

DIJIT AVPC 80 COLUMN CARD

(Written for the Swedish user group PROGRAMBITEN 89-1)

by Jan Alexandersson, Springarvägen 5, S-142 61 TRÅNGSUND, Sweden

1. GENERAL

I have installed an 80-column card from DIJIT with 192 kbytes RAM in the PE-box. It has an EPROM with 50 Hz PAL as default but I can change it to 60 Hz NTSC in a program. The card is delivered with 50 or 60 Hz EPROM dependent of which country you live in. The card comes with an 8 page manual which describes how you connect the card and modify the console. You will also get 3 disks with program and text files. There comes no help for a programmer with the card. If you want to write your own programs which uses the special features of the video processor then you must have a manual from Yamaha. You can buy the manual from Asgard.

The same 9938 video processor is used in Myarc 9640 Geneve and Mechatronic 80 column card. This means that many programs for these may be used with the DIJIT AVPC card. MSX-2 and Nintendo (DIJIT and Asgard have different opinions about this) also have the same 9938 video processor but they have another CPU than the TI-99/4A.

You can order the AVPC from DIJIT Systems, 4345 Hortensia St., San Diego, CA 92103, USA. The price is USD 250 with 192 kbytes RAM plus USD 10 air mail to Europe. You can also buy modified EPROM from DIJIT for the RS232 card from TI(USD 22), Myarc(USD 20) or Corcomp (USD 20 for 24 or 28 pins).

2. MODIFY THE CONSOLE

You must open the console and modify the mother board. This is well described in the manual. Usually you don't need to solder but I had to use the solder iron to get the two metallic screens apart from the mother board. You modify by cutting one trace on the card. The video processor 9929A (PAL in Europe) must be lifted up and one pin shall be bent out. You shall fasten a ready-made cable on this and also at two other places on the card. All this was easy to do. The most difficult thing was to press down the video processor which has a lot of pins. Look very carefully that no pins are bent and put the chip down very slowly. The pins will spread apart somewhat so you must press them together. You have the same problem if you want to change EPROM in a unit like the RS232-card. The whole chip has a white cream which lead away the heat. It is important that this will remain and you may buy more of that.

3. RGB MONITOR

DIJIT recommends an RGB monitor with 12 MHz bandwidth and 0.42 mm CRT-pitch. You cannot use an ordinary TV-set with SCART for RGB because it is only good for 40 column display. I have a Philips CM 8833 monitor with SCART contact for RGB. I had to make a cable with SCART and 6-pin DIN. My cable looks like this:

AVPC	Monitor
6-pin	SCART
DIN	contact
1 Blue	7
2 Red	15
3 Ground	5, 9 ,13
4 Green	11
5 Csync	20
6 +5 V	-

Notice that pin 20 Csync is only mentioned in the english part of the manual and not in the part for Sweden or any other language. I had to press the button for RGB-status on the back of the monitor to get a picture on the screen with AVPC. This was not necessary with TI-99/4A with RGB-modulator. I have not connected pin 16 (blanking) of the SCART-contact. It may have the same function to connect it to +5 V as RGB-status but as it works anyway I will not try it. DIJIT doesn't recommend the use of the blanking pin.

The sound must be connected to the old 6-pins DIN-contact of the console. I made the cable like this:

99/4A PAL	Monitor
6-pin	SCART
DIN	contact
5 Audio	2, 6 Stereo
6 Ground	4

Check very carefully that you have made the cable correct. Use a magnifying glass so you can see the pin numbers which is engraved in the plastic around the contact. Use an ohm meter to verify the connections.

There is also an output for composite video that you can use with a high resolution monochrome monitor. You cannot use a colour monitor because the colours will not look nice.

Philips has up to now sold two types of monitors CM8833 (0.42 mm, 12 MHz) and CM8873 (0.31 mm, 18 MHz) but is now changing to 8CM852 (0.39 mm, 14 MHz) and 8CM875 (0.31 mm, 30 MHz). You must always get linear RGB, 15.6 kHz horizontal frequency, 50 and 60 Hz vertical frequency, Audio input. The AVPC has 15.75 kHz horizontal frequency but it will also work on a monitor for 15.6 kHz. You should ask if the monitor works with an Amiga before you buy it. You must always make the cable yourself. Philips is sold in the USA as Magnavox.

4. NEWS AND PROBLEMS (EPROM version 1)

The AVPC with EPROM version 1 reserves 16 bytes high up in VDP which results in that SIZE in Extended BASIC will show 11824 bytes in VDP-RAM. The card uses CRU >1400 which means that you cannot have any other card at the same address. You must have an other card at CRU >1100 like a disk controller. The power-up will not work if this is missing. The AVPC will after its own power-up do the power-up at CRU >1100. I don't know in which order the other cards are searched and if CRU >1000 will be done. I don't think that this is any problem but it can be useful to know that a 32 kbytes EM isn't enough. I hope there is no other card that takes over the power-up in the same way because two such cards could block each other.

A good news is that QUIT must be done with three buttons simultaneously, CTRL/FCTN/= . This will not work with a RAVE keyboard which only can sense two buttons.

DIJIT says that there may be programs that will not work with AVPC. All programs I have used has worked satisfactory. The picture is much more clear also in the usual graphic modes. In BASIC you will see some coloured or black stripes on the screen when an ERROR occurs. This problem is not seen in Extended Basic. You cannot activate the card by setting CRU >1400 with Easy Bug in Mini Memory because the AVPC works with interrupt. MG Diskassembler can despite of this disassemble the AVPC.

TI-FORTH must be changed so screen 54 row 11 becomes ... 07 4 VWTR. Graphic2 will not work otherwise. TURBO-PASC'99 must be changed so that sector >54 byte >25 becomes >54 (>50 before). The USA-version is correct but if you have bought it from Germany then you may have to change.

5. PROGRAMS FOR AVPC

The three floppy disks have many useful programs and texts:

- Funnelweb for 80 columns
- 11 different graphic demo programs
- Fractal
- Program for showing pictures from Geneve
- 7 pictures for Myarc Geneve
- Modified ROS for Horizon
- CALL LINK for mouse with XB
- Interrupt for mouse with sprite 1
- DSR routine for TI-Artist with mouse
- SC-DOS for RAM >6000
- Modified TI-FORTH for 80 columns
- Cabling of ATARI Trackball
- Cabling of mouse and light pen
- Questions and answers about AVPC

There are also other programs which uses the new features in the 80 column card. TELCO for data communication also works with 80 column. This is very helpful because many data bases is made for 80 column computers. TELCO with EPROM version 1 will show garbage

characters on the screen but besides this it works. TELCO uses also AVPC as a RAM disk so different program modules in TELCO can be stored in AVPC RAM. The AVPC can hold up to 27 modules compared to 3 modules with an ordinary 99/4A.

Many programs which is made for Myarc Geneve may be used by the AVPC-card. This is the case for most programs in Geneve GPL-mode. I have used the program PALETTE from Micropendium february 1989 which works fine with my AVPC. The program gives you the possibility to test all 512 colours in the common graphic mode which is used in Extended Basic. The colour is defined by setting a value of 0-7 for all the three basic colours red, green and blue. Black will be 0-0-0 and white 7-7-7. Dark yellow will be 6-6-1. You can change all the 16 colours numbered 1-16 in Basic.

6. GRAPHIC

The 80 column card with its 9938 video processor has 10 different graphic modes compared to 99/4A which has only the first four in the table below:

Mode	pixels	chars	colours	sprite mode	memory kbytes
Multicolor	64x48	-	16	1	4
Graphic1	256x192	256	16	1	4
Graphic2	256x192	768	16	1	16
Text1	256x192	256	2	-	4
Text2	512x212	256	4	-	8
Graphic3	256x192	768	16	2	16
Graphic4	256x212	bitmap	16	2	32
Graphic5	512x212	bitmap	4	2	32
Graphic6	512x212	bitmap	16	2	64
Graphic7	256x212	bitmap	256	2	64

You can always choose among the 512 different colours for all modes (G7 has only 256 colours) but you cannot use more than the table shows at the same time. You can have twice as many pixels vertically with interlace so you can have max 512x424 pixels. The picture is not stable on my monitor with interlace but rumors say that it will be better with a multisync monitor. Notice that Graphic4-7 have true bitmap so every pixel can have its own colour which is not the case with Graphic2. With Text2 you get 80 columns and 26.5 rows. Sprite model has single coloured sprites and max 4 sprites per pixel row. Sprite mode2 has multicoloured sprites and max 8 sprites per pixel row.

The 9938 has 24 control registers, 15 command registers, 16 colour registers and 10 status registers. The video processor has instructions to move memory VDP-VDP, CPU-VDP and VDP-CPU and can also draw lines and more. I have used VDP register 9 to change 26.5/24 rows (bit 0), Interlace (bit 4) and PAL50Hz/NTSC60Hz (bit 6). You can try this in Extended Basic with a small CALL LINK routine which sets VDP register. These three have the decimal value 128, 8 and 2. If you write 138 to VDP-REG 9 then you have set 26.5 rows, interlace and PAL 50 Hz. The value 2 to VDP-REG 9 gives 24 rows, no interlace and PAL 50 Hz. Notice that also NTSC 60 Hz can be used very well.

7. MOUSE

There are instructions for cabling of the following mice: Amiga mouse, Atari mouse, Logitech P-7 Bus Mouse, Mouse System M4, Microsoft Bus Mouse (requires pull-up resistors) and Myarc mouse. Apparently there is no standard for a mouse cable so all these have different cables. I have a Commodore 1352 mouse with two buttons for an Amiga. I believe this is the easiest one to make a cable for because all shall be mirrored. This means that you draw the cable straight between two 9 pin DB and get it mirrored. Don't connect the mouse to AVPC without an adapter cable. Ground and +5V must be changed. AVPC has ground and +5V as Myarc Geneve but the other pins are different.

The video processor can sense two buttons on the mouse. Myarc Geneve mouse has three buttons because the CPU 9995 can also sense one button (No 1). A comparison gives this:

CALL	DIJIT	Myarc	TI-
LINK	AVPC	Geneve	ARTIST
XB	mouse	mouse	
1	1 left	3 right	fire
2	2 right	2 middle	space
3	1+2	2+3	-
4	-	1 left	-
5	-	1+3	-
6	-	1+2	-
7	-	1+2+3	-

In the demo program for the CALL LINK routine you can change for AVPC as follows:

```
line 160 ... IF B=3 THEN ...  
line 170 ... IF B=1 THEN ...
```

The demo program for mouse that moves sprite 1 may be changed:

```
line 115 IF M2 AND M3 THEN ...  
line 120 IF M2=1 THEN ...  
line 122 IF M3=1 THEN ...
```

TI-Artist 2.01G has two DSR-routines for joystick, EXTDSR and JOYST. They are identical except that JOYST has an extra instruction CLR @RBAND at the beginning. This label RBAND is not mentioned in the manual. All DSR-routines for mouse or joystick may also use the arrow keys and ENTER.

8. RS232 CARD

There is a bug in all RS232 cards from TI, Myarc and Corcomp. If you will use terminal program for modem which uses interrupt then you must change the EPROM. There is one such program which doesn't use interrupt, OMEGA. I have changed EPROM on my Myarc RS232 card. This sits in a socket so it is easy to do it. If you have a TI RS232 this will be more difficult because it is soldered. You must cut the leads of the circuit (don't desolder) and then clear each hole with the soldering iron. You may then solder a new socket in which you mount the the new EPROM from

DIJIT. If you have a TI card you must throw away the old PROM which can be saved for a Myarc card. Corcomp has also the EPROM in a socket from the beginning.

9. REFERENCES

Micropendium:

Oct 87: Mouse interface for Extended Basic
Nov 87: Mouse input routine for TI-Artist
Jun 88: A full screen FORTH editor (2 colours)
Sep 88: Myarc, DIJIT rely on Yamaha 9938
Feb 89: Use palette master to mix colors
Mar 89: 80-column analog RGB monitors
Aug 89: Another approach to a full-screen FORTH editor(4 colours)
Nov 89: High resolution graphics in FORTH, part 1
Feb 90: High resolution graphics in FORTH, part 2
May 90: More on high-resolution graphics

DIJIT AVPC UPDATE

(Written for the Swedish user group PROGRAMBITEN 89-4, 90-2,3,4)
by Jan Alexandersson, Springarvägen 5, S-142 61 TRÅNGSUND, Sweden

Correction to my previous article about AVPC. Graphic7 has only 256 out of 256 colours.

REASONS FOR 9938

Programs for 9938 may use the new video processor in the following ways:

- Correct faults in old programs that prevent the use of 9938.
- Use of VDP register 8 and up for such things as 512 colours for the four old graphic modes: T1, MC and G1-G2.
- Use of VDP-RAM for storage of program segments as is done in TELCO.
- Use of the six new graphic modes: T2 and G3-G7.
- Mouse.

VDP WITH 9938

```
>8800 VDPRD  VDP Read Data
>8802 VDPSTA VDP Status Register
>8C00 VDPWD  VDP Write Data
>8C02 VDPWA  VDP Write Address
>8C04 VDPCD  VDP Color Data
>8C06 VDPID  VDP Indirect Data Write
```

YAMAHA V9938 MANUAL

The manual has 152 pages and is sold by Asgard for USD 30 + air mail USD 7. This is necessary if you want to write programs for the 9938. Notice that Asgard delivers the original manual.

EPROM VERSION 1 (2 kbytes)

I have a supplement to the DIJIT manual: DIJIT SYSTEMS AVPC TECH NOTE 1, by David Allen, march 3,1989 Rev.A. It describes EPROM version 1.00 with 2 kbytes. This has routines for Power-up, Interrupt and a dummy for a future DSR.

The power-up routine initializes VDP registers where TI has set reserved bits in a way which has no meaning to 9918A/9929A but means a lot to 9938. The video processor will always increase the address after each read of data. This will result in a bank

switch when 9938 reads >3FFF. The old four graphic modes which also works with 99/4A works without this bank switch also with 9938, but Text2 and Graphic3-7 have bank switching which means that the disk buffers cannot be read with TI or Corcomp controller card (Myarc doesn't use VDP). The solution is that power-up must set the high address LFAVDP (PAD >8370) to a lower value so that the disk buffer never reaches >3FFF.

The Interrupt routine (ISR) has its own interrupt manager to handle all internal and external interrupts. When an ERROR is detected in the console BASIC then 99/4A will reset VDP registers 2-6 in a wrong way. This is corrected by the ISR-routine but for parts of a second you will see coloured stripes over the screen at ERROR. Extended Basic has no such problems because TI has set the VDP registers wright with XB. When an external interrupt starts then the AVPC will put some code in CPU RAM from >FFD8. This is the same location where Extended Basic has its program lines. This explains why XHI with MOTION of sprites destroys the first XB-line. Texaments The Missing Link has the same problem.

EPROM PWRUP2A (4 kbytes)

I have put a new EPROM in my AVPC Card. This new EPROM PWRUP2AP from february 1990 is sold by DIJIT for 10 dollar. Notice that this version 2 has 4 kbytes (2732) compared to 2 kbytes (2716) for version 1, which means that the jumper J2 shall be put in position A (to the left). The last letter P in the name means PAL 50 Hz so there is also a N-version with NTSC 60 Hz for the USA.

The most important news is improvement of the handling of the disk buffers in VDP-RAM and the interrupt routine. This means that Alexander Hulpkes XHI and Texaments The Missing Link will work without any problems. Programs with speech also works much better than before.

The computer will start in AVPC-mode which can be seen by the text over the colour bars. In this case 2 bytes is reserved high up in the VDP-memory which means that SIZE in Extended Basic will show 11838 bytes stack space (version 1 has 11824 bytes).

If you press SHIFT-CTRL during reset then the computer will start in 99/4A-mode which is the same as the program SET99/4A for version 1. This 99/4A-mode doesn't reserve anything in VDP-RAM so you can only use the 4 graphic modes from 9918A/9929A (T1,MC,G1,G2). SIZE in Extended Basic will now show 11840 bytes stack space.

This new EPROM makes it possible to use the P-code editor for UCSD Pascal. TELCO in 80 column works perfect but TELCO 40 column shows a copy of the first row under the status line, but who wants 40 column when there is 80 column. Also PAGE-PRO works satisfactory.

I have found another problem with this new EPROM when loading Disk Manager V for Myarc HFDC. DM V cannot load from XB in AVPC- or 99/4A-mode. The only way to load is from Editor/Assembler in 99/4A-mode (AVPC-mode will not work).

CALL COINC WITH AVPC

I have found a new problem with AVPC (new EPROM) and CALL COINC(ALL,C). Test the following which works perfect with 9918A/9929A but not with the 80 column card:

```
100 CALL MAGNIFY(4)
110 CALL SPRITE(#1,64,11,100,100)
120 CALL SPRITE
    (#2,64,13,100,100,0,10)
130 CALL COINC(ALL,C)
140 PRINT C
150 GOTO 130
```

Short programs with few sprites will never detect COINC but longer programs like TI XB-TUTORIAL No 6 and a german game SPACETAXI works most of the time so you will not notice the problem at a first look.

Because DIJIT AVPC works with interrupt there is a possibility that COINC isn't tested often enough. A strange thing is that it doesn't help to put two sprites on top of each other and test COINC without any motion.

One possible cause could be if DIJIT interrupt reads the status register #0 all the time. Every read of that register will zero out the content so there may not be any value to read by Extended Basic CALL COINC.

Another possibility could be if the 9938 processor only can sense the dynamic sequence when one sprite passes the frontier of another sprite and not the static case of overlapping.