

Bastelanleitung SHRG 256 * 192 points for LASER / VZ 200

Source: 21 info-box pages 5 to 14 - the first XF / LASER FAN CLUB

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Hello Wolfgang,

for the next INFO BOX I would like to contribute a Crafting. I was most annoyed at our computer, the poor resolution in MODE (1). 128 * 64 pixels! The one can tell anyone geek without being looked at sympathetically. So I made me a few years to move my computer with a soldering iron to the body. It was exciting at first, because I had a panic afraid to do anything broken.

For those who have never soldered in the computer:

A computer is not a raw egg. With the soldering iron you get killed him only if you forget to unplug the AC adapter from the wall socket before loslötet. And when Soldery one should be careful not to produce by solder blobs shorts. Also be distributed via CMOS IC's horror stories. So to have the different electrical charge of the two hands can be enough to destroy them. That may be somewhere happened once before in the world, I do not yet defaulted by touching or place it on a plastic pad no CMOS IC.

So: Do not fear the innards of the computer. And just a cheap computer as the LASER can elicit with some tinkering the most amazing secrets. So can the graphics resolution of the LASER significantly increase !!!

THE LASER MASTERS 8 GRAPHIC MODES AND 2 "block graphics" MODES !!!

The video controller MC 6847, which generates in the computer from the data contents of the image memory RAM, the video signals can, in the graphics mode 7 (GM7) an image of 256 * 192 pixels produce. These are 49,152 pixels (!!!) against 8,192 pixels in GM2, the LASER used.

graphic mode

GM	pin 27	pin 29	pin 30	pixel colors	kByte RAM		
	the video controller						image memory
0	0	0	0	64 * 64	4		1.0
1	0	0	1	128 * 64	2		1.0
2	0	1	0	128 * 64	4		2.0
3	0	1	1	128 * 96	2		1.5
4	1	0	0	128 * 96	4		3.0
5	1	0	1	128 * 192	2		3.0
6	1	1	0	128 * 192	4		6.0
7	1	1	1	256 * 192	2		6.0
	1 = H level = + 5V 0 = L level = mass						

In laser pins are soldered 27 and 30 of the video controller firmly to ground and pin 29 to +5 V. Therefore, only the GM2 is possible in MODE (1). In order to additionally use the GM7 two things at the LASER must be changed.

- 1.)
- That there should be a way by software to create + 5V pin 27 and 30th
- 2.)
- The image memory must be expanded by 2k bytes on 6k bytes.

That sounds quite difficult, but it is quite simple. Switching from GM2 on GM7 and back I do with the I / O latch (74LS174 see diagram). The lowest six bits which one hex to the address 783B poket are stored in the IC and are thus available for the hardware. Of the 6 outputs of IC's only 5 are used. Since the LASER does not use the bit 1, I switch to the video controller with bit first POKE

30779, PEEK (30779) OR 2, the bit is set, and pin 5 is at H level. POKE30779.PEEK (30779) AND 253 resets the bit and pin 5 goes to L level. Now, the pins must be solved 27 and 30 of the board and carefully bending. (Pinch off best with a side cutter directly from the board, or cut off the tip of a knife wallpaper). Then, the two pins are connected with a wire and solder the other end of the wire to pin 5 of the 74LS174.

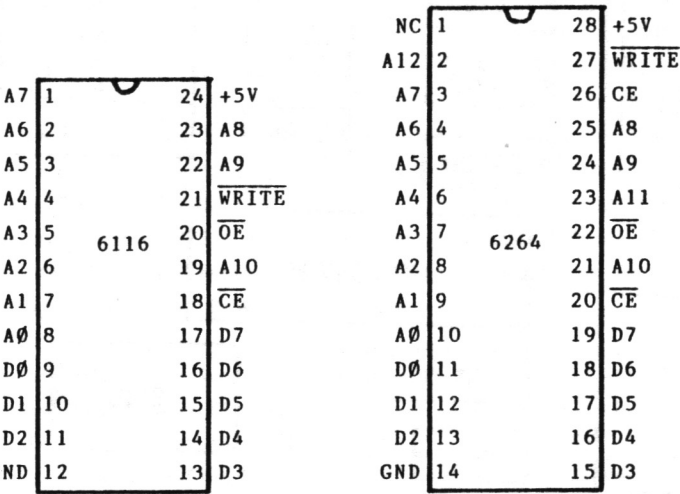
Annotation: only one wire for the effect to be seen!

Now you can get an impression of the new graphics resolution. MODE (1) to get in the GM2. With the poke from above is switched to GM7. Since the upper 4k of graphics RAM are not yet present, the content of the image memory 3 appear even among themselves. The dots on the screen are now six times smaller than before and also square.

*) only POKE 30779, PEEK (30779) OR 2, then MODE (1)!

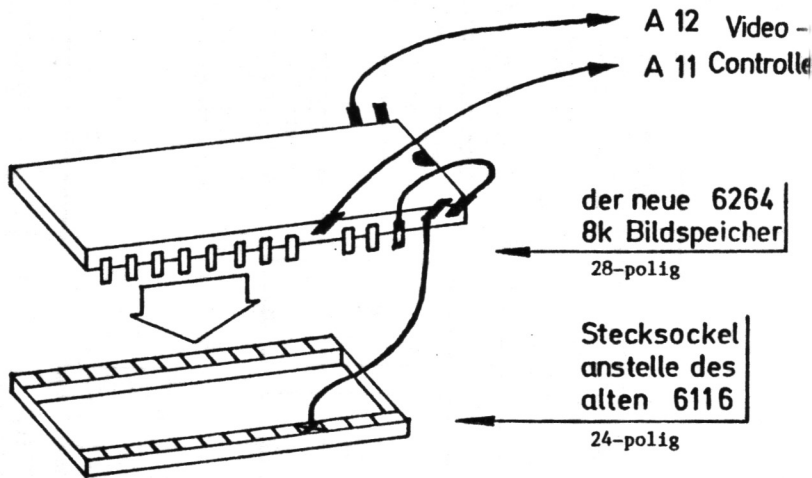
Replacing the RAM

Replacing the image memory RAM is a bit more complex. For this, the old IC must first be unsoldered, because he is no longer needed.



The best way a 24-legged IC must be removed if you have no special Auslötwerkzeuge, pinch off all the "legs" with a side cutter to throw away the IC and then the "leg stump" desoldering individually. In place of the old 6116 he RAMs I soldered a 24-pin jack. Now in the socket 8k RAM is inserted. The 6264 has 4 pins more than the 6116 (see drawing). Pin 23 is bent upward, then the IC so pressed into the socket, the pins 1,

Anschlußbilder des im LASER verwendeten 2k-Bildspeicher-RAM's und des neuen 8k-RAM's für die Erweiterung des Bildspeichers



2, 27 and 28 through. Pin 1 is "not connected", pin 2 is the additional address line A12, the bent-up pin 23, the additional A11, pin 26 and 28 are connected to each other and 27 guided by a wire pin to the free space in the socket. So that the new image memory IC is connected.

So wird der neue Bildspeicher-IC an die Stelle des alten IC's gesetzt.
Die Kerbe am 6264 muß wie bei dem alten IC zum oberen Platinenrand zeigen!
Die Pins 1, 2, 27 und 28 stehen am Stecksocket über!

The Bank Switching

The last problem is to build a control that makes it possible to write in the upper 4k of the image memory or read information from there. If we connect A11 of the RAM pin 20 of the video controller and A12 with pin 21, so the controller can evaluate the data. (If one tests now the new MODE (1) so appears in the upper third of the screen, an erased area == 2k and the remainder represents the content of the non-erased upper 4k a random pattern) as the laser for the processing of the image RAM only the addresses 7000 to 77FF hex hex, so make 2kBytes available, I work with bankswitching to get at the remaining 4k image RAM. This is like switching the Banks of 64k extension. The decoding of the address is done by the IC 74LS138 (see scheme). Will his inputs allocated as written in my drawing, the IC responds to OUT OUT 208 to 223rd

(I always take address 222 because they can best remember). I give the OUT 222.2 command, so goes Pin 9 of the 74LS138 to L level. This signal is fed to the clock input of the memory 74LS174 which is brought thereby to store the lower two bits of data. He remembers in this case the second

Now the two data outputs of the 74LS174 via one 6k8 0hm resistance with A11 and A12 of the RAM are connected and you're done tinkering.

As the bank works switchover?

Since the address lines A11 and A12 through bank switching, via resistors, to the video controller but directly, the signals of the controller are "stronger" and controls the addresses of the RAM in order to generate an image. When writing information into the image memory or reading, is switched off by a short L-level at pin 12 of the video controller (This makes the image interference). At this moment the "throttled" address lines of the bank switching are strong enough to the RAM to control.

After OUT 222.0 the upper third of the screen to OUT can via the addresses 7000 to 77FF hex, 28672-30719 dec describes 222.1 middle and to the lower OUT222,2.

OUT 222.0: POKE 28672.128 sets the dot in the upper left corner. OUT 222.2: POKE 30719.1 sets the point at bottom right.

Thus after turning on the computer and Bank 0 is addressed, pin 1 of the 74LS174 (RESET) to pin 4 of the 74LS04 on computer board should (see drawing) werden.Dadurch the RESET pulse, which the computer generated after power is also our bank switching to 0.

Features of the new circuit:

The "normal" MODE (1) 128 * 64 pixels, and 4 colors will continue to work without restriction. The high-resolution MODE (1) 256 * 192 pixels and 2 colors can be switched via software and again. The new graphics resolution is six times more precise. The pixels are square; that is, a drawn circle is really round, a square of 150 * 150 points is really square. Drawback (?):

SET, RESET and POINT not support the new MODE (1). The pixels must be set with POKE. For the three instructions following line is the same:

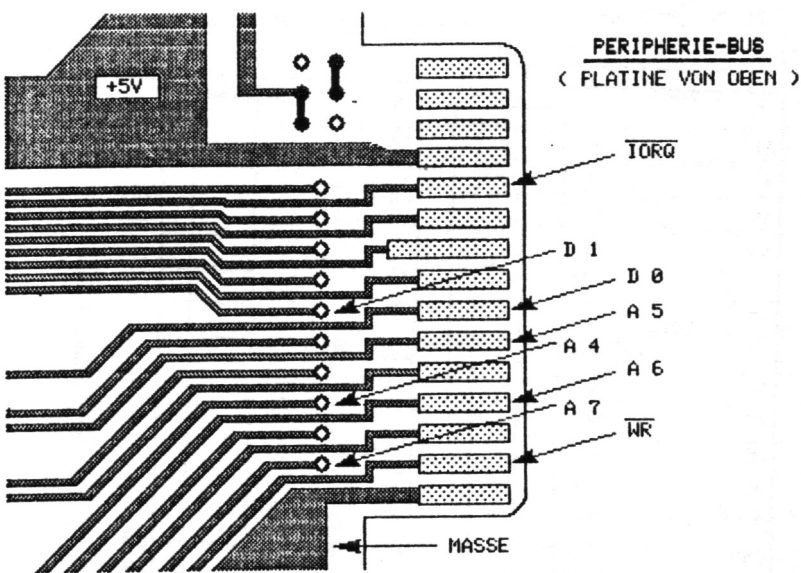
OUT 222, Y / 64: PA = 28672 + 32 * (Y AND 63) + INT (X / 8): X1 = 2 ^ (7- (X AND 7)) then follows for: SET (X, Y)

	POKE PA, PEEK (PA) OR X1
RESET (X, Y)	POKE PA, PEEK (PA) AND 255 - X1
POINT (X, Y)	PO = PEEK (PA) AND X1

PO = -1 if pixel is set, otherwise PO = 0 The new graphics mode is to:

POKE 30779, PEEK (30779) OR2: 222.2 OUT: MODE (1): OUT 222.1: MODE (1): OUT 222.0: MODE (1) is turned on (to delete the three banks).

In this picture I have recorded, where you can connect the cables for the bank switching on the computing board. Right next to the image memory is the peripheral bus. all the necessary connections are available to him. If you look closely at the contact bar, you can see that the contacts more than one centimeter can be inserted deep into the board from the printer interface. But as the bus connections are two centimeters long, you can



the "rear" end of the contact surfaces safely solder lines. The terminals are located on the underside of the board, is achieved in that the line is inserted into the each marked hole and soldered there. to solder at these points makes it unnecessary to turn the computer board when tinkering continuously from the front to the back.

(The drawing I created with the help of 256 * 192 pixel resolution and a drawing program.)

Diagram of the bank switching.

The circuit is so small that it fits into the computer case!

Note: Pin 1 is at an IC always the legs, the to the left side and the viewer, shows if the notch is on the left IC. The leg series before the viewer is from left to right

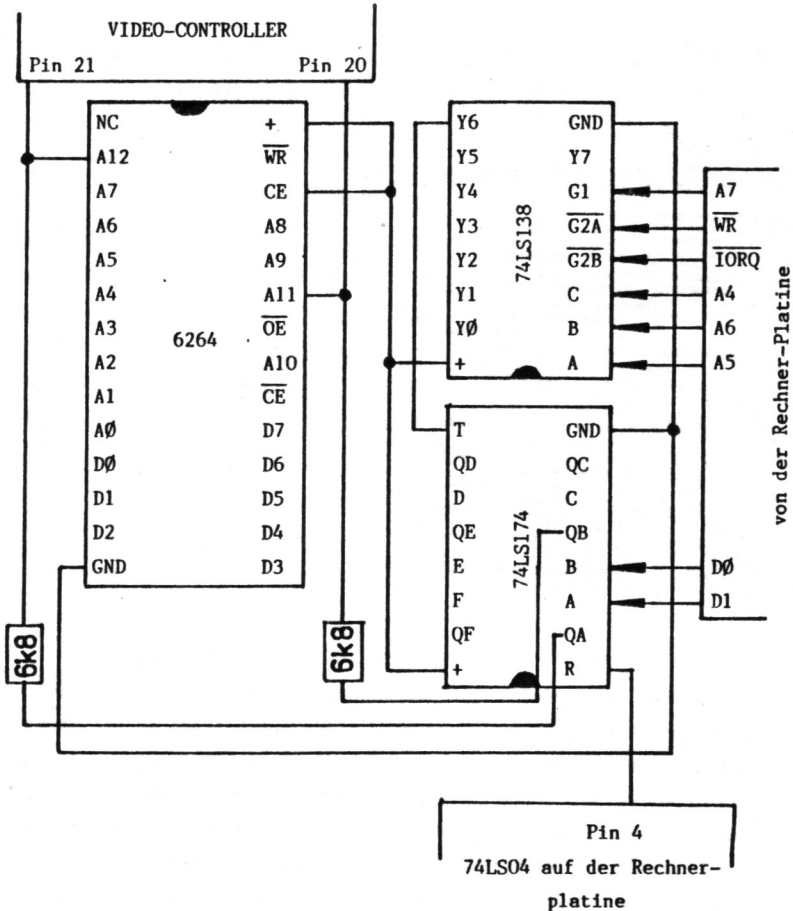
numbered, the side facing away from right to left. So from pin 1 of "counter-clockwise".

If someone should not be trusted at the innards of his computer, I can make the conversion.

If interested, call times.

Annotation : This was in 1987!

The three ICs and socket cost about 20 - so quickly unpack the soldering iron and revamp the LASER LASER for GTI !!!



The "block graphics" mode

In LASER of the so-called "semi Graphic 4" is fixed fashion. Therefore, the name comes as the least significant 4 bits of the byte specify the image memory which quarter of the "Klötzchens" should be displayed. Bits 4, 5 and 6 set the color tight (ie 8 colors are possible). Bit 7 must be set!

The most significant bit set on by alphanumeric characters on blocks to:

D7	D6	D5	D4	D3	D2	D1	D0	1	xxx	
colour					position					

Position D3	
D2	D1 D0

The second "block graphics" mode

The "Semi Graphic 6" mode is used when Pin 31 controller is disconnected from ground on video and is applied to + 5V!

Now the 6 least significant bits are used to control the 6 parts of the Klötzchens. The two remaining bits specify the color. Since, however, when the bit 7 LASER switching serves letters / blocks (ie, greater than 127 characters means blocks, numeral 128 is smaller alphanumeric characters) can be selected only with bit 6 between two colors. There are possible depending on the background color, blue and red or magenta and orange. Bit 7 must be set!

D7	D6	D5	D4	D3	D2	D1	D0	1			
	x										
	color			position							

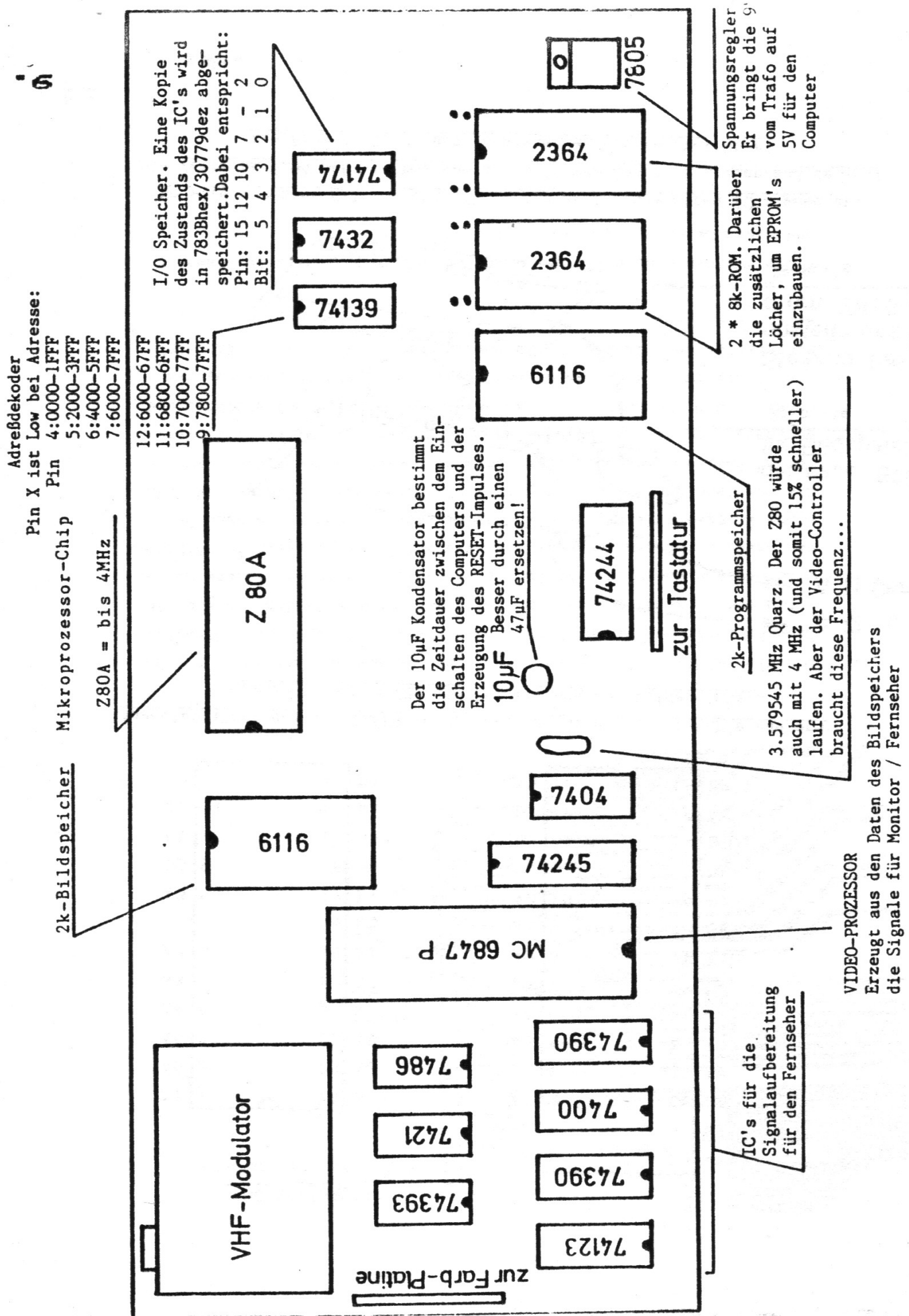
Position D5	
D4	D3 D2 D1
D0	

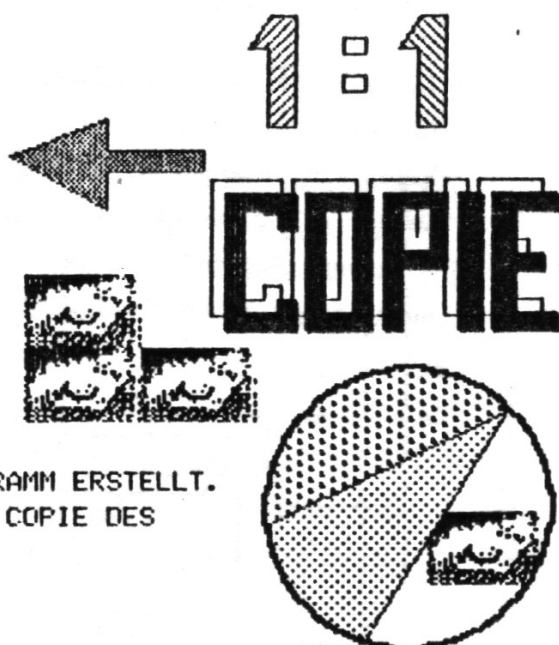
The TRS 80, which is equipped with the same video controller as LASER, uses only the "semi Graphics 0". The advantage is that the "sixth Graphics" has square blocks, 10 blocks above the other so as much space need like 10 blocks side by side. by the other hardware construction of the TRS 80 he can "6 Semigrafics" represent 8 colors also with the.

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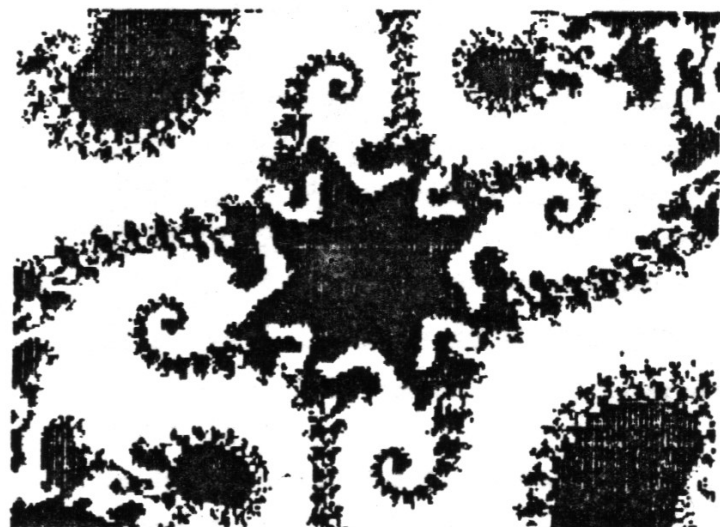
who made himself the remodeling most LASER fans are clearly come without major difficulty. At the latest after a telephone conversation errors could be corrected. What apparently was not clearly written on the Bastelanleitung is this: The 74LS174 on computer board (the input / output latch) controls the switchover to the new high-resolution graphics. Pin 5 of this IC must be connected to pins 27 and 30 of the video controller. The 74LS174 on the new board be soldered controls the bank switching of the extended video RAM's. In this IC, the pin 5 must be connected to the address line A11 of the video RAM.

Actually is this so in the text, although the two IC's are sometimes confused. Now it's clear, however!





DAS GESICHT HABE ICH MIT EINEM GRAFIK-PROGRAMM ERSTELLT.
DER UMRANDETE BEREICH ENTSPRICH T EINER 1:1 COPIE DES
BILDSCHIRMINHALTS VOM 256 * 192 PUNKTEN.



14.

* Das sind drei Bilder als Bei- *
* spiele für die Möglichkeiten *
* der neuen 256 * 192 Punkte *
* Auflösung im MODE(1). *
* *
* Es sind jeweils 1:1 Kopien des *
* Bildschirmbildes!!! *

Die Beispiele zeigen, welche
Grafik-Fähigkeiten im LASER stecken.
Der Umbau lohnt sich, auch wenn es
ein wenig zeitaufwendig ist. Mit
256 * 192 Pixeln braucht sich der
LASER nicht mehr vor anderen
Home-Computern verstecken!!!

Viel Spaß beim Basteln!

Frank Barsch