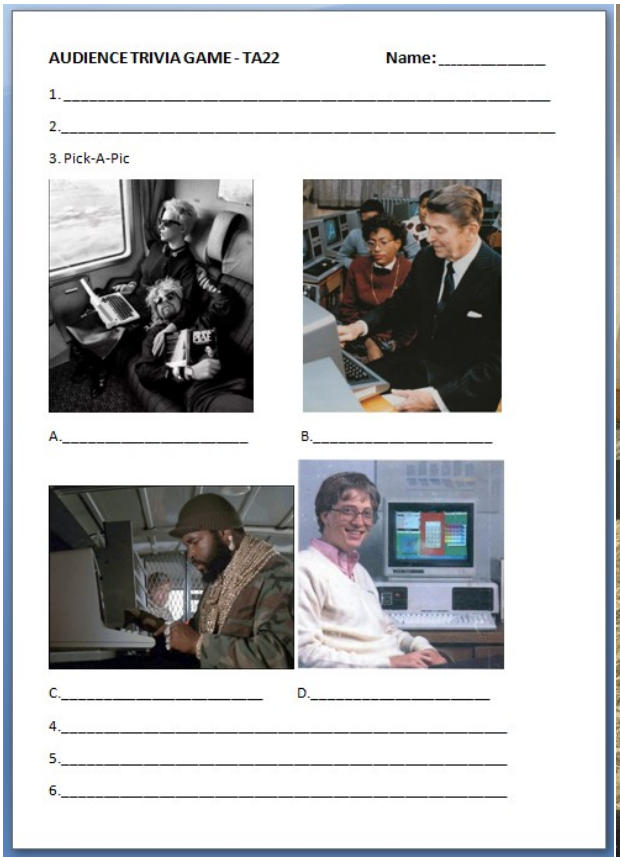
Concluding the night was the trivia competition, which I ran this time, a new improved upgraded version:



https://www.youtube.com/watch?v=PZlgaZVGJFU

I explained to the audience that since I won three years in a row (2017,18,19) I would retire with my no-losses scorecard intact, and the best way to utilise my breadth of knowledge at TA was to become the Quiz Master at the Trivia game.

I used my experience at pub trivia to include elements which would allow all the audience to play along with their own questions. That way we could have two winners, the winner of the three Experts up front, and the winner of the general TRS-80 knowledge in the audience. Everyone in the audience was given a game sheet to fill in the answers to the questions when I asked them.


AUDIENCE TRIVIA GAME - TA22 Name: _____

1. _____

2. _____

3. Pick-A-Pic

A. _____ B. _____

C. _____ D. _____

4. _____

5. _____

6. _____



Picture: Audience Trivia Game answer sheet 2022 and your Quiz Master Vernon Hester, Eric Dittman, and Tim Halloran were the three experts, Eric being there to defend his win at TA21. It was a close game as I wrote different types of TRS-80 related questions into groups such as Math, Geography, Makers, and Rapid Fire questions. Eric was eventually victorious, and will be back at TA23 to defend his crown.

To keep the audience game as honest as possible when it was over I asked everyone to hand the form to the person next to them for checking and scoring, then handing back to it's owner, which is why each form as a space for contestants name. I then ask everyone to stand up and by counting down "If you only got one question correct sit down"... "If only two correct sit down" it was apparent that most people got 5 or 6 right, which was a good result. The eventual winner was Peter with a score of 8. Feedback from the participants was again very positive and now that people understand the new and improved trivia game format we expect it will be a full audience in 2023.

TANDY ASSEMBLY 2022 - DAY 3

Sunday the 2nd of October is a quieter day, all the exhibits are still set up for those who wish to attend and also being the last day, the best deals are often to be had if you intending on buying something. Also the last speaker for the show was on at 10am sharp.

New Hardware and Software for Big 8" TRS-80s : John Elliott IV



https://www.youtube.com/watch?v=7jBKwWGcpl8

Packing up the place commenced at around 11:30am and since no one was in any hurry it was slow going and completed around 3pm, another Tandy Assembly done and dusted. Discussion abound on travel arrangements to get home was the order of the evening as we all headed to various eateries for dinner and drinks.

CONCLUSION - TA23 - WHAT'S STOPPING YOU?

You've read all the way to the end of this article and there is no further convincing needed. TA is the place to be for the gathering if the TRS-80 and Tandy enthusiasts. Remember this event encompasses all computers made by Radio Shack, including the Cocos, Pockets/Portables, MS-DOS machines, in addition to the Z-80 and 8in workhorses the company is best known for. The event is only going to get bigger so expect even more tables in 2023. If travel is a concern start saving early... the cost of long-distance travel is soon forgotten once you are here and in amongst the TRS-80 faithful.



Ian Mavric
ianm@trs-80.com



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

Tandy Assembly

THERE ARE A NUMBER OF VIDEOS TO WATCH ON 'YOUTUBE' IF, LIKE ME, YOU COULDN'T MAKE IT IN PERSON. HERE'S JUST A FEW PHOTOS FROM THE VARIOUS VIDEOS AVAILABLE. *ED*



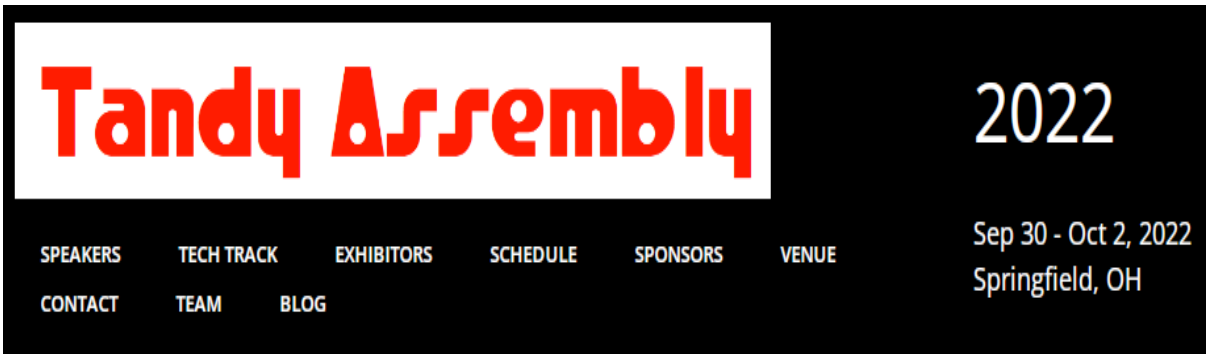












Tandy Assembly 2022 had a lot of great speakers. If you didn't make it, you can see some, or all, of the videos on YouTube:

2022 Trivia Contest
2022 Auction

The RetroStore, TRS-IO and Other Mysteries

History of Tandy Pocket Computers

Keynote – Vernon Hester

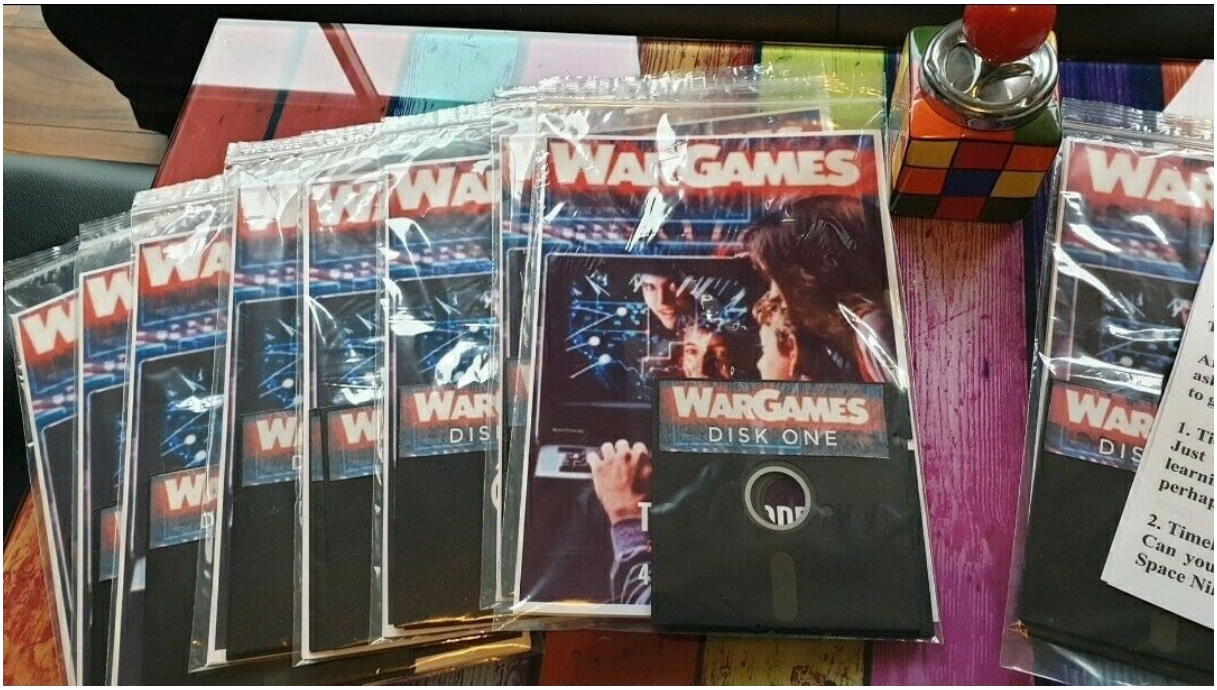
Extending CoCo BASIC's Vocabulary

Using an Oscilloscope to Troubleshoot TRS-80s

The Dick Smith System 80 / PMC-80/81 / Video Genie

Modern App Development for the TRS-80

Vintage Computer Repair / Jeff Birt



All new from Dreamland Software for 2021.

This two disk package comprises what is in effect the FULL Dreamland Software collection.

Based on the classic 80's film 'Wargames', your entire experience is controlled by the W.O.P.R computer from the aforementioned movie.

Greetings Professor Falken.

New titles including (of course) Global Thermonuclear War. (Ouch.)
Retro Football Manager. (Based on the ORIGINAL 80's classic, a full soccer management simulation.)
The Battle of the Mutara Nebula. (If you are a Star Trek fan, then you know FULL WELL what this is.)
And the Kobayashi Maru Scenario. (Another one for the Trekkers.)

Also included, are **ALL** games released by Dreamland Software since inception four years ago.

The hugely successful Actual Reality. It's sequel Actual Reality II - Battlestar Raven And RockStar.

14 Programs in total (Including the W.O.P.R Master Program.)
Both disks full to capacity whilst remaining bootable.

Full video preview available here:
https://youtu.be/XXD1IG8-CO0

Please note that this item is currently available for Model One ONLY.
Model Three/Four will be available soon. (Watch for update.)



HERE'S A REQUEST FOR HELP FROM TERRY STEWART, IN NEW ZEALAND. HAVE YOU ANY ADDITIONAL SOFTWARE FOR HIM WHICH HAS BEEN ENHANCED TO BE USABLE ON AN EXATRON 'STRINGY FLOPPY' ?

Does anyone have a copy of Electric Spreadsheet for Exatron Stringy Floppy? I used to have this but was unable to recover it from my original wafer. I'd like to add it to the ESF wafer image archive page here:

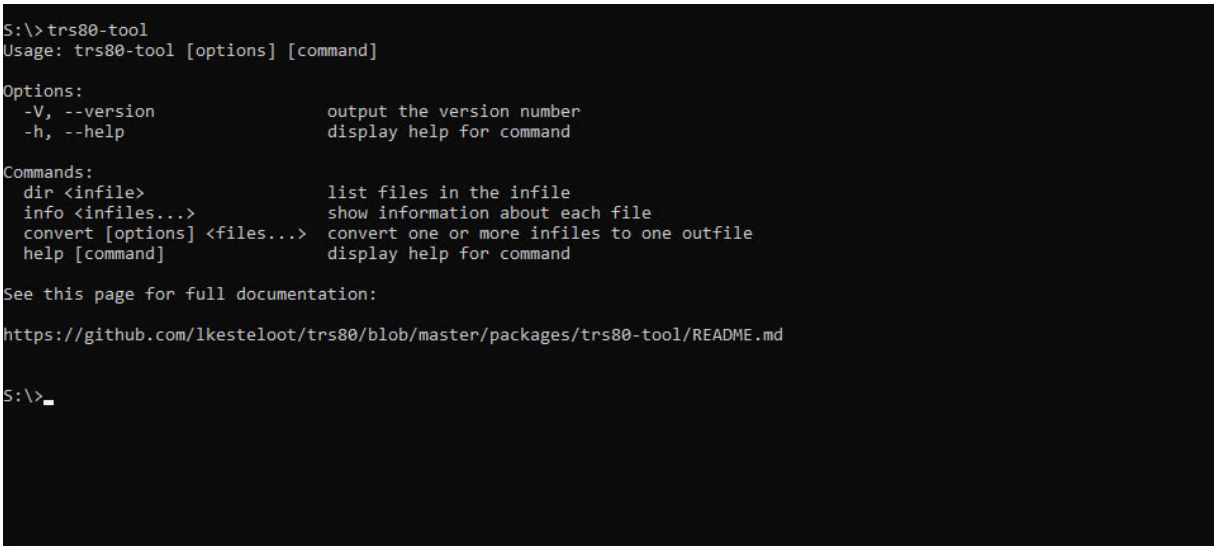
https://www.classic-computers.org.nz/.../software_esf...

Any other ESF software would be most welcome.



AS ALWAYS, OF COURSE, I'M ON THE LOOKOUT FOR ANY SOFTWARE FOR THE U.K.'S ACULAB 'FLOPPY TAPE'. THERE WERE VERSIONS SPECIFICALLY 'ZAPPED', FOR USE ON THE AFT, OF ELECTRIC PENCIL, SCRIPSIT, ZEN, LEVEL III BASIC AND VISICALC. THERE WAS ALSO THE ENHANCED BASIC, XBAS. IT'S SO DISAPPOINTING TO THINK THAT THEY HAVE ALL BEEN LOST!

Lawrence Kesteloot has rewritten, his TRS-80 Cassette command line tool to support many new functions. Called "TRS80-TOOL" it is a command-line tool for manipulating TRS-80 files.



Lawrence Kesteloot has updated his "TRS80-TOOL" to v2.3.1

It runs under NODEJ, Linux, macOS, and Windows. It can be downloaded from Lawrence's site or locally from the The Virtual Tape Utilities page on this site.

The new version adds support for multi-file CAS files (such as CLOAD Magazine or Temple of Apshai) and will try to guess (and set, if you want) the starting address of a SYSTEM file.

The main page for TRS80-TOOL can be found at

https://github.com/lkesteloot/trs80/tree/master/packages/trs80-tool

along with instructions.

It runs under NODEJ, Linux, macOS, and Windows. It can be downloaded from Lawrence's site, the The Virtual Tape Utilities page on this site or right here for Windows / Linux / Mac.

TRS-80 M4 Adapter Board

Mark J. Blair

I previously designed a small adapter board to allow a regular 2764 EPROM to be plugged into a TRS-80 Model 4 (Gate Array version only) in place of ROM chip U4, in order to use the new auto-booting feature of the FreHD hard disk emulator.

As I posted earlier, the assembled board was a bit too tall to fit under the aluminium shield that is present on US Model 4 computers, and it also needed a couple of pull-up resistors added. I changed my board design to address these problems.

I've received my new PCBs from the manufacturer, and they have solved the height problem that I encountered with the first boards. I reduced the height of the assembled board by replacing the DIP sockets with individual socket pins made by Mill-Max. These socket pins required larger holes in the PCB, and I added a couple of necessary pull-up resistors while I was at it.

The socket pins allow the ROM and EPROM to sit almost flush with the PCB when plugged in. They are a tight fit for the IC pins, so extra care is necessary to avoid bending pins when plugging in the chips. I stuck some vinyl equipment feet on the bottom of the board to keep it from popping out of the socket if the left side of the board is pressed.

All of the board files are available on GitLab:

https://gitlab.com/NF6X_Retrocomputing/M4-GA-ROM-BC

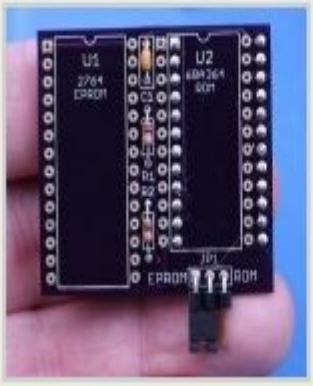
I have also shared the design at OSH Park so that others may order bare boards:

Order bare PCBs at OSH Park

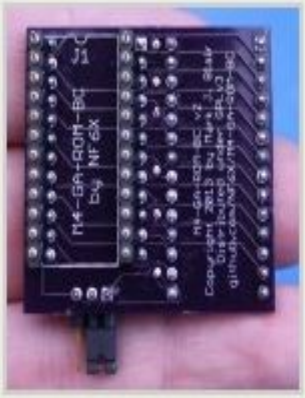
I wanted to be able to select between the original ROM and new EPROM without opening the computer's case. I mounted a small SPDT toggle switch on the aluminium shield so that it could be flipped through one of the vent slots, and connected it to the ROM/EPROM select jumper on my board. I had to do some minor filing of the vent slot

TRS-80 M4 Adapter Board

Mark J. Blair



Assembled Board, Top Side



Assembled Board, Bottom Side



Assembled Board, Bottom/Edge View



Height Comparison: v2 on Left, v1 on Right



Installed in Model 4



Installed in Model 4, Top View



SPDT Switch and Cable



Switch Connected to Board



Switch on Top of Shield



Switch Accessible Through Vent Slot


Joe Kay
Director
NORTH COMPUTER WEST MUSEUM
Create Experience Learn
joe@nwcomputermuseum.org.uk
01942 582826
Information Technology facilities & training
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NORTH WEST COMPUTER MUSEUM
Create Experience Learn
www.nwcomputermuseum.org.uk
Leigh Spinners Mills, Park Lane, Leigh, WN7 2LB

Problems for collectors and users of Big Tandys with their keyboards.

Hans

The collectors and users of these computers will no doubt have encountered various problems with their keyboards It could be missing or sometimes not working and in the best case one is for sale on Ebay , it's priced at an astronomical amount and the same applies to shipping costs too!

Even if you find a suitable keyboard, the problem is not necessarily solved. Either the keyboard appears not to work or can type several letters at once. This is usually because the foam carriers of the Mylar plates have decayed with time.

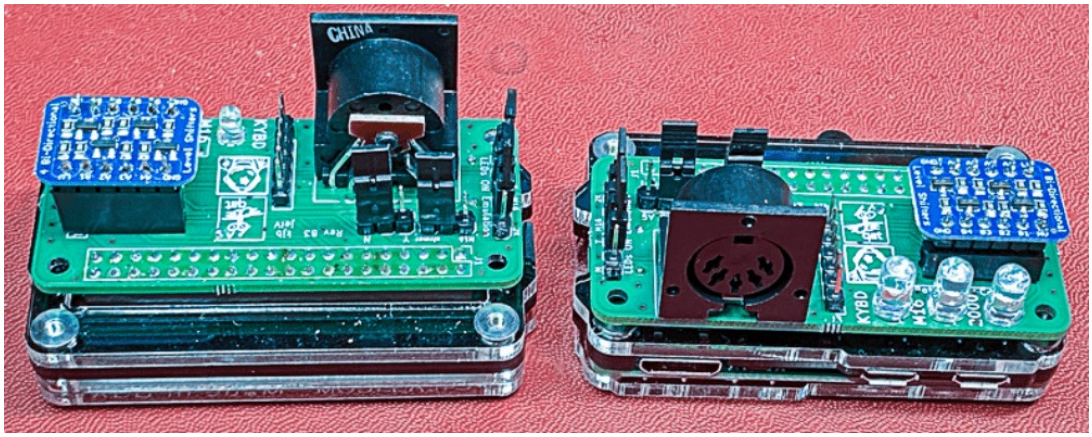
To repair this, a set of foam disks and often more parts are necessary and replacement is absolutely guaranteed to cost you an entire evening's work, not to mention the cost of the materials together with postage and packaging.

I have original foam pads, plungers, springs and housings in stock for the avid users and can do that for provide a reasonable price.



However, there are alternatives available for collectors without a keyboard and those who don't feel like such a tedious job. One of Discord's users, ‘Rocket Fueled’, has developed an adapter to replace the Tandy keyboard allowing the use of a standard Windows keyboard with USB connection The USB keyboard. connects to a RaspberryPi Zero and has a 5 pin Din output in which the cable that comes from the Model II or Model 16 can be plugged in to.

The set consists of a PCB that is mounted on the I/O port of the Pi and which must be assembled by the buyer.
Furthermore, a conversion for the Pi is handy and you need an Ada-Fruit level changer PCB
.
The result will then look like this



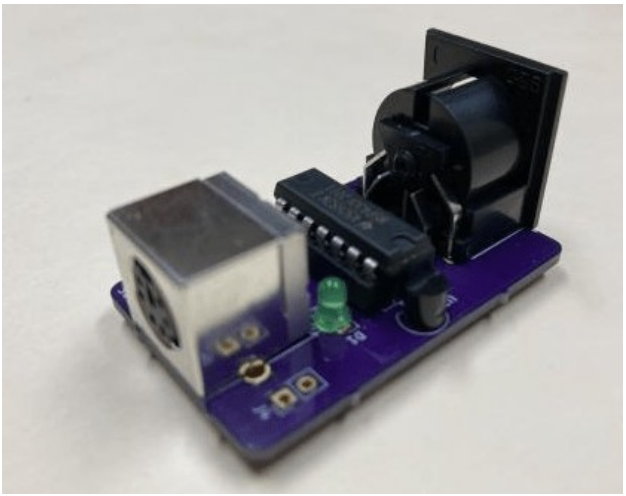
I neatly put mine together in a few hours and it worked right away.
What are the advantages:
It works absolutely flawlessly. The print has many options, such as choosing Tandy 2000 and Model II emulation with jumpers.
Power supply of the PCB is via the connection cable or via an external USB power supply.
Three LEDs that indicate the status and a signal for each key that is sent. These LEDs can also be turned off.

Unfortunately, this solution also has some minor drawbacks.
Since the software works on the Pi, it must be reinitialize each cold boot, which takes 30 seconds.
If you choose the external 5 volt USB power supply this is only once if the adapter remains under voltage.
If you opt for power supply via the computer cable, this delay is after every cold start of the computer.(30 seconds wait).
The adapter has been developed for the Model II and Model 16. It can therefore also be used for a Model, 12, 16B and 6000, but then you have to build an adapter cable yourself according to the supplied diagram.
This is also the case when used on a Tandy 2000.

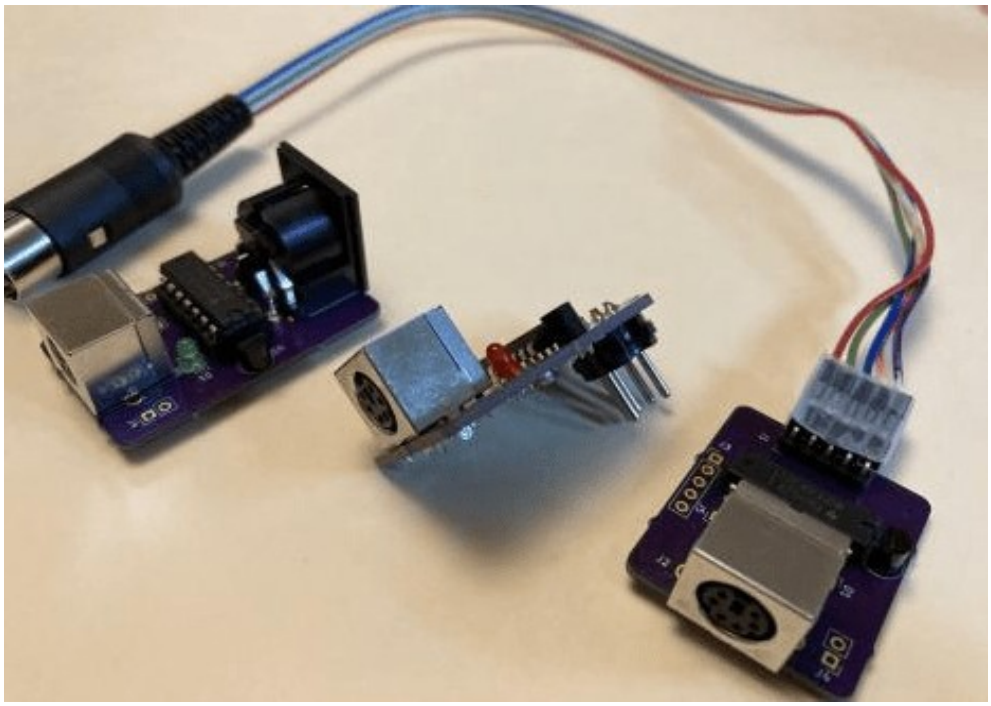
Furthermore, the firmware can be easily updated by modifying or replacing the boot USB of the Pi.
Now the biggest drawback. Since the adapter has its own processor and also needs some additional components, the adapter quite expensive and if shipping and customs costs are added, then the price is close to a used keyboard on Ebay.
However, there is a third option to solve this problem. An old acquaintance of the Tandy users is Mathew Boytim, known for the extensive work he does and has done in the field of video and hard drives for the Models 1,3 and 4.
He had a Model 6000, unfortunately with a defective keyboard. He then decided to make a new adapter according to a different concept. Its design is based on the TI MSP430 and a simple PCB with minimal components.

First up is Model A
The input is provided by an older Windows keyboard with a PS/2 mini connector.
The output is the well-known 5-pin Din connector where the cable of the Model II or Model 16 can be plugged in. The connection cable from the computer and the adapter is always active when you turn on the computer.
The processor comes in a socket and can be updated by swapping or serial programming. The whole adapter is very simple and works absolutely perfectly. The adapter has no additional options or other extras but does the job without any problems. The only extra is a Led which indicates the status of the Caps Lock
switch by changing his blinking speed, rather convenient.

There are 3 models available.
Model A is for Model II and Model 16. Here plugs the computer cable directly into the adapter.
Model B is for the Model 12, 16B and 6000 has a connector that plugs directly into the computer.







All in all, two very elegant and attractive solutions.

There is also a Model AB, it has no DIN connector but a 5 pin header to which the user can adapt for all models of Tandys. The homemade cables can switch between all models.
The major advantages are that it’s a compact construction and has minimal costs. The adapter is so small that the Model B won't even stand out if it is fitted.

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2022 POWER SUPPLIES
FOR THE TRS-80 MODEL 3 / MODEL 4/4D/4P



* Uses modern day MEAN WELL power supply units
* 50w for Model 3 version and 65w for the Model 4 version
* The Model 4 version uses a SEPARATE +12V POWER SUPPLY (prevents video "spasm")
* No more RIFA CAP explosions
* No more COLD solder joints
* Units are DIRECT REPLACEMENTS for the original power supplies in all models
* Extra +5V output connectors (1 on Model 3 and 2 on Model 4) for Gotek/freHD boards
* For more information and pricing contact

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https://jaynewirth.wixsite.com/newsoft (website)
jaynewirth@verizon.net (email)



Sources:
Microcomputing Magazine,
The Space Gamer,
TRS-80.org,
MobyGames…

By **Ernst Krogtoft**

Welcome to another quick bits article. I will do a more general article on med systems software at some point in the future, for now, I'll be doing a few short articles on the company's earliest games. Frank Corr's Deathmaze 5000, a first-person 3d survival adventure game, was the second game released by the company. While it fairly quickly fell into obscurity, its notorious difficulty has over the years earned it somewhat of a reputation along with a small cult following.

Between his studies as a freshman at *MIT*, 18-year-old *Frank Corr* was falling in love with computers. His spare time was spent punching in *BASIC* commands into the *TRS-80* computer. The year was 1980 and while the Apple II and now Atari's 8-bit home computer offerings were better in every aspect, the monochrome text-only TRS-80, which had been introduced three years earlier, was still the best-selling home computer and the one with the largest selection of software.
The computer had come to herald text-only interactive fiction after *Creative Computing*'s Software label had published *Scott Adams*' *Adventureland* in 1978, the very first microcomputer adventure game.

By 1980, fast-paced action games, with graphics and colors, were rapidly emerging on competing systems, and while the TRS-80 was slowly becoming more and more irrelevant in the consumer market interesting titles continued to emerge.

Corr's pastime with the TRS-80 turned into *Rat's Revenge*, a simple yet impressive first-person perspective maze game, initially made for himself to enjoy. When the game was complete it reached *Mike Denman* of *Med Systems Software* in Chapel Hill, North Carolina. Denman saw potential in the game and contacted Corr with a desire to publish it. While Corr initially had no intentions of selling it, he agreed.

Denman marketed and sold Rat's Revenge while Corr plunged into Machine Language and wrote an English research paper on it. By June of 1980, Corr was unsuccessful in finding a job and decided to create a new game using elements from Rat's Revenge. Utilizing Machine Language he was able to create more advanced graphics routines and a more elaborate game started to take shape.

Halfway through development, the new game, *Deathmaze 5000*, slowly took on adventure game elements. While the basis of the game was Corr's first-person perspective maze, he implemented survival elements and a simple two-word text parser for the player to interact with objects and monsters throughout the five levels. The game didn't feature a timer but certain events were determined by the number of moves made. Food, torches, and other objects, some required to complete the game and some irrelevant, could be found throughout the levels.

The majority of adventure games at the time were, for non-seasoned players, difficult or even impossible to complete, not only by hard-to-solve and illogical puzzles but also by obscure game design decisions, complex mazes, and quirky text parsers. Corr wanted to target the seasoned players or the plain-out stubborn ones, completing Deathmaze 5000 shouldn't take mere weeks but months, even with a crude hint system and a save/load feature built in. Navigating the mazes, which had to be mapped out, avoiding traps and monsters were very much based on trial and error as everything in the game was pre-determined, play it enough times and you would progress. One puzzle in particular would become notorious and the source to much brain drain.

When Deathmaze 5000 was finished in the autumn of 1980, after three months of work, Corr had created one of the more difficult games of era. By December 20, 1980, Med Systems claimed that only two people outside the company had successfully solved it…A Hint sheet with 15 encoded hints could be bought from the company at the cost of $1.

Adams' adventures, which had heralded the text-only genre, were much more complex in story and plot but with Corr utilizing graphics as the main attraction of his game, this was pioneer territory. *Ken* and *Roberta Williams*' *Mystery House*, the first adventure game to include graphics, had been released only a few months earlier. While Mystery House would become one the most influential games ever made Corr's survival adventure would eventually fall into obscurity. Deathmaze 5000 would become the first game of four in the *Continuum* series of 3D graphic adventures by Med Systems and helped play an instrumental part in the company's early years. Later games like *Asylum* and *Laser Defense* would further contribute to the company's success.

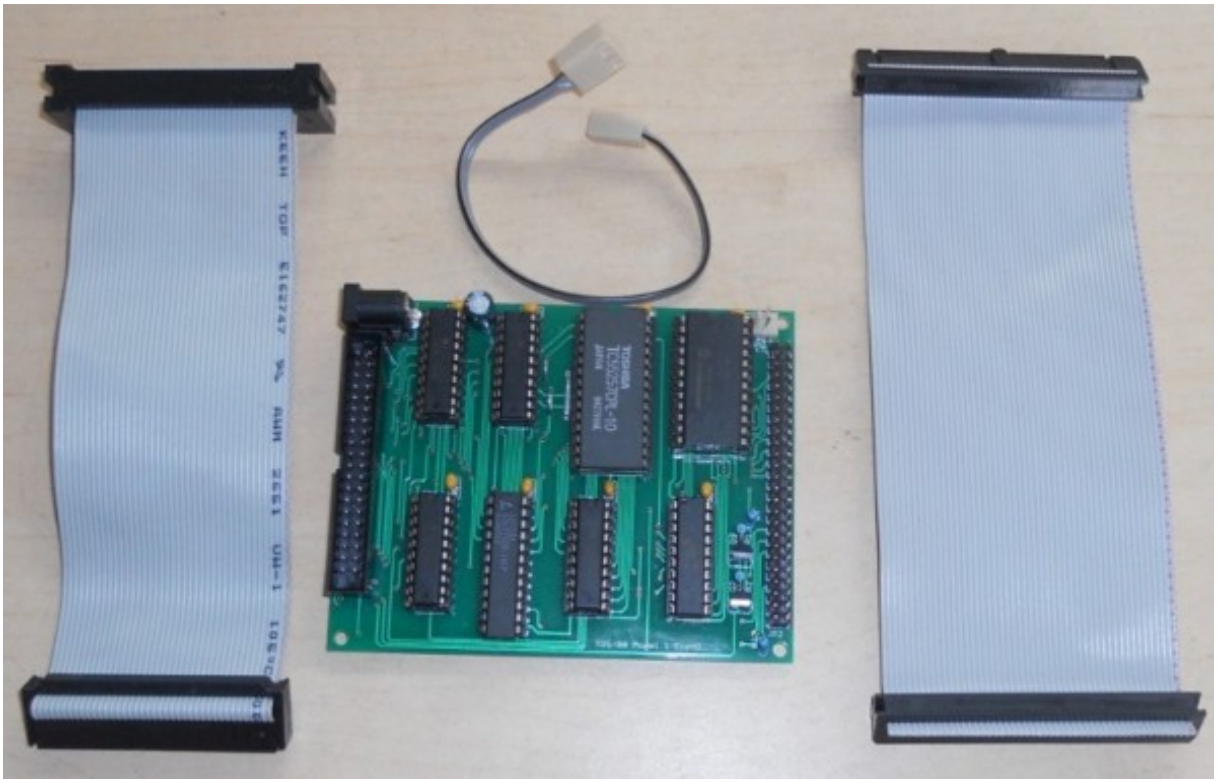

Deathmaze 5000
Copyright 1980 by Med Systems
All rights reserved.
All plagiarism will be prosecuted to the fullest extent possible and rewards given where applicable.
Defective tapes will be replaced promptly upon return. Such reorders will be filled within 48 hours whenever humanly possible.
No warranty is either expressed or implied concerning the validity or desirability of any piece of software. We welcome comments or complaints and try to satisfy, but realize that we cannot please everyone.
Our tapes are left open for user inspection and modification. Therefore, we highly recommend the making of a back-up copy.
Several reasons tapes won't load are:
(1) Dirty tape heads—clean.
(2) Tape drag—tap cassette on both sides.
(3) Magnetization—demagnetize heads frequently.
Please check these before unnecessarily returning a cassette.
MED SYSTEMS
DISK ADVENTURES
Med Systems adventures on disk are auto-boot disks. To load the program, simply insert the disk in drive 0 and reset the system. The program will load and run automatically.
The programs are protected to prevent unauthorized copying. We guarantee these disks to load. If you return it within 30 days of purchase to Med Systems or the dealer from which you bought it. At any time, you may return the disk for replacement if you send Med Systems the original disk and a $5.00 replacement charge.
Deathmaze 5000 is a full scale three-dimensional adventure. You move through a gigantic five story building depicted graphically on your monitor in 3-D perspective. Scattered through this building are a multitude of objects and incredible obstacles. Your only goal is to leave Deathmaze Alive.
Movement is via the four arrow keys. The up arrow actually moves you ahead one step. The other arrows turn you left, right, and around. Graphics generation is instantaneous, this being a machine language program. Additionally, several one word commands will fling you down hallways. One of these is FART
At any time one and two word commands may be issued. These allow you to manipulate objects, solve problems, and probably get yourself killed. You must be on top of a box or other object to manipulate it. Some useful commands are OPEN, BOX, GET, KILL, DROP, and HELP. Many, many more exist.
A game may be saved at almost any time. Simply type SAVE GAME. A save, as well as a restore, takes under five seconds.
The five levels of Deathmaze 5000 are connected by pits, elevators, and a scientific marvel. Connections are not always obvious. Some are deathtraps. Further, many actions are order related. You may have to accomplish one action before safely committing another.
Deathmaze is gigantic. There are over 500 locations. Be patient. You will not solve Deathmaze during the first week. Or the first month. Make maps. And above all, BE CAREFUL!
Med Systems Software
P.O. Box 2674
Chapel Hill, N.C. 27514
DEATHMAZE 5000
TRS-80 L11 16K
COPYRIGHT 1980 BY MED SYSTEMS
ALL RIGHTS RESERVED
INTERIM NOTES:
These revisions will be added to future booklets of DEATHMAZE 5000, LABYRINTH.
BOOTSTRAP:
To dump to Model III disk, follow steps 1-4 on the booklet.
Then, type:
NOW ENTER (CLEAR400)(DEFUSR=&H5200):(A=USR(0)):A=A+&H300
To run, simply type RUN
LABYRINTH:
To dump to Model III disk, follow steps 1-4 on the booklet.
Then, type:
NOW ENTER (CLEAR400)(DEFUSR=&H5200):(A=USR(0)):A=A+&H300
To run, simply type RUN


DEATHMAZE 5000
TRS-80 L11 16K
COPYRIGHT 1980 BY MED SYSTEMS
ALL RIGHTS RESERVED


DEATHMAZE 5000
DEATHMAZE 5000 IS A FULL SCREEN 3-D ADVENTURE. TO MOVE, USE THE FOUR ARROW KEYS. TO MOVE FORWARD, PRESS ↑. TO TURN IN PLACE TO THE LEFT, RIGHT, OR TO TURN AROUND PRESS ←, →, OR ↓ RESPECTIVELY. ONLY ↑ ACTUALLY CHANGES YOUR POSITION. THERE IS NO TIME LIMIT. HOWEVER, YOU MUST PERIODICALLY FIND FOOD AND FRESH TORCHES TO AVOID STARVATION AND/OR DARKNESS. BOTH CAN BE FATAL. ALL OBJECTS ARE IN BOXES THROUGHOUT DEATHMAZE. YOU MUST BE ON TOP OF A BOX TO OPEN OR OTHERWISE MANIPULATE IT. THE FIVE LEVELS OF DEATHMAZE ARE CONNECTED VIA PITS, ELEVATORS, AND A SCIENTIFIC MARVEL. CONNECTIONS ARE NOT ALWAYS OBVIOUS. MULTIPLE MOVEMENT IS AVAILBLE THROUGH FART AND OTHER WORDS YOU WILL NEED. SOME USEFUL WORDS ARE OPEN, GET, DROP, AND SAVE GAME. MANY MORE EXIST.
MED SYSTEMS SOFTWARE P.O. BOX 2674 CHAPEL HILL, N.C. 27514
(919) 933-1990
PRESS ANY KEY TO ENTER DEATHMAZE 5000...
Radio Shack
TRS-80
VIDEO DISPLAY
DEATHMAZE 5000
MED SYSTEMS, LTD. 1980
TRS-80
DEATHMAZE 5000
BY
FRANK CORR, JR.
TRS-80 MODEL I LEVEL II 16K
TRS-80 MODEL III LEVEL II 16K
MED SYSTEMS SOFTWARE

“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"

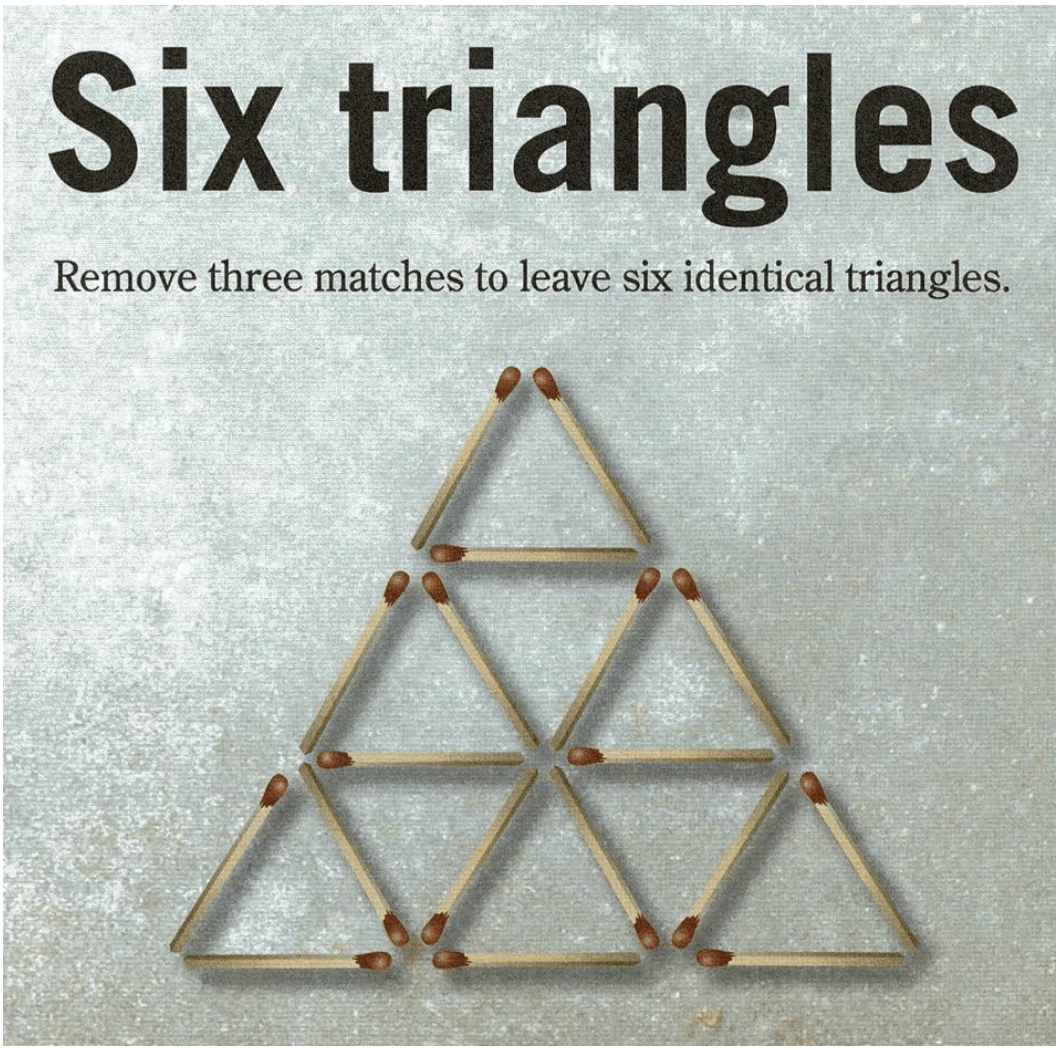


-Emulates a TRS-80 hard drive, but faster than any hard drive!
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-Uses SD card for storage medium
-Bonus free Real Time Clock function!
-Designed in Belgium and proudly built and shipped from Australia
-Kit form or fully assembled

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

STRETCH YOUR MIND

HAROLD FINCH



THE ANSWER IS ON PAGE 67

Applesauce Software Download Page

The Applesauce Floppy Drive Controller is a stand-alone box which acts as a middleman in reading TRS-80 disks. It can read hard sectored disks as well as Apple II, Apple III, Apple Lisa, Apple Macintosh, Atari 8-Bit, Atari ST, Commodore 1541, Commodore Amiga, Heathkit/ Zenith, IBM PC, North Star, TI-99/4, and Victor 9000.

On the hardware side, there are 3 drive connections on the unit: a 20-pin Apple Disk II-compatible, a DB-19 for Apple compatible 5.25″ and 3.5″ drives, and a Shugart-compatible 34-pin port for 5.25″ and 3.5″ PC drives.
At the other end is a USB A connector for plugging into your computer. All of the popular drives used for imaging should be good to go: TEAC FD-55B (5.25 360K), TEAD FD-55GFR (5.25 1.2M), Panasonic JU-475 (5.25 1.2M), Sony MPF920 (3.5 1.44M), etc. Applesauce will test the drive jumper settings when you set up a profile for your drive.

The Applesauce unit provides +12V, +5V, and -12V power for the floppy drive so that no separate power supply is needed and it watches the power consumption of the drive (checks 20,000 times per second) to detect electrical shorts or other unusual conditions and can shut off the power to the drive within milliseconds in order to minimize damage to your equipment.

On the software side, the Applesauce Client Software controls the Applesauce hardware and is also a standalone disk image analysis/repair/conversion tool. The software currently only supports macOS 10.11 or better. Runs natively on 64-bit Intel and M1 Macintosh computers. You can download v1.71 of the software from the **Applesauce Software Download Page.**

One of the things the client can do is convert between disk formats, such as A2R, KryoFlux, SCP, DiscFerret, etc to DMK. The HxC conversion program does **NOT** do this reliably, so this software would be recommended even if you do not own the Applesauce hardware.




PIN 1
PIN 1



HTTPS://WWW.YOUTUBE.COM/WATCH?V=ZE3NMXTLGJK

Thirsting for adventure?
Brass lantern getting dusty?



Take your Model 1, 3 or 4 on exciting new adventures never available until now....

M4ZVM enables your TRS-80 Model 1,3 or 4 to play Infocom and post-Infocom adventures, taking full avdantage of your hardware. Supports old favourites like Zork and Seastalker (including Sonarscope), as well as new-to-Model-4 games including Trinity, Border Zone and Sherlock, plus hundreds more available in the Interactive Fiction archive.



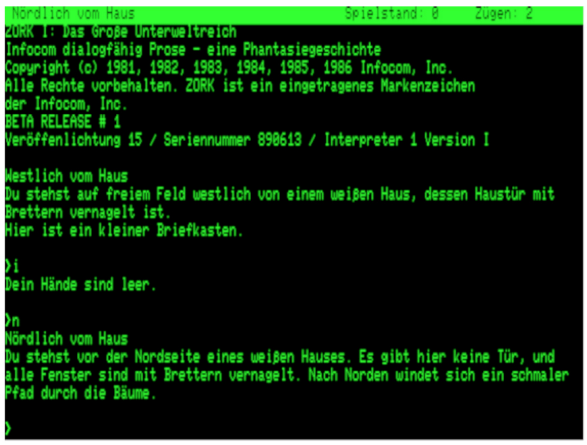
M4ZVM is available for download from https://gitlab.com/sijnstral/m4zvm (includes feature details and source)
Enhanced versions ready for download!

*128K recommended

Actual Screenshots of games new to the model 4, running M4ZVM (on trs80gp)

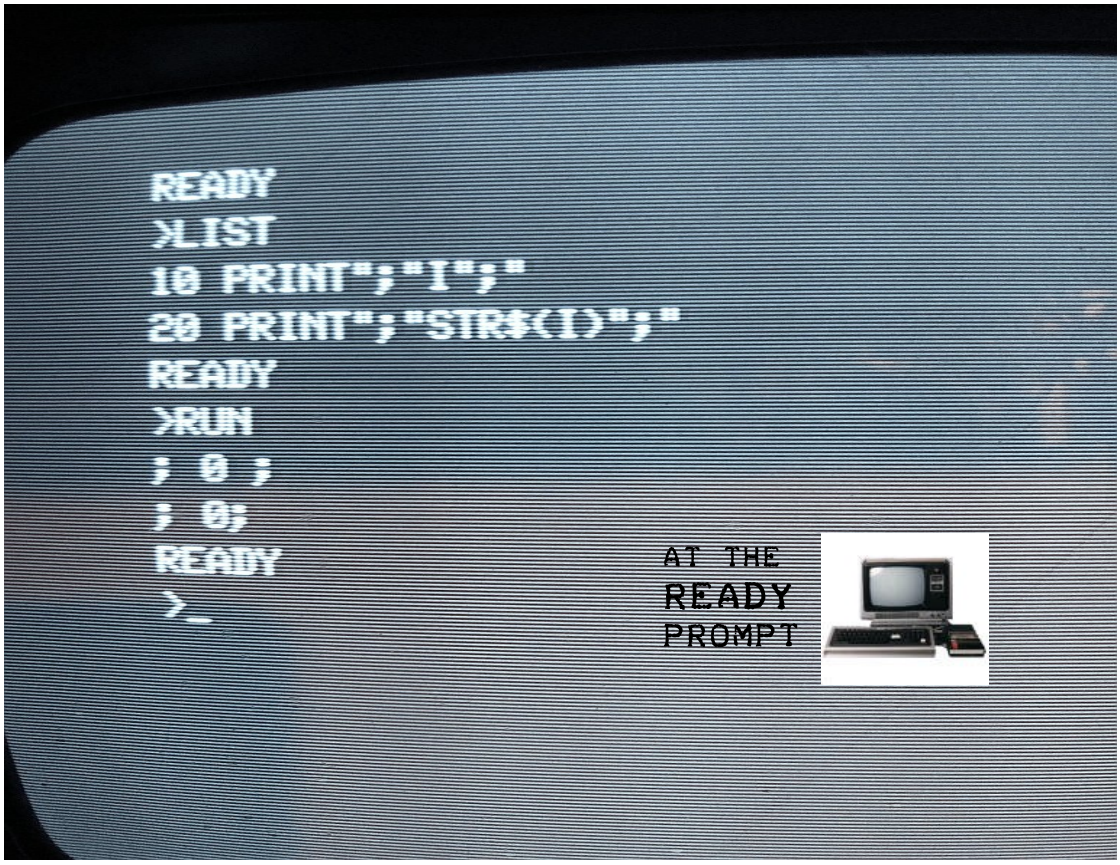


Beyond Zork



Zork 1 (German)

M4ZVM features include:
* z1-z8 game execution (z6 support is experimental)
* named game save/load
* accented characters
* 128K recommended - NEW Minimised 64K version
* Optionaly set the infamous "Tandy bit"
* NEW Model 1 and Model 3 versions



HERE'S A HANDY LITTLE 'TRICK' THAT GEORGE PHILLIPS POSTED ON FACEBOOK. I TRIED A FEW CHANGES BUT THE 'MISSING' SPACE STILL REMAINED MISSING....

```
>LIST
10 PRINT";"I";"
15 STOP
20 PRINT";"STR$(I)";"
READY
>RUN20
; 0;
READY
>RUN
; 0 ;
BREAK IN 15
READY
>CONT
; 0;
READY
>_
```



I CAME ACROSS THIS RATHER INTERESTING ARTICLE ON FACEBOOK. UNFORTUNATELY THOUGH, IN LEVEL 2 BASIC THERE'S NEITHER A 'DEFD FN' OR 'INSTR' VERB AVAILABLE. YOU NEED DISK BASIC (OR LEVEL 3) FOR IT TO RUN. HAS ANYONE TRIED TO COPY AND USE THE CODE FROM DISK BASIC TO LEVEL 2? NOW, THAT WOULD BE A SUPER-START TO 2023

FOR BASIC PROGRAMMERS: A COMPARISON OF SET INCLUSION ALGORITHMS. USING INSTR CAN BE 3X FASTER THAN FUNCTIONS WHICH DETERMINE IF A CHARACTER IS WITHIN RANGE.
MY TEST IS WHETHER A CHARACTER C% [IE, ASC(C$)] IS ALPHANUMERIC: IS IT LOWERCASE, UPPERCASE, OR A DECIMAL DIGIT?
IN MY ASSEMBLER-IN-BASIC PROJECT, I'D DEFINED THE FOLLOWING 5 FUNCTIONS:

```
DEF FN CL%( C%)= C% > &H60 AND C% < &H7B' IS LOWER( C)
DEF FN CU%( C%)= C% > &H40 AND C% < &H5B' IS UPPER( C)
DEF FN CA%( C%)= FN CL%( C%) OR FN CU%( C%)' IS ALPHA( C)
DEF FN CN%( C%)= C% > &H2F AND C% < &H3A' IS NUMERIC( C)
DEF FN CM%( C%)= FN CA%( C%) OR FN CN%( C%)' IS ALPHANUMERIC
( C)
```

SO FNCM%(ASC("X")) WILL RETURN -1 (TRUE).

ANOTHER APPROACH IS TO BUILD A STRING AN$, WHICH CONTAINS THE ENTIRE SET OF UPPERCASE, LOWERCASE, AND NUMERIC CHARACTERS, THEN USE INSTR() TO TEST C% AGAINST IT, AS IN
IF INSTR(AN$, CHR$(C%)) > 0 THEN PRINT "*"
I BUILT AN$ THIS WAY, BEFORE TESTS WERE RUN:

```
AN$= STRING$( 26+26+10, 32)' HOLDER FOR UC + LC + NUM,
ORIGINALLY FULL OF BLANKS
CP%= 1' "CHARACTER POSITION" IN AN$
C1%= &H030: C2%= &H039' NUMERIC DIGITS
C3%= &H041: C4%= &H05A' LC
C5%= &H061: C6%= &H07A' UC
FOR C%= C1% TO C2%: GOSUB 1000: NEXT
FOR C%= C3% TO C4%: GOSUB 1000: NEXT
FOR C%= C5% TO C6%: GOSUB 1000: NEXT
' "HELPER" STUB
1000 MID$( AN$, CP%, 1)= CHR$( C%): CP%= CP% + 1: RETURN
```

'THEN I TESTED THE RELATIVE TIME IT TOOK FOR EACH TEST THIS WAY:

```
INPUT "1-DEF FNS 2-INSTR()"; CH%
FOR C%= 1 TO 127
  ON CH% GOSUB 100, 200
  NEXT
PRINT
STOP
100 IF FN CM%( C%) THEN PRINT "*";
105 RETURN
200 IF INSTR( AN$, CHR$( C%)) > 0 THEN PRINT "*";
205 RETURN
```

(I ADDED A BIT OF CODE TO ALLOW FOR MULTIPLE ITERATIONS, TO PRETTY THINGS UP A BIT, AND TO REPORT START & STOP TIMES. RESULTS? INSTR WAS 3X FASTER THAN CHECKING RANGES. GRANTED, USING FN CM%() IS KIND OF LIKE 5 SUBROUTINE CALLS, ALBEIT WITHOUT THE AGONY OF LINKING THROUGH THE BASIC PROGRAM TABLE (SINCE DEF FN POINTERS ARE STORED IN THE SIMPLE VARIABLE TABLE). BUT THE FNS ARE ONLY PERFORMING A COUPLE OF OVER-UNDER TESTS EACH, WHEREAS INSTR HAS TO TEST AGAINST UP TO ALL THE 62 CONTENTS OF AN$ EVERY TIME. I'M SURPRISED!

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THE WAY WE WERE

1982 1985 1977 1979 1978 1984 1976 1983 1980 1981

Tandy users forced to self-help

Tandy has forced its users into self-help by its hard-line warranty stand, the user group claims.

At a user group workshop held earlier this month at Luton College, group secretary Brian Pain reported that recently in fact antagonism had faded among users.

Pain, an accountant who uses his Tandy for business, said: 'Originally, Tandy's strict rule that if you open the computer, you void the warranty, caused ill feeling. It was quite noticeable at a workshop we held in April.'

Now, users are just ignoring Tandy, he reports.

'With the user group, we have quickly found out which retailer can provide the answer to which problem,' he said, 'and the warranty thing just isn't worth it.'

Users were finding that sending a machine away for repairs under warranty was a dubious privilege. The advantages of plugging in cheap add-ons, especially memory chips, outweighed the warranty, said Pain.

'By insisting on keeping absolute control, Tandy has in fact lost control,' he claimed.

Another workshop, covering two days, is planned for January.



Brian Pain, user group secretary: 'The warranty isn't worth it'

THIS IS A CLIPPING FROM THE UK'S 'COMPUTER WEEKLY' NEWSPAPER, CIRA 1979, WHICH I RECENTLY CAME ACROSS.

SPEECH SYNTHESIS USING THE G.I. SP0256-AL

Using the General Instrument SP0256-AL chip a simple speech synthesiser can be built for around £20. It works fine on my Model I, and should work on the Model III, with some minor changes to the software.

The SP0256-AL can be obtained from Watford Electronics. The crystal is only available from Semiconductor Specialists (089 54) 46415, as far as I know. Although they are a large distributor, they do not seem to mind small orders.

The SP0256-AL is similar to the Votrax SC-01 in that it synthesises speech by generating phonemes. Thus any word can be produced, you just output the appropriate sequence of phoneme codes to the device.

In fact, the device uses allophones, that is, phonemes which sound alike. There are about 64 allophones in the English language, so the data rate is very low, and can easily be handled by simple BASIC programs.

Full details on how to program the device are in G.I.'s publication, VSM2128 Voice Synthesis Module User's Guide, obtainable from Semiconductor Specialists.

The following test program will output all the allophones in turn:-

```
10 FOR I=5 TO 63
20 OUT 0,I
30 IF INP(0)=254 THEN 30 'WAIT UNTIL LRQ GOES HIGH
40 NEXT I
```

The following program converts a file containing allophone codes into appropriate numerical codes. A sort of speech assembler! It is rather slow, as it uses a sequential search technique, but this does not really matter.

```
10 '                    * * * SPEECH/BAS * * *
20 '
30 'PROGRAM TO CONVERT ALLOPHONES IN SYMBOLIC FORM
40 'TO NUMERICAL CODES.
50 '
60 'VERSION 1.0 - 29/5/83
70 'WRITTEN BY LEON HELLER
80 '
90 CLS
100 DIM A$(64),C(64)
110 FOR I=0 TO 63
120 READ A$(I),C(I)
130 NEXT I
140 INPUT "SOURCE FILE";N1$
150 INPUT"DESTINATION FILE";N2$
```

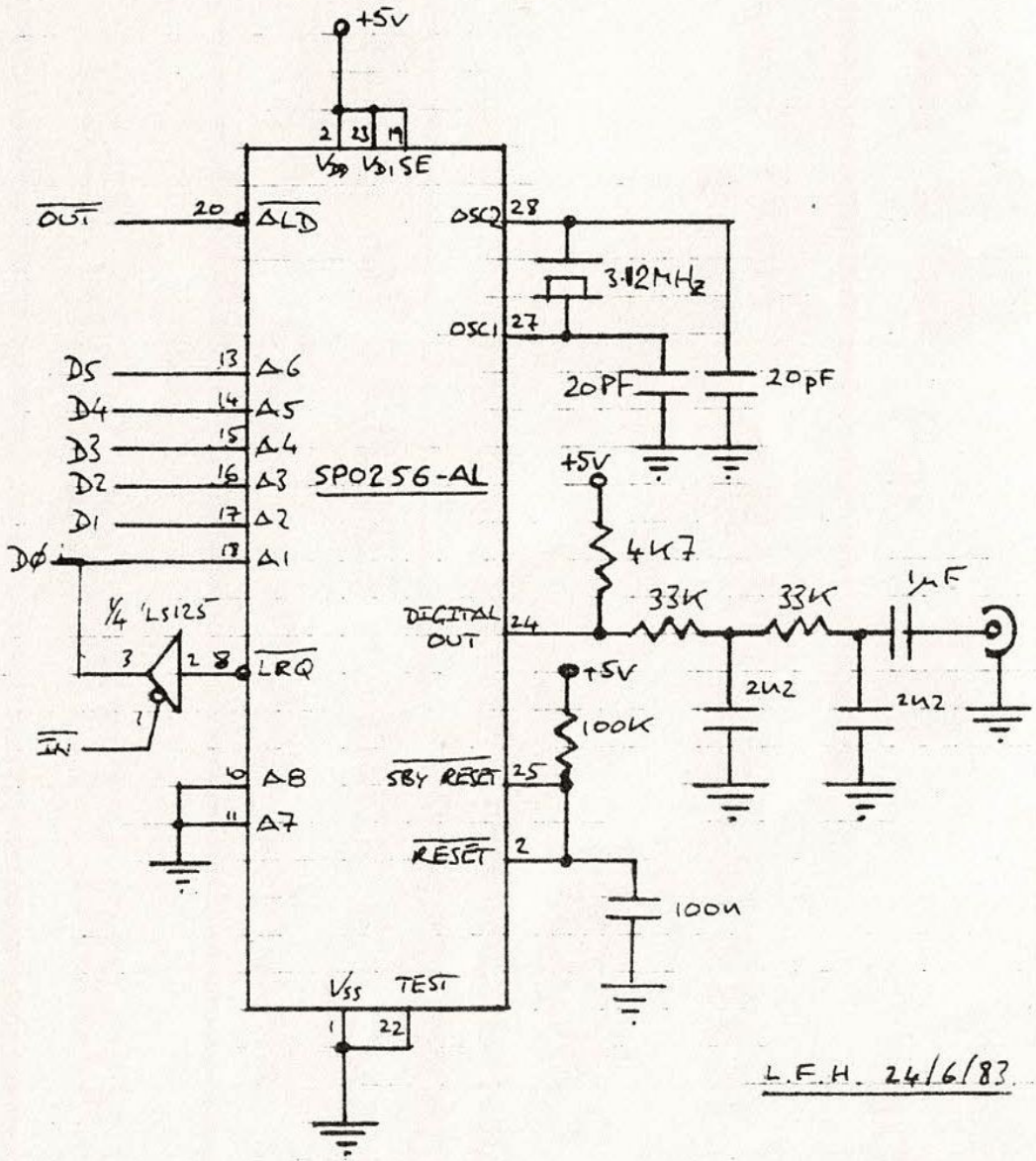
```
160 OPEN "I",1,N1$:OPEN "O",2,N2$
170 IF EOF(1) THEN 290
180 INPUT£1,C$
190 IF C$="" THEN 290
200 N=0
210 IF A$(N)=C$ THEN 260 ELSE 220
220 N=N+1
230 IF N>63 THEN 240 ELSE 250
240 PRINT "CANNOT FIND CODE: ";C$
250 GOTO 210
260 PRINT A$(N),C(N)
270 PRINT£2,C(N)
280 GOTO 170
290 PRINT£2,64
300 END
310 '
320 'SYMBOLIC AND NUMERICAL ALLOPHONE CODES
330 DATA AA,24,AE,26,AO,23,AR,59,AW,32,AX,15,AY,6
340 DATA BB1,28,BB2,63,CH,50,DD1,21,DD2,33,DH1,18,DH2,54
350 DATA EH,7,EL,62,ER1,51,ER2,52,EY,20,FF,40
360 DATA GG1,36,GG2,61,GG3,34,HH1,27,HH2,57,IH,12,IY,19
370 DATA JH,10,KK1,42,KK2,41,KK3,8,LL,45,MM,16
380 DATA NG,44,NN1,11,NN2,56,OR,58,OW,53,OY,5
390 DATA PA1,0,PA2,1,PA3,2,PA4,3,PA5,4,PP,9
400 DATA RR1,14,RR2,39,SH,37,SS,55,TH,29,TT1,17,TT2,13
410 DATA UH,30,UW1,22,UW2,31,VV,35,WH,48,WW,46
420 DATA XR,47,YR,60,YY1,49,YY2,25,ZH,38,ZZ,43
```

This program reads numerical allophone codes from a disk file, and then outputs them continuously to the synthesiser.

```
10 '                    * * * TEST2/BAS * * *
20 '
30 'TEST PROGRAM FOR SP025-AL SPEECH SYNTHESISER BOARD
40 'VERSION 1.0 - 29/5/83
50 'WRITTEN BY LEON HELLER
60 '
70 DIM A(100)
80 CLS
90 INPUT"ALLOPHONE FILE";N$
100 PRINT
110 OPEN "I",1,N$
120 N=0
125 IF EOF(1) THEN 190
130 INPUT£1,A(N)
150 IF A(N)=64 THEN 190
155 PRINT A(N);
160 N=N+1
170 GOTO 125
180 '
190 N=N-1
200 PRINT:PRINT:PRINT "PRESS ANY KEY TO STOP"
210 FOR I=0 TO N
220 K$=INKEY$:IF K$="" THEN 230 ELSE 300
```

```
230 OUT 0,A(I)
240 IF INP(0)=254 THEN 240
250 NEXT I
260 OUT 0,0
270 FOR J=1 TO 500:NEXT J
280 GOTO 210
290 '
300 END
```

Leon Heller



PERCOM

PERCOM DATA COMPANY, INC.

NEWS RELEASE

RELEASE: Immediate

CONTACT: Harold Mauch
(214) 272-3421

PERCOM INTRODUCES BASIC-LANGUAGE DOS FOR TRS-80*

Garland, Texas - May 30, 1979 - Harold Mauch, President of Percom Data Company, today introduced a disk operating system for Radio Shack's TRS-80* computer that works entirely with Level II BASIC commands.

Called MICRODOS;tm the program resides in less than 7K of memory, yet, according to Mauch, is both faster and more powerful than TRSDOS,* the Radio Shack DOS for the TRS-80.*

MICRODOStm was developed especially for business and professional applications. It replaces TRSDOS,* which Mauch described as "ponderous, from a business or professional user's standpoint."

MICRODOStm operates the Percom TFD series of mini-disk systems, a family of small, medium and large capacity add-on storage devices for the TRS-80.*

MICRODOStm is supplied on a system diskette that also includes three BASIC programs: (1) a file management program, (2) a disk utility program which illustrates how disk utilities may be written with only a few BASIC statements, and (3) a sample application program entitled "The Percom 5 1/4 Inch Notebook", an expandable disk-based "notebook" of information about MICRODOStm disk BASIC statements. The notebook may be easily accessed or changed by the user.

PERCOM DATA COMPANY 211 N. Kirby Garland, Texas 75042
(214) 272-3421

I NEVER CAME ACROSS 'SOLO LOAD' IN THE DAY. DOES ANYONE HAVE ANY FURTHER INFORMATION ABOUT IT IN THE U.K.?

NEW FOR THE TRS-80 AND VIDEO GENIE

FLOPPY DISC SYSTEMS EXPENSIVE?
CASSETTE SYSTEMS FRUSTRATING?

THEN YOU NEED THE

SOLO LOAD

Loads programs in less than one second. Saves programs in as little as two seconds.
NO MODIFICATIONS.
Just plug into expansion socket and run your programs instantly.

Completely automatic, contains its own operating system. Anybody can use it — it's that simple to operate. So banish those cassettes and forget about expensive Disc Systems.

LOOK AT THESE UNIQUE FEATURES

Directory of Files — No need to remember names! Load File — Automatic search and load of programs. Load Data — Load Data into any memory locations. Save File — Automatically produces a 'named' file with all information the computer needs for instant reload. Save Data — Effectively an automatic 128K bits PROM Programmer i.e. no need to sectionalize programs into PROM sizes. Multiple programs in single Rompack with overload prevention and auto verify. Does not use any user RAM space.

Perfect for engineers and programmers who want speed and reliability.

The **'SOLOLOAD'** is a new concept in Rompacks. It is unique in that it not only allows you to read pre-programmed Rompacks but create your own. The plug-in Rompacks are of course, **RE-USABLE.**

The function of the **SOLOLOAD** is to provide an alternative storage medium to that of tapes and discs which is very reliable and fast to operate.

It is based upon storing programs and data in semi-conductor memories which can be re-used whenever required but do not lose their information when un-plugged from the mains of host CPU. The memories used are EPROMS and CMOS RAMS.

N.B. Both basic and machine code programs can be saved and loaded.

USAGE OF EPROMS (16K ROMPACKS)

EPROMS provide permanent but re-usable program and data storage which can be loaded into the host CPU in less than one second. However they are not instantly alterable and would normally be used for long term storage, where maximum program security is required, it takes 50 milli-seconds per byte to store a program in EPROMS.

USAGE OF CMOS RAM (8K and 16K RAMPACKS)

These modules have an in built rechargeable battery and can retain data and programs for many months even if not on trickle charge. The advantage of CRAM modules is that they are instantly alterable and can save a 16K program in under two seconds. Their obvious use is for program development and rapidly changing data files.

TWO VERSIONS AVAILABLE For use with up to 16K systems. **EX-STOCK DELIVERY**

SOLOLOAD Read and write unit with printer interface option.
SOLOREAD A read only unit for pre-programmed Rompacks. Ideal for clubs.
Both units attractively boxed with own power supplies.

COMING SOON: Version for expanded systems. Version with Expansion Ram.

SOLO ELECTRONICS LTD
73 PRESTON ROAD, BRIGHTON, SUSSEX BN1 4QG (0273) 671873

The SOLOLOAD has its own internal operating system which is accessed by one simple keyboard command.

THE OPERATING SYSTEM GIVES ALL PROMPTS IN ENGLISH

The operating system has 8 general functions which sub-divide when required.

The options are basically as follows:

1. LIST:— Search through rompack and display the names of all files stored.
2. READ:— Load the host CPU with:
   (A) A named file (PROGRAM) in basic or machine code.
   (B) A prom or series of proms containing data i.e., Not a named file but say a mailing list or bank statement.
3. SAVE:— Save has several options:
   (A) The choice of EPROMS (for permanent storage) or CRAM for high speeds.
   (B) Saving a machine code or basic program.
   (C) Saving as a file or as data (effectively a 128K bits EPROM programmer in the save mode the SOLOLOAD also generates all the information the CPU needs for automatic re-load of the program.
4. BASIC:— A command which returns control to the most host CPU's basic monitor.
5. DATA:— This displays useful information to enable back-up copies of tape programs to be readily made in this format.
6. EXAMINE:— Since the SOLOLOAD is memory mapped but paged a special monitor has been provided to enable memory and rompacks to be examined.
7. FILL:— Enables sections of memory and CRAM to be filled with known data, again useful when making back-up copies of tapes.
8. JUMP:— Enables the operator to go to anywhere in memory e.g., Return to the editor assembler, etc.

INTRODUCTORY PRICE LIST

SOLOLOAD complete with free program in a ROMPACK ...	£125.00
SOLOLOAD printer interface option	£37.50
ROMPACKS (16K capability)	£10.00
8K CRAM RAMPACKS (with battery)	£62.50
16K CRAM RAMPACKS (complete)	£99.50
SOLO READ (read only unit)	£35.00
SOLO READ P.S.U.	£8.69
Spare EPROMs (2532's)	£4.50

Please add V.A.T. and P.&P. (£2.50/order).

Discounts for club and other bulk orders.

Full details available from:

SOLO ELECTRONICS LTD
73 PRESTON ROAD, BRIGHTON, SUSSEX BN1 4QG (0273) 671873

NATIONAL TRS-80 USERS GROUP 1982 WORKSHOP CALENDAR
****

MAY 9 HULL CENTRE HOTEL **********

MAY 15 MANCHESTER SOUTH TRAFFORD COLLEGE OF F.E.

JUN 5 BIRMINGHAM POLY OFF HAGLEY ROAD

JUN 12 BEACONSFIELD FIRST & MIDDLE SCHOOL, SOUTHALL

JUN 26 EDINBURGH CONTACT DICK MACKIE RESIDENTIAL POSSIBLE !

JUL 10/17 BASIC FOR BEGINNERS LONDON 10.00 POUNDS
BY MARTIN MILLER AUTHOR OF THE ELECTRIC ACCOUNTANT

23/24/25 JULY WEEKEND AT LUTON, BEDS.
5 MINS FROM M1, BUS STATION, & RAILWAY STATION

AUG 15(PROV) BLANDFORD FORUM at Os House's premises ****

AUG 22 (PROV) YORK ENTERPRISE CLUB, NUNNERY LANE

Aug/Sept. 2 Saturdays on Assembler by Laurie Shields
Author of Notes on Assembler & Using the Model 3
The cost will be around 10.00 pounds,
as only 20 bookings will be accepted

SEP. 12 CAMBRIDGE UNIVERSITY ARMS HOTEL

OCT 2 BIRMINGHAM POLY OFF HAGLEY ROAD

OCT 25 LONDON BEACONSFIELD FIRST & MIDDLE SCHOOL,SOUTHALL

OCT 31 LEICESTER GRAMMAR SCHOOL(PROV)

NOV MANCHESTER SOUTH TRAFFORD COLLEGE OF ED.

****
A TWO DAY COURSE ON LEVEL II BASIC *
****

The above will be held in London-Bloomsbury- for those requiring a more formal method of coming to an appreciation of the above language. Martin Miller will be taking members through a variety of exercises, explaining wherever this is required by a member. There will be handouts available over the two days and it is anticipated that some work will done at home ready for the following Saturday.

No more than 20 bookings will be accepted, and there will be another course organised for the excess bookings, with arrangements in hand for the same format to be repeated in York later in the year.

The course will be on the Saturdays 10/17 of July, starting at 9.30am going through until around 5.00. For most members it will be more convenient to bring their own food but of course the hotel can provide lunches.
COST 10.00 POUNDS FOR THE TWO DAYS.

BOOKING FORM

To Brian Pain, 40a High Street, Stony Stratford, Milton Keynes.
From .....
Address.....
.....
.....
Tele:- .....
Please reserve places on the BASIC/JULY course.
enclose CHQ/ACCESS/BARCLAYCARD/ details.

****
NATIONAL TRS80 USERS GROUP * ANNOUNCEMENT* 0908-564271
********** JULY WEEKEND 23/24/25 -FRI-SAT-SUN-*******

The above will be held at the Luton Industrial College, which is just off the M1 & 5 minutes from the bus & rail stations. The college will be providing all facilities including single person rooms, with full board where required. The lecture & systems rooms are below the bedrooms, with the refectories alongside the former. As there is a restriction on systems that can come due to the power points, permission will have to be obtained on a first come first served basis. Priority will be given to those booking for the whole weekend, and please ring beforehand regarding this situation.

The Friday will be devoted to business matters only, with Saturday and Sunday following the usual format. It is anticipated that there will be parallel lectures running at all times, structured for either the more advanced or those still struggling with the initial "learning curve"

It is hoped there will be two new features:- Marc Leduc doing a long session on string packing, slowly for everybody to absorb his input on this, and John Taylor and Graham Wickens on the FLOPPY TAPE. There is a very good chance we will have our first robot going through some simple exercises, and a proper long session on an EPROM being blown with a variety of routines that members might like to construct over the weekend.

Free coffee will be available at all times, and the college has advised us that there will be no problem with members wishing to to work late.

==========

Booking Form

To Brian Pain, 40a High Street, Stony Stratford, Milton Keynes.

From :-.....

.....

.....

Tele:- .....

Please book me places for the following:-

Friday Course Only.....5.25

Accomodation & Course.....19.25

Saturday Course Only.....5.25

Accomodation & Course.....19.25

Sunday Course Only.....3.25

Accomodation includes Bed, Breakfast, Lunch & Evening Meal.



HI DUSTY, MANY THANKS FOR ANOTHER FANTASTIC YEAR OF TRS8BIT. JUST TO WISH YOU, DEE AND EVERY TANDY ENTHUSIAST A VERY MERRY ONE-LINER CHRISTMAS. THANKS TO GEORGE & PETER'S SUPER EMULATOR, I'VE ATTACHED AND ANIMATED .GIF FOR YOU!




```
0 CLS:PRINT@333,"M E R R Y  TRS8BIT  C H R I S T M A S":FORZ=0TO
1STEP0:FORX=0TO127STEP3:RESET(X,0):RESET(127-X,47):FORY=1TO10:NE
XT:SET(X,0):SET(127-X,47):NEXT:FORX=2TO45STEP3:RESET(0,X):RESET(
127,45-X):FORY=1TO15:NEXT:SET(0,X):SET(127,45-X):NEXT:NEXTZ
```

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HERE ARE JUST SOME OF THE MORE INTERESTING TANDY EBAY LISTINGS,
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£162



£161



£132



£12



£NS



£36

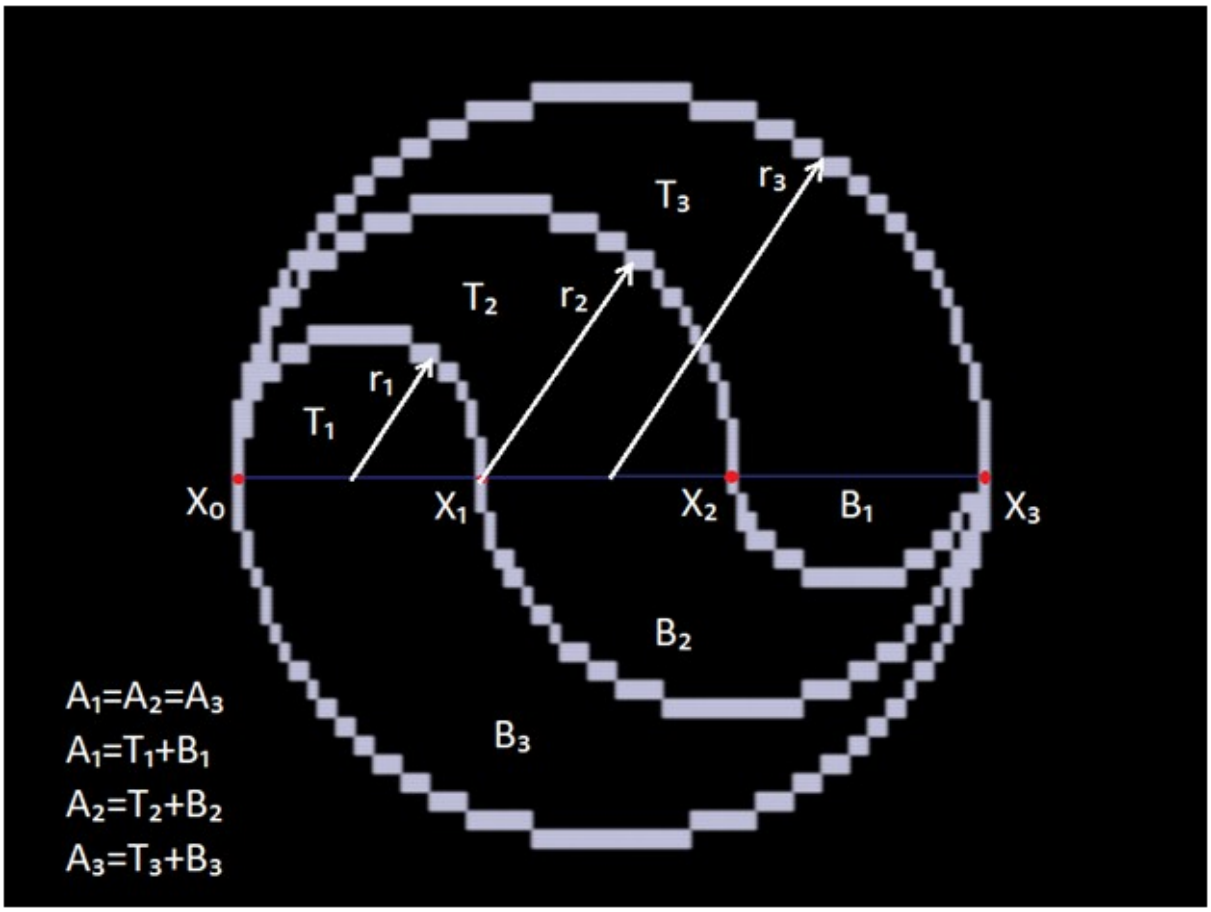
N Easy Pieces

By Peter Phillips

I saw a short video on Twitter which demonstrated how to divide a circle into any number of equal pieces using arcs instead of straight lines. Naturally, I wrote a TRS-80 BASIC program to demonstrate the division (see the listing).

The program uses a "midpoint algorithm" to draw the arcs, slightly modified to double in the X direction to account for the Model I's rectangular pixels.

The division procedure is fairly simple. Place N points (0 ... N) along a horizontal diameter of the circle. Then, in the top half, draw increasingly larger arcs from points 0 to 1, 0 to 2 up to 0 to N. Do the same on the bottom half, but in reverse.



We want n divisions of circle radius r with area πr^2

Set the area equal to n so each piece has area 1

$\pi r^2 = n$

The dividing points at p=0...n on the circle are at:

$X_p = 2pr/n$

Draw increasingly large top-half circles from points X_0 to X_p for p = 1...n
The bottom-half circles are drawn in reverse order (e.g. the smallest on the right)

The radius of each half-circle is:

$r_p = pr/n$

The area of each half-circle:

$H_p = \frac{1}{2}\pi r_p^2 = \pi(pr/n)^2/2 = \frac{1}{2}p^2\pi r^2/n^2$

$H_p = p^2/2n$ (as $\pi r^2 = n$)

That's the area of the half-circles, but the area of each (half) piece is the difference.

$T_p = H_p - H_{p-1} \quad p = 1...n$

$T_p = p^2/2n - (p-1)^2/2n$

$T_p = (2p - 1)/2n$

The area of the bottom pieces is just reversed from the top

$B_p = T_{n-p+1}$

The total area A_p of each piece is:

$A_p = T_p + B_p$

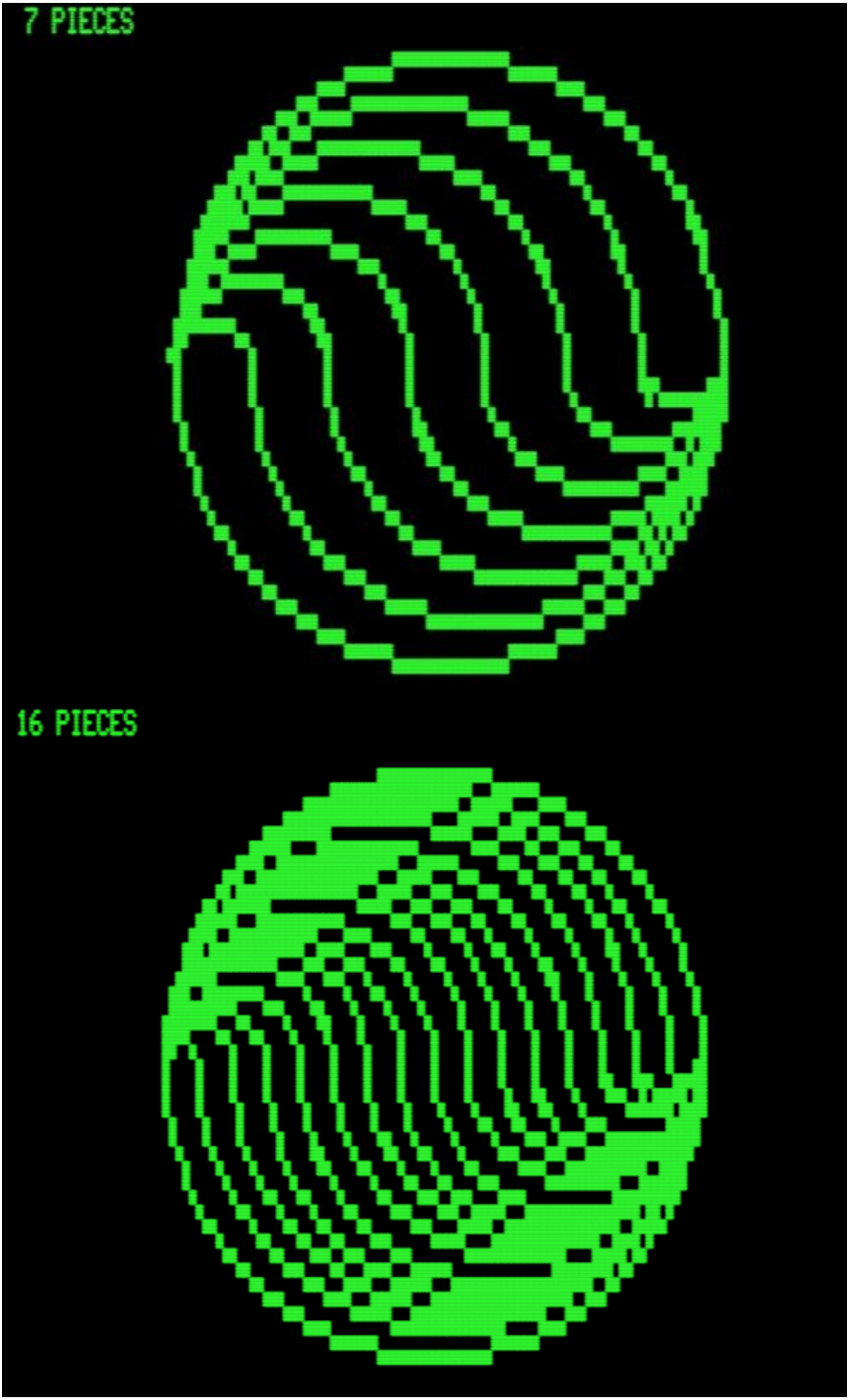
$A_p = T_p + T_{n-p+1}$

$A_p = (2p - 1)/2n + (2(n-p+1) - 1)/2n$

$A_p = (2p - 1 + 2n - 2p + 2 - 1)/2n$

$A_p = 1$

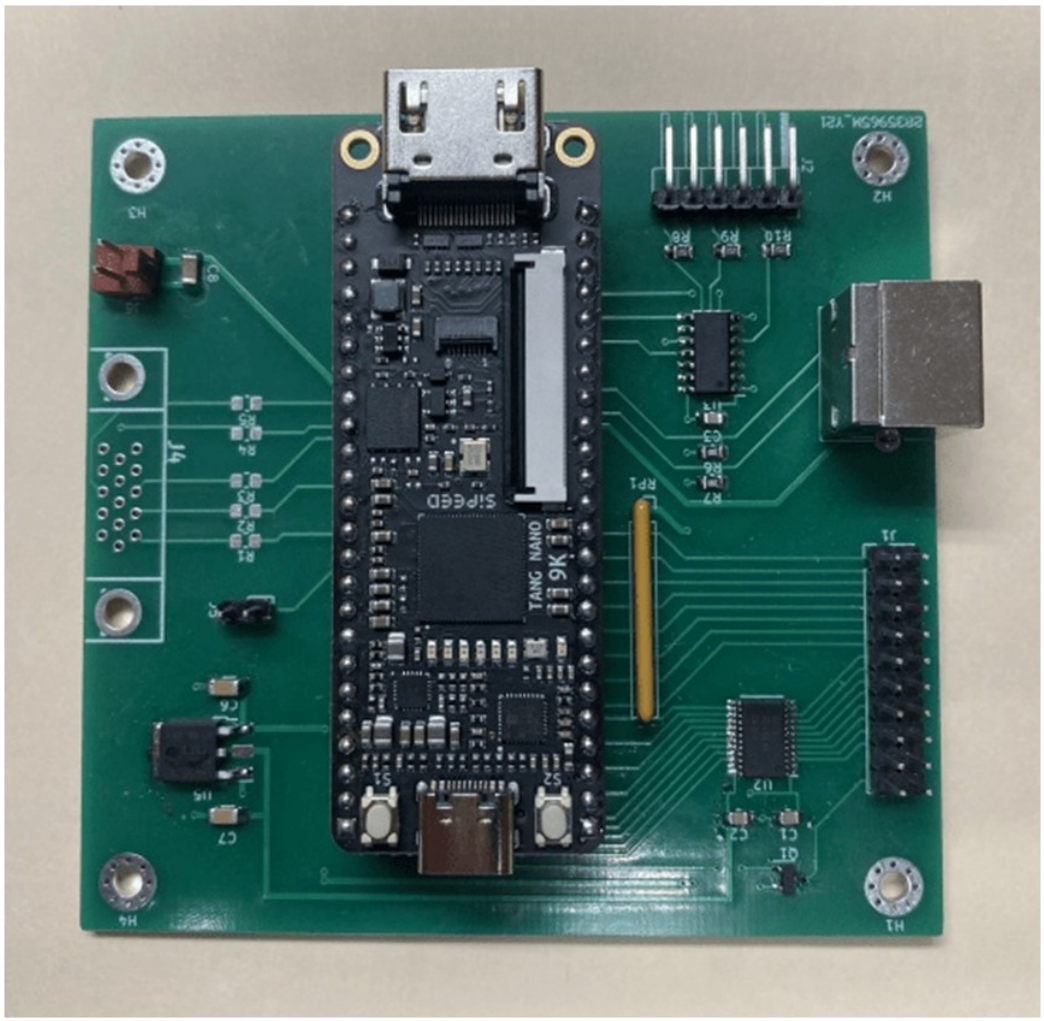
```
5 CLS:REM Divide circle into N equal pieces
10 X=64:Y=24:R=20
20 REM GOSUB 1000:GOSUB 2000
30 INPUT "# DIVISIONS (1-16)";N
35 N=INT(N):IF N<1 OR N>16 THEN 30
40 CLS:X=X-R*2
50 DIM P(N):P(0)=X
60 FOR I=1 TO N:P(I)=P(I-1)+R*4/N:NEXT
80 FOR I=1 TO N
90 R=(P(I)-P(0))/4
100 X=(P(I)+P(0))/2
110 GOSUB 1000
120 NEXT
130 FOR I=N-1 TO 0 STEP -1
140 R=(P(N)-P(I))/4
150 X=(P(N)+P(I))/2
160 GOSUB 2000
170 NEXT
180 PRINT@0,N;"PIECES";
990 GOTO 990
999 REM Draw top half-circle center at X,Y radius R
1000 F=-1
1005 X0=0:Y0=R:E=2-4*R
1010 SET(X+X0,Y+F*Y0)
1020 SET(X-X0,Y+F*Y0)
1030 IF 4*Y0<=X0 GOTO 1060
1040 X0=X0+1:IF E<0 THEN E=E+2*X0+1 ELSE Y0=Y0-1:E=E+2*(X0-4*Y0)
+1
1050 GOTO 1010
1060 X0=2*R:Y0=0:E=4-2*R
1070 SET(X+X0,Y+F*Y0)
1080 SET(X-X0,Y+F*Y0)
1090 IF X0<=4*Y0 RETURN
1100 Y0=Y0+1:IF E<0 THEN E=E+4*(2*Y0+1) ELSE X0=X0-1:E=E+2*(4*Y0
-X0)+4
1110 GOTO 1070
1999 REM Draw bottom half-circle
2000 F=1:GOTO1005
```


7 PIECES
16 PIECES



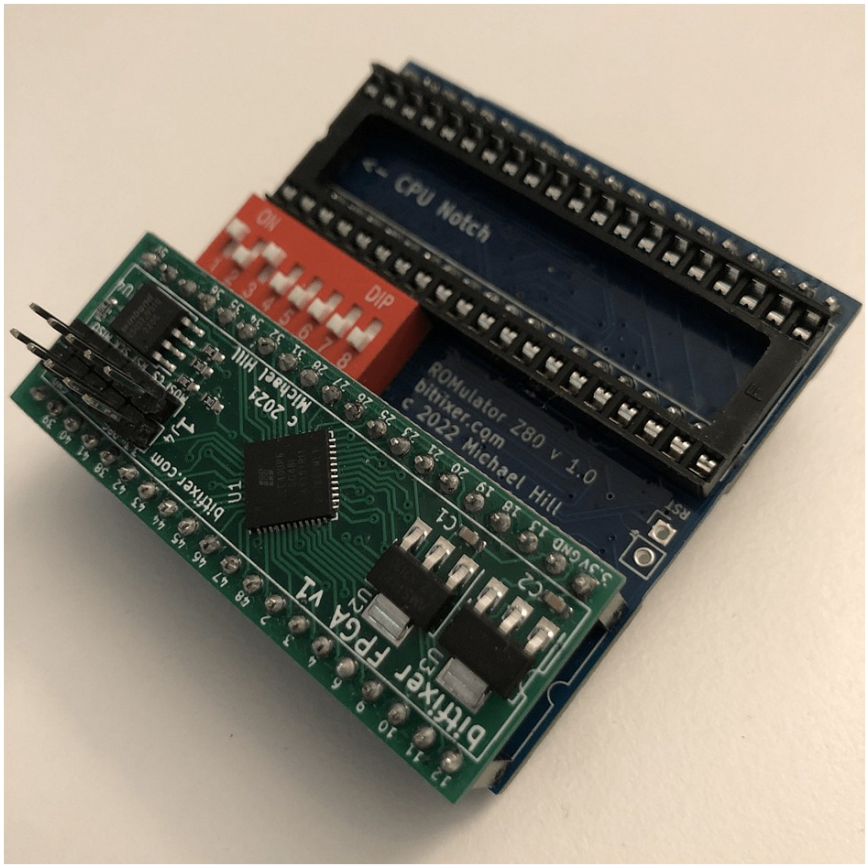
HERE'S JUST A FEW OF THE INTERESTING ITEMS ON 'FACEBOOK' OR 'YOUTUBE' THAT I'VE COME across RECENTLY

Matt Boytim is developing a small board which can be used to replace the keyboard and/or monitor of a TRS-80 Model 3 and 4.
The project, which can be found at **this GITHUB** will permit using a PS2 keyboard and/or a VGA or HDMI monitor.
Matt has advised this is still very much a work in progress.





HTTPS://WWW.YOUTUBE.COM/WATCH?V=XGB4AQHPJNU
HTTPS://STORE.BACKBIT.IO/PRODUCT/CHIP-TESTER/



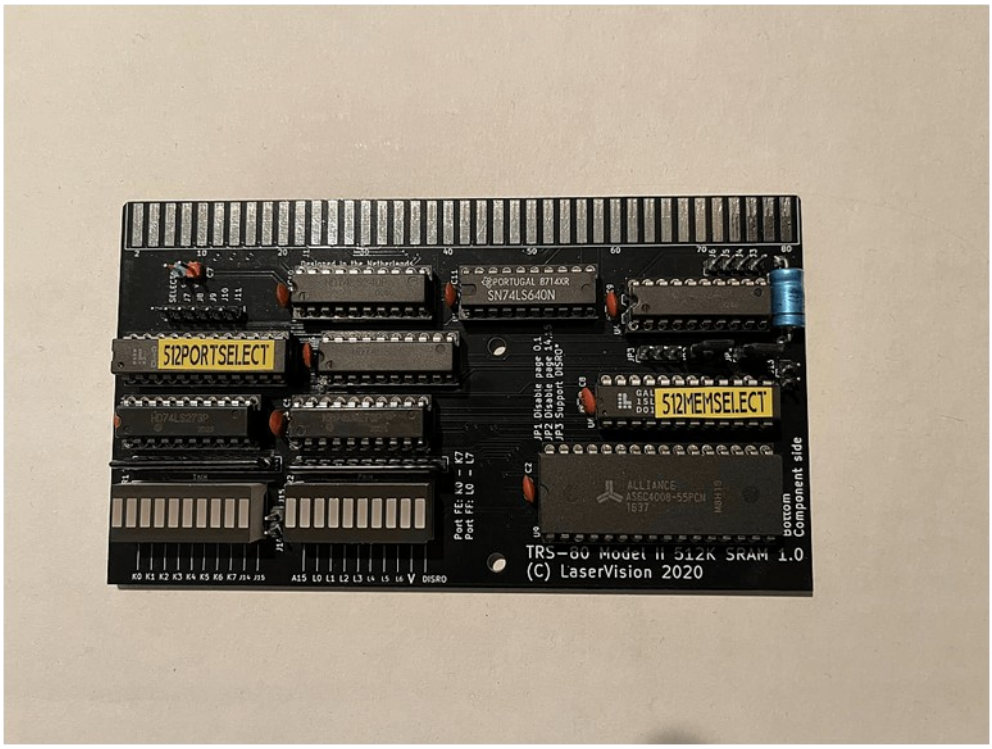
The ROMulator Z80 is here, in early access release.
Early access in this case just means this is a device in active development, and while I don't anticipate much if any change happening on the hardware side, there will be continuing improvements in firmware as more Z80 machines are tested with it. Unlike the 6502 version where several default profiles exist, the default configuration for the Z80 version has almost nothing in it yet and will be expanded as more machines are tested.

A few things to note for this version of the ROMulator Z80 –
– DMA is not supported. Any regions of memory using DMA with devices other than the CPU are not replaceable by the ROMulator with this version.

- Bank Switching is not yet implemented. Many Z80 machines, including several Sinclair models, Kaypro, among others, use some form of memory bank switching to swap regions in and out of memory space for the CPU. The ROMulator has 128k onboard memory and in principle can support bank switching up to this maximum size, but it is not yet implemented. Any machine making use of bank switching will need some work on the Verilog code of the ROMulator to support this. Coming in future firmware updates.

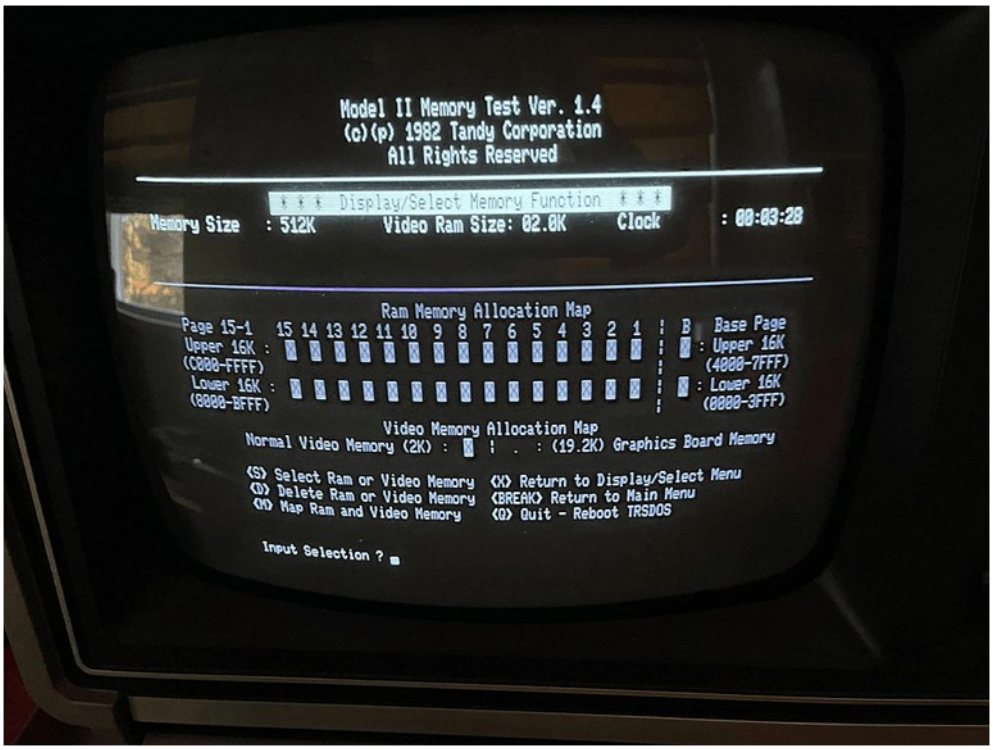
If you are interested in helping with early testing with the ROMulator Z80, it's ready now!
The ROMulator Z80 comes in kit form, and requires assembly. You will need a soldering iron and solder and assembly takes about 10-15 minutes.

www.bitfixer.com

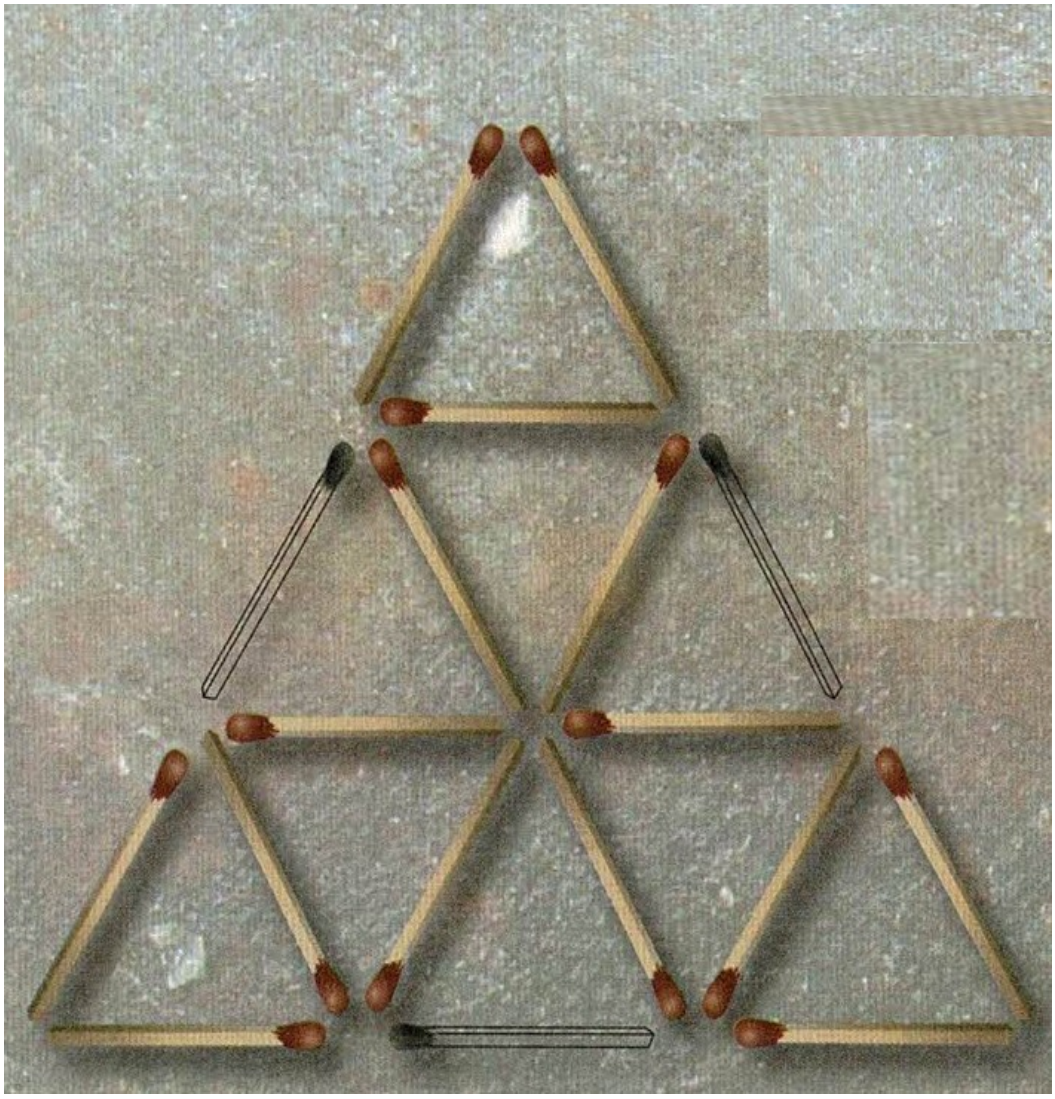


Testing a new 512K RAM Z80 Model II memory board which is currently being developed. It lets your Model II reach its full memory potential with a single miniboard. Radio Shack only marketed the Model II as a 64K machine even though it was capable of supporting up to 512K. The memory was bank switched in software where you could select between one of 15 pages of 32K RAM as the upper half of system 64K memory.

Physical limitations due to the number of required card slots and the high cost of DRAM at the time was a major factor in the limited usage of the extended memory support offered by the platform.



HERE'S THE ANSWERS TO THE QUIZ ON PAGE 40



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