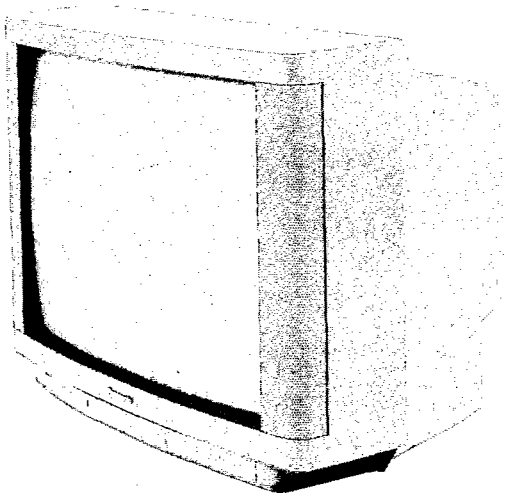
ORDER NO. SM–93018

Service Manual



Colour Television

TX–28X1
TX–25X1
ALPHA–4 Chassis

Specifications

(Information in brackets refer to TX–25X1)

Power Source :	240 V AC, 50Hz	
Power Consumption :	103W (98W)	
Aerial Impedance :	75Ω unbalanced, Coaxial Type	
Receiving System :	PAL–I (UHF), PAL– 60	
Receiving Channels :	UHF E21 – E69	
Intermediate Frequency :	Video	39.5 MHz
	Sound	33.5 MHz
	Colour	35.07 MHz (PAL)

Video / Audio Terminals :

AV1 IN	Video (21 pin)	1 Vp–p 75Ω
	Audio (21 pin)	500 mV rms 10kΩ
	RGB (21 pin)	
AV1 OUT	Video (21 pin)	1 Vp–p 75Ω
	Audio (21 pin)	500 mV rms1kΩ
AV2 IN	Video (21 pin)	1 Vp–p 75Ω
	Audio (21 pin)	500 mV rms10 kΩ
	S–Video IN (21 pin)	Y : 1 Vp–p 75Ω C : 0.3 Vp–p 75Ω
AV2 OUT	Video (21 pin)	1 Vp–p 75Ω
	Audio (21 pin)	500 mV rms1kΩ
	Audio (RCA x 2)	500 mV rms1kΩ
AV3 IN	S–Video IN (4–pin)	Y : 1 Vp–p 75Ω C : 0.3 Vp–p 75Ω
	Audio (RCA x 2)	500 mV rms10kΩ
	Video (RCA x 1)	1 Vp–p 75Ω

High Voltage :	28.0kV (+0.7/–1.0)kV at zero beam current. (27.3kV(+0.7 /–1.0)kV at zero beam current).
Picture Tube :	66cm (59 cm) V FST 110° measured diagonally.
Audio Output : Internal Speaker	2 x 10 W (Music Power) 8 Ω Impedance
Speakers	2 : 12.5cm x 7.5cm Oval
Headphones	1 x 8 Ω Impedance
Accessories supplied :	Remote Control R6 (UM3) Battery TV Stand.
Dimensions :	Height : 551mm (507mm) Width : 686mm (635mm) Depth : 489mm (467mm)
Net Weight	38kg (32.5kg)

Specifications are subject to change without notice.
Weight and dimensions shown are approximate.

Panasonic (U.K.) Ltd.
WILLOUGHBY ROAD,
BRACKNELL,
BERKS,
RG12 4FP.

Panasonic

CONTENTS

SAFETY PRECAUTIONS

General Guide Lines

1. It is advisable to insert an isolation transformer in the AC supply before servicing a hot chassis.
2. When servicing, observe the original lead dress in the high voltage circuits. If a short circuit is found, replace all parts which have been overheated or damaged by the short circuit.
3. After servicing, see that all the protective devices such as insulation barriers, insulation papers, shields and isolation R–C combinations are correctly installed.
4. When the receiver is not being used for a long period of time, unplug the power cord from the AC outlet.
5. Potentials as high as 29.0 kV are present when this receiver is in operation. Operation of the receiver without the rear cover involves the danger of a shock hazard from the receiver power supply. Servicing should not be attempted by anyone who is not familiar with the precautions necessary when working on high voltage equipment. Always discharge the anode of the picture to the chassis before handling the tube.
6. After servicing make the following leakage current checks to prevent the customer from being exposed to shock hazards.

Leakage Current Cold Check

1. Unplug the AC cord and connect a jumper between the two prongs of the plug.
2. Turn on the receiver's power switch.
3. Measure the resistance value with an ohmmeter, between the jumpered AC plug and each exposed metallic cabinet part on the receiver, such as screw heads, aerials , connectors, control shafts etc. When the exposed metallic part has a return path to the chassis the reading should be between 4M ohm and 20M ohm. When the exposed metal does not have a return path to the chassis the reading must be infinite.

Leakage Current Hot Check

1. Plug the AC cord directly into the AC outlet. Do not use an isolation transformer for this check.
2. Connect a 2k ohm 10W resistor in series with an exposed metallic part on the receiver and an earth such as a water pipe.
3. Use an AC voltmeter with high impedance to measure the potential across the resistor.
4. Check each exposed Metallic part and check the voltage at each point.
5. Reverse the AC plug at the outlet and repeat each of the above measurements.
6. The potential at any point should not exceed 1.4 Vrms. In case a measurement is outside the limits specified, there is a possibility of a shock hazard, and the receiver should be repaired and rechecked before it is returned to the customer.

HOT CHECK CIRCUIT

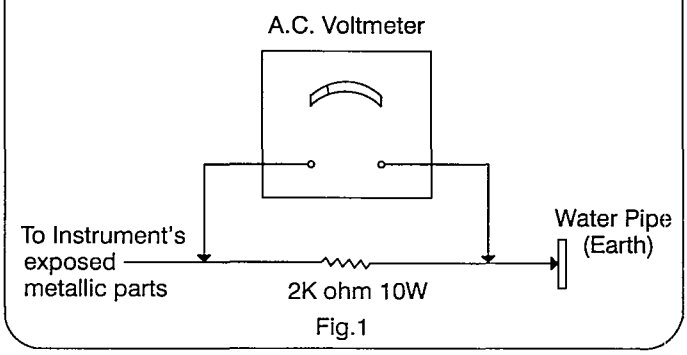


Fig.1

X–Radiation Warning

1. The potential sources of X–Radiation in TV sets are the high voltage section and the picture tube.
2. When using a picture tube test jig for service ensure that the jig is capable of handling 29.0 kV without causing X–Radiation.

NOTE : It is important to use an accurate periodically calibrated high voltage meter

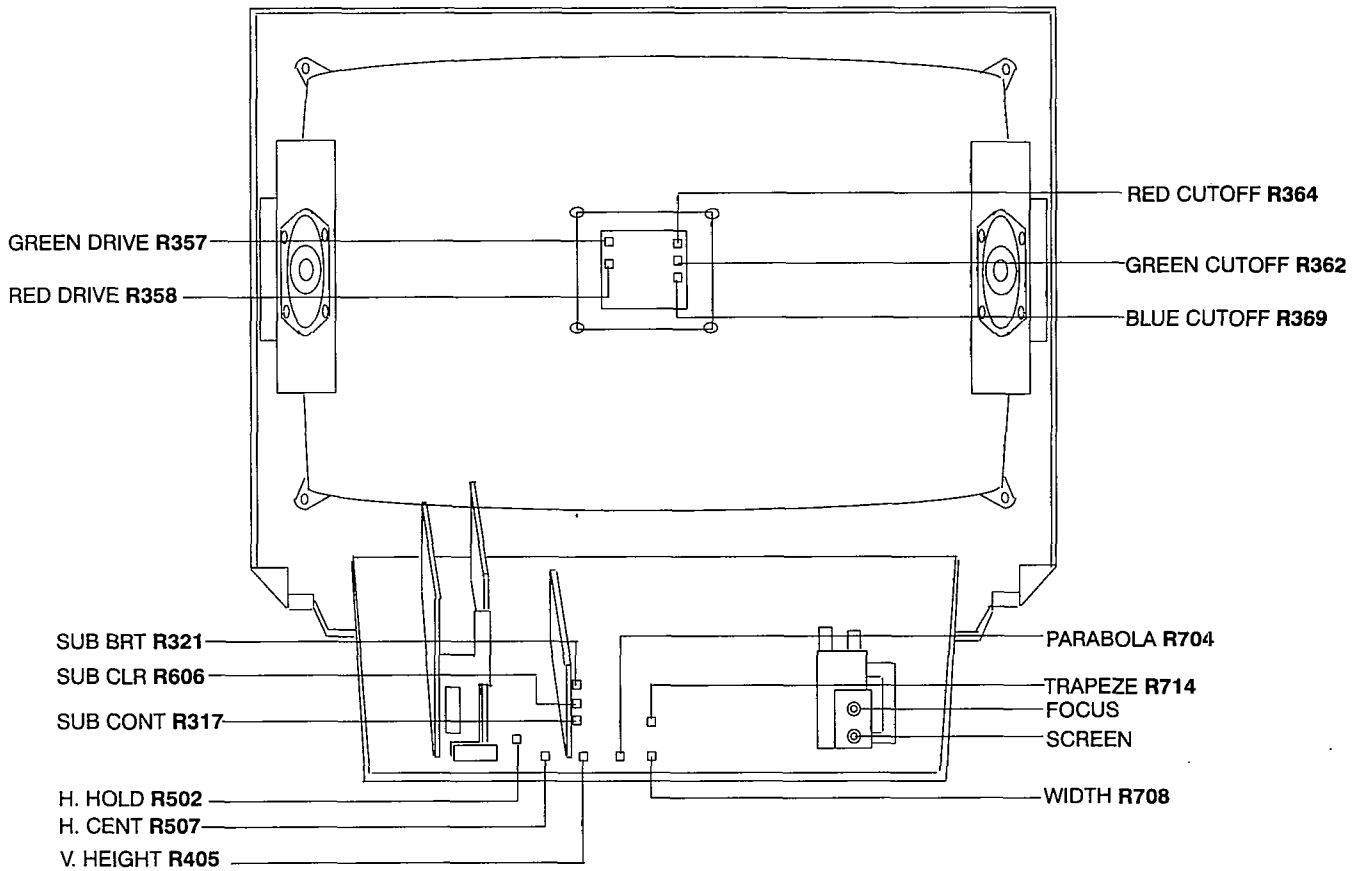
1. Set the brightness to minimum.
2. Measure the high voltage. The meter should indicate 28.0kV(+0.7/–1.0)kV (27.3kV(+0.7 / –1.0)kV for TX–25X1), if the meter indication is out of tolerance, immediate service and correction is required to prevent the possibility of premature component failure.
3. To prevent an X–Radiation possibility, it is essential to use the specified tube.

Shut Down Circuit Test

This test must be made as a final check before the set is returned to the customer.

1. Receive the Philips pattern.
2. Check that the shut down circuit functions when –60V is applied to TPE7, but does not function when –40V is applied.

LOCATION OF CONTROLS



SERVICE HINTS

How to remove the rear cover

1. Insert a flat blade screwdriver into the slot of each rear cover fixing clip and release the 6 rear cover fixing clips as shown in Fig.3.
2. Remove the screws (A) as shown Fig.4.

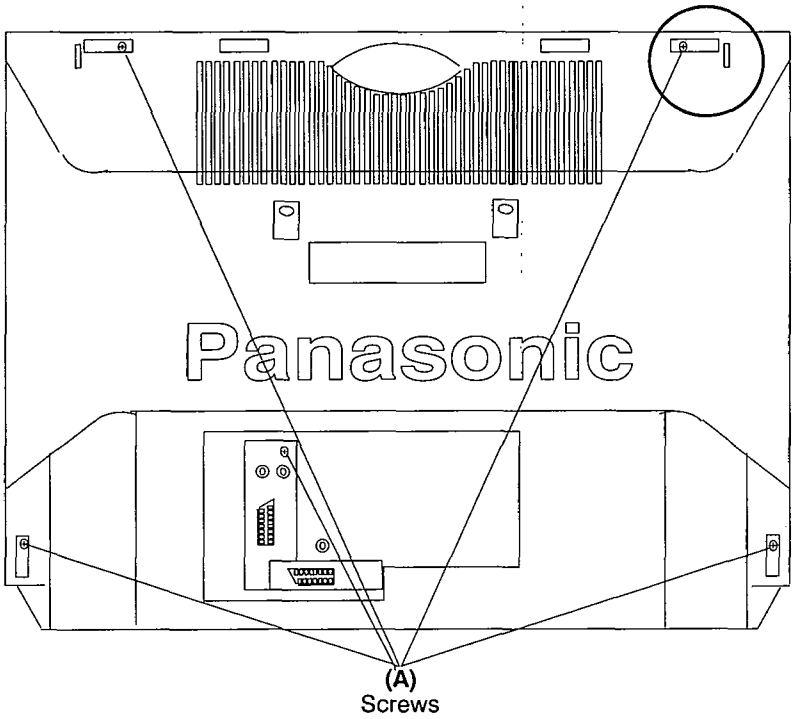


Fig.4

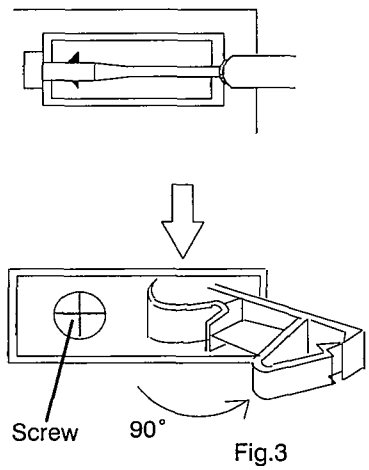


Fig.3

HOW TO MOVE THE CHASSIS INTO SERVICE POSITION

1. Remove screw (B) from the front AV panel (Fig.5), remove screws (C) from either side of the control panel then lift the plastic clips and pull the chassis towards you (Fig.6).
2. Release the respective wiring clips and turn the chassis through 90°, anti−clockwise, as shown in Fig.7.
3. Clip the heatsink (D) onto the metal bracket as shown in Fig.8.
4. After servicing ensure all wiring is returned to its original position before returning the receiver to the customer

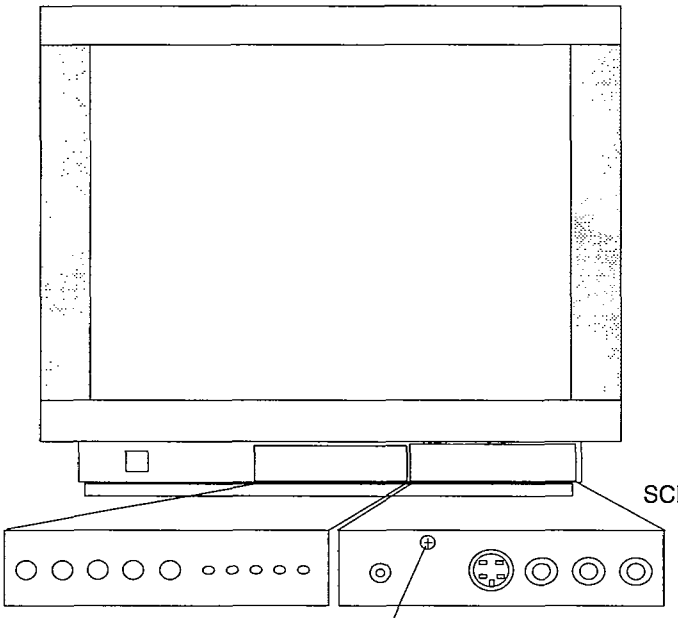


Fig.5.

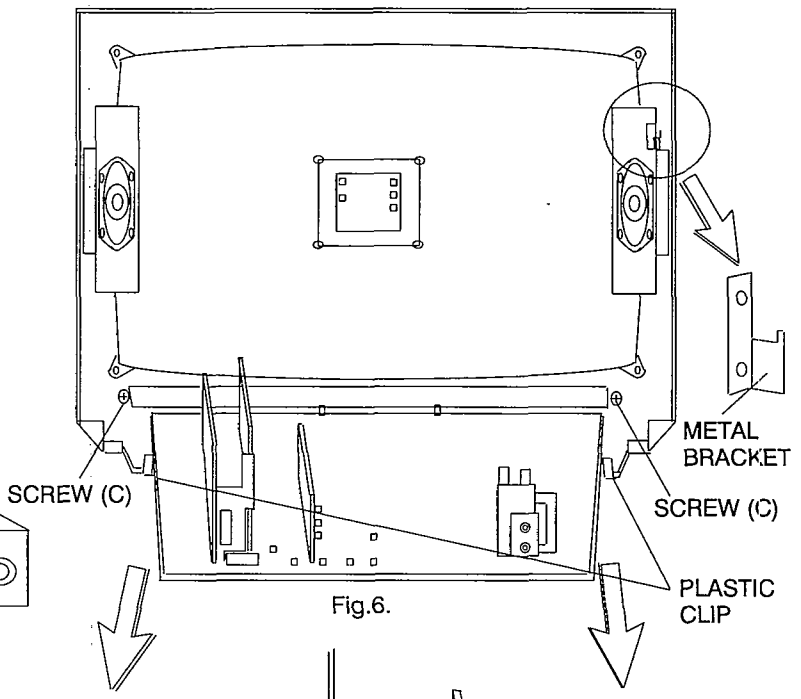


Fig.6.

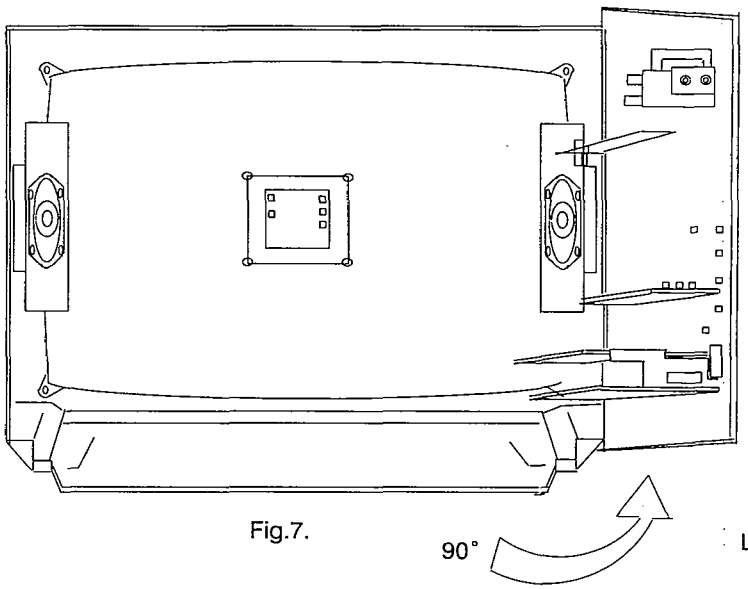
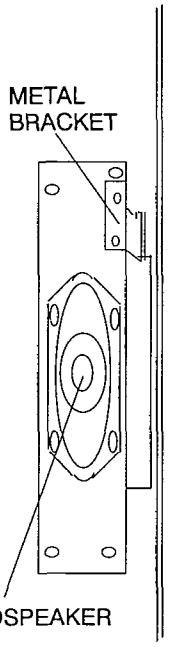


Fig.7.



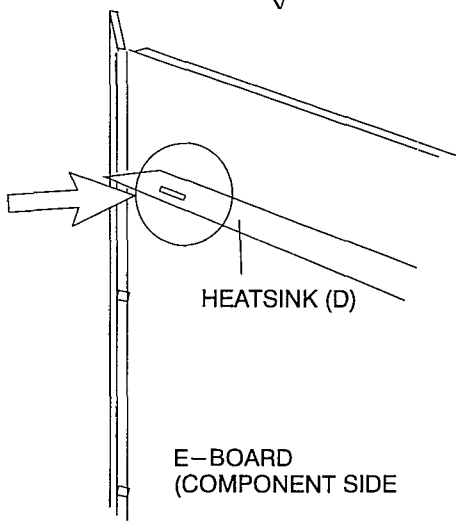


Fig.8.

SERVICE POSITION FOR B,H,C BOARDS.

1. Remove the board that is to be worked on from the main circuit board (E−board)..
2. Connect the extention leads between the chosen board and the E−board, position the board away from the E−board and ensure that they are not touching..
3. After servicing ensure all wiring is returned to its original position before returning the receiver to the customer.
   NOTE: The extention lead kit is supplied as a service kit, part number TZSEL000.

ADJUSTMENTS

ITEM/PREPARATION	ADJUSTMENT PROCEDURE
+B VOLTAGE 1. Operate the TV set. 2. Set controls to : Brightness minimum. Sub brightness minimum.	1 Confirm the indicated test points for the specified voltage. **TPE1:** 150.0 +/−1.5V **TPE5:** 12.0 +/−1.0V **TPE2:** 5.0 +/−0.3V **TPE9:** 31.0 +/−2.5V **TPE3:** 30.0 +/−1.0V **TPE28:** 28.0 +/−1.0V **TPE4:** 15.5 +/−1.0V **TPE10:** 210.0 +/−10.0V **TPE66:** 8.0 +/−1.0V
AFC 1. Supply 39.5MHz continuous wave from an oscillator to **TPB20** (0.5V p−p, 75Ω terminated) 2. Connect a DC voltmeter to **TPB25**. 3. Operate the TV set.	1. Adjust **L106** so that the voltage at **TPB25** becomes 4.0 (+/− 0.5V). 2. Change the frequency and confirm the voltage as shown below. +100KHz less than 1.5V. −100KHz more than 5.5V.
RF AGC 1. Receive a Philips Pattern. 2. Set the input level to 65dB +/−2dB (75Ω open). 3. Connect an oscilloscope between **TPB24** and earth in DC mode.	1. Turn RF AGC control **(R128)** fully clockwise. 2. Slowly turn **R128** counterclockwise to set it at the point before the voltage at **TPB24** drops. **NOTE:** In this case, gain range of the oscilloscope is 1V/div, and set **R128** to a point where this voltage drops by 0.2V.
HIGH VOLTAGE 1. Receive a cross hatch pattern. 2. Set controls to: Brightness minimum. Contrast minimum. Sub brightness minimum. (Zero beam current)	1. Connect a DC voltmeter to **TPE1** and confirm the Voltage is 150V (+/− 1.5V). 2. Connect a high−voltage meter (Electrostatic type) to the anode of the picture tube. 3. Confirm that the high voltage is within a range of 28.0kV(+0.7/1.0)kV (27.3kV +0.7kV−1.0kV for TX−25X1 models).
CUT OFF VOLTAGE ADJUSTMENT 1. Receive a black and white signal. 2. Degauss the CRT externally. 3. Turn the SCREEN VR on the FBT fully counter−clockwise (minimum voltage), and set **R357**,**R358** to centre position. 4. Set the service switch **S401** to SERVICE position.	1. Connect a DC Voltmeter to **TPY1**, **TPY2** and **TPY3**, and in turn adjust **R362**, **R369** and **R364** (CUT OFF) set the voltages at each test point to170V. 2. Slowly turn the SCREEN control clockwise to the point where one of the RGB beams just appears on the CRT. 3. Leave the CUT OFF control of the colour which appeared at step 2 as it is, and turn the remaining CUT OFF controls clockwise so a white horizontal line appears on the CRT 4. Reset the service switch to the NORMAL position.

SELF CHECK

Self check is a function for checking the I^2C bus path through the TV and is displayed on the TV screen, as shown below :−

SELF CHECK		
1.	OK	04
2.	OK	07
3.	OK	06
4.	−−	02
5.	OK	03
6.	−−	

NB:
(OK or −−) is the **Path Check** and the number i.e. 04 is the **Link Option**.

NOTE.
The Link Options are factory preset and are not changable, they are displayed on screen as a reference only.

PATH CHECK

1. Memory / RAM.
2. Teletext micro
3. Tuner
4. C.T.I. (NOT USED)
5. NICAM
6. A2 Stereo (NOT USED)

To select Self Check, press the local VOLUME DOWN button and the remote control OFF−TIMER button at the same time.
If the particular path is GOOD "OK" is displayed next to the number.
If the path is NO GOOD "−−" is displayed.

ADJUSTMENTS

SUB CONTRAST

1. Receive a Philips pattern.
   (Input level 75dB).
2. Connect an oscilloscope to **TPC15 (TPE15).**
3. Set controls to :

Brightness	minimum
Contrast	maximum
Colour	minimum
Sub colour	minimum
Sharpness	centre

4. Connect a short jump wire between **TPE7** and earth.

1. Adjust Sub brightness **(R321)** to set the black level to 0.2V.
2. Adjust the Sub contrast **(R317)** to set the drive voltage to 2.8V+/− 0.1V−p.
3. Remove the earth from **TPE7**.

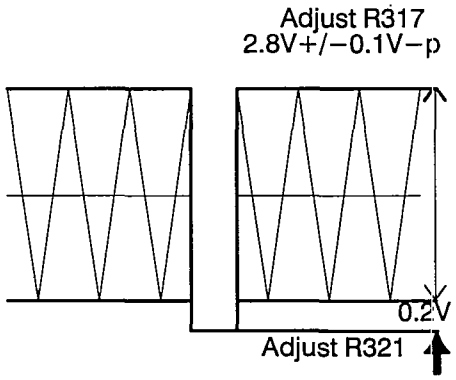


Fig.9.

PAL APC

1. Receive a Philips pattern.
2. Connect a short jumper between **TPC76** and earth.
3. Connect an oscilloscope to **TPC15**.

1. Adjust APC trimmer **(C637)** to obtain the waveform at **TPC15** as shown in Fig.10.
2. Remove the earth link and confirm the bars are stationery.

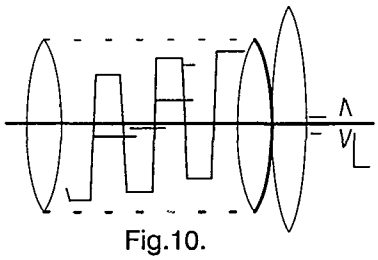


Fig.10.

SUB COLOUR

1. Receive a PAL colour bar pattern.
2. Set controls to:

Brightness	minimum
Contrast	maximum
Sub colour	centre
Colour	centre
Sharpness	minimum

3. Connect an oscilloscope to **TPC15 (TPE15).**

1. Connect a short jumper between **TPE6** and earth.
2. Adjust the sub colour **(R606)** for 1.6Vp−p +/− 0.1V at **TPC15 (TPE15)** as shown in Fig.11.
3. Remove the earth jumper wire.

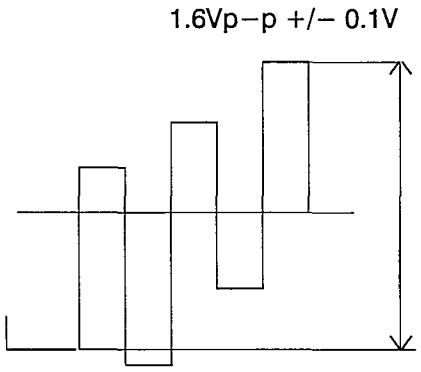


Fig.11.

TEXT CONTRAST

1. Receive a teletext signal.
2. Connect an oscilloscope to **H1 pin 6.**

NOTE:

If the H−board is disconnected from the E−board a 10KΩ resistor has to be connected between H1 pin 6 and earth.

1. Adjust **R3514** to obtain the waveform as shown in Fig.12.

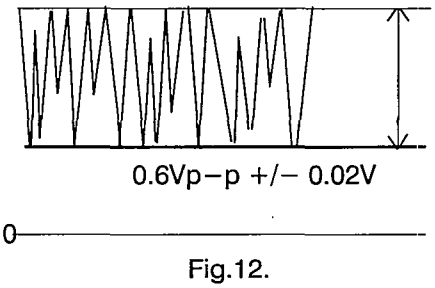
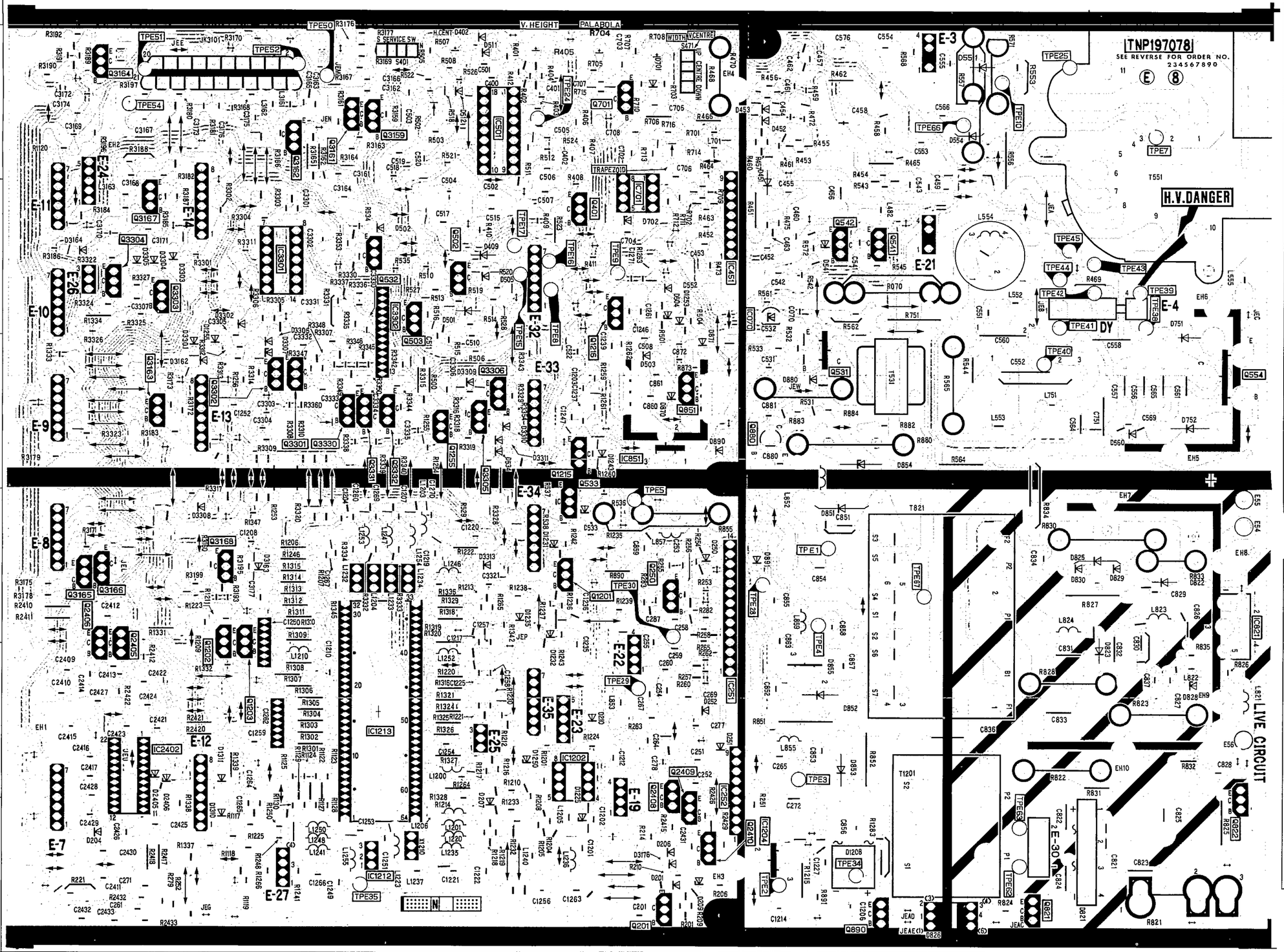


Fig.12.

CONDUCTOR VIEWS

E BOARD TNP197078



PARTS LOCATION

E-BOARD IC	
IC2402	A2
IC3301	B5
IC1212	C1
IC1213	C2
IC3302	C5
IC1202	D2
IC501	D6
IC251	E3
IC701	E5
IC451	E5
IC1204	F1
IC070	F5
IC821	I 3

E-BOARD Transistor	
Q2405	A3
Q2406	A3
Q3304	A5
Q3165	A3
Q3166	A3
Q8561	A6
Q3164	A6
Q3168	B3
Q1202	B3
Q1203	B3
Q3301	B4
Q3302	B4
Q3163	B4
Q250	B4
Q3167	B5
Q3303	B5
Q3162	B6
Q3167	B6
Q3330	C4
Q3331	C4
Q1255	C4
Q3330	C4
Q3331	C4
Q3332	C4
Q1255	C4
Q503	C5
Q532	C5
Q532	C5
Q503	C5
Q3159	C6
Q3161	C6

E-BOARD Diode	
D204	A1
D1310	B2
D1311	B3
D3163	B3
D3308	B3
D3162	B4
D1255	B4
D3307	B4
D3302	B5
D3303	B5
D3304	B5
D3305	B5
D3306	B5
D1255	B5
D502	C5
D502	C5
D207	D2
D210	D2
D1208	D2
D1235	D3
D3313	D3
D1232	D3
D1231	D3
D1243	D4
D3310	D4
D534	D4
D3311	D4
D501	D5
D505	D5
D409	D5
D402	D6
D201	E1
D206	E1
D3176	E1
D250	E3
D503	E4
D890	E4
D871	E5
D1253	E5
D552	E5
D702	E5
D701	E6
D852	F2
D853	F2
D855	F2
D851	F3
D691	F3
D880	F4
D854	F4
D451	F6
D826	G1
D551	G6
D554	G6
D821	H1
D822	H3
D823	H3
D825	H3
D752	H4
D560	H4
D751	H5

E-BOARD Diode	
D2405	B2
D2406	B2
D3307	B4
D3301	B5
D504	D4
D409	D5
D502	C5
D1225	D1
D1250	D2
D533	D3
D1232	D3
D3309	D4
D512	D6
D511	D7
D209	E1
D870	E4
D541	F5
D828	H2

Test Points	
TPE54	A6
TPE51	B6
TPE35	C1
TPE52	C6
TPE50	C6
TPE8	D5
TPE15	D5
TPE16	D5
TPE17	D5
TPE24	D6
TPE29	E2
TPE30	E3
TPE5	E5
TPE9	E9
TPE34	F1
TPE2	F1
TPE3	F2
TPE4	F3
TPE28	F3
TPE1	F3
TPE62	G1
TPE63	G1
TPE67	G3
TPE40	G4
TPE41	G5
TPE44	G5
TPE45	G5
TPE66	G6
TPE10	G6
TPE25	G6
TPE38	H5
TPE39	H5
TPE42	H5
TPE43	H5

E-BOARD Transistor	
Q1201	D3
Q553	D3
Q1255	D4
Q533	D4
Q1215	D4
Q3306	D4
Q401	D5
Q502	D5
Q2401	E1
Q201	E1
Q2408	E2
Q2409	E2
Q205	E3
Q851	E4
Q1216	E5
Q701	E6
Q890	F1
Q890	F1
Q880	F4
Q531	F4
Q531	F5
Q541	F5
Q542	F5
Q821	G1
Q554	H4
Q822	I 2
Q554	I4

B BOARD TNP107947

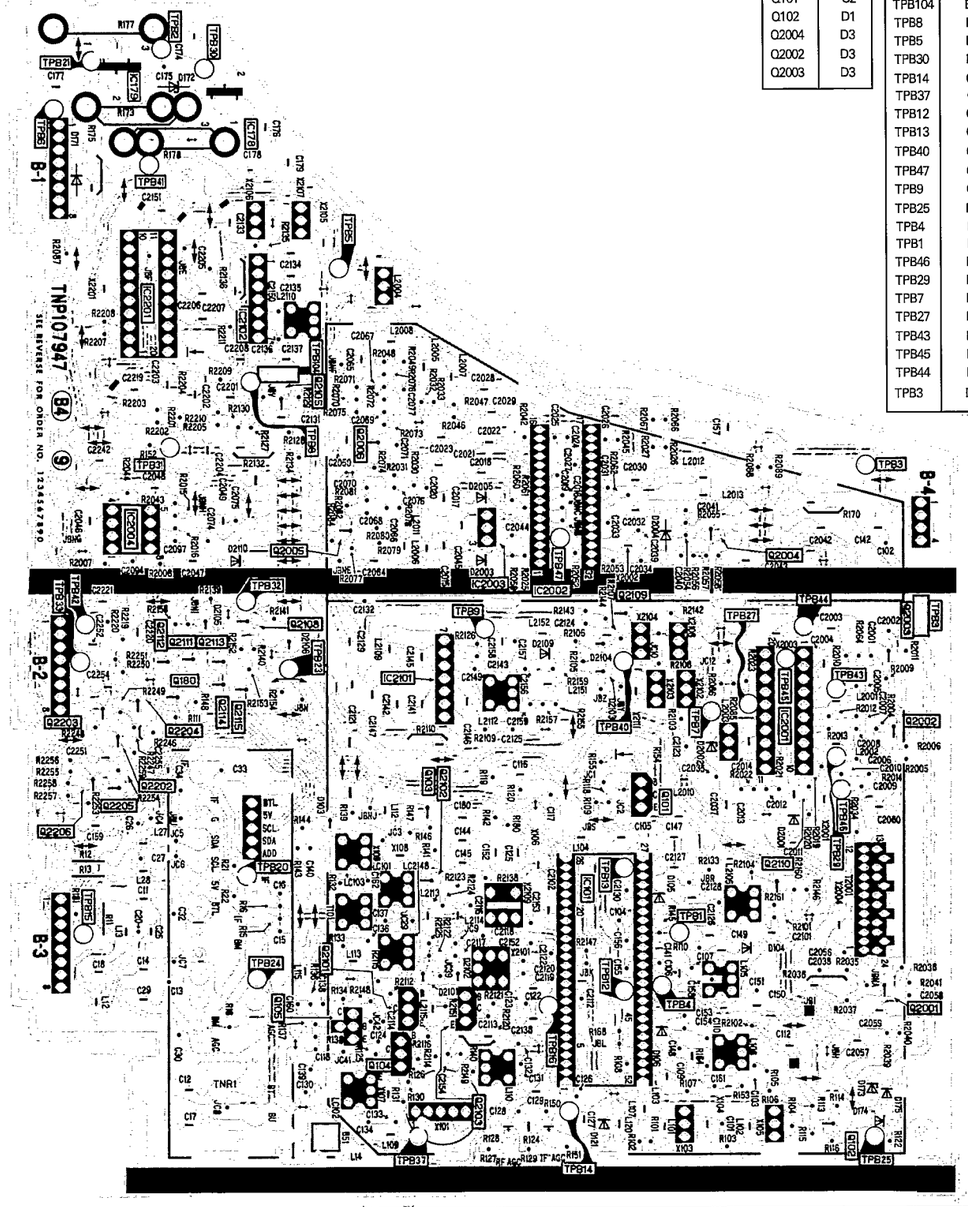
PARTS LOCATION

B-BOARD IC	
IC2004	A3
IC179	A5
IC2102	B4
IC178	B5
IC101	C2
IC2002	C3
IC2101	C3
IC2001	D3

Transistor	
Q2202	A2
Q2204	A3
Q2203	A3
Q105	B1
Q104	B1
Q2101	B1
Q180	B3
Q2105	B4
Q2006	B4
Q101	C2
Q102	D1
Q2004	D3
Q2002	D3
Q2003	D3

B-BOARD Diode	
D2003	C3
D175	D1
D174	D1
D173	D1
D2001	D2
D2004	D3

Test Points	
TPB15	A2
TPB33	A3
TPB31	A4
TPB2	A5
TPB6	A5
TPB21	A5
TPB41	A5
TPB24	B1
TPB20	B2
TPB23	B3
TPB32	B3
TPB104	B4
TPB8	B4
TPB5	B4
TPB30	B5
TPB14	C1
TPB37	C1
TPB12	C1
TPB13	C2
TPB40	C3
TPB47	C3
TPB9	C3
TPB25	D1
TPB4	D1
TPB1	D2
TPB46	D2
TPB29	D2
TPB7	D3
TPB27	D3
TPB43	D3
TPB45	D3
TPB44	D3
TPB3	D4



H BOARD TNP107946

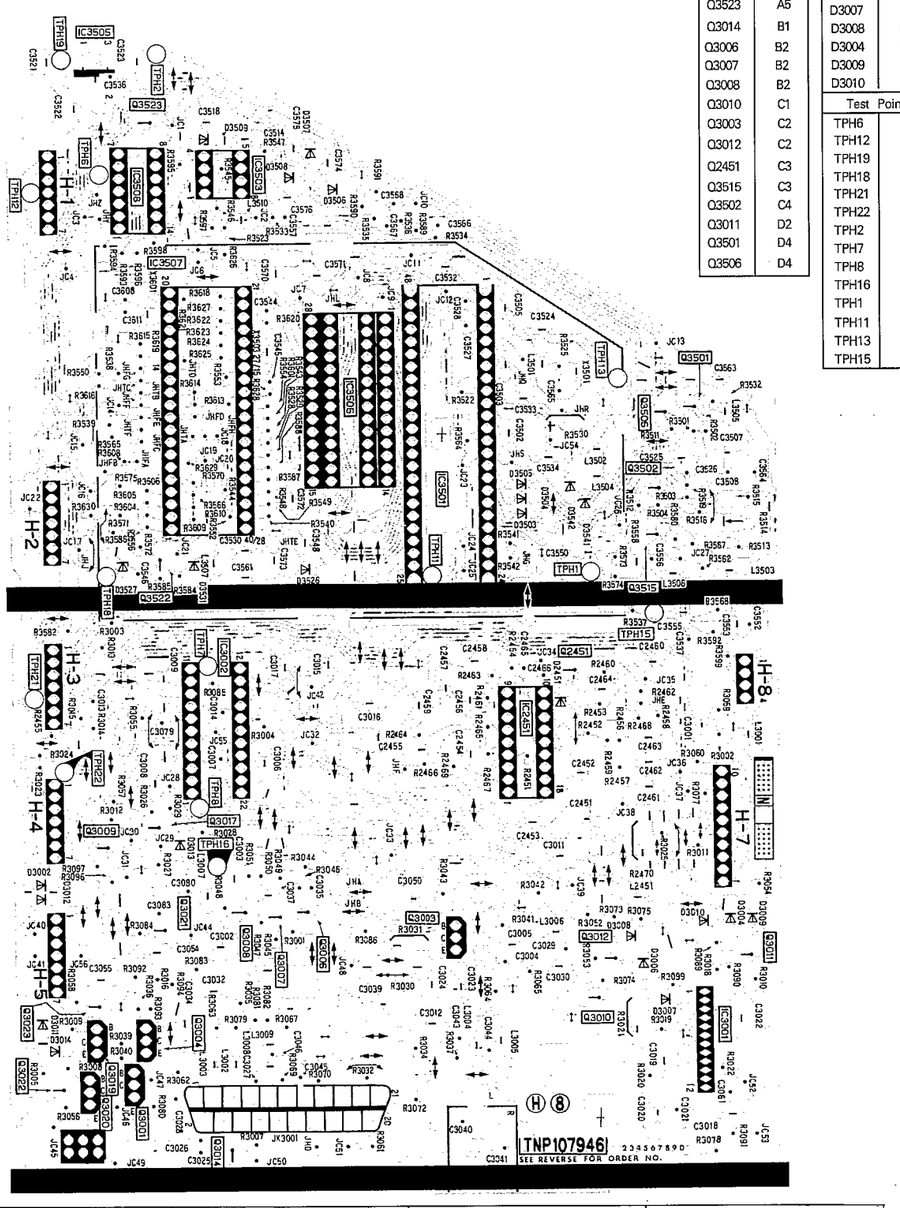
PARTS LOCATION

H-BOARD IC	
IC3505	A5
IC3508	A5
IC3002	B3
IC3507	B4
IC3503	B5
IC2451	C2
IC3501	C4
IC3001	D1

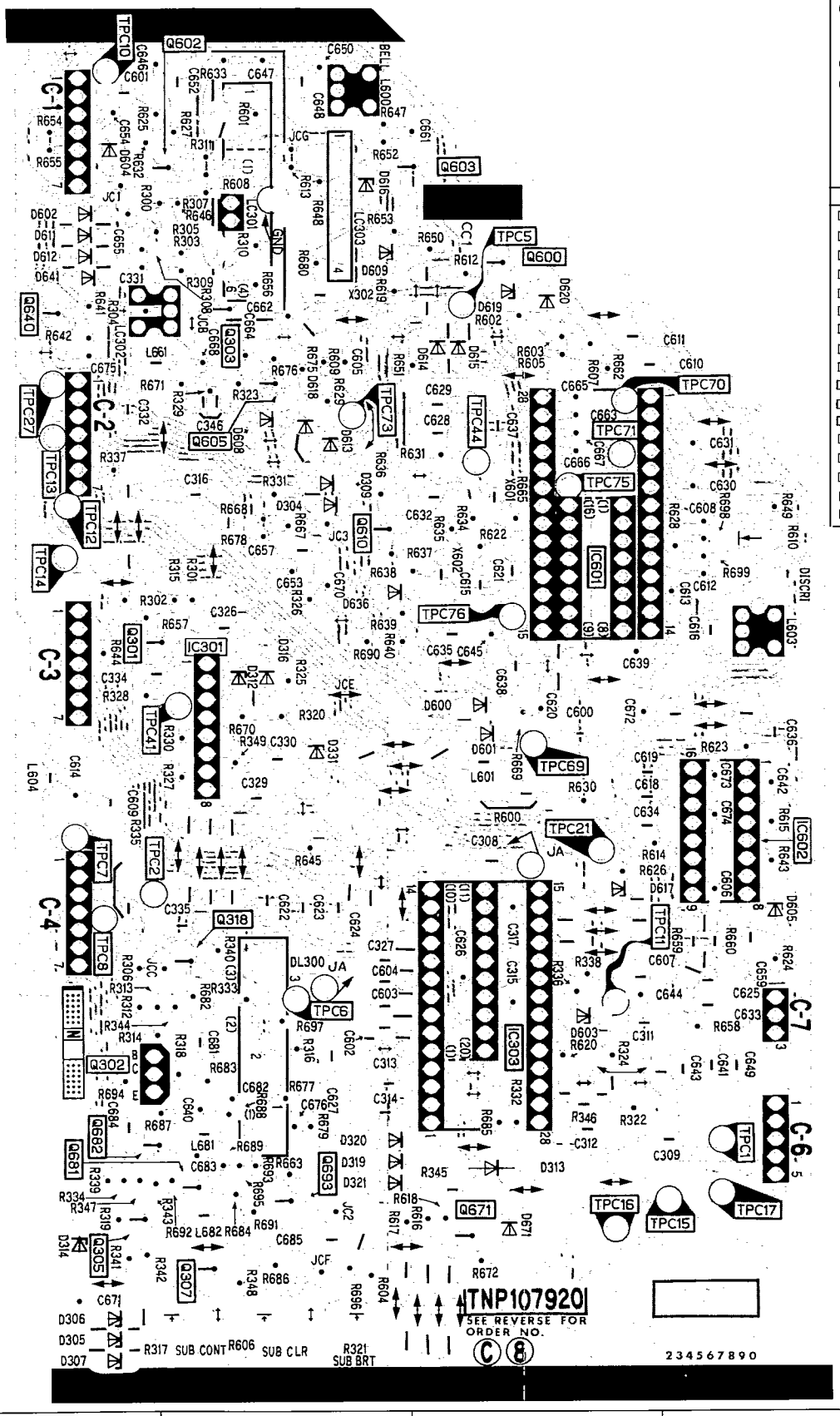
Transistor	
Q3019	A1
Q3020	A1
Q3022	A1
Q3023	A1
Q3001	A1
Q3004	A1
Q3009	A2
Q3017	A2
Q3522	A3
Q3523	A5
Q3014	B1
Q3006	B2
Q3007	B2
Q3008	B2
Q3010	C1
Q3003	C2
Q3012	C2
Q2451	C3
Q3515	C3
Q3502	C4
Q3011	D2
Q3501	D4
Q3506	D4

H-BOARD Diode	
D3011	A1
D3014	A1
D3002	A2
D3012	A2
D3527	A3
D3531	B3
D3508	B3
D3526	B3
D3513	B3
D3509	B5
D3507	B5
D3506	B5
D3006	C2
D2451	C3
D3503	C3
D3504	C3
D3505	C3
D3541	C4
D3542	C4
D3007	D1
D3008	D2
D3004	D2
D3009	D2
D3010	D2

Test Points	
TPH6	A5
TPH12	A5
TPH19	A5
TPH18	A3
TPH21	A3
TPH22	A2
TPH2	B5
TPH7	B3
TPH8	B2
TPH16	B2
TPH1	C3
TPH11	C3
TPH13	C4
TPH15	D3



C BOARD TNP107920



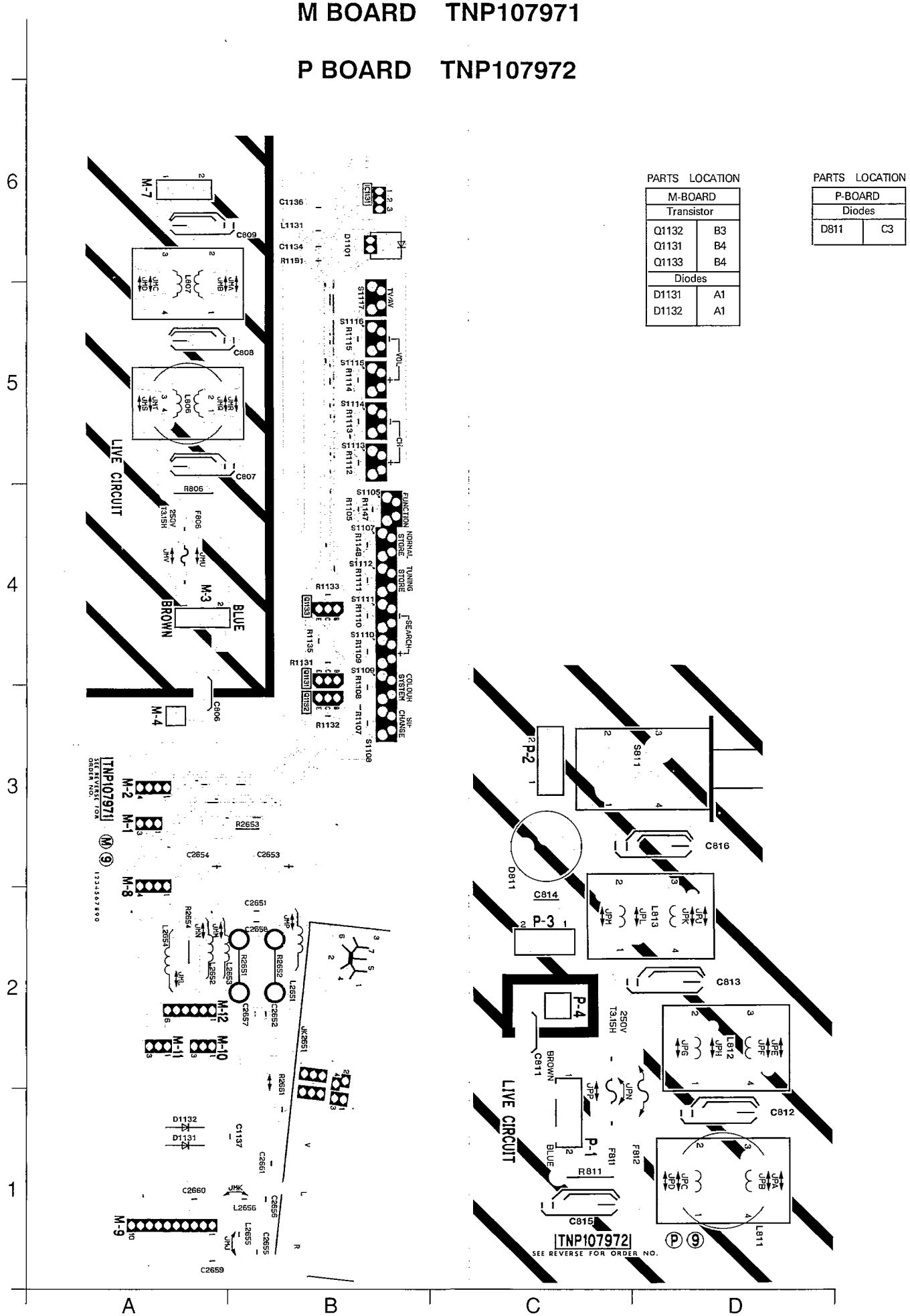
PARTS LOCATION

C-BOARD	
IC	
IC601	B5
IC301	B3
IC303	C2
IC602	D3
Transistor	
Q305	A1
Q682	A2
Q681	B1
Q307	B1
Q693	B1
Q318	B2
Q302	B2
Q605	B4
Q303	B5
Q602	B6
Q671	C1
Diode	
D305	A1
D306	A1
D307	A1
D314	A1
D321	B1
D319	B2
D320	B2
D316	B3
D331	B3
D304	B4
D309	B4
D313	C1
D671	C1
D600	C3
D601	C3
D617	C3
D605	D2

C-BOARD	
Test Points	
TPC2	A3
TPC6	A2
TPC8	A2
TPC7	A3
TPC10	A6
TPC14	A4
TPC13	A4
TPC27	A5
TPC41	B3
TPC73	B4
TPC5	C5
TPC16	C1
TPC21	C3
TPC44	C4
TPC69	C3
TPC70	C5
TPC75	C4
TPC76	C4
TPC1	D2
TPC15	D1
TPC17	D1

M BOARD TNP107971

P BOARD TNP107972



PARTS LOCATION

M-BOARD	
Transistor	
Q1132	B3
Q1131	B4
Q1133	B4
Diodes	
D1131	A1
D1132	A1

PARTS LOCATION

P-BOARD	
Diodes	
D811	C3

SCHEMATIC DIAGRAM FOR MODELS TX–28/25X1 (ALPHA–4 CHASSIS)

IMPORTANT SAFETY NOTICE

Components identified by ⚠ mark have special characteristics important for safety. When replacing any of these components, use only manufacturer's specified parts.

Notes

1. RESISTOR
All resistors are carbon ¼W resistor, unless marked.
Unit of resistance is OHM (Ω) (K=1,000, M=1,000,000).

: Nonflammable : Metal Oxide : Solid : Wire Wound
: Metal Film : Fuse

2. CAPACITOR
All capacitors are ceramic 50V capacitors, unless marked as follows:
Unit of capacitance is μF, unless otherwise stated.

: Temprature Compensation : Polyester : Metallised Polyester
: Polypropylene : Dipped Tantalum : Z–Type
: Electrolytic NP : Bipolar

3. COIL
Unit of inductance is μH, unless otherwise stated.

4. TEST POINT
: Test Point position : Waveform Test Point position

5. EARTH SYMBOL
: Chassis Earth (Cold) : Line Earth (Hot)

6. VOLTAGE MEASUREMENT
Voltage is measured by a DC voltmeter.Measurement conditions are as follows:

Power source	AC 240V, 50Hz
Receiving Signal	Colour Bar signal (RF)
All customer controls	Maximum position

7.
: Indicates the Video signal path
: Indicates the Audio signal path
: Indicates the Vertical/Horizontal signal path

8. This schematic diagram is the latest at the time of printing and is subject to change without notice.

Remarks

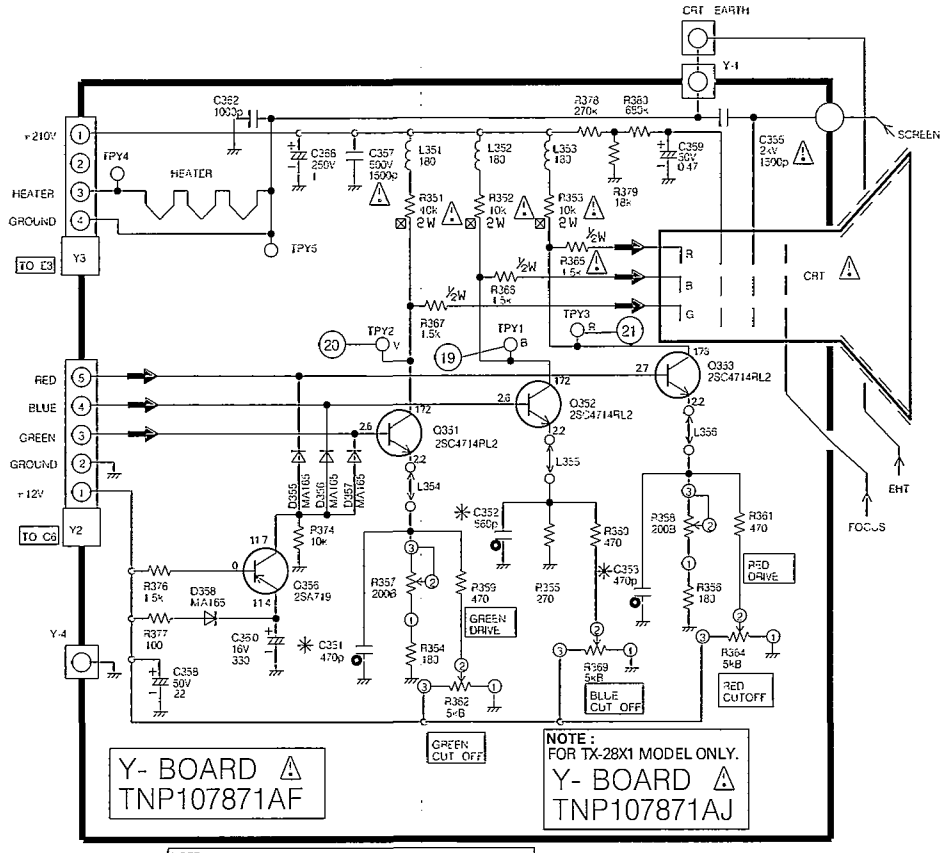
1. The Power Circuit contains a circuit area which uses a separate power supply to isolate the earth connection. The circuit is defined by HOT and COLD indications in the schematic diagram. All circuits, except the Power Circuit, are COLD.

Precautions

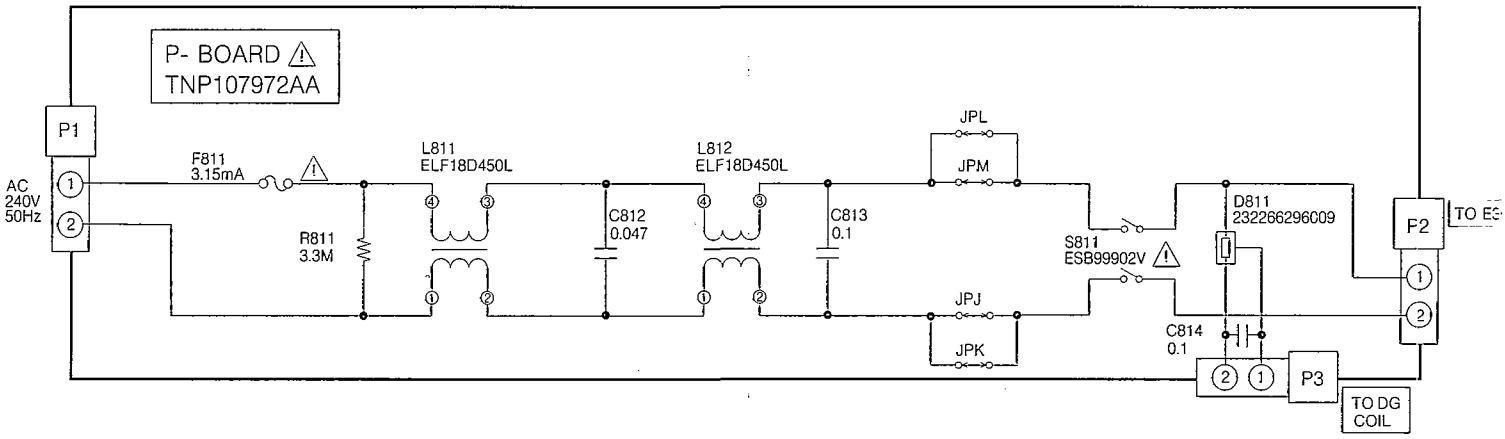
a. Do not touch the hot part, or the hot and cold parts at the same time, as you are liable to a shock hazard.
b. Do not short–circuit the hot and cold circuits as electrical components may be damaged.
c. Do not connect an instrument, such as an oscilloscope, to the hot and cold circuits simultaneously, as this may cause fuse failure. Connect the earth of the instruments to the earth connection of the circuit being measured.
d. Make sure to disconnect the power plug before removing the chassis.

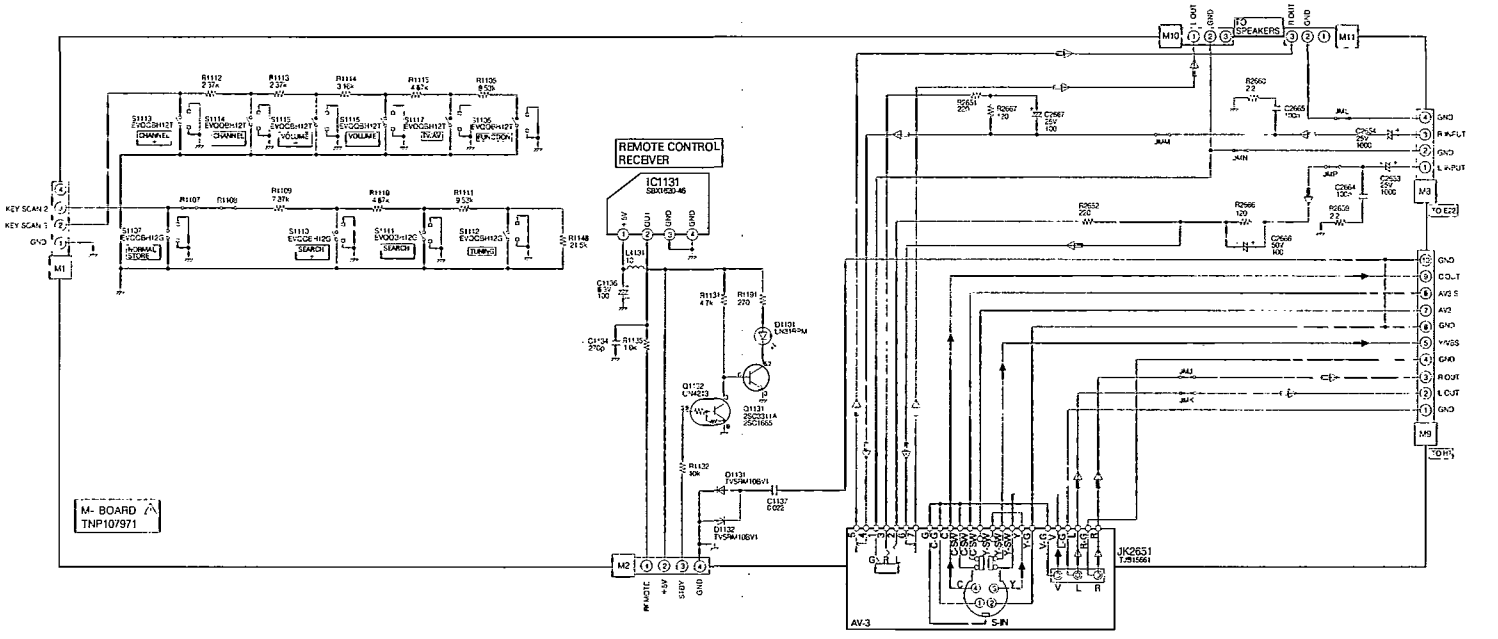
2. The following resistors are fusible safety components, and are rated at the following values :

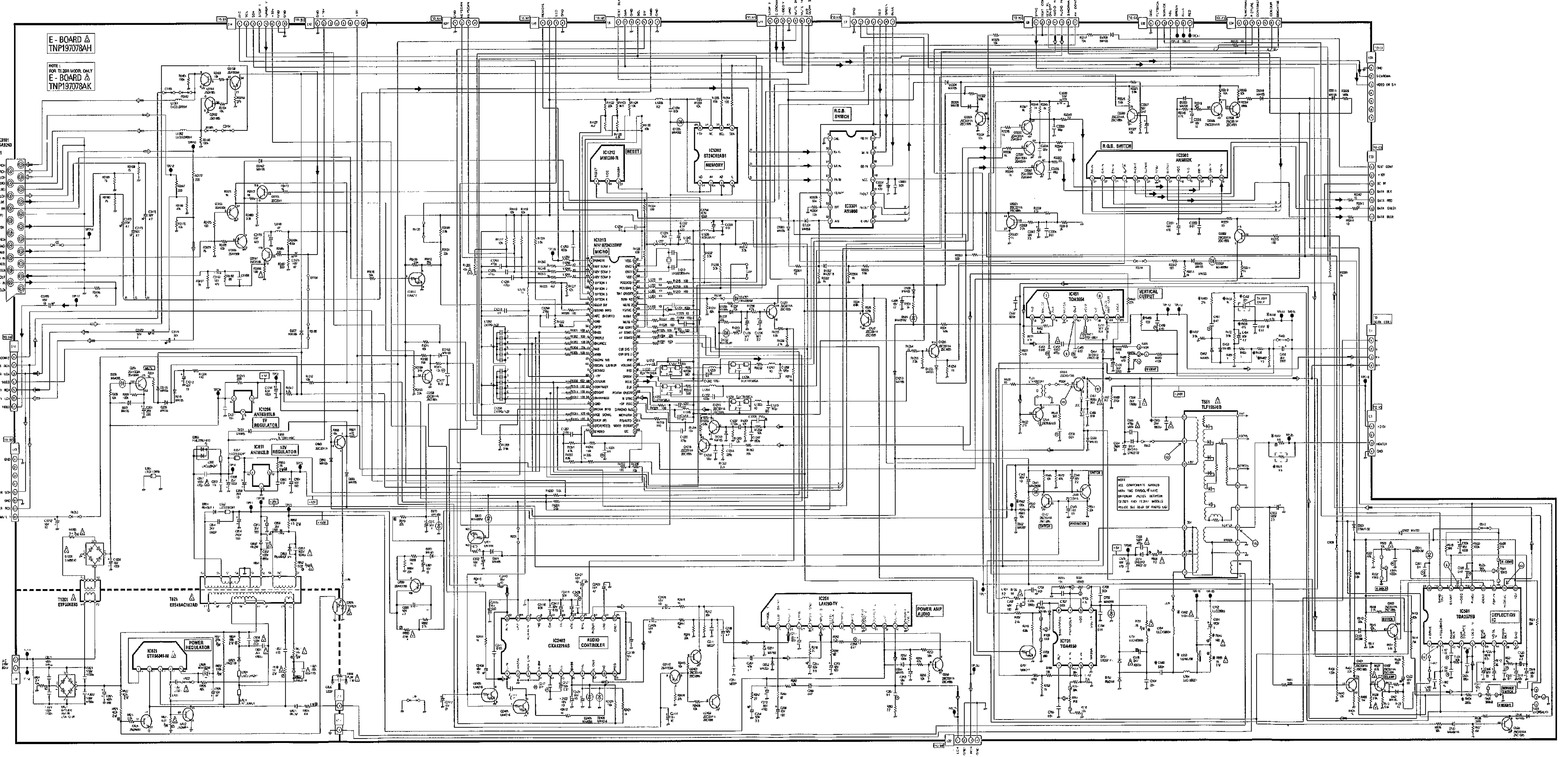
Ref:	Part number	Current rating
R451	**TSF19801**	**800mA**



NOTE
ALL COMPONENTS MARKED WITH THE SYMBOL ✳ HAVE DIFFERENT VALUES BETWEEN TX-28X1 AND TX-25X1 MODELS
PLEASE SEE REAR OF PARTS LIST

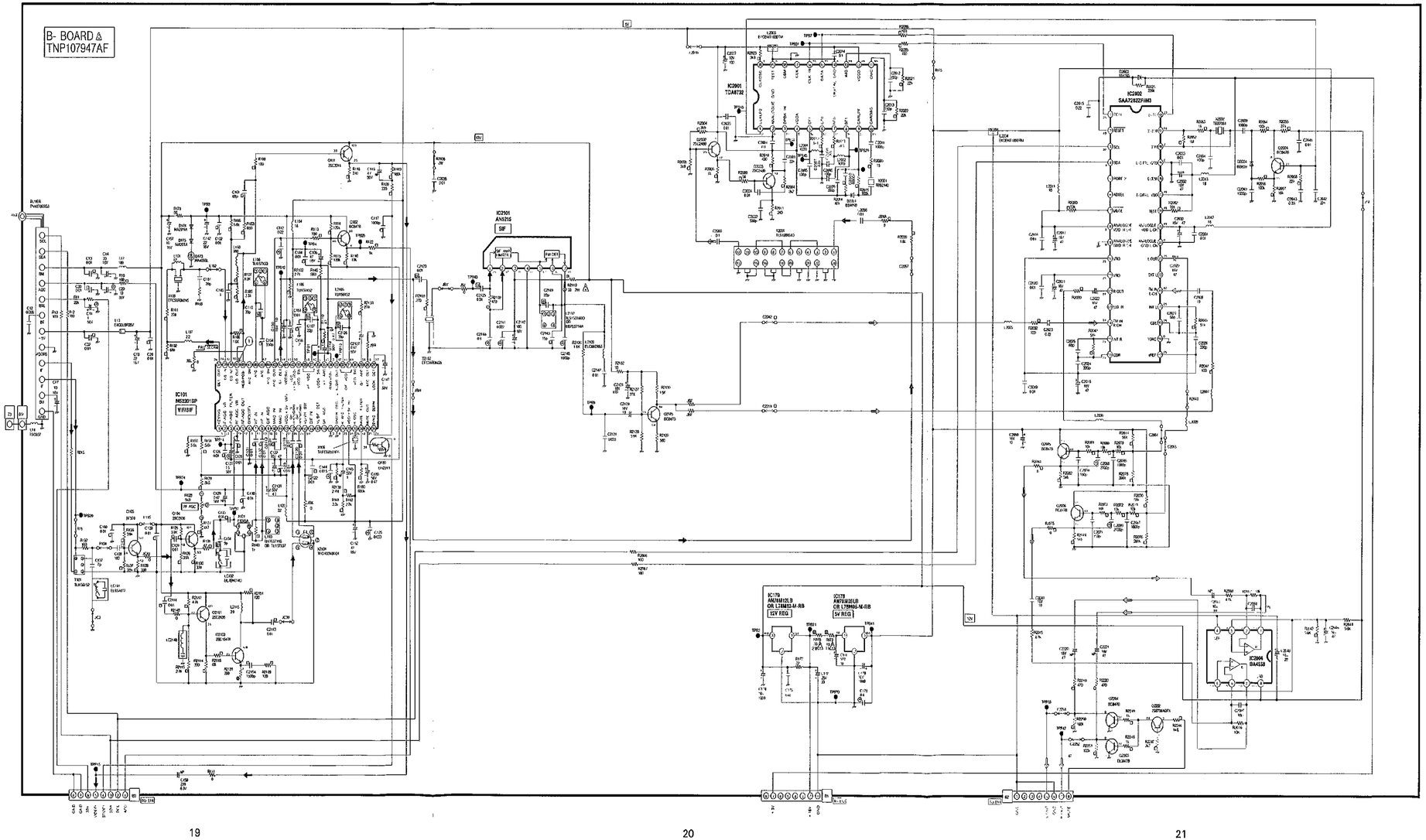





E-BOARD
TNP197078AH
NOTE :
FOR TX-28XT MODEL ONLY
E-BOARD
TNP197078AK
AV1
R.G.B. SWITCH
MEMORY
RESET
MICRO
5V REGULATOR
12V REGULATOR
POWER REGULATOR
AUDIO CONTROLLER
POWER AMP AUDIO
VERTICAL OUTPUT
DEFLECTION

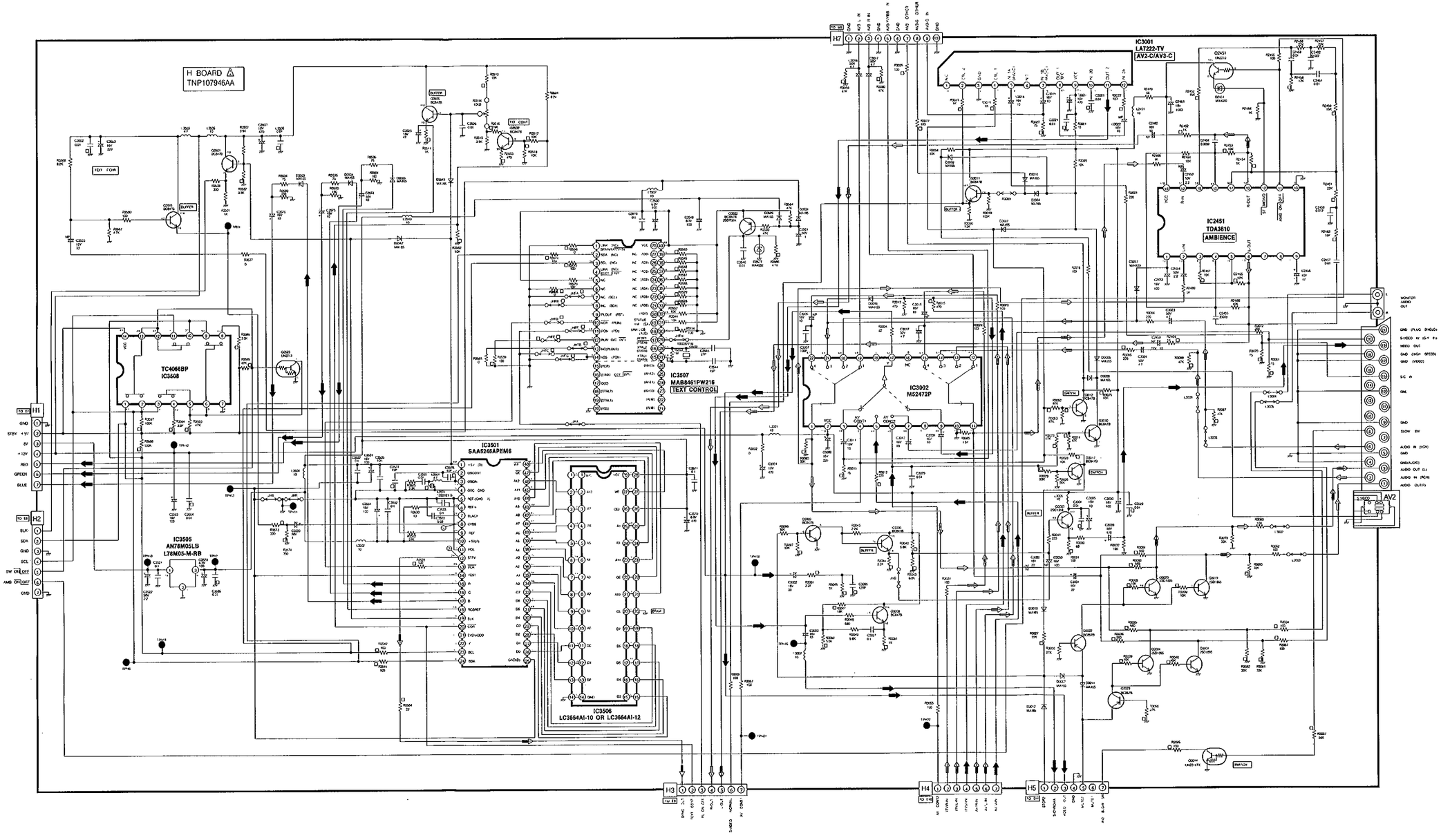
15 16 17 18

B- BOARD △
TNP107947AF



WAVEFORM PATTERNS

① 3.1Vp-p (20uS)	② 2.8Vp-p (20uS)	③ 2.8Vp-p (20uS)
④ 0.4Vp-p (20uS)	⑤ 1.2Vp-p (20uS)	⑥ 3.0Vp-p (20uS)
⑦ 3.6Vp-p (5mS)	⑧ 22Vp-p (5mS)	⑨ 46Vp-p (5mS)
⑩ 2Vp-p (20uS)	⑪ 18Vp-p (10uS)	⑫ 1500Vp-p (10uS)
⑬ 100Vp-p (20uS)	⑭ 100Vp-p (20uS)	⑮ 25.2Vp-p (20uS)
⑯ 4.5Vp-p (20uS)	⑰ 4.5Vp-p (20uS)	⑱ 4.5Vp-p (20uS)
⑲ 150Vp-p (20uS)	⑳ 150Vp-p (20uS)	㉑ 150Vp-p (20uS)


H BOARD
TNP107946AA
IC3001
LA7222-TV
AV2-C/AV3-C
IC2451
TDA3810
AMBIENCE
IC3002
M52472P
IC3501
SAA5246APEM6
IC3507
MAB5461PW216
TEXT CONTROL
IC3506
LC3654AI-10 OR LC3664AI-12
IC2505
AN78M05LB
L78M05-M-RB
TC4066BP
IC3508
AV2
H1
H2
H3
H4
H5
H7