

INTRODUCTION

The purpose of this Application Note is to aid in the selection of monochrome video display monitors for use with the Megatel Quark family of single board microcomputers. The Note provides a list of some recommended models, and discusses some important considerations in the selection of a monitor.

MONOCHROME VIDEO OUTPUTS

A monochrome video display interface is included on the Quark/100, /200, and /300. Both direct-drive and composite outputs are provided on pins of the Quark's 96-pin connector.

Direct-Drive Video Output

For connection of a direct-drive monitor, separate TTL signals for Vertical Sync (pin A2), Horizontal Sync (pin C1), and Video (pin B1) are provided.

Composite Video Output

The Quark's composite video generator combines the V-sync, H-sync, and video to produce an output with negative composite sync and a 1.0 Vp-p video signal. This composite sync output is provided on pin C5 of the Quark's connector. See the section below on "Vertical Sync" for other important information regarding the composite video output.

RECOMMENDED MONOCHROME MONITORS

Table 1 lists several monochrome monitors which, according to the manufacturer's specifications, will operate properly with the Quark. Some, but not all, of those listed have been successfully tested by Megatel or its customers.

Before purchasing any monitor (even if it is listed in Table 1) check with the vendor to see if you will be allowed an evaluation period. This is the best way to avoid possible disappointment.

The user should note that some of the cheaper composite monitors on the market may operate poorly with the Quark. The most common difficulty with such monitors is their inability to display a full 80 characters with the Quark operating in Alphanumeric mode. The reason for this is explained later in this Note.

Such monitors can still be used successfully if either the number of characters per row is reduced through software modifications, or the Quark is run in bit-mapped graphics mode with 7x8 characters and an offset. Megatel CP/M software releases 2.22 and Plus provide terminal handler software for this purpose.

MANUFACTURER	MODEL	INPUT TYPE	SIZE (inches)	PHOSPHORS OFFERED	ENCLOSURE INCLUDED	BUILT-IN POWER SUPPLY	DEFLECTION ANGLE (degrees)	MEGATEL TESTED
Electrohome	EVM 920	Comp	8.55	P4,P31,P39	Yes	Yes	90	No
Electrohome	EVM 1220	Comp	11.69	P4,P31,P39	Yes	Yes	90	No
Electrohome	EVM 1519	Comp	13.86	P4,P31,P39	Yes	Yes	110	No
Electrohome	EVM 1719	Comp	16.25	P4,P31,P39	Yes	Yes	114	No
Electrohome	EVM 2319	Comp	22.31	P4,P31,P39	Yes	Yes	110	No
Electrohome	V15	Comp,DD	9/12	P4,P31,P39	-	Opt	90	Yes
Electrohome	V23	Comp,DD	9/12	P4,P31,P110,P39	No	No	90	Yes
Electrohome	V24	Comp,DD	5/7	P4,P31,P110,P39	No	No	90	Yes
Motorola	MD3570	DD	12	P4 and others	No	No	90	No
Motorola	MD3970	DD	12	P4 and others	No	No	90	No
TSD	NDC-15	DD	15	P4,P31,P39,P42	No	Opt	110	No
Zenith	ZVM-121	Comp	12	P31	Yes	Yes	-	Yes
Zenith	ZVM-122	Comp	12	H5	Yes	Yes	-	Yes
Zenith	ZVM-123	Comp	12	P31	Yes	Yes	-	Yes

Note: Under INPUT TYPE, DD means monochrome with TTL level direct-drive inputs, Comp means monochrome with EIA RS-170 level composite input.

TABLE 1. Monochrome Monitors Recommended For Use With The Quark

**CONSIDERATIONS IN SELECTING
 A VIDEO DISPLAY MONITOR**

All Quark microcomputers have identical video specifications. These specifications should be closely compared with those of the monitor the user is considering, to determine the monitor's compatibility with the Quark. Any monitor conforming to the specifications

of the Quark's video display interface should be capable of displaying 80 characters per row. The monitor's ability to achieve this is directly related to the performance characteristics of its sync circuitry.

Table 2 provides the Quark Video Display Interface Specifications. Figure 1 illustrates the Quark Video Timing.

PARAMETER		QUARK/100, /200, /300 60 Hz	50 Hz	UNITS
VIDEO:	Horizontal Sync Frequency	15.540	16.150	kHz
	Horizontal Sync Period	64.35	61.92	us
	Horizontal Retrace Interval	10.75	10.34	us
	Vertical Sync Frequency	60	50	Hz
	Vertical Sync Period	16.67	20.0	ms
	Vertical Retrace Interval*	1.22	1.18	ms
DIRECT DRIVE VIDEO:	Horizontal Sync Pulse Width	21.45	20.64	us
	Horizontal Sync Polarity	positive	positive	
VIDEO:	Vertical Sync Pulse Width	187.7	180.6	us
	Vertical Sync Polarity	negative	negative	
	Length of Video Data	53.6	51.6	us
	Percentage Of Line Utilized	83.3	83.3	%
	Video Output Amplitude	4.0	4.0	Vp-p +/- 3dB
	H-Sync Output Amplitude	4.0	4.0	Vp-p +/- 3dB
	V-Sync Output Amplitude	4.0	4.0	Vp-p +/- 3dB
	COMPOSITE VIDEO:	Horizontal Sync Pulse Width	8.0	8.0
VIDEO:	Front Porch	1.8	1.8	us
	Back Porch	0.7	0.7	us
	Composite Video Amplitude	1.0	1.0	Vp-p +/- 3dB
	Composite Sync Level Relative To Black Level	-0.5	-0.5	V

* see the text on Vertical Sync, below.

TABLE 2. Quark Monochrome Video Display Interface Specifications

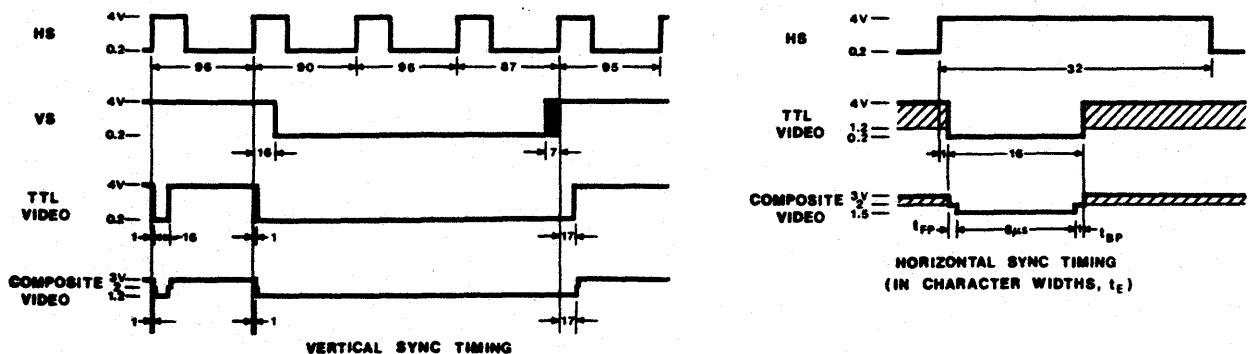


FIGURE 1. Quark Video Timing

Vertical Sync

The start of the vertical retrace interval is indicated by a high-to-low transition on the vertical sync line. The vertical sync line is low for approximately three horizontal sync periods (3 t_{HS}). During this time, the video output is blanked by the video display interface. Normal horizontal sync pulses appear on the horizontal sync line, although the horizontal sync period varies slightly. The composite video output stays low during the entire time in which the vertical sync output is low. No horizontal sync pulses appear on the composite video output when the vertical sync is low. This usually does not affect most composite video monitors that conform to EIA RS-170 standards.

When the vertical sync returns high again, the video display interface resumes scanning, starting at the bottom of the video memory, and unblanks the video output. Since monitors require more than three horizontal sync periods for vertical retrace, no video should be displayed on the first few scan lines. It is the responsibility of any software using the Quark's video display interface to ensure that null data (blanks in alphanumeric mode, 00 bytes in graphics mode) are loaded into the bottom of the video memory. The terminal drivers in Megatel's CP/M distribution software normally leave 16 blank scan lines at the top of the screen followed by a further 8 blank scan lines which are used only if the Display screen mode is used. As a result, the default vertical blanking period for a Megatel CP/M system is 1.74ms with a 60Hz Quark model and 1.67ms with a 50Hz one. With the Display screen in use, the vertical blanking period is 1.22ms for 60Hz, and 1.18ms for 50Hz.

If the upper portion of the screen appears to be warped, the monitor may be having trouble staying in horizontal sync after vertical retrace. The Quark's vertical blanking interval can be extended in software under CP/M Plus by re-installing the terminal driver to use fewer lines on the screen. This will lengthen the period between the end of the vertical sync pulse and the start of the video information, thus allowing more time for the monitor to recover. See the Megatel Quark Manual for detailed instructions on this procedure.

On the composite video output, the lack of inverted horizontal sync pulses during vertical blanking will not affect most composite video monitors. Nevertheless, if this appears to cause problems for your monitor, the external composite video generator of Figure 2 can be used. It provides a composite video signal with inverted horizontal sync pulses during vertical retrace, which conforms to EIA RS-170 standards.

Horizontal Sync

The horizontal sync frequency is 15.540 kHz on 60Hz models of the Quark (16.150 kHz on 50 Hz models). The active video field is 83.3% of the horizontal sync period. This allows 10.75 us on 60 Hz models for horizontal retrace (10.34 us on 50 Hz models).

When reviewing a monitor for its suitability, be absolutely sure to obtain its horizontal retrace specification. If it is not stated in the monitor's data sheet, it is advisable that the distributor or the manufacturer be contacted for this information. A monitor with a longer horizontal retrace will probably not be able to display the full 80 characters per row. Usually, one or more columns will not be completely displayed on the left side of the CRT.

Most monitors have adjustments (horizontal phase, horizontal width, beam adjustments etc.) that will allow the display field to be "squeezed" and/or shifted. These adjustments could result in an improvement, although the video display may still be unsatisfactory.

A monitor that specifies a minimum horizontal retrace (or horizontal blanking) spec of 10us or less should work properly in this respect. Remember, a 50 Hz Quark has a slightly shorter horizontal retrace period than a 60 Hz model.

Bandwidth

The Quark has a resolution of 640 pixels horizontally, which is required to produce an 80 character display. For proper resolution, be certain that any prospective monitor has a video bandwidth in the area of 12 MHz or greater.

IMPORTANT NOTES

1. Note that any modifications to a Quark performed by a user will void the Quark's warranty. Be sure to read all the warranty information before attempting any modifications. BE EXTREMELY CAREFUL.

2. Refer to the Megatel Quark Manual for detailed technical information on the Quark's video display interface hardware and software.

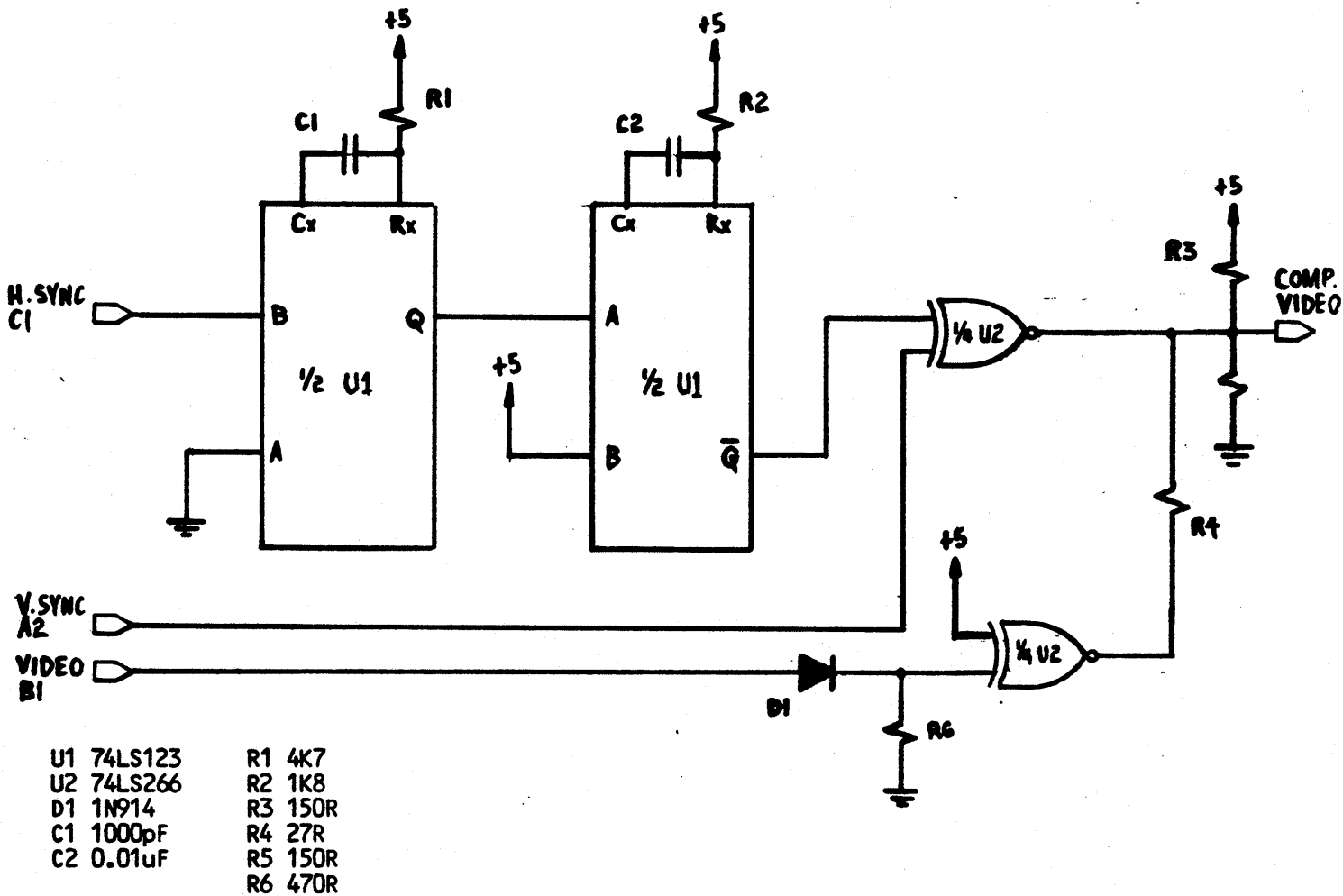


FIGURE 2. External Composite Video Generator

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