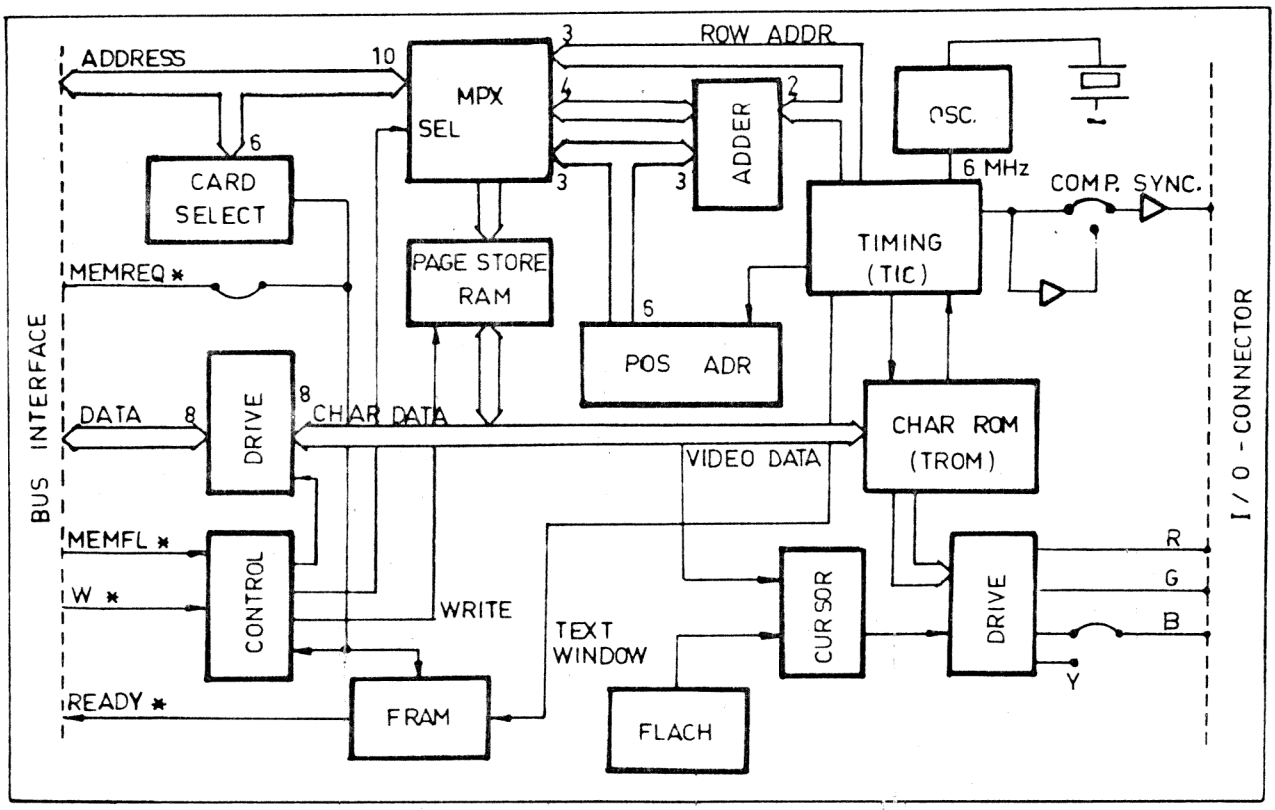


DESCRIPTION

The 2081 FVRAM controller provides direct interfacing to colour or monochrome TV-receivers and monitors. The controller adapts to a standard character set for alpanumeric and graphic presentation. Special standardized control by control characters provides an effetive and versatile coloured text display including high graphics capability. Different markets are catered for by the optional character generator LSI, the TROM. See tables 1 and 2.

The character code conforms to the ASCII-code comprising 32 control characters, 96 alphanumerics and 64 graphics.

Display Memory

The data for a displayed page of 40-by-24 characters is stored in two 2114 1k x 4 static RAMs. As the display only requires 960 (40 x 24) bytes, 96 bytes remain unused. Each byte contains 8 bits, the 8 bits in each location comprise 7 bits of character data and 1 bit of cursor data. The 960 bits in the display memory allocated to the cursor contain a single 1, indicating the position of the cursor.

FVRAM software structure

The structure of the FVRAM for programming is shown in the following table written in assembler:

```
                ORG     <expression>
FVRAM           DS      1024
*
FVRAM           STRUC                   ; 8 GROUPS OF 128 BYTES
ROW0            DS      40
ROW8            DS      40
ROW16           DS      40
                DS      8               FILLER
ROW1            DS      40
ROW9            DS      40
ROW17           DS      40
                DS      8               FILLER
  !
ROW7            DS      40
ROW15           DS      40
ROW23           DS      40
                DS      8               FILLER
                ENDS
```

Character Generator

The basic input to the TIC is the character data from the page memory. This is a 7 bit code. Each character code defines a dot matrix pattern. The character period is 1 µs and the character dot rate is 6 MHz. The timings are derived from the internal 6MHz clock. Each character rectangle is 6 dots wide by 10 TV lines high. One dot space is left between adjacent characters, and there is one line space left between rows. Alhpanumeric characters are generated on a 5 x 9 matrix, allowing space for descending characters. Each of the 64 graphics characeters is decoded to form a 2 x 3 block arrangement which occupies the complete 6 x 10 dot matrix (Fig 1). Graphics characters may be either contiguous or separated (Fig 2). The alphanumeric characters are character rounded, i.e. a half dot is inserted before or after a whole dot in the presence of a diagonal in a character matrix.
The character video output signals comprise a monochrome signal and RGB signals for a colour receiver.
The use of the 32 control characters provides information on the nature of the display, e.g. colour. The full character set is given in Table 1 and 2 respectively

Control Characters

There are 32 control characters, which determine the nature (mode) of the display. These modes are listed in table 3 as complementary pairs, those on the left are assumed at the start of every row. The control character codes listed with each mode are used to initiate that mode. Some control characters have immediate effect ("set at") in that the new mode obtains for and from the corresponding character rectangle. Others have subsequent effect ("set after") when the new mode obtains for and from the next character rectangle. The later control character takes precedence over an earlier one.

A description of the effects produced by the control characters is given below.

Coloured characters

The alphanumeric characters can be displayed on the screen in any of seven colours, depending on the alphanumeric control character chosen. These colours are: red, green, yellow, blue, mangeta, cyan and white.

Graphic characters

Each of the 64 graphics characters can be in any of the seven standard colours above. The use of these characters permits the construction of extra large letters and simple diagrams. Graphics characters are displayed on a 2-by-3 matrix as shown in Fig. 1. Six bits determine which cells on the matrix are illuminated, while the seventh bit (b_6) distinguishes between alphanumeric and graphics characters. If b_6 is a '0', then the code is always for an alpanumeric character; if it is a '1', the the code is either for an alphanumeric or a graphic character; the control characters determine which.

The control characters 'contiguous graphics' and 'separated graphics' allow different areas of graphics or outlines to be distinguished by either being contiguous (a continuous line, for instance) or being separated (a dotted line, for instance); see Fig 2.
The 'hold graphics' control character enables the blanks on the display produced by the control characters to be filled by a repeat of the preceding graphics character. The character is to be displayed in the Contiguous or Separated mode as when it was first displayed. In the absence of such a character the held graphics character is considered to be a space. Thus, for example, different coloured areas in graphics can be joined up without gaps between them. The command 'release graphics' cancels this command.

Coloured backgrounds

The background of a display is normally black, but a background of any of the seven standard colours can be selected by the control character 'new background'. The background then becomes the colour of the preceding colour control character. A black background is restored by the control character 'black background'.

Flashing characters

All characters following the control 'flash' flash repetively until the command 'steady' is received.

Double-height characters

The control 'double height' causes the characters following it to be displayed twice the normal height but with the same width, and thus selected characters can be displayed double-height. Note that the selection of a double-height character causes the information for the row below to be ignored and blanked out. The command 'normal height' cancels this command

Operating FVRAM

The FVRAM is accessed in the same way as the ordinary RAM-modules connected to the 4680-bus. The READY*-signal is, however, used to avoid conflicts between the bus and internal accesses. It is controlled by the "text window", which is closed, if RAM is busy in display generation. The READY*-signal stops the CPU until the window is opened again as follows:

10 µsec at every line flyback (64 µsec).

2 msec at every field flyback (20 msec).

SPECIFICATION

Power Supply	+ 5 V ± 5 %
Peripheral interface:	TTL, low-power shottk y
	Standard, RGB-signal output and black/white by jumper selection.
	Positive or negative composite sync.
Software support	EXTENDED BASIC
Bus connection	On the memory-side of the 4680-bus.
Connectors:	B 64 two-row Europe connector on the bus-side.
	On the peripheral side: Four koax. connectors type.
	and alternatively 8 pin two-row UBC,
Size	Standard Europe card, 100 x 160 mm.

BUS SIGNALLING AND PIN NUMBERING

- 16 bit address bus
- 8 bit tri-state data bus
- The "memory control" comprises both the read and write signals, MEMFL* and W*.
- Jumper-selected MEMREQ* when the system uses dynamic RAMs.
- READY*, controls access to FVRAM.

Refer to System Manual for further information on memory signalling and bus pin numbering.

I/O CONNECTOR

The FVRAM outputs are provided on both a two-row UBC and koax.connectors. The optional jumper-connected black/white output is provided on the BLUE-output.

UBC

1B/1A	COMP. SYNC/ground
2B/2A	BLUE/ground
3B/3A	GREEN/ground
4B/4A	RED/ground

Koax. connectors

Type =

Each connector is identified by corresponding colour-paint .

ADDRESS SELECTION

The module base address and the boundary in the main memory is selected on a code plug-location 3D.

2K	4K	8K	16K	32K	1K
1	2	3	4	5	6

Refer to System Manual about coding.

Example: 1,3 and 6 cut gives base address = 11 - 12K (2 + 8 + 1 = 11)

JUMPERS

S1) MEMREQ*, location 2B - 2C. Install the jumper if your system uses dynamic RAMs

S2) RGB-output, located to the right of 2D. S2 installed and S3 removed.

S3) BLACK/WHITE - output, located to the left of 3D. S3 installed and S2 removed.

S4) POSITIVE SYNC, located below 3A. S4 installed and S5 removed.

S5) NEGATIVE SYNC, located above 3B. S5 installed and S4 removed.

OPTIONS

The user is provided optional character set as defined by the character generator - TROM.

Continental character set by SAA 5050.

Swedish chracter set (SEN 850200) by SAA 5052

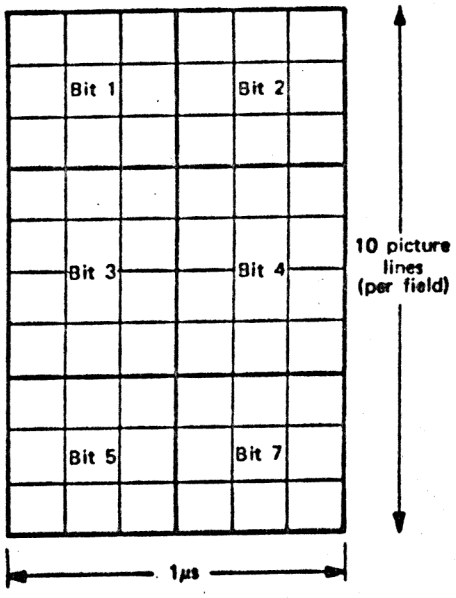
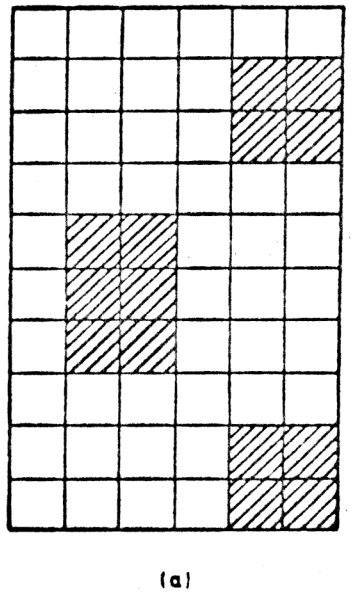


Fig.1-Size of the character rectangle and allocation of data bits to a graphics character.



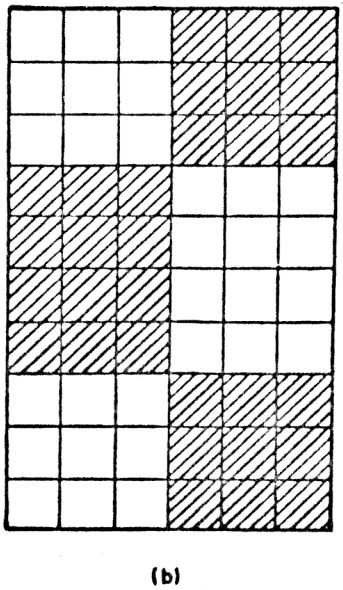


Fig.2-Graphics character 11001 10
(a) separate mode (b) contiguous mode

Datum
Date

Presentation av färgbilder med DataBoard FVRAM 9081

Följande beskrivning visar informationsbehandlingen i FVRAM-kortet, vilket är kompatibelt med specifikationen för Teletext/Viewdata.

Bildskärmen betraktas uppdelad i 960 rektanglar. Dessa bildar en teckenmatris av 24 rader och 40 kolumner. Ett tecken upptar en rektangelarea. Teckenuppsättningen anges med ASCII-koden och omfattar alfanumeriska gemener och versaler inkluderande Å,Ä och Ö samt grafiska tecken. Styrtecken utnyttjas för olika arbetssätt för bilden. Vissa av dessa styrtecken kommer i början av en rad, andra har omedelbar verkan på aktuell eller nästa teckenposition. Ett nytt styrtecken har företräde framför ett tidigare. Följande styrtecken används:

"Display Colour" Ett tecken kan presenteras i en av sju färger, nämligen; Vitt, gult, gul/grönt(cyan), grönt, lila, rött eller blått. Olika styrtecken anger valet.

"Background Colour". Den del av rektangeln som ej upptas av teckensymbolen är normalt svart. Styrtecknet "ny bakgrund" växlar bakgrundsfärgen. Den senaste valda teckenfärgen ger bakgrunden.

"Flash Mode" Väljes denna mod blinkar tecknet.

"Double Mode". Tecknen kan erhållas med dubbel höjd, på aktuell och efterföljande rad. Även normal texthöjd tillåts på samma rad.

"Graphics Mode". Bilden kan grafiskt presenteras med upplösningen 80 teckenelement horisontellt och 72 vertikalt. Sex teckenelement erhålles genom att teckenmatrisen delas upp med två tecken i horisontell led och tre i vertikal led. ASCII-koden medger 64 grafiska tecken. De 32 versala tecknen presenteras alltid som alfanumeriska tecken.

"Hold Graphics" Generellt ger samtliga styrtecken upphov till "mellanslag" (space), som ger en blank position på bilden vid färgväxling. Man kan undvika detta genom att utnyttja styrtecknet "Hold Graphics". Färgväxlingarna erhålles då kant i kant.

Stödrutiner för programmeringen är inlagda i Extended Basic.

Programexempel:

```
OPEN    "RGB:"  AS FILE 1
PRINT #1, CUR (1,0) BLUE; NEWBG;
        YELLOW; DOUBH; "SATTCO AB"
        NEWBG; BLUE; SINGH
        "DATABOARD 4680"
        BLACKBG
```

Printsatsen utför följande:
Positionerar cursor:n till vänster kant på rad 1 och väljer bakgrundsfärgen blå, teckenpresentation i gul färg samt dubbel höjd. Strängen "SATTCO AB" matas ut med början på vänster kant i gult, blå botten och dubbel höjd. Bakgrundsfärgen växlas sedan till gul och teckenpresentationen till blå färg och normal höjd. Strängen "DATABOARD 4680" visas i blått på gul botten och normal höjd. Resten av raden växlas till svart.

SAA 5050 CHARACTER SET

Data bits	b_7	0	0	0	0	1	1	1	1
	b_6	0	0	1	1	0	0	1	1
b_4 b_3 b_2 b_1	b_5	0	1	0	1	0	1	0	1
0 0 0 0		NUL*	DLE*	␣	0	@	P	‑	p
0 0 0 1		Alpha^{n} Red	Graphics Red	!	1	A	Q	a	q
0 0 1 0		Alpha^{n} Green	Graphics Green	"	2	B	R	b	r
0 0 1 1		Alpha^{n} Yellow	Graphics Yellow	£	3	C	S	c	s
0 1 0 0		Alpha^{n} Blue	Graphics Blue	$	4	D	T	d	t
0 1 0 1		Alpha^{n} Magenta	Graphics Magenta	%	5	E	U	e	u
0 1 1 0		Alpha^{n} Cyan	Graphics Cyan	&	6	F	V	f	v
0 1 1 1		Alpha^{n} White	Graphics White	'	7	G	W	g	w
1 0 0 0		Flash	Conceal Display	(	8	H	X	h	x
1 0 0 1		Steady	Contiguous Graphics	)	9	I	Y	i	y
1 0 1 0		End Box	Separated Graphics	*	:	J	Z	j	z
1 0 1 1		Start Box	ESC*	+	;	K	←	k	¼
1 1 0 0		Normal Height	Black Background	,	<	L	½	l	‖
1 1 0 1		Double Height	New Background	‑	=	M	→	m	¾
1 1 1 0		SO*	Hold Graphics	.	>	N	↑	n	÷
1 1 1 1		SI*	Release Graphics	/	?	O	#	o	■

Black represents display colour, and white represents background.
*These control characters are reserved for compatibility with other data codes.

Table 1

SAA 5052 CHARACTER SET

Bits	b_7 b_6 b_5	$0\,0_0$	$0\,0_1$	$0\,1_0$		$0\,1_1$		$1\,0_0$	$1\,0_1$	$1\,1_0$		$1\,1_1$	
b_4 b_3 b_2 b_1	Col / Row	0	1	2	2a	3	3a	4	5	6	6a	7	7a
0 0 0 0	0	(NUL*)	(DLE*)	␣	␣	@	‑	É	P	é	‑	p	‑
0 0 0 1	1	Alpha^{n} Red	Graphics Red	!	■	1	■	A	Q	a	■	q	■
0 0 1 0	2	Alpha^{n} Green	Graphics Green	"	‑	2	■	B	R	b	‑	r	■
0 0 1 1	3	Alpha^{n} Yellow	Graphics Yellow	#	‑	3	■	C	S	c	‑	s	■
0 1 0 0	4	Alpha^{n} Blue	Graphics Blue	¤	■	4	■	D	T	d	■	t	■
0 1 0 1	5	Alpha^{n} Magenta	Graphics Magenta	%	■	5	■	E	U	e	■	u	■
0 1 1 0	6	Alpha^{n} Cyan	Graphics Cyan	&	■	6	■	F	V	f	■	v	■
0 1 1 1	7	Alpha^{n} White**	Graphics White	'	■	7	■	G	W	g	■	w	■
1 0 0 0	8	Flash	(Conceal Display)	(	■	8	■	H	X	h	■	x	■
1 0 0 1	9	Steady**	Contiguous Graphics**	)	■	9	■	I	Y	i	■	y	■
1 0 1 0	10	(End Box**)	Separated Graphics	*	■	:	■	J	Z	j	■	z	■
1 0 1 1	11	(Start Box**)	(ESC*)	+	■	;	■	K	Ä	k	■	ä	■
1 1 0 0	12	Normal Height**	Black Background**	,	■	<	■	L	Ö	l	■	ö	■
1 1 0 1	13	Double Height	New Background	‑	■	=	■	M	Å	m	■	å	■
1 1 1 0	14	(SO*)	Hold Graphics	.	■	>	■	N	Ü	n	■	ü	■
1 1 1 1	15	(SI*)	Release Graphics**	/	■	?	■	O	_	o	■	■	■

Control characters shown in columns 0 and 1 are normally displayed as spaces.

* These control characters are reserved for compatability with other data codes.

** These control characters are presumed before each

■ Character rectangle

Black represents display colour.

White represents background.

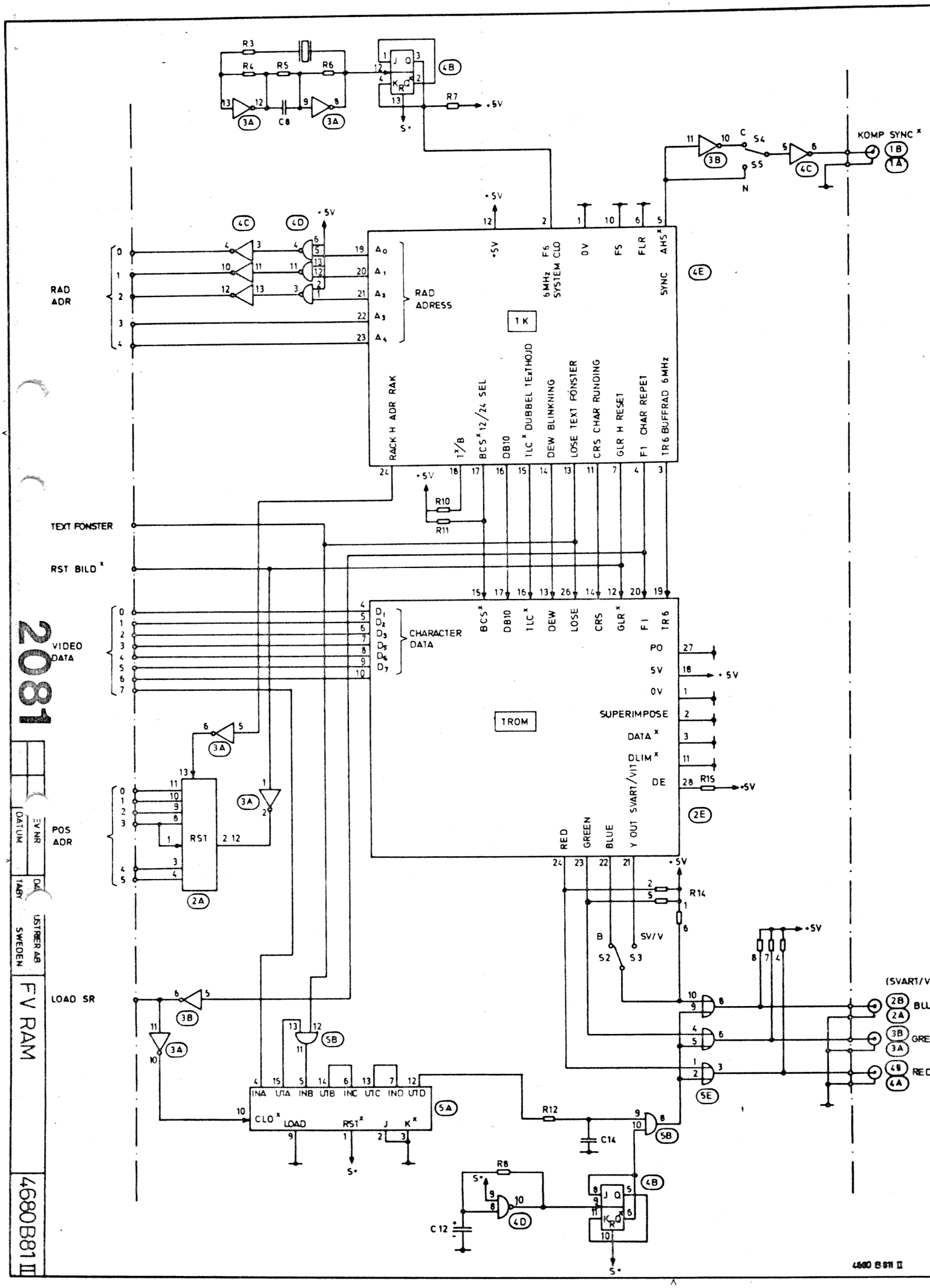
Table 2

DISPLAY MODE	SET AT	SET AFTER	COMPLEMENTARY DISPLAY MODE	SET AT	SET AFTER
ALPHANUMERICS	Row Start	0/1 0/2 0/3 0/4 0/5 0/6 0/7	GRAPHICS	–	1/1 1/2 1/3 1/4 1/5 1/6 1/7
CONTIGUOUS	Row Start 1/9*	1/9*	SEPARATED	1/10*	1/10*
DISPLAY COLOUR includes RED	Row Start	0/1 0/3 0/5 0/7 1/1 1/3 1/5 1/7	DISPLAY COLOUR excludes RED	–	0/2 0/4 0/6 1/2 1/4 1/6
DISPLAY COLOUR includes GREEN	Row Start	0/2 0/3 0/6 0/7 1/2 1/3 1/6 1/7	DISPLAY COLOUR excludes GREEN	–	0/1 0/4 0/5 1/1 1/4 1/5
DISPLAY COLOUR includes BLUE	Row Start	0/4 0/5 0/6 0/7 1/4 1/5 1/6 1/7	DISPLAY COLOUR excludes BLUE	–	0/1 0/2 0/3 1/1 1/2 1/3
BLACK BACKGROUND	Row Start 1/12	–	NEW BACKGROUND	1/13**	–
STEADY	Row Start 0/9	–	FLASH	–	0/8
NORMAL HEIGHT	Row Start 0/12	–	DOUBLE HEIGHT	–	0/13
RELEASE	Row Start	1/15	HOLD	1/14	–

* these codes may take effect 'at' or 'after' their occurrence,

** whenever this code occurs the Display Colour is adopted as the New Background colour,

Table 3. Display Modes and Control Characters


R3
R4
R5
R6
C8
R7
+5V
S*
KOMP SYNC x
S4
S5
C
N
RAD ADR
RAD ADRESS
A0
A1
A2
A3
A4
1K
6MHz SYSTEM CLO
0V
FS
FLR
AHS x
SYNC
RACK H ADR RAK
1*/B
BCS x 12/24 SEL
DB10
TLC x DUBBEL TEXTHOJD
DEW BLINKNING
LOSE TEXT FÖNSTER
CRS CHAR RUNDING
GLR H RESET
F1 CHAR REPET
TR6 BUFFRAD 6MHz
R10
R11
TEXT FONSTER
RST BILD x
VIDEO DATA
CHARACTER DATA
D1
D2
D3
D5
D6
D7
BCS x
DB10
TLC x
DEW
LOSE
CRS
GLR x
F1
TR6
1TROM
PO
5V
0V
SUPERIMPOSE
DATA x
DLIM x
DE
Y OUT SVART/VIT
RED
GREEN
BLUE
R15
R14
B
SV/V
S2
S3
POS ADR
RST
LOAD SR
INA
UTA
INB
UTB
INC
UTC
IND
UTD
CLO x
LOAD
RST x
J
K x
R12
C14
R8
C12
(SVART/V
BLU
GRE
RED
4680 B81 II
2081
FV RAM
4680B81 III
DATUM
TABY
USTRÖER AB
SWEDEN