article

In times, when to 8-bits ATARI is installed 320 KB RAM, I want to propose only 32 KB. This is also so expensive. It have also advantages:
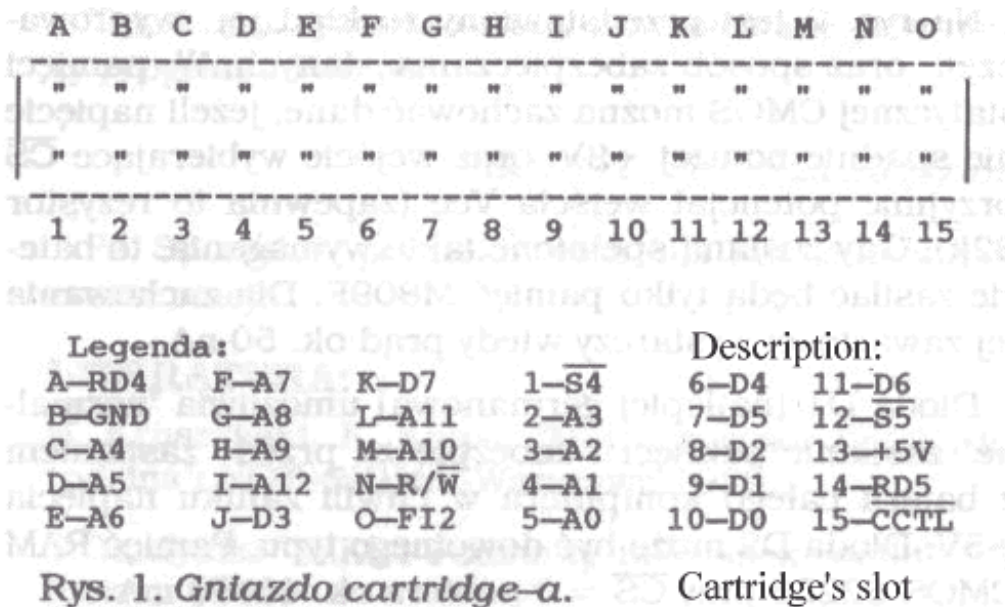
- working with typical memory expanding without any conflict
- keeping content of RAM after disappearance of power supply. Don't think that is EPROM, it's RAM
- Simply construction and easy installation outside interior of computer

First advantage is result of use memory at region: $8000 - $9FFF. Traditional expanding are located at $4000 - $7FFF.

Second and third advantage is result of place of installing cartridge with static RAM, which content is hold up with small clock batteries.

Let's look at cartridge slot, we look at back part (ATARI 65 XE) or through the top „door" of computer's cover (ATARI 800XL).
Behind plastic cover are situated two rows of contacts:

```
   A   B   C   D   E   F   G   H   I   J   K   L   M   N   O
  ---------------------------------------------------------------
   "   "   "   "   "   "   "   "   "   "   "   "   "   "   "
   "   "   "   "   "   "   "   "   "   "   "   "   "   "   "
  ---------------------------------------------------------------
   1   2   3   4   5   6   7   8   9  10  11  12  13  14  15
```

Legenda:				Description:	
A—RD4	F—A7	K—D7	1—$\overline{S4}$	6—D4	11—D6
B—GND	G—A8	L—A11	2—A3	7—D5	12—$\overline{S5}$
C—A4	H—A9	M—A10	3—A2	8—D2	13—+5V
D—A5	I—A12	N—R/$\overline{W}$	4—A1	9—D1	14—$\overline{RD5}$
E—A6	J—D3	O—FI2	5—A0	10—D0	15—$\overline{CCTL}$

Rys. 1. *Gniazdo cartridge-a.*   Cartridge's slot

Meaning of most of signals is easy to guess. Below is description of all of them:

- A0 - A12   - address bus of microprocessor CPU.
- D0 - D7   - data bus
- +5V, GND - power supply
- R/W   - signal read/write
- FI2   - signal of clock CPU (phase 2)
- RD4   - command for MMU. If RD4 = 1 (hi) then MMU switch off internal memory at region $8000 - $9FFF

S4   - controling signal for cartridge memory. If RD4 =1 and on address bus appears address between \$8000 - \$9FFF, then MMU set signal S4 = 0 (lo): internal memory in this region (between \$8000 - \$9FFF) are switch off.

RD5   - similarly to RD4 but for addresses from \$A000 to \$BFFF.

S5   - like S4, adequately for addresses from \$A000 to \$BFFF

CCTL   - (Cartridge ConTroL): when on address bus appears address from page \$D5, the MMU set CCTL = 0.

(In the description I pass over the negation. They should be there like on the picture).

In cartridge I propose to place static memory RAM type 62256. Becasue it will be located at address \$8000 - \$9FFF, therefore we will call it M809F, and this prefix will have signals related with this memory.

Rozkład wyprowadzeń pamięci statycznej CMOS 62256 z zasilaniem alternatywnym.

RYS. 2.
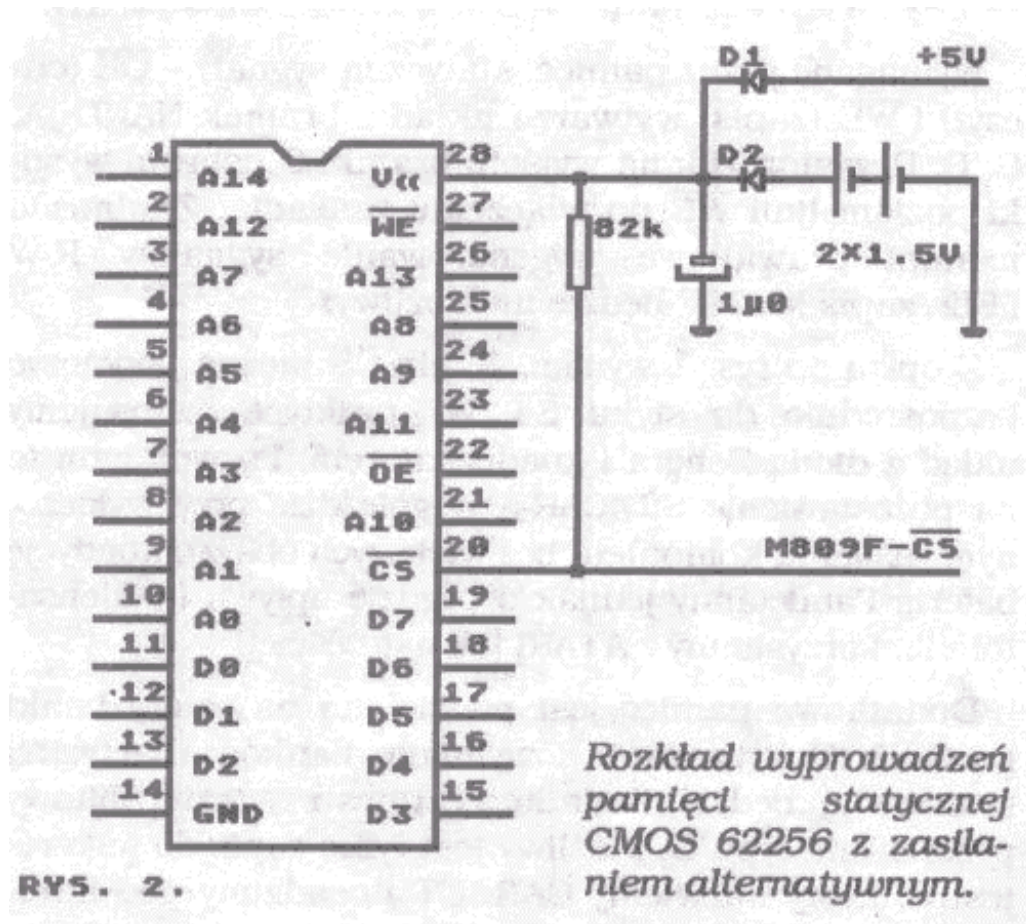
On picture 2 is introduced schedule of connections and method of protection of data. In static memory CMOS it is possible to keeping data if voltage don't come down below +2V and choosing entry CS will have potential of Vcc (ensure it resistor 82 k). When this will be fulfil then batteries will supply only memory M809F. For keeping data will be enough current about 50 nA.

Diode D1 (the best is german) make possible „normal" power supply of memory and protect against power supply from battery the whole computer when power supply +5V disappear. Diode D2 can be any type. Memory RAM CMOS 62256 when CS=0 gets about 40-50 mA.

Lets talk about specific system of controling additional memory. There is on picture 3. Signals on the left side of the picture belong to described before contacts of ramcart slot with exception the signal WE, which should be get from output of gate C.

On the picture don't put full set of address and data lines for M809F. Don't forget about it!

memory driver
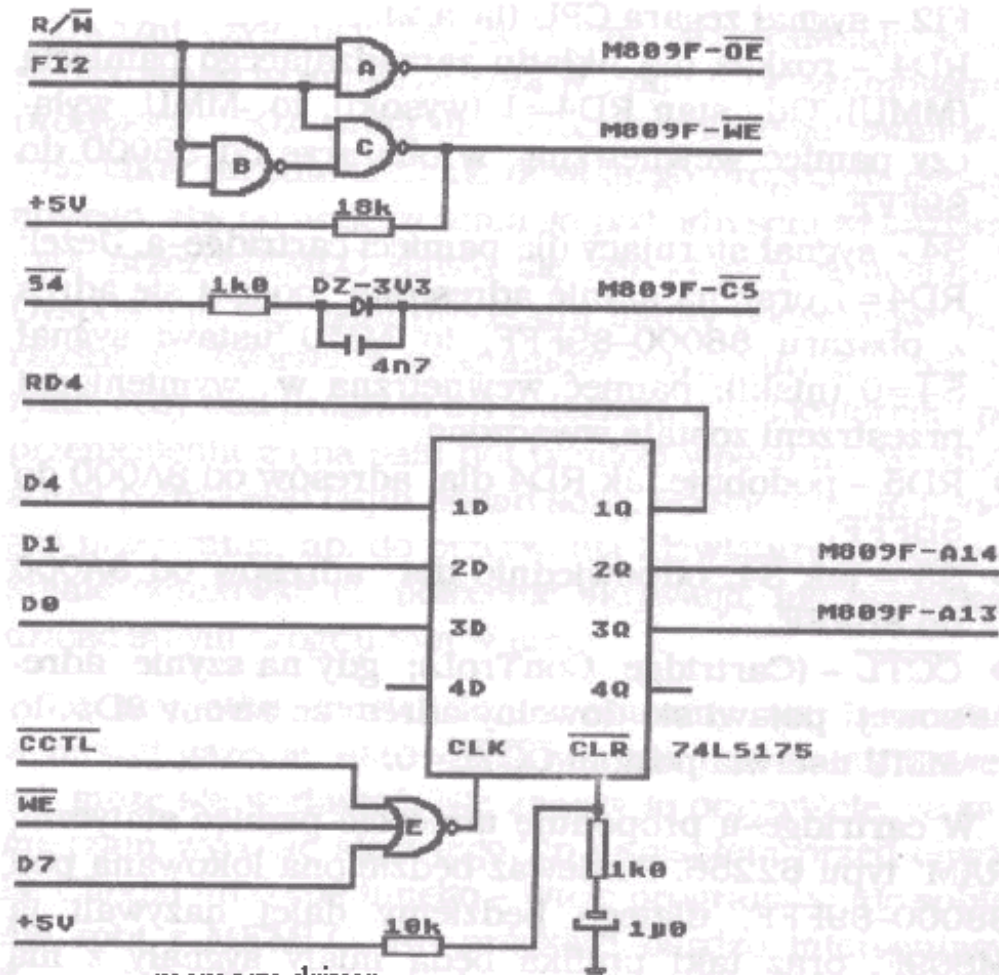
RYS. 3. Sterownik pamięci.

A, B, C – 74HCT00
E – 74LS27

Required by static memory signals - OE (read) and WE (write) are created by system of NAND's gates: A, B, C. Resistor 18 k on the output of gate C sets hi level on line WE after switch on the power supply. Before correct signals R/W and FI2 wouldn't generate, writing to M809F wouldn't possible.

From the description of picture 1 follows that CS may be connect directly to contact S4. In practice we use system with Zener's diode and condenser. It's allow us to leave cartridge in slot when power supply of the computer is turned off, without worry about battery power. Don't forget about current which is lose on condenser and use ATARI as often as possible!

Additional memory is divided on four banks, each have 8 KB. Changing the banks will realize additional register - fourbits flip-flop type D. It is possible only write to this register, which will be called CARSET and will be placed under address $D5FF. As we see, only three bits writen to CARSET have importance.

Meaning of bits in register CARSET presented below table.

| bit danej | | | znaczenie |
D4	D1	D0	
.	x	x	przygotowanie banku:
.	0	0	– bank 0
.	0	1	– bank 1
.	1	0	– bank 2
.	1	1	– bank 3
x	.	.	dez–/aktywacja banku:
0	.	.	– przygotowany bank jest wyłączony
1	.	.	– przygotowany bank jest aktywny

Example:
After execute of below instructions:

```
carset    equ  $D5FF
          lda  #%01111110
          sta  carset
```

we will have, under addresses $8000 - $9FFF, bank 2 memory M809F.
After execute of below instructions:

```
          lda  #%01101111
          sta  carset
```

we will have, under addresses $8000 - $9FFF, „normal" ATARI memory.

Note:
- If the bits aren't use we will set they to 1.
- Address of CARSET will be set to $D5FF

We should talk more about bit D7, which controling gate E (NOR). Gate E is a very simple decoder. Unambiguous, high state on its output appear only when data for CARSET will have bit D7=0. If one of bits on data bus is 0, this means that on data bus is setting valid data. If we take into consideration delay on gate E and input CLK, CARSET latch stability value.

„One picture - thousand words". Insted long argument about driver's working, I propose analysis dependence between signals. It's presented at picture 4.
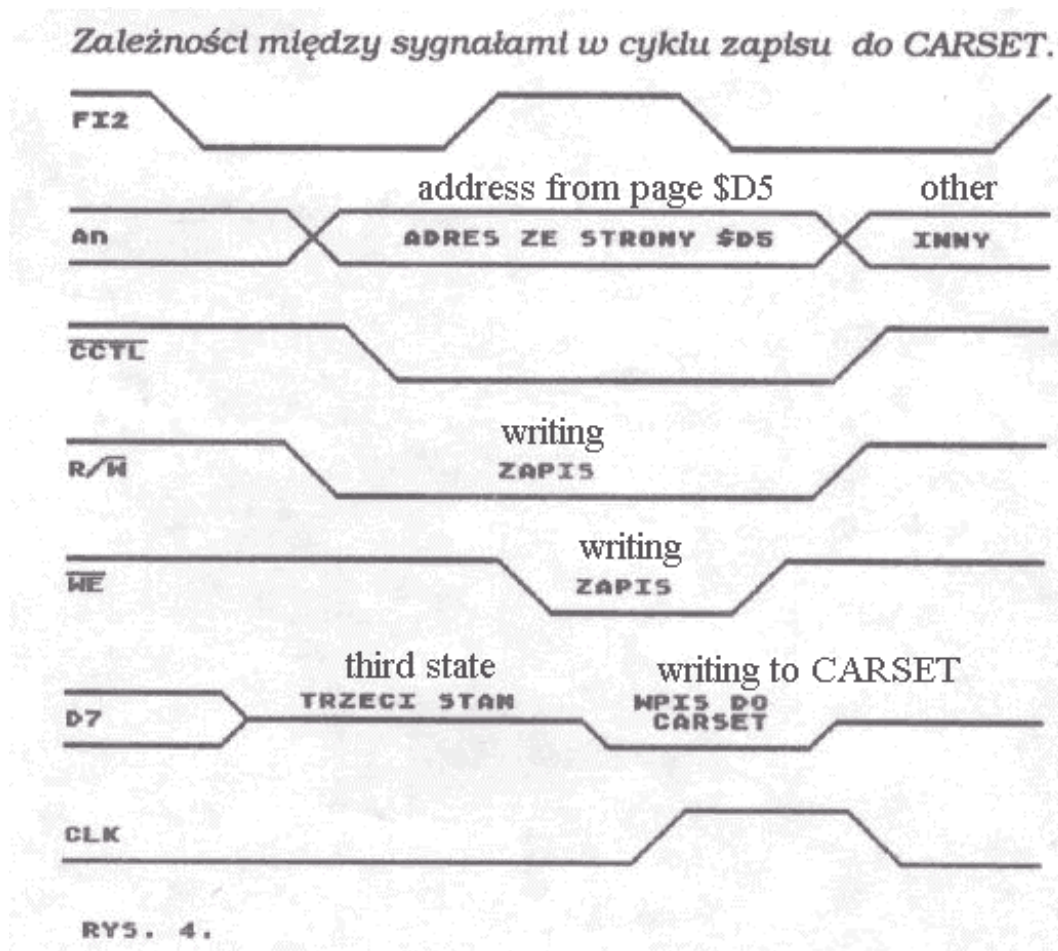
Why worth to do it ?
Here is some possible application:

- We work with important data. To protect this data we write procedure which will be activated to making „dump" some region of memory to „very hard disc" (VHD?) without noise of disc drive and almost in background.
- If we want to have favorite program on cartridge. It's simple! I recommend literature. Especially compulsory fans of popular streamer XC12 and its variety, may find a new friend in SIDICAR.
- SIDICAR is perfect for RAM-files and RAM-DISKs
- Additional memory never too much!

Last notes

It's possible to project switch, which will connect WE from memory M809F with voltage +5V or with output of gate C. This switch will be called PROTECT (it's similar to protect disc by remove the hole).

Register CARSET (74LS175) is reseting (set to 0) one time - after switch on the power. Others depends on programmer. By the way: take note that including to data bus inputs series 74LS... is for computer serious problem. Let us remember about this when we will still upgrade ATARI.

With described cartridge we should proceed as with any other cartridge - put in when power is switch off, and pull out when the power is switch on.

Text and pictures was prepared with using program Panther.

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(translation: K. P.)

SIDICAR - correction

Copy of SIDICAR with storage capacity which I send lately to editor's office „Tajemnice ATARI" is different in some details from described in last article. I want to inform about it.

I begin with two errors. At first I thing nobody treat serious sugestion about pulling out any cartridge when the power is on. It should be done when the power is turned off. The second: on the picture 4 high state of signal CLK is „too long"; falling slope of this signal appears after that signal WE reach high lewel. Fortunately flip-flop D don't care at falling slope CLK.

The fundamental moment for correct working of SIDICAR is growing slope CLK. Practice shows that conditions needed to its create may (!) be too little precision and CLK

will appear too fast and cause lock by CARSET unexpectedly value. This negative case of „independent thinking" is easy to eliminate. Necessary delay we get if we include parallel to line CLK, matching experimentally capacity (from 10 to 330 pF). Will be enough to solder to pin8 and pin9 of integrated circuit 74..175 selected capacitor. I also encourage to using flip-flop in version CMOS 74HCT175.

If in our computer coexist many extension that will be better to use on line D7 serial included resistor with value about 33 ohms. I can't find integrated circuit 74HCT175 (are they exist?).

I propose also new way for production signal CS for memory M809F. As we remember, it is problem with isolate battery from inner integrated circuits of computer. Simple diagram look like this:
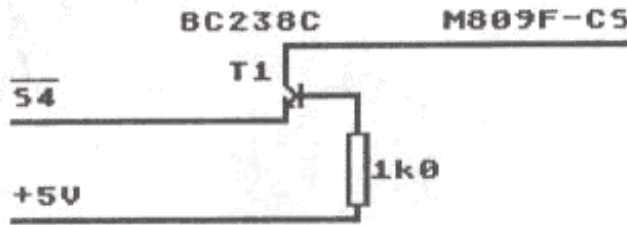
Because its possible that occurs problems with poor matching levels of voltage (it depends on integrated circuit in computer) so we solve it in that way:
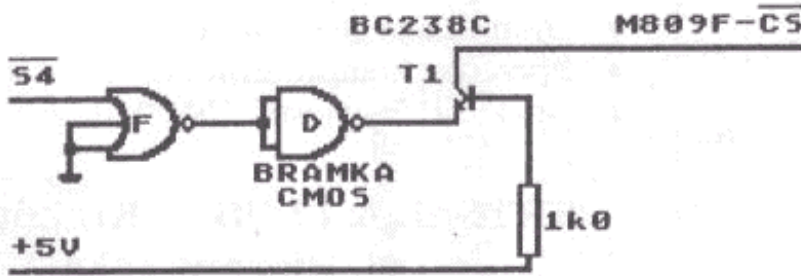
After bringing this changes, working with SIDICAR will really pleasure. For happiness we need only „silicon" DOS. I wish you and myself arise „silicon" DOS.

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