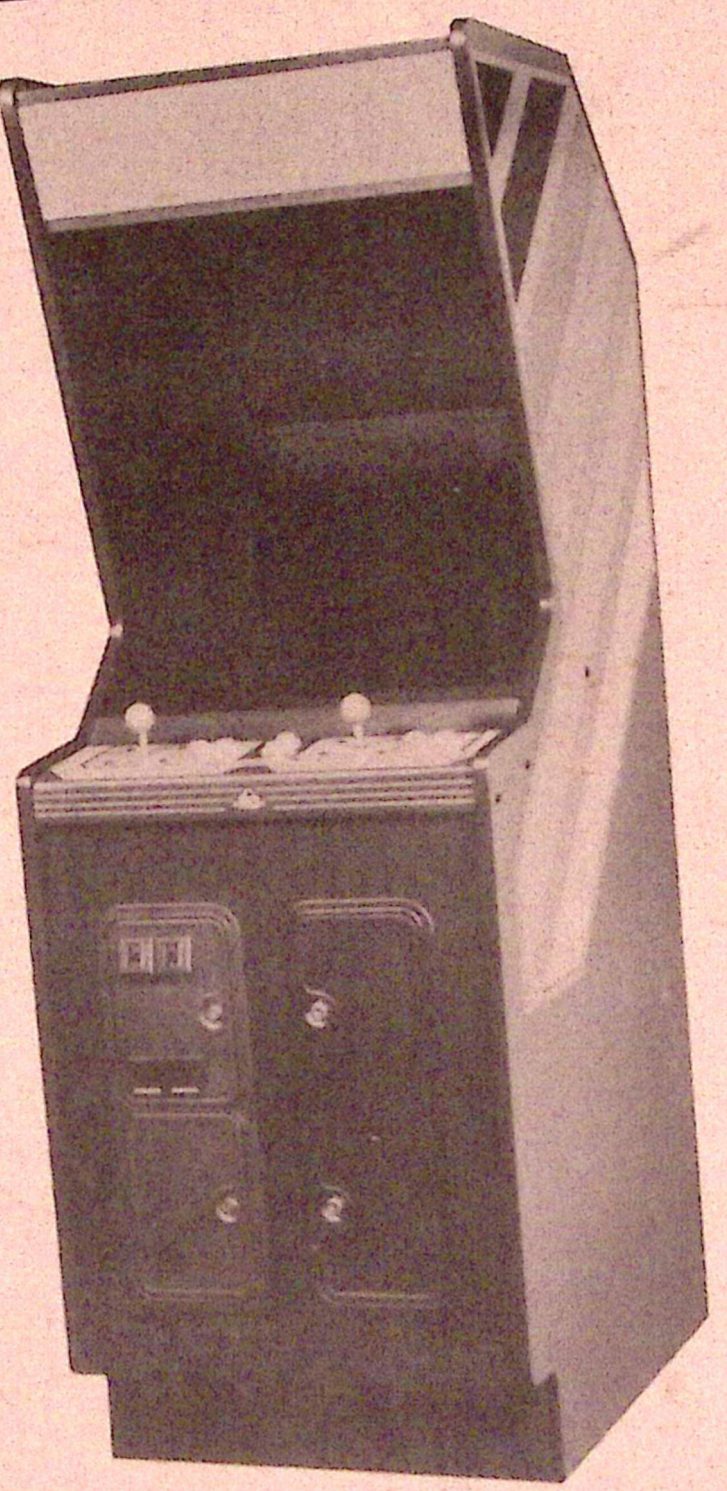
CINEMAT SYSTEM*



Service Manual
Rev. B 1986

W A R N I N G

This equipment generates, uses, and can radiate radio frequency energy and if not installed and used in accordance with the instructions manual, may cause interference to radio communications. It has been tested and found to comply with the limits for class A computing device pursuant to subpart J of part 15 of FCC Rules, which are designed to provide reasonable protection against such interference when operated in a commercial environment. Operation of this equipment in a residential area is likely to cause interference in which case the user at his own expense will be required to take whatever measures may be required to correct the interference.

OPERATION AND MAINTENANCE

MANUAL FOR

THE CINEMATRONICS CINEMAT SYSTEM

With Illustrated Parts Lists

CINEMATRONICS INCORPORATED

1841 Friendship Drive

El Cajon, California 92020

NOTICE REGARDING THE USE OF NON-CINEMATRONICS REPLACEMENT PARTS:

Cinematronics recommends the use of only Cinematronics parts when replacing any malfunctioning component or assembly in the Cinemat system. For safety and reliability, Cinematronics does not recommend or authorize any substitute parts or modifications of Cinematronics equipment. Such alterations may adversely affect game play, cause serious injury, and void your warranty. Unauthorized parts, modifications and non-Cinematronics game conversion kits may also void FCC compliance.

WHAT YOU WILL FIND IN THIS MANUAL:

This manual contains information on your Cinemat system, including: Illustrated parts lists of system components, cabinet wiring diagrams, main logic board schematics and video monitor data.

WHAT YOU WON'T FIND IN THIS MANUAL:

Information regarding a specific game or game conversion, detailed instructions for the book-keeping and diagnostic functions and other game specific material. This information will be found in the appropriate Cinemat Game Manual.

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SET-UP PROCEDURE

A. SHIPPING BOLT REMOVAL

The component drawer of your Cinemat system is secured during shipment by means of a bolt located at the rear of the component drawer. (See Figure 1)

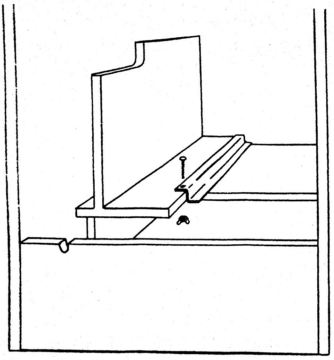

FIGURE 1

B. GAME INSPECTION

1. Examine the exterior of the game cabinet for dents, chips or broken parts.

2. Inspect the interior of the cabinet as follows:

   a) Check that all plug in connectors are firmly seated. Re-plug any connectors found unplugged.

   b) Check that all socketed components on the main logic board are firmly seated in their sockets.

3. Note the location of the serial number located on a tag affixed to the back of the cabinet and the main logic board serial number located near the lower right-hand corner of the board. Please make note of these numbers in the front of this manual for easy reference and mention them whenever you call your distributor or Cinematronics for service.

C. GAME MODULE INSTALLATION

Your Cinemat system may come to you with no game installed. A Cinemat game conversion consists of a game module (ROMs and custom chips) and a game enhancement module (control panel and add-on boards). All conversions require a game module, however adding an enhancement module may not necessary when converting to another game with similar control configuration. Instructions for installing game and enhancement modules can be found in the specific game manual for that particular game.

D. AC POWER REQUIREMENTS

Connect this system only to a grounded three wire outlet providing 108-132 volts A.C. If you have only a two wire outlet we recommend you hire a licensed electrician to install a grounded outlet. The possibility exists that players may receive an electric shock if this system is not properly grounded.

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MAINTENANCE AND SERVICE

A. WARRANTY

Cinematronics warrants that whenever the video display (television monitor) and/or the power supply and/or the printed circuit boards and/or all parts contained therein are furnished with its product, that such part or parts will be free from defects in materials and workmanship for a period of ninety (90) days from date of shipment. Cinematronics' warranty of above parts is subject to the normal use and service of its products. No other products or parts are warranted except those herein stated.

If Cinematroncs' warranted parts fail to perform as stated in this Warranty, then Cinematronics' sole liability shall be, at its option, to replace or repair such products which are returned to Cinematronics during the herein stated warranty period, provided:

A. Cinematronics is notified immediately in writing at the time the parts are determined to be defective.

B. That the defective parts are returned pre-paid to Cinematronics' plant accompanied by an authorized RMA number.

C. That Cinematronics' examination of returned products determines to Cinematronics' satisfaction that the alleged defects existed and were not caused by improper repair, installation, improper testing or by accident.

NOTE: Cinematronics is not responsible for bent pins on integrated circuits NOT installed by Cinematronics' employees.

In no event shall Cinematronics be liable for loss of profits, loss of use, or incidental or consequential damages.

EXCEPT FOR THIS EXPRESS WARRANTY, CINEMATRONICS DISCLAIMS ALL OTHER WARRANTIES, EXPRESSED OR IMPLIED, INCLUDING THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE, AND ALL OTHER OBLIGATIONS OR LIABILITIES ON CINEMATRONICS' BEHALF, AND IT NEITHER ASSUMES NOR AUTHORIZES ANY OTHER PERSON TO ASSUME FOR CINEMATRONICS ANY OTHER LIABILITIES IN CONNECTION WITH THE SALE OF PRODUCTS MANUFACTURED BY CINEMATRONICS.

B. FUSE REPLACEMENT

The Cinemat system contains three fuses located on the power supply assembly. See figure 2A for position and type. Replace these fuses only with the type indicated. Use of fuse types other than those shown will void your warranty and may cause system failure or serious personal injury. For monitor fuse information see the video monitor technical section of this manual.

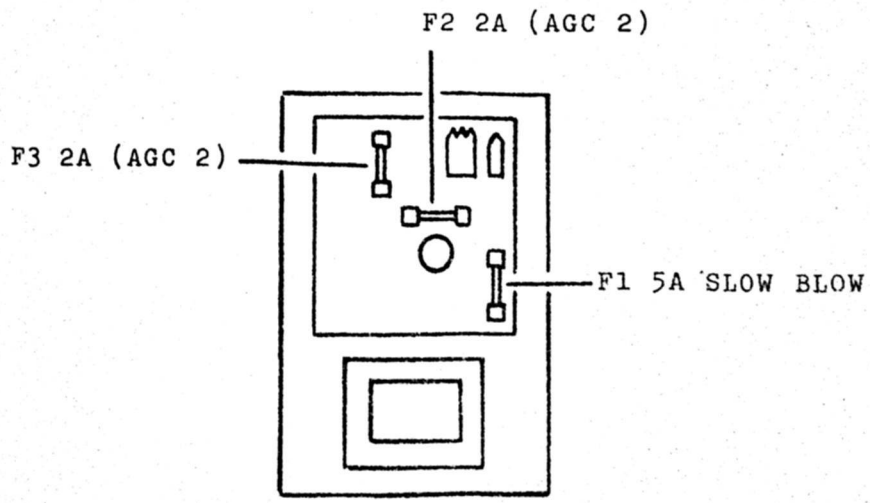


FIGURE 2A

C. SERVICE ASSISTANCE

For parts, service and technical information, first contact your authorized Cinematronics distributor. For additional technical aid contact Cinematronics Customer Service Department at (619) 562-7004 Monday thru Friday from 7:00 A.M. to 6:00 P.M. Pacific Standard time.

To provide you with the quickest possible response to your questions, please have the following information ready when calling the Cinematronics Customer Service Department:

1) Your Cinemat system serial and model numbers.

2) The game software serial number.

3) Any referenced drawings or schematics.

ILLUSTRATED PARTS LISTS

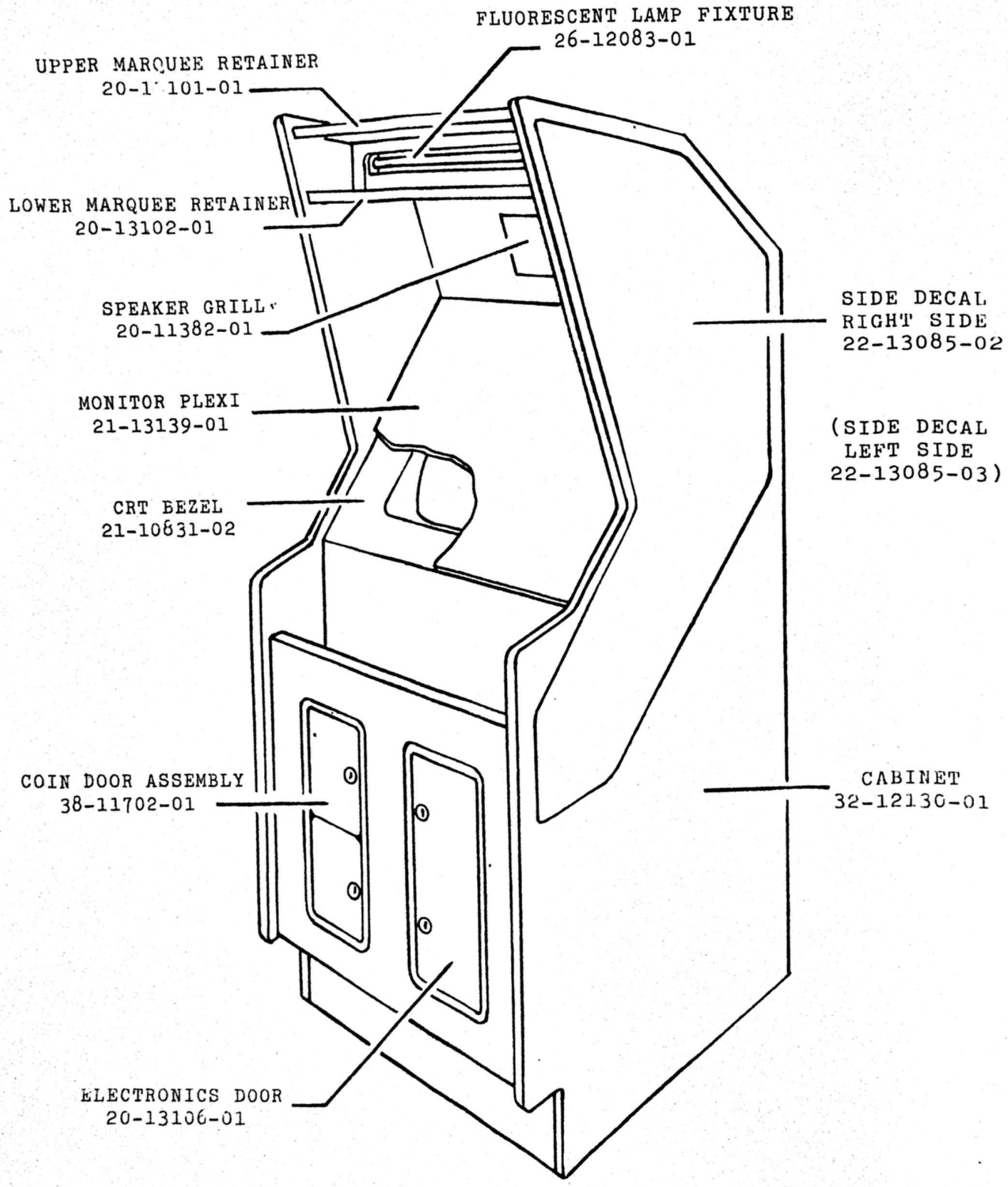


FIGURE 3A: CINEMAT CABINET (FRONT VIEW)

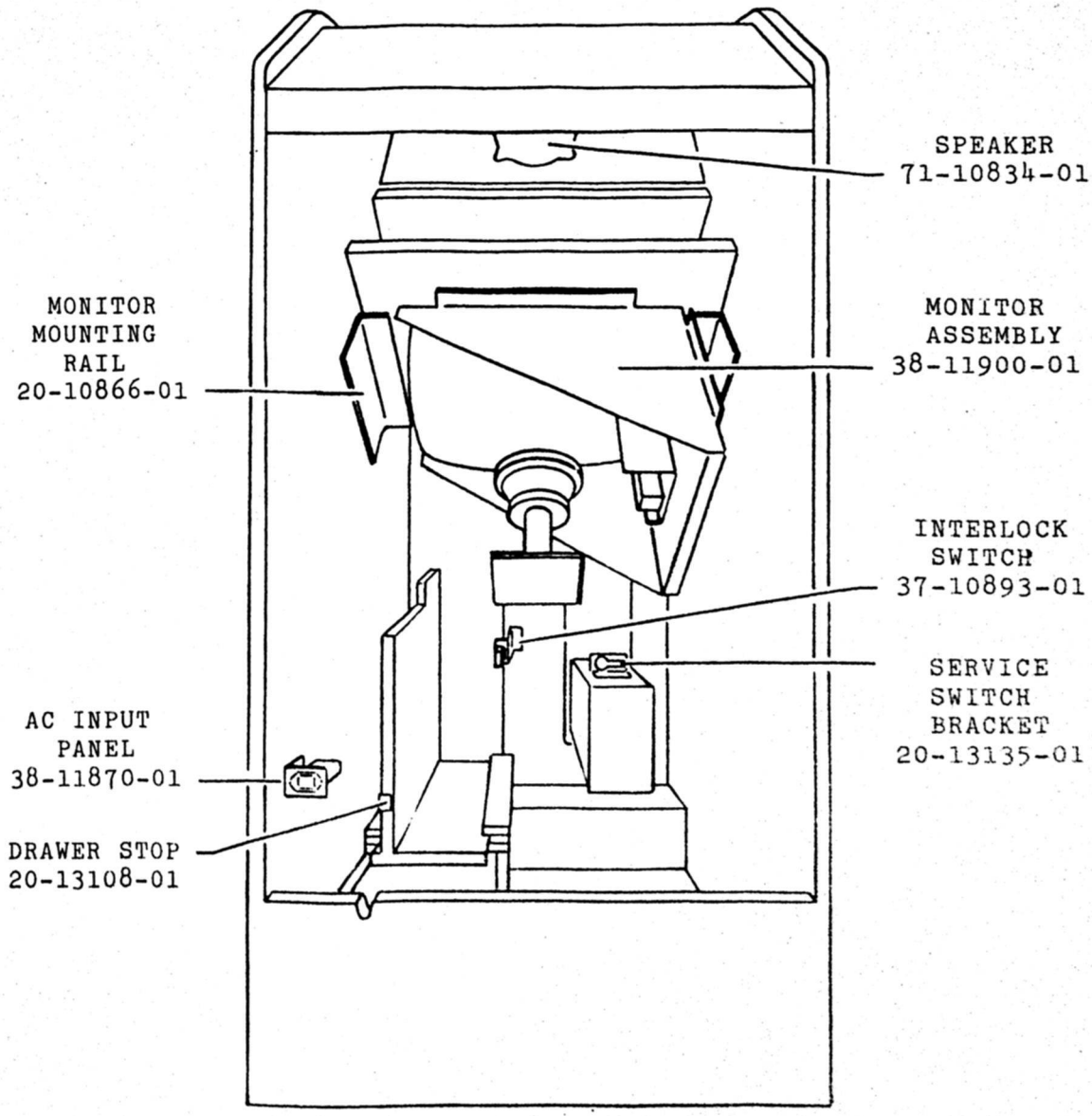


FIGURE 3B: CINEMAT CABINET (REAR VIEW)

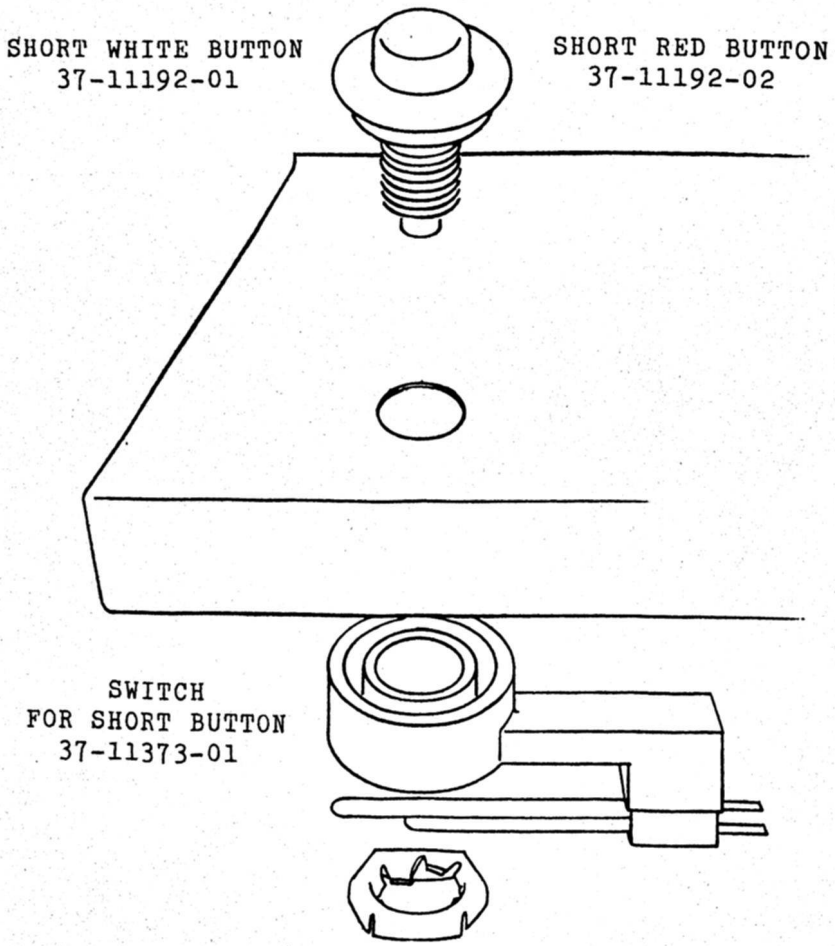
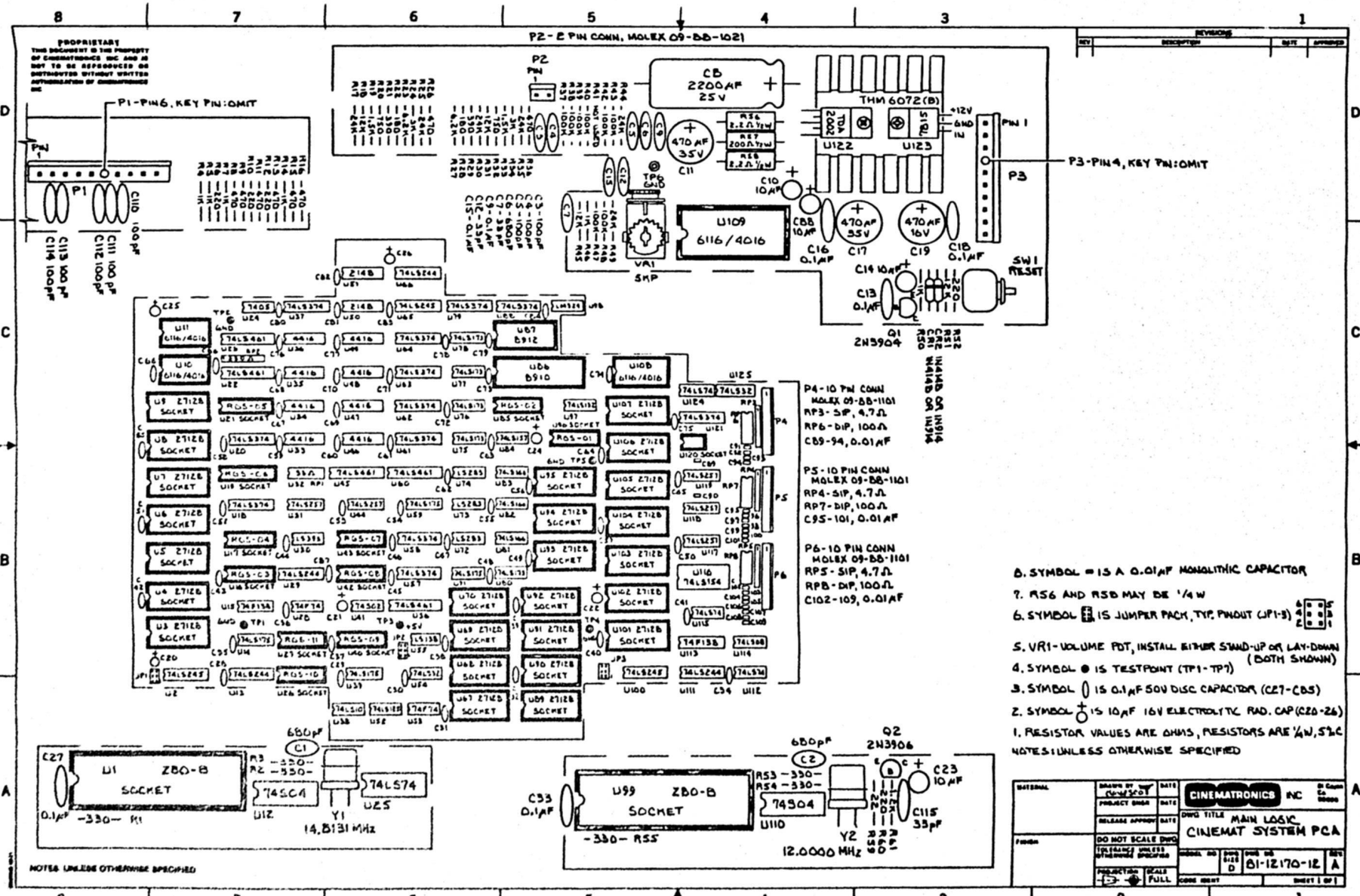


FIGURE 3C: CONTROL BUTTON DETAIL



A. SYMBOL = IS A 0.01 MF MONOLITHIC CAPACITOR

7. RS6 AND RS8 MAY BE 1/4 W

6. SYMBOL IS JUMPER PACK, TYP. PINOUT (JP1-3)

5. VR1 - VOLUME POT, INSTALL EITHER STAND-UP OR LAY-DOWN (BOTH SHOWN)

4. SYMBOL ● IS TESTPOINT (TP1 - TP7)

3. SYMBOL ⟨⟩ IS 0.1 MF 50V DISC CAPACITOR (C27-C85)

2. SYMBOL ⊕ IS 10 MF 16V ELECTROLYTIC RAD. CAP (C20-26)

1. RESISTOR VALUES ARE OHMS, RESISTORS ARE 1/4W, 5%

NOTES: UNLESS OTHERWISE SPECIFIED

NOTES: UNLESS OTHERWISE SPECIFIED

REVISIONS			
REV	DESCRIPTION	DATE	APPROVED

CINEMATRONICS INC

DWG TITLE: MAIN LOGIC
CINEMAT SYSTEM PCA

DWG NO 81-12170-12 REV A

SIZE D

SCALE FULL

CINEMAT SYSTEM MAIN LOGIC BOARD PARTS LIST

PART NUMBER	DESCRIPTION	LOCATION	QTY
44-10680-01	IC, 74LS08	U114	1
44-10681-01	IC, 74LS10	U38	1
44-10683-01	IC, 74LS32	U54, U125	2
44-11028-01	IC, 74LS74	U115, 112, 25, 124	4
44-11130-01	IC, 74LS125	U52	1
44-11030-01	IC, 74LS132	U97	1
44-11029-01	IC, 74LS138	U55	1
44-13077-01	IC, 74F138	U15, 113	2
44-11031-01	IC, 74LS154	U116	1
44-11032-01	IC, 74LS157	U84	1
44-11033-01	IC, 74LS166	U81-83	3
44-11034-01	IC, 74LS173	U30, 75-78	5
44-11484-01	IC, 74LS175	U14, 39, 59, 71	4
44-11486-01	IC, 74LS244	U13, 29, 66, 111	4
44-11487-01	IC, 74LS245	U2, 65, 100	3
44-11490-01	IC, 74LS257	U31, 44, 117-119	5
44-11810-01	IC, 74LS283	U72-74	3
44-11492-01	IC, 74LS374	U18, 20, 37, 57, 58, 61-64, 79, 88, 121	12
44-10697-01	IC, 74LS393	U30	1
44-10698-01	IC, 74LS461	U22, 23, 45, 56, 60	5
44-10670-01	IC, 74S02	U41	1
44-10700-01	IC, 74S04	U12, 110	2
44-10774-01	IC, 74S74	U28, 53	2
44-11895-01	IC, 7405	U24	1
44-11834-01	IC, Z80B(6MHZ)	U1, 99	2
44-11835-01	IC, CUSTOM.	U120	1
44-12053-01	IC, AY-3-8910	U86	1
44-11890-01	IC, 4016(200NS)	U10, 11, 108, 109	4
44-11915-01	IC, TDA 2002	U122	1
44-11916-01	REG, LM324N	U98	1
44-12080-01	REG, LM7815	U123	1
44-11896-01	RAM, (TMS4416-15)	U33-36, 46-49	8
44-11533-01	RAM, STATIC (2148-55)	U50, 51	2
44-12101-01	RGS-01 CUSTOM.	U96	1
44-12102-01	RGS-02 CUSTOM.	U85	1
44-12103-01	RGS-03 CUSTOM.	U16	1
44-12104-01	RGS-04 CUSTOM.	U17	1
44-12201-01	RGS-08 CUSTOM.	U42	1
44-12301-01	RGS-07 CUSTOM.	U43	1
44-12302-01	RGS-09 CUSTOM.	U40	1
44-12303-01	RGS-10 CUSTOM.	U26	1
44-12304-01	RGS-11 CUSTOM.	U27	1
44-12304-01	RGS-05 CUSTOM.	U21	1
44-12401-01	RGS-06 CUSTOM.	U19	1
65-10993-01	DIODE, 1N914	CR1, CR2	2
66-10816-01	TRANSISTOR, NPN 2N3904	Q1	1
66-10817-01	TRANSISTER, NPN 2N3906	Q2	1
69-12070-01	CRYSTAL, 12 MHZ	Y2	1
69-12063-01	CRYSTAL, 14.31818MHZ	Y1	1

CINEMAT SYSTEM MAIN LOGIC BOARD PARTS LIST (CONTINUED)

PART NUMBER	DESCRIPTION	LOCATION	QTY
53-11306-01	RES.1.2K OHM 1/4W 5% C.	R61	1
53-10735-01	RES.1.5K OHM 1/4W 5% C.	R19,33	2
53-10734-01	RES.1K OHM 1/4W 5% C.	R4,5,7,14,46,50	6
53-10740-01	RES.3K OHM 1/4W 5% C.	R24,34	2
53-12118-01	RES.6.2K OHM 1/4W 5%	R23,27	2
53-11369-01	RES.12K OHM 1/4W 5%	R18,31,45,51	4
53-10751-01	RES.24K OHM 1/4W 5% C.	R17,25,30,35,44,49	6
53-10982-01	RES.100K OHM 1/4W 5% C.	R37-43,47,48	9
53-12120-01	RES.180 OHM 1/4W 5%	R22,28	2
53-11684-01	RES.220 OHM 1/4W 5%	R6,10,12,52,R60	5
53-10731-01	RES.330 OHM 1/4W 5% C.	R1-3,53-55	6
53-10914-01	RES.390 OHM 1/4W 5% C.	R21,29	2
53-10732-01	RES.470 OHM 1/4W 5% C.	R8,9,11,13,15,16, 26,36	8
53-11130-01	RES.750 OHM 1/4W 5% C.	R20,32	2
53-13101-01	RES.22 OHM 1/4W 5% C.	R59	
53-12117-01	RES.2.2K OHM 1/2W 5%	R56,58	2
53-12137-01	RES.200 OHM 1/2W 5%	R57	1
53-12220-01	RES.SIP PACK,4.7K OHM	RP3-5	3
53-13111-01	RES.DIP PACK,8X100 OHM	RP6,7,8	3
53-12221-01	RES.DIP PACK,33 OHM	RP1	1
53-12223-01	RES.SIP PACK,330 OHM	RP2	1
51-12222-01	POT.5K OHM	VR01	1
63-11785-01	CAP. .01mf MONO 50V	C89-109	21
63-10785-01	CAP. .1mf MONO 50V	(SEE BOARD LAY-OUT)	66
63-12149-01	CAP.33pf,NPO CER DISC	C7,12,115	3
63-12148-01	CAP.100pf,NPO CER DISC	C3-5,110-114	8
63-11035-01	CAP.680pf 50V CER DISC	C1,2,6	3
63-12141-01	CAP.10mf,25V ELECT	C10,14,20-26,88	10
63-11042-01	CAP.470mf,35V ELECT	C11,17,19	3
63-12118-01	CAP.2200mf,25V ELECT AX	C8	1
36-10501-01	SOCKET,8 PIN DIP	U120	1
36-11852-01	SOCKET,20 PIN DIP	U16,17,26,27,40, 42,43,85,96	9
36-11902-01	SKT. 24 PIN SKINNY DIP	U19,21	2
36-10621-01	SOCKET,24 PIN DIP	U10,11,108,109	4
36-11547-01	SOCKET,28 PIN DIP	U3-9,67-70,87,89, 90-95,101,107	26
36-11784-01	SOCKET,40 PIN DIP	U1,86,99	3
37-11535-01	SWITCH,PUSHBUTTON,RED	SW1	1
41-10649-01	CONN.10 PIN MOLEX	P1,3,4,5,6	5
41-10640-01	CONN.2 PIN MOLEX	P2	1
20-10521-01	HEAT SINK,THERM.6072B		1
41-11521-01	HEADER,65805-406	JP1-3	3

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TECHNICAL INFORMATION

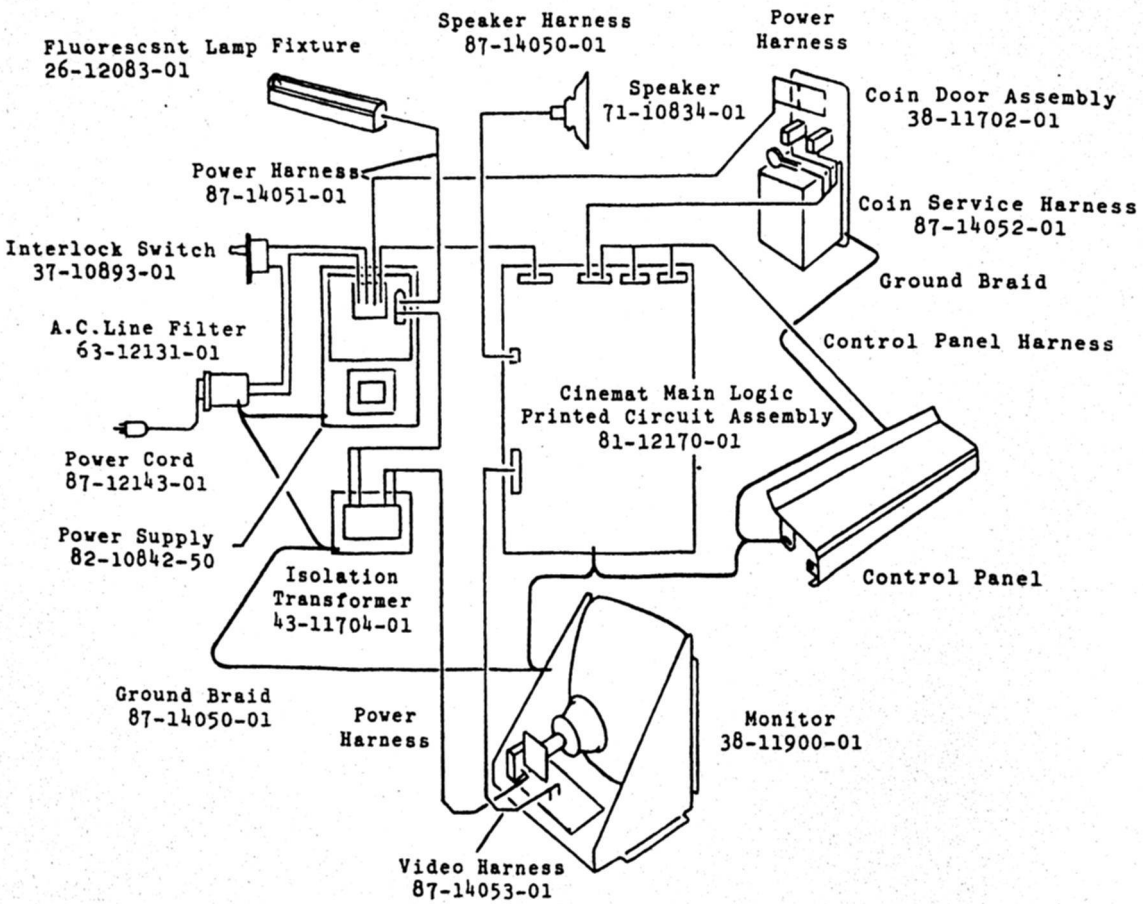


FIGURE 4A: OVERALL HARNESS WIRING DIAGRAM

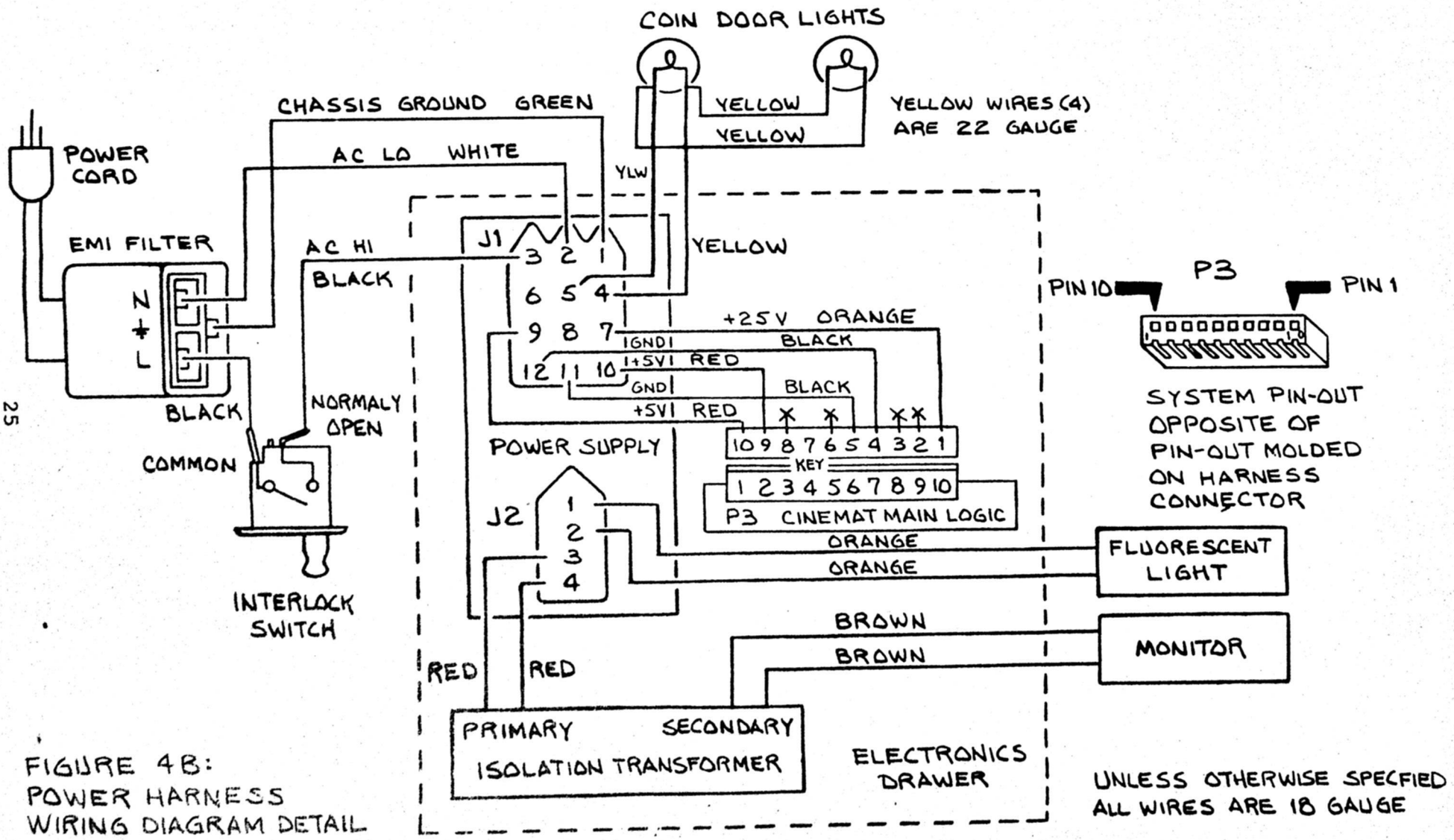


FIGURE 4B:
POWER HARNESS
WIRING DIAGRAM DETAIL

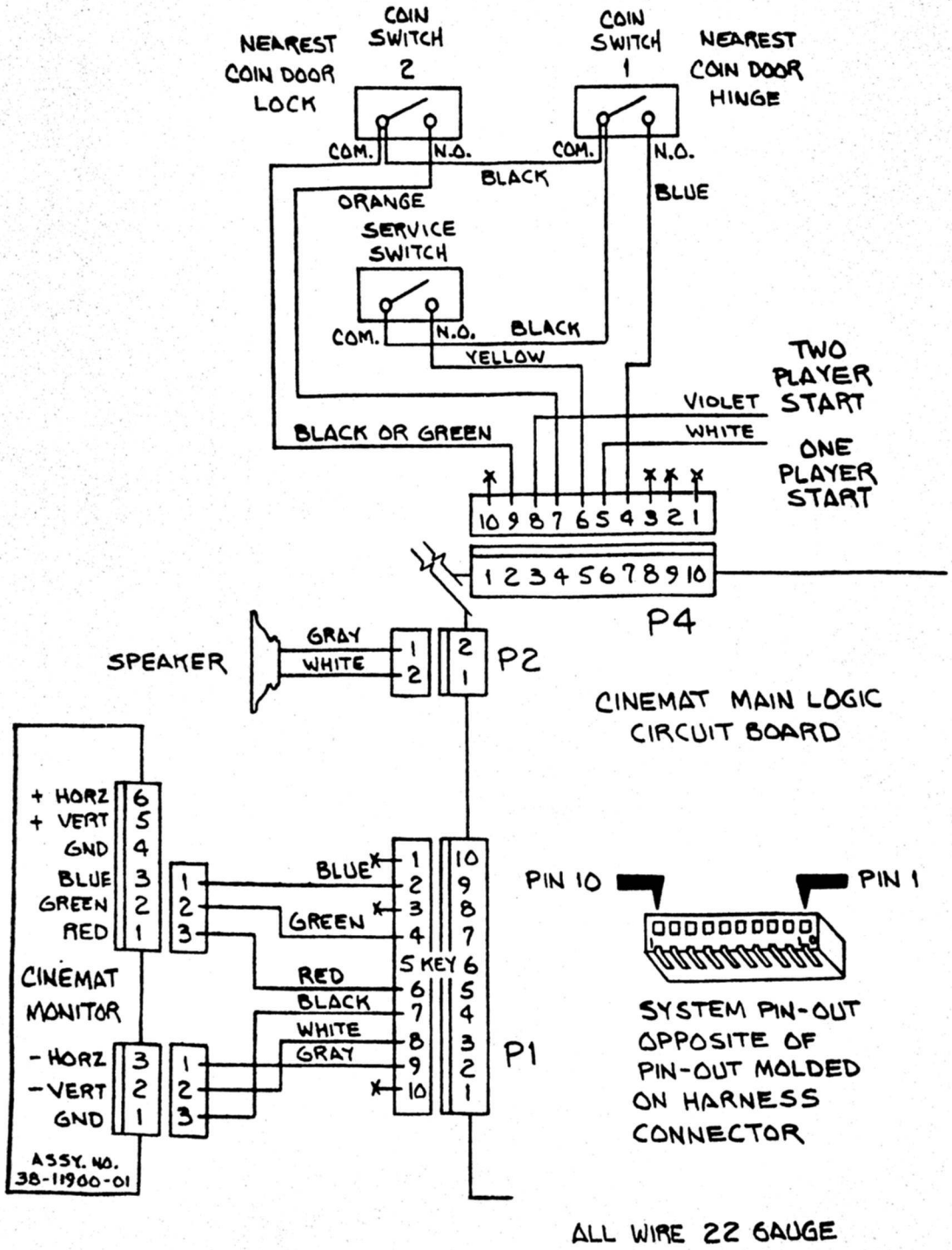
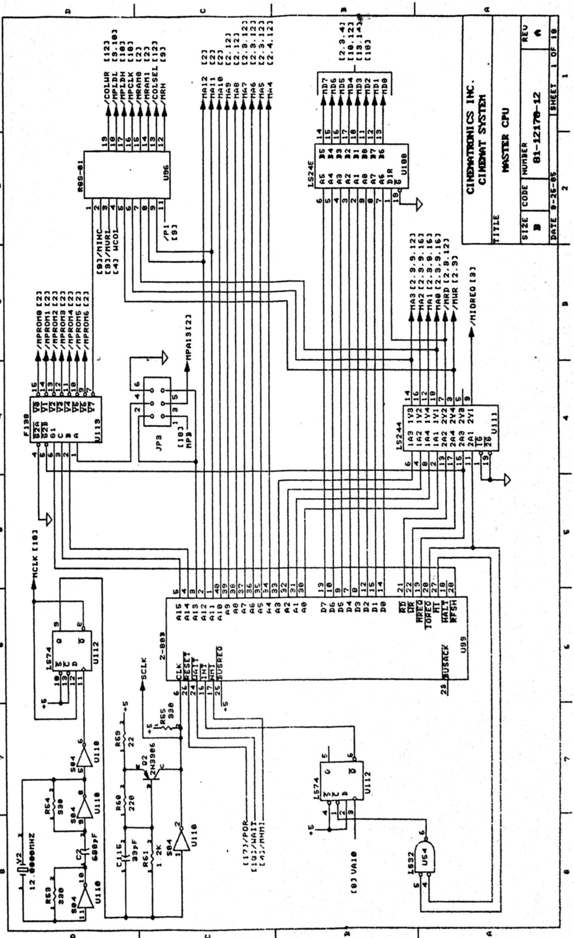
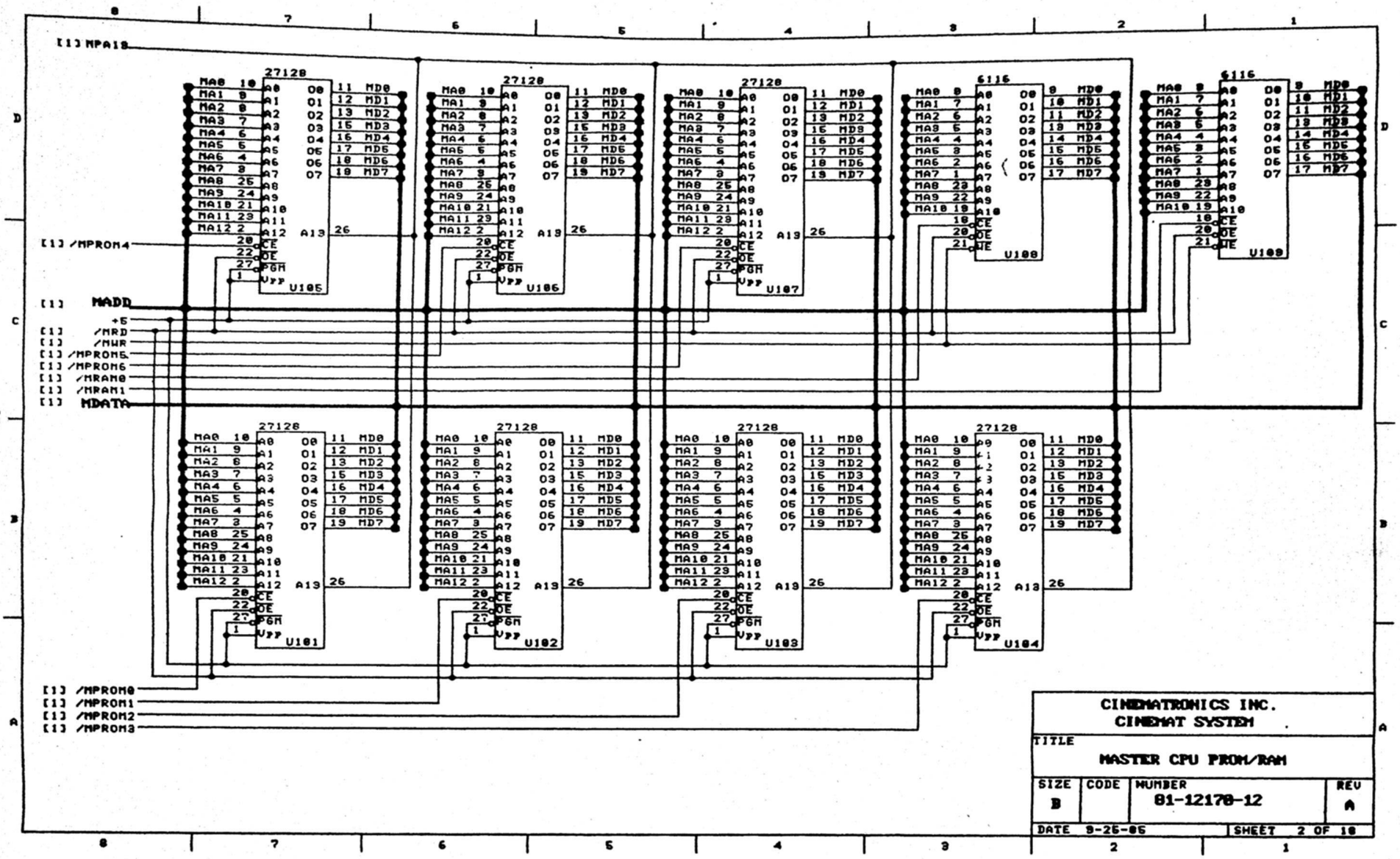


FIGURE 4C:
VIDEO, SPEAKER, COIN SERVICE
WIRING DETAIL


CINEMATRONICS INC.
CINEMAT SYSTEM
TITLE
MASTER CPU
SIZE B
CODE
NUMBER
81-12170-12
REV A
DATE 9-26-85
SHEET 1 OF 18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[1] /MRAM1
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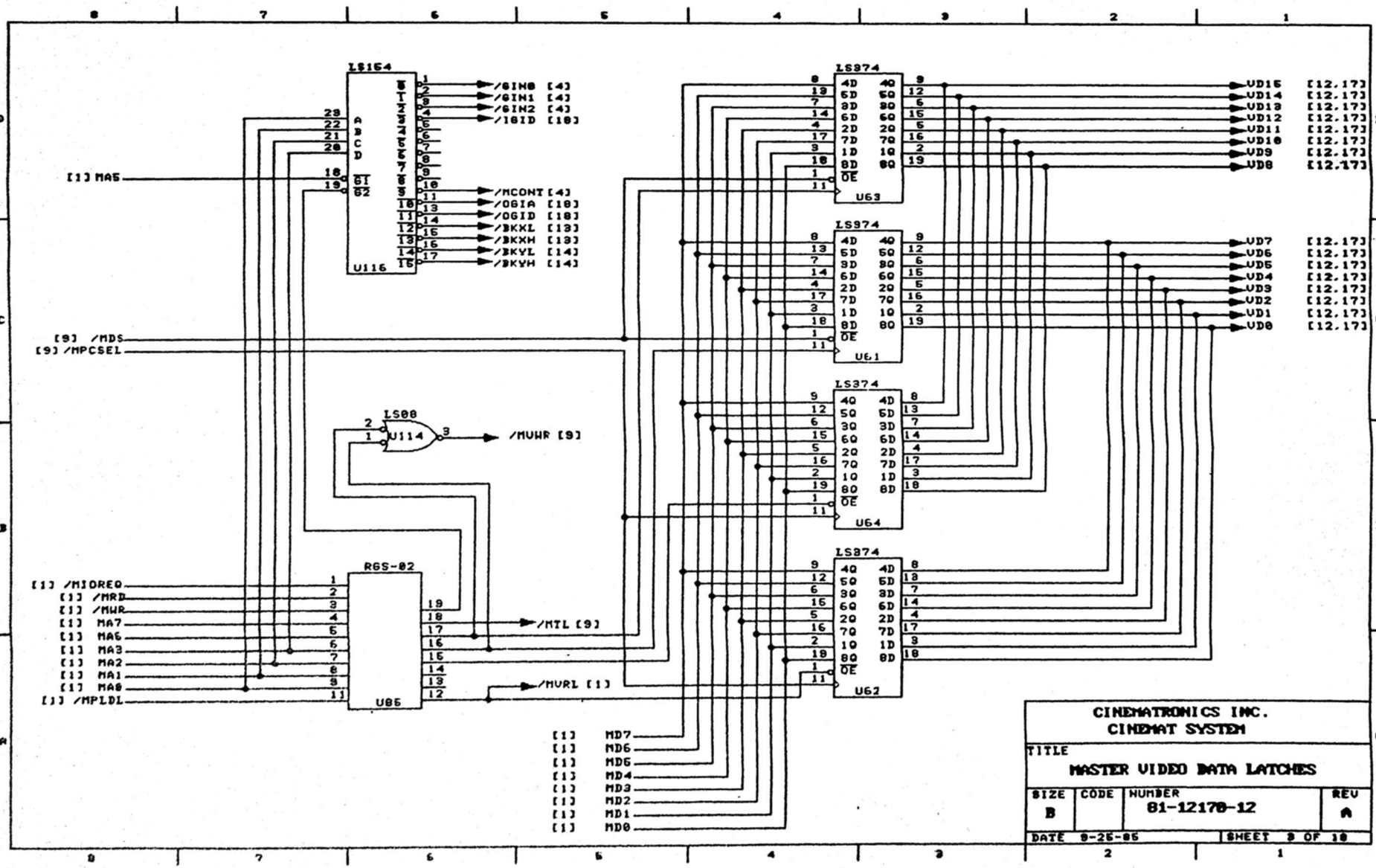
[1] /MPROM2
[1] /MPROM3
27128
6116
U105
U106
U107
U108
U109
U101
U102
U103
U104
CINEMATRONICS INC.
CINEMAT SYSTEM
TITLE
MASTER CPU PROM/RAM
SIZE
B
CODE
NUMBER
81-12170-12
REV
A
DATE 9-26-86
SHEET 2 OF 10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U116
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/GIN1 [4]
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[9] /MPCSEL
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RGS-02
U85
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U61
U64
U62
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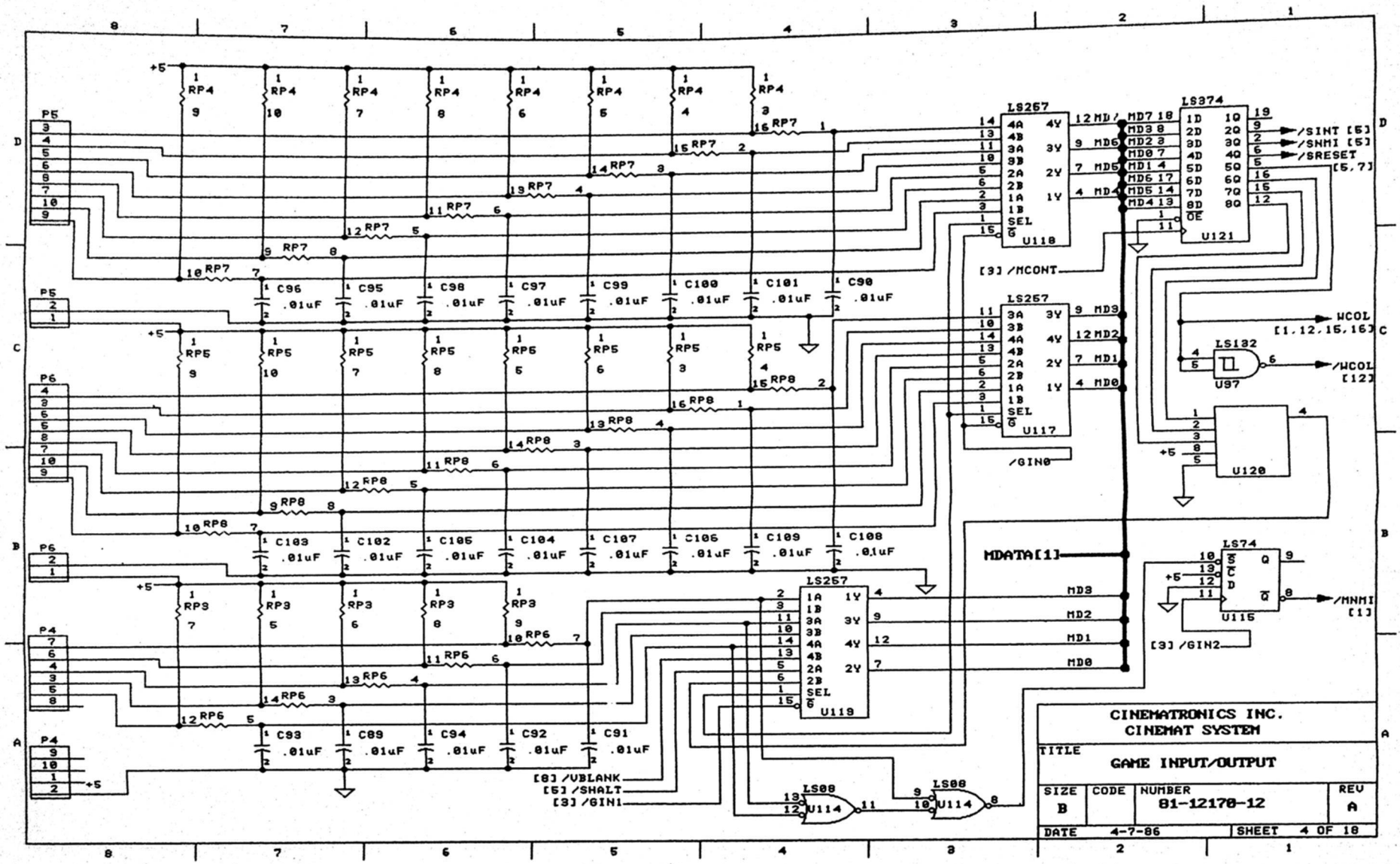
CINEMATRONICS INC.
CINEMAT SYSTEM
TITLE
MASTER VIDEO DATA LATCHES
SIZE B
CODE
NUMBER 81-12170-12
REV A
DATE 9-25-85
SHEET 9 OF 10


CINEMATRONICS INC.
CINEMAT SYSTEM
TITLE
GAME INPUT/OUTPUT
SIZE B
CODE
NUMBER 81-12170-12
REV A
DATE 4-7-86
SHEET 4 OF 18
LS257
LS374
LS132
LS74
LS08
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U117
U119
U121
U120
U97
U115
U114
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MD2
MD1
MD0
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/SRESET [5,7]
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/MNMI [1]
[3] /MCONT
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[3] /GIN2
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[5] /SHALT
[3] /GIN1
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P6
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RP4
RP5
RP8
RP7
RP3
RP6
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C95 .01uF
C98 .01uF
C97 .01uF
C99 .01uF
C100 .01uF
C101 .01uF
C90 .01uF
C103 .01uF
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C104 .01uF
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C106 .01uF
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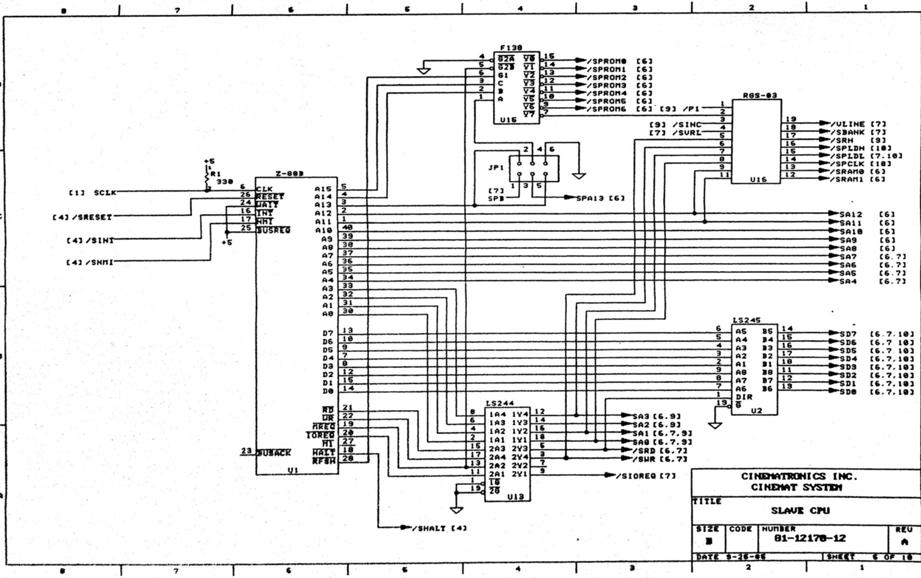
C92 .01uF
C91 .01uF
+5

30


CINEMATRONICS INC.
CINEMAT SYSTEM
TITLE
SLAVE CPU
SIZE B
CODE
NUMBER 81-12170-12
REV A
DATE 9-26-86
SHEET 6 OF 10
Z-80B
U1
F138
U15
R0S-03
U16
LS245
U2
LS244
U13
JP1
R1
330
+5
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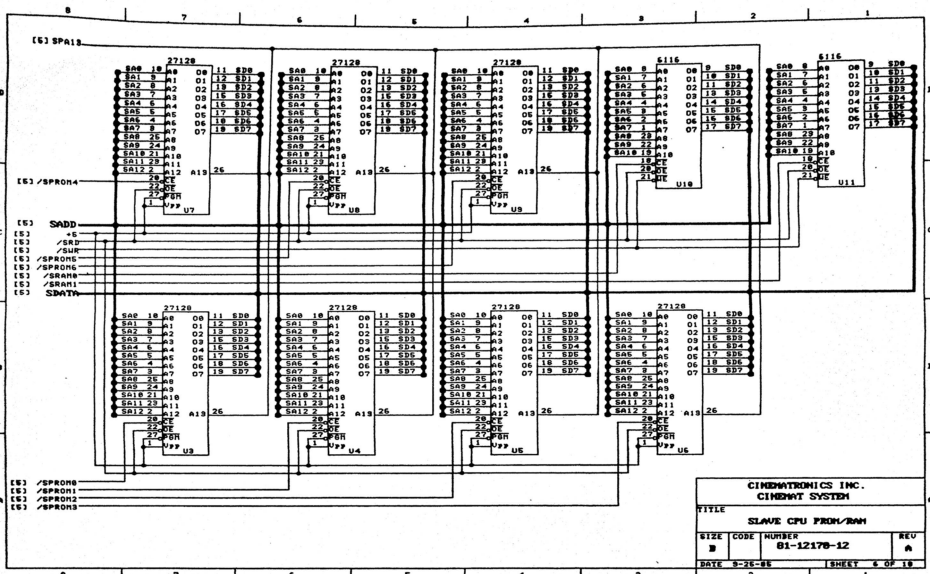
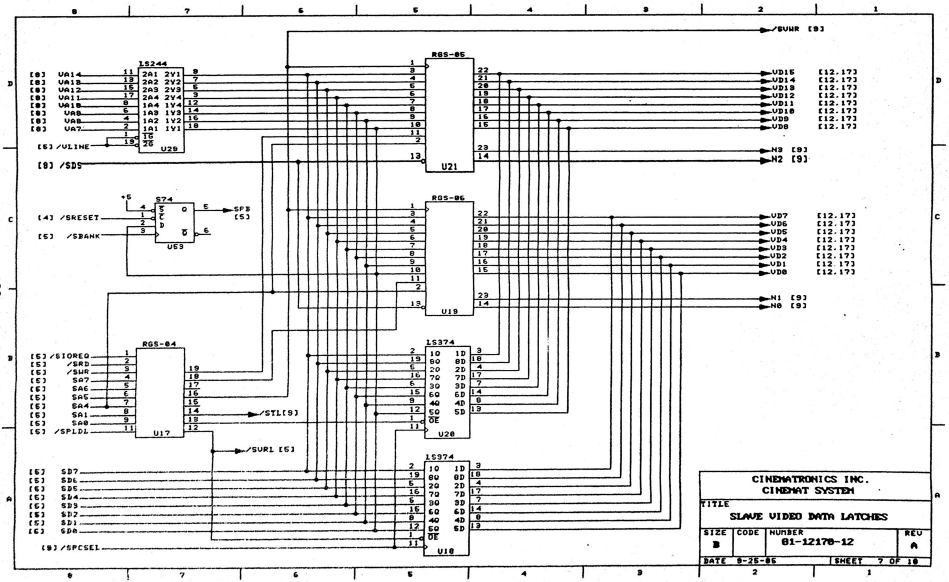
SD0 [6.7.10]
SA3 [6.9]
SA2 [6.9]
SA1 [6.7.9]
SA0 [6.7.9]
/SRD [6.7]
/SWR [6.7]
/SIOREQ [7]
/SHALT [4]


[E] $PA13
[E] /$PRON4
[E] $ADD
[E] +5
[E] /$RP
[E] /$WR
[E] /$PRON5
[E] /$PRON6
[E] /$RAM0
[E] /$RAM1
[E] $DATA
[E] /$PRON0
[E] /$PRON1
[E] /$PRON2
[E] /$PRON3
27128
U7
U8
U9
U3
U4
U5
U6
$116
U10
U11
CINEMATRONICS INC.
CINEMAT SYSTEM
TITLE
SLAVE CPU PROM/RAM
SIZE
B
CODE
NUMBER
81-12178-12
REV
A
DATE 9-26-85
SHEET 6 OF 19



LS244
U29
RGS-05
U21
RGS-06
U19
S74
U53
RGS-04
U17
LS374
U20
LS374
U18
[8] VA14
[8] VA13
[8] VA12
[8] VA11
[8] VA10
[8] VA9
[8] VA8
[8] VA7
[5] /VLINE
[8] /SDS
[4] /SRESET
[5] /SBANK
+5
SPB [5]
/SVWR [9]
VD15 [12,17]
VD14 [12,17]
VD13 [12,17]
VD12 [12,17]
VD11 [12,17]
VD10 [12,17]
VD9 [12,17]
VD8 [12,17]
N3 [9]
N2 [9]
VD7 [12,17]
VD6 [12,17]
VD5 [12,17]
VD4 [12,17]
VD3 [12,17]
VD2 [12,17]
VD1 [12,17]
VD0 [12,17]
N1 [9]
N0 [9]
[5] /SIOREQ
[5] /SRD
[5] /SWR
[5] SA7
[5] SA6
[5] SA5
[5] SA4
[5] SA1
[5] SA0
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/STL[9]
/SVRL [5]
[5] SD7
[5] SD6
[5] SD5
[5] SD4
[5] SD3
[5] SD2
[5] SD1
[5] SD0
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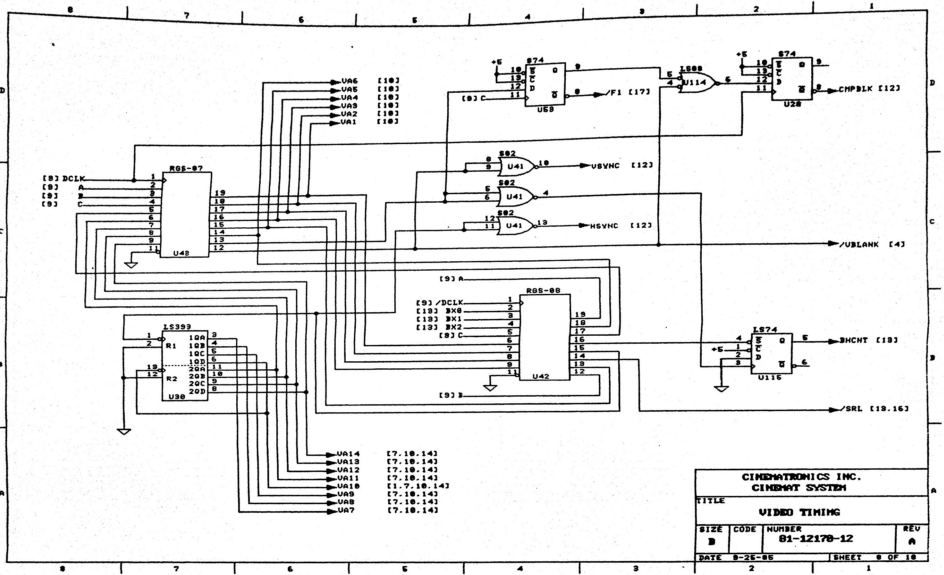
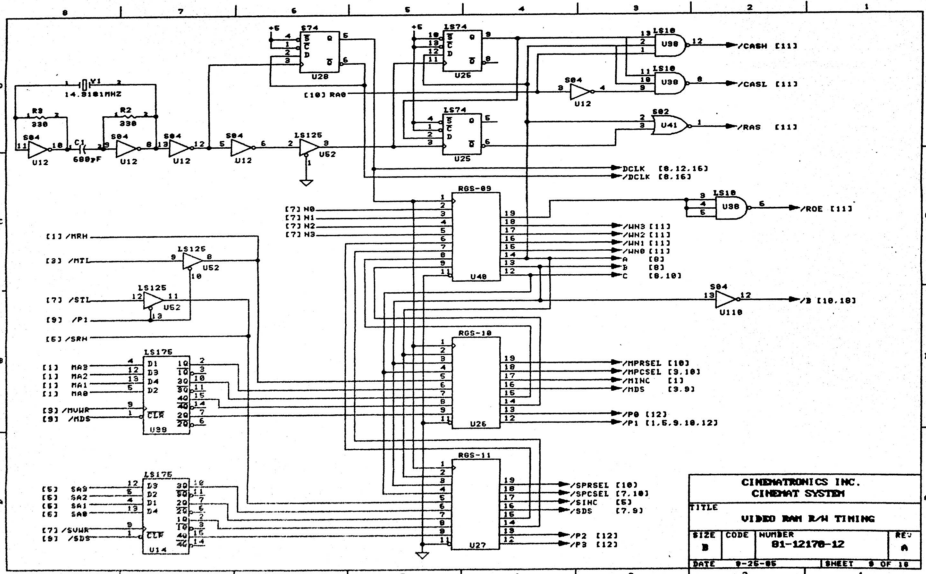
CINEMATRONICS INC.
CINEMAT SYSTEM
TITLE
SLAVE VIDEO DATA LATCHES
SIZE B
CODE
NUMBER 01-12170-12
REV A
DATE 9-25-86
SHEET 7 OF 10


VA6 [10]
VA5 [10]
VA4 [10]
VA3 [10]
VA2 [10]
VA1 [10]
[9] DCLK
[9] A
[9] B
[9] C
RGS-87
U48
S74
U68
[9] C
/F1 [17]
LS08
U114
S74
U28
CMPBLK [12]
S02
U41
VBVNC [12]
S02
U41
S02
U41
HSVNC [12]
/VBLANK [4]
[9] A
[9] /DCLK
[19] BX0
[19] BX1
[19] BX2
[9] C
RGS-88
U42
[9] B
LS393
R1
R2
U30
S74
U116
BHCNT [19]
/SRL [19,16]
VA14 [7,10,14]
VA13 [7,10,14]
VA12 [7,10,14]
VA11 [7,10,14]
VA10 [1,7,10,14]
VA9 [7,10,14]
VA8 [7,10,14]
VA7 [7,10,14]
CINEMATRONICS INC.
CINEMAT SYSTEM
TITLE
VIDEO TIMING
SIZE B
CODE
NUMBER 81-12170-12
REV A
DATE 8-25-85
SHEET 9 OF 18



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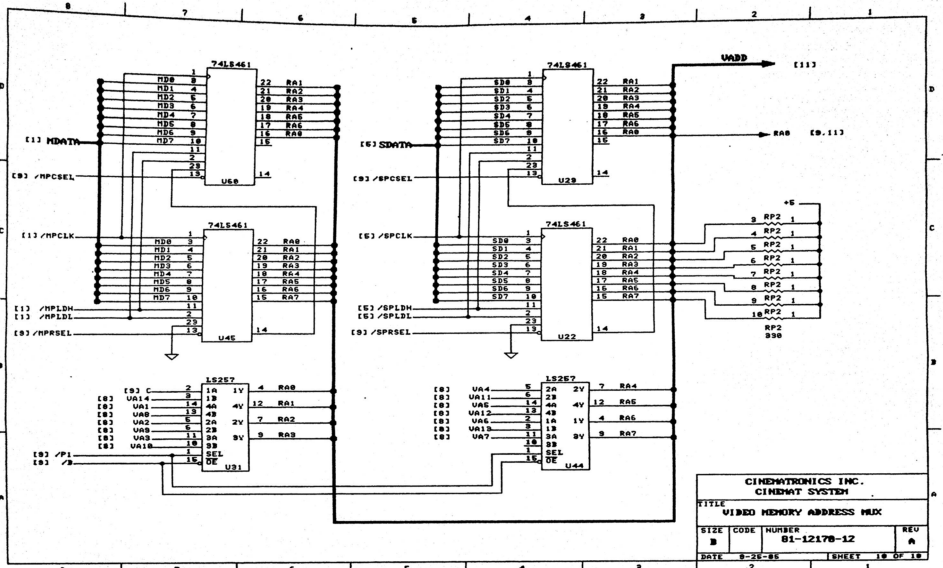
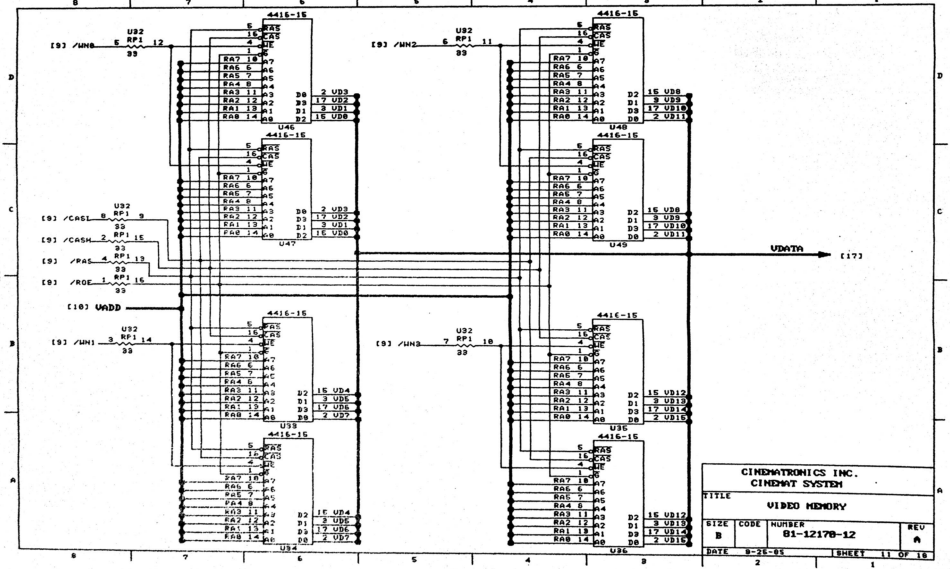
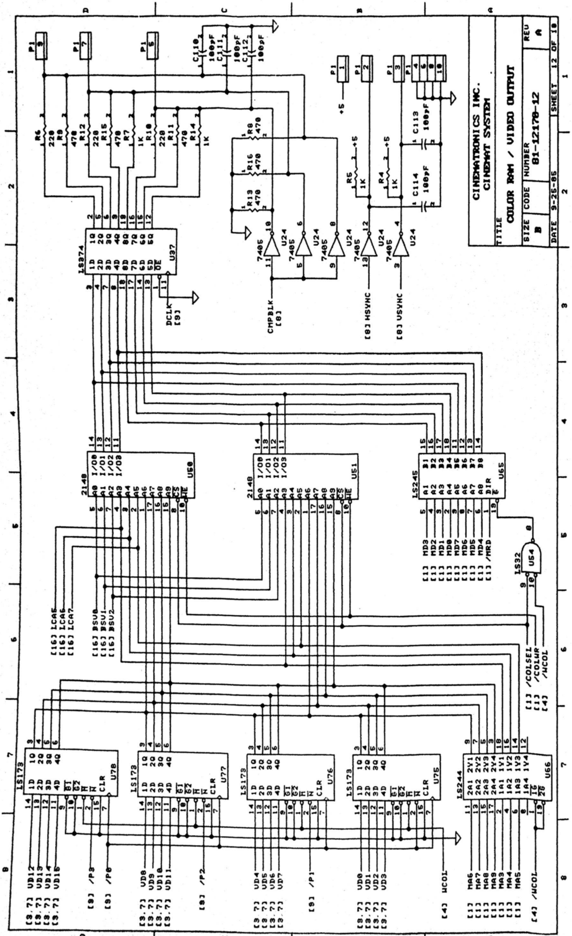
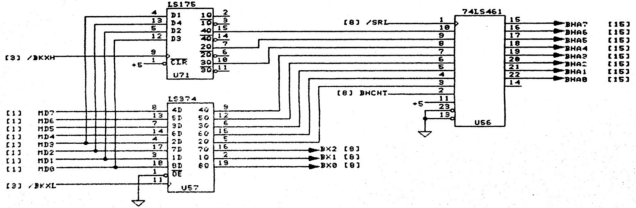
DATE: 9-25-85		SHEET: 9 OF 10	

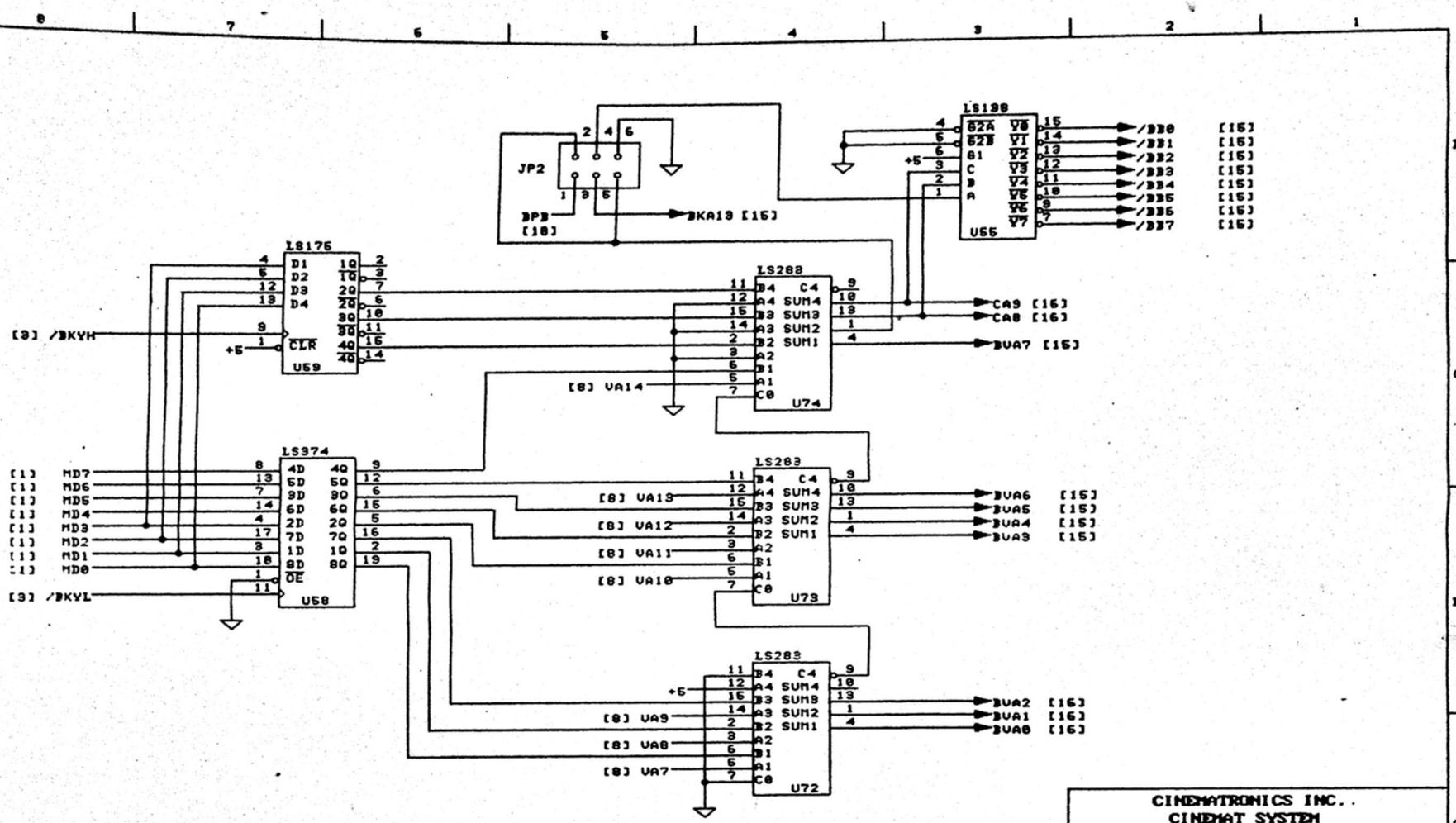

74LS461
U60
U45
U29
U22
LS257
U31
U44
VADD
[11]
[1] MDATA
[9] /MPCSEL
[1] /MPCLK
[1] /MPLDH
[1] /MPLDL
[8] /MPRSEL
[6] SDATA
[9] /SPCSEL
[6] /SPCLK
[6] /SPLDH
[6] /SPLDL
[9] /SPRSEL
RA0 [9,11]
+5
RP2
330
CINEMATRONICS INC.
CINEMAT SYSTEM
TITLE
VIDEO MEMORY ADDRESS MUX
SIZE B
CODE
NUMBER 81-12178-12
REV A
DATE 9-28-85
SHEET 18 OF 18


4416-15
U32
RP1
33
[9] /WN0
[9] /WN1
[9] /WN2
[9] /WN3
[9] /CAS
[9] /CASH
[9] /RAS
[9] /ROE
[10] UADD
VDATA
[17]
U46
U47
U48
U49
U35
U36
U37
U38
2 VD3
17 VD2
3 VD1
15 VD0
15 VD8
9 VD9
17 VD10
2 VD11
15 VD4
3 VD5
17 VD6
2 VD7
15 VD12
9 VD13
17 VD14
2 VD15
CINEMATRONICS INC.
CINEMAT SYSTEM
TITLE
VIDEO MEMORY
SIZE
B
CODE
NUMBER
81-12170-12
REV
A
DATE
9-25-81
SHEET
11 OF 18


CINEMATRONICS INC.
CINEMAT SYSTEM
TITLE
COLOR RAM / VIDEO OUTPUT
SIZE B
CODE
NUMBER 81-12178-12
REV A
DATE 9-25-85
SHEET 12 OF 18



CINEMATRONICS INC. CINEMAT SYSTEM			
TITLE: BACKGROUND HORIZONTAL ADDRESS			
SIZE: B	CODE:	NUMBER: 81-12170-17	REV: A
DATE: 9-26-85		SHEET 19 OF 18	

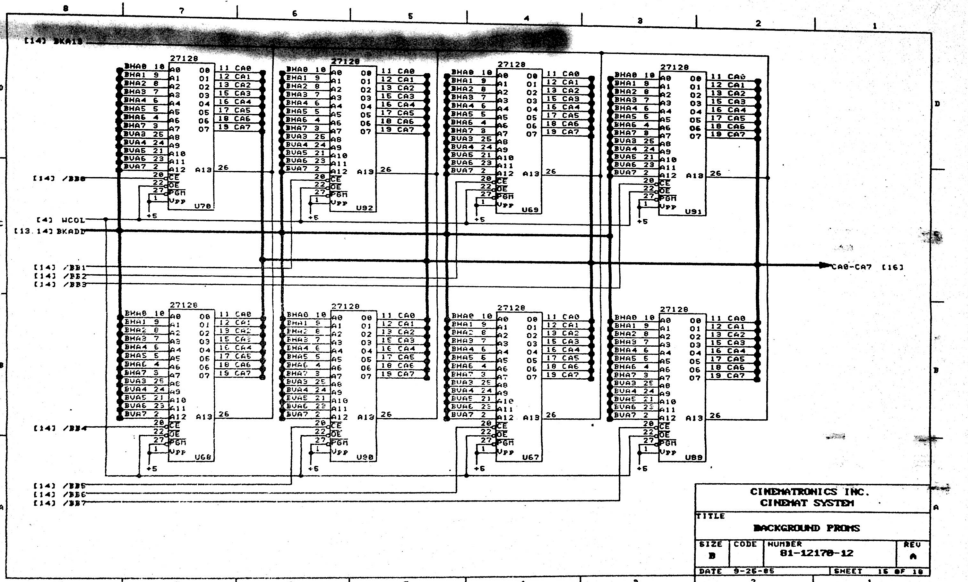


CINEMATRONICS INC..
CINEMAT SYSTEM

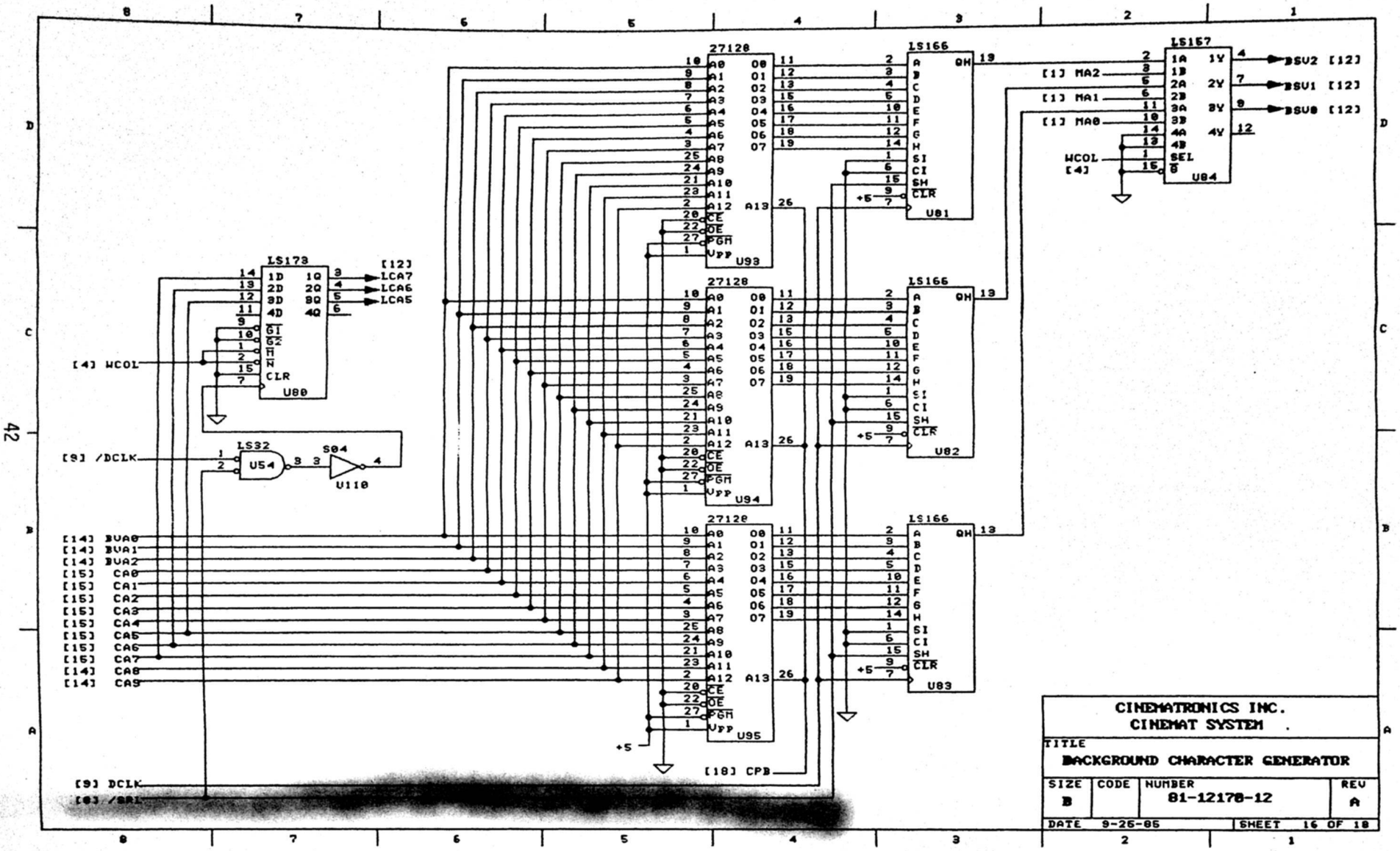
TITLE
BACKGROUND VERTICAL ADDRESS

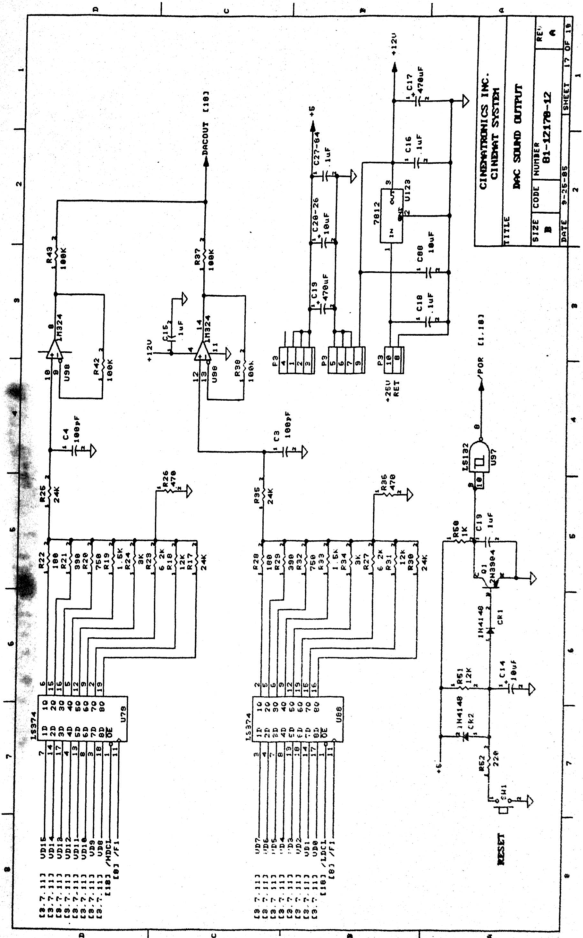
SIZE	CODE	NUMBER	REV
B		81-12178-12	A

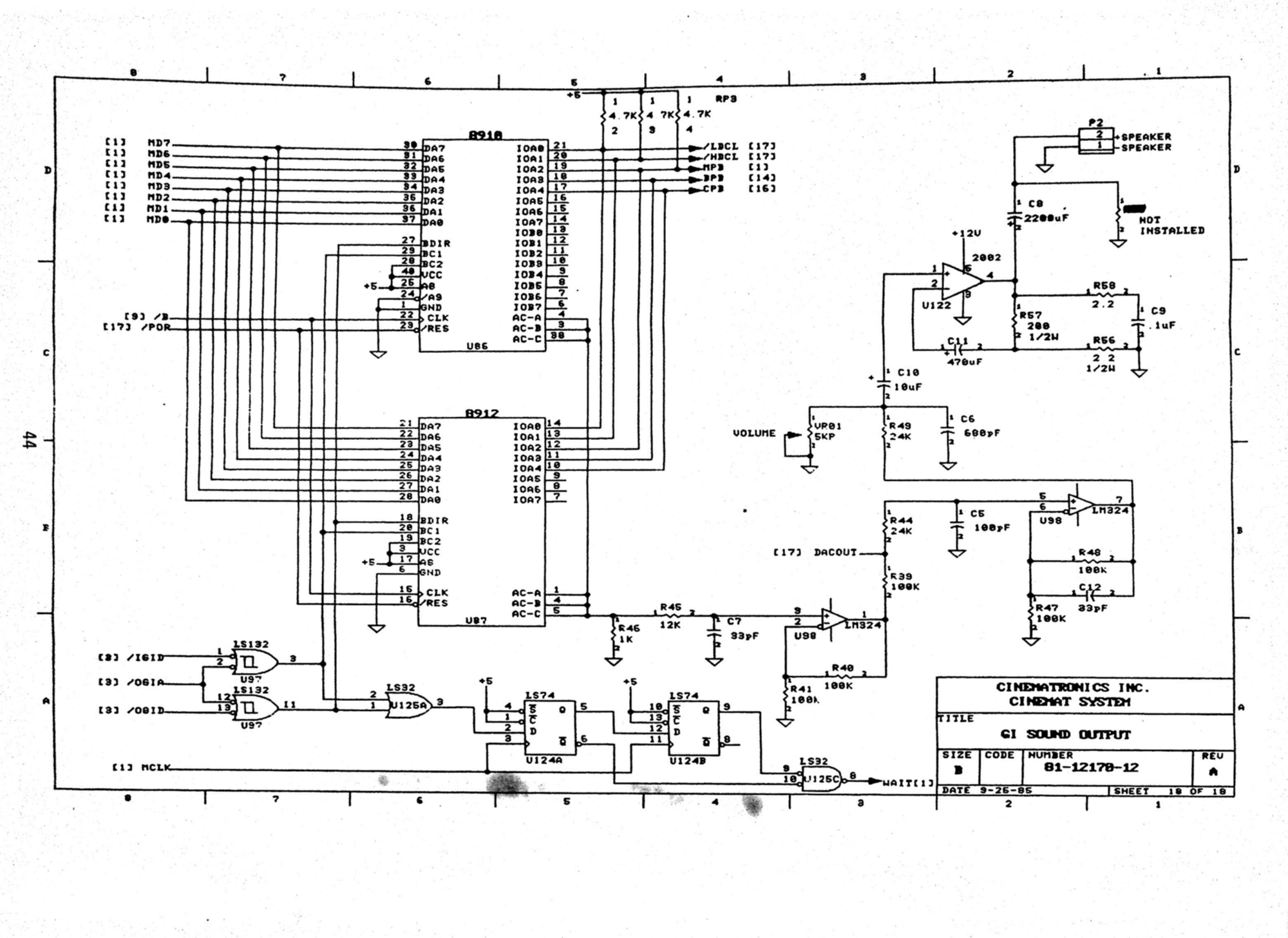
DATE 9-25-85 SHEET 14 OF 19

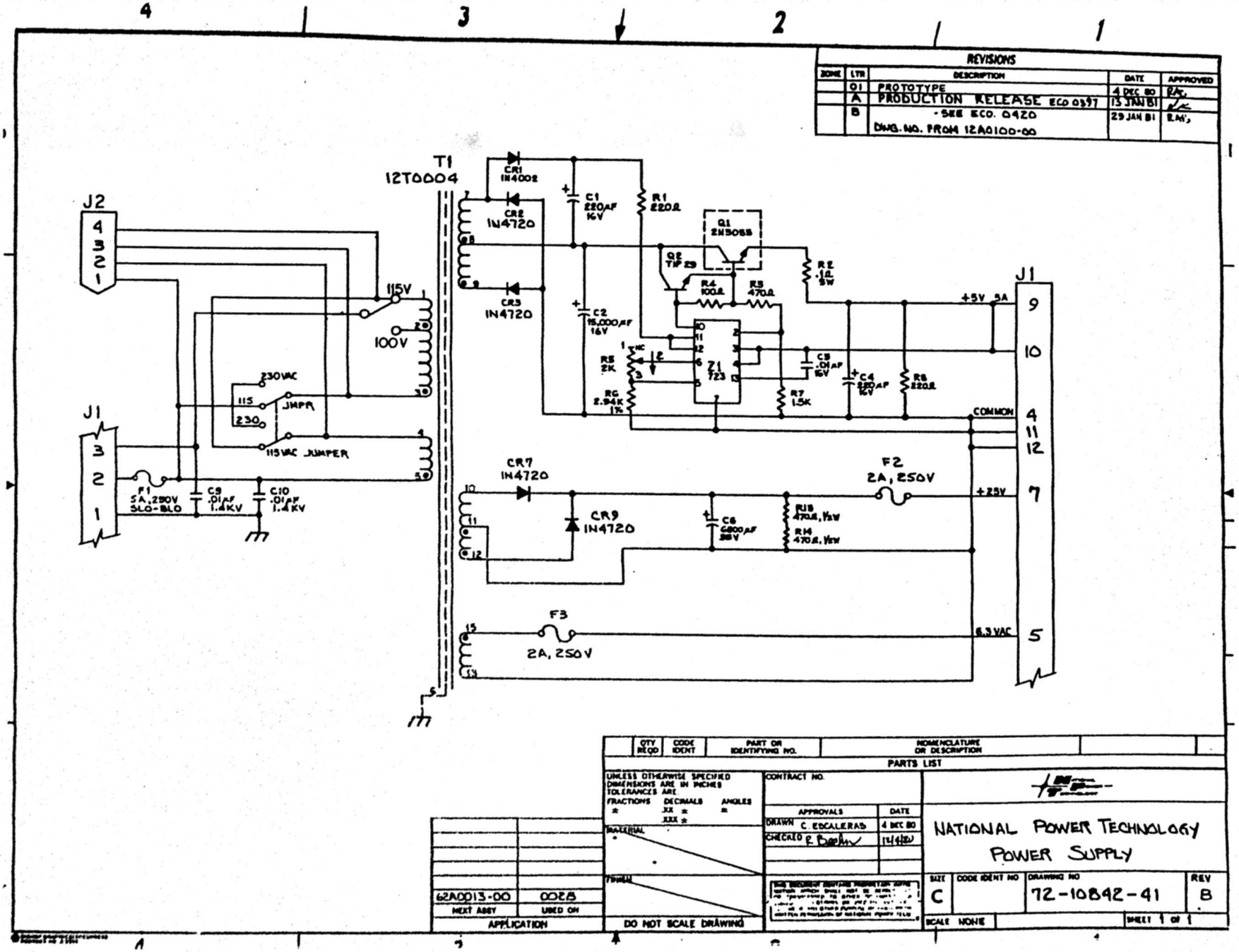


CINEMATRONICS INC. CINEMAT SYSTEM			
TITLE	BACKGROUND PROMS		
SIZE B	CODE	NUMBER 81-12170-12	REV A
DATE 9-26-85		SHEET 15 OF 19	


LS173
U80
LS32
U54
S04
U110
27128
U93
U94
U95
LS166
U81
U82
U83
LS157
U84
[4] WCOL
[9] /DCLK
[9] DCLK
[8] /SRL
[18] CPB
[1] MA2
[1] MA1
[1] MA0
[12] LCA7
[12] LCA6
[12] LCA5
[12] BSU2
[12] BSU1
[12] BSU0
[14] BVA0
[14] BVA1
[14] BVA2
[15] CA0
[15] CA1
[15] CA2
[15] CA3
[15] CA4
[15] CA5
[15] CA6
[15] CA7
[14] CA8
[14] CA9
+5
CINEMATRONICS INC.
CINEMAT SYSTEM
TITLE
BACKGROUND CHARACTER GENERATOR
SIZE B
CODE
NUMBER 81-12178-12
REV A
DATE 9-26-86
SHEET 16 OF 18


CINEMATRONICS INC.
CINEMAT SYSTEM
TITLE
DAC SOUND OUTPUT
SIZE
B
CODE
NUMBER
81-12170-12
REV
A
DATE 9-26-85
SHEET 17 OF 18
DACOUT [18]
/POR [1,18]
RESET
LS374
U79
U88
LM324
U98
7812
U123
LS132
U97
2N3904
1N4148
+12V
+5
+25V
RET


8918
8912
U86
U87
[1] MD7
[1] MD6
[1] MD5
[1] MD4
[1] MD3
[1] MD2
[1] MD1
[1] MD0
[9] /B
[17] /POR
+5
RP9
4.7K
/LBCL [17]
/HBCL [17]
MPB [1]
BPB [14]
CPB [16]
BDIR
BC1
BC2
VCC
A8
/A9
GND
CLK
/RES
AC-A
AC-B
AC-C
A6
P2
SPEAKER
SPEAKER
C8
2200uF
NOT INSTALLED
+12V
2002
U122
R58
2.2
C9
.1uF
R57
200
1/2W
C11
470uF
R56
2.2
1/2W
C10
10uF
VOLUME
VR01
5KP
R49
24K
C6
680pF
U98
LM324
R44
24K
C5
100pF
[17] DACOUT
R39
100K
R48
100K
C12
33pF
R47
100K
R45
12K
C7
33pF
R46
1K
R40
100K
R41
100K
[3] /IGID
[3] /OGIA
[3] /OGID
LS132
U97
LS32
U125A
LS74
U124A
U124B
U125C
[1] MCLK
WAIT[1]
CINEMATRONICS INC.
CINEMAT SYSTEM
TITLE
GI SOUND OUTPUT
SIZE B
CODE
NUMBER 81-12178-12
REV A
DATE 9-26-85
SHEET 10 OF 10


REVISIONS
ZONE | LTR | DESCRIPTION | DATE | APPROVED
01 | PROTOTYPE | 4 DEC 80 | RAC
A | PRODUCTION RELEASE ECO 0397 | 13 JAN 81 | RAC
B | - SEE ECO. 0420 | 29 JAN 81 | RAC
DWG. NO. FROM 12A0100-00
T1
12T0004
J2
J1
115V
100V
230VAC
115
230
JUMPER
115VAC JUMPER
F1
5A, 250V
SLO-BLO
C9
.01µF
1.4KV
C10
.01µF
1.4KV
CR1
IN4002
CR2
IN4720
CR3
IN4720
C1
220µF
16V
R1
220Ω
Q1
2N5058
Q2
TIP29
R4
100Ω
R5
470Ω
R2
1Ω
5W
C2
15,000µF
16V
R3
2K
R6
2.94K
1%
Z1
723
C3
.01µF
16V
C4
220µF
16V
R7
1.5K
R8
220Ω
+5V 5A
COMMON
CR7
IN4720
CR9
IN4720
C6
6800µF
35V
R13
470Ω, ½W
R14
470Ω, ½W
F2
2A, 250V
+25V
F3
2A, 250V
6.3VAC
J1
9
10
4
11
12
7
5
PARTS LIST
QTY REQD | CODE IDENT | PART OR IDENTIFYING NO. | NOMENCLATURE OR DESCRIPTION
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ARE
FRACTIONS DECIMALS ANGLES
CONTRACT NO.
APPROVALS | DATE
DRAWN C. ESCALERAS | 4 DEC 80
CHECKED P. Bardin | 12/4/80
MATERIAL
FINISH
DO NOT SCALE DRAWING
NATIONAL POWER TECHNOLOGY
POWER SUPPLY
62A0013-00 | 0028
NEXT ASSY | USED ON
APPLICATION
SIZE C | CODE IDENT NO | DRAWING NO 72-10842-41 | REV B
SCALE NONE | SHEET 1 OF 1

CINEMAT SYSTEM KIT TECHNICAL INFORMATION

Video Monitor

MAYHEM 2002 requires a horizontal oriented monitor. The Cinemat System produces separate negative horizontal and vertical sync.

Cinemat System Power Supply Requirements

1) +5 Vdc @ 5 amps regulated

2) +17-30 Vdc @ 1 amp unregulated (see note below)

Note: If your power supply provides a regulated 12-15 volts, then the on-board regulator must be bypassed. Follow the necessary modification below.

Step 1: Remove retaining hardware from the voltage regulator, U123.

Step 2: Desolder the regulator.

Step 3: With the regulator removed, place an insulated 18-gauge wire from pin 10 of connector P3 to the output pin of previously removed regulator on the underside of Cinemat PC board as shown in Figure 1.

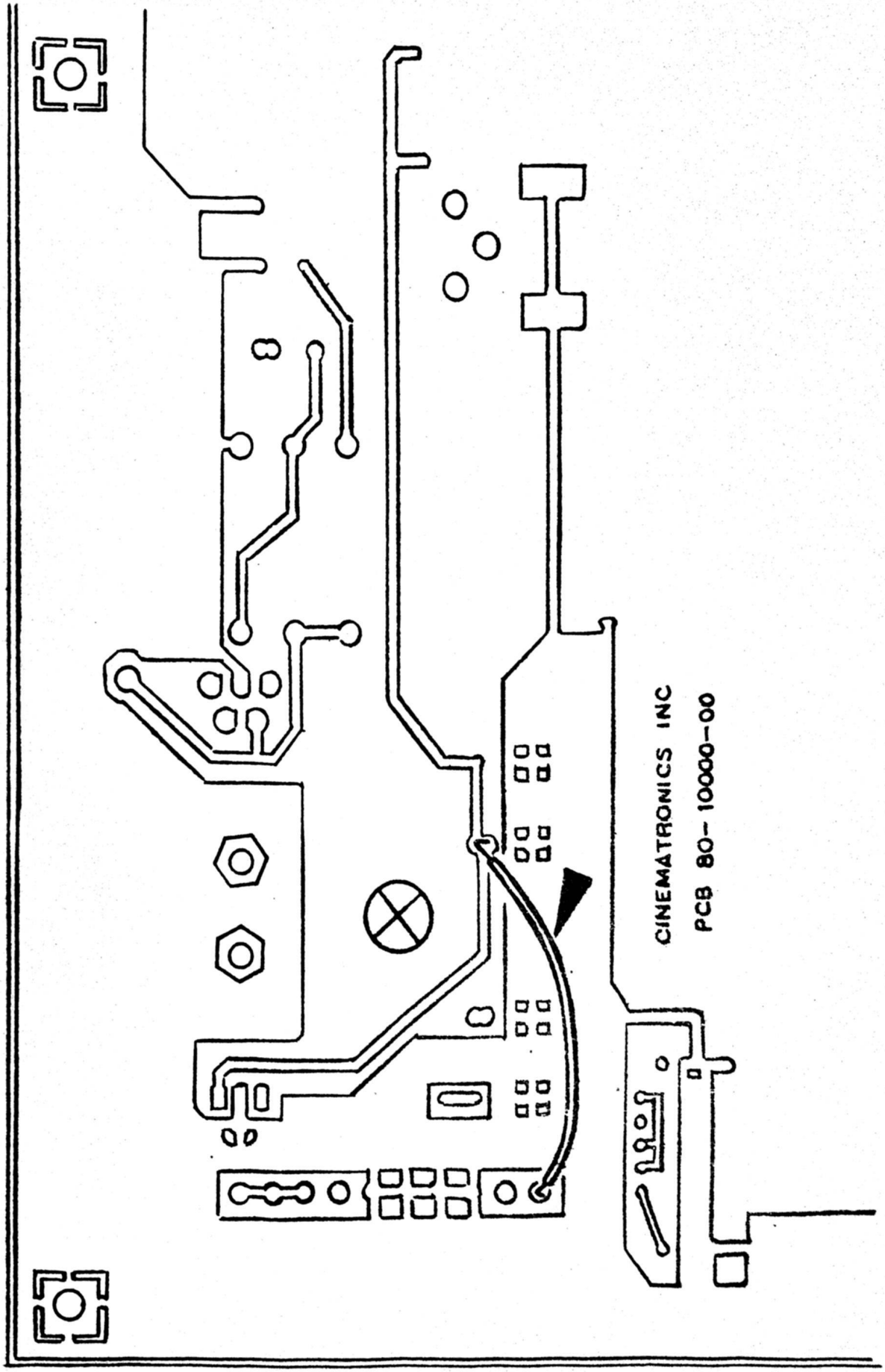


Figure 1

A. WARRANTY

Cinematronics warrants that whenever the video display (television monitor) and/or the power supply and/or the printed circuit boards and/or all parts contained therein are furnished with its product, that such part or parts will be free from defects in materials and workmanship for a period of ninety (90) days from date of shipment. Cinematronics' warranty of above parts is subject to the normal use and service of its products. No other products or parts are warranted except those herein stated.

If Cinematroncs' warranted parts fail to perform as stated in this Warranty, then Cinematronics' sole liability shall be, at its option, to replace or repair such products which are returned to Cinematronics during the herein stated warranty period, provided:

A. Cinematronics is notified immediately in writing at the time the parts are determined to be defective.

B. That the defective parts are returned pre-paid to Cinematronics' plant accompanied by an authorized RMA number.

C. That Cinematronics' examination of returned products determines to Cinematronics' satisfaction that the alleged defects existed and were not caused by improper repair, installation, improper testing or by accident.

NOTE: Cinematronics is not responsible for bent pins on integrated circuits NOT installed by Cinematronics' employees.

In no event shall Cinematronics be liable for loss of profits, loss of use, or incidental or consequential damages.

EXCEPT FOR THIS EXPRESS WARRANTY, CINEMATRONICS DISCLAIMS ALL OTHER WARRANTIES, EXPRESSED OR IMPLIED, INCLUDING THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE, AND ALL OTHER OBLIGATIONS OR LIABILITIES ON CINEMATRONICS' BEHALF, AND IT NEITHER ASSUMES NOR AUTHORIZES ANY OTHER PERSON TO ASSUME FOR CINEMATRONICS ANY OTHER LIABILITIES IN CONNECTION WITH THE SALE OF PRODUCTS MANUFACTURED BY CINEMATRONICS.

CONTRACTS MARKETING

ELECTROHOME ELECTRONICS

54-7294-02 THIS INFORMATION IS UP TO DATE AS OF MAY 1982

SERVICE AND OPERATION MANUAL

G07 R.G.B. COLOUR MONITOR

13" AND 19" VERSIONS

ELECTROHOME ELECTRONICS
ELECTROHOME LIMITED, KITCHENER, ONTARIO, CANADA N2G 4J6

ZZ-729402-01
Video Display 1982-2

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13" & 19" CRT PCB Component Layouts	11
13" & 19" Main PCB Component Layout	12
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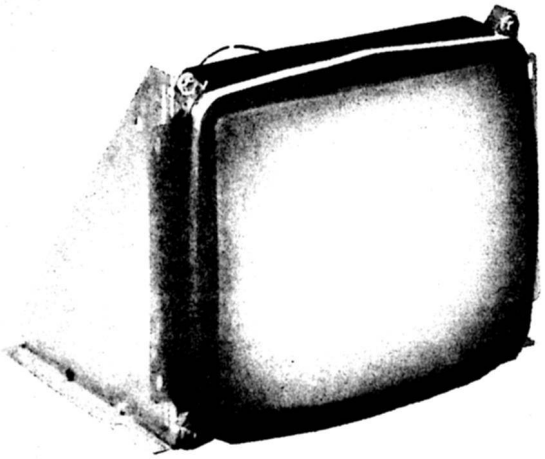
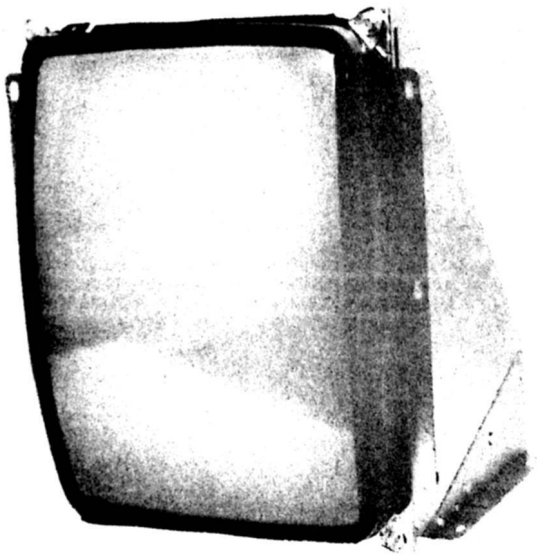
19" Model



FRONT

REAR

G07-904



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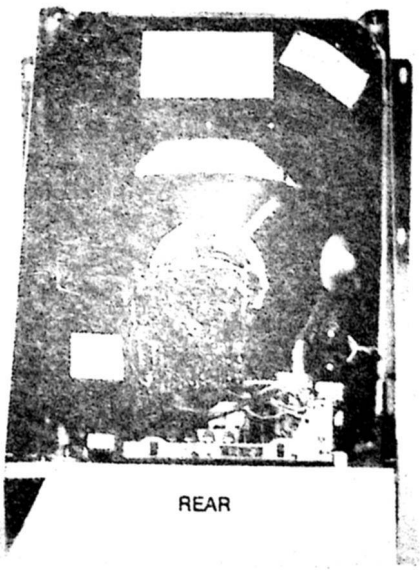
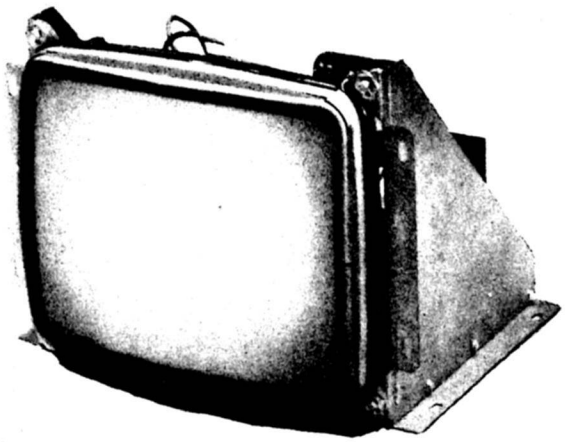


REAR

G07-907

13" Model



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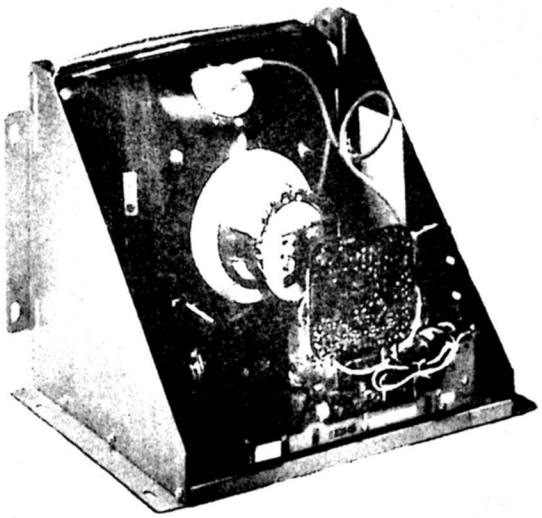
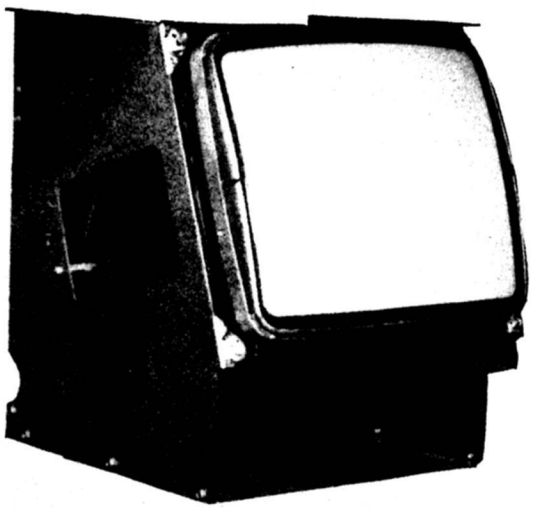


REAR

G07-902



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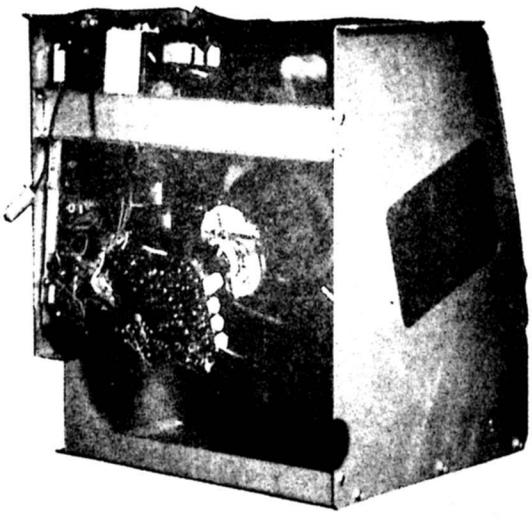


REAR

G07-906

Service Data Reference

When writing for Service Information, please quote chassis type number and model code. See chassis type number and model code located on the right hand side panel.
This information is correct as of May, 1982.

File Supplementary Model Data with this G07 Manual.

Warnings

1. Power Up Warning

   Caution: If the monitor is to be powered up outside of the games console, an isolation transformer must be used for the AC power source.

2. X-Radiation

   This chassis has been designed for minimal x-radiation hazard. However, to avoid possible exposure to soft x-radiation it is IMPERATIVE that the EHT circuitry IS NOT modified.

3. High Voltage

   The colour monitor contains HIGH VOLTAGES derived from power supplies capable of delivering LETHAL quantities of energy. To avoid DANGER TO LIFE, do not attempt to service the chassis until all precautions necessary for working on HIGH VOLTAGE equipment have been observed.

4. CRT Handling

   The picture tube encloses a high vacuum and due to the large surface area is subject to extreme force. Care must be taken not to bump or scratch the picture tube as this may cause the tube to implode resulting in personal injury and property damage. Shatter-proof goggles must be worn by individuals while handling the CRT or installing it in the monitor. Do not handle the CRT by the neck.

5. To prevent fire or shock hazard DO NOT EXPOSE THIS MONITOR TO RAIN OR MOISTURE.

Operating Instructions

1. Apply a suitable power source to the monitor through an isolation transformer by means of P901.
2. Apply a suitable signal source to the monitor PCB by mean of J201.
3. For negative input pulses use J202 D2 for vertical ⊔ , D3 for Horizontal ⊔ .
4. Set up Controls
   All controls are preset at the factory, but may be adjusted to suit program material. Refer to pages 7 and 9 (WHITE BALANCE AND GRAY SCALE TRACKING).

Performance and Operating Data

1.0 Supply **Min. — Max.**

Voltage	108 VAC - 132 VAC
Frequency	44 Hz - 63 Hz

Note: Apply supply voltage through an isolation transformer with 1 Amp. capability.

2.0 High Voltage (EHT)

For 13"V models	19.5KV - 22.5KV
For 19"V models	22.5KV - 25.5 KV

Note: Condition for above I (beam) = 0
B_1 = 120V

3.0 Input Signal and Pin Assignments for J201

Pin No.	Description	Impedance	Signal Range
1	Red input	5K nom.	0 to 4V
2	Green input	5K nom.	0 to 4V
3	Blue input	5K nom.	0 to 4V
4	Ground		
5	Vertical sync pulse	35K nom.	+2V to +4V
6	Horizontal sync pulse	35K nom.	+2V to +4V

4. Service Set-Up Controls

4.1 B1 adjustment, R909 - Set for B1 = 120V DC
4.2 Vertical Linearity, R406
4.3 Vertical hold control, R422
4.4 Horizontal Frequency control, R504
4.5 Vertical Hight control, R408
4.6 Vertical centering tabs, 3 positions
4.7 .Horizontal centering tabs, 3 positions
4.8 CRT cut off controls (See fig. 3)
- Red cut off, R114
- Green cut off, R115
- Blue cut off, R113

4.9 Video drive controls (See fig. 3)
- Red drive, R105
- Green drive, R106

4.10 Horizontal width coil, L503
4.11 Focus control R11
4.12 Screen Control

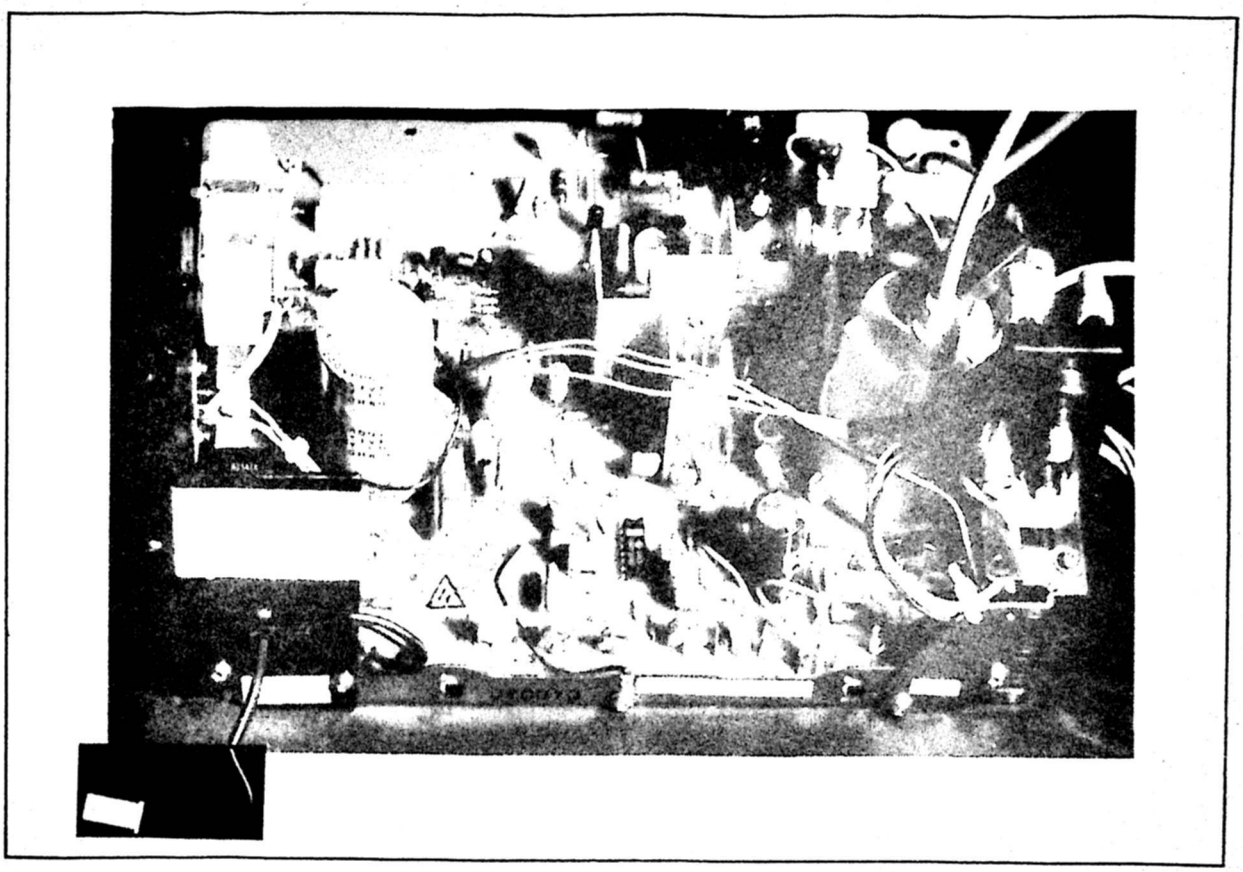


Figure 1

13" and 19" Models

Product Safety and Servicing Guidelines

Safety Checks

Subject: Fire and Shock Hazard

1. No modification of any circuit should be attempted. Service work should be performed only after you are thoroughly familiar with all of the following safety checks and service guidelines. To do otherwise increases the risk of potential hazards and injury to the user.
2. When service is required, observe the original lead dress. Extra precaution should be given to assure correct lead dress in the high voltage circuitry area. Where a short circuit has occurred, replace those components that indicate evidence of overheating. Always use the manufacturer's specified replacement component. See parts list in the back of this manual.
3. Periodically check the high voltage for proper value using a meter of known accuracy and calibration.
4. Check for frayed insulation on wires.

Notes

Service Set-Up Procedure

NOTE: All monitors are equipped with automatic degaussing coils which effectively demagnetize the picture tube each time the monitor is turned on. The degaussing coils will operate any time the set is turned on after having been off for at least five minutes.

The degaussing effect is confined to the picture tube since the coils are mounted on the ferrous tube shield. Should any part of the chassis or cabinet become magnetized, it will be necessary to degauss the affected area by means of a manual degaussing coil. Move the coil slowly around the CRT face area, then slowly withdraw for a distance of six feet before disconnecting the coil from the AC power supply.

Normally little, if any adjustment should be necessary. However, when a picture tube, yoke or similar component is replaced, preliminary static convergence should be done before attempting purity adjustment, and so on.

Set up should be done in a north/south direction. Horizontal and vertical centering taps should be set to the centre position if a major component has been changed.

1.0 Purity

1.1 Loosen yoke retaining clamp (figure 2), remove adhesive material fixing wedges to CRT. Remove wedges completely and clean off dried adhesive from picture tube and wedges.

1.2 A small quantity of "nail polish" has been used to lock the purity convergence rings in place. This seal must be broken with a sharp tipped instrument before any adjustments are attempted. Some models also use a locking ring at either end of the purity and convergence rings. This must be loosened before adjustments are made. It goes without saying that upon completion of all adjustments, the lock must be reset and/or a dab of paint or nail polish must be re-applied to edge of rings to prevent movement.

1.3 Connect an appropriate signal source, eg: Electrohome RGB generator producting a white field plus individual red, green and blue fields.

1.4 Bring the long and short purity tab protrusions in line with each other to obtain near-zero magnetic field (figure 4) (In some cases bring the flat and indented tabs together to obtain zero field). Protrusions can then be vertical, horizontal or at any convenient angle to start.

1.5 Turn off the green and blue fields and adjust setup controls to produce a red field. (See fig. 3)

1.6 Pull the deflection yoke back so that a red band appears in the centre of the screen.

1.7 Spread the tabs apart as little as necessary and rotate both rings together to center the red band horizontally on the face of the CRT (approximate). (See Fig. 5)

1.8 Slide the yoke towards the bell of the picture tube slowly to obtain a uniform red field (pure in color) across the entire tube face. Juggle back and forth slightly as necessary. Lightly tighten yoke retaining clamp.

1.9 Momentarily switch on a cross-hatch signal and rotate yoke to level the pattern on the face of CRT.

1.10 Return generator to regain red raster.

1.11 Turn off red field and check for pure field for each of the green and blue fields. Reposition yoke if necessary to obtain optimum purity on all fields.

1.12 Tighten yoke retaining clamp to prevent yoke shift or rotation. (Do not install wedges at this time.)

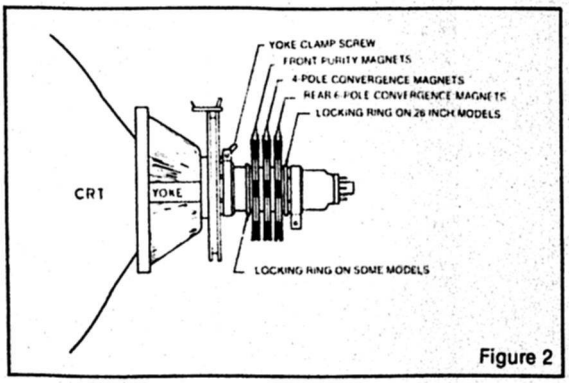


Figure 2

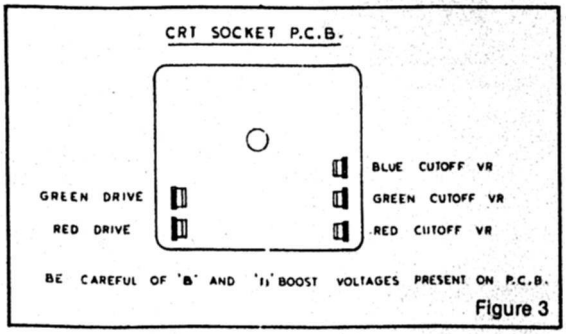


Figure 3

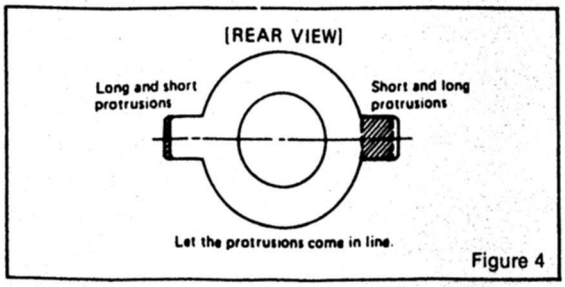


Figure 4

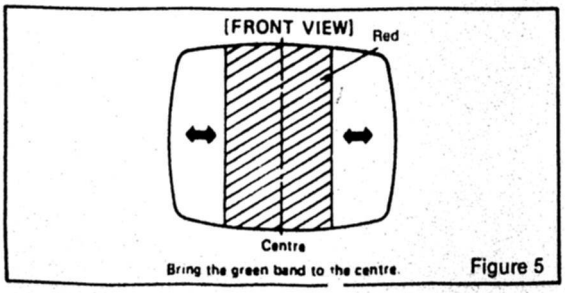


Figure 5

2.0 Static and Dynamic Convergence

NOTE: Static convergence is achieved by four magnets located on the neck, nearest the base of the picture tube, Fig. 2. The middle pair of magnetic rings are adjusted to converge the blue and red crosshatch lines. The rear pair of convergence rings (closest to the base of the picture tube) are adjusted to converge the magenta (blue/red) to the green crosshatch lines. Dynamic convergence is achieved by tilting the deflection yoke up-down and left-right.

2.1 Ensure that the controls misadjusted during purity setup (screen, cut-off, etc.) are set to give white balance. See 3.0 below.

2.2 Switch generator to the crosshatch pattern.

2.3 Adjust convergence around the edges of the picture tube by tilting the yoke up-down and left-right, and temporarily install one wedge at the top of the yoke or in a more optimum position. (Figures 8, 9, 10)

2.4 Turn off green input and turn on the red and blue input.

2.5 Rotate the 4-pole (middle) pair of magnets as a unit to minimize separation of the red and blue crosshatch lines around the center of the screen (Figure 6). Variation of the angle between the tabs adjusts convergence of red and blue. (Tilt yoke as required to converge red and blue at the edges as in 2.3 above.)

2.6 Turn on green input to obtain magenta (red/blue) and green crosshatch lines. Rotate the 6-pole (rear) pair of magnets as a unit to minimize separation of the magenta and green lines (figure 7). Vary angle between the two tabs and further rotate as a unit to finalize.

2.7 When converence of 3 colors is optimized (static in center and dynamic around edges) apply stripe of paint or nail polish to converence magnet rings to prevent movement. If applicable, tighten locking ring carefully.

2.8 Remove temporary wedge from yoke. Tilt yoke in up-down and left-right direction for best circumference convergence and install 3 wedges. (It is best to use 3 new wedges since they have adhesive backing. Simply pull off tape, slide wedge in place and press outer flap down firmly. For more permanency apply small quantity of silastic or similar material at junction of wedges and picture tube. Do not disturb while material is setting. (Order wedges by part number 39-1233-01).

3.0 White Balance (Grey Scale Tracking)

Refer to figure 3. Do the following in subdued light:

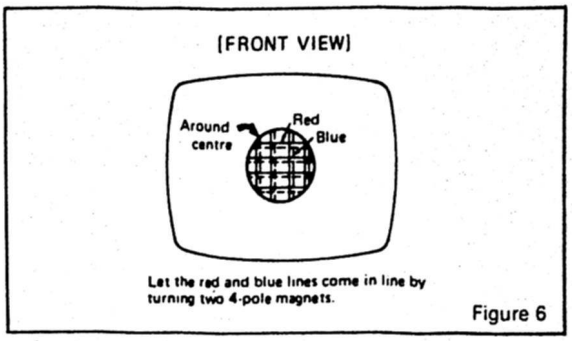
3.1 Note this adjustment can be accomplished with no signal connected; eg: input connector open or if a signal generator is connected, switch off all 3 inputs at the generator.

3.2 Set red and green drive controls to their mechanical center and turn the common G2 screen control and 3 cut-off controls to minimum (fully counterclockwise).

3.3 Slowly turn up G2 screen control until the first faint color appears, then back off to edge of visibility. Do not touch the associated cut-off control - it should stay fully CCW for the remaining set-up.

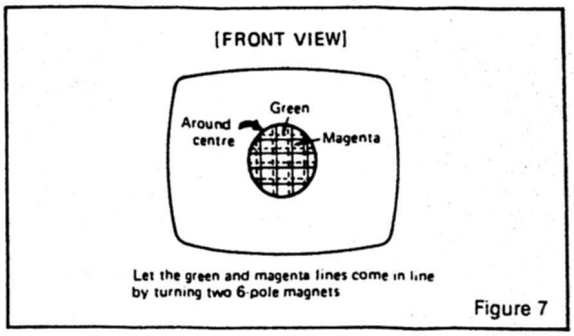
3.4 Slowly turn up the other two color cut-off controls in turn to match the first. This should result in the faintest grey.

3.5 Turn on the signal generator with all 3 inputs on. (a crosshatch pattern would be appropriate).



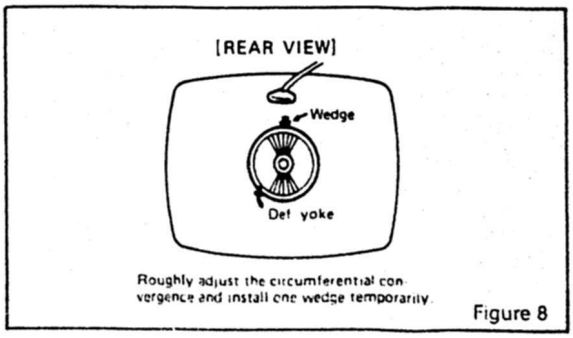
Let the red and blue lines come in line by turning two 4-pole magnets.

Figure 6



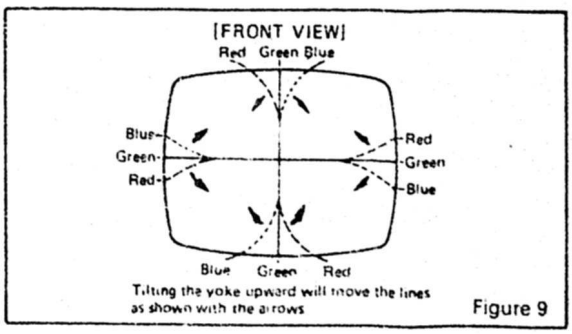
Let the green and magenta lines come in line by turning two 6-pole magnets

Figure 7



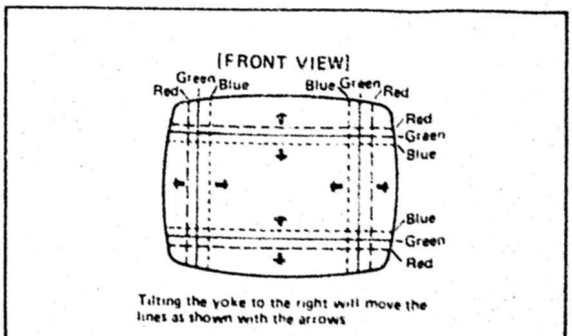
Roughly adjust the circumferential convergence and install one wedge temporarily.

Figure 8



Tilting the yoke upward will move the lines as shown with the arrows

Figure 9



Tilting the yoke to the right will move the lines as shown with the arrows

Figure 10

3.6 Adjust the red and green drive controls for "neutral white" on high white picture areas. Generally these controls will be left at mech. centre.

3.7 Note: When monitor is re-connected with the game the screen control (G2) may require a slight adjustment to obtain proper black level. (the black portion of picture just extinguished).

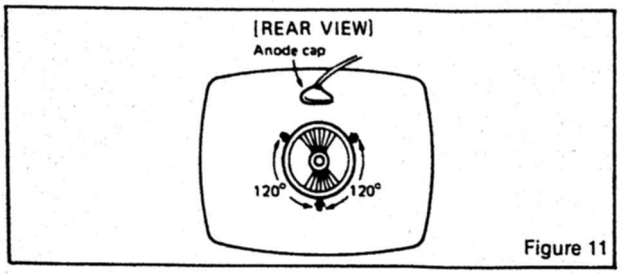


Figure 11

4.0 Power Supply

The regulated +B1 control (R909) has been factory adjusted and normally requires no adjustment. However, if any repairs have been made to the chassis it is recommended that this adjustment should be made.

a) Allow 5 minutes to warm up.
b) No signal applied.
c) Connect an accurate D.C. voltmeter to TP-91 or the emitter of X04 power regulator transistor.
d) Adjust R909 for 120V. (See fig. 1)

Note:

Should +B1 control be set too high, it may cause possible component damage. Use an accurate D.C. voltmeter to set B1 (B+).

5.0 Focus

Adjust focus control for best overall definition and picture detail an average signal applied. (Highlights should be favoured.)

6.0 Color Service Generator for G07 Monitor

Electrohome has developed a color service generator that is specifically designed for use with the G07 color data monitor. It provides the monitor with both horizontal and vertical sync, as well as the following test patterns:

1) Fine cross-hatch pattern
2) Broad bar cross-hatch pattern
3) Complete field

Three color selection switches, red, green and blue, provide the ability to display the above patterns in the three primary colors as well as the three secondary colors.

This product may be ordered from:
Contracts Marketing
ELECTROHOME (USA) Limited
250 Wales Avenue,
Tonawanda, New York 14150
Telephone: 1-716-694-3332

7.0 X-Ray Emission Check

7.1 Assure the power supply B1 is properly adjusted to 120V DC. See Item 4.0 (page 8)

7.2 Assure that the anode voltage does not exceed max. as per Item 2.0 page 4.

7.3 Assure that the high voltage hold down circuit is operating correctly. Use the following procedure.

a) Increase the B1 greater than 138.5V by shorting collector/emitter of the power regulator, X04.

b) Observe that the anode voltage (EHT) goes to 0. If the EHT does not go to 0, a fault must be located and repaired.

c) Remove short and set should return to normal operation. (Note, after the short is removed some monitors may not restart. In this case, remove power from monitor momentarily and normal operation will be restored.

Note:

The protector circuit consists of the components shown below in Fig. 13 with a circuit description.

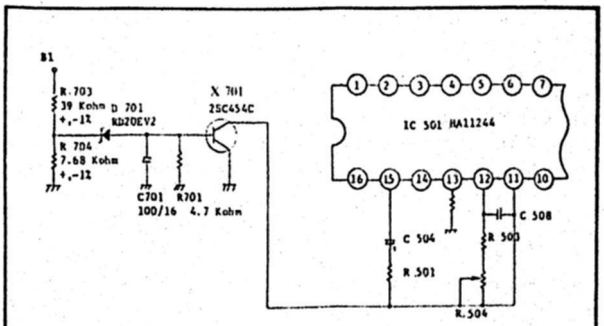


Figure 13

8.0 Circuit Diagram and Description of High Voltage Hold Down or Safety Circuit

8.1 Circuit Diagram of High Voltage Hold Down Circuit.

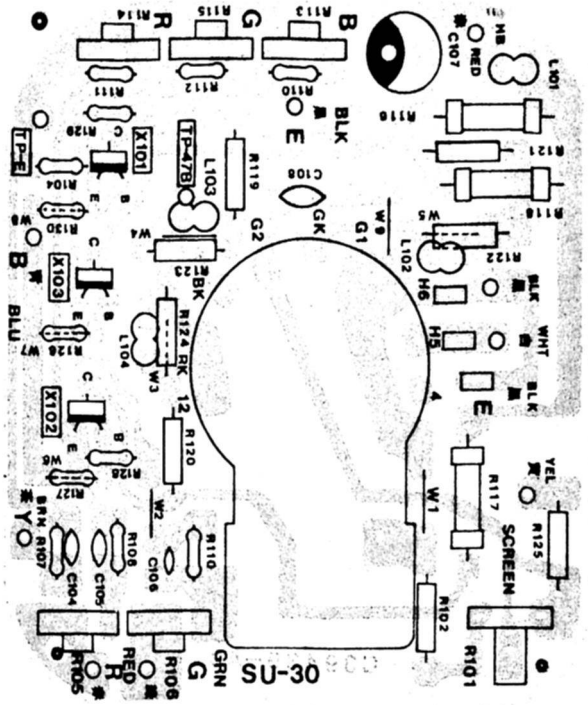
8.2 Operation of High Voltage Hold Down Circuit.

The high voltage hold-down circuit protects the high voltage circuit from dangerous voltage with short circuiting between emitter and collector of power regulating transistor.

The base voltage of X701 is increased when the B1 voltage is increased more than 138.5 V DC.

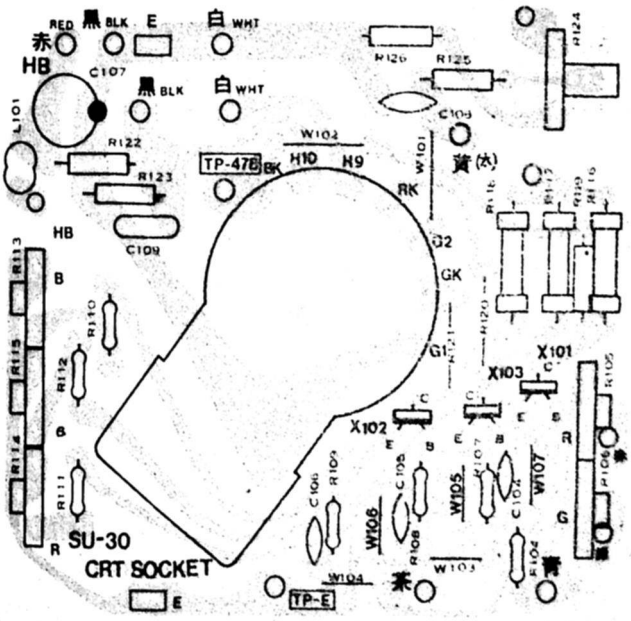
When the base of X701 is increased, a short is produced by X701 between pin 11 and ground of IC 501, shutting down the horizontal osc. and high voltage.

19" C.R.T. P.C.B. COMPONENT LAYOUT (SU3032A)



00-18025-06

13" C.R.T. P.C.B. COMPONENT LAYOUT (SU3016A)



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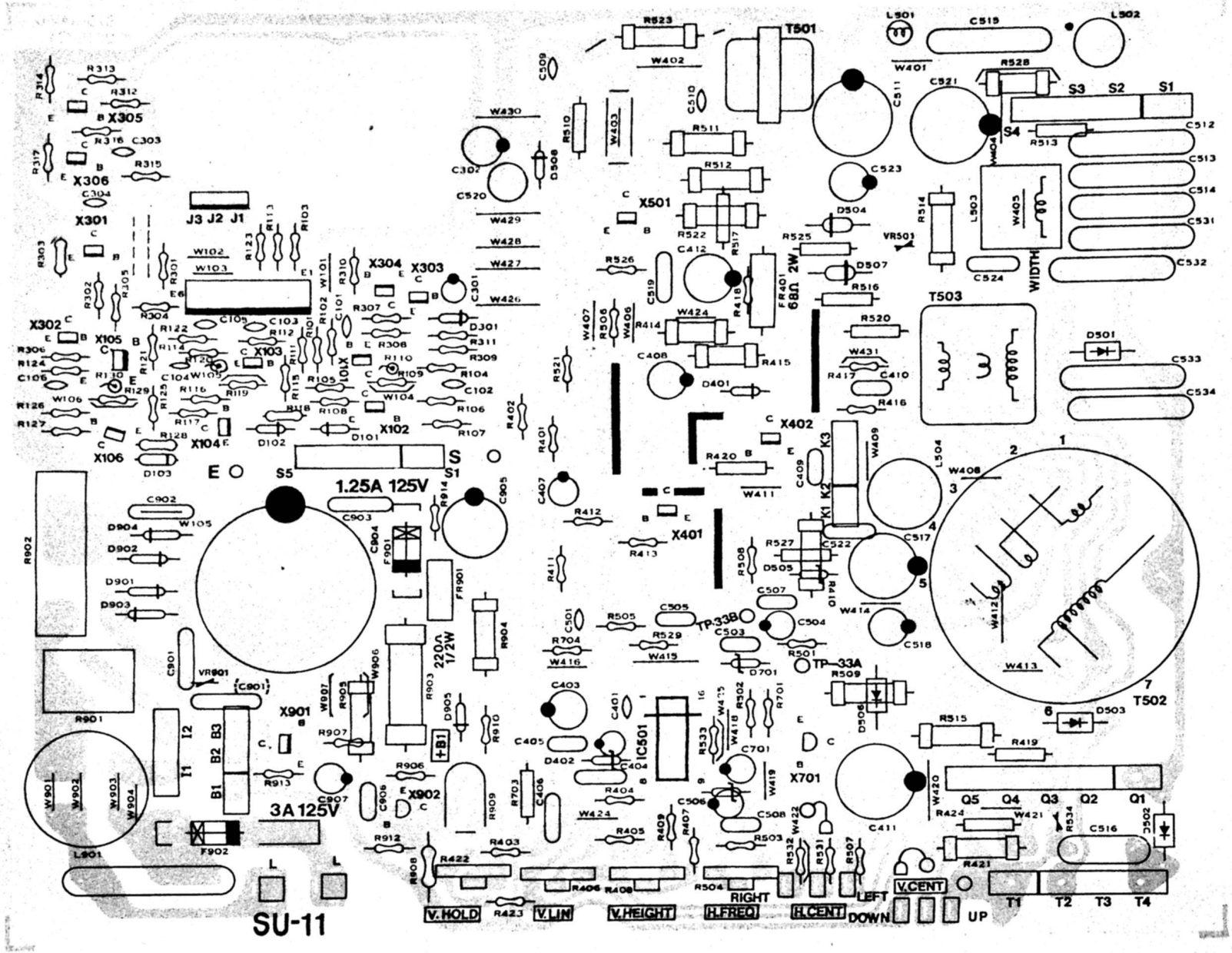
13'' & 19'' MAIN P.C.B. COMPONENT LAYOUT (SU1103A-13'', SU1133A-19'')



REPLACEMENT PARTS LIST

IMPORTANT SAFETY NOTICE

Components identified by the ⚠ symbol on the schematic and parts list have special characteristics for safety. These critical safety components are designed to "fail safe" under abnormal conditions. The failure of any one component often causes stress in other components which could lead to smoke or fire or other hazards. Because of this, components are selected and tested under actual fault conditions to ensure safe operation. Replacement with anything other than the identical Electrohome part may present a hazard.

ALWAYS ORDER BY PART NUMBER, TO ENSURE FAST DELIVERY AND CORRECT REPLACEMENT

Note 1: When ordering replacement parts, specify the Model and Chassis Code as well as the Part Description and Part Number.

Note 2: ¼ watt resistors and 50 volt ceramic capacitors are omitted from this parts list. The part number for these parts can be determined if the resistance or capacitance is known as follows:

Resistors: XH-□□□01 (0- x 1.0) (1- x 10)
Resistance (ohms) — Multiplier (9- x 0.1)

□□□-□□

XH-129-01 ⟶ 1.2 ohm ¼W
XH-333-01 ⟶ 33K ¼W
XH-475-01 ⟶ 4.7 Meg ¼W

Capacitors: XL-C □□□-02 (0- x 1) (1- x 10)
Capacitance (pF) — Multiplier (7- x .1)

XL-C □□□-02

XL-C 680-02 ⟶ 68pF 60V
XL-C 153-02 ⟶ .015uF 50V
XL-C 337-02 ⟶ 3.3pF 50V

SERVICE REPLACEMENT PARTS LIST

CHASSIS PARTS

Symbol	Description	Reference Number	Part Number
	Main PCB Assy. – 13"	SU1103A	ZS-1-29
	Main PCB Assy. – 19"	SU1133A	ZS-1-37
	CRT Socket PCB – 13"	SU3016A	ZS-3-12
	CRT Socket PCB – 19"	SU3032A	ZS-3-17
	Purity Shield Assy – 19"	07-220083-03	07-220083-03
V01	CRT – 13"	370ESB22	ZS-7-03
V01	CRT – 19"	17-7198-03	17-19VMNP22
DY01	Deflection Yoke – 13"	C29123-V	ZS-9-11
DY01	Deflection Yoke – 19"	A29779-D	ZS-9-07
	PC Magnet – 13"	A76366-A	ZS-10-04
	PC Magnet – 19"	A75034-B	ZS-10-01
T502	Flyback Transformer – 13"	A19183-A	ZS-65-08
T502	Flyback Transformer – 19"	A29951-B	ZS-65-17
R11	Focus Control – 13"	A46606-A	ZS-85-07
R11	Focus Control – 19"	A46600-A	ZS-85-06
R05	Wirewound Res., 220μ 25W	QRF258K-221	ZS-19-03
C04	Ceramic Cap, 150pF 150 VAC	QCZ0101-005	ZS-56-04
X01	Transistor, Horiz. Out – 13"	2SD869	XQ-2SD870
X01	Transistor, Horiz. Out – 19"	2SD870	XQ-2SD870
X02	Transistor, Volt Reg. – 19"	2SC1106	XQ-2SC1106
IC01	IC, Volt Reg. – 13"	STR383	XQ-STR383
L01	Degaussing Coil – 13"	21-1007-31	21-1007-31
L01	Degaussing Coil – 19"	21-1007-30	21-1007-30

MECHANICAL PARTS

Symbol	Description	Reference Number	Part Number
	PIN Terminal (Degaussing) (2)		34-708-01
	Housing – PIN Terminal (2)		34-709-01
	Ground Strap Assy – 13"		34-697-04
	Ground Strap Assy – 19"		34-574-02
	Ground Strap Wire Terminal		34-228-03

MECHANICAL PARTS (cont'd)

Symbol	Description	Reference Number	Part Number
	Ground Spring (2) – 13"		35-3560-01
	Ground Spring (1) – 19"		35-212-03
	Screw – CRT Mount (4)		31-631018-08
	Washer – CRT Mount (4)		33-255-01
	Nut Retainer –CRT Mount (4) – 19"		33-494-01
	Bracket – RH – CRT Mount – 13"		35-3919-01
	Bracket – LH – CRT Mount – 13"		35-3919-02
	Bracket – RH – CRT Mount – 19"		35-3890-01
	Bracket – LH – CRT Mount – 19"		35-3890-02
	Clip – PCB Support (2)		33-629-02
	Chassis Base – 13"		38-452-01
	Chassis Base – 19"		38-449-02
	Yoke Wedge (3)		39-1233-01

MAIN PCB ASSEMBLY (SU1103A-13") ZS-1-29
(SU1133A-19") ZS-1-37

RESISTORS

Symbol	Description	Reference Number	Part Number
R1406	Trim Pot, 200μ Vert Lin	QVZ3230-022	ZS-80-25
R1408	Trim Pot, 200μ Vert Height	QVZ3230-022	ZS-80-25
R1410	Metal film, 6R8 1W 5%	QRX019J-6R8	ZS-94-13
R1414	Metal Oxide, 3K3 1W 5%	QRG019J-332	XH-332-03
R1415	Metal Oxide, 2K7 1W 5%	QRG019J-272	XH-272-03
R1421	Metal Oxide, 12K 2W 5%	QRG029J-123	XH-123-04
R1422	Trim Pot, 10K Vert Hold	QVZ3224-014H	ZS-80-40
⚠FR1401	Fusible, 68μ 2W	QRH024-680M	ZS-41-09
⚠R1503	Carbon Film, 11K8 1/4W 1%	QRV142F-1182	ZS-116-05
R1504	Trim Pot, 5K Hor. Freq.	QVZ3230-053	ZS-80-12
R1509	Metal Oxide, 10K 2W 5%	QRG029J-103	XH-103-04
R1511 (SU1103A)	Metal Oxide, 5K6 2W 5%	QRG029J-562	ZS-94-15
R1512 (SU1133A)	Metal Oxide, 8K2 2W 5%	QRG026J-822Z	ZS-94-12
R1514 (SU1103A)	Metal Oxide, 680μ 2W 5%	QRG019J-681	XH-681-04
R1514 (SU1133A)	Metal Oxide, 820μ 2W 5%	QRG019J-821Z	XH-821-04
R1515	Carbon Film, 8R2 1W 5%	QRX019J-8R2	ZS-94-14
R1522	Carbon Film, 4R7 1W 5%	QRX19J-4R7	ZS-141-01
R1523 (SU1103A)	Metal Oxide, 56R 2W 5%	QRG029J-560	ZS-94-16
R1523 (SU1133A)	Metal Oxide, 68R 2W 5%	QRG026J-680Z	ZS-94-17
R1528	Metal Oxide, 390R 1W 5%	QRG019J-391	XH-391-03
R1534	ZNR	ERZ-C05ZK471	ZS-42-04
R1501	ZNR	ERZ-C05DK271	ZS-42-03
⚠R1703	Carbon Film, 39K 1/2W 1%	QRV122F-3902	ZS-96-01
⚠R1704	Carbon Film, 7K68 1/4W 1%	QRV142F-7681	ZS-116-07
⚠R1901	Posistor	A75414	ZS-55-03
R1902	Wirewound, 2R0 7W 10%	QRF076K-2R0	ZS-125-02
R1903	Carbon Film, 5R6 3W 5%	QRX039J-5R6	ZS-94-07
R1903	Carbon Film, 4R7 3W 5%	QRX039J-4R7	ZS-94-03
R1904	Metal Oxide, 10K 2W 5%	QRG026J-103Z	XH-103-04
R1905 (SU1133A)	Metal Oxide, 18K 1W 5%	QRG019J-183	XH-183-03
⚠R1908 (SU1133A)	Carbon Film, 47K 1/2W 1%	QRV22F-4702	ZS-96-02
R1909 (SU1133A)	Trim Pot, 2K	QVP5A0B-023E	ZS-61-07
⚠R1910 (SU1133A)	Carbon Trim, 2K74 1/4W 1%	QRV142F-2741	ZS-116-09
⚠FR1901	Fusible, 220μ 1/2W 10%	QRH124K-221M	ZS-41-04

CAPACITORS

Symbol	Description	Reference Number	Part Number
C1301 (SU1133A)	Bipolar, 3V3 50V	QEN61HA-335Z	ZS-52-10
C1402	Tantalum, 2U2 16V	QEE51CK-225B	ZS-52-09
C1407 (SU1133A)	Electrolytic, 4U7 6.3V	QEW51JA-475	ZS-52-14
C1411	Electrolytic, 100μF 160V	QEW52CA-107	ZS-52-12
C1412	Electrolytic, 3U3 160V	QEW52CA-335	ZS-52-06
C1508	Polypropylene, 5600pF 50V	QFP31HJ-562	ZS-73-02
⚠C1512, C1513	Polypropylene, 2000pF 1500V	QFZ0082-202	ZS-71-09
⚠C1514 (SU1103A)	Polypropylene, 2500pF 1500V	QFZ0082-252	ZS-71-18
⚠C1514 (SU1133A)	Polypropylene, 2000pF 1500V	QFZ0082-202	ZS-71-09
C1515	Polypropylene, 0U53 1200V	QFZ0067-534	ZS-71-03
C1520	Bipolar, 3U3 50V	QEN61HA-335Z	ZS-52-10
C1523 (SU1133A)	Electrolytic, 1μF 200V	QEW62CA-105Z	ZS-52-07
C1524	Mylar, 0.1μF 200V	QFM72DK-104M	ZS-139-07
⚠C1531 (SU1133A)	Polypropylene, 2000pF 1500V	QFZ0082-202	ZS-71-09
⚠C1532 (SU1133A)	Polypropylene, 1500pF 1500V	QFZ0082-152	ZS-71-10
C1904	Electrolytic, 600μF 200V	QEY0034-001	ZS-52-02

MAIN PCB ASSEMBLY (cont'd)

CAPACITORS (cont'd)

Symbol	Description	Reference Number	Part Number
C1905	Electrolytic, 10μF 250V	QEW52EA-106	ZS-52-04
C1907 (SU1103A)	Met. Mylar, 0.1μF 250V	QFZ9008-104	ZS-140-02

COILS

Symbol	Description	Reference Number	Part Number
L1501 (SU1103A)	Peaking Coil	A75360-6	ZS-138-05
L1502 (SU1103A)	Linearity	A39934	ZS-77-02
L1502 (SU1133A)	Linearity	A39835	ZS-77-03
L1503	Width	C30380-A	ZS-76-04
L1504 (SU1103A)	Heater Choke	C30333-A	ZS-79-05
L1504 (SU1133A)	Heater Choke	C30445-A	ZS-79-06
L1901 (SU1103A)	Line Filter	A39475-J	ZS-171-03

TRANSFORMERS

Symbol	Description	Reference Number	Part Number
T1501	Horizontal Drive	A46022-BM	ZS-113-02
T1503	Side Pin	C39049-A/C39050-A	ZS-66-04

SEMICONDUCTORS

Symbol	Description	Reference Number	Part Number
IC1501	IC, Horiz. and Vertical	HA11244	XQ-HA11244
X1101	Video Amplifier, NPN	2SC1685(R)	XQ-2SC1685
X1102	Video Amplifier, PNP	2SA673(C)	XQ-2SA673
X1103	Video Amplifier, NPN	2SC1685(R)	XQ-SC1685
X1104	Video Amplifier, PNP	2SA673(C)	XQ-2SA673
X1105	Video Amplifier, NPN	2SC1685(R)	XQ-2SC1685
X1106	Video Amplifier, PNP	2SA673(C)	XQ-2SA673
X1301	Sync Amplifier	2SC1685(R)/2SC454	XQ-2SC1685
X1302	Sync Amplifier	2SC1685(R)/2SC454	XQ-2SC1685
X1303	Beam Limiter	2SA673(C)	XQ-2SA673
X1304	Blanking	2SC1685(R)/2SC454	XQ-2SC1685
X1305	Sync Amplifier	2SC1685(R)/2SC454	XQ-2SC1685
X1401	Vertical Output	2SD478/2SD1138	XQ-2SD478
X1402	Vertical Output	2SD478/2SD1138	XQ-2SD478
X1501	Horiz. Drive	2SC2610BK/2SC1507	XQ-2SC2610
X1701 (SU1103A)	X-Ray Protector	2SC1685(P,S)/2SC454C	XQ-2SC1685
X1901 (SU1133A)	Power Driver	2SC688(K,L,M)	XQ-2SC2688
X1902 (SU1133A)	Error Amp	2SC1890A(E,F)	XQ-2SC1890
D1101	Diode	1S2473H	XQ-1S2473
D1102	Diode	1S2473H	XQ-1S2473
D1103	Diode	1S2473H	XQ-1S2473
D1301	Diode	1S2473H	XQ-1S2473
D1401	Diode, Bias	1S2473H	XQ-1S2473
D1402	Zener	RD10F(C)	XQ-RD10FC
D1503	Diode	HF-1/RF-1	XQ-HF1
D1504	Diode	V09E	XQ-V09E
D1505	Zener	RD11E(B)	XQ-RD11EB
D1506	Diode	W06A	XQ-W06A
D1507	Diode	1SS81	XQ-1SS81
D1508	Diode	1S2473H	XQ-1S2473
⚠D1701	Zener	RD20EV2	XQ-RD20EV2
⚠D1901	Power Rectifier	1S1887A	XQ-1S1887A
⚠D1902	Power Rectifier	1S1887A	XQ-1S1887A
⚠D1903	Power Rectifier	1S1887A	XQ-1S1887A
⚠D1904	Power Rectifier	1S1887A	XQ-1S1887A
⚠D1905 (SU1133A)	Zener	RD6.8EV3	XQ-RD68EV3

FUSES

Symbol	Description	Reference Number	Part Number
⚠F1901 (SU1103A)	Fuse 1A 250V	QMF53U1-1R05	ZS-120-09
⚠F1901 (SU1133A)	Fuse 1.25A 250V	QMF53U1-1R25S	ZS-120-12
⚠F1902	Fuse 3A 250V	QMF66U1-3R0S	ZS-120-05

CRT SOCKET PCB ASSEMBLY (SU-3016A-13") ZS-3-12
(SU-3032A-19") ZS-3-17

RESISTORS

Symbol	Description	Reference Number	Part Number
R3105	Trim Pot, 200μ, R Drive	QVZ3224-022	ZS-80-02
R3106	Trim Pot, 200μ, G Drive	QVZ3224-022	ZS-80-02
R3113	Trim Pot, 5K, B Cut-off	QVZ3224-053	ZS-80-04
R3114	Trim Pot, 5K, R Cut-off	QVZ3224-053	ZS-80-04
R3115	Trim Pot, 5K, G Cut-off	QVZ3224-053	ZS-80-04
R3116	Metal Oxide, 10K 2W 5%	QRG029J-103	XH-103-04
R3117	Metal Oxide, 10K 2W 5%	QRG029J-103	XH-103-04
R3118	Metal Oxide, 10K 2W 5%	QRG029J-103	XH-103-04
R3119	Carbon Comp, 3K3 1/2W 5%	QRZ0039-332	ZS-72-03
R3120	Carbon Comp, 3K3 1/2W 5%	QRZ0039-332	ZS-72-03
R3121	Carbon Comp, 3K3 1/2W 5%	QRZ0039-332	ZS-72-03

CAPACITORS

Symbol	Description	Reference Number	Part Number
C3107	Electrolytic, 10μF 250V	QEW52EA-106	ZS-52-04
C3108	Ceramic, 1000pF 1400V	QCZ9001-102M	ZS-56-05

COILS

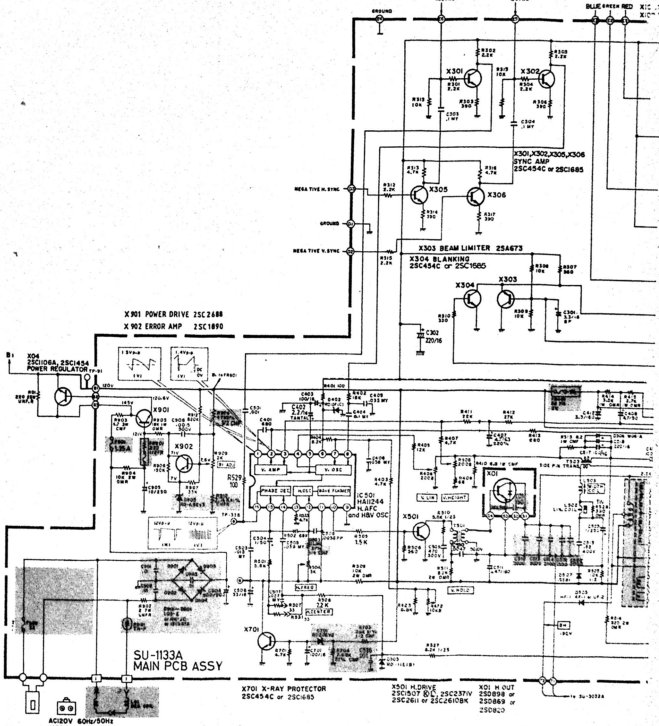
Symbol	Description	Reference Number	Part Number
L3101	Peaking	QQL043K-101	ZS-138-15

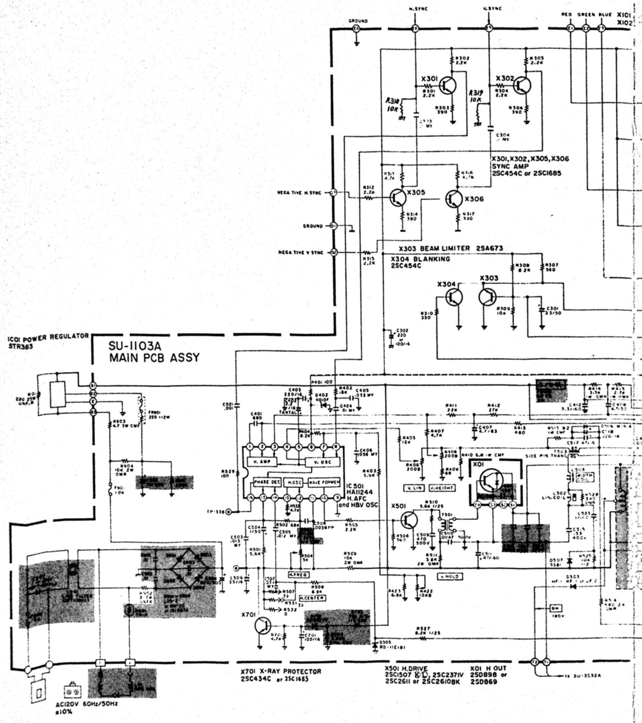
SEMICONDUCTORS

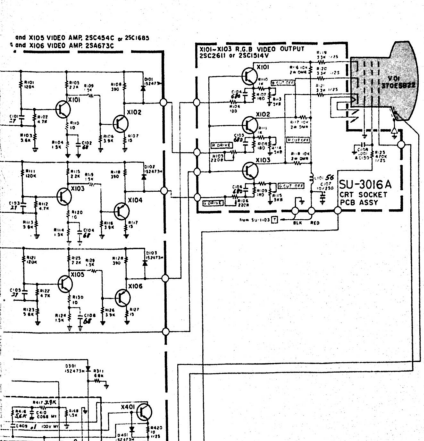
Symbol	Description	Reference Number	Part Number
X3101 (SU3016A)	Blue Video Output	2SC2611	XQ-2SC1514V
X3101 (SU3032A)	Blue Video Output	2SC1514VC	XQ-2SC1514V
X3102 (SU3016A)	Red Video Output	2SC2611	XQ-2SC1514V
X3102 (SU3032A)	Red Video Output	2SC1514VC	XQ-2SC1514V
X3103 (SU3016A)	Green Video Output	2SC2611	XQ-2SC1514V
X3103 (SU3032A)	Green Video Output	2SC1514VC	XQ-2SC1514V

MISCELLANEOUS

Symbol	Description	Reference Number	Part Number
⚠ (SU3016A)	CRT Socket (13")	A75522	ZS-78-05
⚠ (SU3032A)	CRT Socket (19")	A76068	ZS-78-06


H. SYNC
V. SYNC
BLUE
GREEN
RED
GROUND
X301
X302
X301,X302,X305,X306
SYNC AMP
2SC454C or 2SC1685
NEGA TIVE H. SYNC
NEGA TIVE V. SYNC
X305
X306
X303 BEAM LIMITER 2SA673
X304 BLANKING
2SC454C or 2SC1685
X304
X303
X901 POWER DRIVE 2SC2688
X902 ERROR AMP 2SC1890
X04
2SC1106A, 2SC1454
POWER REGULATOR
X901
X902
IC501
HA1124
H.AFC
and H&V OSC
X501
X701
SU-1133A
MAIN PCB ASSY
X701 X-RAY PROTECTOR
2SC454C or 2SC485
X501 H.DRIVE
2SC1507 B/C 2SC2371V
2SC2611 or 2SC2610BK
X01 H OUT
2SD838 or
2SD869 or
2SD820
AC120V 60Hz/50Hz
±10%


SU-1103A
MAIN PCB ASSY
IC01 POWER REGULATOR
STR383
X301,X302,X305,X306
SYNC AMP
2SC454C or 2SC1685
X303 BEAM LIMITER 2SA673
X304 BLANKING
2SC454C
IC501
HA11244
H.AFC
and H&V OSC
X701 X-RAY PROTECTOR
2SC434C or 2SC1685
X501 H.DRIVE
2SC1507, 2SC2371V
2SC2611 or 2SC2610BK
X01 H OUT
2SD898 or
2SD869
AC120V 60Hz/50Hz
±10%
H.SYNC
V.SYNC
GROUND
RED
GREEN
BLUE
X101
X102
NEGATIVE H.SYNC
NEGATIVE V SYNC
V. AMP
V. OSC
PHASE DET.
H.OSC
WAVE FORMER
H.FREQ
H.CENTER
V. LIN
V. HEIGHT
V. HOLD
SIDE PIN TRANS
WIDTH COIL
LIN. COIL
TP-539
X301
X302
X303
X304
X305
X306
X501
X701
X01



Schematic Notes

Unless otherwise specified

Resistance: (Ω) (K→KΩ, M→MΩ), 1/4 (W) carbon resistor

Capacitance: 1 or higher→ (pF), less than 1→ (μF)
working voltage→ 50 (V)
ceramic capacitor

Inductance: (μH)

Electrolytic Cap: Capacitance Value (μF)/working voltage (V),
NP → non-polar (or bipolar) electrolytic cap.

Refer to the parts list for additional component information.

⏚ indicates test point connection

⏚ indicates chassis ground unless otherwise specified

Hz indicates cycles per second

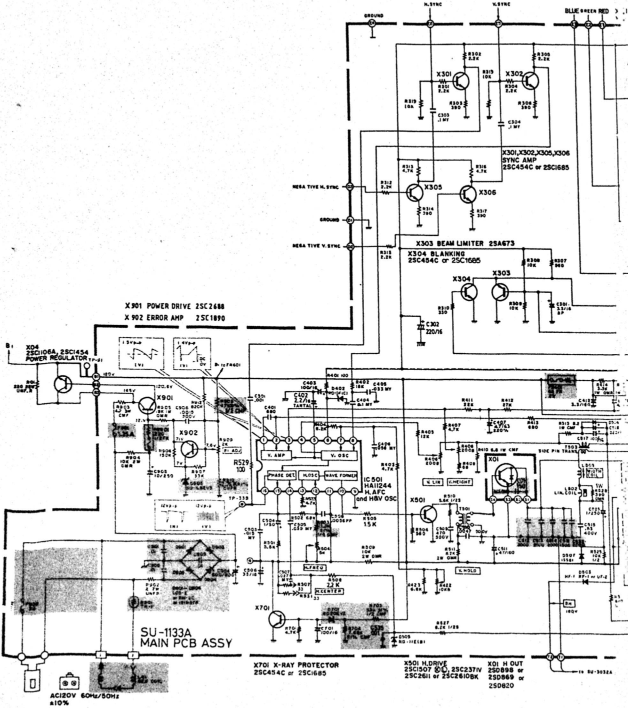
For **safety** purposes (and continuing reliability)

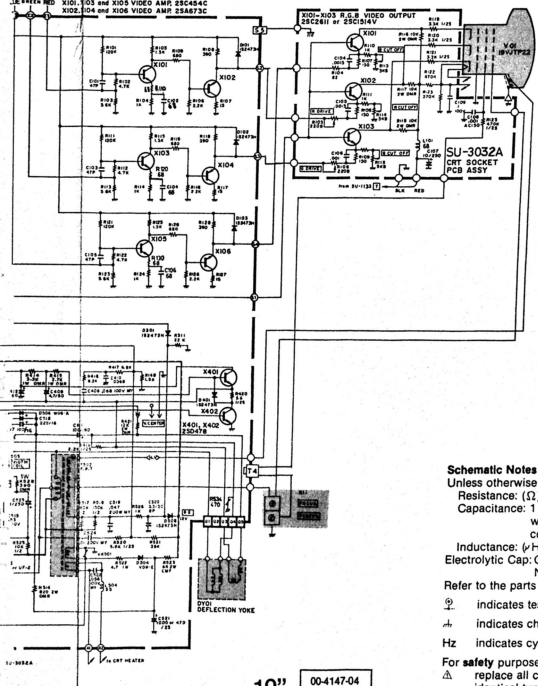
⚠ replace all components marked with safety symbol with identical type.
NOTE: FR→ fusible resistor

Parts identification on circuit boards:
e.g. SU1126A (R107 = R1107)
SU3030A (R113 = R3113)

13"

G07-FBO
00-4147-03


H.SYNC
V.SYNC
GROUND
BLUE GREEN RED
X301
X302
X301,X302,X305,X306
SYNC AMP
2SC454C or 2SC1685
NEGA TIVE H. SYNC
X305
X306
GROUND
NEGA TIVE V. SYNC
X303 BEAM LIMITER 2SA673
X304 BLANKING
2SC454C or 2SC1685
X304
X303
X901 POWER DRIVE 2SC2688
X902 ERROR AMP 2SC1890
X04
2SC1106A, 2SC1454
POWER REGULATOR
X901
X902
R529
100
V. AMP
V. OSC
PHASE DET
H.OSC
WAVE FORMER
IC501
HA11244
H.AFC
and H&V OSC
X01
X501
X701
SU-1133A
MAIN PCB ASSY
X701 X-RAY PROTECTOR
2SC454C or 2SC1685
X501 H.DRIVE
2SC1507, 2SC2371V
2SC2611 or 2SC2610BK
X01 H OUT
2SD898 or
2SD869 or
2SD820
AC120V 60Hz/50Hz
±10%



Schematic Notes

Unless otherwise specified
Resistance: (Ω) (K→KΩ, M→MΩ), 1/4 (W) carbon resi
Capacitance: 1 or higher→ (pF), less than 1→ (μF)
working voltage→ 50 (V)
ceramic capacitor
Inductance: (μH)
Electrolytic Cap: Capacitance Value (μF)/working voltage (V)
NP → non-polar (or bipolar) electrolytic ca

Refer to the parts list for additional component information.

⏚ indicates test point connection

⏚ indicates chassis ground unless otherwise specified

Hz indicates cycles per second

For **safety** purposes (and continuing reliability)
⚠ replace all components marked with safety symbol w
identical type.
NOTE: FR → fusible resistor

Parts identification on circuit boards:
e.g. SU1126A (R107 = R1107)
SU3030A (R113 = R3113)

19" 00-4147-04 G07-CB0

PARTS AND SERVICE LOCATIONS

USA

ELECTROHOME (USA) Limited
250 Wales Avenue,
Tonawanda, New York 14150
Telephone: 1-716-694-3332

CANADA

AABEX Electronic Services
145 Idema Road,
Markham, Ontario
Canada L3R 1A9
Telephone: 1-416-475-0313
Telex: 06-986-819

AABEX Electronic Services
3444 Lougheed Highway,
Vancouver, British Columbia
Canada V5M 2A5
Telephone: 1-604-253-8421
Telex: 045-1486

Service Electrohome
370 Isabey St.
Ville St-Laurent, Quebec
Canada H4T 1W1
Telephone: 1-514-731-2736
Telex: 058-26588

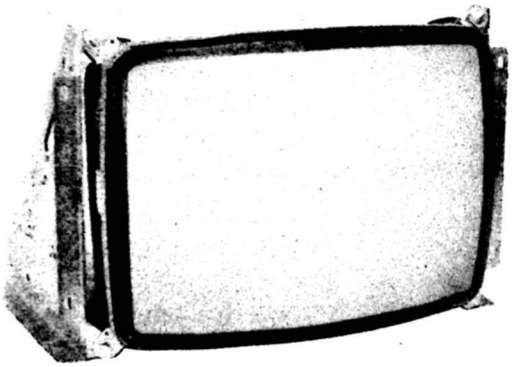
Service Electrohome
809 Wellington St. N.,
Kitchener, Ontario
Canada N2G 4J6
Telephone: 1-519-579-7600

INTERNATIONAL

Service Electrohome
809 Wellington St. N.,
Kitchener, Ontario
Canada N2G 4J6
Telephone: 1-519-744-7111, Ext. 441, 442, 443
Telex: 069-55320

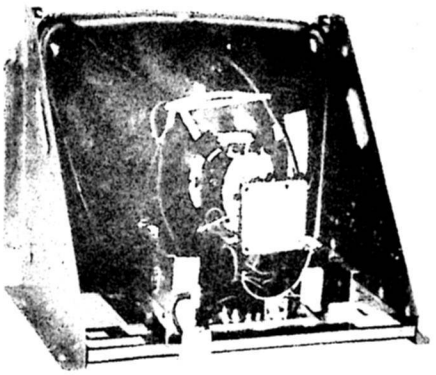
WELLS-GARDNER ELECTRONICS CORPORATION

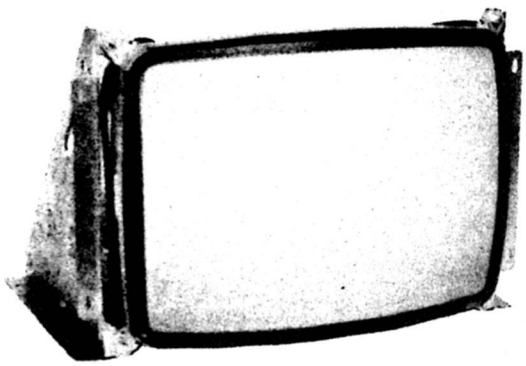
19" IN LINE COLOR MONITORS



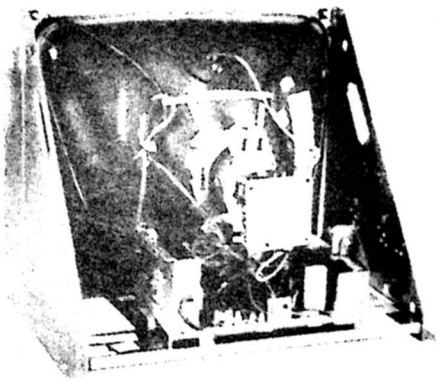
MODELS

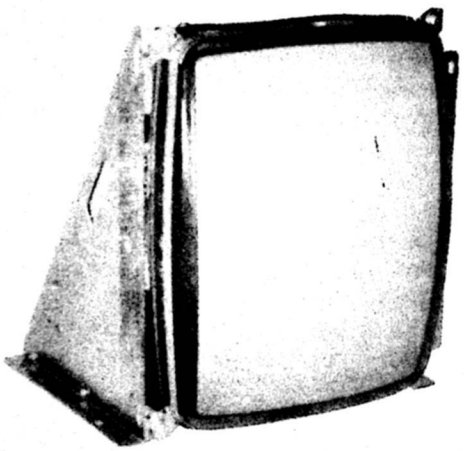
19K4901
19K4902
19K4903
19K4906
19K4911





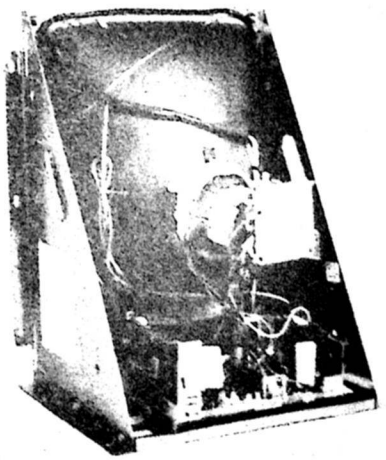
MODEL
19K4904





MODELS

19K4951
19K4952
19K4953
19K4956
19K4956R
19K4961



WELLS-GARDNER ELECTRONICS CORPORATION

2701 NORTH KILDARE AVENUE
CHICAGO, ILLINOIS 60639

THIS MANUAL APPLIES TO THOSE MONITORS WITH SERIAL NUMBERS OF 576001 AND ABOVE.

WARNINGS

1. Power Up Warning—

An isolation transformer must be used between the AC supply and the AC plug of the monitor before servicing or testing is performed since the chassis and the heat sink are directly connected to one side of the AC line which could present a shock hazard.

Before servicing is performed, read all the precautions labelled on the CRT and chassis.

2. X-RAY RADIATION WARNING NOTICE

WARNING: PARTS WHICH INFLUENCE X-RAY RADIATION IN HORIZONTAL DEFLECTION, HIGH VOLTAGE CIRCUITS AND PICTURE TUBE ETC. ARE INDICATED BY (★) IN THE PARTS LIST FOR REPLACEMENT PURPOSES. USE ONLY THE TYPE SHOWN IN THE PARTS LIST.

3. High Voltage—

This monitor contains HIGH VOLTAGES derived from power supplies capable of delivering LETHAL quantities of energy. Do not attempt to service until all precautions necessary for working on HIGH VOLTAGE equipment have been observed.

4. CRT Handling—

Care must be taken not to bump or scratch the picture tube as this may cause the picture tube to implode resulting in personal injury. Shatter proof goggles must be worn when handling the CRT. High voltage must be completely discharged before handling. Do not handle the CRT by the neck.

5. PRODUCT SAFETY NOTICE

WARNING: FOR CONTINUED SAFETY REPLACE SAFETY CRITICAL COMPONENTS ONLY WITH MANUFACTURER RECOMMENDED PARTS. THESE PARTS ARE IDENTIFIED BY SHADING AND BY (△) ON THE SCHEMATIC DIAGRAM.

AVERTISSEMENT: POUR MAINTENIR LE DEGRE DE SECURITE DE L'APPAREIL NE REMPLACER LES COMPOSANTS DONT LE FONCTIONNEMENT EST CRITIQUE POUR LA SECURITE QUE PAR DES PIECES RECOMMANDEES PAR LE FABRICANT.

For replacement purposes, use the same type or specified type of wire and cable, assuring the positioning of the wires is followed (especially for H.V. and power supply circuits). Use of alternative wiring or positioning could result in damage to the monitor or in a shock or fire hazard.

PERFORMANCE AND OPERATING DATA

1. Apply a suitable power source to the monitor through an isolation transformer.
2. Apply a suitable signal source to the monitor PCB by means of P201 and P202
3. Set Up Controls.
   All controls are preset at the factory, but may be adjusted to suit program material.

1.0 Supply

Voltage	108 VAC-132 VAC
Frequency	50 Hz-60 Hz

Note: Apply supply voltage through an isolation transformer with 1 Amp. minimum capability.

2.0 High Voltage (EHT)

For 19"V models 24.3 ± 0.8 K.V. at 0 Beam; 22.8 ± 0.8 K.V. at 1 mA Beam

Note: Condition for above: A.C. = 120V

3.0 Service Set-Up Controls

MAIN PC BOARD

3.1 Vertical Hold Control, VR301
3.2 Vertical Size Control, VR303
3.3 Horizontal Hold Control, VR351
3.4 Vertical Raster Position Control, VR 901
3.5 Horizontal Raster Position Adjustment Jumper (3 positions)
3.6 Screen Control (Part of H.V. Unit, T352)
3.7 Focus Control (Part of H.V. Unit, T352)
3.8 Horizontal Width Coil, L352 (L601 on Model K4904)
3.9 Black Level Control, VR201
3.10 Horizontal Video Position Control, (Horizontal Shift) VR352
3.11 Vertical Damping Control, VR302

NECK PC BOARD

3.12 Video Drive Controls, Red VR401, Green VR402
3.13 CRT Cut Off Controls, Red VR403, Green VR404, Blue VR405

SERVICE INSTRUCTIONS

NOTE: All monitors are equipped with automatic degaussing coils (L701) which demagnetize the picture tube every time the monitor is turned on after being off for a minimum of 5 minutes. Should any part of the chassis become magnetized it will be necessary to degauss the affected area with a manual degaussing coil. Move the coil slowly around the CRT face area and all surrounding metal parts. Then slowly withdraw for a distance of 6 feet before turning off.

Horizontal vs. Vertical:

Some models have the picture tube mounted vertically rather than horizontally. That is, the picture tube is mounted in the frame such that the long dimension of the tube is up and down. Examples of this include (but are not limited to) Models K4951, K4952, K4956, K4956R, and K4961 as in the pictures on the bottom of the front cover. Other than the physical orientation of the picture tube, there is no electrical difference between these models and their horizontal counterparts. The same circuits, the vertical circuits, produce and control deflection along the short dimension of the tube in all models.

The same circuits, the horizontal circuits, produce and control deflection along the long dimension of the tube in all models. Therefore, wherever "vertical" appears in this manual or on the monitor, it refers to the short dimension of the picture tube; wherever "horizontal" appears, it refers to the long dimension of the picture tube.

1.0 BLACK LEVEL CONTROL ADJUSTMENT

This control has been set at the factory and should not need further attention. However, when the game is connected a slight adjustment of VR201 may be necessary to obtain the proper black level (the black portion of the picture just extinguished).

2.0 VERTICAL SIZE (HEIGHT)

Location of this control is shown in Fig. 1. This control must be adjusted slowly, if necessary, until the picture or test pattern attains the correct vertical proportions.

NOTE: This adjustment interacts with the vertical damping adjustment described in the paragraph below. It may be necessary to readjust the vertical size after the vertical damping control has been adjusted.

3.0 VERTICAL DAMPING

Adjustment of this control is required only if the monitor is being used with a game in which the top several raster lines are visible on the screen. Adjust the vertical damping control for uniform spacing of the top raster lines.

4.0 CIRCUIT PROTECTION

A 4.0A pigtail fuse, mounted on the Main Board has been provided to protect the Power Output Circuit.

5.0 FOCUS

Adjust the Focus control, located on the HV unit (T352), for maximum over-all definition and fine picture detail.

6.0 HORIZONTAL HOLD CONTROL ADJUSTMENT, VR351 (See Fig. 1a or 1b)

A warm-up period of at least five minutes should be allowed before alignment is carried out. With the monitor being driven from the game signal, short TP601 to TP31. Adjust VR351 until the picture stops sliding horizontally. Remove the short.

7.0 HORIZONTAL VIDEO POSITION

If the video is off center on the raster, some compensation can be made by adjusting this control.

8.0 VERTICAL RASTER POSITION ADJUSTMENT

If the video is off center vertically, (short dimension of picture tube) some compensation can be made by turning the vertical raster position control.

9.0 HORIZONTAL RASTER POSITION ADJUSTMENT

If the video is off center horizontally (long dimension of the picture tube), some compensation can be made by moving the horizontal raster position adjustment jumper to either positions "R" or "L".

NOTE: This adjustment is not provided on Model K4903.

10.0 HORIZONTAL WIDTH ADJUSTMENT

The horizontal width coil is a hexagonal tuning tool adjustment. This control must be adjusted slowly, if necessary, until the picture or test pattern attains the correct horizontal proportions.

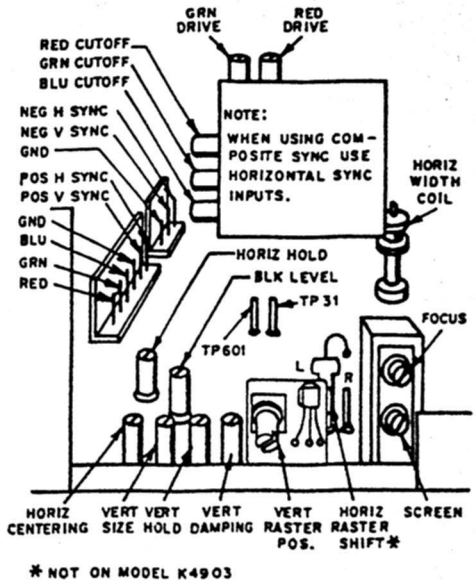


Figure 1(a)

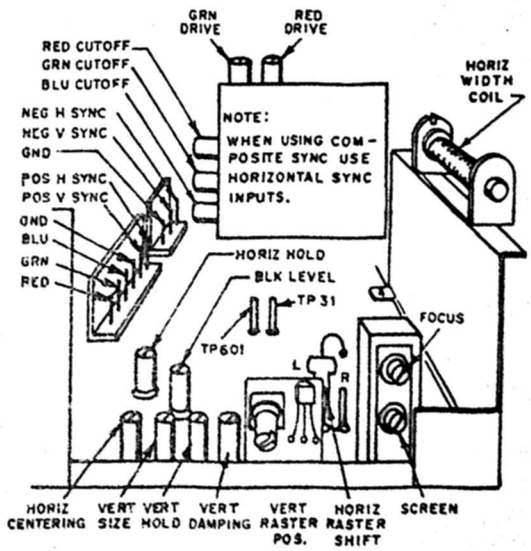


Figure 1(b)

NOTE: All of the following procedures have been performed at the factory and should require no further attention. If the monitor is serviced for any reason, it should be observed afterward to determine whether any of these procedures need to be performed again.

OUTLINE OF CONVERGENCE AND SET-UP PROCEDURE

1.0 **DEGAUSSING:** Demagnetize the shadow mask and all surrounding metal parts with an external degaussing coil.

2.0 **PURITY:** Adjust the purity magnets and the yoke position.

3.0 **STATIC CONVERGENCE:** Converge Red and Blue on Green in the center of the screen.

4.0 **DYNAMIC CONVERGENCE:** Converge Red and Blue at the edges of the screen.

5.0 **WHITE BALANCE:** Set Gray and White brightness tracking.

NOTE: Number 2.0 and 3.0 adjustments interact.

1.0 DEGAUSSING

The monitor is equipped with an automatic degaussing circuit. However, if the CRT shadow mask has become excessively magnetized, it may be necessary to degauss it with a manual coil. Do not switch the coil OFF while the raster shows any effect from the coil.

2.0 COLOR PURITY ADJUSTMENT

2.1 For best results, it is recommended that the purity adjustment be made in the final monitor location. If the monitor will be moved, perform this adjustment with it facing west or east. The monitor must have been operating 15 minutes prior to this procedure.

2.2 Set the converger assembly on the CRT neck with the center line (of the Purity Adjustment Magnet) over the gap between grids no. 3 and 4. (See Figures 2 and 6)

2.3 Make certain that the magnetic ring-pairs are in their correct positions before starting procedure.
This produces a zero-correction condition on the CRT beam and helps facilitate adjustments.

2.4 Vertical raster position control must be at the center of its rotation.

2.5 Remove the R-G-B signal from the monitor.

2.6 Turn the Green Cut off Control (VR404) on the Neck Board fully CW. (See Fig. 3)

2.7 Turn the Red and Blue Cut off Controls (VR403 & VR405) fully CCW.

2.8 Pull the Deflection Yoke backward so that the Green belt will appear. (See Fig. 4)

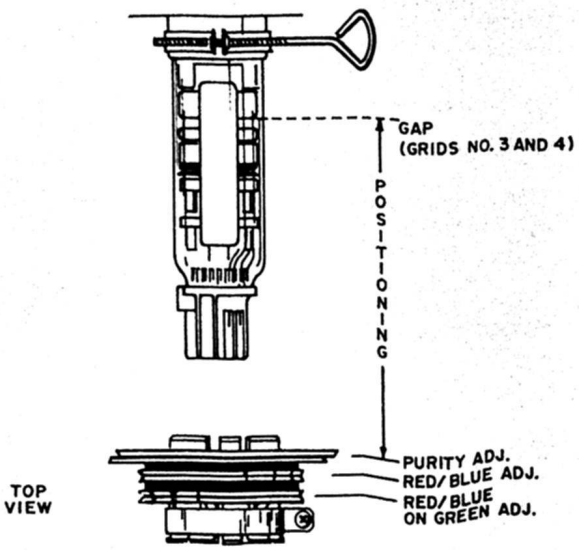
2.9 Decrease the horizontal width of the raster, if necessary, in order to be able to see the right and left edges of the raster.

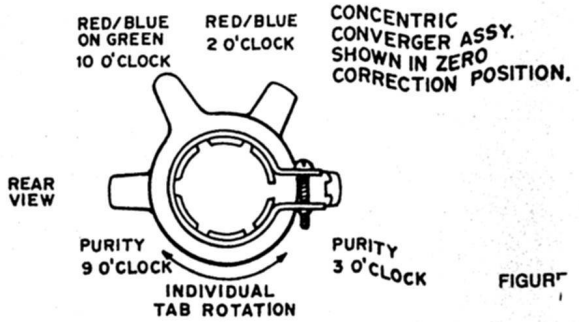
2.10 Move the two Purity Magnets with respect to each other in order to center the raster horizontally on the screen and the Green belt on the raster horizontally.

2.11 Push the Deflection Yoke forward gradually and fix it at the place where the Green screen becomes uniform throughout.

2.12 Turn the Cut off and Drive Controls and confirm that each color is uniform.

2.13 If the color is not uniform, re-adjust it, moving the Purity Magnets slightly.





FIGURE

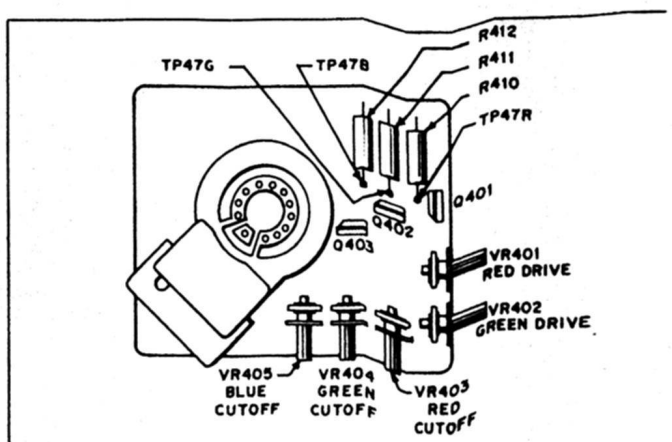


FIGURE 3: Component Side of Neck Board
(with horizontally mounted CRT)

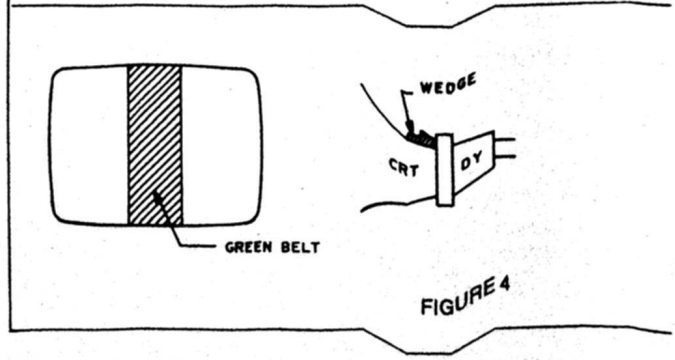


FIGURE 4

2.14 Turn all three cut off controls fully counterclockwise (CCW). Slowly turn up (CW) the Red cutoff control until a Red raster is just barely visible.

2.15 Slowly turn up the Green and Blue cutoff controls such that their associated colors, mixing with the Red, results in a White or Gray raster.

2.16 Confirm that the white or gray color is uniform throughout the screen.

2.17 Insert a wedge temporarily as shown in Fig. 4 and adjust the angle of the Deflection Yoke.

3.0 STATIC CONVERGENCE ADJUSTMENT

4-Pole Magnets and 6-Pole Magnets are for static convergence.

3.1 A cross hatch signal should be connected to the monitor.

3.2 A pair of 4-Pole Convergence Magnets is provided and adjusted to converge the blue and red beams (See Fig. 6). When the Pole opens to the left and right 45° symmetrically, the magnetic field maximizes. Red and blue beams move to the left and right (See Fig. 5). Variation of the angle between the tabs adjusts the convergence of red and blue vertical lines.

3.3 When both 4-Pole Convergence Magnet Tabs are rotated as a pair, the convergence of the red and blue horizontal lines is adjusted.

3.4 A pair of 6-Pole Convergence Magnets is also provided and adjusted to converge the magenta (red + blue) to green beams (See Fig. 6). When the Pole opens to the left and right 30° symmetrically, the magnetic field is maximized. Red and blue beams both move to the left and right (See Fig. 5). Variation of the opening angle adjusts the convergence of magenta to green vertical lines.

3.5 When both 6-Pole Convergence Magnet Tabs are rotated as a pair, the convergence of magenta to green horizontal lines is adjusted.

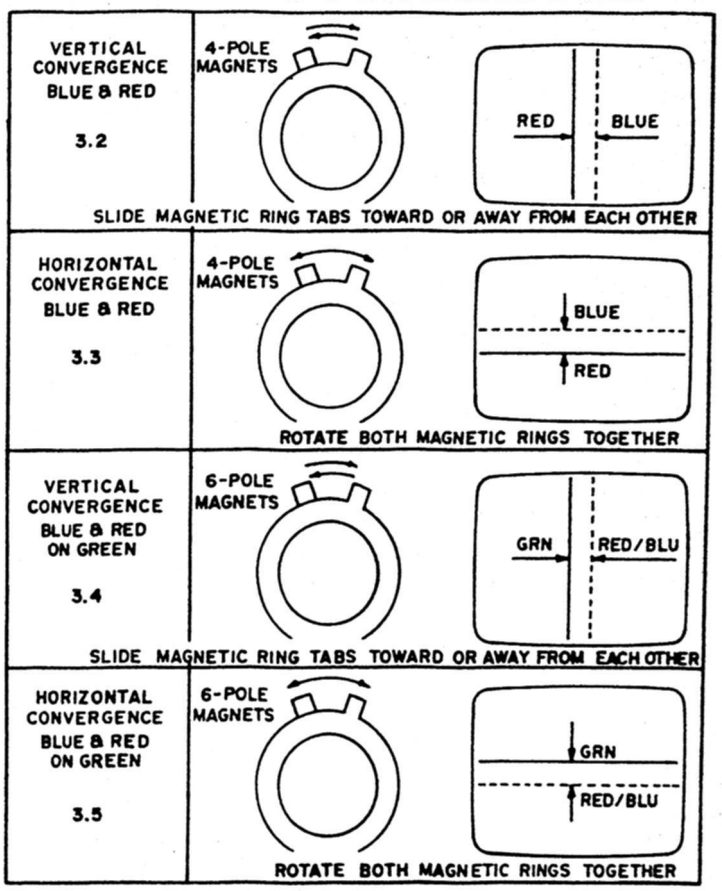


FIGURE 5

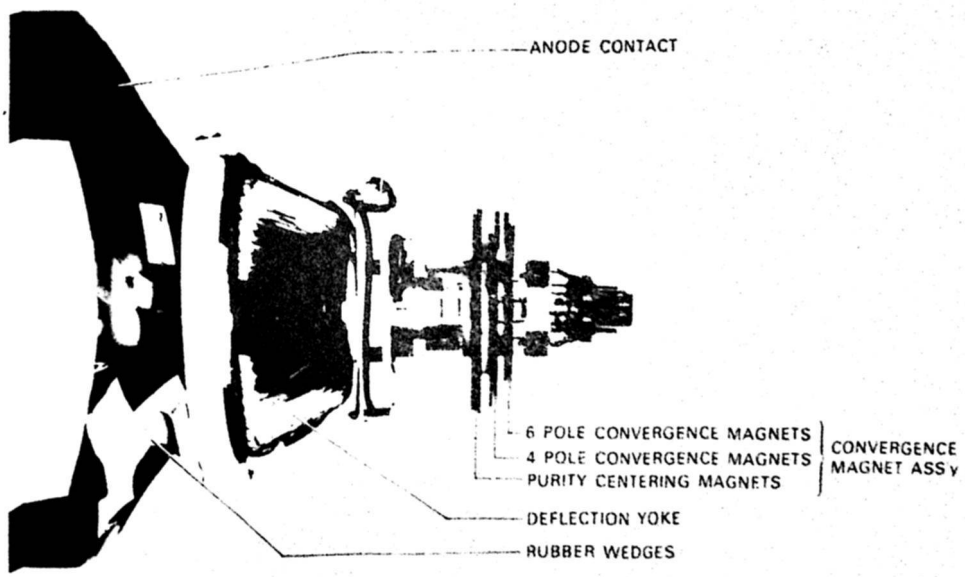


FIGURE 6

4.0 PRECISE ADJUSTMENT OF DYNAMIC CONVERGENCE (See Fig. 7, 8 and 9)

4.1 Feed a cross hatch signal to the monitor.

4.2 Insert a wedge temporarily and fix the Deflection Yoke so as to obtain the best circumference convergence (See Fig. 8 and 9)
NOTE:
The wedges may need to be moved during adjustments.

4.3 Insert three rubber wedges to the position as shown in Fig. 7 to obtain the best circumference convergence.

NOTE:

1) Tilting the angle of the yoke up and down adjusts the crossover of both vertical and horizontal red and blue lines. See Fig. 8 (a) and (b).
2) Tilting the angle of the yoke sideways adjusts the parallel convergence of both horizontal and vertical lines at the edges of the screen. See Fig. 9 (a) and (b).
3) Use three rubber wedges (tapered rubber wedges are used for a purpose).
4) The position of each rubber wedge is shown in Fig. 7.
5) Do NOT force the permanent wedges in. They are to be inserted until they just make contact with the yoke—after the yoke has been positioned.
6) Fix the three permanent rubber wedges with chloroprene rubber adhesive.
7) After the adhesive has dried enough to hold the wedges in place, carefully remove the temporarily installed wedge.

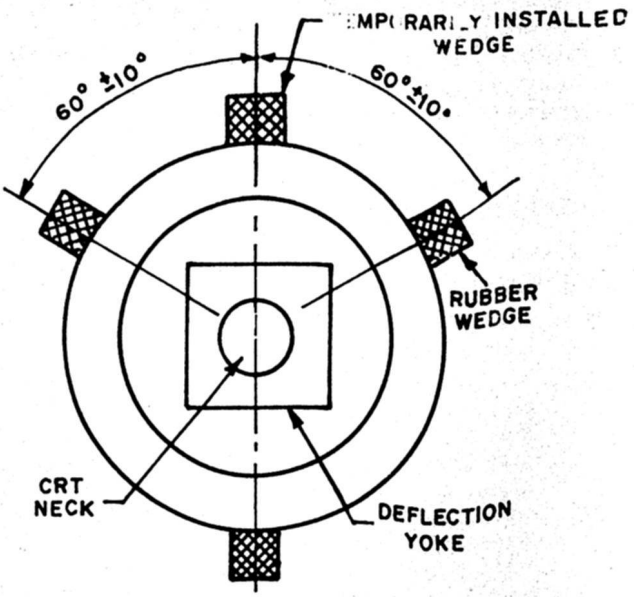


FIGURE 7

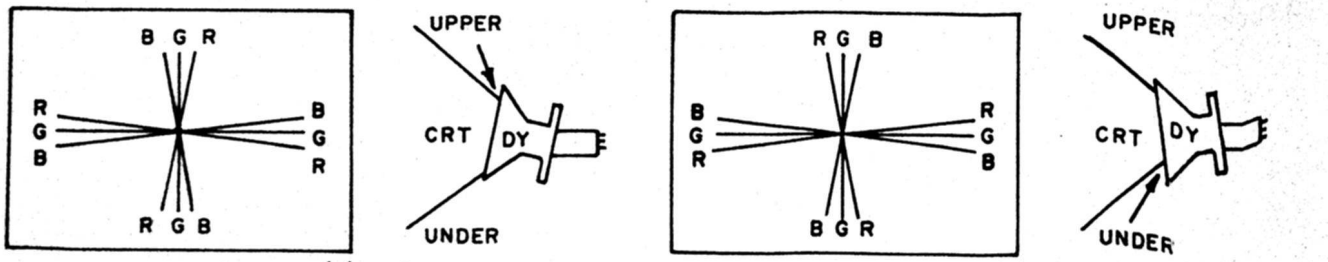


FIGURE 8

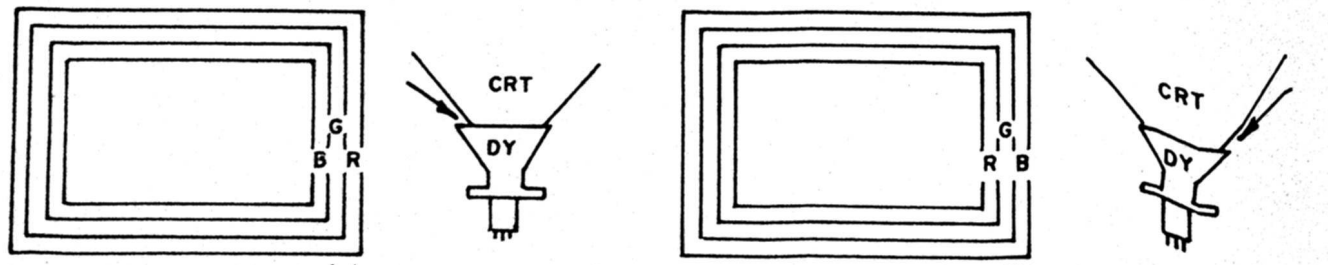


FIGURE 9

5.0 WHITE BALANCE

5.1 Equipment Required: An oscilliscope with a DC coupled mode in the vertical amplifier, or a digital multimeter, or a VOM with a DC input impedance of at least 20,000 ohms/volt.

5.2 Referring to Fig. 1(a) or 1(b) and 3, do the following adjustments in subdued light after degaussing and setting the purity of the CRT.

5.3 Ground the R/G/B video inputs.

5.4 Set the Red and Green drive controls, VR401 and VR402, to approximately 80% of full CW rotation.

5.5 Set the screen and R/G/B cutoff controls to their minimum (fully CCW) positions.

5.6 Connect the oscilloscope, multimeter, or VOM, to the collector of a video output transistor (Q401, Q402, or Q403) on the CRT neck PCB at TP47R, TP47G, or TP47B as shown in Fig. 3.

5.7 Adjust the black level control (VR201) to obtain the waveform shown in Fig. 10 or a +150 volt DC reading on the multimeter or the VOM.

5.8 Slowly turn the screen control CW until the raster is just visible. The color of this raster is called the lead color gun. DO NOT adjust its associated cutoff control. It must remain fully CCW.

5.9 Adjust the screen control CCW until the raster is just extinguished. Then adjust the black level control for a dim raster.

5.10 Adjust the two remaining cutoff controls (NOT the lead color gun cutoff control) for best gray uniformity.

5.11 Adjust the black level control for a bright raster but not maximum brightness. Adjust the R/G drive controls, if necessary, for best neutral white.

5.12 Repeat steps 5.10 and 5.11 until good tracking of white balance is achieved.

5.13 With the oscilloscope, multimeter, or VOM connected to the collector of the lead color video output transistor (See Fig. 3), adjust the black level control to obtain the waveform in Fig. 10 or a +150 volt DC reading on the multimer or VOM.

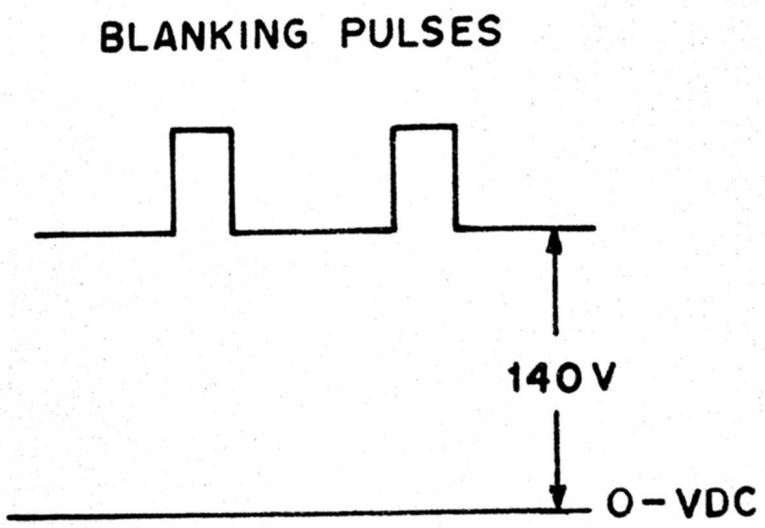


FIGURE 10

REPLACEMENT PARTS LIST

MODELS K4901, K4906, K4951, and K4956

This monitor contains circuits and components included specifically for safety purposes.

For continued protection no changes should be made to the original design, and components shown in shaded areas of schematic, or ★ on parts list should be replaced with exact factory replacement parts.

The use of substitute parts may create a shock, fire, radiation or other hazard. Service should be performed by qualified personnel only.

MAIN BOARD

RESISTORS

Ref. No.	Part No.	Description
R201	203X6500-645	1K Ohm, 5%, 1/4W Carbon
R202	340X2331-934	330 Ohm, 5%, 1/4W Carbon
R203	203X6500-405	100 Ohm, 5%, 1/4W Carbon
R204	203X6700-327	100 Ohm, 5%, 1/2W Carbon
R205	203X6700-421	270 Ohm, 5%, 1/2W Carbon
R206	203X6500-540	390 Ohm, 5%, 1/4W Carbon
R207	340X2221-934	220 Ohm, 5%, 1/4W Carbon
R208	203X6500-540	390 Ohm, 5%, 1/4W Carbon
R209	340X2221-934	220 Ohm, 5%, 1/4W Carbon
R210	203X6500-540	390 Ohm, 5%, 1/4W Carbon
R211	340X2221-934	220 Ohm, 5%, 1/4W Carbon
R214	203X6500-645	1K Ohm, 5%, 1/4W Carbon
R215	203X6501-126	100K Ohm, 5%, 1/4W Carbon
R216	203X6500-645	1K Ohm, 5%, 1/4W Carbon
R217	203X6500-405	100 Ohm, 5%, 1/4W Carbon
R218	203X6500-645	1K Ohm, 5%, 1/4W Carbon
R219	203X6501-126	100K Ohm, 5%, 1/4W Carbon
R220	203X6500-645	1K Ohm, 5%, 1/4W Carbon
R221	203X6500-405	100 Ohm, 5%, 1/4W Carbon
R222	203X6500-762	3.3 Ohm, 5%, 1/4W Carbon
R224	203X6500-169	10 Ohm, 5%, 1/4W Carbon
R225	203X6500-169	10 Ohm, 5%, 1/4W Carbon
R226	203X6500-169	10 Ohm, 5%, 1/4W Carbon
R227	203X6501-044	47K Ohm, 5%, 1/4W Carbon
R228	340X2152-934	1.5K Ohm, 5%, 1/4W Carbon
R229	203X6700-421	270 Ohm, 5%, 1/2W Carbon
R230	203X6500-863	8.2K Ohm, 5%, 1/2W Comp.
R231	203X6500-863	8.2K Ohm, 5%, 1/2W Comp.
R232	203X6500-863	8.2K Ohm, 5%, 1/2W Comp.
R233	203X6500-468	180 Ohm, 5%, 1/4W Carbon
R234	340X2820-934	82 Ohm, 5%, 1/4W Carbon
R235	340X2820-934	82 Ohm, 5%, 1/4W Carbon
R236	340X2820-934	82 Ohm, 5%, 1/4W Carbon
R301	203X6500-508	270 Ohm,5%, 1/4W Carbon
R302	203X6500-863	8.2K Ohm, 5%, 1/4W Carbon
R303	203X6500-863	8.2K Ohm, 5%, 1/4W Carbon
R304	203X6500-724	2.2K Ohm, 5%, 1/4W Carbon
R305	203X6500-842	6.8K Ohm, 5%, 1/4W Carbon
R306	203X6003-201	7.5K Ohm, 2%, 1/4W Carbon
R307	203X6500-825	5.6K Ohm, 5%, 1/4W Carbon
R309	203X6500-965	22K Ohm, 5%, 1/4W Carbon
R310	203X6500-988	39K Ohm, 5%, 1/4W Carbon
R311	203X9014-709	3.3K Ohm, 5%, 1W Carbon
R312	203X9014-741	4.7K Ohm, 5%, 1W Metal Oxide
R313	204X1527-528	470 Ohm, 5%, 7W Carbon
R314	203X6500-481	220 Ohm, 5%, 1/4W Carbon
R315	203X6500-169	10 Ohm, 5%, 1/4W Carbon
R317	203X6700-061	8.2 Ohm, 5%, 1/2W Carbon
R318	203X6500-584	560 Ohm, 5%, 1/4W Carbon
R319	203X6500-645	1K Ohm, 5%, 1/4W Carbon
R320	203X6501-002	33K Ohm, 5%, 1/4W Carbon
R321	203X6501-224	270K Ohm, 5%, 1/2W Carbon
R322	203X6500-886	10K Ohm, 5%, 1/4W Carbon
R351	203X6500-886	10K Ohm, 5%, 1/4W Carbon
R352	203X6500-785	3.9K Ohm, 5%, 1/4W Carbon
R353	203X6501-088	68K Ohm, 5%, 1/4W Carbon
R354	203X6500-762	3.3K Ohm, 5%, 1/4W Carbon
R355	203X9205-143	6.8K Ohm, 5%, 3W Metal Oxide
R358	340X3663-934	68K Ohm, 5%, 1/2W Carbon
R360	203X6500-561	470 Ohm, 5%, 1/4W Carbon
R361	203X6500-886	10K Ohm, 5%, 1/4W Carbon
R362	203X9014-645	1.8K Ohm, 5%, 1W Metal Oxide
★ R363	204X1450-516	3.9K Ohm, 5%, 5W Metal Oxide
R364	203X6500-246	22 Ohm, 5%, 1/4W Carbon
R365	340X2183-934	18K Ohm, 5%, 1/4W Carbon
R367	203X6500-886	10K Ohm, 5%, 1/4W Carbon
R368	203X6502-185	330K Ohm, 5%, 1/2W Comp.
R369	203X6502-329	680K Ohm, 5%, 1/2W Comp.

RESISTORS (Cont.)

Ref. No.	Part No.	Description
R370	203X8501-002	33K Ohm, 5%, 1/4W Carbon
R371	203X9014-584	1K Ohm, 5%, 1W Metal Oxide
R372	203X9104-809	12K Ohm, 5%, 2W Metal Oxide
R375	203X9014-724	3.9K Ohm, 5%, 1W Carbon
R376	203X9104-404	270 Ohm, 5%, 2W Metal Oxide
R377	203X6500-447	150 Ohm, 5%, 1/4W Carbon
R378	203X6500-886	10K Ohm, 5%, 1/4W Carbon
R379	203X8500-886	10K Ohm, 5%, 1/4W Carbon
R380	203X6500-865	8.2K Ohm, 5%, 1/4W Carbon
R381	203X6500-724	2.2K Ohm, 5%, 1W Metal Oxide
R383	203X9014-387	150 Ohm, 5%, 1W Metal Oxide
R384	203X6501-088	68K Ohm, 5%, 1/4W Carbon
R385	340X2224-934	1.2K Ohm, 5%, 1/4W Carbon
R387	340X2224-934	220K Ohm, 5%, 1/4W Carbon
R389	340X5183-633	18K Ohm, 5%, 2W Metal Oxide
R390	340X4222-633	2.2K Ohm, 5%, 2W Metal Oxide
R502	203X6500-886	10K Ohm, 5%, 1/4W Carbon
R503	204X1700-535	150 Ohm, 5%, 15W Metal Oxide
R504	203X9014-267	47 Ohm, 5%, 1W Metal Oxide
R505	203X8501-209	220K Ohm, 5%, 1/4W Carbon
R506	204X1425-196	15 Ohm, 5%, 5W Wire Wound
R507	203X5602-185	330K Ohm, 5%, 1/2W Comp.
△★ R601	204X1625-058	3.3 Ohm, 5%, 10W WW
R701	203X9105-141	2.2 Ohm, 5%, 2W Metal Oxide
R702	203X6206-441	2.2 Ohm, 5%, 1/2W Carbon
VR201	204X2070-072	2K Ohm-B Semi-Fixed
VR301	204X2070-084	5K Ohm-B Semi-Fixed
VR302	204X2070-084	5K Ohm-B Semi-Fixed
VR303	204X2070-055	500 Ohm-B Semi-Fixed
VR351	204X2070-072	2K Ohm-B Semi-Fixed
VR352	204X2070-072	2K Ohm-B Semi-Fixed

CAPACITORS

Ref. No.	Part No.	Description
C201	203X0014-088	1000 uF, 16V, Electrolytic
C202	202X7200-064	330 pF, 500V, Ceramic
C203	202X7200-043	220 pF, 500V, Ceramic
C204	202X7200-043	220 pF, 500V, Ceramic
C205	203X0014-076	470 uF, 16V, Electrolytic
C206	203X1810-149	0.1 uF, 125V Mylar
C207	349X2232-109	.022 uF, 100V Mylar
C301	203X0014-065	330 uF, 50V Electrolytic
C302	203X1600-563	.022 uF, 50V Mylar
C303	203X0629-037	2.2 uF, 50V Electrolytic
C304	203X1600-366	.0068 uF, 50V Mylar
C306	203X0412-012	2.2 uF, 16V Tantalum
C307	203X1600-634	0.033 uF, 50V Mylar
C308	203X0025-163	2.2 uF, 50V Electrolytic
C309	203X1207-100	0.068 uF, 100V PP
C310	203X0629-061	10 uF, 100V Electrolytic
C311	203X0041-162	4.7 uF, 160V Electrolytic
C312	202X7500-248	1000 pF, 500V Ceramic
C313	203X0040-068	100 uF, 160V Electrolytic
C314	203X1201-096	0.039 uF, 200V PP
C315	203X0629-023	1 uF, 50V Electrolytic
C351	203X0629-023	1 uF, 50V Electrolytic
C352	203X0619-045	47 uF, 25V Electrolytic
C353	203X1190-015	0.0082 pF, 50V Mylar-PP
C354	203X0619-045	47 uF, 25V Electrolytic
C355	203X1600-366	0.0068 pF, 50V Mylar
C356	203X1130-287	0.0047 uF, 50V Mylar
C359	202X8065-606	100 pF, 500V Ceramic
C360	202X7050-366	0.0033 pF, 500V Ceramic
C361	202X7050-483	0.01 uF, 500V Ceramic
C362	202X7203-032	0.01 uF, 50V Ceramic
△★ C363	203X1270-911	8700 pF, 1.5 KV PP
C365	203X1201-265	0.33 uF, 200V PP
C366	203X0019-026	22 uF, 25V Electrolytic

MAIN BOARD (CONT.)

CAPACITORS (Cont.)

Ref. No.	Part No.	Description
C367	202X8065-162	6 pF, 500V Ceramic
C368	202X7203-032	0. 1 uF, 50V
C369	203X1207-087	0.047 uF, 100V, PP
C372	203X1207-125	0.1 uF, 100V PP
C373	203X0029-021	1 uf, 50V, Electrolytic
C380	202X7200-087	470 pF, 500V Ceramic
C381	80X0099-006	470 pF, 500V, Ceramic
⚠ C501	203X1810-149	0.1 uF, 125V Mylar
⚠ C502	202X7050-282	1500 pF, 500V Ceramic
⚠ C503	202X7810-214	2200 pF, 125V Ceramic
⚠ C504	202X7810-214	2200 pF, 125V Ceramic
C505	203X0220-075	560 uF, 200V Electrolytic
C506	203X0040-034	22 uF, 160V Electrolytic
C507	203X0041-057	47 uF, 160V Electrolytic
C701	203X0019-092	1000 uF, 25V Electrolytic
C702	203X0634-061	10 uF, 100V Electrolytic
C703	202X7050-248	1000 pF, 500V Ceramic

SEMICONDUCTORS

D203	201X2010-159	Diode, IS2076-27
D204	201X2010-159	Diode, IS2076-27
D205	201X2010-159	Diode, IS2076-27
D206	201X2010-159	Diode, IS2076-27
D207	201X2010-159	Diode, IS2076-27
D208	201X2010-159	Diode, IS2076-27
D209	201X2010-159	Diode, IS2076-27
D302	201X2010-159	Diode, IS2076-27
D303	201X2010-159	Diode, IS2076-27
D304	201X2120-009	Diode, RH-IV
D305	201X2120-009	Diode, RH-IV
D306	201X2010-159	Diode, IS2076-27
D307	201X2010-165	Diode, ISS81
⚠ D501	201X3120-216	Diode, RM-1AV
⚠ D502	201X3120-216	Diode, RM-1AV
⚠ D503	201X3120-216	Diode, RM-1AV
⚠ D504	201X3120-216	Diode, RM-1AV
D505	201X3120-216	Diode, RM-1AV
D506	201X3120-216	Diode, RM-1AV
D701	201X2130-234	Diode, RU-2V
D702	201X2120-009	Diode, RH-1V
Q201	200X3181-523	Transistor (NPN) 2SC1815GR
Q202	200X3181-523	Transistor (NPN) 2SC1815GR

SEMICONDUCTORS (Cont.)

Q203	200X4056-260	Transistor (PNP) 2SA562-Y-TM
Q204	200X4056-260	Transistor (PNP) 2SA562-Y-TM
Q205	200X4056-260	Transistor (PNP) 2SA562-Y-TM
Q206	200X3181-523	Transistor (NPN) 2SC1815GR
Q207	200X3181-523	Transistor (NPN) 2SC1815GR
Q208	200X3181-523	Transistor (NPN) 2SC1815GR
Q209	200X3181-523	Transistor (NPN) 2SC1815GR
Q210	200X3181-523	Transistor (NPN) 2SC1815GR
Q301	200X3181-523	Transistor (NPN) 2SC1815GR
Q302	200X3207-306	Transistor (NPN) 2SC2073LBGL2
Q303	200X3207-306	Transistor (NPN) 2SC2073LBGL2
Q351	200X3248-217	Transistor (NPN) 2SC2482BK
Q352	200X4589-802	Transistor (NPN) 2SD898B
ZD301	66X0040-031	Diode, Zener 24V, 3%, 1/2W
IC301	200X2300-033	IC HA11423
△★ IC501	200X2600-183	IC STR381

TRANSFORMERS & COILS

■ L351	201X4710-134	Coil, (RF Choke)
★ L352	201X5000-083	Coil, Horiz. Size
L701	611X0005-005	Coil, Degaussing
T351	202X1300-080	Transformer, Hor. Drive
△★ T352	200X9720-301	HV-Unit M-11
■ L351		Omitted from late versions

MISCELLANEOUS

△ F501	204X7120-073	Fuse, 4 Amp. 125V
J402	206X5008-632	Recep W Wire 3P-M-BG
P201	204X9600-466	Plug, PWB 3P-J
P202	204X9601-477	Plug, PWB 6P-Q
P401	204X9600-298	Plug, PWB 4P-B
P501	204X9600-249	Plug, PWB 2P-B
P601	204X9600-304	Plug, PWB 4P-C
TH501	201X0100-112	Thermistor

FINAL ASSEMBLY PARTS

△★	88X0138-506	19VLTP22 Pix Tube
	205X9800-158	Lateral/Purity Assembly
△★	202X1111-258	Yoke Deflection
or	202X1111-264	
	291X5004-262	Automatic Degaussing Coil Unit

NECK BOARD

RESISTORS

R401	203X6000-729	220 Ohm, 5% 1/4W Carbon
R402	203X6500-540	390 Ohm, 5% 1/4W Carbon
R403	203X6000-661	820 Ohm, 5% 1/4W Carbon
R404	203X6000-729	220 Ohm, 5% 1/4W Carbon
R405	203X6500-540	390 Ohm, 5% 1/4W Carbon
R406	203X6000-661	820 Ohm, 5% 1/4W Carbon
R407	203X6000-729	47 Ohm, 5% 1/4W Carbon
R408	203X6000-998	270 Ohm, 5% 1/4W Carbon
R409	203X6000-661	820 Ohm, 5% 1/4W Carbon
R410	203X9104-824	15K Ohm, 5% 2W M.O. Forming
R411	203X9104-824	15K Ohm, 5% 2W M.O. Forming
R412	203X9104-824	15K Ohm, 5% 2W M.O. Forming
R413	203X6000-998	2.7K Ohm, 5% 1/2W Comp.
R414	203X6000-998	2.7K Ohm, 5% 1/2W Comp.
R415	203X6000-998	2.7K Ohm, 5% 1/2W Comp.
R416	203X9105-154	2.2 Ohm, 5% 2W Metal Oxide
R419	203X6500-741	2.7K Ohm, 5% 1/4W Carbon
R420	203X6500-741	2.7K Ohm, 5% 1/4W Carbon
R421	203X6500-741	2.7K Ohm, 5% 1/4W Carbon
VR401	204X2115-014	500 Ohm, -B Semi-Fixed
VR402	204X2115-014	500 Ohm, -B Semi-Fixed
VR403	204X2115-006	5K Ohm, -B Semi-Fixed
VR404	204X2115-006	5K Ohm, -B Semi-Fixed
VR405	204X2115-006	5K Ohm, -B Semi-Fixed

CAPACITORS

C401	202X7050-269	1200 pF, 500V Ceramic
C402	202X7050-248	1000 pF, 500V Ceramic
C403	202X7050-248	1000 pF, 500V Ceramic
C404	202X7050-282	1500 pF, 1.5KV Ceramic
C405	202X7050-483	0.01 uF, 500V Ceramic

SEMICONDUCTORS

Q401	200X3206-800	Transistor (NPN) 2SC2068LB
Q402	200X3206-800	Transistor (NPN) 2SC2068LB
Q403	200X3206-800	Transistor (NPN) 2SC2068LB

MISCELLANEOUS

J401	206X5009-296	RECEP W Wire 4P-E
P402	204X9600-254	Plug, PWB 3P-A
P403	204X9600-981	Plug, 1 Pin
P701	204X9601-020	Plug, PWB 4P-E
	204X9301-255	CRT Socket

VERTICAL POSITION BOARD (P344)

RESISTORS

VR901	40X0645-001	25K Ohm Vert. Position Control

SEMICONDUCTORS

Q901	86X0127-001	Transistor (NPN) TPS98

REPLACEMENT PARTS LIST

Ref. No.	Part No.	Description

MODELS K4902, K4952

Same as K4901, K4906, K4951, K4956 except:

C365	46X0536-021	0.27uF, 200V, PP
R389		Omitted from certain versions of these models.
L351		Omitted from late versions.

MODEL K4903, K4953

Same as K4901, K4906, K4951, K4956 except:

C365	46X0536-022	0.15 uF, 400V, PP
R389		Omitted from these models.
L351		Omitted from late versions of these models.
	Add the following to late versions:	
C385	46X0536-037	820 pF, 1600V, PP, 5%

MODELS K4911, K4961

Same as K4901, K4906, K4951, K4956 except:

MAIN BOARD

RESISTORS

R206	340X2221-934	220 Ohm, 5%, 1/4W Carbon
R208	340X2221-934	220 Ohm, 5%, 1/4W Carbon
R210	340X2221-934	220 Ohm, 5%, 1/4W Carbon
R229	340X3391-934	390 Ohm, 5%, 1/2W Carbon

CAPACITORS

C202	80X0099-020	680 pF, 500V, Ceramic
C203	80X0099-012	560 pF, 500V, Ceramic
C204	80X0099-006	470 pF, 500V, Ceramic

TRANSFORMERS AND COILS

L351		Omitted from late versions.

NECK BOARD

CAPACITORS

C406	80X0099-020	680 pF, 500V, Ceramic
C407	80X0099-020	680 pF, 500V, Ceramic

MODEL K4904

Same as K4901, K4906, K4951, K4956 except:

MAIN BOARD

RESISTORS

R391	340X221-934	220 Ohm, 5%, 1/4W Carbon

CAPACITORS

C365	46X0536-025	0.56 uF, 200V, PP
C390	46X0544-004	0.012 uF, 100V, PP

TRANSFORMERS AND COILS

L352	9A2813-003	Coil, Horiz. Lin.
★L601	9A2822-001	Coil, Horiz. Size
L351		Omitted from late versions.

MODEL K4956R

*Same as K4901, K4906, K4956, except add the following:

RELAY BOARD (P 340)

RESISTORS

R801	340X2162-934	1.6K Ohm, 5%, 1/4W Carbon
R802	340X2473-934	47K Ohm, 5%, 1/4W Carbon
R803	340X2222-934	2.2K Ohm, 5%, 1/4W Carbon
R804	340X2514-934	510K Ohm, 5%, 1/4W Carbon
R805	340X2102-934	1K Ohm, 5%, 1/4W Carbon

SEMICONDUCTORS

D801	66X0046-001	Diode, Silicon FDH-444
Q801	86X0113-001	Transistor (NPN) 2N3904
Q802	86X0113-001	Transistor (NPN) 2N3904

MISCELLANEOUS

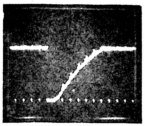
K801	2A0685-001	Relay, 12V, DPDT
K802	2A0685-001	Relay, 12V, DPDT
J601	3A0627-004	Socket, 4 Pin
P802	6A0393-004	Plug, 3 Pin, Right Angle
P803	6A0406-001	Plug, 4 Pin

*NOTE: *L351 omitted from all late versions of all models included in this manual.*

OSCILLOSCOPE WAVEFORM PATTERNS

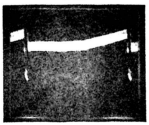
The waveforms are as observed on the wide band oscilloscope with the monitor turned to a reasonably strong signal and a normal picture. The voltages shown on each waveform are the approximate peak amplitudes. If the waveforms are observed on the oscilloscope with a poor high frequency response, the corner of the pulses will tend to more rounded than those shown and the amplitude of any high frequency pulse will tend to be less.

A



2V/DIV 100uSEC/DIV

TP-81

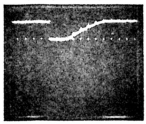


0.5V/DIV 2mSEC/DIV

Q351 COLLECTOR

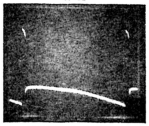
20V/DIV 10uSEC/DIV

TP-31 DC COUPLED
BOTTOM LINE = 0 VDC



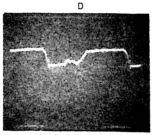
2V/DIV 100uSEC/DIV

TP-82



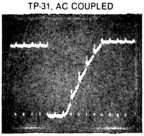
20V/DIV 2mSEC/DIV

D



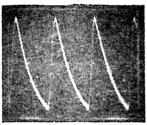
2V/DIV 10uSEC/DIV

TP-31, AC COUPLED



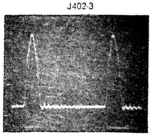
0.5V/DIV 100uSEC/DIV

B



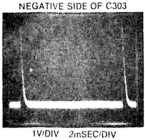
0.2V/DIV 20uSEC/DIV

J402-3



5V/DIV 10uSEC/DIV

NEGATIVE SIDE OF C303

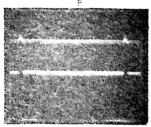


1V/DIV 2mSEC/DIV

IC 301/PIN 13

1V/DIV 20uSEC/DIV

F

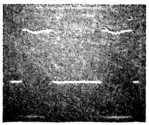


1V/DIV 2mSEC/DIV

IC 301/PIN 3

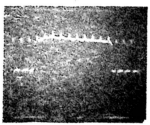
0.5V/DIV 5mSEC/DIV

IC 301/PIN 15



1V/DIV 10uSEC/DIV

F



1V/DIV 100uSEC/DIV

Power Supply Voltage and Symbols

Symbol	Voltage	Operating Circuit
■	15V	Vert. Osc. Sync Blanking CRT Cut-Off
⊗	130V	Horiz. Osc. Horz. Drive Horz. Output Vert. Output
⊙	175V	Video Output

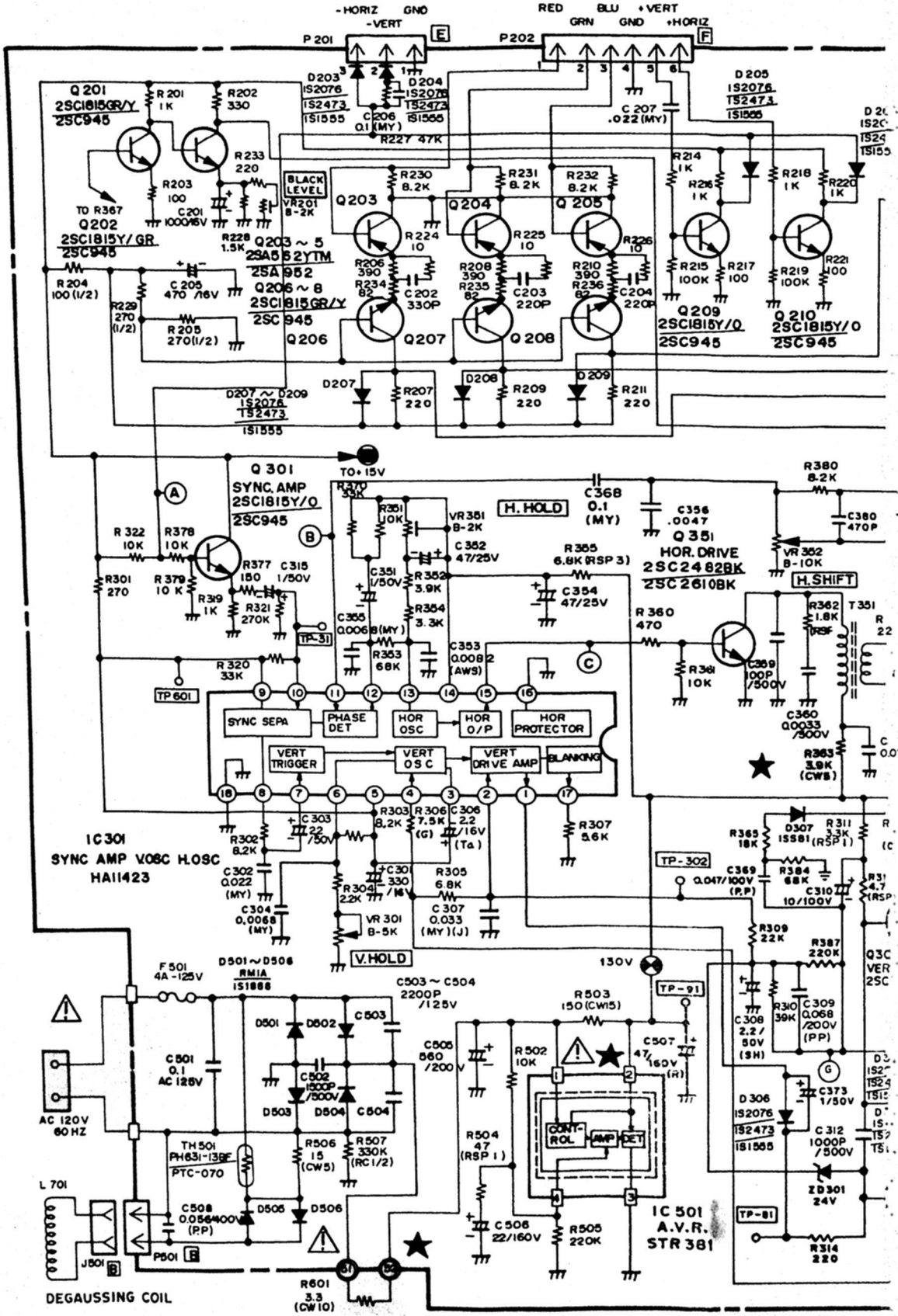
⚠

CAUTION: FOR CONTINUED SAFETY, REPLACE SAFETY CRITICAL COMPONENTS ONLY WITH MANUFACTURER'S RECOMMENDED PARTS.
AVERTISSEMENT: POUR MAINTENIR LE DEGRE DE SECURITE DE L'APPAREIL NE REMPLACER LES COMPOSANTS DONT LE FONCTIONNEMENT EST CRITIQUE POUR LA SECURITE QUE PAR DES PIECES RECOMMANDEES PAR LE FABRICANT.

★

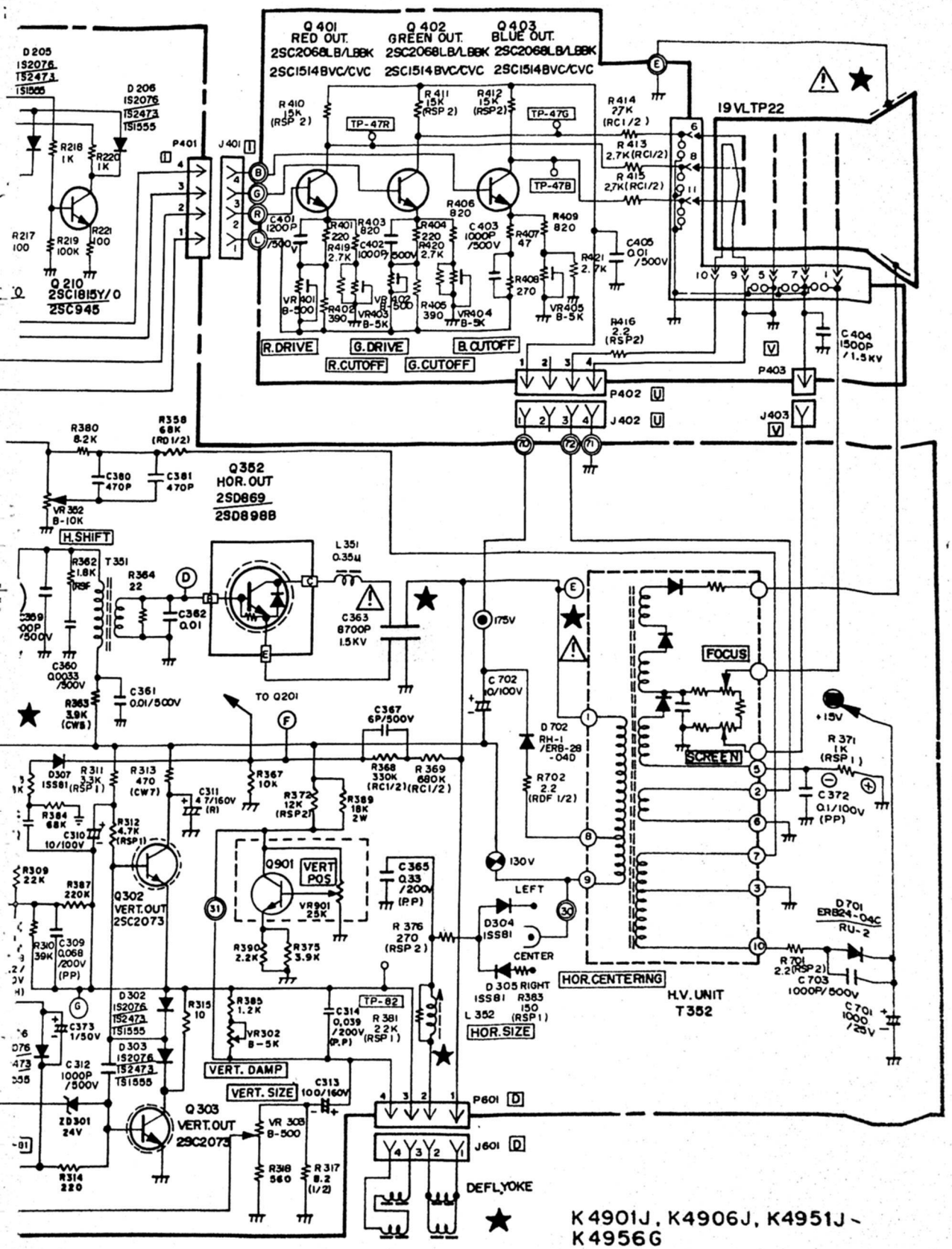
SERVICE TECHNICIAN WARNING
X-RAY RADIATION PRECAUTION:

THIS PRODUCT CONTAINS CRITICAL ELECTRICAL AND MECHANICAL PARTS ESSENTIAL FOR X-RAY RADIATION PROTECTION.
FOR REPLACEMENT PURPOSES, USE ONLY TYPE PARTS SHOWN IN THE PARTS LIST.

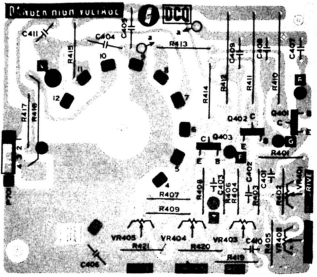


MONITOR SCHEMATIC DIAGRAM

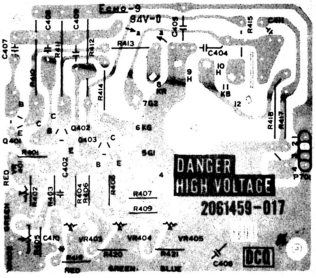
19K4901, 19K4906, 19K4951, 19K4956



PC BOARD LAYOUT



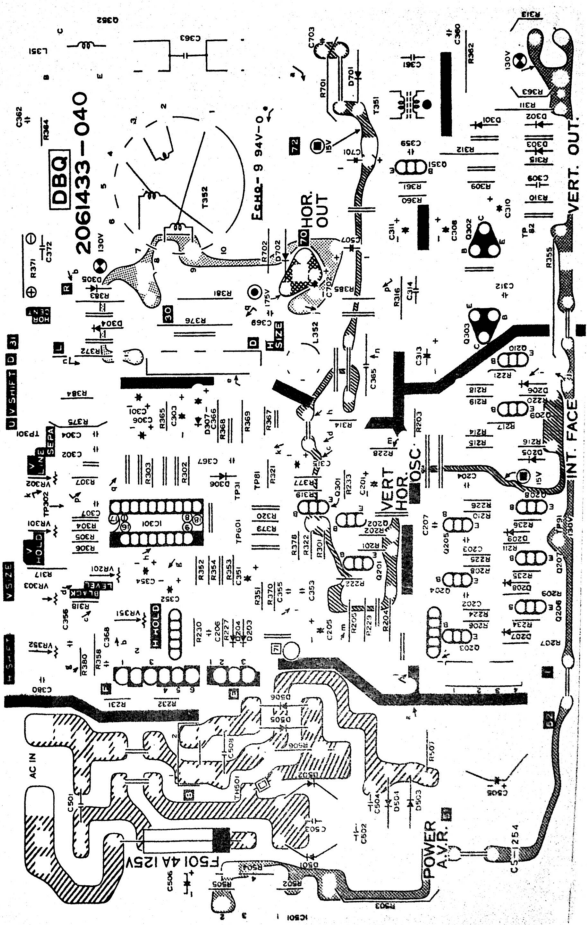
VIEW OF COMPONENT SIDE



VIEW OF FOIL SIDE

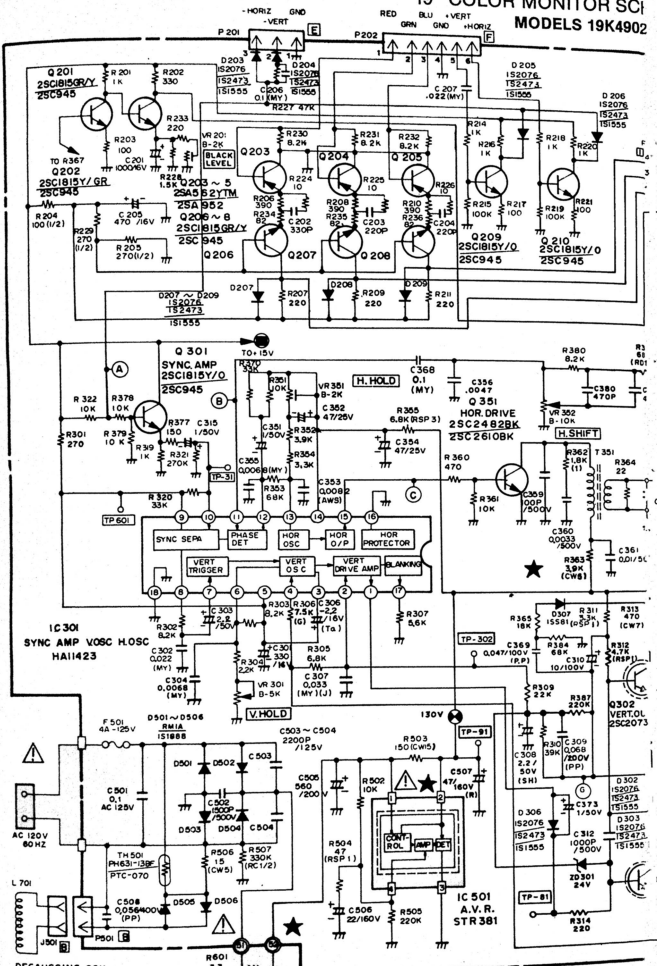
FIGURE 12 NECK PC BOARD

PC BOARD LAYOUT



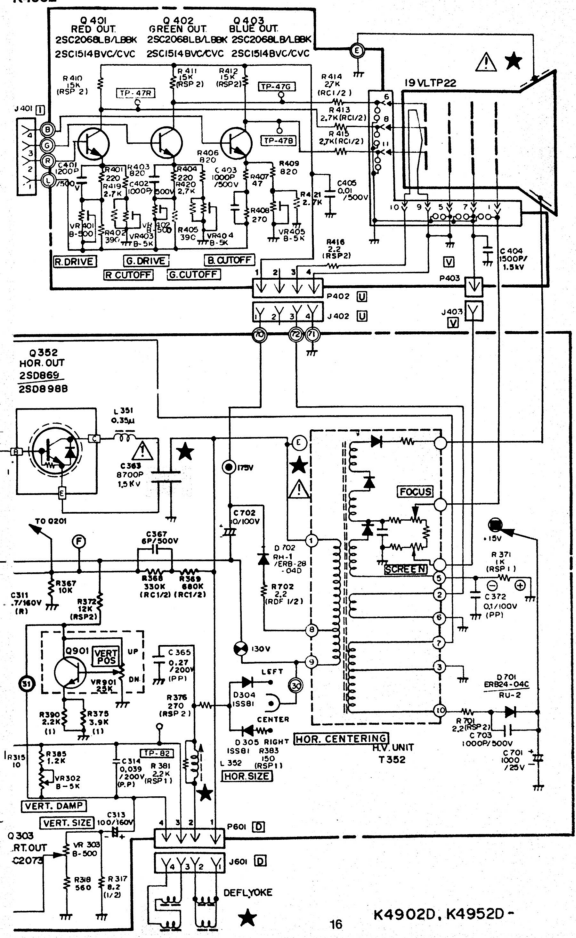
19" COLOR MONITOR SCI

MODELS 19K4902



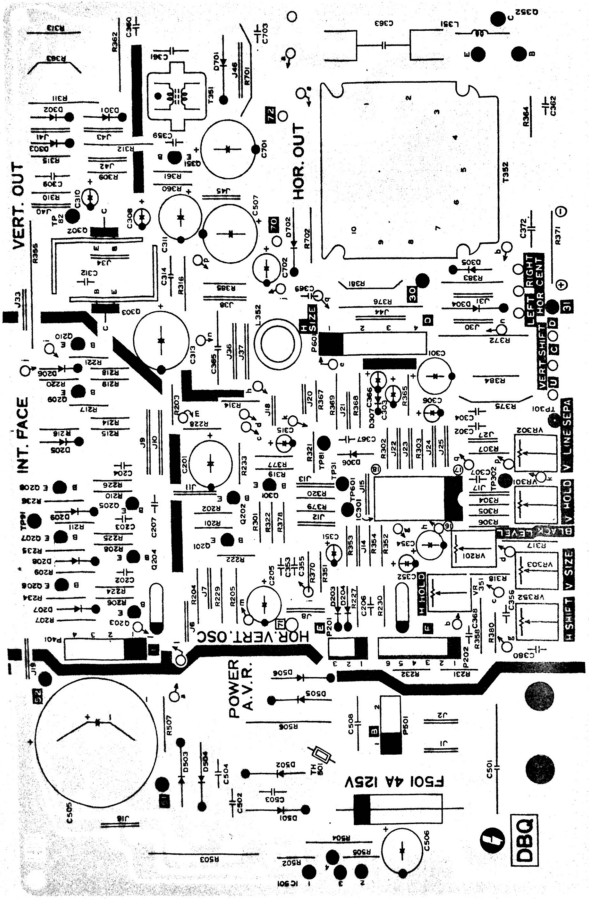
1ATIC DIAGRAM

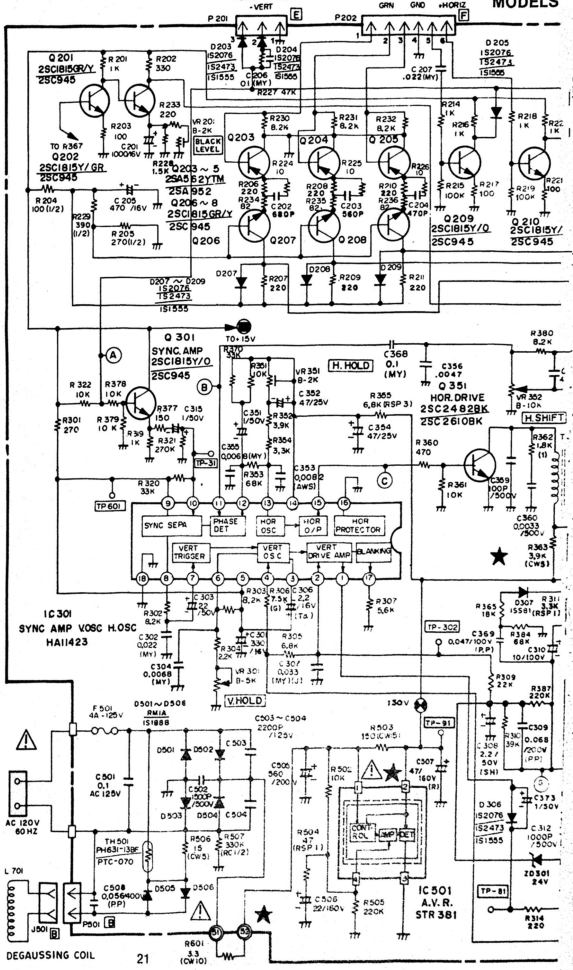
K4952



K4902D, K4952D-

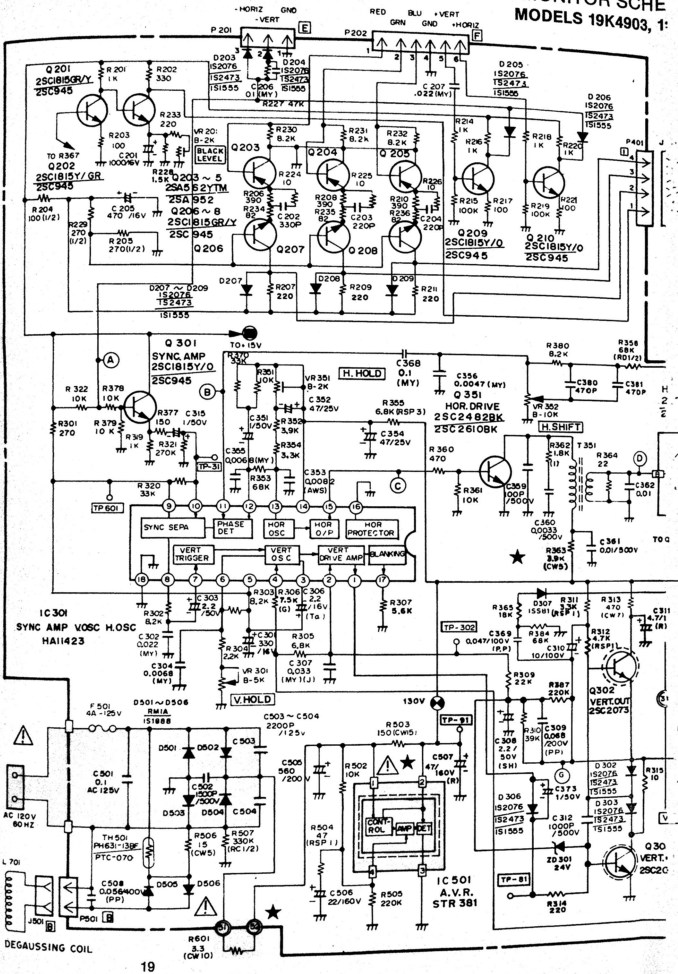
PC BOARD LAYOUT




-HORIZ GND
-VERT
P 201
E
RED BLU +VERT
GRN GND +HORIZ
P202
F
D203 D204 D205
Q 201 2SC1815GR/Y 2SC945
R 201 1K
R202 330
R233 220
R203 100
C201 1000/16V
VR 201 B-2K BLACK LEVEL
TO R367
Q202 2SC1815Y/GR 2SC945
R231 1.5K
Q203 ~ 5 2SA952F2YTM 2SA952
Q206 ~ 8 2SC1815GR/Y 2SC945
Q206
Q207
Q 208
Q 209 2SC1815Y/O 2SC945
Q 210 2SC1815Y/ 2SC945
R204 100 (1/2)
R229 390 (1/2)
C205 470 /16V
R205 270Ω(1/2)
D207 ~ D209 1S2076 1S2473 1S1555
D207
D208
D209
R207 220
R209 220
R211 220
T0+15V
Q 301 SYNC. AMP 2SC1815Y/O 2SC945
R370 5K
R361 10K
VR 351 B-2K
H. HOLD
C368 0.1 (MY)
C356 .0047
Q 351 HOR. DRIVE 2SC2482BK 2SC2610BK
R380 8.2K
VR 352 B-10K
H.SHIFT
R322 10K
R378 10K
R377 150
C315 1/50V
R301 270
R379 10K
R39 1K
R321 270K
C351 1/50V
R352 3.9K
R354 3.3K
C355 .0068 (MY)
TP-311
R365 6.8K RSP 3)
C354 47/25V
R360 470
R362 1.8K (1)
R361 10K
C359 100P /50V
C360 .00033 /500V
R363 3.9K (CW5)
C353 0.0082 (MS)
R353 6.8K
R320 33K
TP 601
SYNC SEPA
PHASE DET
HOR OSC
HOR D/P
HOR PROTECTOR
VERT TRIGGER
VERT OSC
VERT DRIVE AMP
BLANKING
IC 301 SYNC AMP VOSC H.OSC HA11423
R302 8.2K
C303 22 /50V
R303 8.2K
R306 2.2K 1/6W (Ta)
C306 2.2 /16V (Ta)
R307 5.6K
C302 0.022 (MY)
R304 22K
C301 330 /16
R305 6.8K /16
C307 0.033 (MY)(J)
C304 0.0068 (MY)
VR 301 B-5K
V.HOLD
R365 18K
D307 1S1588 (RSP1)
R311 3.3K (RSP1)
TP-302
C369 0.047/100~ (PP)
R384 68K
C310 10/120V
R309 22K
R387 220K (RSP1)
R365 18K
R384 68K
C309 0.068 /100 (PP)
C308 2.2 / 50V (SH)
130V
TP-91
R503 15Ω(2W5)
C307 47 /160V (R)
R306 39K
D306 1S2076 1S2473 1S1555
C373 1/50V
C312 1000P /500V
ZD301 24V
TP-81
R314 220
F 501 4A-125V
RM1A S1888
D501~D506
D501
D502
D503
D504
D505
D506
C503
C503 ~ C504 2200P /125V
C505 560 /200V
C501 0.1 AC125V
C502 .022 /500V
AC 120V 60HZ
TH501 PH451-13E PTC-070
R506 15 (CW5)
R507 330K (RC1/2)
R502 10K
R504 47 (RSP1)
CONT. SCL SMP DET
C506 22/160V
R505 220K
IC 501 A.V.R. STR 381
L 701
C508 0.056400 (PP)
J501
P501
R601 3.3 (CW10)
DEGAUSSING COIL

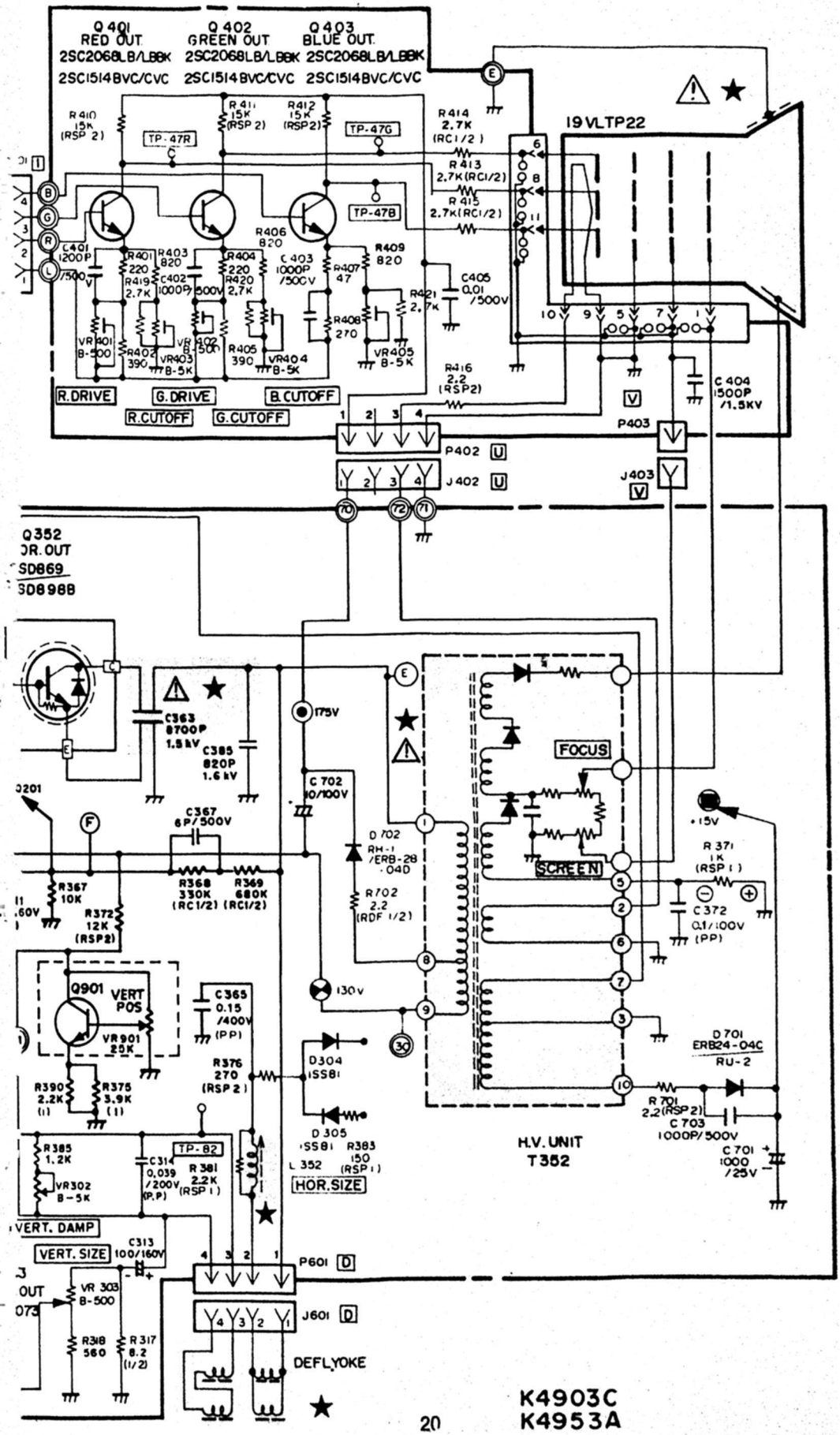
19" COLOR MONITOR SCHE

MODELS 19K4903, 1

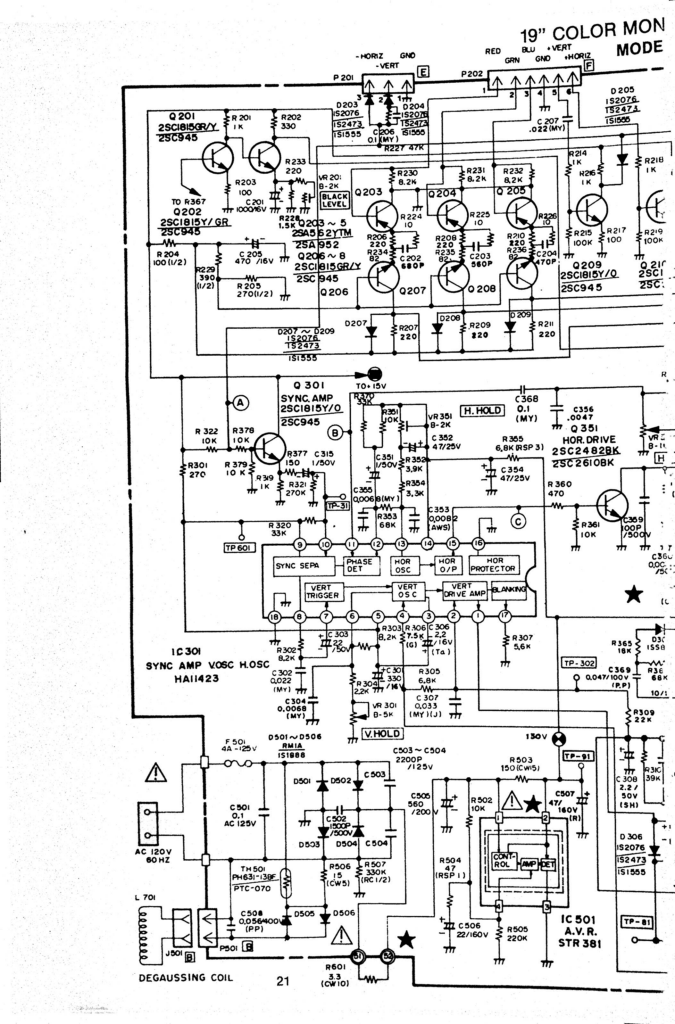


MATIC DIAGRAM

K4953

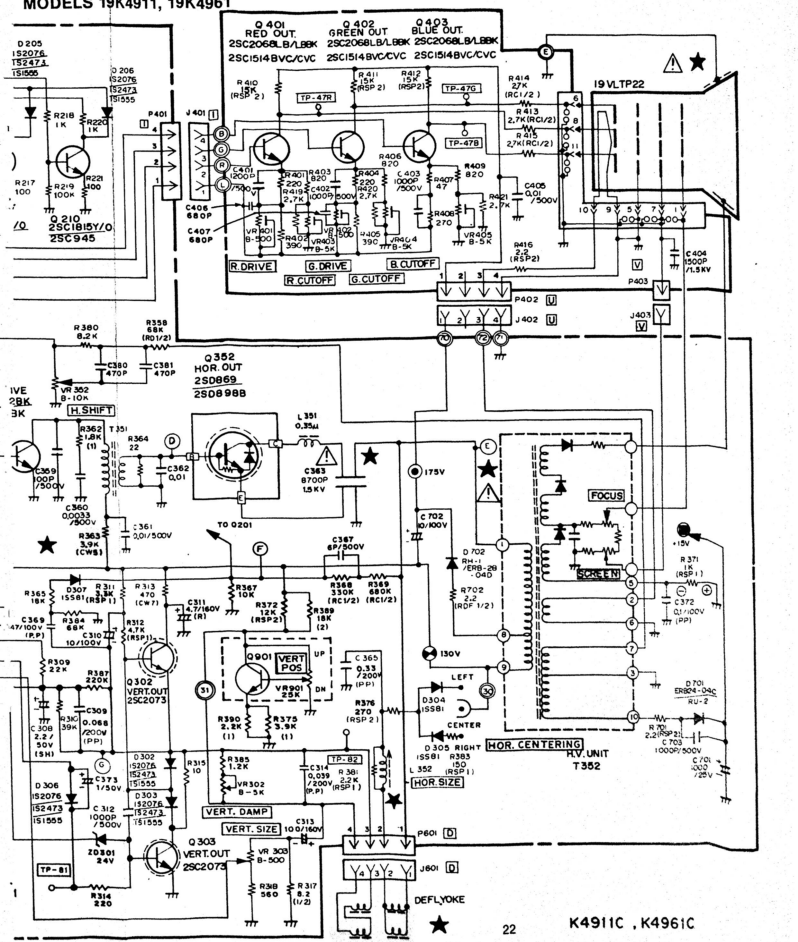


K4903C
K4953A

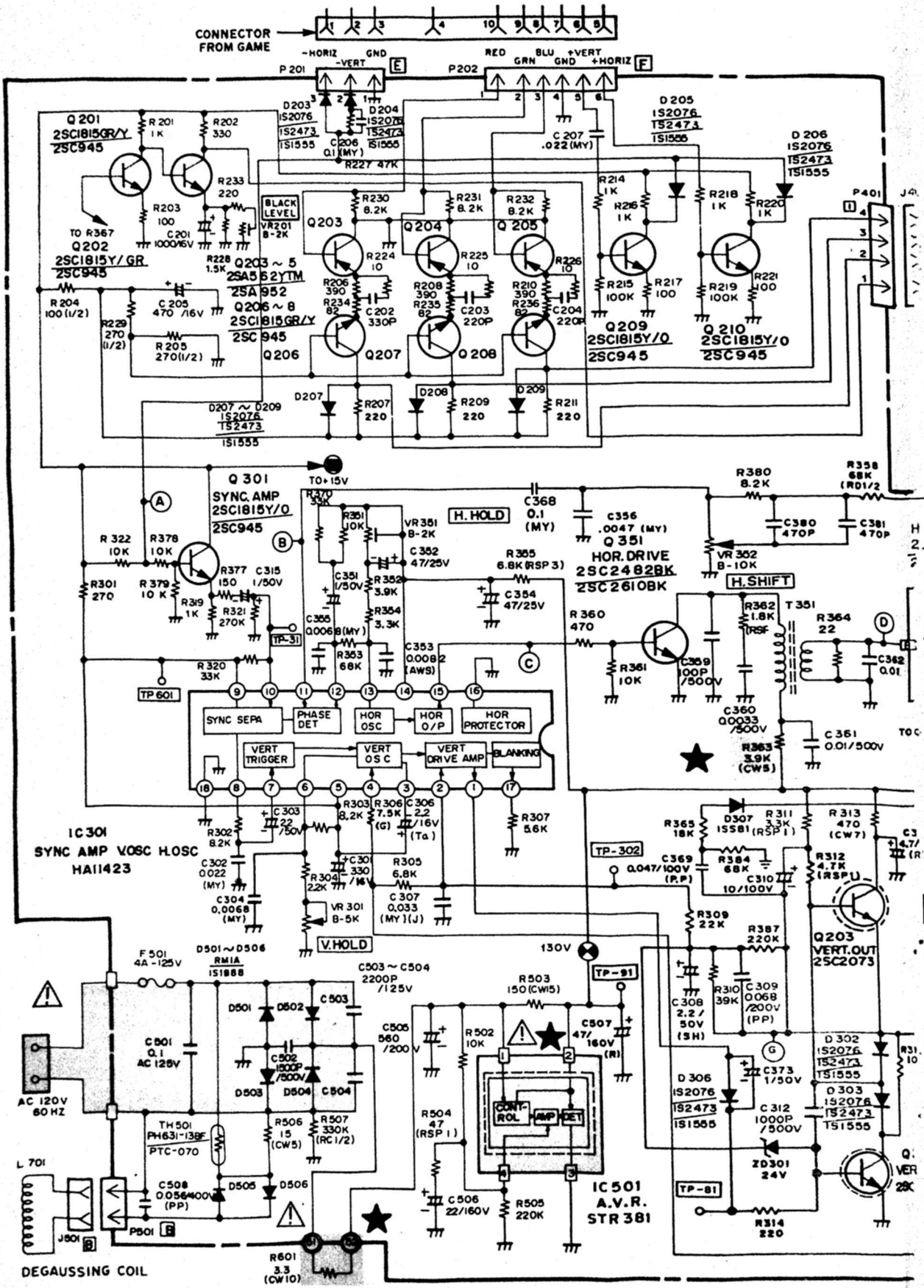

19" COLOR MON
MODE
Q 201
2SC1815GR/Y
2SC945
Q202
2SC1815Y/GR
2SC945
Q203
Q204
Q205
Q206
Q207
Q208
Q209
2SC1815Y/O
2SC945
Q 301
SYNC. AMP
2SC1815Y/O
2SC945
H. HOLD
Q 351
HOR. DRIVE
2SC2482BK
2SC2610BK
SYNC SEPA
PHASE DET
HOR OSC
HOR O/P
HOR PROTECTOR
VERT TRIGGER
VERT OSC
VERT DRIVE AMP
BLANKING
V.HOLD
IC 301
SYNC AMP VOSC H.OSC
HA11423
IC 501
A.V.R.
STR 381
DEGAUSSING COIL
21

R MONITOR SCHEMATIC DIAGRAM

MODELS 19K4911, 19K4961

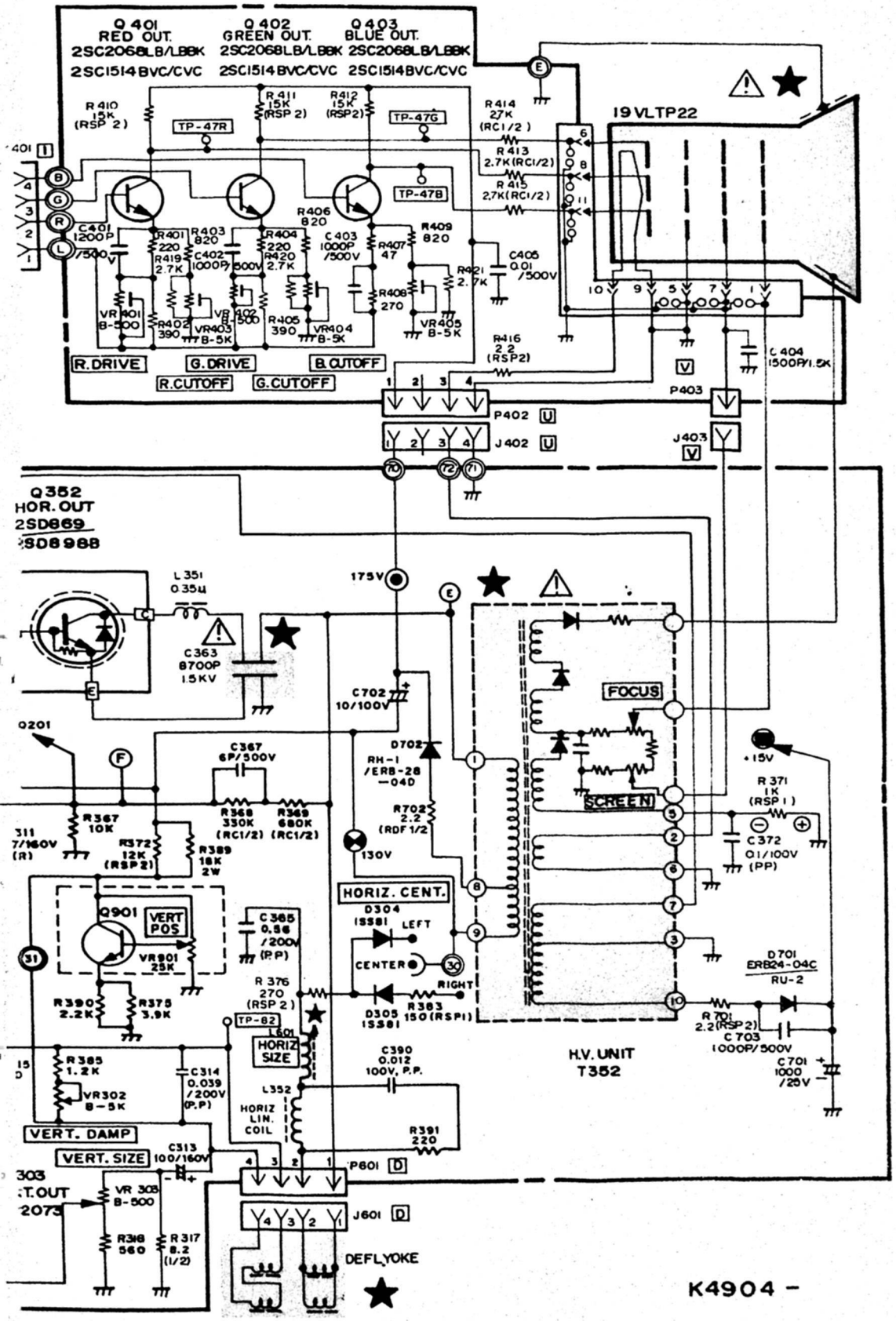


K4911C , K4961C

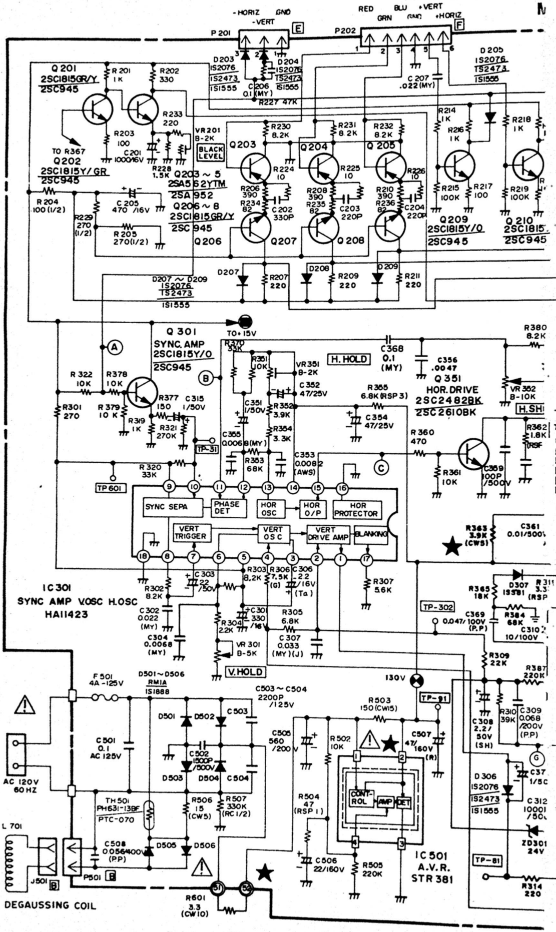

CONNECTOR FROM GAME
P201
P202
-HORIZ
-VERT
GND
RED
GRN
BLU
GND
+VERT
+HORIZ
Q201 2SC1815GR/Y 2SC945
Q202 2SC1815Y/GR 2SC945
Q203 ~ 5 2SA562YTM 2SA952
Q206 ~ 8 2SC1815GR/Y 2SC945
Q207
Q208
Q209 2SC1815Y/O 2SC945
Q210 2SC1815Y/O 2SC945
Q 301 SYNC. AMP 2SC1815Y/O 2SC945
Q 351 HOR. DRIVE 2SC2482BK 2SC2610BK
Q203 VERT.OUT 2SC2073
IC 301 SYNC AMP VOSC H.OSC HA11423
IC 501 A.V.R. STR 381
BLACK LEVEL
H. HOLD
H. SHIFT
V. HOLD
TO+15V
130V
SYNC SEPA
PHASE DET
HOR OSC
HOR O/P
HOR PROTECTOR
VERT TRIGGER
VERT OSC
VERT DRIVE AMP
BLANKING
CONT-ROL
AMP
DET
AC 120V 60 HZ
DEGAUSSING COIL
P401
P501
J501
TP-31
TP 601
TP-302
TP-91
TP-81

MATIC DIAGRAM

4

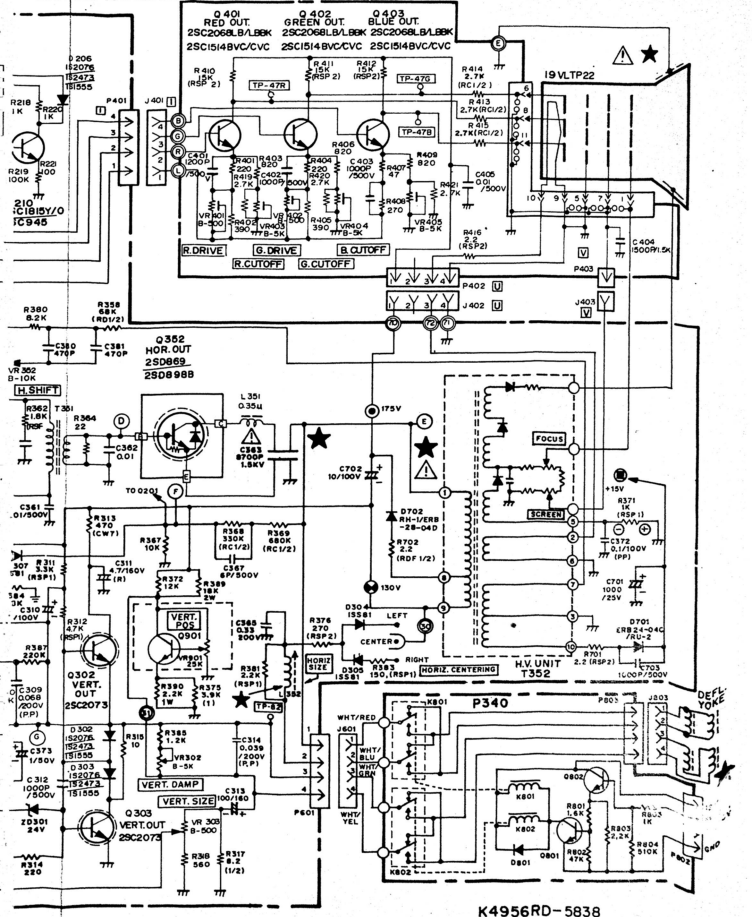


19" COLOR MON


P 201
P202
Q 201
2SC1815GR/Y
2SC945
Q202
2SC1815Y/GR
2SC945
Q 301
SYNC. AMP
2SC1815Y/O
2SC945
Q 351
HOR. DRIVE
2SC2482BK
2SC2610BK
H. HOLD
V. HOLD
BLACK LEVEL
SYNC SEPA
PHASE DET
HOR OSC
HOR O/P
HOR PROTECTOR
VERT TRIGGER
VERT OSC
VERT DRIVE AMP
BLANKING
IC301
SYNC AMP V.OSC H.OSC
HA11423
AC 120V
60 HZ
L 701
DEGAUSSING COIL
IC 501
A.V.R.
STR 381
TP 601
TP-31
TP-302
TP-91
TP-81

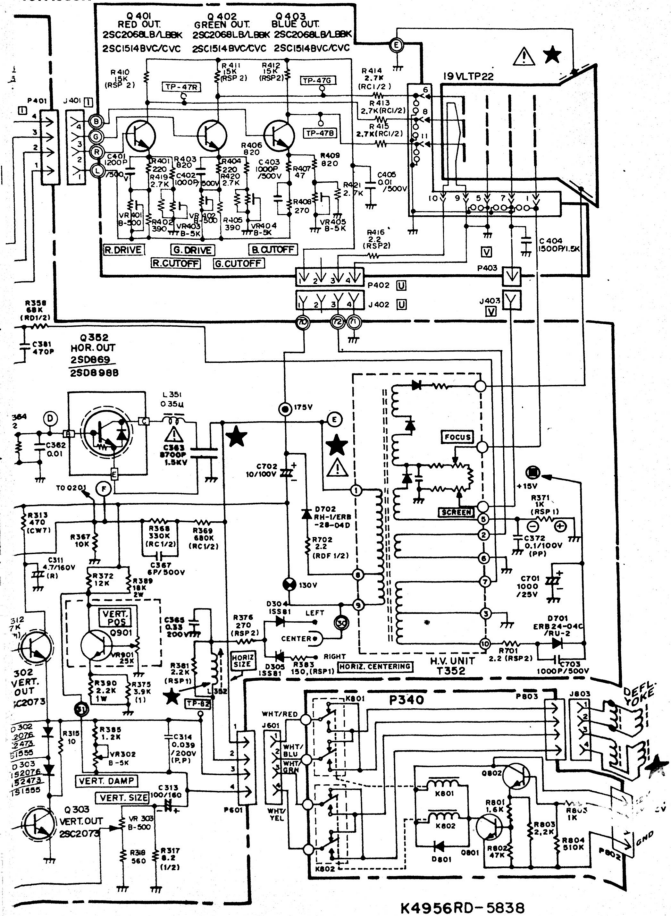
MONITOR SCHEMATIC DIAGRAM

MODEL 19K4956R



SCHEMATIC DIAGRAM

19K4956R



TYPICAL DC VOLTAGES WITH INPUT SIGNAL

TRANSISTOR NO.	TERMINAL		
	COLLECTOR	BASE	EMITTER
Q201	8.1	0.43	0.36
Q202	9.8	8.1	9.3
Q203	0	0.35	1.0
Q204	0	0.35	1.0
Q205	0	0.35	1.0
Q206	9.7	5.5	4.8
Q207	9.7	5.5	4.8
Q208	9.7	5.5	4.8
Q209	15.4	—0.30	0.01
Q210	14.0	0.31	0.17
Q301	15.5	4.7	4.2
Q302	79	37.8	37.7
Q303	37	0.51	0
Q351	41.4	0.41	0
Q352	DO NOT MEASURE	—0.03	0
Q401	139	9.7	9.3
Q402	139	9.7	9.3
Q403	139	9.7	9.3

I.C. 301	
PIN NO.	VOLTAGE
1	1.16
2	4.0
3	6.8
4	3.9
5	12.1
6	4.1
7	4.1
8	1.9
9	12.2
10	14.2
11	3.6
12	7.9
13	6.8
14	12.8
15	1.52
16	0
17	0.83
18	0

I.C. 501	
PIN NO.	VOLTAGE
1	163
2	130
3	0
4	132

WGEC SERIES 19K 4900 69X1394-1 00

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