# Yugoslav home computers of the 80's

When the whole world started making home computers, former Yugoslavia had an import law that practically forbade import of such machines.

In 1984 the first Yugoslav home computer appeared (completely open source, by today's standards) and started a revolution in home computing...

Who am I...

- Passionate about old 8-,16- and 32-bit home computers (not x86 PC!)
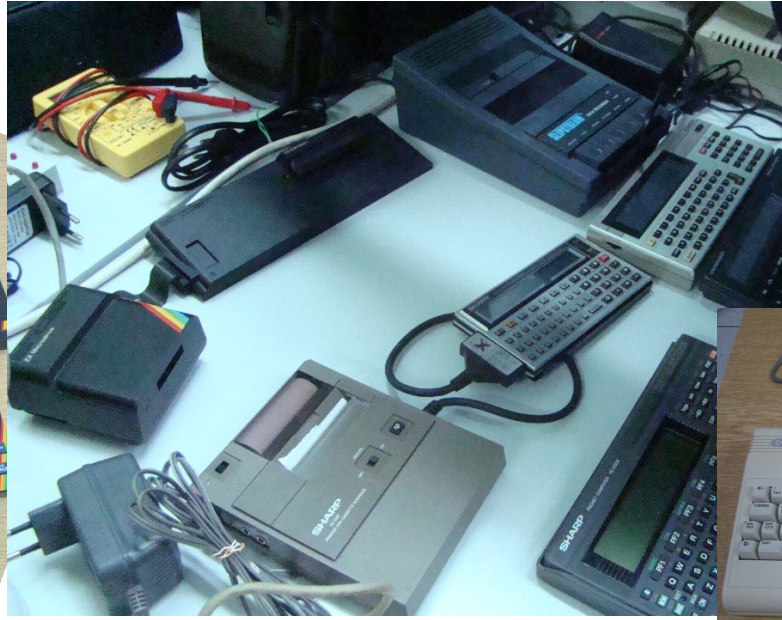
- One of the founders of Once Uopn a Byte nonprofit organization, www.onceuponabyte.org

Night of Museums
Novi Sad, 2012

Night of Museums, Novi Sad, 2013

LUGoNS BarCamp 1,2
BalCCon 2013
Novi Sad

More professional background...

- Linux user and promoter since 2006, member of Linux User Group of Novi Sad www.lugons.org – BalCCon, LUGoNS BarCamp

- Teaching assistant/assistant professor at Faculty of Technical Sciences, University of Novi Sad

- zzarko at lugons.org, uns.ac.rs

Yugoslavia, 1956

CER-10, 1956-1960
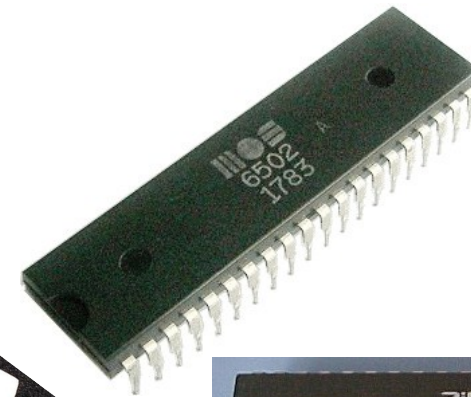

CER-12, 1971

World, 1971-1977
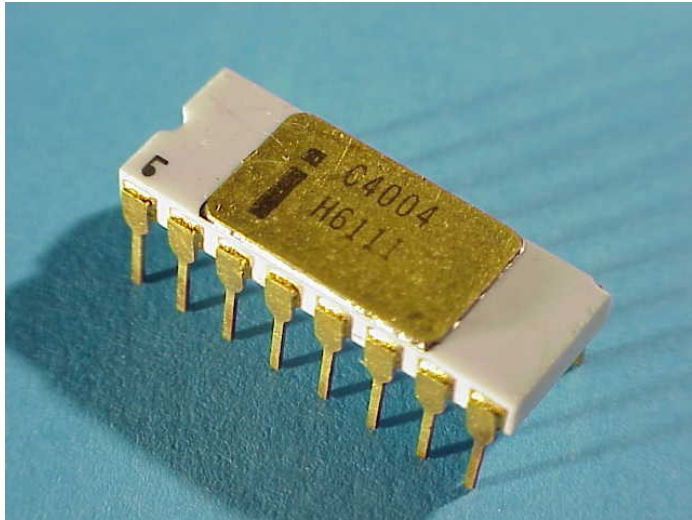
1975

1974

1976

1971

1975, 8080A

1976, 6502

1977, Z80

World, 1977-1984

1982
Z80A

1981
Z80A

1983
6502

1977
6502

1981
9900
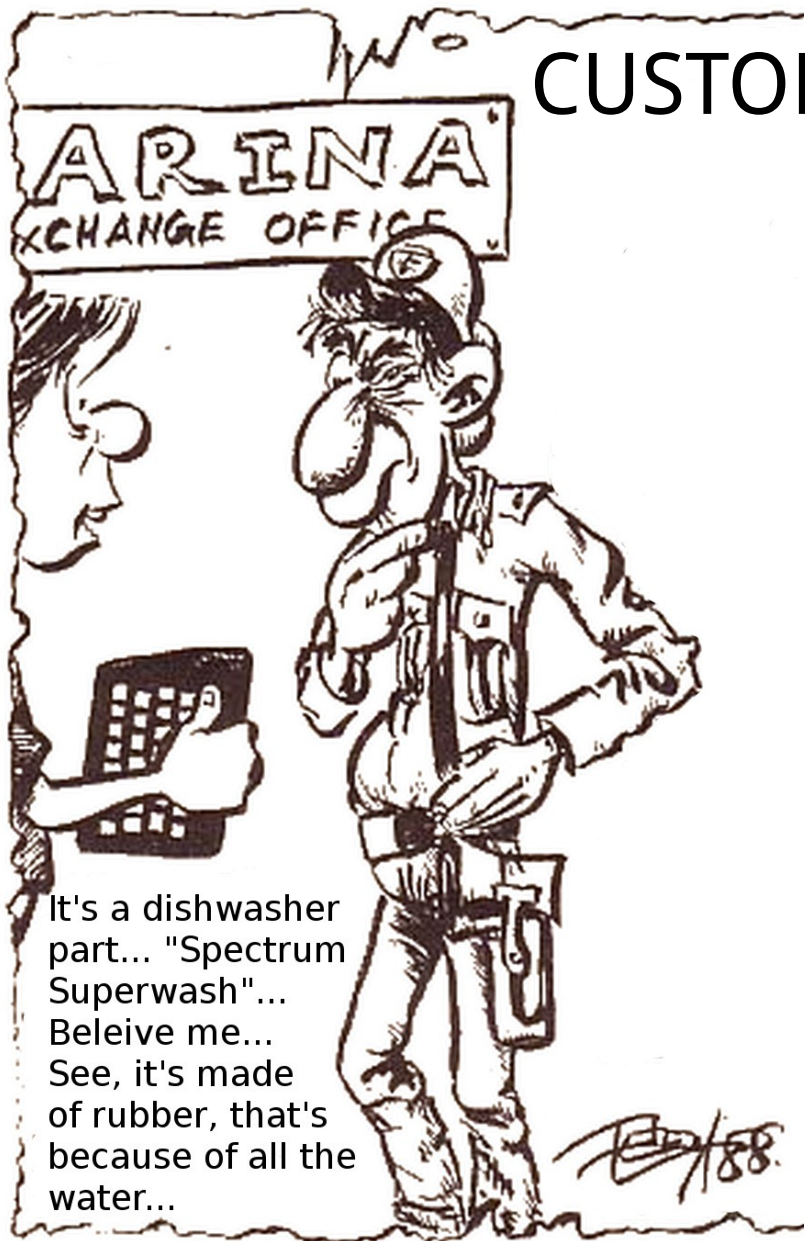
1979
6502

1981
6502

1981
6502A

1982
6510

Home computers in Yugoslavia, 1980-1984

- 50DM limit on import of any foreign goods
- Relatively poor domestic integrated circuit industry, no microprocessors
- Draconian import charges
- 1982: EL-82, Z80, 16kB RAM, 6000DM

So, how could average person (salary) in Yugoslavia obtain a home computer?

First solution...
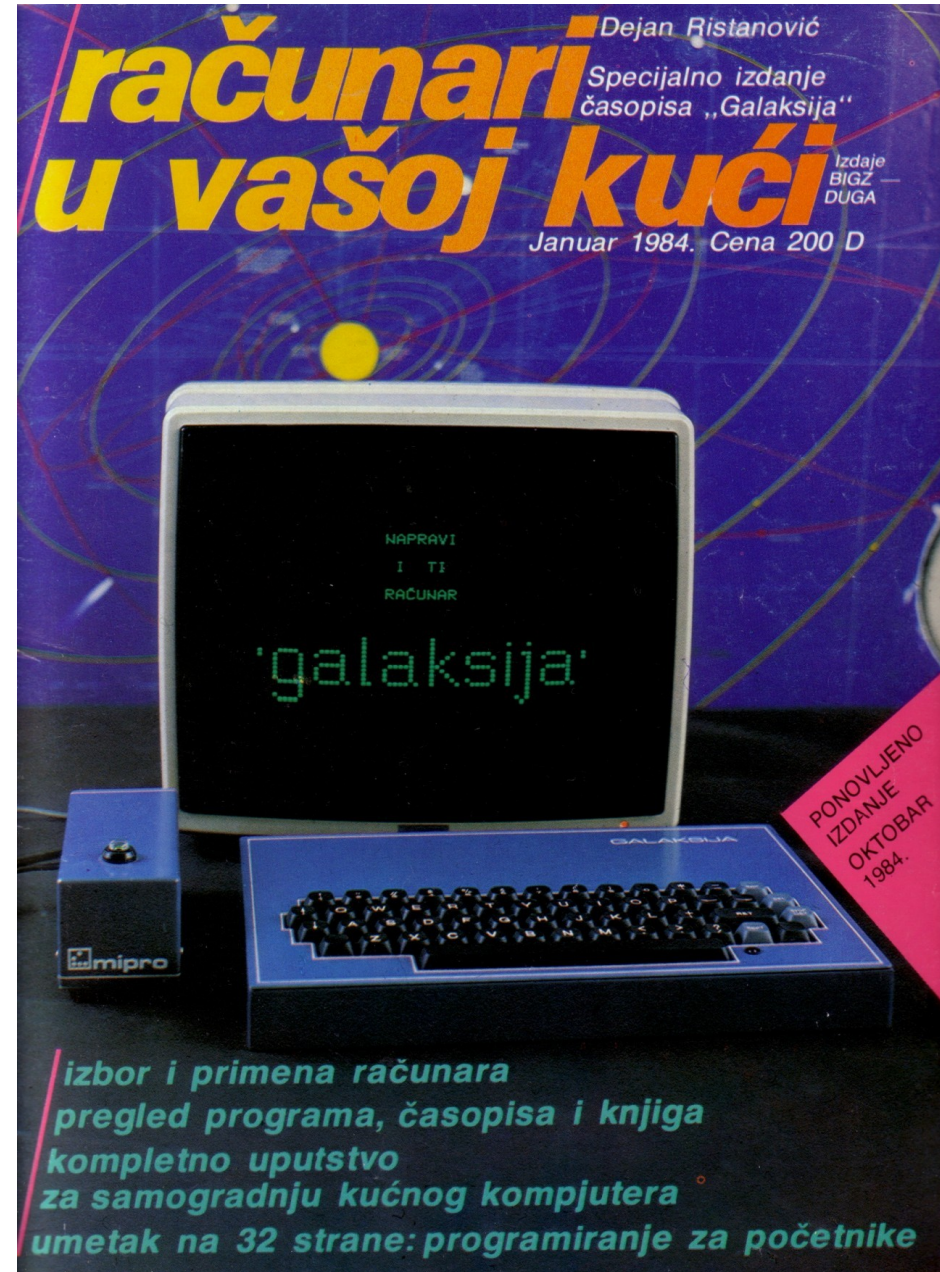
CUSTOMS

Smuggling, of course!

[It's a dishwasher part...
"Spectrum Superwash"... Beleive
me... See, it's made of rubber,
that's because of all the water...]

...second...

Legally importing foreign computers, and selling them for 2,3 or more times the price outside Yugoslavia

... and finally, the third one!

A vision of one man – Voja Antonić

1983

2013

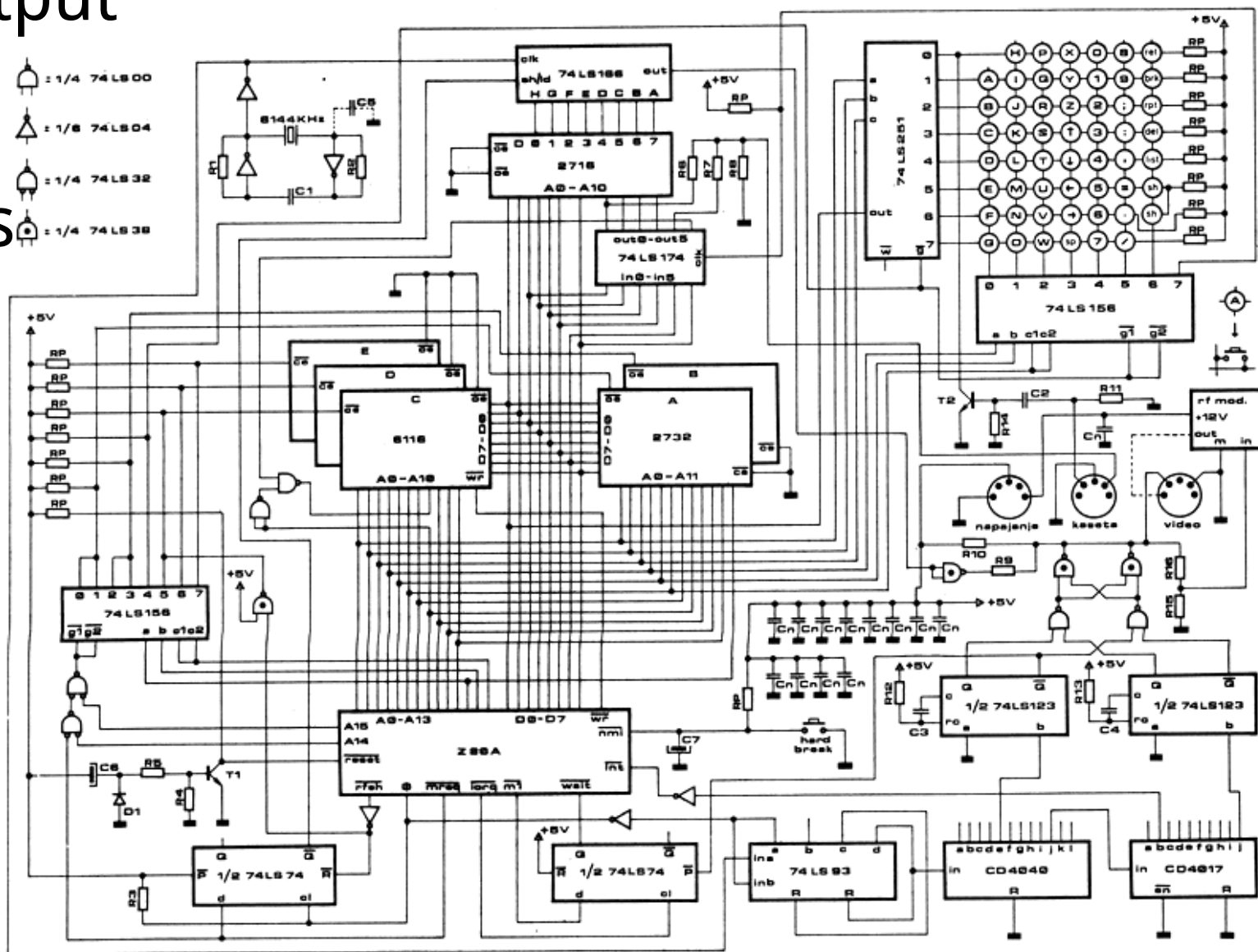# How to make an affordable computer

1. Video output
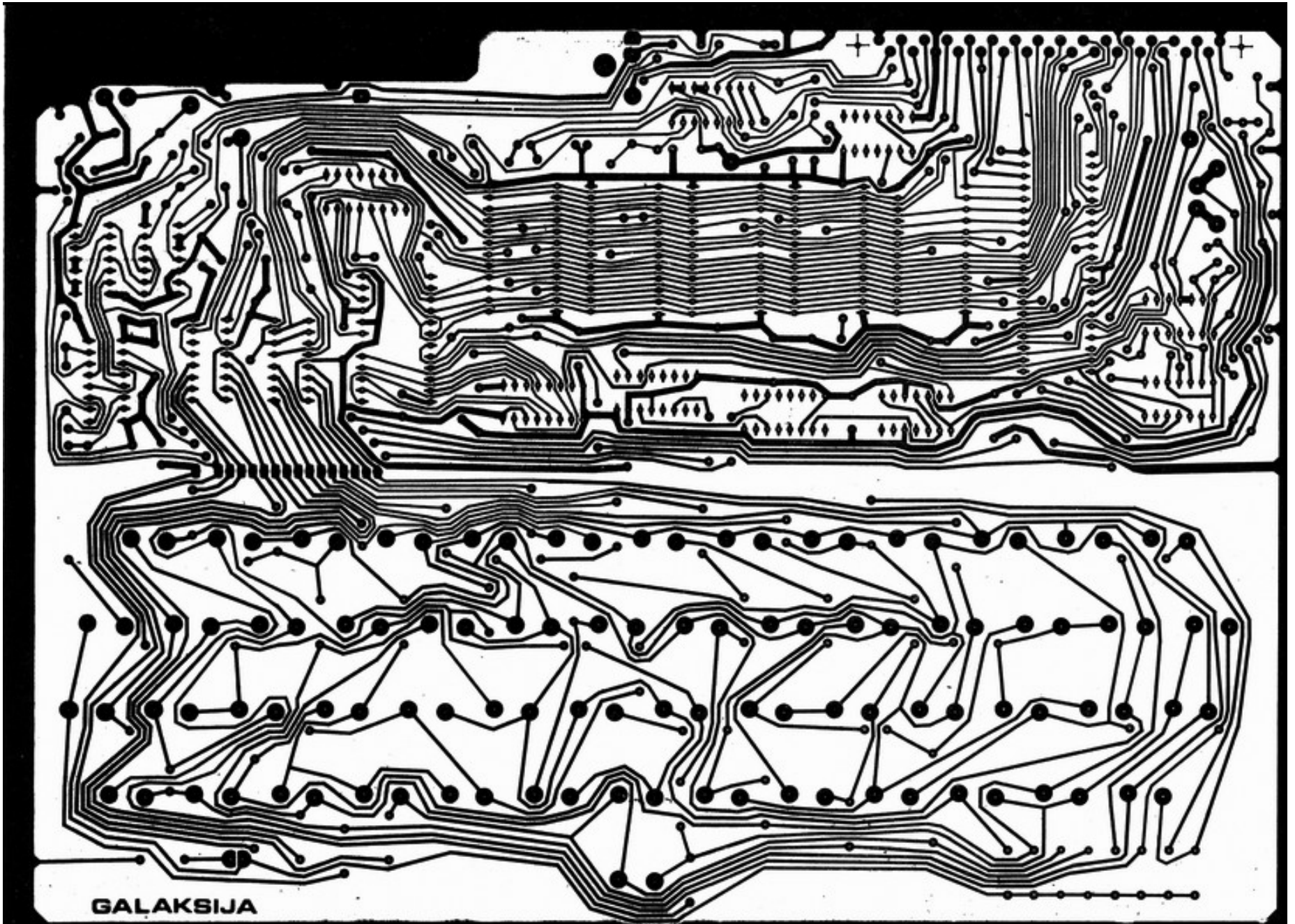
2. BASIC

3. Few parts

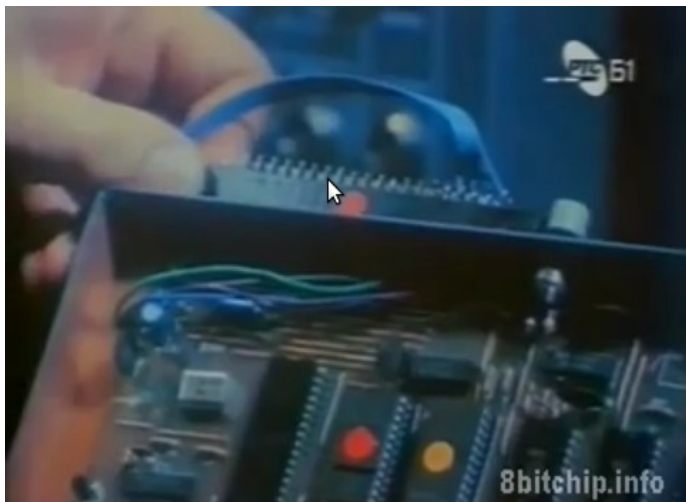Z80A

6KiB RAM

4KiB ROM

64x48 pix

32x16 chr

4. Single-sided PCB

GALAKSIJA

Peripherals

EAR and MIC

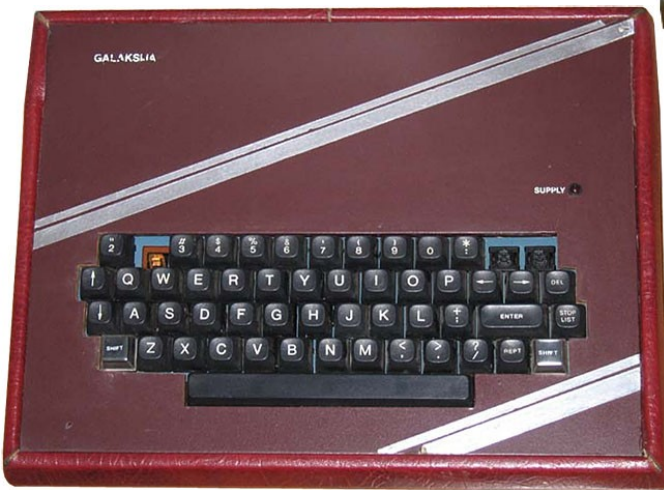# Public response to Galaksija

Over 8000 kits
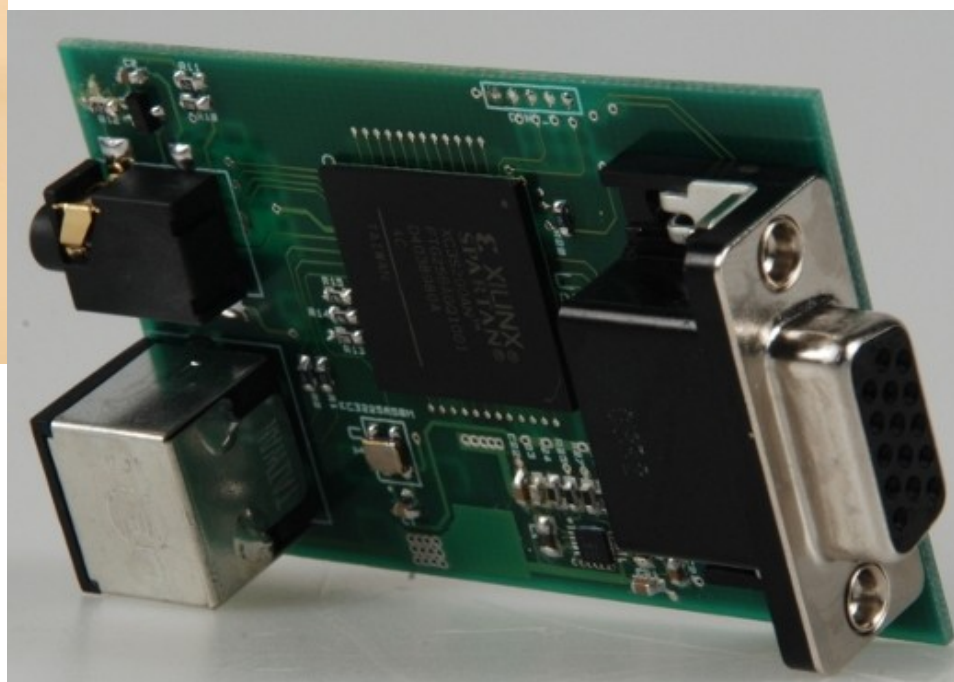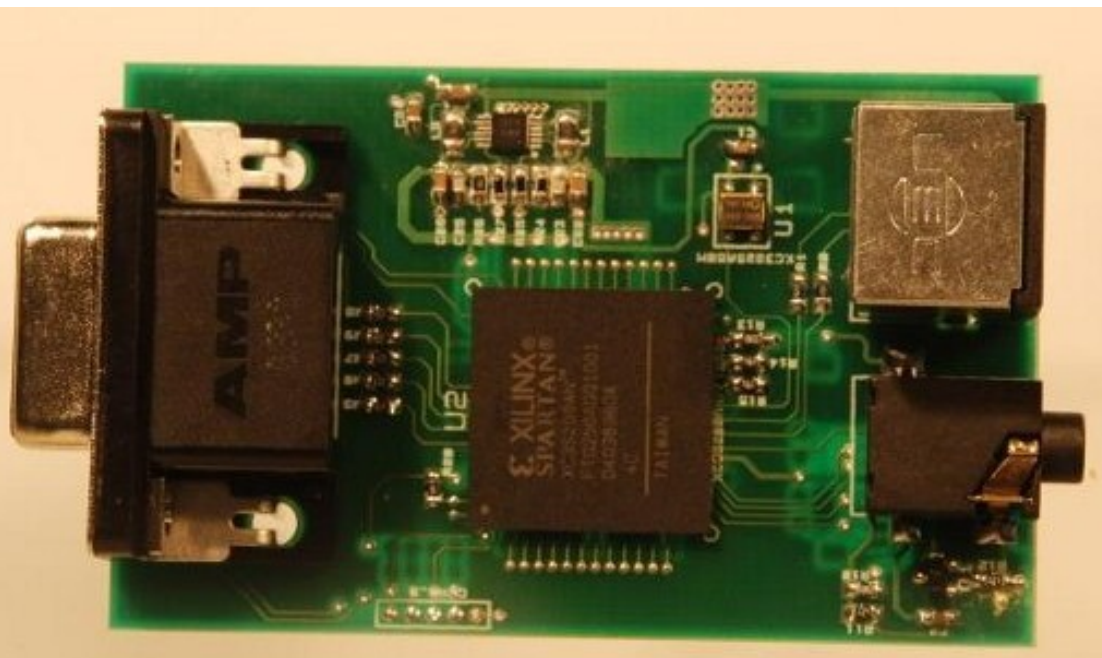were sold

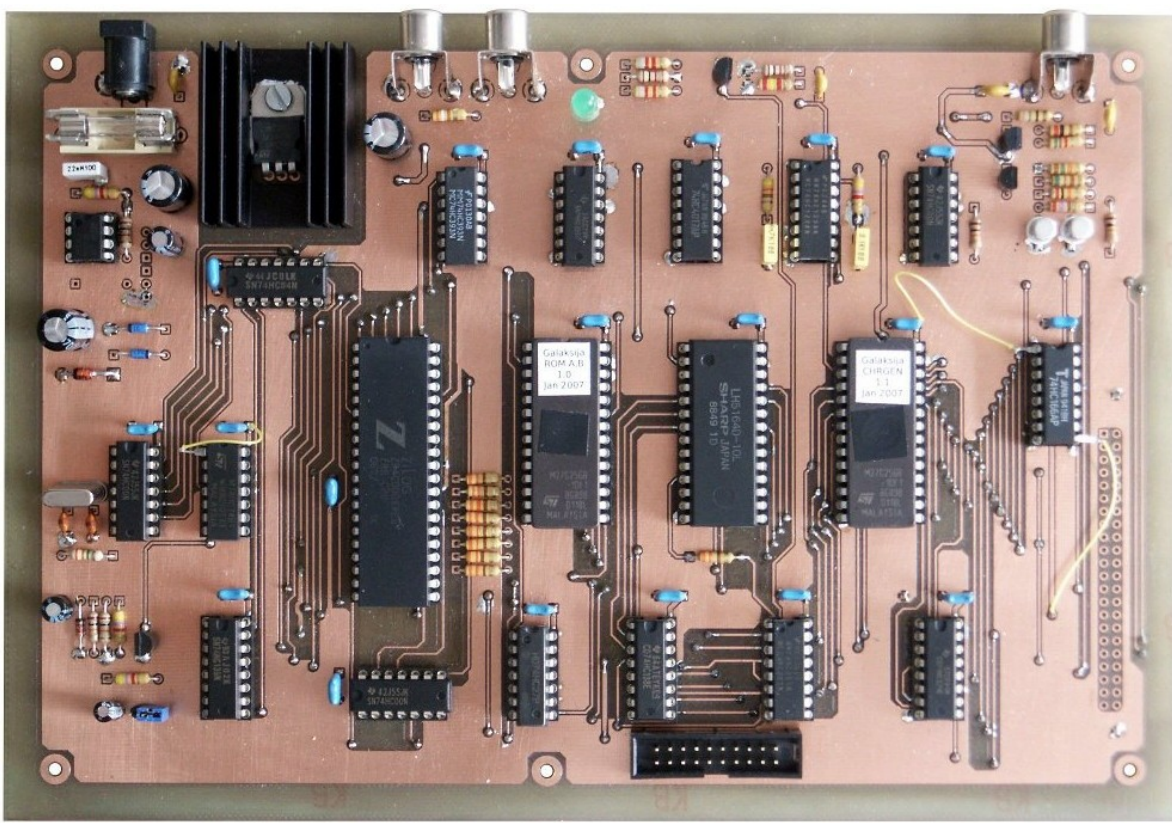Commercial version, 600DM

As many as the constructors...

Galaksija today

- 2011 – microGalaksija, Dragan Toroman, Dušan Grujić, http://galaksija.petnica.rs/

Galaksija today

- 2012 - CMOS Galaksija, Tomaž Šolc and his "The Ultimate Galaksija Talk" presented at CCC, http://www.tablix.org/~avian/blog/articles/galaksija/
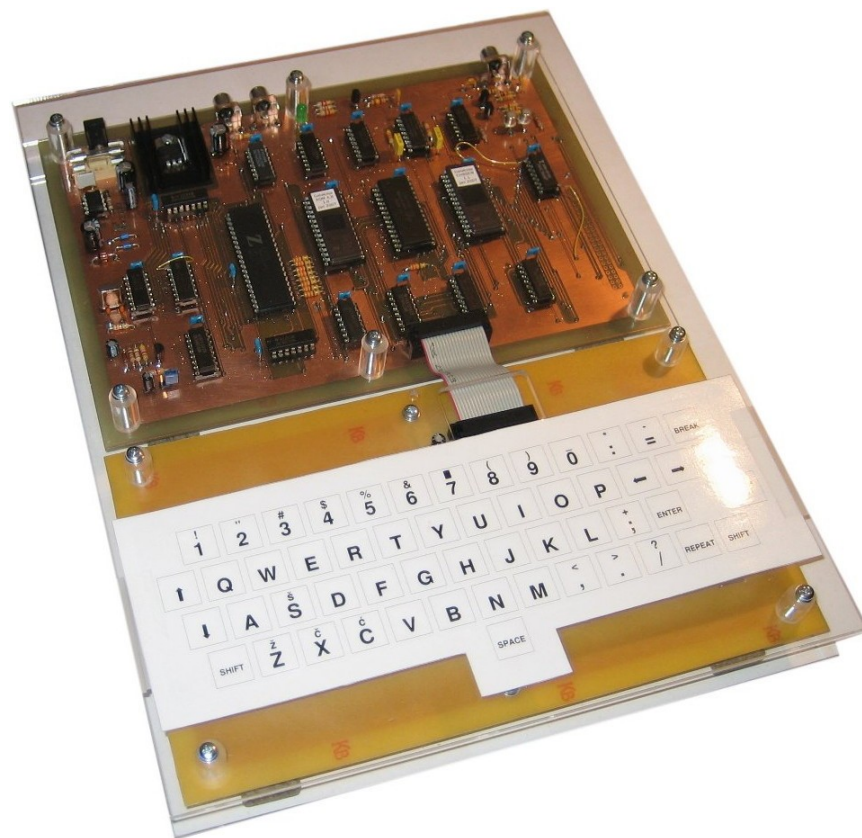
Other computers

Lola 8 and 8A

Pecom 32 and 64

Hobby ZR-84

Galeb and Orao

Misedo 85

Oric Nova 64

Many CP/M clones
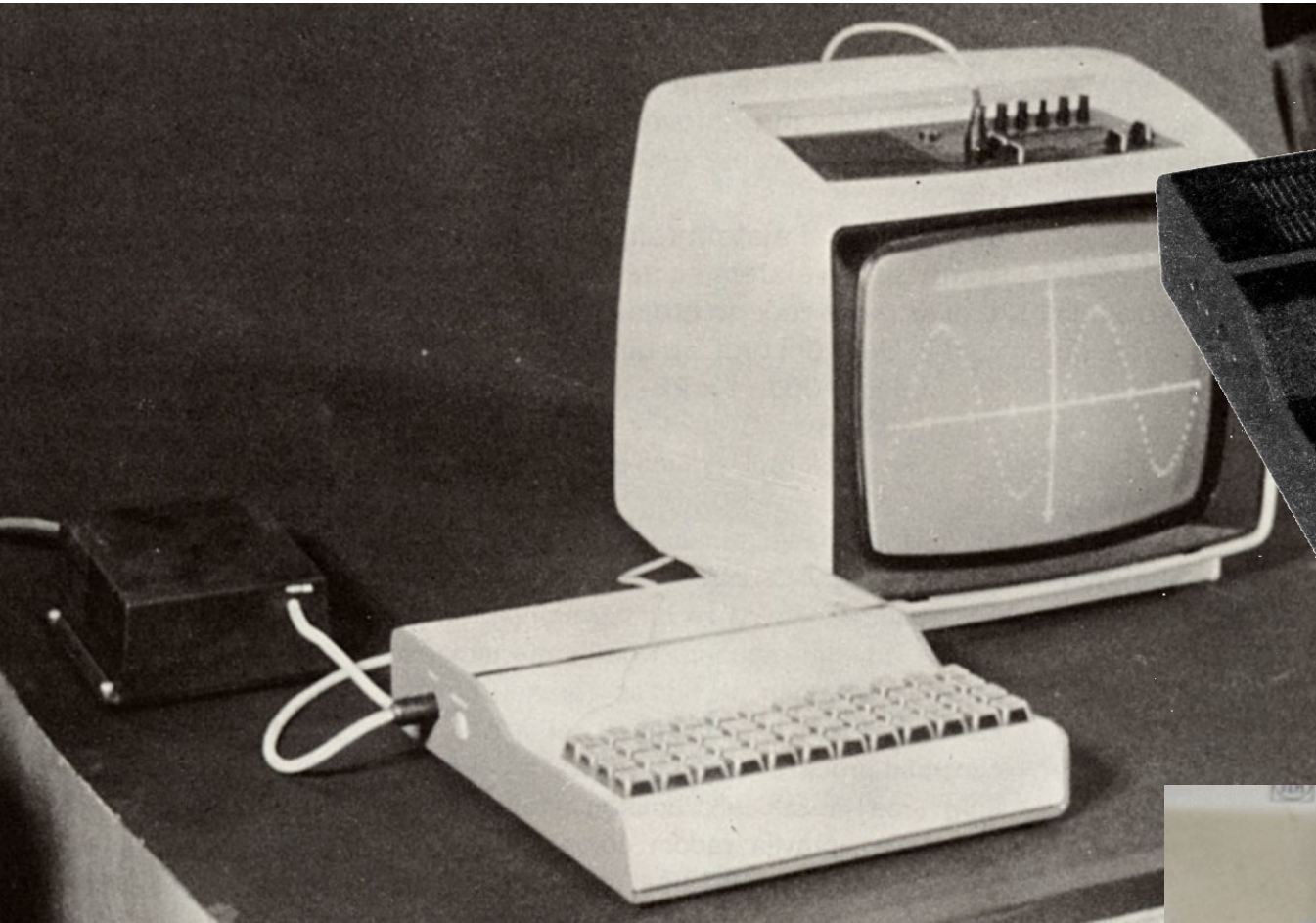
TIM 011

Partner D

A few PC compatibles

Lira 512

Novel ET-188

DOCUMENTATION!!!
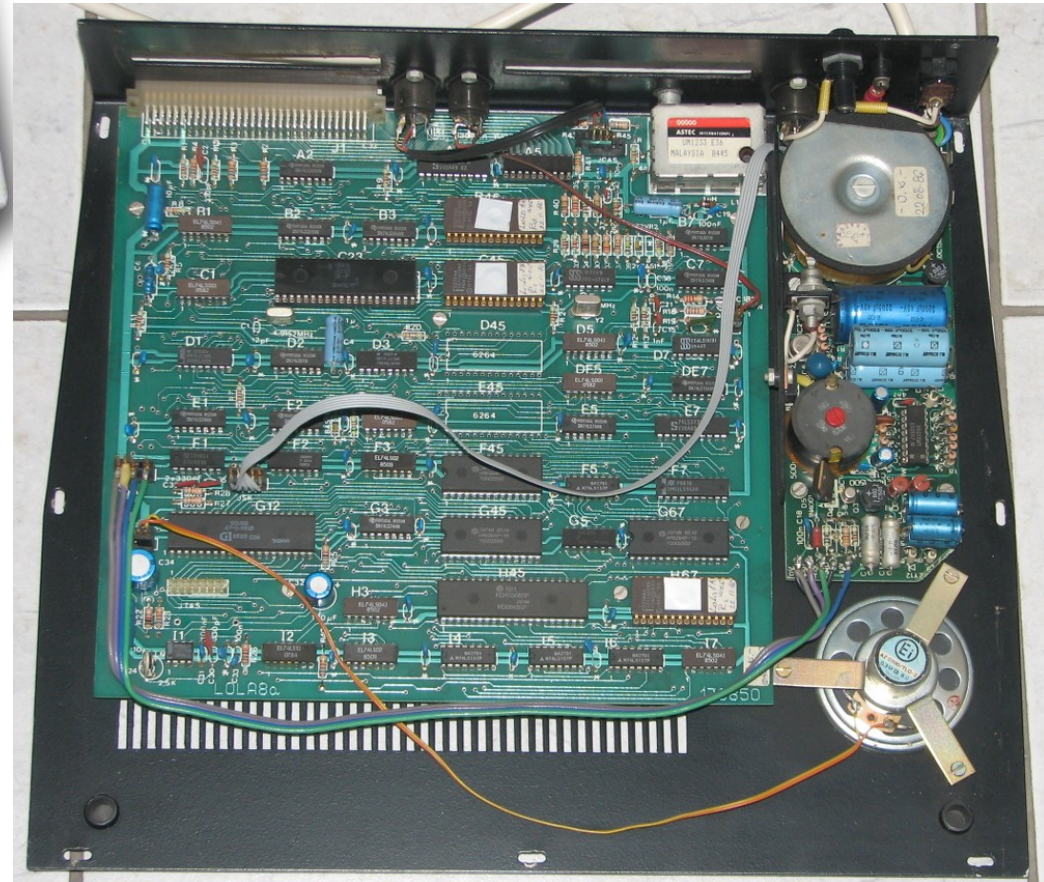
Lola 8

I8085   16KiB ROM

6KiB RAM   600DM

Lola 8A

i8085   980DM

24KiB ROM   16KiB RAM

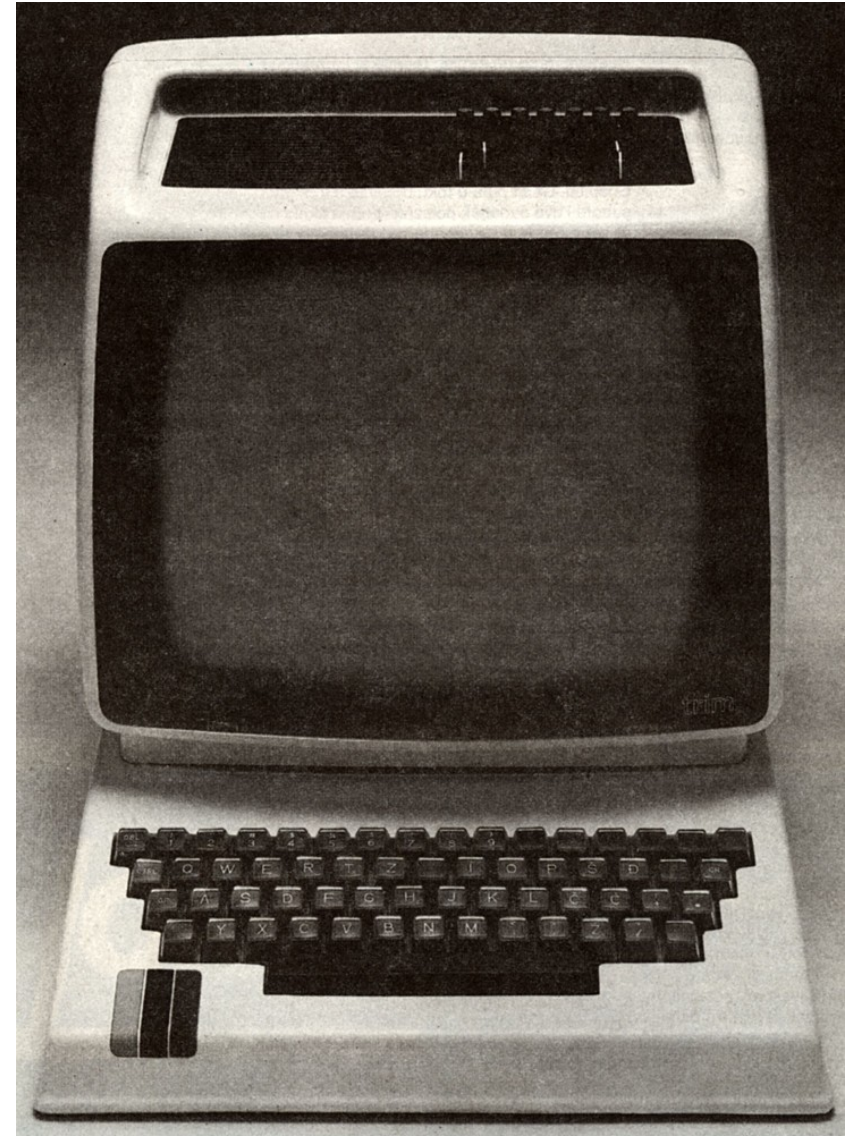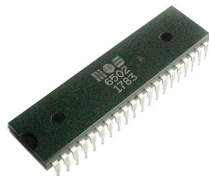320x200 pix, 3 channels
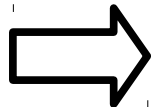
Galeb

6502 ~1400DM

16KiB ROM 9KiB RAM

96x48 pix, 1 channel

Galeb 101 (early)

Orao

Orao MR102

Orao 102
(early)

2013

6502   ~1250DM

16KiB RAM   16KiB ROM

256x256 pix, 32x32 chr

1 channel

Orao+

6502

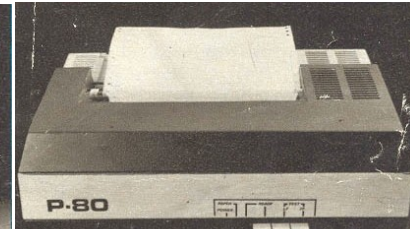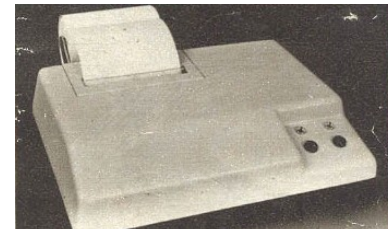64KiB RAM   32KiB ROM

640x400 pix, 80x25 chr

1 channel
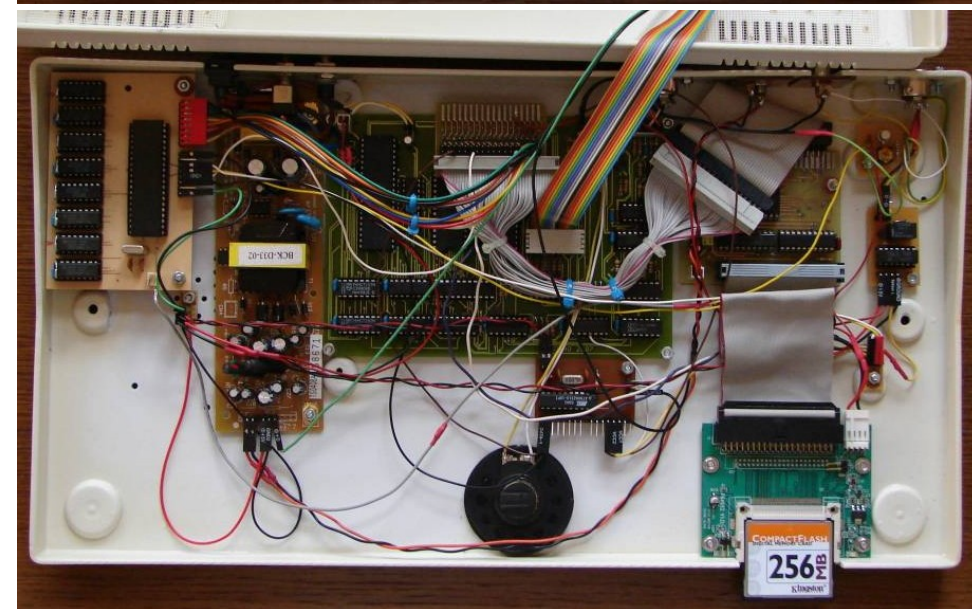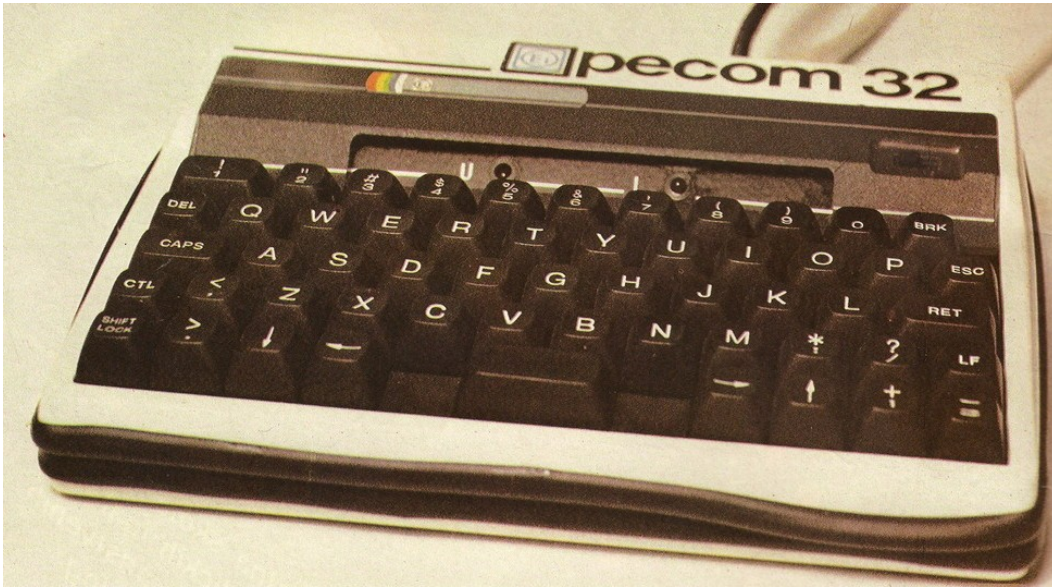

6502

32KiB RAM   16KiB ROM

256x256 pix, 32x32 chr

1 channel

Orao 2007, 2008

IDE interface

SID sound

TMS9918A
video

http://www.deltasoft.com.hr/retro/index.htm

Ei Pecom 32 and 64

CPD 1802B 5V7

32/64KiB RAM 16KiB ROM
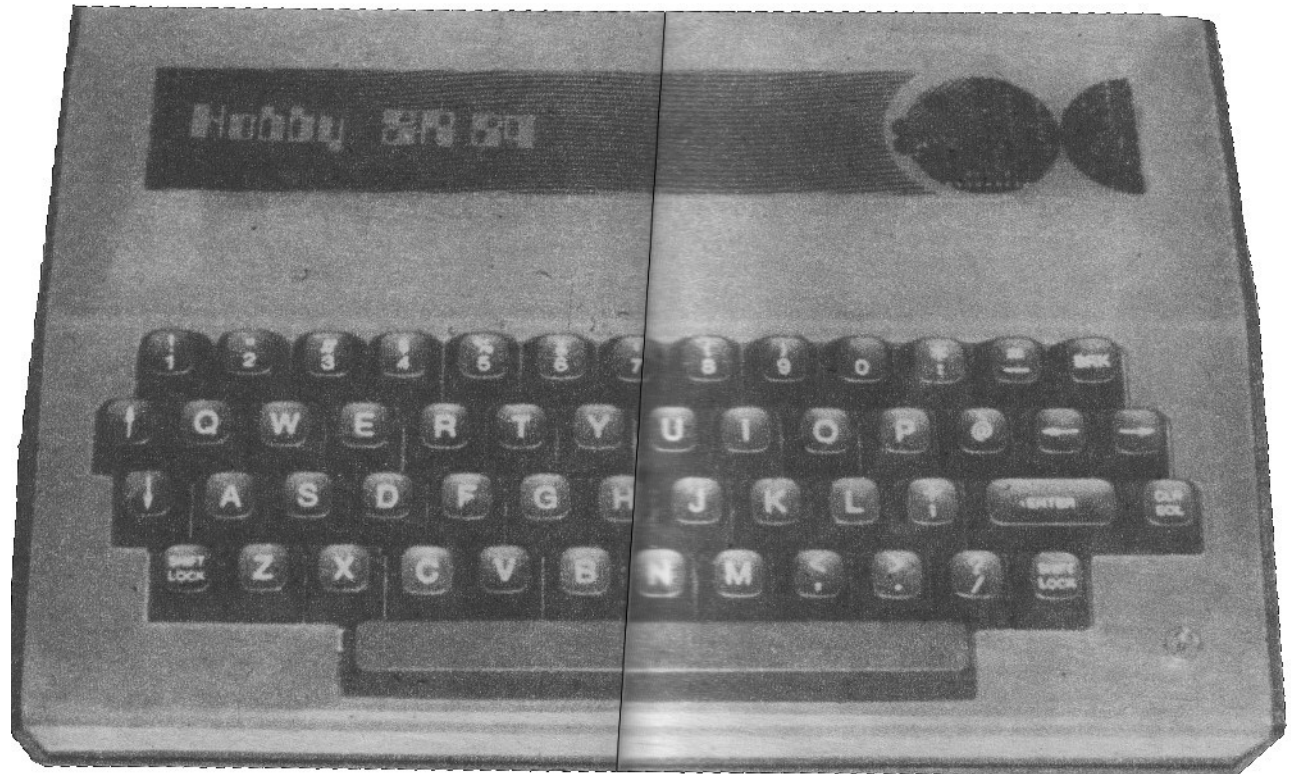
240x216 pix, 40x24 chr

2 channels

Hobby ZR-84

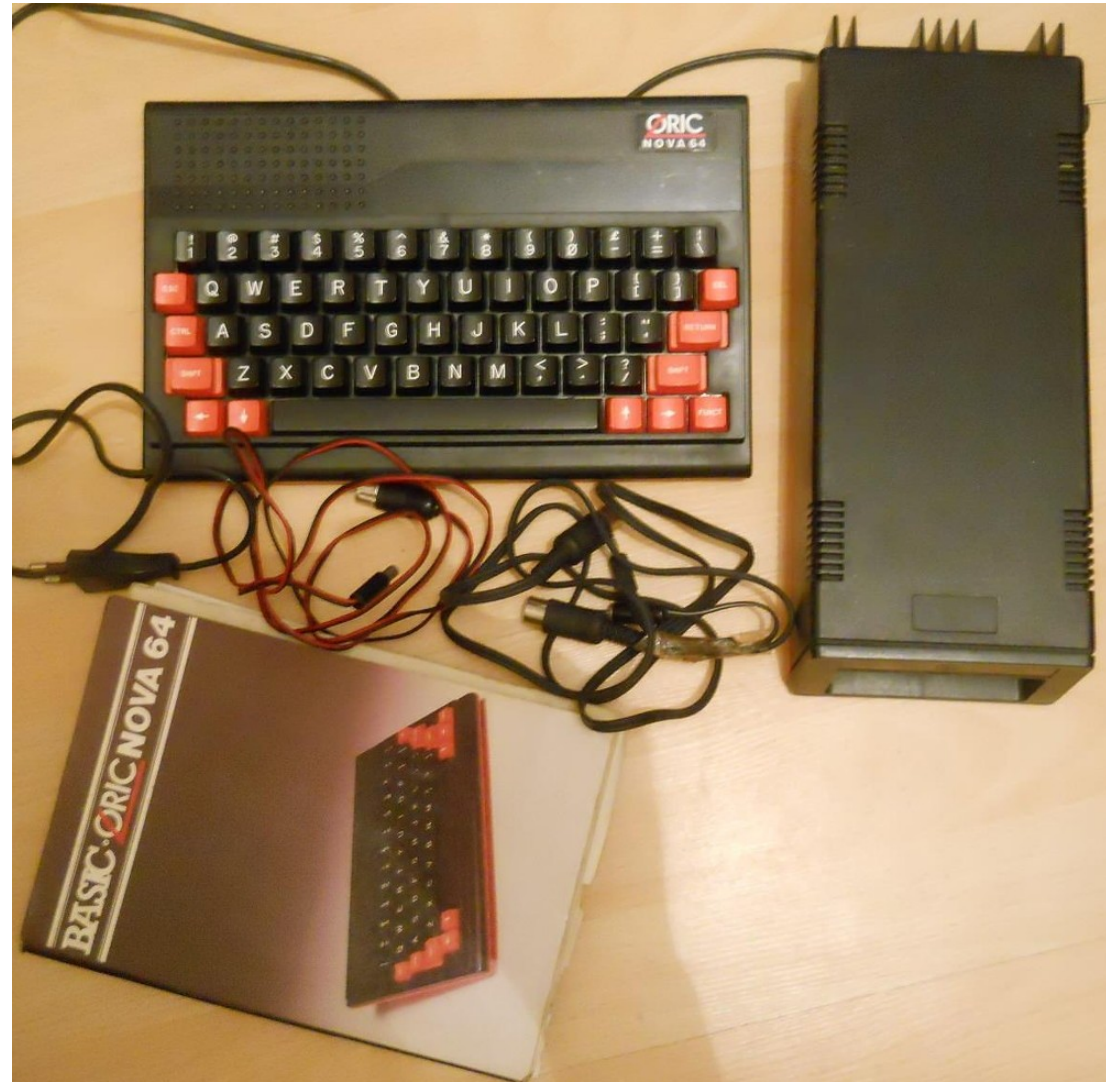Z80A   ~300DM

4KiB RAM 12KiB ROM

128x48 pix, 64x16 chr

Misedo 85
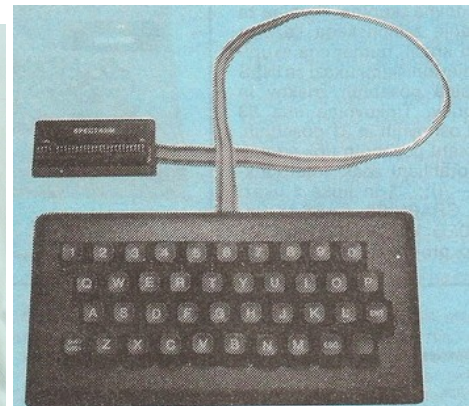

Re-branded Tandy Color Computer 2
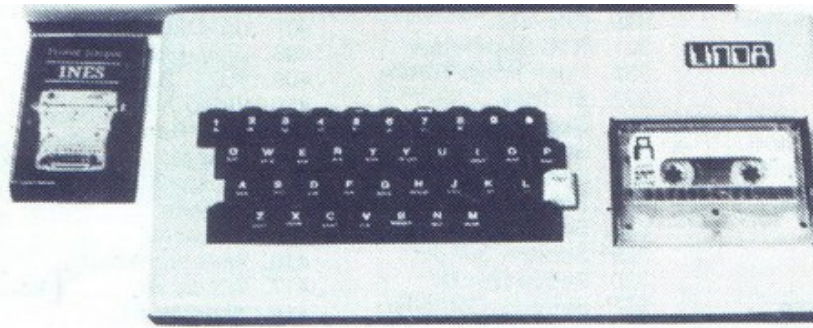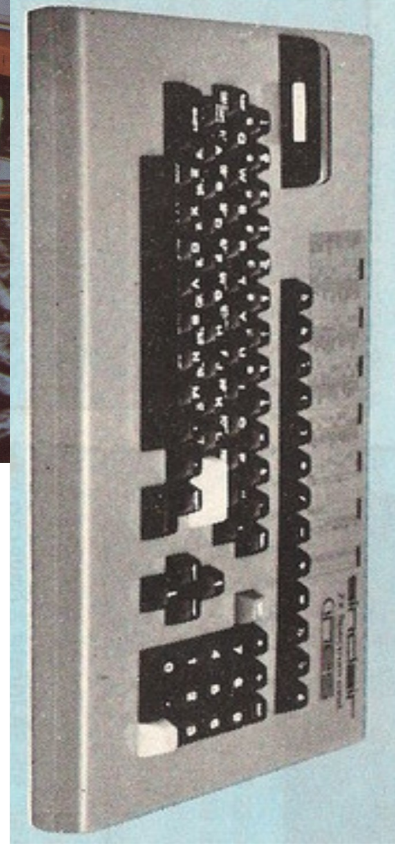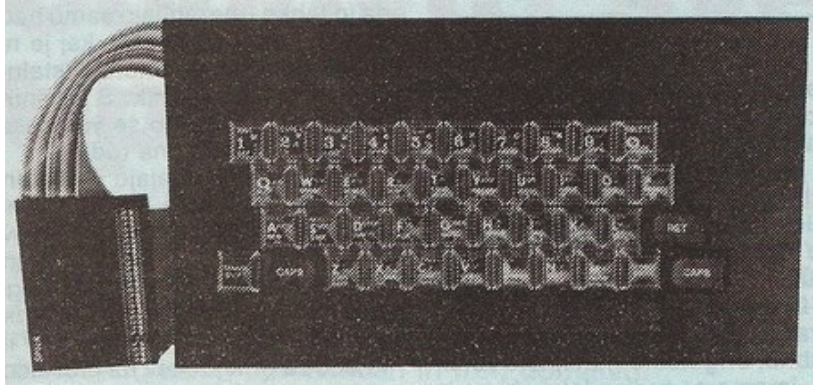
Oric Nova 64

Re-branded
Oric Atmos,
but with 64KiB RAM

ZX Keyboards

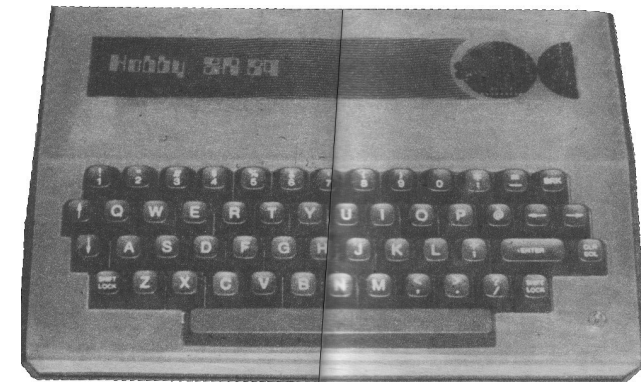# CP/M machines

TIM 011

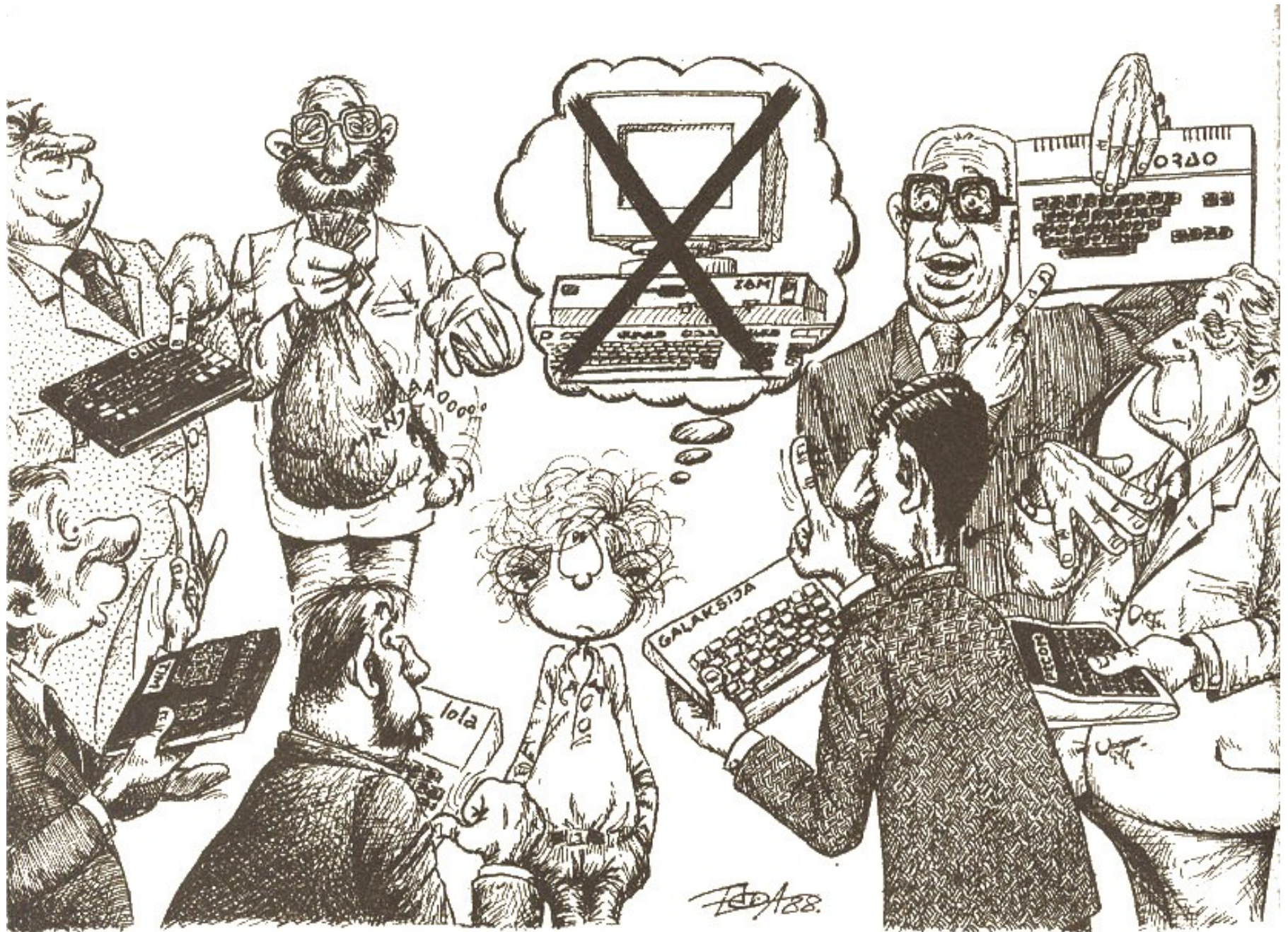# PC compatibles

Novkabel ET-188

Ei Lira 512

So, what happened to all those computers?

ZX vs C64 vs CPC vs Atari vs …

The promise of a school computer

Old Yugoslav home computers today

- Emulators for most machines exist

- Pecom Emulator (part of MESS), Miodrag Milanović (he was working many other east-european computers emulators), http://micko-wip.blogspot.com/2008/11/pecom-64.html

- Work is ongoing on Lola 8A emulator (ROMS were extracted only a few months ago)

- A lot of individuals (including people at Once Upon a Byte) are trying to save as many about those machines as they can

- They can be seen in several computer history museums in former Yugoslavia

The End... (References)

- Jelica Protić, Dejan Ristanović: Building Computers in Serbia: The First Half of the Digital Century, ComSIS, Volume 8, Issue 3, 2011
- Računari, Svet Kompjutera, Moj Mikro and other Yugoslav magazines from the 80's
  - personal collection
  - http://retrospec.sgn.net/users/tomcat/yu/revije.php
- "The Ultimate Galaksija Talk", Tomaž Šolc, http://www.tablix.org/~avian/blog/articles/galaksija/
- Wikipedia
- Caricatures by Predrag Milićević, used with his permission
- Personal experience :)