

*Williams*<sup>®</sup>

16-3000-100C  
January, 1983

# 19" RASTER MONITOR TYPE C

**instruction manual  
supplement**

© 1983 Williams Electronics, Inc.  
Portions reprinted by permission from Hantarex USA.

Call TOLL-FREE with your  
monitor problems!  
800-621-1253  
In Illinois call 800-572-1324

*Williams*<sup>®</sup>   
**ELECTRONICS, INC.**  
3401 N. California Avenue  
Chicago, Illinois 60618

# **19" RASTER MONITOR TYPE C**

## **instruction manual supplement**

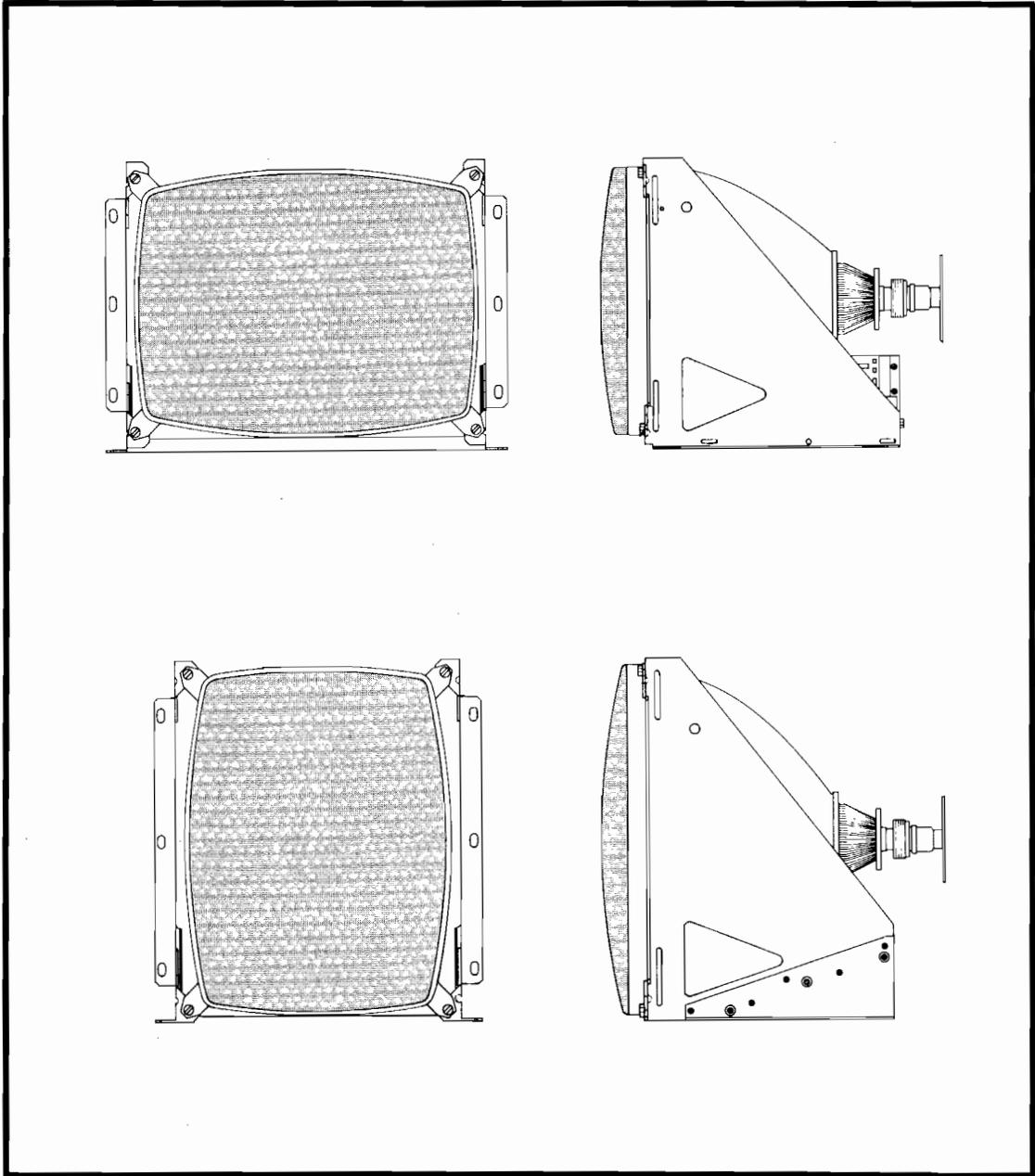
© 1983 Williams Electronics, Inc.  
Portions reprinted by permission from Hantarex USA.

**Call TOLL-FREE with your  
monitor problems!**  
800-621-1253  
In Illinois call 800-572-1324

*Williams*<sup>®</sup>   
**ELECTRONICS, INC.**  
3401 N. California Avenue  
Chicago, Illinois 60618

# CONTENTS

Warnings.....	3
X-Ray Protection.....	3
Setup Procedure.....	4
Adjustment Controls.....	5
Performance and Operating Data.....	6
Static Convergence Rings.....	7
Waveforms.....	7
Schematic Diagram.....	8
Printed Circuit Boards.....	10
Horizontal Combination IC Philips TDA 2593.....	12
Vertical Deflection IC Philips TDA 2653 A.....	13
Monitor Parts List.....	14



# WARNINGS

The chassis and heat sinks are connected to ground. When measuring voltages, connect the negative terminal of the measuring instrument to the chassis.

- **X-RAYS**

This monitor is designed for minimum X-radiation. A special safety circuit guarantees that even in the event of failure, radiation will never exceed 0.5mR/h. For this reason **NEVER** alter the CRT circuit in any way.

- **EHV**

This monitor contains high voltages capable of delivering **LETHAL** amounts of energy. Avoid harm to the operator; follow precautions set down for the servicing of EHV equipment.

- **CRT**

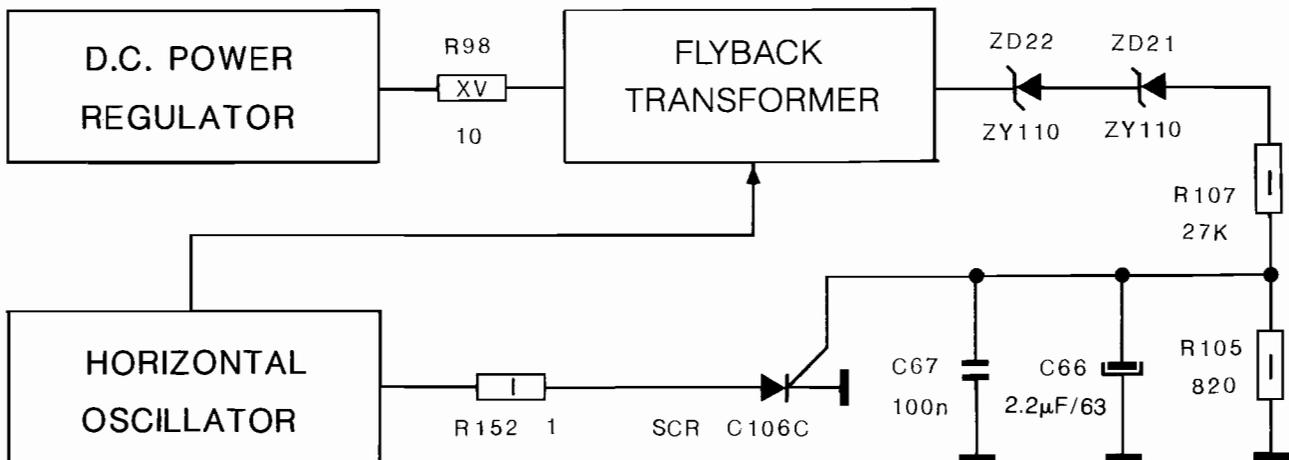
The cathode-ray tube is a high-vacuum component and its surfaces are subjected to strong exterior pressure. Take care not to knock or scratch the tube as this could cause its implosion, resulting in personal injury and property damage. Installation personnel must use safety glasses and clothing protective against flying splinters.

- **SHOCK**

To prevent the possibility of electrical discharges do not expose the monitor to rain or humidity.

# X-RAY PROTECTION

(patent no. 91830158.4)



This monitor incorporates a special circuit to eliminate radiation exceeding the legal limit of 0.5mR/h.

A 200V reference voltage (taken from the secondary of the flyback transformer) is fed via a resistive voltage divider to the gate of an SCR. Should component failure cause the EHV to rise above 26.5kV the reference voltage will increase sufficiently to fire the SCR. The SCR then shunts horizontal oscillator Vcc to ground through a current-limiting resistor, thus preventing generation of EHV. The SCR circuit will shut off EHV before it rises to 27kV. At this point, X-radiation is only 0.15mR/h. The horizontal oscillator is disabled until the breakdown has been repaired and the supply reset.

# SETUP PROCEDURE

---

## INSTRUMENTS REQUIRED

- Digital multimeter with input impedance of 10M
- Oscilloscope with a bandwidth of 10MHz
- 10/1 probe attenuator

Turn on the monitor and let the circuitry heat up for about 5 minutes. Then adjust the controls for an acceptable image. Next align the chassis according to the following instructions.

### POWER SUPPLY WITHOUT SIGNAL

Variable resistor RV 12 adjusts the **supply voltage** and requires adjustment only following repair. Proceed as follows:

- turn **brightness grid** control all the way counterclockwise.
- connect digital voltmeter to SP20 and adjust RV12 to obtain 115VDC.

**CAUTION: Voltages greater or less than nominal impair the functioning of the monitor.**

### RGB INPUT LEVELS (signal: color bars)

Turn RV10 **brightness control** up all the way; checking voltage at R27, R28, R31, adjust input control RV1/RV2/RV3 (**contrast**) to obtain 0.6Vpp for each color.

### RGB VIDEO OUTPUT (signal: color bars)

—Adjust RV5, RV7 and RV9 on neckboard to obtain a **black level** of 140VDC at KG, KR and KB.

—Adjust RV4, RV6, RV8 for a gain of 50Vpp at KG, KR and KB.

—Adjust RV10 (**input brightness**) for a **black level** of 160VDC at KG, KR and KB.

—Adjust G2 to obtain CRT cutoff.

### WHITE BALANCE (no signal)

With RV10 adjusted to make a white background visible, correct the gray by means of RV5, RV7 and RV9.

### HORIZONTAL OSCILLATOR (signal: crosshatch)

Jumper TP7 to TP8. Adjust RV13 to obtain maximum horizontal stability. Then remove the jumper.

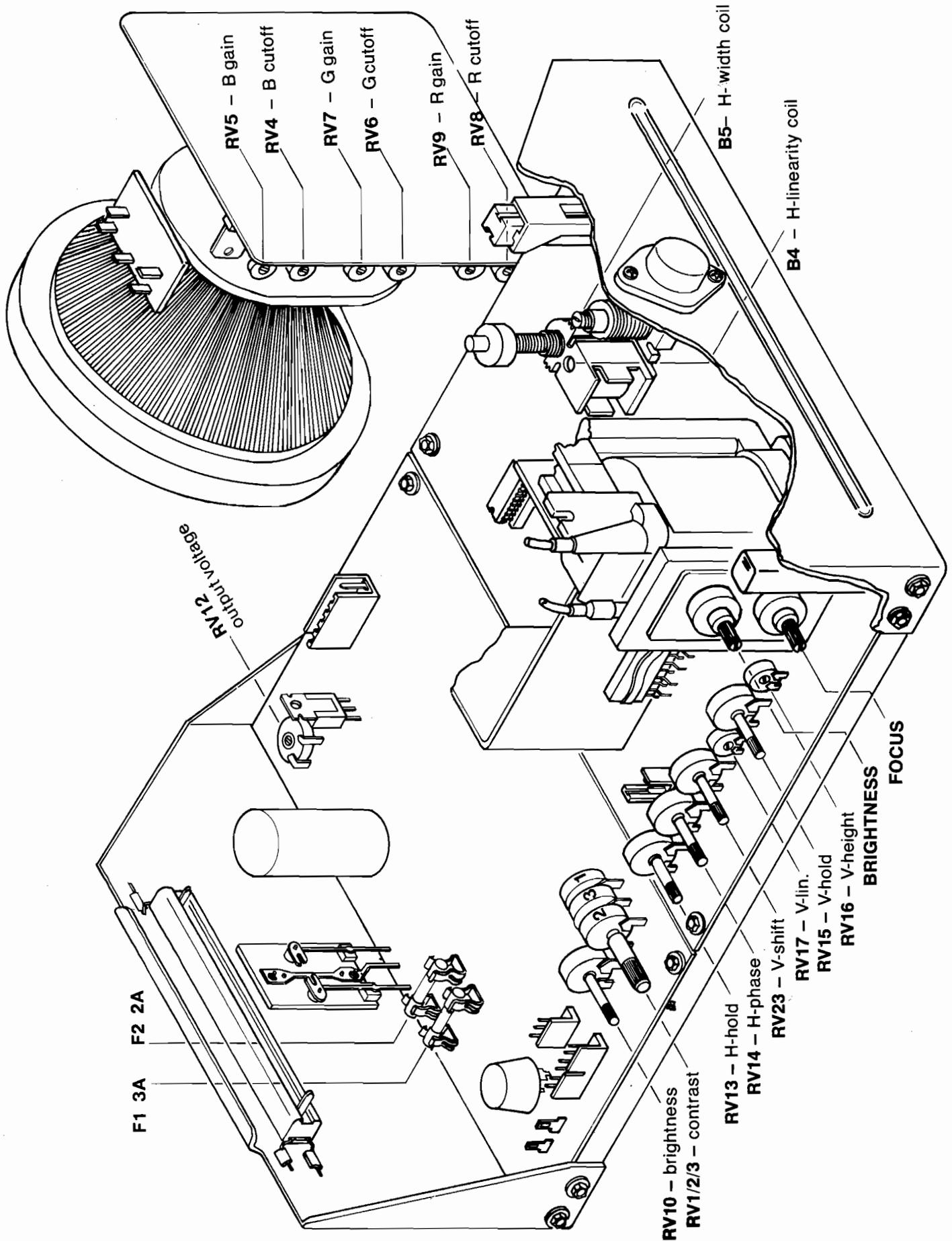
### VERTICAL OSCILLATOR (signal: crosshatch)

Adjust RV15 to obtain a slight downward rollover of the image. Then turn back slowly to eliminate rollover.

### FOCUS (signal: crosshatch)

Adjust **focus grid** control for clearest picture.

# ADJUSTMENT CONTROLS



# PERFORMANCE AND OPERATING DATA

	min	max
<b>1) PRIMARY (HV) VOLTAGE SUPPLY</b>		
VOLTAGE .....	98VAC	130VAC
FREQUENCY .....	44Hz	65Hz

**WARNING: SHOCK HAZARD!** Apply supply voltage **ONLY** through an isolation transformer with 1.5A capability.

<b>2) EHV</b>		
for 19" models. ....	22.5kV	25.5kV

NOTE: conditions for above:

I (beam) = 0mA  
DC supply voltage = 1.15VDC

### 3) CONNECTOR CA

PIN	DESCRIPTION	IMPEDANCE	SIGNAL RANGE
1	red input	1k nom.	0 to 4V
2	green input	1k nom.	0 to 4V
3	blue input	1k nom.	0 to 4V
4	ground		
5	vertical sync pulse	10k nom.	1.5V to 4V
6	horizontal sync pulse	10k nom.	1.5V to 4V

### 4) SERVICE SETUP CONTROLS

#### INTERFACE BOARD

RV 12 supply voltage adjustment—should be set for 115VDC

RV 10 brightness control

RV 1/2/3 contrast

#### DEFLECTION BOARD

RV 13 horizontal hold

RV 14 horizontal phase

RV 23 vertical shift

RV 17 vertical linearity

RV 15 vertical hold

RV 16 vertical height

B 4 horizontal linearity coil

B 5 horizontal width coil

#### FLYBACK TRANSFORMER

— G2—brightness control (preset)

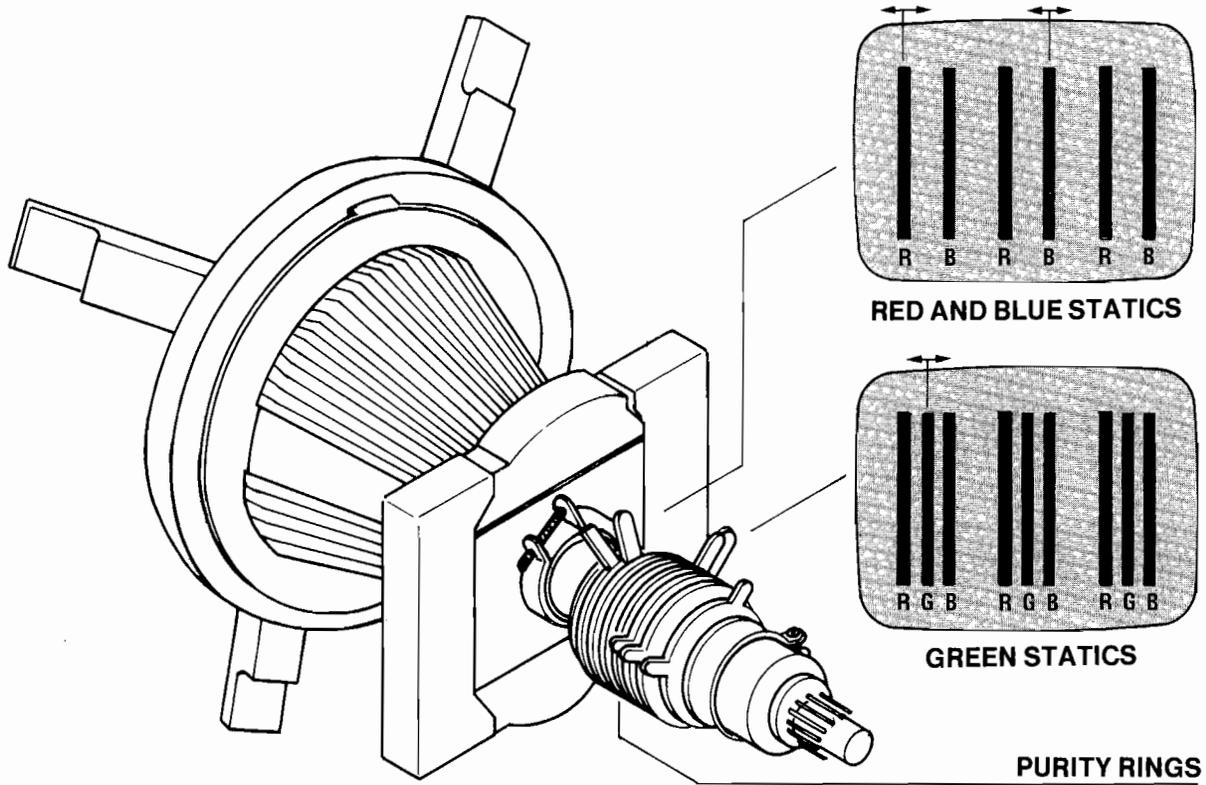
— G3—focus control

#### NECKBOARD

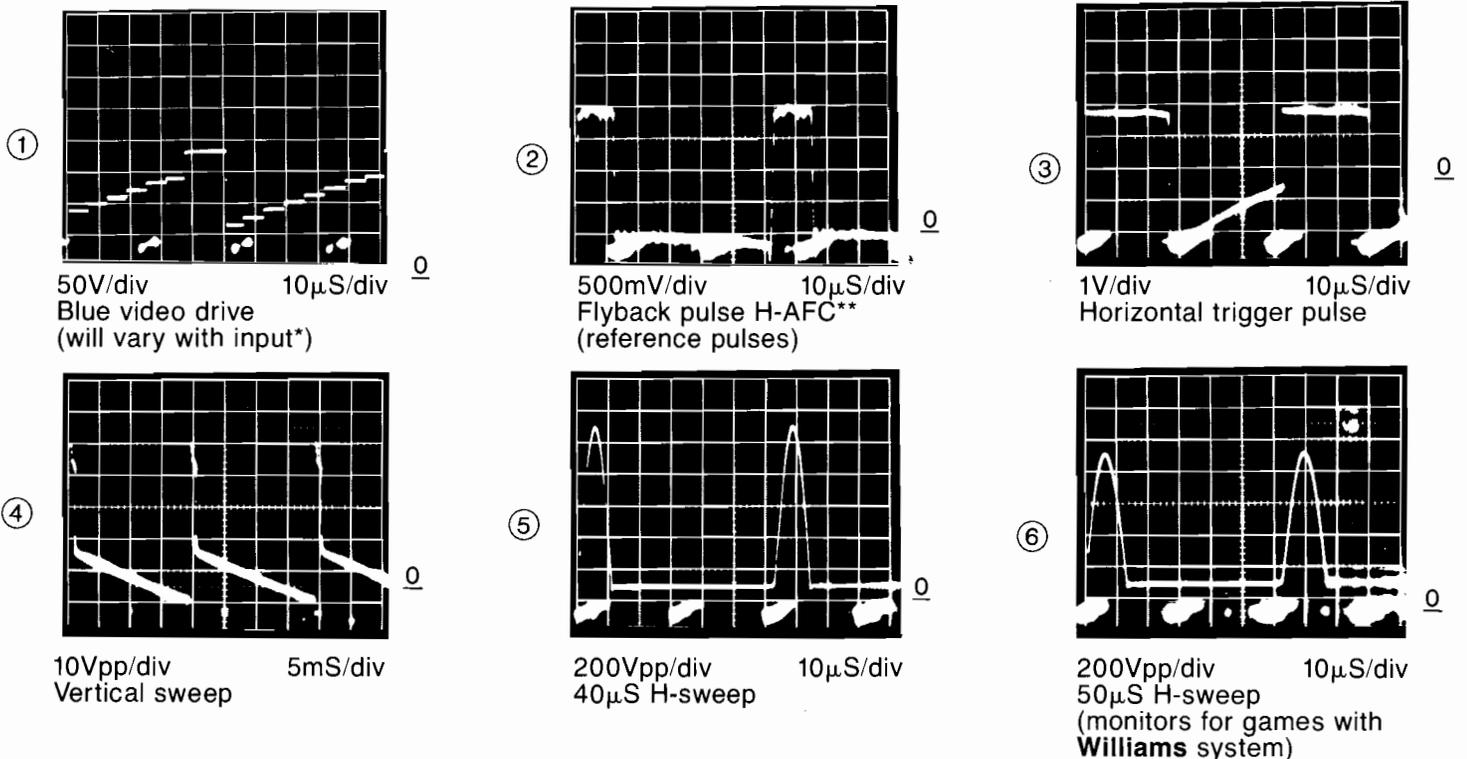
video drive (gain) controls—RV4 (blue), RV6 (green), RV8 (red)

CRT cutoff (black level) controls—RV5 (blue), RV7 (green), RV9 (red)

# STATIC CONVERGENCE RINGS

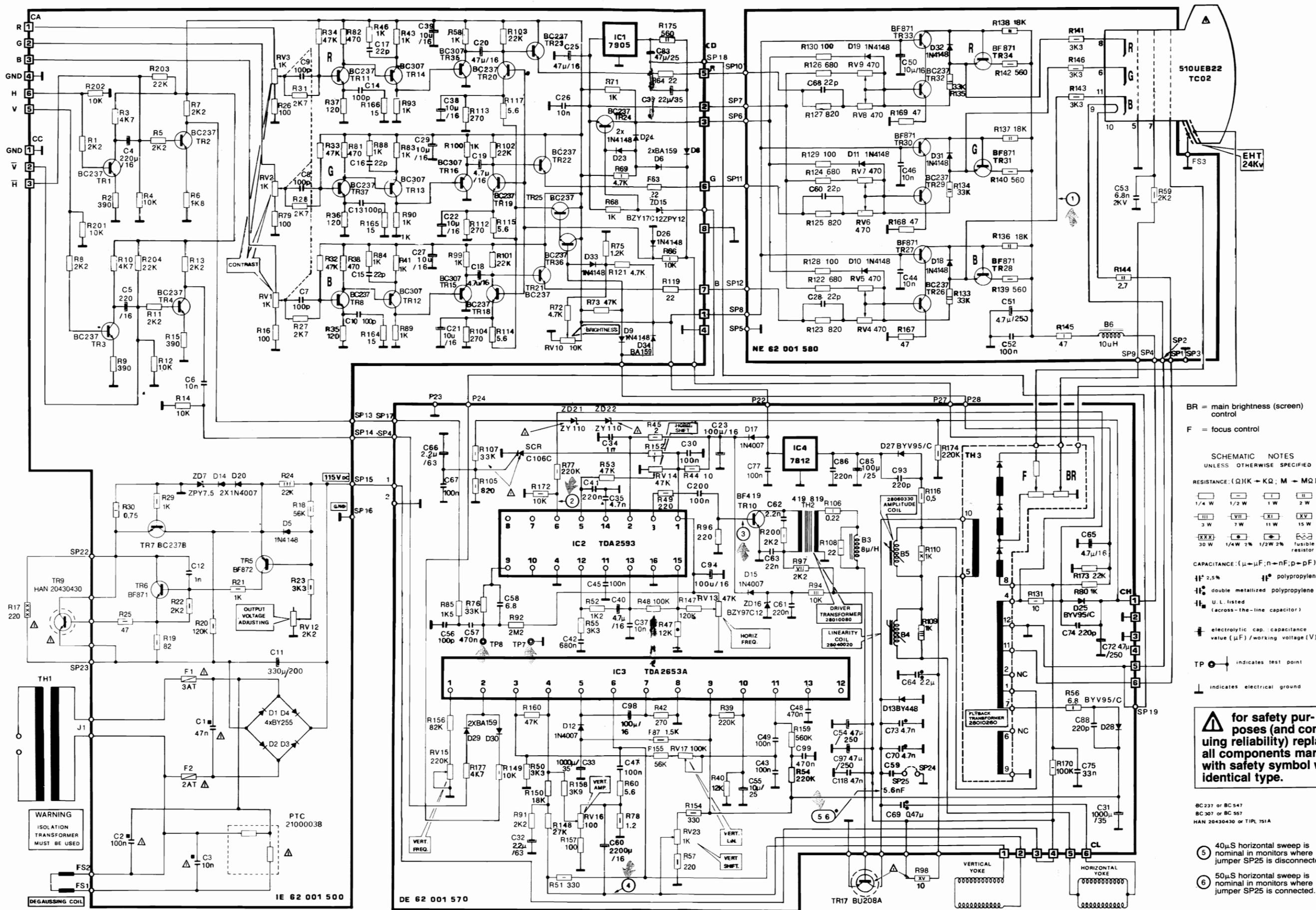


# WAVEFORMS



\*shown: 7-step gray bars  
 \*\*H = horizontal  
 AFC = automatic frequency control

# SCHEMATIC DIAGRAM



BR = main brightness (screen) control  
 F = focus control

### SCHEMATIC NOTES UNLESS OTHERWISE SPECIFIED

- RESISTANCE: (Ω) (K → KΩ; M → MΩ)
- 1/4 W
  - 1/2 W
  - 1 W
  - 2 W
  - 3 W
  - 7 W
  - 11 W
  - 15 W
  - 30 W
  - 1/4 W 2%
  - 1/2 W 2%
  - fusible resistor
- CAPACITANCE: (μ → μF; n → nF; p → pF)
- 2.5%
  - polypropylene
  - double metallized polypropylene
  - U.L. listed (across-the-line capacitor)
  - electrolytic cap.: capacitance value (μF) / working voltage (V)
  - TP indicates test point
  - indicates electrical ground

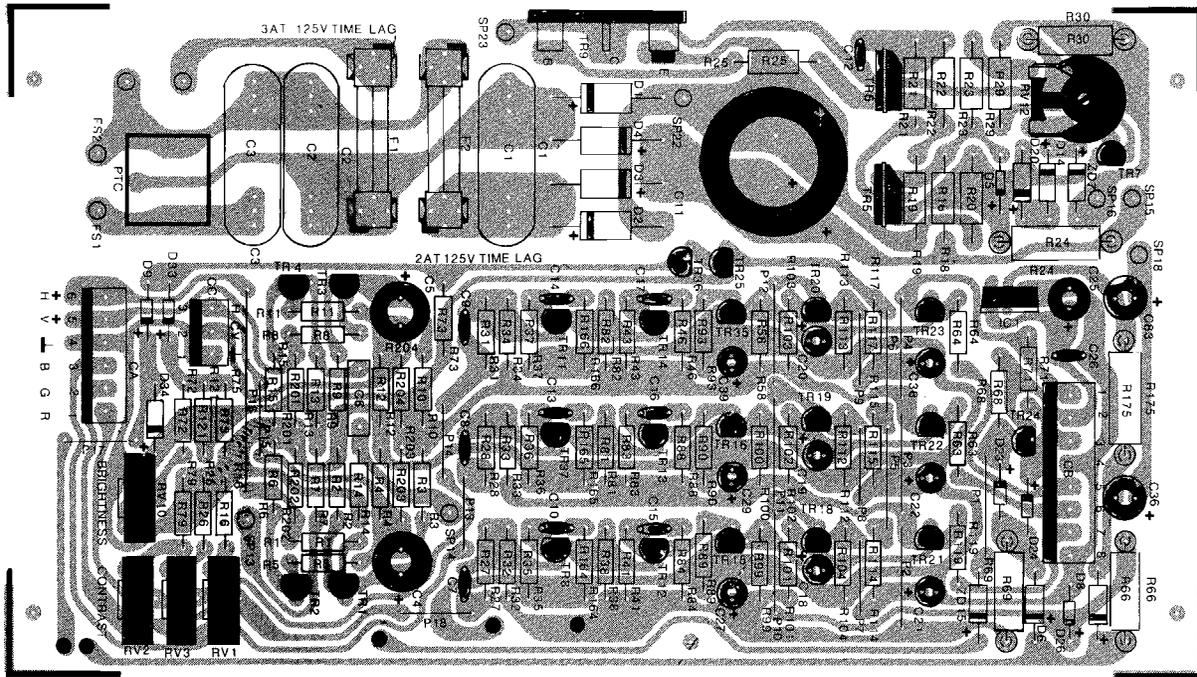
**⚠ for safety purposes (and continuing reliability) replace all components marked with safety symbol with identical type.**

BC237 or BC547  
 BC307 or BC557  
 HAN 20430430 or TIPL 751A

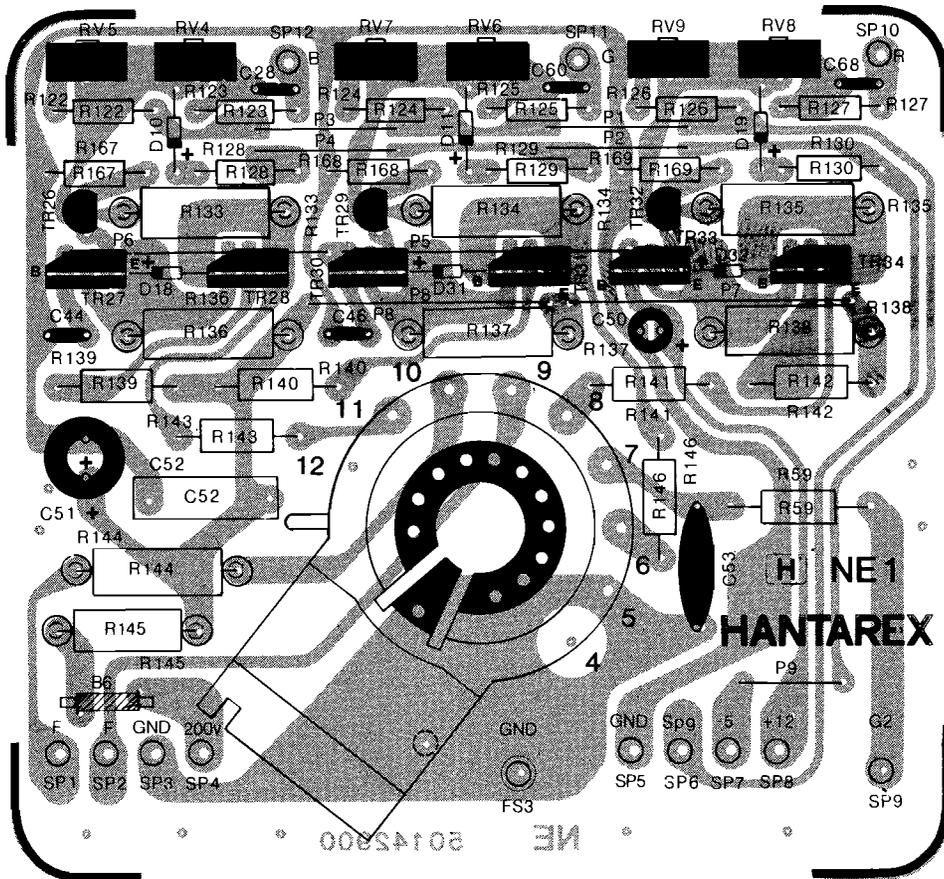
- ⑤ 40μS horizontal sweep is nominal in monitors where jumper SP25 is disconnected.
- ⑥ 50μS horizontal sweep is nominal in monitors where jumper SP25 is connected.



# INTERFACE BOARD IE

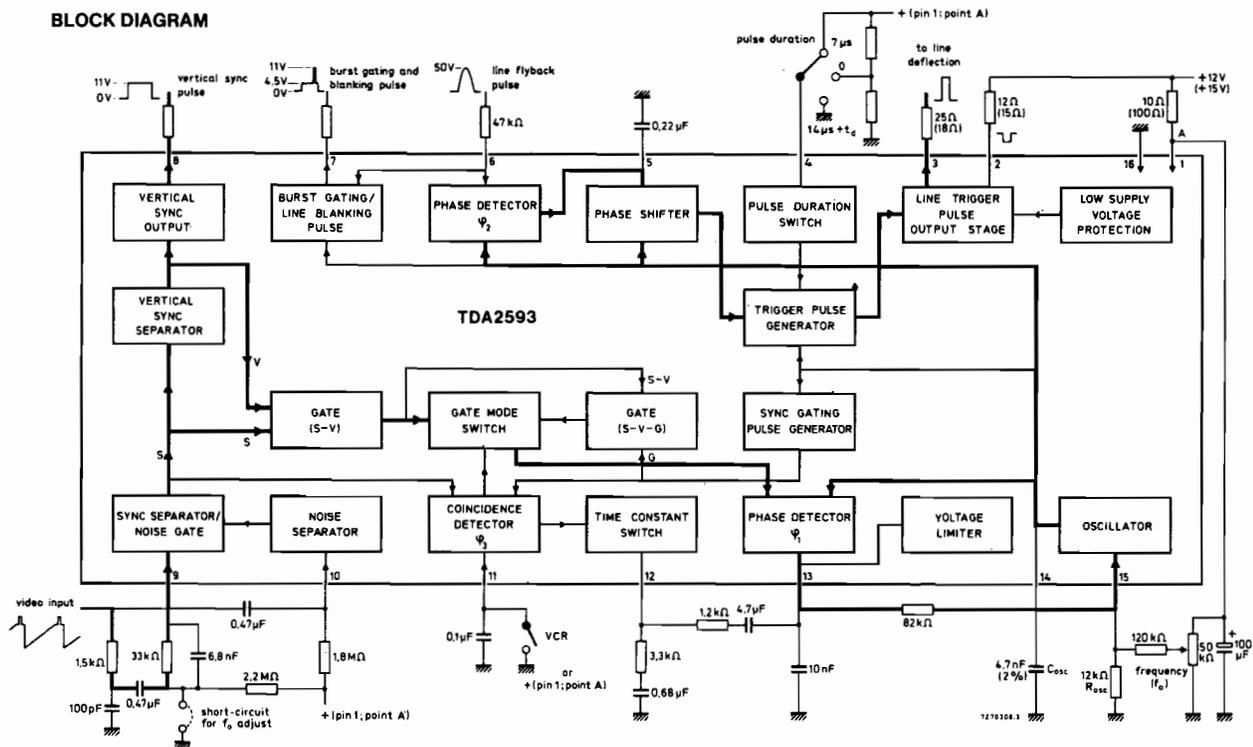


# NECK BOARD NE



# HORIZONTAL COMBINATION I.C. PHILIPS TDA 2593

## BLOCK DIAGRAM



## RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

### Supply voltage

at pin 1 (voltage source)	V <sub>1-16</sub>	max.	13.2 V
at pin 2	V <sub>2-16</sub>	max.	18 V

### Voltages

Pin 4	V <sub>4-16</sub>	max.	13.2 V
Pin 9	$\pm V_{9-16}$	max.	6 V
Pin 10	$\pm V_{10-16}$	max.	6 V
Pin 11	V <sub>11-16</sub>	max.	13.2 V

### Currents

Pins 2 and 3 (peak value)	I <sub>2M-13M</sub>	max.	400 mA
Pin 4	I <sub>4</sub>	max.	1 mA
Pin 6	$\pm I_6$	max.	10 mA
Pin 7	-I <sub>7</sub>	max.	10 mA
Pin 11	I <sub>11</sub>	max.	2 mA
Total power dissipation	P <sub>tot</sub>	max.	800 mW
Storage temperature	T <sub>stg</sub>		-25 to +125 °C
Operating ambient temperature	T <sub>amb</sub>		-20 to +70 °C

CHARACTERISTICS at V<sub>1-16</sub> = 12V; T<sub>amb</sub> = 25 °C

### Sync separator

Input switching voltage	V <sub>9-16</sub>	typ.	0.8 V
Input keying current	I <sub>g</sub>		5 to 100 $\mu$ A
Input leakage current at V <sub>9-16</sub> = 5V/I <sub>g</sub>		<	1 $\mu$ A
Input switching current	I <sub>g</sub>	$\leq$	5 $\mu$ A
Switchoff current	I <sub>g</sub>	<	100 $\mu$ A
		typ.	150 $\mu$ A
Input signal (peak-to-peak value)	V <sub>9-16</sub> (p-p)		1 to 7 V

## DE DEFLECTION code 62001590

CODE	DESCRIPTION	REF. NO.	QTY.
<b>SEMICONDUCTORS</b>			
20100010	diode BA 159	D 29-D30	2
20110100	zener diode 1.3 W BZY 97 C 12	D 16	1
20110300	zener diode 1.3 W ZY 100	D 21	1
20110500	zener diode 1.3 W ZPY 110	D 22	1
20150007	diode 1N 4007	D 12-D 15-D 17	3
20150170	diode BYV 95/C-600	D 25-D 27-D 28	3
20150200	diode BY 44B	D 13	1
20420140	transistor FB 459	TR 10	1
20440000	thyristor C 106 C	SCR	1
20620190	integrated circuit TDA 2593	IC 2	1

CODE	DESCRIPTION	REF. NO.	QTY.
<b>RESISTORS</b>			
21215600	res. 1/4 W 5% 5.6 Ω	R 60	1
21231000	res. 1/4 W 5% 100 Ω	R 157	1
21232700	res. 1/4 W 5% 270 Ω	R 42	1
21241000	res. 1/4 W 5% 1K	R 80	1
21241200	res. 1/4 W 5% 1.2 K	R 52	1
21241500	res. 1/4 W 5% 1.5 K	R 85	1
21242200	res. 1/4 W 5% 2.2 K	R 91	1
21243300	res. 1/4 W 5% 3.3 K	R 50-R 55	2
21243900	res. 1/4 W 5% 3.9 K	R 158	1
21244700	res. 1/4 W 5% 4.7 K	R 205	1
21351000	res. 1/2 W 5% 10 K	R 172	1
21251200	res. 1/4 W 5% 12 K	R 40	1
21251202	metal film resistor 1/4 W 1% 12 K PH MR 25	R 47	1
21251800	res. 1/4 W 5% 18 K	R 150	1
21252200	res. 1/4 W 5% 22 K	R 173	1
21252700	res. 1/4 W 5% 27 K	R 148	1
21253300	res. 1/4 W 5% 33 K	R 76	1
21254700	res. 1/4 W 5% 47 K	R 53-R 160	2
21255600	res. 1/4 W 5% 56 K	R 155	1
21258200	res. 1/4 W 5% 82 K	R 156	1
21261000	res. 1/4 W 5% 100 K	R 48	1
21261200	res. 1/4 W 5% 120 K	R 147	1
21262200	res. 1/4 W 5% 220 K	R 39-R 54	2
21265600	res. 1/4 W 5% 560 K	R 159	1
21272200	res. 1/4 W 5% 2.2 M	R 94	1
21305000	res. 1/2 W 5% 0.5 Ω	R 116	1
21311201	metal film resistor 1/2 W 2% 1.2 Ω PHVR 37	R 78	1
21311500	res. 1/2 W 5% 1.5 Ω	R 87	1
21321000	res. 1/2 W 5% 10 Ω	R 44-R 131	2
21321200	res. 1/2 W 5% 12 Ω	R 45	1
21332200	res. 1/2 W 5% 220 Ω	R 49-R 200	2
21333300	res. 1/2 W 5% 330 Ω	R 51-R 154	2
21338200	res. 1/2 W 5% 12 Ω	R 45	1
21332200	res. 1/2 W 5% 220 Ω	R 49-R 200	2
21333300	res. 1/2 W 5% 330 Ω	R 51-R 154	2
21338200	res. 1/2 W 5% 820 Ω	R 105	1
21342200	res. 1/2 W 5% 2.2 K	R 96	1
21351000	res. 1/2 W 5% 10 K	R 149	1
21352200	res. 1/2 W 5% 22 K	R 107	1
21362200	res. 1/2 W 5% 220 K	R 77-R 174	2
21402200	res. 1 W 10% 0.22 Ω VTM 200-0	R 106	1
21411000	res. 1 W 5% 1 Ω WK4	R 152	1
21416800	res. 1 W 5% 6.8 Ω	R 56	1
21422200	res. 1 W 5% 22 Ω	R 108	1
21461000	res. 1 W 5% 100 Ω	R 170	1
21641000	res. 3 W 5% 1 K	R 109	1
21651000	metal oxide res. 3 W 5% 10 K	R 94	1
23100000	trimmer PT 10 H 100 Ω	RV 16	1
23041000	vertical trimmer PT 15 NH 1 K	RV 23	1
23054703	vertical trimmer PT 15 NH 47 K	RV 13-RV 14	1
23061002	vertical trimmer PT 10 NH 100 K	RV 17	1
23062201	vertical trimmer PT 15 NH 220 K	RV 15	1

CODE	DESCRIPTION	REF. NO.	QTY.
<b>CAPACITORS</b>			
24314700	electrolytic capacitor EN 12.35 4.7 μF 16 V	C 40-C 65	2
24331000	electrolytic capacitor EN 12.35 100 μF 16 V	C 23-C 94-C 98	3
24342200	electrolytic capacitor EN 12.35 2200 μF 16 V	C 60	1
24421000	electrolytic capacitor EN 12.35 10 μF 25 V	C 55	1
24431000	electrolytic capacitor EN 12.35 100 μF 25 V	C 85	1
24541000	electrolytic capacitor EN 12.35 1000 μF 35 V	C 31-C 33	2
24612200	electrolytic capacitor EN 12.35 2.2 μF 63 V	C 32-C 66	2
24914700	electrolytic capacitor EN 12.35 4.7 μF 250 V	C 54	1
24924702	electrolytic capacitor EN 12.35 4.7 μF 250 V	C 72-C 97	2
25144701	polyester capacitor 4.7 nF 2.5% 63 V 1.42	C 35	1
25262200	polyester capacitor 220 nF 10% 100 V 1.60	C 41-C 61-C 86	3
25264700	polyester capacitor 470 nF 10% 100 V 1.60	C 48-C 57-C 99	3
25266800	polyester capacitor 680 nF 10% 100 V 1.60	C 42	1
25361001	polyester capacitor 1 μF 10% 160 V 1.60	C 43-C 45-C 47-C 49- C 200-C 201-C 121	6
25444700	polyester capacitor 4.7 nF 10% 250 V 1.60	C 118	1
25451000	polyester capacitor 10 nF 10% 250 V 1.60	C 24-C 37	2
25452200	polyester capacitor 22 nF 10% 250 V 1.60	C 63	1
25464710	polyester capacitor 470 nF 10% 250 V 1.76	C 69	1
25472200	polyester capacitor 2.2 μF 10% 250 V 1.60	C 64	1
25553300	polyester capacitor 33 nF 10% 630 V 1.60	C 75	1
25646800	polyester capacitor 6.8 nF 10% 630 V 1.60	C 58	1
25741000	polyester capacitor 1 nF 10% 1000 V 1.60	C 34	1
25941001	polyester capacitor 5.6 nF 10% 2000 V 1.73	C 59	1
25944700	polyester capacitor 4.7 nF 5% 1750 V 1.73	C 70-C 73	1
26310100	ceramic capacitor 100 pF 5% 50 V NPO	C 56	1
26322400	ceramic capacitor 220 pF 10% 1000 V	C 74-C 88-C 93	3
26422608	ceramic capacitor 2.2 nF -20 + 50 500 V	C 62	1
26610601	ceramic capacitor 0.1 μF -20 + 80 50 V	C 30-C 67-C 77	3

CODE	DESCRIPTION	REF. NO.	QTY.
<b>INDUCTORS</b>			
28010081	driver transformer	TH 2	1
28010250	transf. diode split HIT. 2433011	TH 3	1
28020200	choke B mH with ferrite core	B 3	1
28040020	horizontal linearity coil	B 4	1
28060330	horizontal width coil	B 5	1
29300010	Ferric beads 8 mm		24

CODE	DESCRIPTION	REF. NO.	QTY.
<b>MISCELLANEOUS PARTS</b>			
34020000	terminal PE 1 120/D	TP 7-TP 8-TP 16	3
34020090	socket for integrated circuit 16 pin		1
50142930	printed circuit deflection	DE	1

## IE INTERFACE code 62001500

CODE	DESCRIPTION	REF. NO.	QTY.
<b>SEMICONDUCTORS</b>			
20100000	diode 1N4148	D 5-9-23 D 24-26-33 D 6-8-34	6 3
20100010	diode BA 159	D 15	1
20110100	zener diode 1.3 W BZY 97 C 12	ZD 7	1
20110200	zener diode 1.3 W ZY 7.5	D 14-D 20	2
20150007	diode 1 N 4007	D 1-D 2-D 3-D 4	4
20150130	diode BY 255	TR 6-TR 10-TR 18-TR 19- TR 20-TR 21-TR 22-TR 23- TR 24-TR 25-TR 26	17
20400403	transistor 8C 557 B	TR 6 TR 5	1 1
20420500	transistor BF 871	TR 5	1
20420510	transistor BF 872	IC 1	1
20620071	integrated circuit MA 7905	IC 1	1
21000038	dual PTC thermistor 2322.552.98013 110V	PTC	1

CODE	DESCRIPTION	REF. NO.	QTY.
<b>RESISTORS</b>			
21215600	res. 1/4 W 5% 5.6 Ω	R 114-R 115-R 117	3
21221500	res. 1/4 W 5% 15 Ω	R 164-165-166	3
21222200	res. 1/4 W 5% 22 Ω	R 63-R 64-R 19	3
21231000	res. 1/4 W 5% 100 Ω	R 16-R 26-R 79	3
21231200	res. 1/4 W 5% 120 Ω	R 35-R 36-R 37	3
21232700	res. 1/4 W 5% 270 Ω	R 104-R 112-R 113	3
21233900	res. 1/4 W 5% 390 Ω	R 2-R 9-R 15	3
21234700	res. 1/4 W 5% 470 Ω	R 38-R 81-R 82	3
21241000	res. 1/4 W 5% 1 K	R 41-R 43-R 46-R 58- R 68-R 71-R 83-R 84- R 88-R 89-R 90-R 93- R 99-R 100	14
21241200	res. 1/4 W 5% 1.2 K	R 75	1
21241800	res. 1/4 W 5% 1.8 K	R 6	1
21242200	res. 1/4 W 5% 2.2 K	R 1-R 5-R 7-R 8-R 11-R 13	6
21242700	res. 1/4 W 5% 2.7 K	R 27-R 28-R 29	3
21244700	res. 1/4 W 5% 4.7 K	R 3-R 10-R 72-R 121	4
21251000	res. 1/4 W 5% 10 K	R 4-R 12-R 14-R 201-R 02	5
21252200	res. 1/4 W 5% 22 K	R 101-R 102-R 103-R 203- R 204	5
21254700	res. 1/4 W 5% 47 K	R 32-R 33-R 34-R 73	4
21324700	res. 1/2 W 5% 47 Ω	R 25	1
21328200	res. 1/2 W 5% 82 Ω	R 19	1
21341000	res. 1/2 W 5% 1 K	R 21-R 29	2
21342200	res. 1/2 W 5% 2.2 K	R 22	1
21343300	res. 1/2 W 5% 3.3 K	R 23	1
21355600	res. 1/2 W 5% 56 K	R 18	1
21361200	res. 1/2 W 5% 120 K	R 20	1
21407500	res. 1 W 5% 0.75 Ω	R 30	1
21444700	res. 1 W 5% 4.7 K	R 69	1
21451000	res. 1 W 5% 10 K	R 66	1
21535600	metal oxide res. 2 W 5% 560 Ω	R 175	1
21652200	res. 3 W 5% 22 K RESISTA WK 8	R 24	1
23041000	vertical trimmer PT 15 NH 1 K	RV 1/2/3	3
23042203	horizontal trimmer PT 15 V 2.2 K	RV 12	1
23051004	vertical trimmer PT 15 NH 10 K	RV 10	1

CODE	DESCRIPTION	REF. NO.	QTY.
<b>CAPACITORS</b>			
24314700	electrolytic capacitor EN 12.35 4.7 μF 16 V	C 18-C 19-C 20	3
24321000	electrolytic capacitor EN 12.35 10 μF 16 V	C 21-C 22-C 28-C 29- C 38-C 39	6
24324700	electrolytic capacitor EN 12.35 47 μF 16 V	C 25	1
24332200	electrolytic capacitor EN 12.35 220 μF 16 V	C 4-C 5	2
24424700	electrolytic capacitor EN 12.35 47 μF 25 V	C 83	1
24522200	electrolytic capacitor EN 12.35 22 μF 35 V	C 36	1
24933302	electrolytic capacitor 330 μF 200 V	C 11	1
25651000	polyester capacitor 10 nF 10% 630 V 1.60 P 10	C 6	1
25751003	polyester capacitor 10 nF U.L. listed [across-the-line capacitor]	C 3	1
25754703	polyester capacitor 47 nF U.L. listed [across-the-line capacitor]	C 1	1
25761003	polyester capacitor 100 nF U.L. listed [across-the-line capacitor]	C 2	1
26222100	ceramic capacitor 22 pF 5% 50 V NPO	C 15-C 16-C 17	3
26210100	ceramic capacitor 100 pF 5% 50V NPO	C 7-C 8-C 10-C 13-C 14	6
26410803	ceramic capacitor 1 nF 10% 50 V	C 12	1
26510501	ceramic capacitor 10 nF -20 + 80 50 V	C 26	1

CODE	DESCRIPTION	REF. NO.	QTY.
<b>FUSES</b>			
29100080	fuse holder for printed circuit		4
29100200	fuse 2A SB 250V	F 2	1
29100212	fuse 3A SB 250V	F 1	1

# PARTS LIST

## MISCELLANEOUS PARTS

29300010	ferric beads 8 mm.		10
34020004	fast-on terminal	FS 1-FS 2	2
34023358	AMP connector 8 D 2806 1/2 1	CB	1
34025103	MOLEX connector 3190-03	CC	1
34025106	MOLEX connector 3190-06	CA	1
50142910	printed circuit interface	IE	1

## NE C.R.T. BASE code 62001580

CODE	DESCRIPTION	REF. NO.	QTY.
------	-------------	----------	------

## SEMICONDUCTORS

20100000	diode 1N4148	D 10-D 11-D 18-D 19-D 31-	
		D 32	6
20400422	transistor 8C 547 B	TR 26-TR 29-TR 32	3
20420500	transistor BF 871	TR27-TR 28-TR 30-TR 31-TR 33-TR 34	6

## RESISTORS

21231000	res. 1/4 W 5% 100 Ω	R 128-R 129-R 130	3
21236800	res. 1/4 W 5% 680 Ω	R 122-R 124-R 126	3
21238200	res. 1/4 W 5% 820 Ω	R 123-R 125-R 127	3
21324700	res. 1/4 W 5% 47 Ω	R 167-R 168-R 169	3
21335600	res. 1/2 W 5% 560 Ω	R 139-R 140-R 142	3
21342200	res. 1/2 W 5% 2.2 K	R 59	1
21343300	res. 1/2 W 5% 3.3 K	R 141-R 143-R 146	3
21424700	res. 1 W 5% 47 Ω	R 145	1
21512700	res. 2 W 5% 2.7 Ω Resista W/K 5	R 144	1
21551800	res. 2 W 5% 18 K	R 136-R 137-R 138	3
21552200	metal oxide res. 2 W 5% 33 K	R 133-R 134-R 135	3
23034703	vertical trimmer PT 10 H 470 μ	R 4-RV 5-RV 6-RV 7-RV 8-RV 9	6

## CAPACITORS

24321000	electrolytic capacitor EN 12.35 10 μF 16 V	C 50	1
24914700	electrolytic capacitor EN 12.35 4.7 μF 250 V	C 51	1
25461000	polyester capacitor 100 nF 10% 250 V 1.60	C 52	1
26222100	ceramic capacitor 22 pF 5% 50 V NPO	C 28-C 60-C 68	3
26468720	ceramic capacitor 6800 pF 20% 2000 V 507.6	C 53	1
26510601	ceramic capacitor 10 nF -20 + 80 50 V	C 44-C 46	2

## MISCELLANEOUS PARTS

28020130	choke 10 mH with ferrite core	B 6	1
29300010	Ferric beads 8 mm		16
34020004	terminal AMP Fast-on M. 735084/2	FS3	1
50142940	socket printed circuit	NE	1

## VERTICAL ALUMINUM HEAT SINK ASSEMBLY code 62001390

CODE	DESCRIPTION	REF. NO.	QTY.
------	-------------	----------	------

20620080	integrated circuit MA 7812	IC 4	1
20620270	integrated circuit TDA 2653 A	IC 3	1
40029065	self-tapping screw 2.9x6.5 TCC		1
50111530	aluminum heat sink		1

## POWER UNIT HEAT SINK ASSEMBLY code 62001510

CODE	DESCRIPTION	REF. NO.	QTY.
------	-------------	----------	------

20430430	transistor HAN 20430430	TR 9	1
34020210	socket for transistor TO3		1
40029010	self-tapping screw 2.1x10 TCC		1
40029014	self-tapping screw	2.9x14 TCC	2
50110540	wirewound resistor 30 W 10% 220 Ω	R 17	1
50111040	heat sink 205 MO 32		1
50420120	mica insulator for TO3/500 V		1

## ALUMINUM HEAT SINK ASSEMBLY code 62000613

CODE	DESCRIPTION	REF. NO.	QTY.
------	-------------	----------	------

20430200	transistor BU 208 A	TR 17	1
22621000	wirewound resistor 15 W 10% 10 Ω	R 98	1
34020211	socket for transistor TO3	-	1
40029010	self-tapping screw 2.9x10 TCC	-	1
40029014	self-tapping screw 2.9x14 TCC	-	2
42000070	washer 3.2x6	-	2
50110550	heat sink	-	1
50420180	mica insulator for TO3/2000 V	-	1

