

# **OPERATIONS MANUAL MCM/LPM-SVGA**

WinSystems reserves the right to make changes in the circuitry  
and specifications at any time without notice.  
© Copyright 1993 by WinSystems. All Rights reserved.

**REVISION HISTORY**

**P/N 403-0181-000**

<b>ECO Number</b>	<b>Date Code</b>	<b>Rev Level</b>
ORIGINATED	930611	B
93-48	930720	C

# TABLE OF CONTENTS

<b>Section Number</b>	<b>Paragraph Title</b>	<b>Page Number</b>
1	General Information	
1.1	Features	1-1
1.2	General Description	1-1
1.3	Specifications	1-2
2	MCM/LPM-SVGA Technical Reference	
2.1	Introduction	2-1
2.2	Address Bus Size Select	2-1
2.3	Interrupt routing	2-2
2.4	Wait state control	2-3
2.5	Supported VIDEO Modes	2-3
2.6	VIDEO Connector Pin Definitions	2-4
2.7	VESA Feature Connector	2-5
APPENDIX A	MCM/LPM-SVGA Monitor Compatibility Chart	
APPENDIX B	MCM/LPM-SVGA Parts Placement Guide	
APPENDIX C	MCM/LPM-SVGA Parts List	
APPENDIX D	MCM/LPM-SVGA Schematic Diagrams	

# 1 General Information

## 1.1 Features

- Based on Cirrus Logic GD5420 Super VGA Controller Chip
- 100% Hardware compatible with IBM VGA display standards
- Industry Standard VGA BIOS
- STD-BUS Compatible
- Up to 1Mb Display memory Supported
- VESA Compliant Pass through Feature Connector
- 132 column Text mode support
- Extended SVGA modes through 1024 X 768 and 256 Colors with 1MB installed.
- Windows, Autocad, Lotus, Ventura and other device drivers available for SVGA usage.
- On Board EEPROM stores monitor information.

## 1.2 General Description

The MCM/LPM-SVGA is a high resolution, Super VGA STD-BUS video display board that provides low cost standard VGA with the capability of extended Super VGA modes of up to 1024 X 768 with 256 colors. The PCM-VGA is based on the Cirrus Logic GD5420 Chip which is the latest in a long line of successful VGA controllers. This experience provides the benefit of a highly compatible product with a wealth of SVGA drivers for all of the most popular applications.

## **1.3 Specifications**

### **1.3.1 Electrical**

Bus Interface : STD-8088/188 Compatible

VCC: +5v +- 5% @ 250mA with 256K RAM. (MCM)

### **1.3.2 Mechanical**

Dimensions: 4.5" x 6.5" X 0.6"

PC-Board : FR-4 epoxy glass with 2 signal layers and 2 power planes with screened component legend, plated through holes, and gold plated fingers.

Jumpers : 0.025" square posts on 0.10" centers.

### **1.3.3 Connectors :**

Analog VGA : DB15F

Feature Connector : 26 Pin RN type IDH-26-LP

### **1.3.4 Environmental**

Operating Temperature : 0° to 70° C

Non-Condensing Humidity : 5 to 95%

# 2

## MCM/LPM-SVGA Technical Reference

### 2.1 Introduction

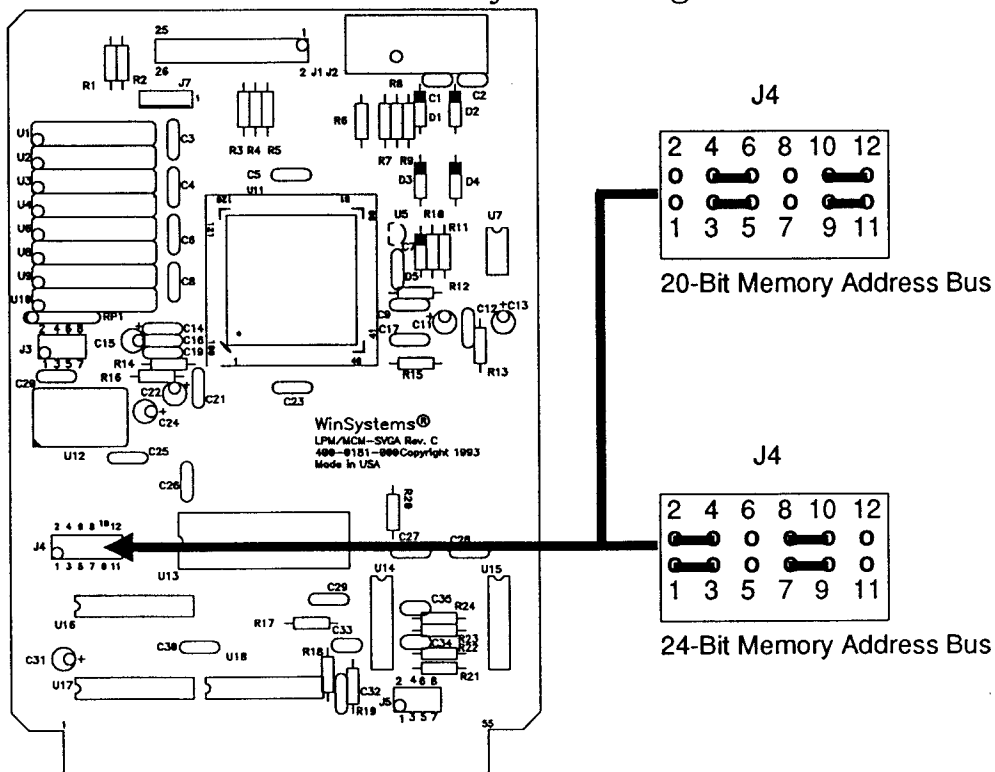
This section of the manual provides information regarding installation and configuration of the MCM/LPM-SVGA board. Questions or problems using the MCM/LPM-SVGA board should be addressed to the WinSystems Technical Support department at (817) 274-7553 between 8:00AM and 5:00PM Central time. Assistance can also be obtained via FAX at (817) 548-1358.

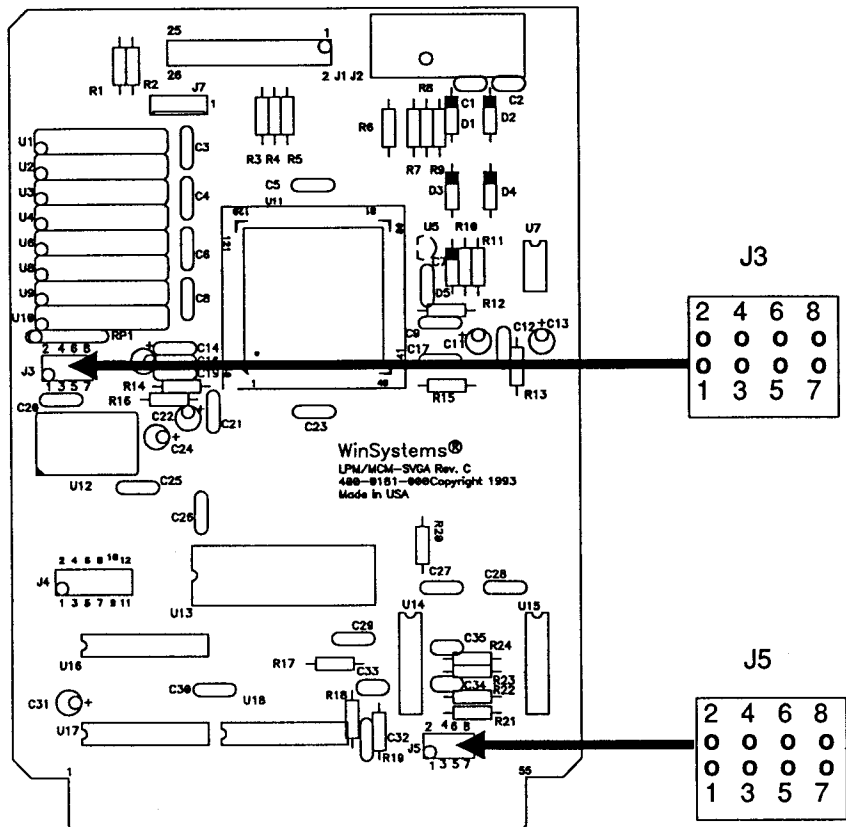
#### 2.1.1 Installation

The MCM/LPM-SVGA board is a standard STD-BUS card and may be placed in any position in the rack. Any user configuration jumpering should be accomplished prior to installation, as the jumper posts may not be accessible once installed in a card rack.

### 2.2 Address Bus Size Selection

The PCM-VGA may be used in STD-BUS systems driving either 20 or 24-bit memory addresses to the BIOS and VRAM array. The jumper block at J4 allows selection of 20-bit or 24-bit memory addressing.



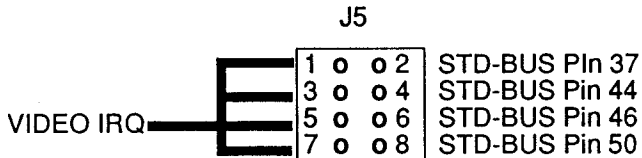


Configuration  
Jumper J3

Interrupt Routing  
Header J5

## 23 Interrupt Routing

The MCM/LPM-SVGA is capable of generating a retrace interrupt compatible with EGA systems. This interrupt is not used with VGA software but is provided only for compatibility with EGA software requiring it or for user software. When used for EGA compatibility J5 is jumpered in order to route the interrupt into IRQ2 on the CPU. Alternate interrupt routing options can be made using the following diagram as a guide.



## **2.4 Wait State Control**

In order to further improve video response time, pins 1-2 on J3 may be jumpered to enable the "0 wait state mode" this mode when enabled will allow 0 wait state Display memory writes if the internal write buffer is not full and 0 wait state BIOS ROM reads if enabled by an internal register. This position is unjumpered from the factory and it is the responsibility of the user to determine if enabling this option will result in a reasonable performance increase without a significant degradation in reliability. Most CPU boards allow SHADOWING of the BIOS ROM into system RAM which will be many times faster than even the "0 wait state" option, and the on-board write ahead FIFO causes most video display writes to be executed with minimal delay.

## **2.5 Supported Video Modes**

The actual video modes available are dependent on the amount of RAM installed on the video module and the capability of the attached monitor. Running the optional CLmode utility allows determination of allowable modes and monitor usability. There is a monitor compatibility chart provided in Appendix A. The following table defines the various modes available and the memory requirement for each.



Video Mode	Screen Format	No. of Colors	Display Mode	Char. Cell	Pixel Freq. Mhz.	Horiz. Freq. kHz	Vert. Freq. Hz.	Memory Required
0,1	360 X 400	16/256k	Text	9 X 16	14	31.5	70	256KB
2,3	720 X 400	16/256K	Text	9 X 16	28	31.5	70	256KB
4,5	320 X 200	4/256K	Graphics	8 X 8	12.5	31.5	70	256KB
6	640 X 200	2/256K	Graphics	8 X 8	25	31.5	70	256KB
7	720 X 400	Mono	Text	9 X 16	28	31.5	70	256KB
D	320X 200	16/256K	Graphics	8 X 8	12.5	31.5	70	256KB
E	640 X 200	16/256K	Graphics	8 X 14	25	31.5	70	256KB
F	640 X350	Mono	Graphics	8 X 14	25	31.5	70	256KB
10	640 X 350	16/256K	Graphics	8 X 14	25	31.5	70	256KB
11	640 X 480	2/256K	Graphics	8 X 16	25	31.5	60	256KB
12	640 X 480	16/256K	Graphics	8 X 16	25	31.5	60	256KB
12+	640 X 480	16/256K	Graphics	8 X 16	31.5	37.9	72	256KB
13	320 X 200	256/256K	Graphics	8 X 8	12.5	31.5	70	256KB
14	1056 X 400	16/256K	Text	8 X 16	41.5	31.5	70	256KB
54	1056 X 350	16/256K	Text	8 X 8	41.5	31.5	70	256KB
55	1056 X 350	16/256K	Text	8 X 14	41.5	31.5	70	256KB
58,6A	800 X 600	16/256K	Graphics	8 X 16	36/40/50	35.2/37.8/ 48.1	56/60/72	256KB
5C	800 X 600	256/256K	Graphics	8 X 16	36/40/50	35.2/37.9 48.1	56/60/72	512KB
5D	1024 X 768	16/256K	Graphics	8 X 16	65/75/77	48.3/56/ 58	60/70/72	512KB
5F	640 X 480	256/256K	Graphics	8 X 16	25/31.5	31.5/37.9	70/72	512KB
60	1024 X 768	256/256K	Graphics	8 X 16	65/75/77	48.3/56/58	60/70/72	1Meg
64	640 X 480	64K	Graphics	-	25/31.5	31.5/37.9	60/72	1Meg
66	640 X 480	32K	Graphics	-	25/31.5	31.5/37.9	60/72	1Meg
6F	320 X 200	64K	Graphics	8 X 8	12.5	31.5	70	256K

## 2.6 Video Connector Pin Definitions

The MCM/LPM-SVGA terminates in a standard 15-Pin D-Shell connector suitable for connection to an ANALOG VGA or ANALOG Multi-Sync monitor capable of displaying the desired video mode(s). In no case will WinSystems or Cirrus Logic be liable for damage to monitors due to incorrect connection or usage. The pin definitions for the Video connector J2 are show on the following page.

Pin	Signal	Monochrome	Color
1	Red	No Pin	Red
2	Green	Mono Dots	Green
3	Blue	No Pin	Blue
4	Reserved	No Pin	No Pin
5	Digital Gnd	Self Test	Self Test
6	Red Return	Key Pin	Red Return
7	Green Return	Mono Return	Green Return
8	Blue Return	No Pin	Blue Return
9	Plug	No Pin	No Pin
10	Digital Gnd	Digital Gnd	Digital Gnd
11	Reserved	No Pin	Digital Gnd
12	Reserved	Digital Gnd	No Pin
13	Horizontal Sync	Horizontal Sync	Horizontal Sync
14	Vertical Sync	Vertical Sync	Vertical Sync
15	Reserved	No Pin	No Pin

## 2.7 VESA Feature Connector Pin Definitions

J1 provides a VESA-compliant VGA pass through connector for transferring pixel data to or from the internal video DAC. The 13 pin 2 row connector is a less costly alternative than the IBM version, which requires a plated finger card-edge connector. The pin definitions for the J1 feature connector are shown below:

P0	1	0	0	2	GND
P1	3	0	0	4	GND
P2	5	0	0	6	GND
P3	7	0	0	8	EVIDEO
P4	9	0	0	10	ESYNC
P5	11	0	0	12	EDCLK
P6	13	0	0	14	N/C
P7	15	0	0	16	GND
DCLK	17	0	0	18	GND
BLANK	19	0	0	20	GND
HSYNC	21	0	0	22	GND
VSYNC	23	0	0	24	N/C
GND	25	0	0	26	N/C

## 3

## APPENDIX A

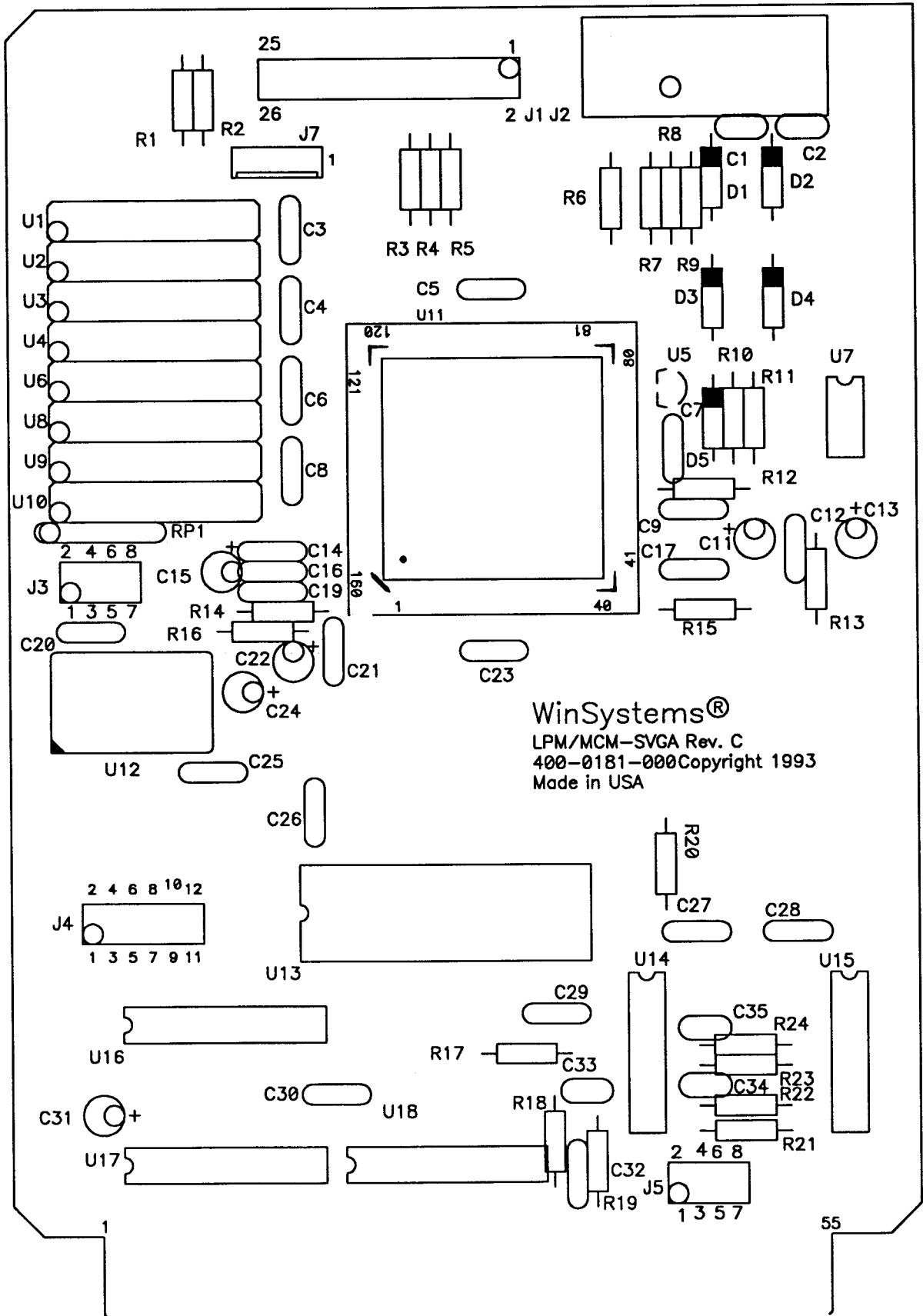
MCM/LPM-SVGA MONITOR COMPATIBILITY CHART

Monitor Type	Examples	Horizontal Frequency (kHz)	Vertical Frequency (Hz)	Display Resolutions
0	IBM 8512 8513 8503	31.5	60 or 70	640 X 480
1	IBM 8514 8515	31.5 35.5	60 or 70 43.5 interlaced	640 X 480 1024 X 768
2	NEC 2A	31.5 35.2	60 or 70 56	640 X 480 800 X 600
3	NEC II	31.5 35.2 37.8	60 or 70 56 43.5 interlaced	640 X 480 800 X 600 1024 X 768
4	NEC 3D	31.5 37.8 37.8	60 or 70 60 43.5 interlaced	640 X 480 800 X 600 1024 X 768
5	Sony CPD-1304 NEC 3FGx Nanao 9065S, 9070U	31.5 48.0 48.0 48.0	60 or 70 72 60 43.5 interlaced	640 X 480 800 X 600 1024 X 768 1280 X 1024
6	NEC 4D 4FG Nanao T240i	31.5 48.0 56.0 48.0	60 or 70 72 72 43.5 interlaced	640 X 480 800 X 600 1024 X 768 1280 X 1024
7	NEC 5D 5FG, 6FG Nanao T550i, T560i, T660i, F550i, F570i	31.5 48.0 58.3 48.0	60 or 70 72 72 43.5 interlaced	640 X 480 800 X 600 1024 X 768 1280 X 1024

4

## APPENDIX B

MCM/LPM-SVGA COMPONENT PLACEMENT GUIDE



WinSystems®  
 LPM/MCM-SVGA Rev. C  
 400-0181-000 Copyright 1993  
 Made in USA

# 5 APPENDIX C

MCM/LPM-SVGA PARTS LIST

LEVEL	ITEM KEY	ITEM DESCRIPTION	BOM DESCRIPTION	LOC	OVHD KEY	ITEM TYPE	QTY REQUIRED
1	0181-102-0000	ASSY LPM-SVGA-1M REV C					1
2	999-9999-001	SPECIAL NOTES	07-01-93 RC PRELIMINARY BOM	ARLIN		Inv	1
2	110-0010-003	CAP .1 UF CER RAD SR215E104MAA	C3-C9,C12,C14,C16,C17,C19-C21,C23,C25-30	ARLIN		Inv	22
2	999-9999-001	SPECIAL NOTES	C32	ARLIN		Inv	1
2	110-0014-005	CAP 10 UF TAN RAD T350G106K025AS	C13,C31,C22	ARLIN		Inv	3
2	110-0038-005	CAP 2.2 UF 35V TAN RAD 199D225X9	C11,C15	ARLIN		Inv	2
2	110-0044-005	CAP 22UF TAN RAD 10V	C24	ARLIN		Inv	1
2	110-0030-003	CAP 47PF CER RAD ULTRA C315C470K	C33-C35	ARLIN		Inv	3
2	110-0047-003	CAP 220 PF CER RAD .1SP C315C221	C1,C2	ARLIN		Inv	2
2	114-0470-450	RESISTOR 47 OHMS 1/4 W 5%	R18,R21,R23	ARLIN		Inv	3
2	114-0101-450	RESISTOR 100 OHM 1/4 5%	R15	ARLIN		Inv	1
2	114-0103-450	RESISTOR 10K 1/4 5%	R17,R19,R20,R22,R24	ARLIN		Inv	5
2	114-0151-450	RESISTOR 150 OHM 1/4 5%	R7-R9	ARLIN		Inv	3
2	114-0220-450	RESISTOR 22.0 OHM 1/4 5%	R1-R5,R10	ARLIN		Inv	6
2	114-0221-450	RESISTOR 220 OHM 1/4 5%	R11	ARLIN		Inv	1
2	114-0330-450	RESISTOR 33 OHMS 1/4 5%	R13,R14	ARLIN		Inv	2
2	114-0682-450	RESISTOR 6.8K 1/4W 5%	R6	ARLIN		Inv	1
2	114-0750-450	RESISTOR 75 OHM 1/4 5%	R12,R16	ARLIN		Inv	2
2	115-0682-050	RN SIP 6P-5 RES 6.8K CSC06A01682	RP1	ARLIN		Inv	1
2	124-0004-000	DIODE 1N4148	D1-D5	ARLIN		Inv	5
2	200-0286-100	SOCKET 28 P .6 ICO-286-S8A-T (18	U13	ARLIN		Inv	1
2	201-0004-003	HDR MOLEX 4 POS 22-11-2042	J7	ARLIN		Inv	1
2	201-0015-300	CONN PC MT FEM 15 MICRO D 302-12	J2	ARLIN		Inv	1
2	201-0072-120	HDR 2X36 UN BG 67997-572	J3,J5=2X4,J4=2X6,J1=2X13	ARLIN		Inv	.75
2	220-0032-000	OSC 14.31818 MHZ SG51K	U12	ARLIN		Inv	1
2	741-0004-200	IC, 74HC04	U15	ARLIN		Inv	1
2	741-0032-200	IC, 74HC32	U14	ARLIN		Inv	1
2	741-0373-200	IC, 74HC373	U17,U18	ARLIN		Inv	2
2	400-0181-000	PCB, LPM/MCM-SVGA REV C	PCB, LPM/MCM-SVGA REV C	ARLIN		Inv	1
2	500-0001-000	EJECTOR SCANBE S208	STAMP (BLUE) SVGA	ARLIN		Inv	1
2	500-0002-000	ROLL PIN MS171492	ROLL PIN MS171492	ARLIN		Inv	1
2	730-0037-000	IC LM334 Z	U5	ARLIN		Inv	1
2	741-0244-200	IC, 74HC244	U16	ARLIN		Inv	1
2	801-0143-200	IC CL-GD5420-75-QC-C (24) CIRBUS	U11	ARLIN		Inv	1
2	900-0027-100	IC DRAM 256K X 4 70NS ZIP	U1-U4,U6,U8-U10	ARLIN		Inv	8
2	901-0021-000	IC EEPROM 93C46AB6	U7	ARLIN		Inv	1
1	0181-202-0000	ASSY MCM-SVGA-1M REV C					1
2	999-9999-001	SPECIAL NOTES	07-01-93 RC PRELIMINARY BOM	ARLIN		Inv	1
2	110-0010-003	CAP .1 UF CER RAD SR215E104MAA	C3-C9,C12,C14,C16,C17,C19-C21,C23,C25-30	ARLIN		Inv	22
2	999-9999-001	SPECIAL NOTES	C32	ARLIN		Inv	1
2	110-0014-005	CAP 10 UF TAN RAD T350G106K025AS	C13,C31,C22	ARLIN		Inv	3
2	110-0038-005	CAP 2.2 UF 35V TAN RAD 199D225X9	C11,C15	ARLIN		Inv	2
2	110-0044-005	CAP 22UF TAN RAD 10V	C24	ARLIN		Inv	1
2	110-0030-003	CAP 47PF CER RAD ULTRA C315C470K	C33-C35	ARLIN		Inv	3
2	110-0047-003	CAP 220 PF CER RAD .1SP C315C221	C1,C2	ARLIN		Inv	2

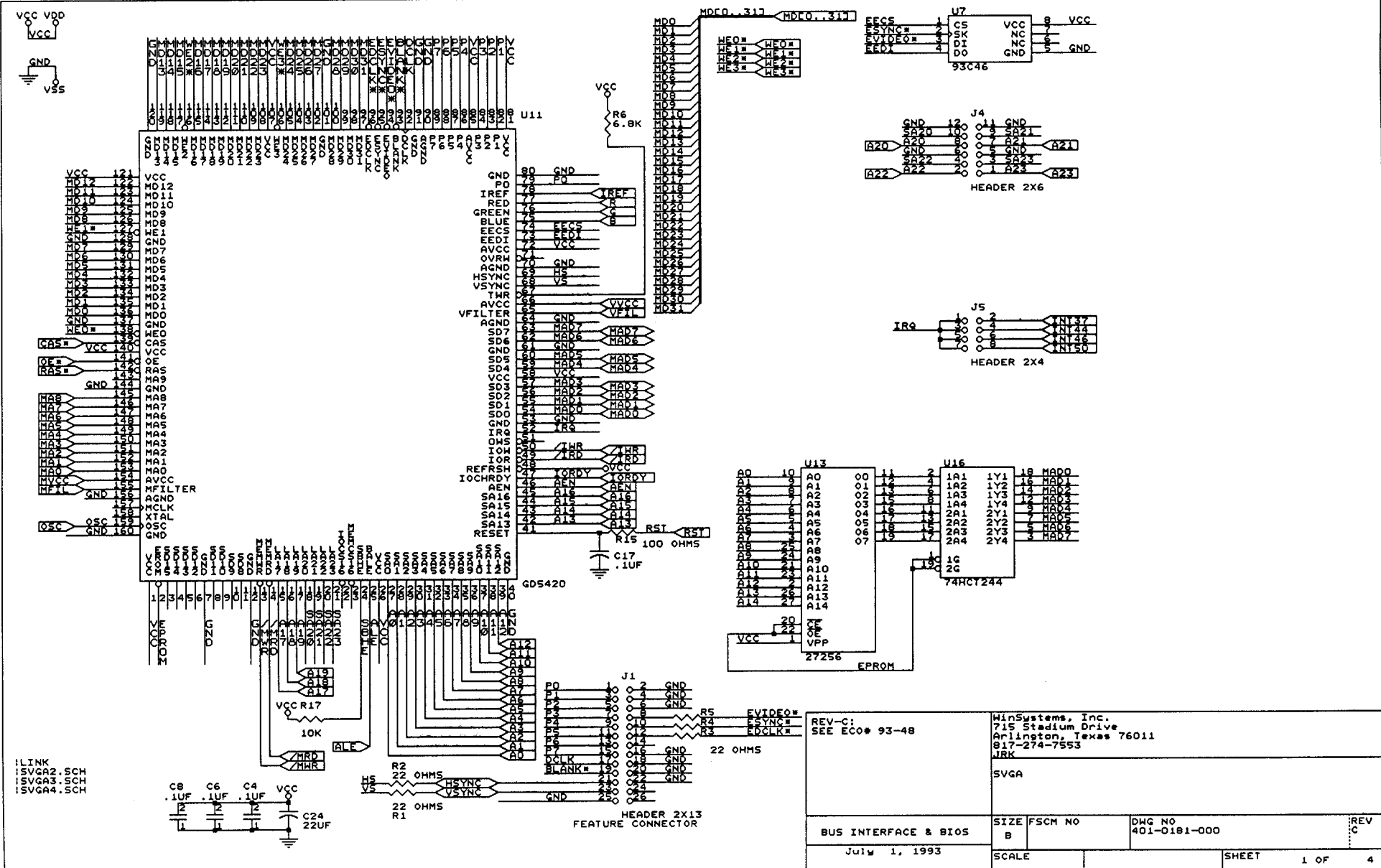
LEVEL	ITEM KEY	ITEM DESCRIPTION	BOM DESCRIPTION	LOC	OVHD KEY	ITEM TYPE	QTY REQUIRED
2	114-0470-450	RESISTOR 47 OHMS 1/4 W 5%	R18,R21,R23	ARLIN		Inv	3
2	114-0101-450	RESISTOR 100 OHM 1/4 5%	R15	ARLIN		Inv	1
2	114-0103-450	RESISTOR 10K 1/4 5%	R17,R19,R20,R22,R24	ARLIN		Inv	5
2	114-0151-450	RESISTOR 150 OHM 1/4 5%	R7-R9	ARLIN		Inv	3
2	114-0220-450	RESISTOR 22.0 OHM 1/4 5%	R1-R5,R10	ARLIN		Inv	6
2	114-0221-450	RESISTOR 220 OHM 1/4 5%	R11	ARLIN		Inv	1
2	114-0330-450	RESISTOR 33 OHMS 1/4 5%	R13,R14	ARLIN		Inv	2
2	114-0682-450	RESISTOR 6.8K 1/4W 5%	R6	ARLIN		Inv	1
2	114-0750-450	RESISTOR 75 OHM 1/4 5%	R12,R16	ARLIN		Inv	2
2	115-0682-050	RN SIP 6P-5 RES 6.8K CSC06A01682	RP1	ARLIN		Inv	1
2	124-0004-000	DIODE 1N4148	D1-D5	ARLIN		Inv	5
2	200-0286-100	SOCKET 28 P .6 ICO-286-S8A-T (18	U13	ARLIN		Inv	1
2	201-0004-003	HDR MOLEX 4 POS 22-11-2042	J7	ARLIN		Inv	1
2	201-0015-300	CONN PC MT FEM 15 MICRO D 302-12	J2	ARLIN		Inv	1
2	201-0072-120	HDR 2X36 UN BG 67997-572	J3,J5=2X4,J4=2X6,J1=2X13	ARLIN		Inv	.75
2	220-0032-000	OSC 14.31818 MHZ SG51K	U12	ARLIN		Inv	1
2	340-0004-100	IC, 74LS04	U15	ARLIN		Inv	1
2	741-0032-200	IC, 74HC32	U14	ARLIN		Inv	1
2	340-0373-100	IC, 74LS373	U17,U18	ARLIN		Inv	2
2	400-0181-000	PCB, LPM/MCM-SVGA REV C	PCB, LPM/MCM-SVGA REV C	ARLIN		Inv	1
2	500-0001-000	EJECTOR SCANBE S208	STAMP (RED) SVGA	ARLIN		Inv	1
2	500-0002-000	ROLL PIN MS171492	ROLL PIN MS171492	ARLIN		Inv	1
2	730-0037-000	IC LM334 Z	U5	ARLIN		Inv	1
2	340-0244-100	IC, 74LS244	U16	ARLIN		Inv	1
2	801-0143-200	IC CL-GD5420-75-QC-C (24) CIRBUS	U11	ARLIN		Inv	1
2	900-0027-100	IC DRAM 256K X 4 70NS ZIP	U1-U4,U6,U8-U10	ARLIN		Inv	8
2	901-0021-000	IC EEPROM 93C46AB6	U7	ARLIN		Inv	1
1	0181-300-0000	SUB ASSY L/MCM-SVGA REV C					1
2	999-9999-001	SPECIAL NOTES	06-30-93 RC PRELIMINARY BOM	ARLIN		Inv	1
2	901-0007-000	IC, 27C256 32K X 8 EPROM	U13 CS=8D00 \PCMVGA\5420REVA.BIN	ARLIN		Inv	1
2	201-0002-000	PLUG JUMPER 999-19-310-00	J3,J5=OPEN	ARLIN		Inv	4
2	999-9999-001	SPECIAL NOTES	J4=3-5 4-6 9-11 10-12	ARLIN		Inv	1



6

# APPENDIX D

MCM/LPM-SVGA SCHEMATIC DIAGRAMS

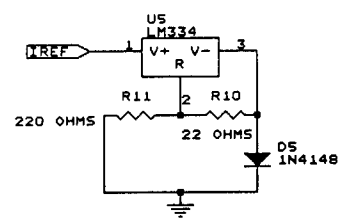
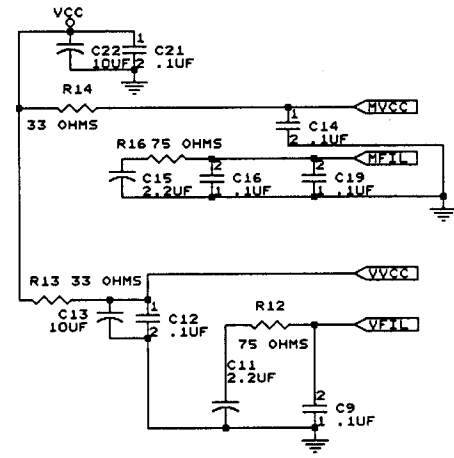
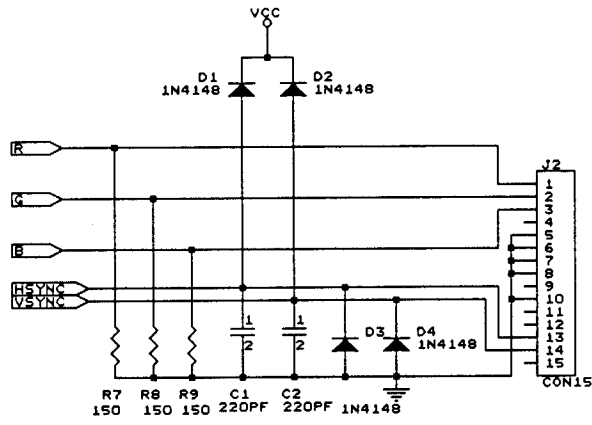


!!LNK  
 !SVGA2.SCH  
 !SVGA3.SCH  
 !SVGA4.SCH

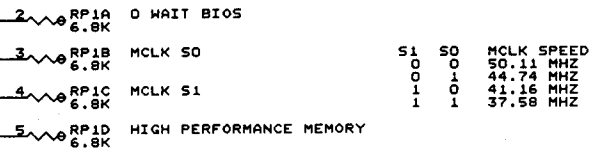
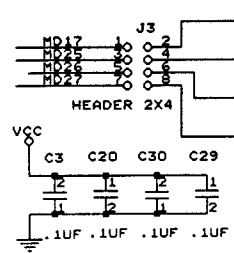
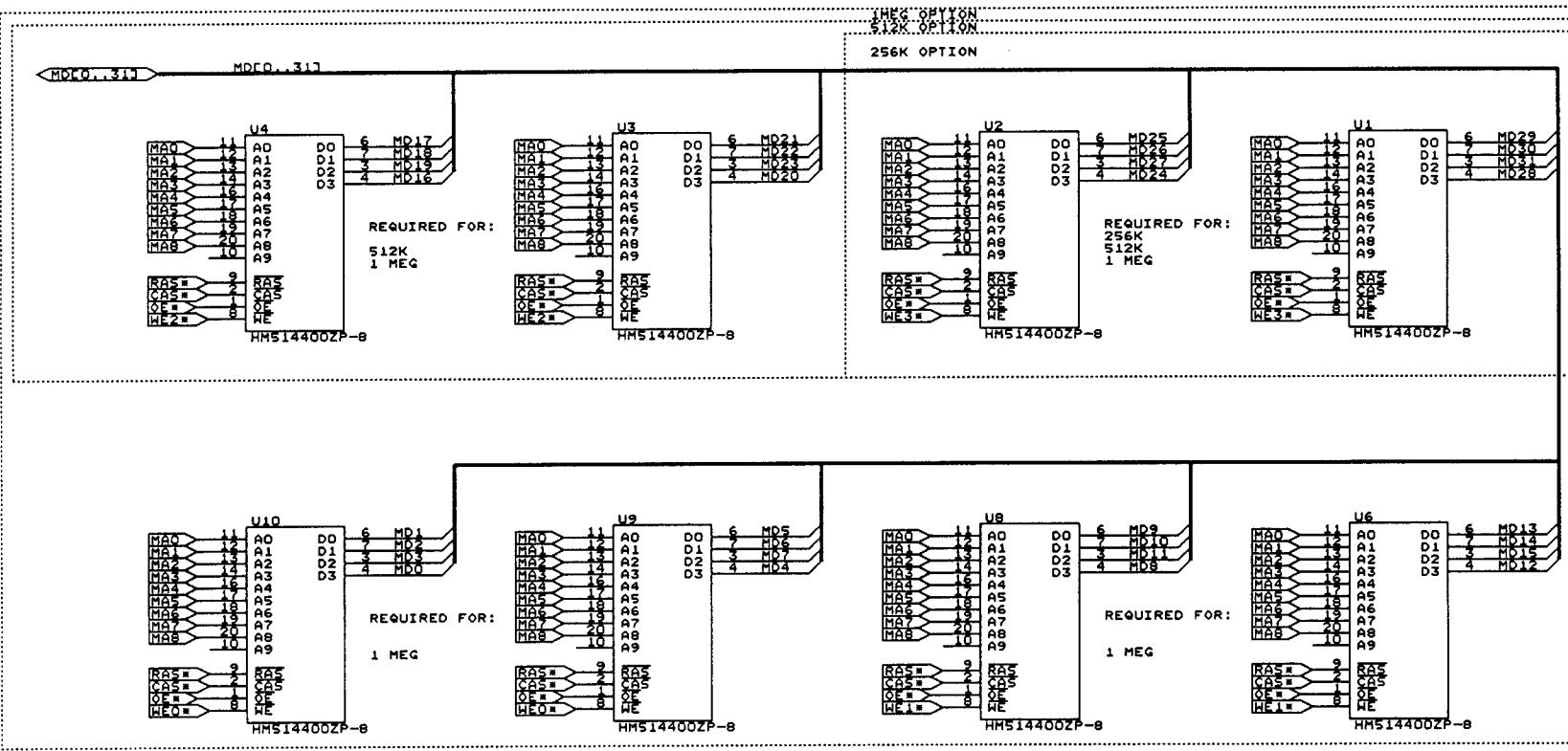
REV-C:  
 SEE ECO# 93-48

WinSystems, Inc.  
 715 Stadium Drive  
 Arlington, Texas 76011  
 817-274-7553

BUS INTERFACE & BIOS	SIZE B	FSCM NO	DWG NO 401-0181-000	REV C
July 1, 1993	SCALE		SHEET	1 OF 4

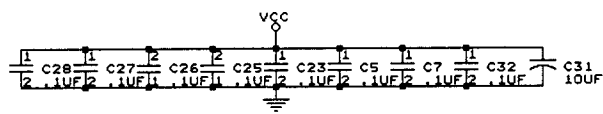
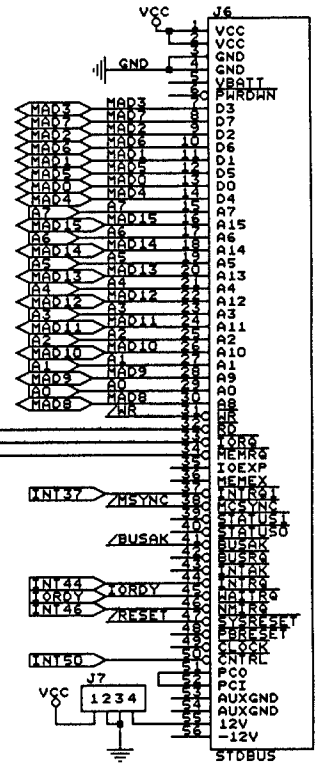
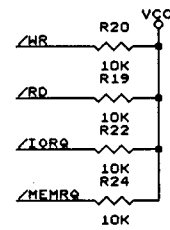
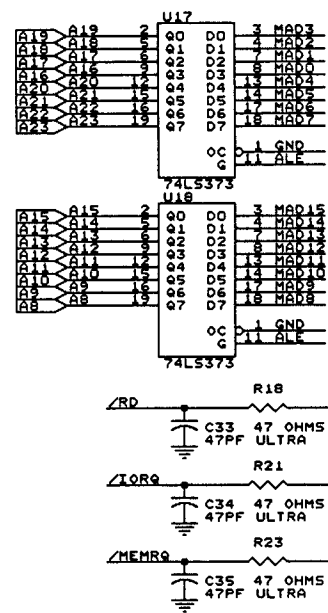
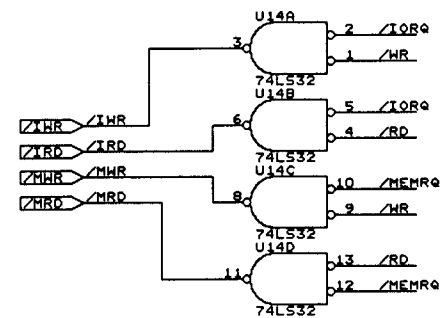
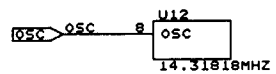
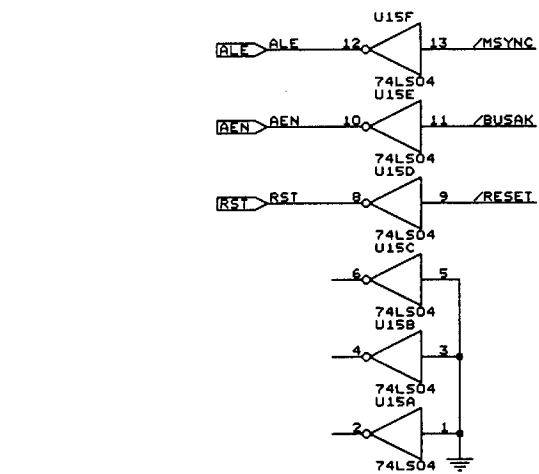


WinSystems, Inc. 715 Stadium Drive Arlington, Texas 76011 817-274-7553 JRK			
SVGA			
ANALOG CIRCUITRY	SIZE B	FSCM NO 401-0181-000	DWG NO REV C
June 28, 1993	SCALE	SHEET	2 OF 4



CONFIGURATION OPTIONS

WinSystems, Inc. 715 Stadium Drive Arlington, Texas 76011 817-274-7553 JRK			
SVGA			
VIDEO MEMORY	SIZE	FSCN NO	DWG NO
June 28, 1993	B		401-0181-000
	SCALE		SHEET 3 OF 4
			REV C



WinSystems, Inc. 715 Stadium Drive Arlington, Texas 76011 817-274-7553 JIRK			
SVGA			
BUS INTERFACE	SIZE B	FSCM NO	DWG NO 401-0181-000
June 29, 1993	SCALE		REV C
		SHEET	4 OF 4



Telephone: 817-274-7553 . . Fax: 817-548-1358  
<http://www.winsystems.com> . . E-mail: [info@winsystems.com](mailto:info@winsystems.com)

## **WARRANTY**

WinSystems warrants that for a period of two (2) years from the date of shipment any Products and Software purchased or licensed hereunder which have been developed or manufactured by WinSystems shall be free of any material defects and shall perform substantially in accordance with WinSystems' specifications therefore. With respect to any Products or Software purchased or licensed hereunder which have been developed or manufactured by others, WinSystems shall transfer and assign to Customer any warranty of such manufacturer or developer held by WinSystems, provided that the warranty, if any, may be assigned. The sole obligation of WinSystems for any breach of warranty contained herein shall be, at its option, either (i) to repair or replace at its expense any materially defective Products or Software, or (ii) to take back such Products and Software and refund the Customer the purchase price and any license fees paid for the same. Customer shall pay all freight, duty, broker's fees, insurance changes and other fees and charges for the return of any Products or Software to WinSystems under this warranty. WinSystems shall pay freight and insurance charges for any repaired or replaced Products or Software thereafter delivered to Customer within the United States. All fees and costs for shipment outside of the United States shall be paid by Customer. The foregoing warranty shall not apply to any Products or Software which have been subject to abuse, misuse, vandalism, accidents, alteration, neglect, unauthorized repair or improper installations.

**THERE ARE NO WARRANTIES BY WINSYSTEMS EXCEPT AS STATED HEREIN. THERE ARE NO OTHER WARRANTIES EXPRESS OR IMPLIED INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE, IN NO EVENT SHALL WINSYSTEMS BE LIABLE FOR CONSEQUENTIAL, INCIDENTAL, OR SPECIAL DAMAGES INCLUDING, BUT NOT LIMITED TO, DAMAGES FOR LOSS OF DATA, PROFITS OR GOODWILL. WINSYSTEMS' MAXIMUM LIABILITY FOR ANY BREACH OF THIS AGREEMENT OR OTHER CLAIM RELATED TO ANY PRODUCTS, SOFTWARE, OR THE SUBJECT MATTER HEREOF, SHALL NOT EXCEED THE PURCHASE PRICE OR LICENSE FEE PAID BY CUSTOMER TO WINSYSTEMS FOR THE PRODUCTS OR SOFTWARE OR PORTION THEREOF TO WHICH SUCH BREACH OR CLAIM PERTAINS.**

## **WARRANTY SERVICE**

All products returned to WinSystems must be assigned a Return Material Authorization (RMA) number. To obtain this number, please call or FAX WinSystems' factory in Arlington, Texas and provide the following information:

1. Description and quantity of the product(s) to be returned including its serial number.
2. Reason for the return.
3. Invoice number and date of purchase (if available), and original purchase order number.
4. Name, address, telephone and FAX number of the person making the request.
5. Do not debit WinSystems for the repair. WinSystems does not authorize debits.

After the RMA number is issued, please return the products promptly. Make sure the RMA number is visible on the outside of the shipping package.

The customer must send the product freight prepaid and insured. The product must be enclosed in an anti-static bag to protect it from damage caused by static electricity. Each bag must be completely sealed. Packing material must separate each unit returned and placed as a cushion between the unit(s) and the sides and top of the shipping container. WinSystems is not responsible for any damage to the product due to inadequate packaging or static electricity.