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FILE NO. SM-CTV-O-044

COLOR TELEVISION

SERVICE MANUAL

MODEL NO. AT2408S/AT2408

CHASSIS NO. CH-10C1(S)

Please read this manual carefully before service

PRINTED IN CHINA.MAY.2003 ©

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SAFETY INSTRUCTIONS

WARNING: BEFORE SERVICING THIS CHASSIS, READ THE “X-RAY RADIATION PRECAUTION”, “SAFETY PRECAUTION” AND “PRODUCT SAFETY NOTICE” INSTRUCTION BELOW.

X-RAY RADIATION PRECAUTION

1. The EHT must be checked every time the TV is serviced to ensure that the CRT does not emit X-ray radiation as result of excessive EHT voltage. The nominal EHT for this TV is 27.5KV at zero beam current (minimum brightness) operating at AC 120V. The maximum EHT voltage permissible in any operating circumstances must not exceed 30KV. When checking the EHT, use the High Voltage Check procedure in this manual using an accurate EHT voltmeter.
2. The only source of X-RAY in this TV is the CRT. To prevent X-ray radiation, the replacement CRT must be identical to the original fitted as specified in the parts list.
3. Some components used in this TV have safety related characteristics preventing the CRT from emitting X-ray radiation. For continued safety, replacement component should be made after referring the PRODUCT SAFETY NOTICE below.

SAFETY PRECAUTION

1. The TV has a nominal working EHT voltage of 27.5KV. Extreme caution should be exercised when working on the TV with the back removed.
 - 1) Do not attempt to service this TV if you are not conversant with the precautions and procedures for working on high voltage equipment.
 - 2) When handling or working on the CRT, always discharge the anode to the TV chassis before removing the anode cap in case of electric shock.
 - 3) The CRT, if broken, will violently expel glass fragments. Use shatterproof goggles and take extreme care while handling.
 - 4) Do not hold the CRT by the neck as this is a very dangerous practice.
2. It is essential that to maintain the safety of the customer all power cord forms be replaced exactly as supplied from factory.
3. Voltage exists between the hot and cold ground when the TV is in operation. Install a suitable isolating transformer of beyond rated overall power when servicing or connecting any test equipment for the sake of safety.
4. Replace blown fuses within the TV with the fuse specified in the parts list.
5. When replacing wires or components to terminals or tags, wind the leads around the terminal before soldering. When replacing safety components identified by the international hazard symbols in the circuit diagram and parts list, it must be the company-approved type and must be mounted as the original.
6. Keep wires away from high temperature components.

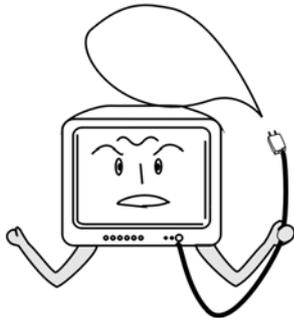
SAFETY INSTRUCTIONS (continued)

PRODUCT SAFETY NOTICE

Many electrical and mechanical components in this chassis have special safety-related characteristics. These characteristics are often passed unnoticed by a visual inspection and the X-ray radiation protection afforded by them cannot necessarily be obtained by using replacements rated at higher voltages or wattage, etc. Components which have these special safety characteristics in this manual and its supplements are identified by the international hazard symbols in the circuit diagram and parts list. Before replacing any of these components read the parts list in this manual carefully. Substitute replacement components which do not have the same safety characteristics as specified in the parts list may create X-ray radiation.

PRECAUTIONS

Power Sources-The TV set should be operated only from the type of power source indicated on the TV set or as indicated in the Service Manual. If you are not sure of the type of power supply in your home, consult your sales person or your local power company. For TV sets designed to operate from battery power, or other sources, refer to the operating instructions.

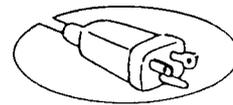


Grounding or Polarization-Do not defeat the safety purpose of the polarized or grounding-type plug. A polarized plug has two blades with one wider than the other. A grounding-type plug has two blades and a third grounding prong. The wide blade or the third prong is provided for your safety. If the provided plug does not fit into your outlet, consult an electrician for replacement of the obsolete outlet.

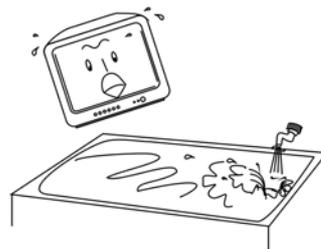


Wide blade
Lame large
Cuchilla ancha

Alternate Warnings-A three wire grounding type plug-a plug having a third (grounding) pin. This plug will only fit into grounding type power outlet.



Water and Moisture Warnings-Do not use the TV set near water-for example, near a bath tub, wash bowl, kitchen sink, or laundry tub; in a wet basement; or near a swimming pool; and the like. The TV set shall not be exposed to dripping or splashing and no objects filled with liquids, such as vases, shall be placed on the TV set.



Ventilation-Slots and openings in the cabinet are provided for ventilation and to ensure reliable operation of the TV set and to protect it from overheating, and these openings must not be blocked or covered. The openings should never be blocked by placing the TV set on a bed, sofa, rug, or other similar surface. This TV set should not be placed in a built-in installation such as a bookcase or rack unless proper ventilation is provided or the manufacturer's instructions have been adhered to.

SPECIFICATIONS

Television system:	NTSC-M
Channel coverage:	VHF 2~13 UHF 14~69 CABLE TV: MID BAND (A-8~A-1, A~I) SUPER BAND (J~W) HYPER BAND (AA~ZZ, AAA, BBB) ULTRA BAND (65~94, 100~125)
Channels preset:	181
Antenna input:	75 Ω (unbalanced)
Picture tube;	Effective screen dimensions: 478mm×363mm (18.82×14.29 in.)
Max. audio output;	5W×2 (for AT2408 only); 5W+5W (for AT2408S only)
Power source;	~120Vac 60Hz
Weight:	31.5kg (69 lbs) (Approx.)
Dimensions(W/H/D):	660×522×458mm (25.98×20.55×18.03 in.) (Approx.)
Packing dimensions(W/H/D):	740×610×545mm (29.13×24.02×21.46 in.) (Approx.)
Rated power consumption:	125W

Designs and specifications are subject to change without notice.

KEY ICs AND ASSEMBLIES

Table 1 Key ICs and Assemblies

Serial No.	Position No.	Model No.	Function Description
1	N301	OM8839PS/TDA8843-N2	Small signal processor
2	N401	TDA8350Q	Vertical output circuit
3	N402	LM317	Tri-terminal regulator
4	N601	TDA7057AQ	Sound power amplifier
5	N001	CH04T1002/CH04T1009	Microcontroller
6	N002	AT24C04	EEPROM
7	N811	TDA4605	Switching power control circuit
8	NY01	TDA6107Q	Video amplifier
9	DS01	HEF4052	Analog switch circuit
10	DS02	HEF4053	Analog switch circuit
11	N606	TDA9859	Audio processor
12	U101	TDQ-6F2M2	Tuner

Note: TDA9859 (N606) is not available in AT2408.

SYSTEM BLOCK DIAGRAMS

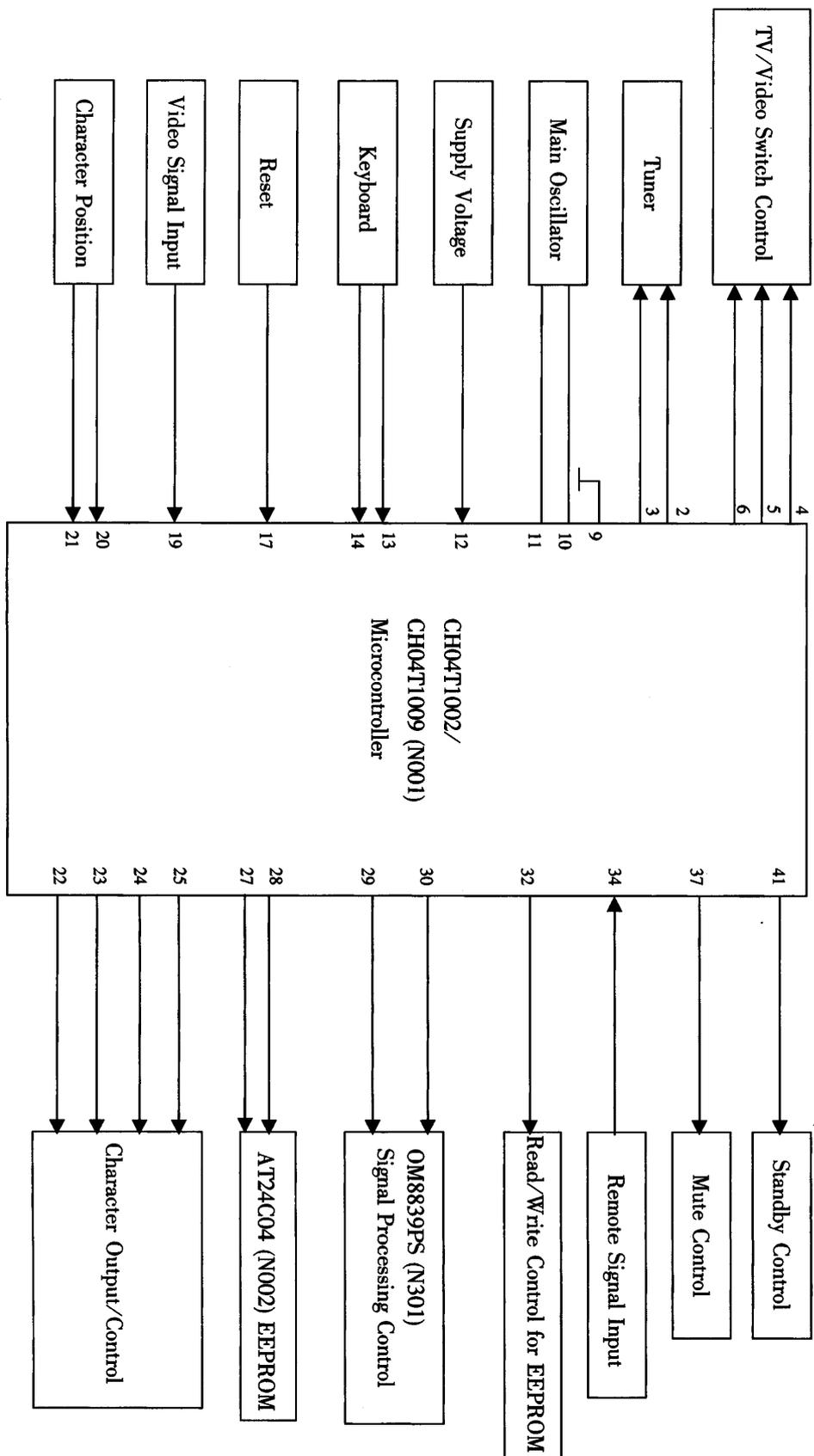


Fig. 1 Block Diagram for CH-10C1(S) Remote Control Structure

SYSTEM BLOCK DIAGRAMS (continued)

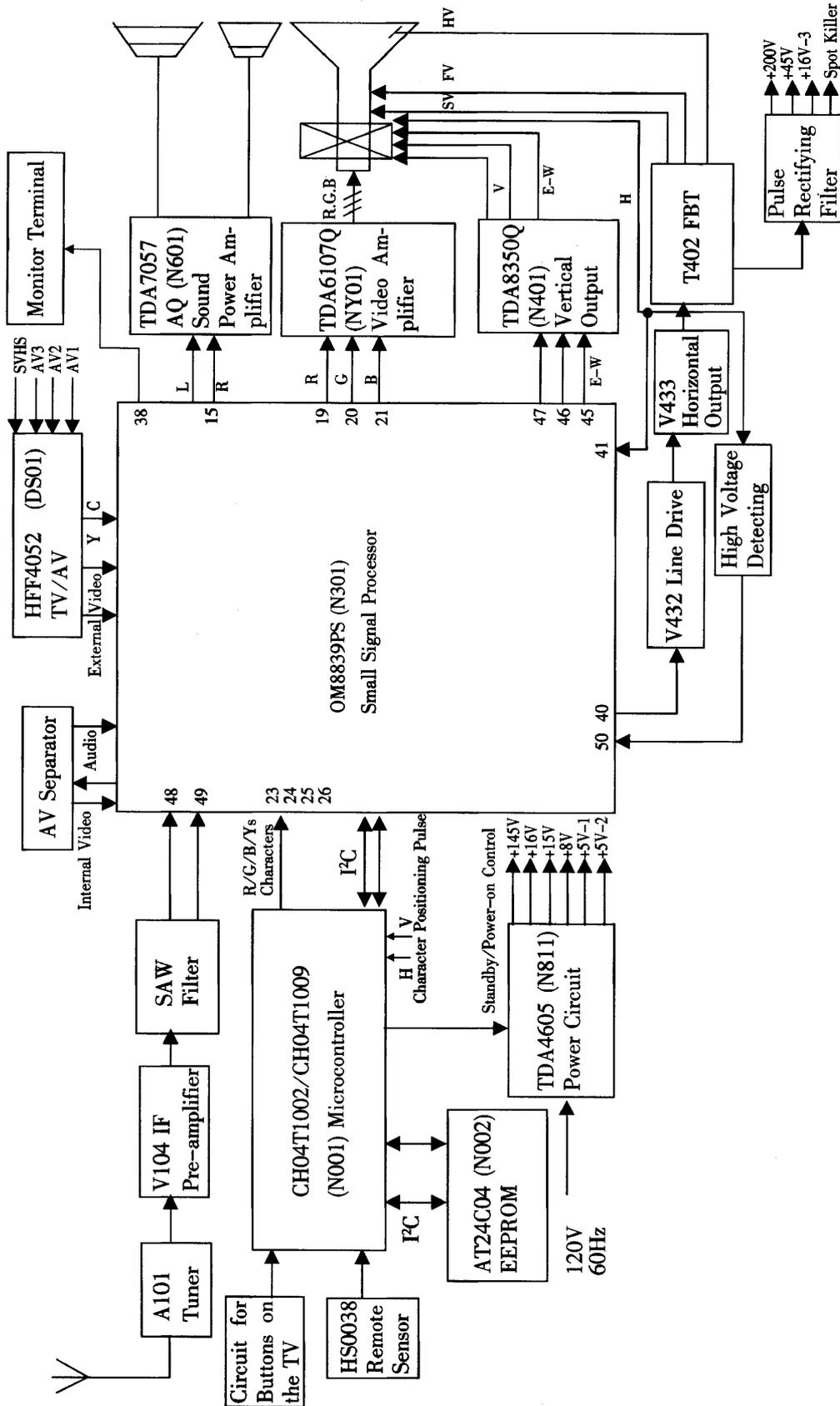


Fig. 2 Structure Block Diagram for CH-10C1(S) Chassis

SYSTEM BLOCK DIAGRAMS (continued)

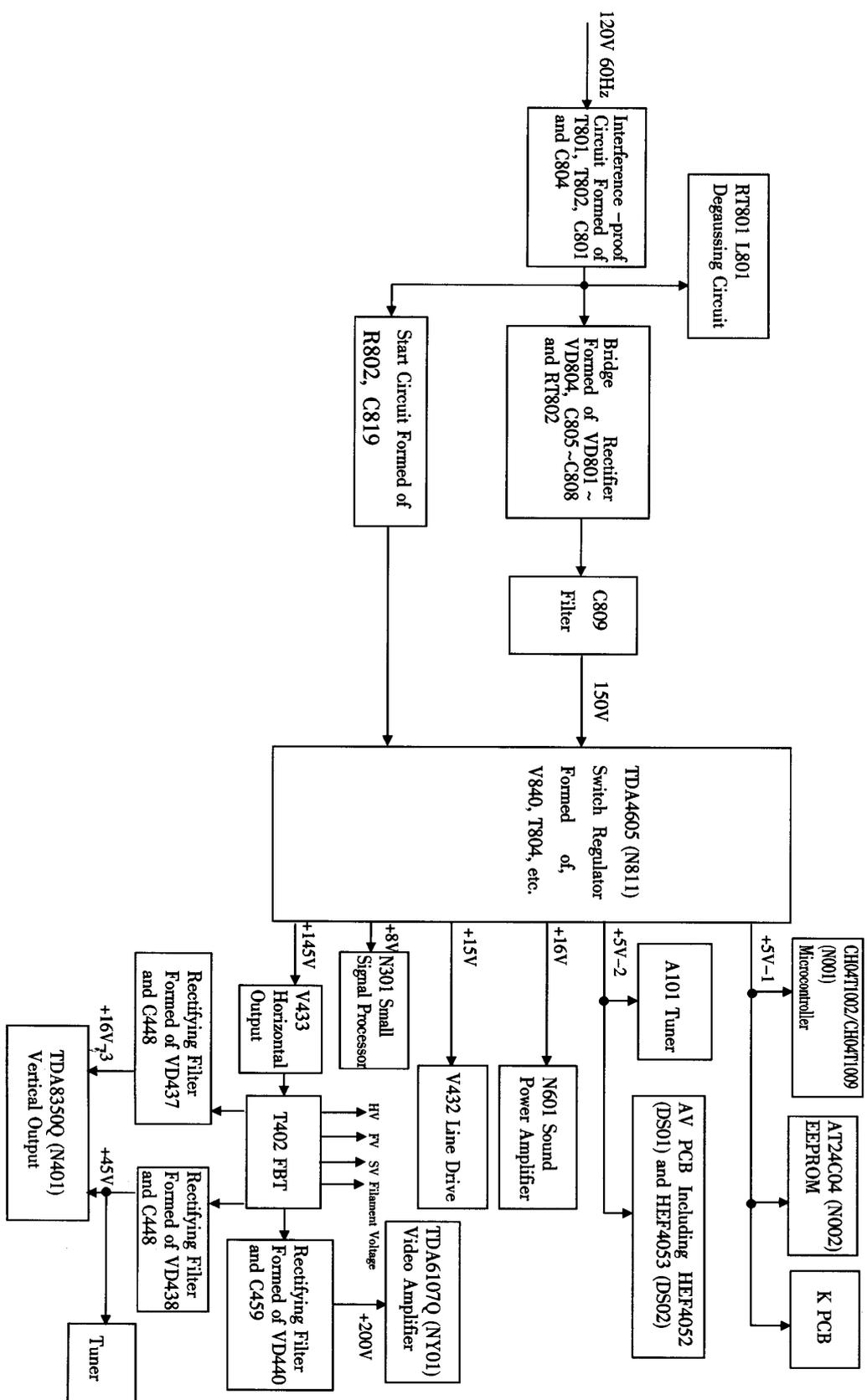


Fig. 3 Block Diagram for CH-10C1(S) Supply Voltage System

IC DATA AND WAVEFORMS OF KEY POINTS

TDA 4605

Control IC for Switched-Mode Power Supplies Using MOS-Transistor

1. Features

- Fold-back characteristics provides overload protection for external components
- Burst operation under secondary short-circuit condition implemented
- Protection against open or a short of the control loop
- Switch-off if line voltage is too low (undervoltage switch-off)
- Line voltage depending compensation of fold-back point
- Soft-start for quiet start-up without noise generated by the transformer
- Chip-over temperature protection implemented(thermal shutdown)
- On-chip ringing suppression circuit against parasitic oscillations of the transformer
- AGC-voltage reduction at low load

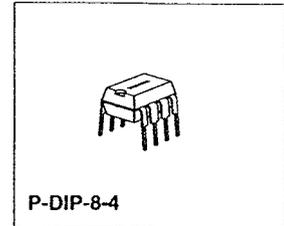
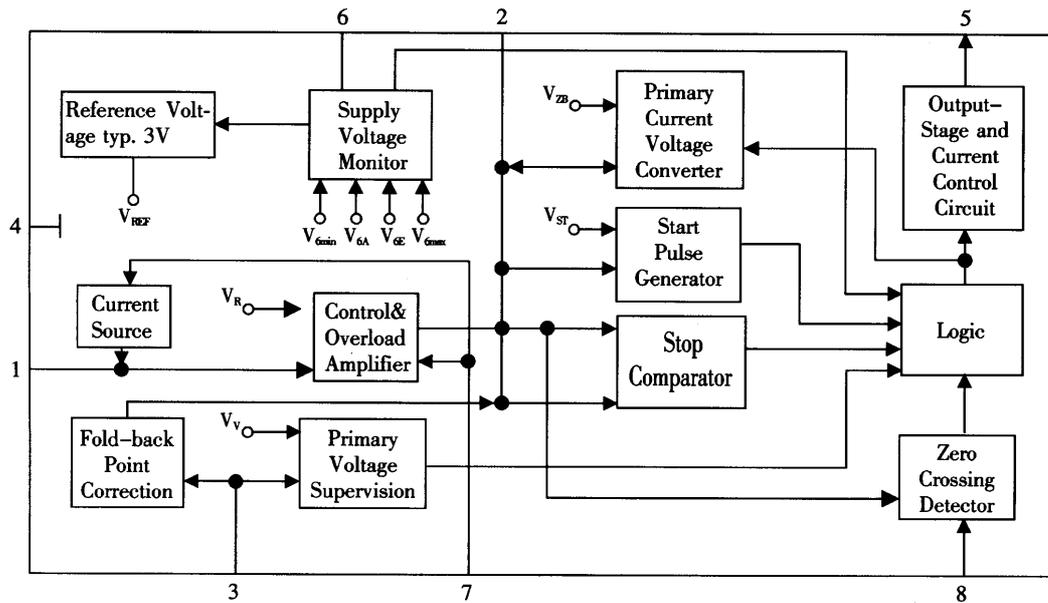


Fig. 10

2. Block Diagram



UEB03855

Fig. 11

3. Refer to Table 3 about Functions and Data of the IC's Each Pin.

IC DATA AND WAVEFORMS OF KEY POINTS (continued)

CH04T1002/ CH04T1009

1. Terminal Assignment Layouts

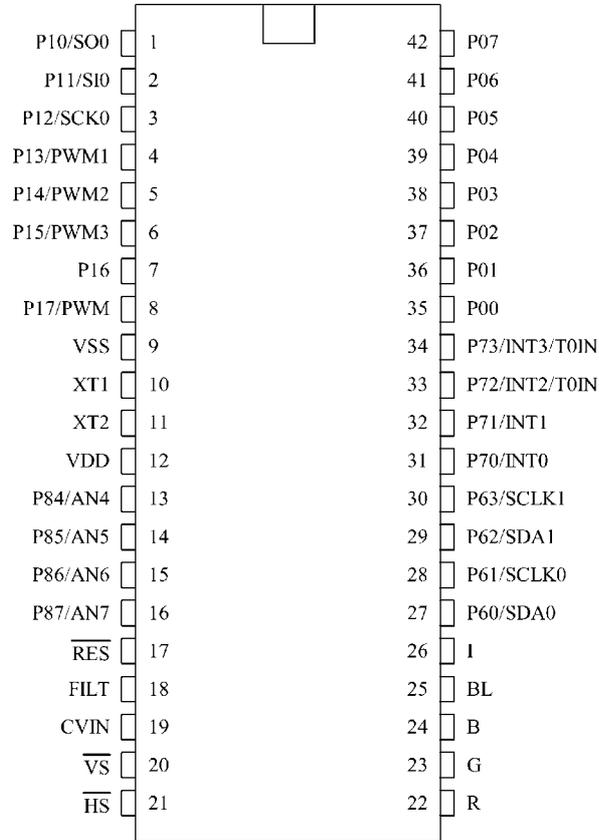


Fig. 12 CH04T1002/ CH04T1009 DIP42S Terminal Assignment Layoutd

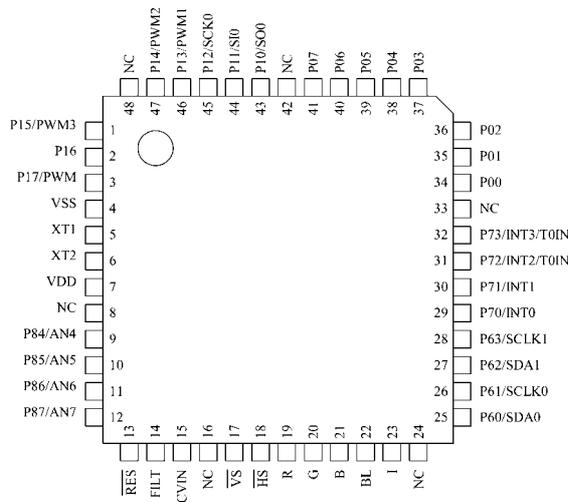


Fig. 13 CH04T1002/ CH04T1009 QIP48E Terminal Assignment Layout

IC DATA AND WAVEFORMS OF KEY POINTS (continued)**CH04T1002/ CH04T1009 (continued)****2. Terminal Function**

Table 2 Terminal Function Table

Terminal	I/O	Function Description	Option	Format														
VSS	-	Negative power supply																
XT1	1	Input terminal for crystal oscillation																
XT2	O	Output terminal for crystal oscillation																
VDD	-	Positive power supply																
RES	I	Reset terminal		A														
FILT	O	Charge-pump output terminal		N														
CVIN	I	Image signal input terminal (available only in CH04T1002)		M														
VS	I	Vertical synchronization signal input terminal		A														
HS	I	Horizontal synchronization signal input terminal																
R	O	Red (R) output terminal of RGB image		O														
G	O	Green (G) output terminal of RGB image																
B	O	Blue (B) output terminal of RGB image																
I	O	Intensity (I) output terminal of RGB image																
BL	O	Fast blanking control signal Switch TV image and caption/OSD image signal																
Part 0	I/O	<ul style="list-style-type: none"> 8-bit input/output port Input/output can be specified in nibble unit Other functions: Hold release input Internal input 	Pull-up resistor provided/not provided	E														
P00-p07			Output format CMOS/Nch-OD															
Port 1	I/O	<ul style="list-style-type: none"> 8-bit input/output port Each bit can be independently programmable Other functions: <table border="1"> <tr> <td>P10</td> <td>SIO0 data output</td> </tr> <tr> <td>P11</td> <td>SIO0 data input/bus input/output</td> </tr> <tr> <td>P12</td> <td>SIO0 clock input/output</td> </tr> <tr> <td>P13</td> <td>PWM1 output</td> </tr> <tr> <td>P14</td> <td>PWM2 output</td> </tr> <tr> <td>P15</td> <td>PWM3 output</td> </tr> <tr> <td>P17</td> <td>Timer 1(PWM) output</td> </tr> </table>	P10	SIO0 data output	P11	SIO0 data input/bus input/output	P12	SIO0 clock input/output	P13	PWM1 output	P14	PWM2 output	P15	PWM3 output	P17	Timer 1(PWM) output	Output format CMOS/Nch-OD	F
P10			SIO0 data output															
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P12			SIO0 clock input/output															
P13			PWM1 output															
P14			PWM2 output															
P15			PWM3 output															
P17	Timer 1(PWM) output																	
P10-P17																		
Port 6	I/O	<ul style="list-style-type: none"> 4-bit input/output port Each bit can be independently programmable Other functions: <table border="1"> <tr> <td>P60</td> <td>IIC0 data input/output</td> </tr> <tr> <td>P61</td> <td>IIC0 clock output</td> </tr> <tr> <td>P62</td> <td>IIC1 data input/output</td> </tr> <tr> <td>P63</td> <td>IIC1 clock output</td> </tr> </table>	P60	IIC0 data input/output	P61	IIC0 clock output	P62	IIC1 data input/output	P63	IIC1 clock output								
P60			IIC0 data input/output															
P61			IIC0 clock output															
P62			IIC1 data input/output															
P63	IIC1 clock output																	

IC DATA AND WAVEFORMS OF KEY POINTS (continued)

CH04T1002/CH04T1009 (continued)

Terminal	I/O	Function Description	Option	Format																																											
Port 7	I/O	<ul style="list-style-type: none"> 4-bit input/output port Each bit can be independently programmable Other functions: <table border="1" data-bbox="443 555 1078 757"> <tr> <td>P70</td> <td>INT0 input/HOLD release input /Nch-Tr. output for watchdog timer</td> </tr> <tr> <td>P71</td> <td>INT1 input/HOLD release input</td> </tr> <tr> <td>P72</td> <td>INT2 input/timer 0 event input</td> </tr> <tr> <td>P73</td> <td>INT3 input (noise rejection filter attached input)/timer 0 event input</td> </tr> </table> Interrupt receiver format vector address <table border="1" data-bbox="411 797 1114 1034"> <thead> <tr> <th></th> <th>Rising</th> <th>Falling</th> <th>Rising/ Falling</th> <th>H level</th> <th>L level</th> <th>Vector</th> </tr> </thead> <tbody> <tr> <td>INT0</td> <td>yes</td> <td>yes</td> <td>no</td> <td>yes</td> <td>yes</td> <td>03H</td> </tr> <tr> <td>INT1</td> <td>yes</td> <td>yes</td> <td>no</td> <td>yes</td> <td>yes</td> <td>0BH</td> </tr> <tr> <td>INT2</td> <td>yes</td> <td>yes</td> <td>yes</td> <td>no</td> <td>no</td> <td>13H</td> </tr> <tr> <td>INT3</td> <td>yes</td> <td>yes</td> <td>yes</td> <td>no</td> <td>no</td> <td>1BH</td> </tr> </tbody> </table> 	P70	INT0 input/HOLD release input /Nch-Tr. output for watchdog timer	P71	INT1 input/HOLD release input	P72	INT2 input/timer 0 event input	P73	INT3 input (noise rejection filter attached input)/timer 0 event input		Rising	Falling	Rising/ Falling	H level	L level	Vector	INT0	yes	yes	no	yes	yes	03H	INT1	yes	yes	no	yes	yes	0BH	INT2	yes	yes	yes	no	no	13H	INT3	yes	yes	yes	no	no	1BH		P70 W P71-P73 V
P70		INT0 input/HOLD release input /Nch-Tr. output for watchdog timer																																													
P71	INT1 input/HOLD release input																																														
P72	INT2 input/timer 0 event input																																														
P73	INT3 input (noise rejection filter attached input)/timer 0 event input																																														
	Rising	Falling	Rising/ Falling	H level	L level	Vector																																									
INT0	yes	yes	no	yes	yes	03H																																									
INT1	yes	yes	no	yes	yes	0BH																																									
INT2	yes	yes	yes	no	no	13H																																									
INT3	yes	yes	yes	no	no	1BH																																									
Port 8	I I/O	<ul style="list-style-type: none"> 1-bit input port (P83 is set only in CH04T1002) 4-bit input/output port(P84-P87) Each bit can be independently programmable Other function: AD converter input port 		P83 B P84-P87 X																																											

- Port options can be specified independently for each bit.
- The programmable pull-up resistors are provided, depending on whether CMOS or Nch-OD (Nch open drain) is selected as the port 1 option.

3. Refer to Table 3 about Functions and Data of the IC's Each Pin.

IC DATA AND WAVEFORMS OF KEY POINTS (continued)

EEPROM AT24C04

1. Features

- Data EEPROM internally organized as 512 bytes and 32 pages×16 bytes
- Low power CMOS
- Vcc=2.7 to 5.5V operation
- Two wire serial interface bus , I²C-Bus compatible
- Filtered inputs for noise suppression with Schmitt trigger
- Clock frequency up to 400 kHz
- High programming flexibility
 - Internal programming voltage
 - Self timed programming cycle including erase
 - Byte-write and page-write programming , between 1 and 16 bytes
 - Typical programming time 6 ms(<10ms) for up to 16 bytes
- High reliability
 - Endurance 10⁶ cycles¹⁾
 - Data retention 40 years¹⁾
 - ESD protection 4000 V on all pins
- 8 pin DIP/DSO packages
- Available for extended temperature ranges
 - Industrial: -40°C to +85°C
 - Automotive: -40°C to +125°C

2. Pin Configuration

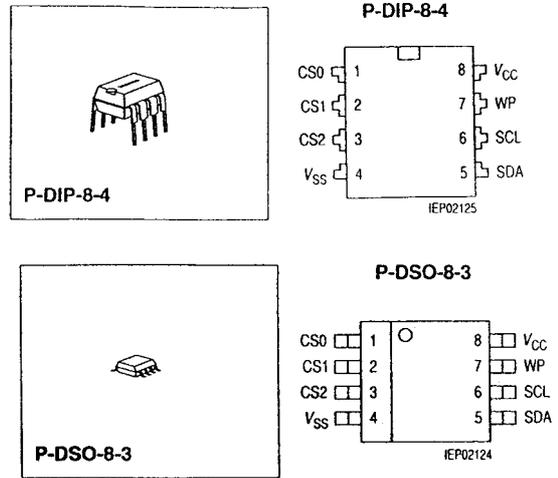


Fig. 14

4. Refer to Table 5 about Functions and Data of the IC's Each Pin

3. Block Diagram

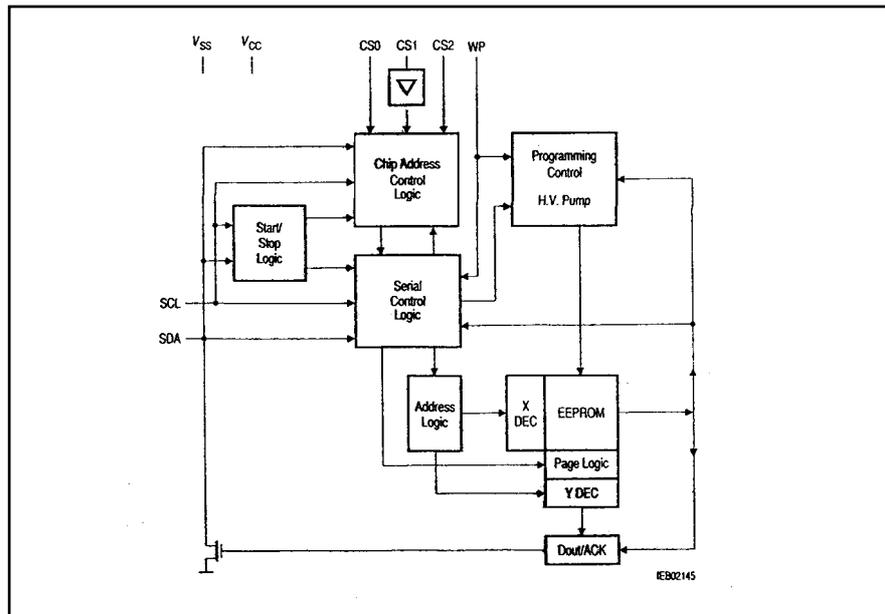


Fig. 15

IC DATA AND WAVEFORMS OF KEY POINTS (continued)**OM8839PS/TDA8843-N2****I²C-bus Controlled PAL/NTSC/SECAM TV Processors****1. Features**

The following features are available in all IC' s:

- Multi-standard vision IF circuit with an alignment-free PLL demodulator without external components
- Alignment-free multi-standard FM sound demodulator (4.5 MHz to 6.5 MHz)
- Audio switch
- Flexible source selection with CVBS switch and Y(CVBS)/C input so that a comb filter can be applied
- Integrated chrominance trap circuit
- Integrated luminance delay line
- Asymmetrical peaking in the luminance channel with a (defeatable) noise coring function
- Black stretching of non-standard CVBS or luminance signals
- Integrated chroma band-pass filter with switchable centre frequency
- Dynamic skin tone control circuit
- Blue stretch circuit which offsets colours near white towards blue
- RGB control circuit with "Continuous Cathode Calibration" and white point adjustment
- Possibility to insert a "blue back" option when no video signal is available
- Horizontal synchronization with two control loops and alignment-free horizontal oscillator
- Vertical count-down circuit
- Vertical driver optimised for DC-coupled vertical output stages
- I²C-bus control of various functions

2. General Description

The various versions of the TDA 884X/5X series are I2C-bus controlled single chip TV processors which are intended to be applied in PAL, NTSC, PAL/NTSC and multi-standard television receivers. The N2 version is pin and application compatible with the N1 version, however, a new feature has been added which makes the N2 more attractive. The IF PLL demodulator has been replaced by an alignment-free IF PLL demodulator with internal VCO (no tuned circuit required). The setting of the various frequencies (33.4, 33.9, 38, 38.9, 45, 75 and 58.75 MHz) can be made via the I²C-bus.

Because of this difference the N2 version is compatible with the N1, however, N1 devices cannot be used in an optimised N2 application.

Functionally the IC series is split up in 3 categories, viz:

- Versions intended to be used in economy TV receivers with all basic functions (envelope: S-DIP 56 and QFP 64)
 - Versions with additional features like E-W geometry control, H-V zoom function and YUV interface which are intended for TV receivers with 110° picture tubes (envelope: S-DIP 56)
 - Versions which have in addition a second RGB input with saturation control and a second CVBS output (envelope: QFP 64)
- The various type numbers are given in the table below.

3. Survey of IC Types

Envelope	S-DIP 56		QFP 64	
	Economy	Mid/High end	Economy	Mid/High end
PAL only	TDA 8840		TDA 8840H	
PAL/NTSC	TDA 8841	TDA 8843	TDA 8841H	
PAL/SECAM/NTSC	TDA 8842	TDA 8844	TDA 8842H	TDA 8854H
NTSC only	TDA 8846/46A	TDA 8847		TDA 8857H

IC DATA AND WAVEFORMS OF KEY POINTS (continued)
OM8839PS/TDA8843-N2 (continued)

4. Block Diagram

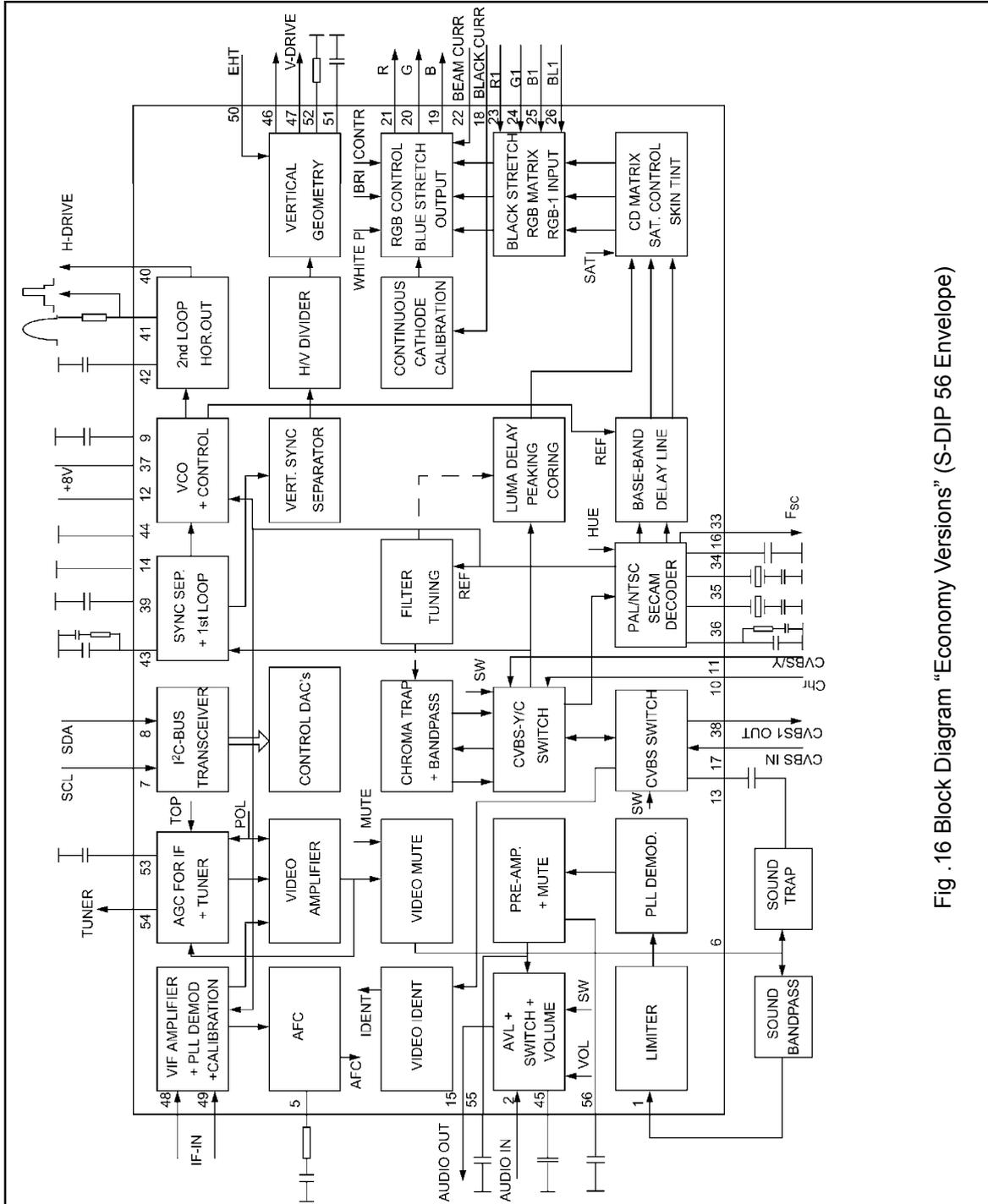


Fig . 16 Block Diagram "Economy Versions" (S-DIP 56 Envelope)

5. Refer to Table 6 about Functions and Data of the IC's Each Pin.

IC DATA AND WAVEFORMS OF KEY POINTS (continued)

TDA8350Q

DC-coupled Vertical Deflection and East-West Output Circuit

1. Features

- Few external components
- Highly efficient fully DC-coupled vertical output bridge circuit
- Vertical flyback switch
- Guard circuit
- Protection against:
 - short-circuit of the output pins
 - short-circuit of the output pins to V_P

3. Block Diagram

- High EMC immunity due to common mode inputs
- Temperature (thermal) protection
- East-West output stage with one single conversion resistor.

2. General Description

The TDA8350Q is a power circuit for use in 90° and 110° colour deflection systems for field frequencies of 50 to 120 Hz. The circuit provides a DC driven vertical deflection output circuit, operating as a highly efficient class G system and an East-West driver for sinking the diode modulator current.

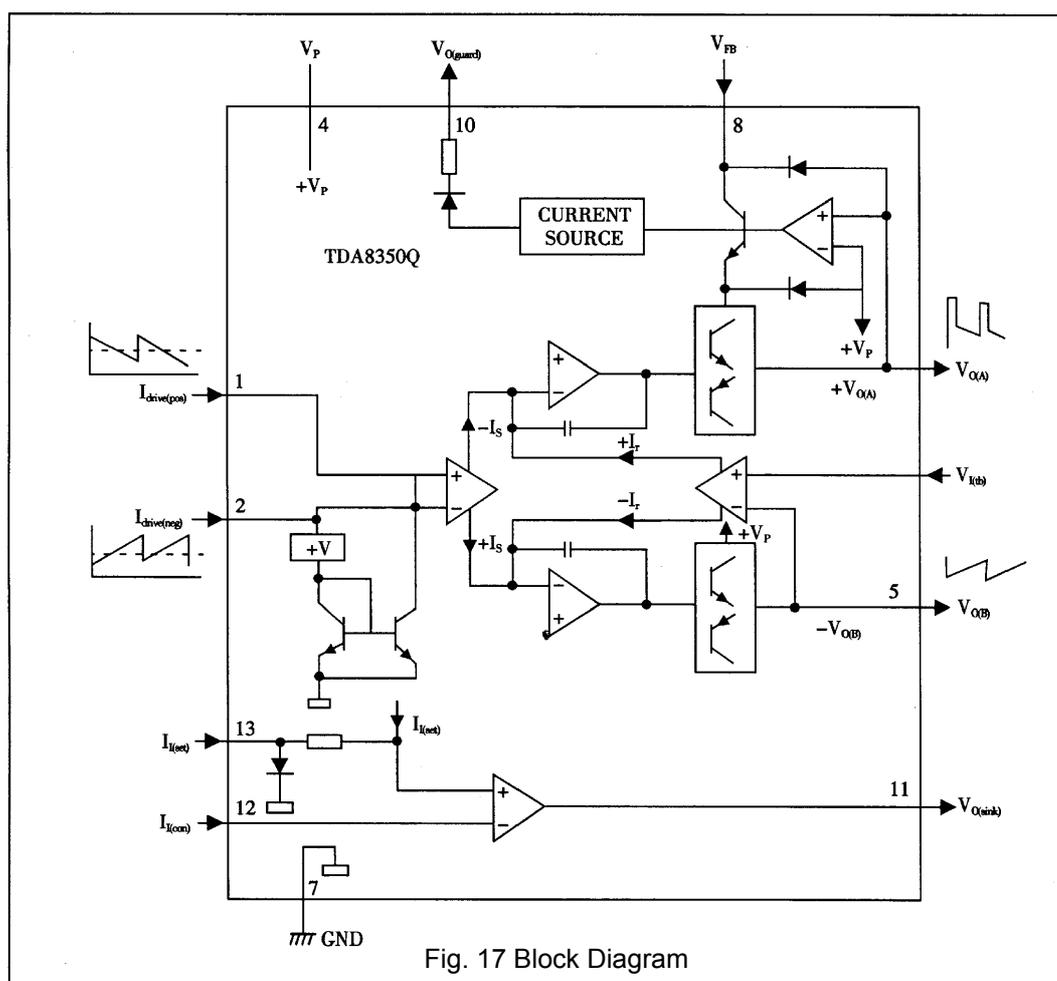


Fig. 17 Block Diagram

4. Refer to Table 7 about Functions and Data of the IC's Each Pin.

IC DATA AND WAVEFORMS OF KEY POINTS (continued)

TDA7057AQ

2×8W Stereo BTL Audio Output Amplifier with DC Volume Control

1. Features

- DC volume control
- Few external components
- Mute mode
- Thermal protection
- Short-circuit proof
- No switch-on and switch-off clicks
- Good overall stability
- Low power consumption
- Low HF radiation
- ESD protected on all pins.

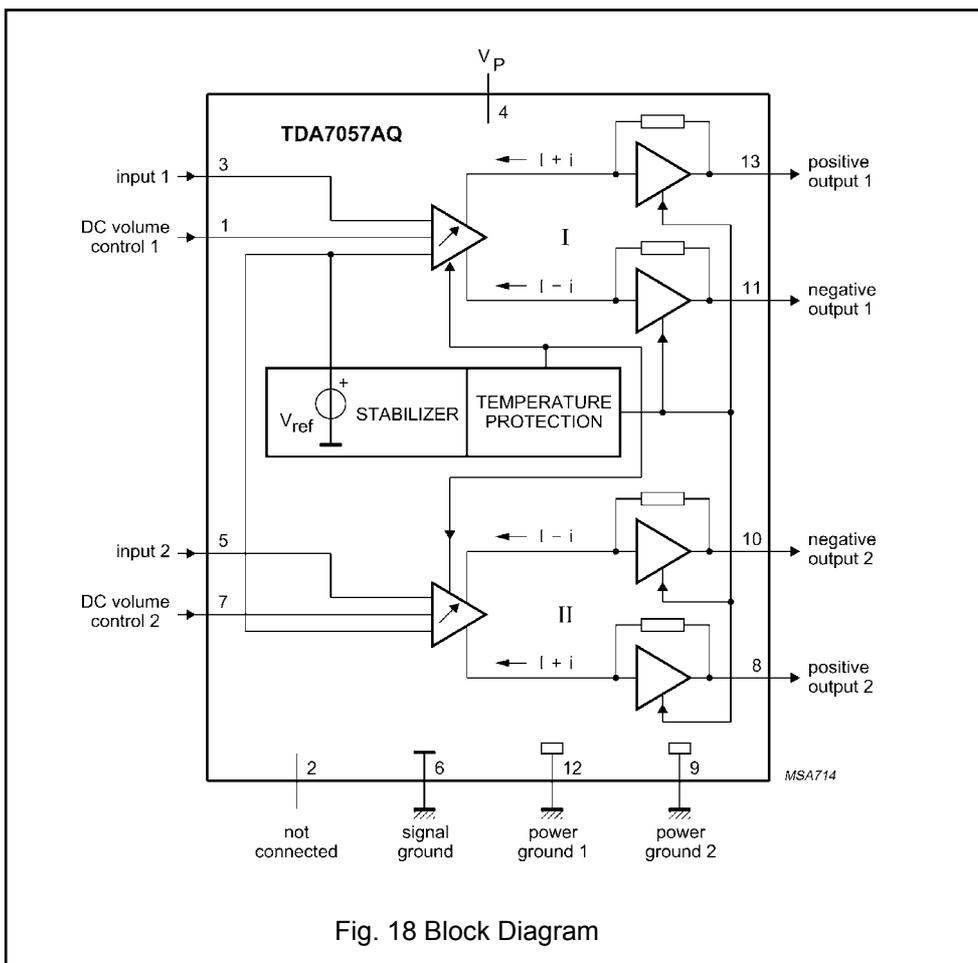
General Description

The TDA7057AQ is a stereo BTL output amplifier with DC volume control. The device is designed for use in TVs and monitors, but is also suitable for battery-fed portable recorders and radios.

Issuing Current Limiter (MCL)

A MCL protection circuit is built-in. The MCL circuit is activated when the difference in current between the output terminal of each amplifier exceeds 100 mA (typical 300 mA). This level of 100 mA allows for single-ended headphone applications.

3. Block Diagram



4. Refer to Table 8 about Functions and Data of the IC's Each Pin.

IC DATA AND WAVEFORMS OF KEY POINTS (continued)

TDA6107Q

Triple Video Output Amplifier

1. Features

- Typical bandwidth of 5.5 MHz for an output signal of 60 V (p-p)
- High slew rate of 900 V/S
- No external components required
- Very simple application
- Single supply voltage of 200 V
- Internal reference voltage of 2.5 V
- Fixed gain of 50
- Black-Current Stabilization (BCS) circuit
- Thermal protection.

2. General Description

The TDA6107Q includes three video output amplifiers in one plastic DIL-bent-SIL 9-pin medium power (DBS9MPF) package (SOT 111-1), using high-voltage DMOS technology, and is intended to drive the three cathodes of a colour CRT directly. To obtain maximum performance, the amplifier should be used with black-current control.

3. Ordering Information

Type Number	Package		
	Name	Description	Version
TDA6107Q	DBS9MPF	Plastic DIL-bent-SIL medium power package with fin; 9 leads	SOT111-1

4. Block Diagram

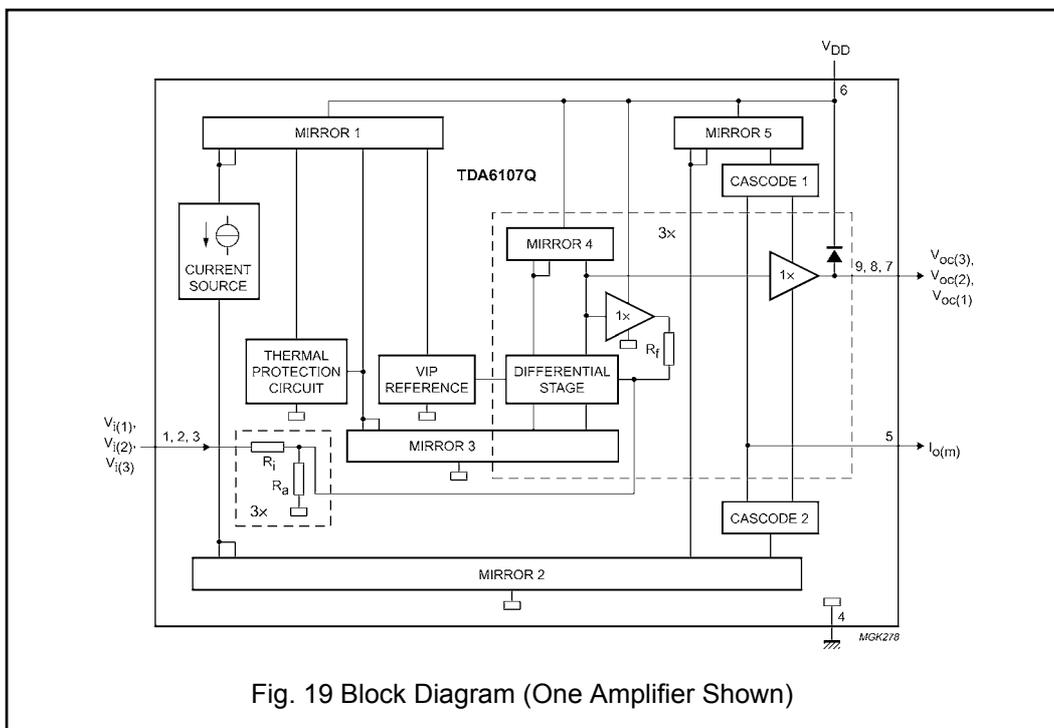


Fig. 19 Block Diagram (One Amplifier Shown)

5. Refer to Table 9 about Functions and Data of the IC's Each Pin.

IC DATA AND WAVEFORMS OF KEY POINTS (continued)

HEF4052

Dual 4-channel Analog Multiplexer/Demultiplexer

1. Description

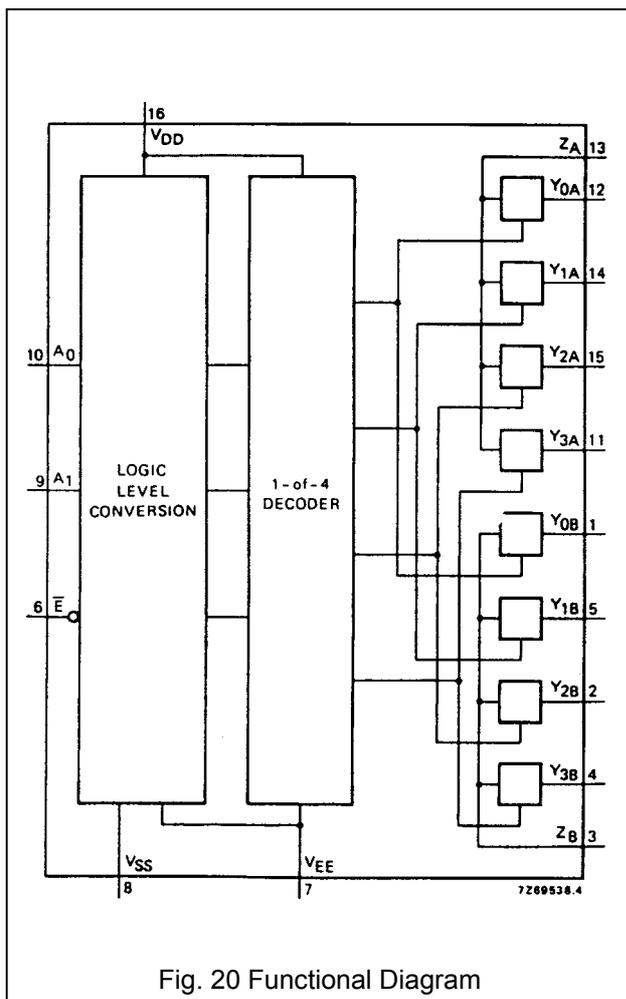
The HEF4052 is a dual 4-channel analog multiplexer/demultiplexer with common channel select logic. Each multiplexer/demultiplexer has four independent inputs/outputs (Y_0 to Y_3) and a common input/output (Z). The common channel select logic includes two address inputs (A_0 and A_1) and an active LOW enable input (\bar{E}). Both multiplexers/demultiplexers contain four bidirectional analog switches, each with one side connected to an independent input/output (Y_0 to Y_3) and the other side connected to a common input/output (Z).

With \bar{E} LOW, one of the four switches is selected (low impedance ON-state) by A_0 and A_1 . With \bar{E} HIGH, all switches are in the high impedance OFF-state, independent of A_0 and A_1 . V_{DD} and V_{SS} are the supply voltage connections for the digital control inputs (A_0 , A_1 and \bar{E}). The V_{DD} to V_{SS} range is 3 to 15 V. The analog inputs/outputs (Y_0 to Y_3 , and Z) can swing between V_{DD} as a positive limit and V_{EE} as a negative limit.

$V_{DD}-V_{EE}$ may not exceed 15 V.

For operation as a digital multiplexer/demultiplexer, V_{EE} is connected to V_{SS} (typically ground).

2. Block Diagrams



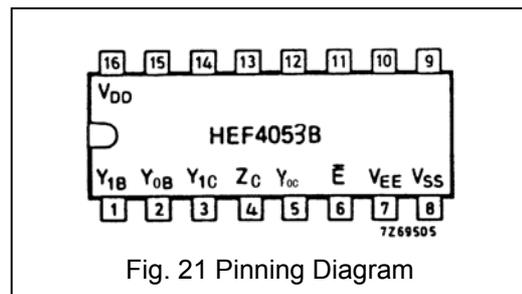
Pinning

Y_{0A} to Y_{3A}	Independent inputs/outputs
Y_{0B} to Y_{3B}	Independent inputs/outputs
A_0 A_1	Address inputs
\bar{E}	Enable input (active LOW)
Z_A Z_B	Common inputs/outputs

Family data,

IDD LIMITS category MSI

See Family Specifications



HEF4052P (N): 16-lead DIL; plastic (SOT38-1)

HEF4052D (F) 16-lead DIL; ceramic (cerdip) (SOT74)

HEF4052T (D): 16-lead SO; plastic (SOT109-1)

(): Package Designator North America

IC DATA AND WAVEFORMS OF KEY POINTS (continued)
HEF4052 (continued)

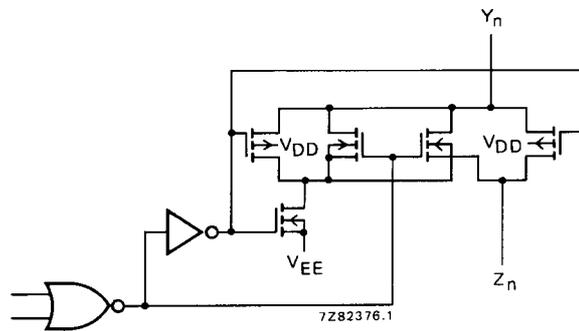


Fig. 22 Schematic Diagram (One Switch)

3. Function Table

Inputs			Channel
E	A1	A0	On
L	L	L	$Y_{0A}-Z_A; Y_{0B}-Z_B$
L	L	H	$Y_{1A}-Z_A; Y_{1B}-Z_B$
L	H	L	$Y_{2A}-Z_A; Y_{2B}-Z_B$
L	H	H	$Y_{3A}-Z_A; Y_{3B}-Z_B$
H	X	X	none

Notes

H=HIGH state (the more positive voltage)

L=LOW state (the less positive voltage)

X=state is immaterial

Ratings

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

Supply voltage (with reference to V_{DD}) V_{EE} -18 to +0,5 V

Note

To avoid drawing V_{DD} current out of terminal Z, when switch current flows into terminals Y, the voltage drop across the bidirectional switch must not exceed 0,4V. If the switch current flows into terminal Z, no V_{DD} current will flow out of terminals Y, in this case is no limit for the voltage drop across the switch, but the voltages at Y and Z may not exceed V_{DD} or V_{EE}

4. Refer to Table 10 about Functions and Data of the IC's Each Pin.

IC DATA AND WAVEFORMS OF KEY POINTS (continued)

HEF4053

Triple 2-channel Analog Multiplexer/Demultiplexer

1. Description

The HEF4053 is a triple 2-channel analog multiplexer/demultiplexer with a common enable input (\bar{E}). Each multiplexer/demultiplexer has two independent inputs/outputs (Y_0 and Y_1), a common input/output (Z), and select inputs (S_n). Each also contains two-bidirectional analog switches, each with one side connected to an independent input/output (Y_0 and Y_1) and the other side connected to a common input/output (Z). With (\bar{E}) LOW, one of the two switches is connected to V_{SS} (typically ground)

selected

(low impedance ON-state) by S_n . With \bar{E} HIGH, all switches are in the high impedance OFF-state, independent of S_A to S_C .

V_{DD} and V_{SS} are the supply voltage connections for the digital control inputs (S_A to S_C and \bar{E}). The V_{DD} to V_{SS} range is 3 to 15V. The analog inputs/outputs (Y_0 , Y_1 and Z) can swing between V_{DD} as a positive limit and V_{EE} as a negative limit. $V_{DD}-V_{EE}$ may not exceed 15 V.

For operation as a digital multiplexer/demultiplexer, V_{EE} is connected

2. Block Diagrams

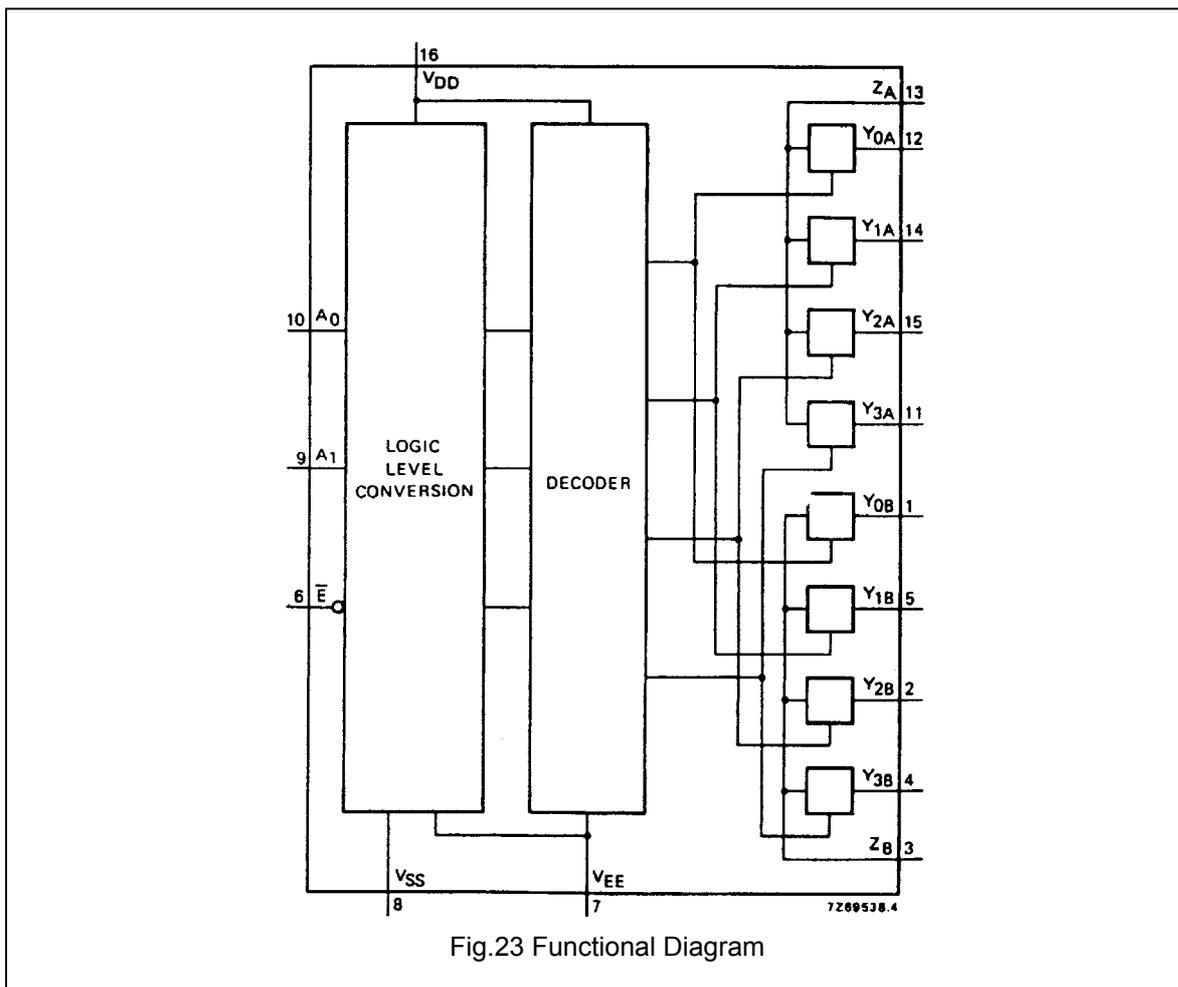


Fig.23 Functional Diagram

IC DATA AND WAVEFORMS OF KEY POINTS (continued)

HEF4053 (continued)

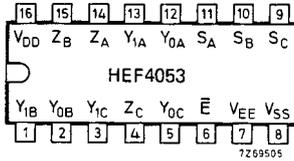


Fig. 20 Pinning Diagram

HEF4053P(N): 16-lead DIL; plastic
(SOT38-1)

HEF4053D(F): 16-lead DIL; ceramic
(cerdip)
(SOT74)

HEF4053T(D): 16-lead SO; plastic
(SOT109-1)

(): Package Designator North America

Pinning

Y_{0A} to Y_{0C}	Independent inputs/outputs
Y_{1A} to Y_{1C}	Independent inputs/outputs
S_A to S_C	Select inputs
E	Enable input (active LOW)
Z_A to Z_C	Common inputs/outputs

3. Function Table

Inputs		Channel
E	Sn	On
L	L	Y_{0n} - Z_n
L	H	Y_{1n} - Z_n
H	X	none

Notes

H=HIGH state (the more positive voltage)

L=LOW state (the less positive voltage)

X=STATE is immaterial

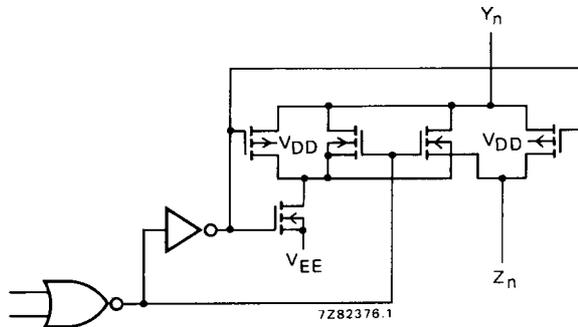


Fig. 25 Schematic Diagram (One Switch)

Ratings

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

Supply voltage (with reference to V_{DD}) V_{EE} -18 to +0,5 V

Note

To avoid drawing V_{DD} current out of terminal Z, when switch current flows into terminals Y, the voltage drop across the bidirectional switch must not exceed 0,4 V. If the switch current flows into terminal Z, no V_{DD} current will flow out of terminals Y, in this case there is no limit for the voltage drop across the switch, but the voltages at Y and Z may not exceed V_{DD} or V_{EE} .

4. Refer to Table 11 about Functions and Data of the IC's Each Pin.

IC DATA AND WAVEFORMS OF KEY POINTS (continued)**Table 3 Functions and Service Data of TDA4605 (N811)'s Pins**

Pin No.	Function Description	Digital Multimeter		
		Reference Voltage (V)	Positive Resistance (K Ω)	Negative Resistance (K Ω)
1	Regulation control	0.4	0.713	0.4
2	Primary current input	1.34	9.71	1.34
3	Primary voltage monitoring input	1.91	7.09	1.91
4	Groundy	0	0	0
5	Drive pulse output	4.08	0.84	4.08
6	Supply voltage	0.74	16.35	4.9
7	Soft-start	2.36	8.69	6.19
8	Zero crossing input detection	0.33	6.72	5.94

Table 4 Functions and Service Data of CH04T1009 (N001)'s Pins

Pin No.	Function Description	Digital Multimeter		
		Reference Voltage (V)	Positive Resistance (K Ω)	Negative Resistance (K Ω)
1	Not connected	0	9.62	5.35
2	Clock line	4.89	9.56	5.08
3	Data line	4.87	9.56	5.06
4	AV1 control	5	6.84	5.22
5	AV2 control	0	6.89	5.16
6	AV3 control	0	7.28	5.29
7	Not connected	0	9.61	5.4
8	Not connected	0.92	9.6	5.4
9	Ground	0	0	0
10	Input terminal for clock oscillating signal	1.88	9.55	6.12
11	Output terminal for clock oscillating signal	2.63	9.05	6.08
12	Power supply	5	3.64	3.33
13	Button-control voltage input terminal	5	8.91	5.21
14	Button-control voltage input terminal	5	8.93	5.21
15	Not connected	5	9.45	5.45
16	Not connected	4.9	9.53	5.45
17	Reset	4.96	4.64	4.48
18	Filter	2.76	9.52	5.31
19	Video signal input terminal	3	9.51	5.92
20	Input terminal for vertical flyback pulse	4.74	8.73	5.03
21	Input terminal for horizontal flyback pulse	4.27	8.81	5.01
22	R character output terminal	0	2.08	2.08
23	G character output terminal	0	2.1	2.1
24	B character output terminal	0	2.08	2.08
25	Output terminal for fast blanking signal	0	1.97	1.97
26	Character level clamping	0	9.54	5.73
27	Clock line 0	5	7.12	4.91
28	Data line 0	5	7.12	5.18
29	Clock line 1	4.52	7.05	5.12

(continued)

IC DATA AND WAVEFORMS OF KEY POINTS (continued)

30	Data line 1	4.41	7.03	5.09
31	Overload detecting input terminal	5	6.95	5.13
32	Input terminal for selectable production modes	5	9.62	5.29
33	Not connected	0	9.56	5.46
34	Remote control input	4.64	9.22	5.33
35	Not connected	0	9.58	5.4
36	Not connected	0	9.58	5.42
37	Mute	0	9.58	4.3
38	Not connected	0	9.58	5.36
39	Not connected	0	9.59	5.28
40	Not connected	0	9.59	5.36
41	Standby control	0	7.43	4.9
42	Not connected	0	9.6	5.36

Table 5 Functions and Service Data of AT24C04 (N002)'s Pins

Pin No.	Function Description	Digital Multimeter		
		Reference Voltage (V)	Positive Resistance (K Ω)	Negative Resistance (K Ω)
1	Address input	0	0	0
2	Address input	0	0	0
3	Address input	0	0	0
4	Common ground	0	0	0
5	Clock line	5	7.05	4.82
6	Data line	5	7.06	5.24
7	Write protect	4.99	9.58	5.49
8	Power supply	5	3.64	3.33

Table 6 Functions and Service Data of OM8839PS (N301)'s Pins

Pin No.	Function Description	Digital Multimeter		
		Reference Voltage (V)	Positive Resistance (K Ω)	Negative Resistance (K Ω)
1	SIF signal input	0	2.21	2.21
2	External audio signal input	3.65	9.02	6.04
3	Reference frequency resonant coil terminal	0	∞	∞
4	Reference frequency resonant coil terminal	0	∞	∞
5	PLL filter	2.51	8.92	5.82
6	Video detection output	3.06	2.2	2.2
7	Clock line	4.4	7.15	5.15
8	Two-way transmission data line	4.52	7.15	5.15
9	Gap decoupling	6.7	7.52	5.68
10	SVHS chroma signal input	1.35	9	6
11	SVHS luminance signal input	3.4	9.04	5.91
12	Supply voltage	8.24	2.78	1.96
13	Composite video signal input terminal	4.32	9.15	5.94
14	Ground	0	0	0

(continued)

IC DATA AND WAVEFORMS OF KEY POINTS (continued)

15	Audio signal output	3	9.24	5.98
16	Decoupling capacitor connection	0	∞	∞
17	Video input	3.4	9.12	5.94
18	Black current control input	5.81	9.22	5.88
19	Blue (B) signal output	3.04	6.19	5.2
20	Green (G) signal output	3.1	6.19	5.23
21	Red (R) signal output	3.2	6.2	5.26
22	Beam current control	2.1	8.22	6.04
23	Red (R) signal input	3.6	9.01	6.12
24	Green (G) signal input	3.61	9.01	6.12
25	Blue (B) signal input	3.6	9.01	6.12
26	Selectable primary color signal input control	0.1	1	1
27	Luminance signal input	3.26	9.25	5.87
28	Luminance signal output	3.26	9.25	5.87
29	B-Y color difference signal output	2.38	8.5	5.91
30	R-Y color difference signal output	2.37	8.5	5.91
31	B-Y color difference signal input	2.38	8.5	5.91
32	R-Y color difference signal input	2.37	8.5	5.91
33	Sub-carrier output for SECAM demodulation	0.35	6.78	5.96
34	3.58MHz crystal oscillator	2.54	8.02	6.04
35	4.43MHz crystal oscillator	2.53	8.02	6.04
36	APC low pass filter	4.99	9.37	6
37	Horizontal starting supply voltage	8.22	2.64	2.56
38	Composite video output	3.68	7.52	6.11
39	Black level stretch	4.95	9.26	4.93
40	Line drive pulse output	3.55	3.5	3.49
41	Horizontal flyback pulse input / sandcastle pulse output	0.76	8.82	5.92
42	Line discriminator	3.66	8.81	6.04
43	Line discriminator	3.92	9.31	6.04
44	Ground	0	0	0
45	Vertical frequency parabola output	0.73	9.05	5.97
46	Field drive signal output	2.32	9.3	5.97
47	Field drive signal output	2.35	9.3	5.97
48	IF signal input	4.62	8.52	6.2
49	IF signal input	4.62	8.52	6.2
50	High voltage detection input	2.05	8.04	6.14
51	Vertical sawtooth generation	3.8	8.65	6.09
52	Vertical reference bias setting	3.9	8.89	6.05
53	AGC filter for IF amplifier	4.49	9.25	6
54	AGC output for IF amplifier	0.67	10.05	5.82
55	Audio deemphasis	2.93	8.93	6.12
56	Audio decoupling	4.02	9.37	6.08

IC DATA AND WAVEFORMS OF KEY POINTS (continued)**Table 7 Functions and Service Data of TDA8350 (N401)'s Pins**

Pin No.	Function Description	Digital Multimeter		
		Reference Voltage (V)	Positive Resistance (K Ω)	Negative Resistance (K Ω)
1	Vertical drive input (positive)	2.32	9.4	5.84
2	Vertical drive input (negative)	2.3	9.4	5.87
3	Feedback input	8.15	5.81	4.72
4	Supply voltage	16.27	7.99	7.62
5	Output 1	8.14	5.88	4.72
6	Not connected	0	∞	∞
7	Ground	0	0	0
8	Pump supply voltage input	46.94	∞	4.29
9	Output 1	8.22	5.92	4.71
10	Guard output	0.28	8.51	5.899
11	Pincushion output	16.99	9.45	4.16
12	Pincushion input (negative)	0.25	9.12	5.93
13	Pincushion input (positive)	0	0	0

Table 8 Functions and Service Data of TDA7057AQ (N601)'s Pins

Pin No.	Function Description	Digital Multimeter		
		Reference Voltage (V)	Positive Resistance (K Ω)	Negative Resistance (K Ω)
1	Volume control input	1.03	6.88	6.15
2	Not connected	0	∞	∞
3	Audio R signal input	2.45	12.68	6.5
4	Supply voltage	16.18	0.46	0.46
5	Audio L signal input	2.45	12.6	6.5
6	Ground	0	0	0
7	Volume control input	1.03	6.88	6.15
8	Left channel in-phase signal output	7.64	6.48	5.6
9	Ground	0	0	0
10	Left channel inverting signal output	7.71	6.47	5.6
11	Right channel inverting signal output	7.67	6.47	5.6
12	Ground	0	0	0
13	Right channel in-phase signal output	7.79	6.48	5.6

Table 9 Functions and Service Data of TDA6017Q's Pins

Pin No.	Function Description	Digital Multimeter		
		Reference Voltage (V)	Positive Resistance (K Ω)	Negative Resistance (K Ω)
1	G inverting input	2.94	5.72	4.96
2	R inverting input	3	5.72	4.96
3	B inverting input	2.91	5.72	4.96
4	Ground	0	0	0
5	Black level current input	6.5	19.28	5.68
6	Supply voltage	198.65	∞	4.53
7	B output	103	∞	5.48
8	R output	98.6	∞	5.48
9	G output	100.6	∞	5.48

IC DATA AND WAVEFORMS OF KEY POINTS (continued)**Table 10 Functions and Service Data of HEF4052 (DS01)'s Pins**

Pin No.	Function Description	Digital Multimeter		
		Reference Voltage (V)	Positive Resistance (K Ω)	Negative Resistance (K Ω)
1	Switch input	0.3	7.5	26
2	Switch input	0	7.5	26
3	Switch output	0	2.3	2.3
4	Switch input	0.4	7.5	26
5	Switch input	0	7.5	26
6	Inhibit terminal	0	0	0
7	VEE	0	0	0
8	Ground	0	0	0
9	Control signal input	3.5	10	6.3
10	Control signal input	3.5	10	6.3
11	Switch input	3	0.5	0.5
12	Switch input	3	0.5	0.5
13	Switch output	3.5	2.3	2.3
14	Switch input	2.8	0.5	0.5
15	Switch input	3	0.5	0.5
16	Supply voltage	7.8	1.5	1.5

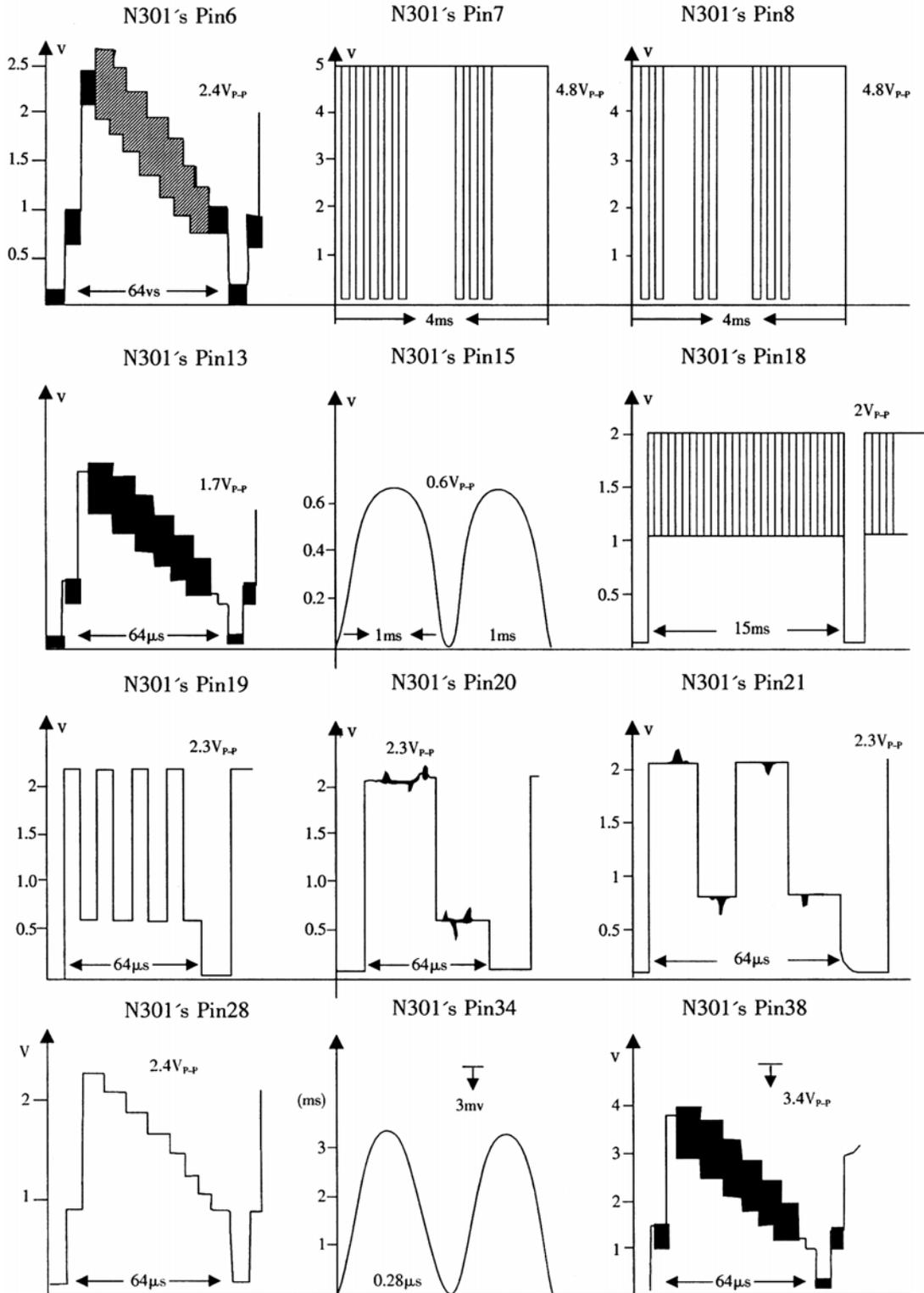
Table 11 Functions and Service Data of HEF4053 (DS02)'s Pins

Pin No.	Function Description	Digital Multimeter		
		Reference Voltage (V)	Positive Resistance (K Ω)	Negative Resistance (K Ω)
1	Signal input	0	9.81	6.15
2	Signal input	0	0	0
3	Signal input	0	9.81	6.15
4	Signal output	0	6.66	6.21
5	Signal input	0	0	0
6	Ground	0	0	0
7	Ground	0	0	0
8	Ground	0	0	0
9	Control signal input	0.12	7.97	5.7
10	Control signal input	0.12	7.99	5.7
11	Control signal input	4.98	7.8	5.6
12	Signal input	0	0	0
13	Signal output	0	9.81	6.15
14	Signal input	0	6.9	6.4
15	Audio output	0	6.95	6.4
16	Supply voltage	5.09	6.89	4.44

Table 12 Functions and Service Data of TDQ-6F2M's Pinss Pins

Pin No.	Function Description	Digital Multimeter		
		Reference Voltage (V)	Positive Resistance (K Ω)	Negative Resistance (K Ω)
1	AGC	0.98	9.56	6.04
2	NC	26.73		6.85
3	NC	0.61	9.76	7.39
4	SCL	4.89	9.58	5.13
5	SDA	4.88	9.58	5.12
6	VDD	5	2.2	2.2
7	NC	4.9	2.2	2.2
8	NC	0	0	0
9	BT	3.021	∞	13.07
10	NC	0	0	0
11	IF	0	∞	∞

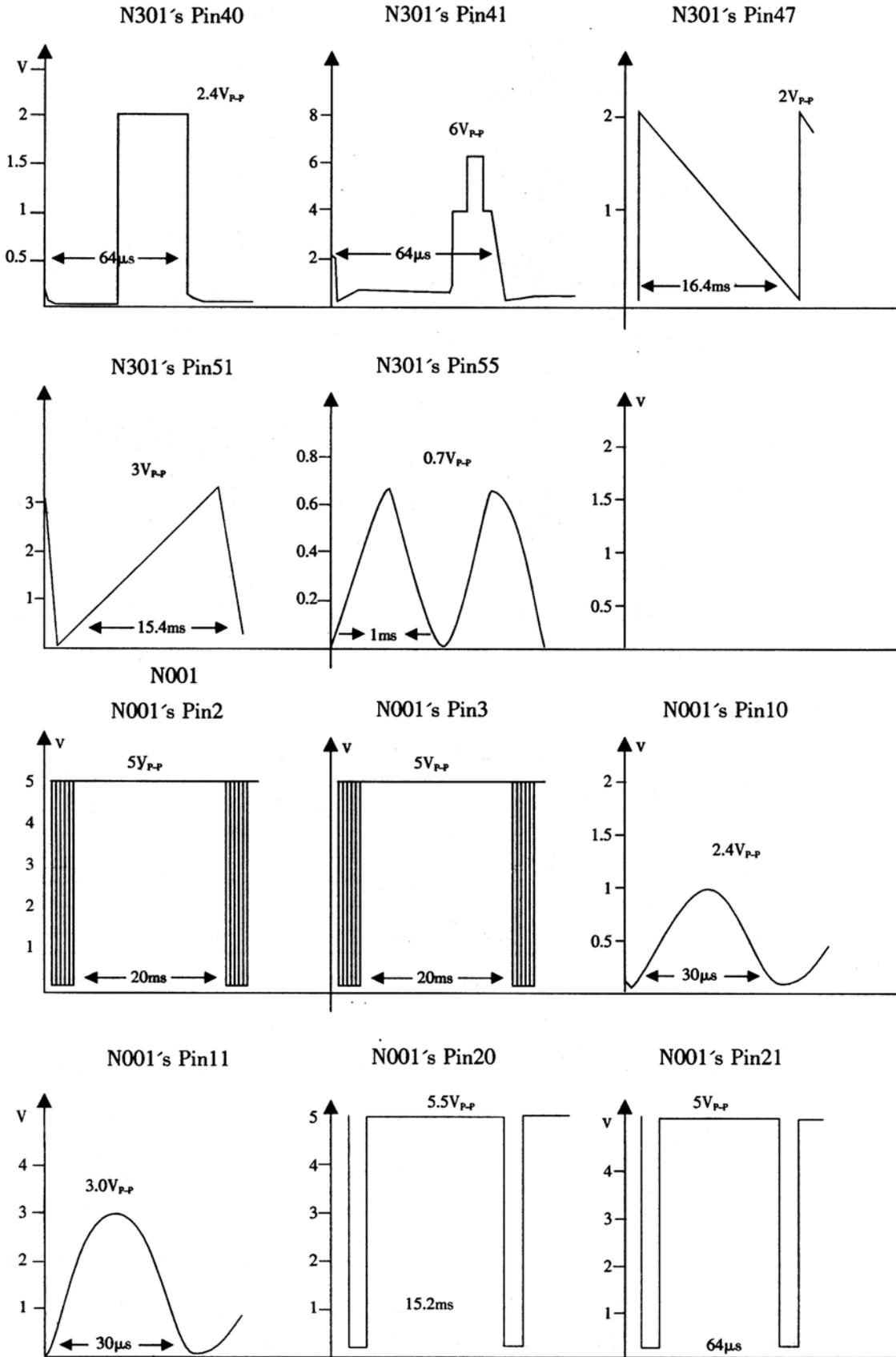
IC DATA AND WAVEFORMS OF KEY POINTS (continued)



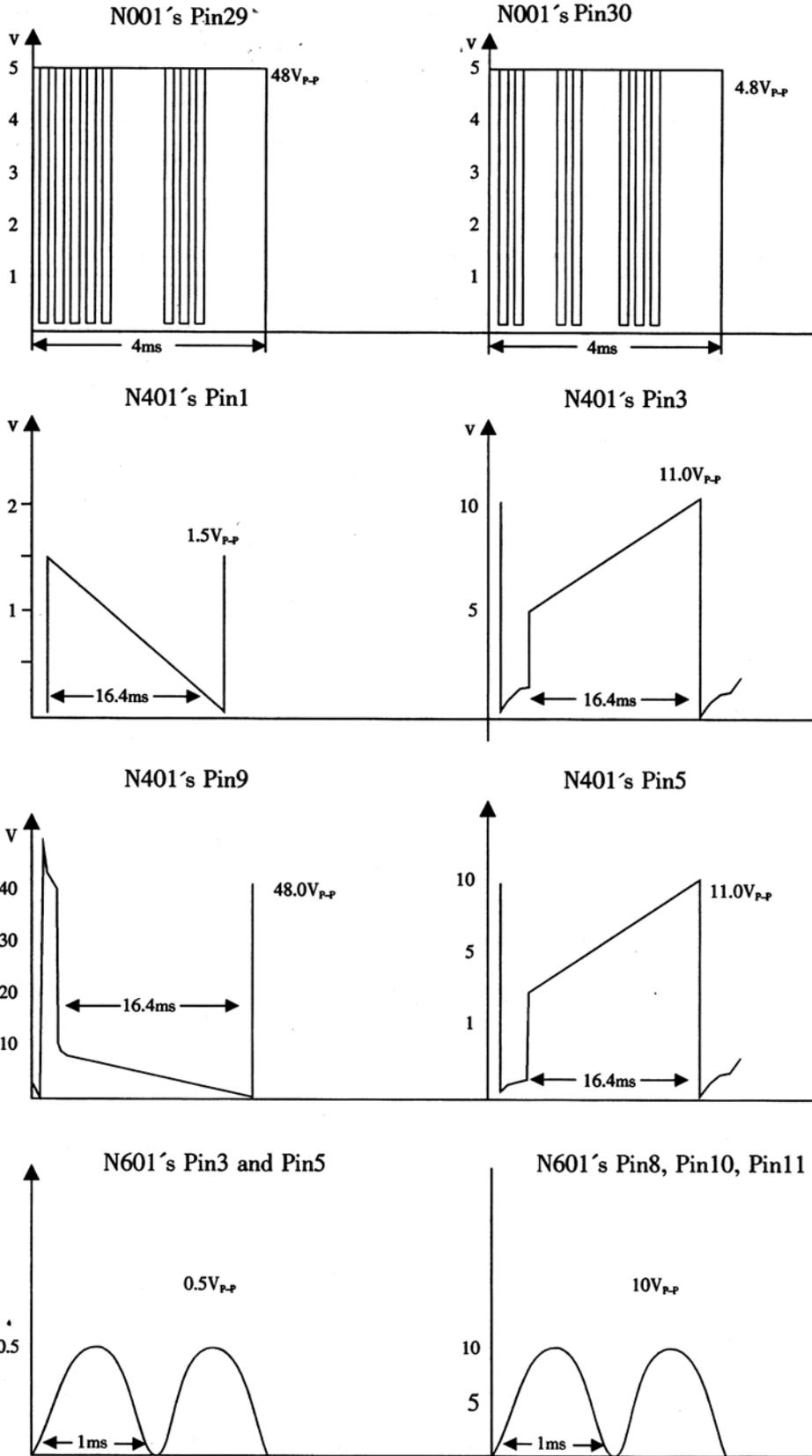
Note:

The TV receives NTSC color bar with 1KHz sine wave audio reception in Normal mode when measuring voltage and resistance with a GDM-8145 multimeter (Max. resistance: 20 KΩ, Max. DC voltage: 20V).

IC DATA AND WAVEFORMS OF KEY POINTS (continued)

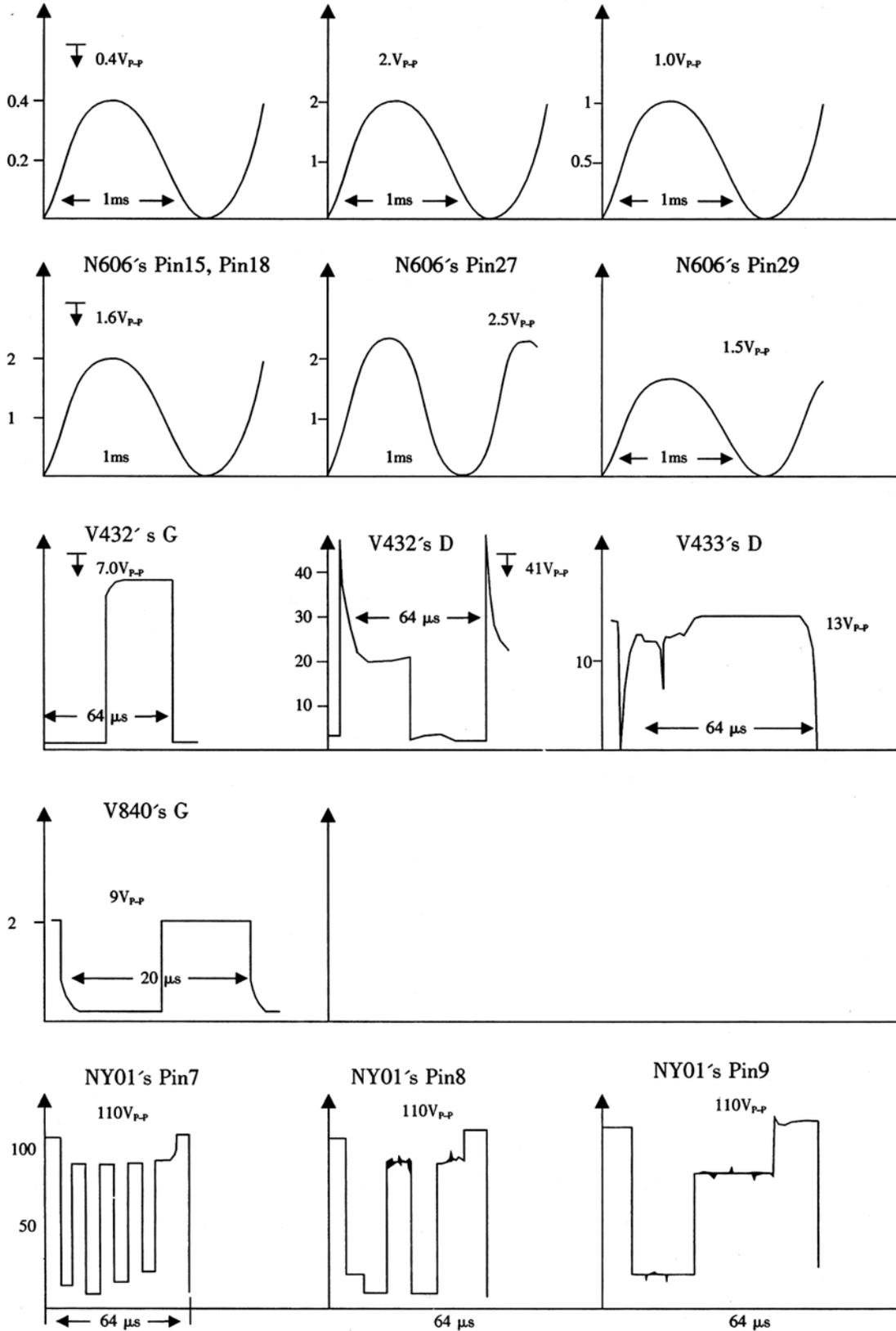


IC DATA AND WAVEFORMS OF KEY POINTS (continued)



Measure with a GOS-622G oscilloscope.

IC DATA AND WAVEFORMS OF KEY POINTS (continued)



IC DATA AND WAVEFORMS OF KEY POINTS (continued)

Serial No.	Type	Base (B)	Collector (C)	Emitter (E)	Serial No.	Type	Input	Reference	Output
V104	C388A	2.12	8.35	1.35	N861	LM317	11.56	7.37	8.63
V609	C1815	2.99	8.47	2.29					
V601S	C1815	2.54	6.94	1.88	N863	L7805	15.65	0	5.00
V602S	C1815	6.94	8.48	6.24					
V204	C1815	2.07	5.08	1.37	N851	C3852	(B)	(C)	(E)
V227	C1815	3.66	8.43	2.99			5.74	11.56	5.17
V432	BSN274	2.35	10.70	0	N402	LM317	15.64	7.41	8.66
V433	BV2720DF	-0.07	113.6	0					
V436	A1015	1.67	0	1.98	+B voltage: 134.49V AV voltage: 16.23V Frame supply voltage: 16.73V				
V437	A1015	8.53	2.05	8.53					
V438	C1815	0	8.52	0					
V001	C1815	0.06	4.73	0					
V002	C1815	0.12	4.28	0					
V009	A1015	4.33	4.96	5					
V631A	C1815	0.19	1.03	0					
V632A	A1015	8.52	-0.10	8.41					
V289	C1815	0.18	7.41	0					
V862	C1815	0.18	7.37	0					
V863	C3852	0.18	5.17	0					
V840	BVZ334	3.92	156.90	0					
VS10	C1815	2.40	5.13	1.78					
VS20	C1815	2.40	5.13	1.78					
VS30	C1815	2.98	5.13	2.32					
V217	C1815	0.35	8.53	0					

CIRCUIT ADJUSTMENTS**1. General Description**

All adjustments are thoroughly checked and corrected before the TV outgoing. Therefore the TV should operate normally and deliver proper colour pictures upon installation. However, several minor adjustments may be required depending on the particular location where the TV is operated.

This TV is shipped completely in carton. Carefully take out the TV from the carton and remove all packing materials. Connect the power cord into a 120V AC, 60Hz two-pin power outlet. Turn on the TV. Check and adjust all the customer controls such as brightness, contrast and colour to obtain natural colour pictures.

2. Automatic Degaussing

A degaussing coil is mounted around the CRT so that external degaussing after moving the TV is generally unnecessary, providing it is properly degaussed upon installation. The degaussing coil operates in about 1 second after power on. If the set is moved or faced to a different direction, the power switch must be switched off for at least 30 minutes in order that the automatic degaussing circuit operates properly. Should the chassis or parts of the cabinet become magnetized to cause poor colour purity, use an external-degaussing coil. Slowly move the degaussing coil around the screen the sides and front of the TV and slowly withdraw the coil to a distance of about 2m before unplug it. If colour shading still exists, perform the Colour Purity Adjustment and Convergence Adjustment procedures.

3. Supply Voltage Adjustment

Caution: +B voltage has close relation to high voltage. To avoid X-ray radiation +B voltage should be +145V.

- 1) Set RV801 to the mechanical center and AC power supply to $120\pm 2V$.
- 2) Connect a digital voltmeter to two pins of C898, and then turn on the TV.
- 3) Receive Philips test pattern signals.
- 4) Adjust RN823 to make the voltmeter read $145\pm 0.5V$.

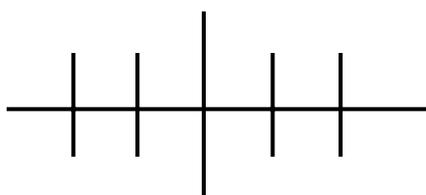
4. High Voltage Inspection

Caution: No high voltage adjustment should be done in the chassis.

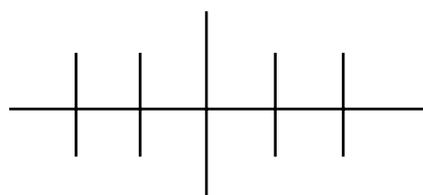
- 1) Connect a precise high voltmeter to the second anode of the CRT.
- 2) Turn on the TV and set the brightness and contrast to minimum (i.e. set beam current of the CRT to zero).
- 3) The high voltage tested should be $27.5\pm 0.5KV$.
- 4) Set the brightness to minimum or maximum, and ensure high voltage not beyond limitation of 30KV in any case.

5. Focus Adjustment

- 1) Use the remote control to set the contrast to maximum and the brightness, chroma to medium.
- 2) Set H. V. lines near Philips pattern center to thinnest with the FCB on the FBT. After finishing adjustment, ensure that no poor focusing exists near the center or around of the frame.



Before Adjusting



After Adjusting

SET-UP ADJUSTMENTS

• The following adjustments should be made when a complete realignment is required or a new CRT is installed. Perform the adjustments in order as follows.

1. Colour purity
2. Convergence
3. White Balance

Note:

The purity/convergence magnet assembly and rubber wedges need mechanical positioning. Refer to Fig. 26.

1. Colour Purity Adjustment

Note:

Before attempting any purity adjustment, the TV should be operated for at least 15 minutes.

- 1) Demagnetize the CRT and cabinet using a degaussing coil.
- 2) Set the brightness and contrast to maximum.
- 3) Receive the green raster test signals.
- 4) Loosen the clamp screw holding the deflection yoke and slide it backward or forward to display vertical green belt (zone) on the screen.
- 5) Remove the rubber wedge.
- 6) Rotate and spread the tabs of the purity magnet around the neck of the CRT until the green belt is on the centre of the screen.
- 7) Slowly move the deflection yoke forward or backward until a uniform green screen is obtained.
Tighten the clamp screw of the yoke temporarily.
- 8) Check purity of the red and blue raster.

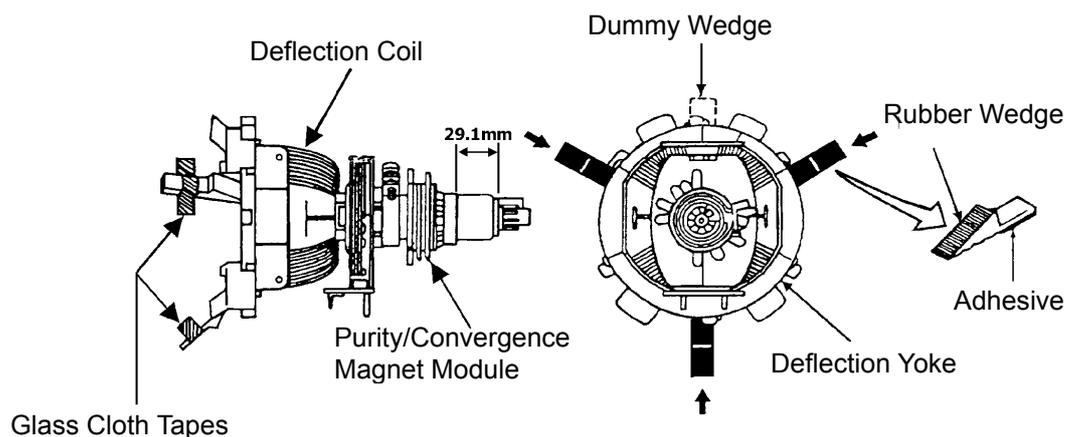


Fig. 26

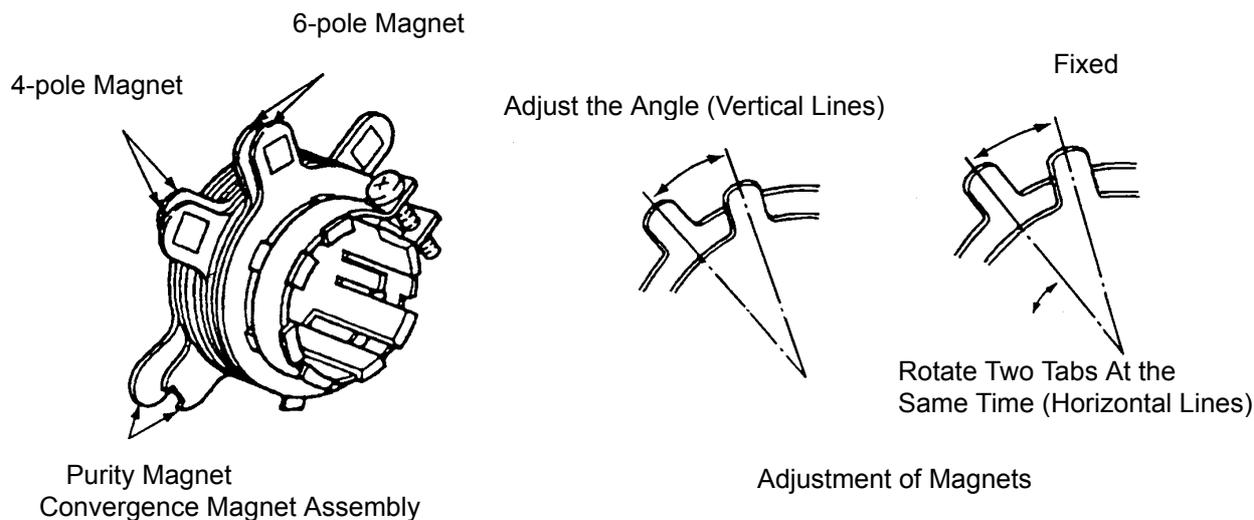
SET-UP ADJUSTMENTS (continued)

Fig. 27

2. Convergence Adjustment**Note:**

Before attempting any convergence adjustment, the TV should be operated for at least 15 minutes.

- Center convergence adjustment

- 1) Receive the grille test pattern signals.
- 2) Set the brightness and contrast properly.
- 3) Adjust two tabs of the 4-pole magnet to change the angle between them and red and blue vertical lines are superimposed on the center area of the screen.
- 4) Turn both tabs at the same time keeping the angle constant to superimpose red and blue horizontal lines on the center of the screen.
- 5) Adjust two tabs of 6-pole magnet to superimpose red/blue line and green line. Adjusting the angle affects the vertical lines and rotating both magnets affects the horizontal lines.
- 6) Repeat steps 3)~5) keeping in mind red, green and blue movement. 4-pole magnet and 6-pole magnet interact each other, resulting in complicating and dot movement.

- Circumference convergence adjustment

- 1) Loosen the clamping screw of the deflection yoke slightly to allow it to tilt.
- 2) Temporarily put a wedge as shown in Fig.26. (Do not remove cover paper on adhesive part of the wedge.)
- 3) Tilt front of the deflection yoke up or down to obtain better convergence in circumference. Push the mounted wedge into the space between the CRT and yoke to fix the yoke temporarily.
- 4) Put other wedge into bottom space and remove the cover paper to stick.
- 5) Tilt front of the deflection yoke right or left to obtain better convergence in circumference.
- 6) Keep the deflection yoke position and put another wedge in either upper space. Remove cover paper and stick the wedge on the CRT to fix the yoke.
- 7) Detach the temporarily mounted wedge and put it in another upper space. Stick it on the CRT to fix the yoke.
- 8) After fixing three wedges, recheck overall convergence. Tighten the screw firmly to fix the yoke and check if the yoke is fixed.

SET-UP ADJUSTMENTS (continued)

9) Stick three adhesive tapes on wedges as shown in Fig. 26.

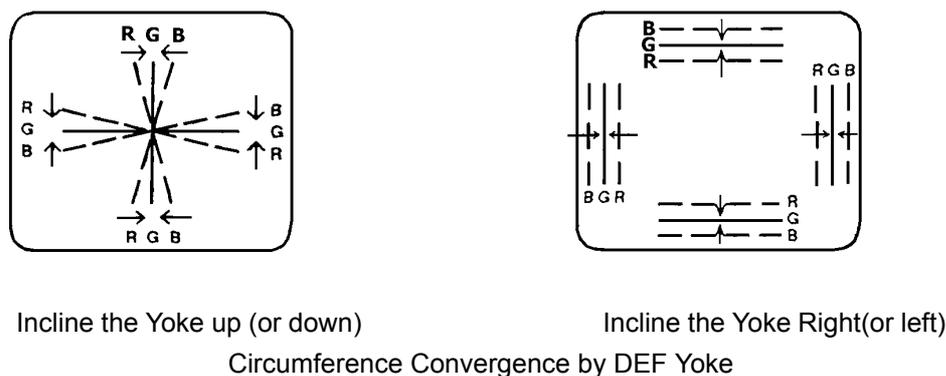
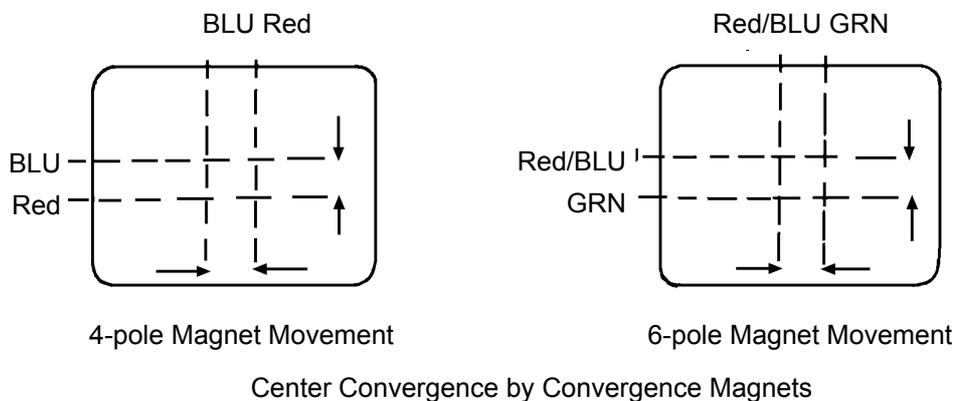


Fig. 28

SERVICE MODE AND BUS DATA

Decrease the volume to 00. Press the MUTE button on the remote control and "Mute" appears on the TV screen. Then press and hold the MUTE button on the remote control and MENU on the TV at the same time for 3 seconds and the TV enters the S mode.

Description	Data								
AFW:240KHz	1	De interta	0	S CORRECT	20	AUTO ADJUST	0	OPT SPKON	0
IF-PLL	1	H shift	40	V SHIFT	32	SUB BRIGHT	27	OPT SPATAL	1
AGC over f	9	H shift-50	32	V SHIFT-50	32	LOUDNESS	18	OPT COLOR	0
IFS	0	E/W WIDE	45	V 200M	25	CNTRST MAX	63	OPT V-CHIP	1
MOD	0	PARABOLA	32	V SCROLL	31	CNTRST MID	31	OPT CCD	1
Fixed Avd	1	E/WCORNER	63	V HALF	0	CNTRST MIN	0	OPT PWR-ON	1
Sound Mute	0	TRAPZIUM	23	SPK PRESCL	55	COLOR CORE	31	SRCH SPEED	0

Auto Limit	0	OSDH-POS	13	AV PRESCAL	66	SPATIAL	32	ROM CORREC	0
VOLUME	0	V CENTER	31	ST SPECTRL	31	SUB TINT	31	MSP/TDA	0
Blank HOB	0	V AMP	30	ST TIM CVR	7	OPT STEREO	0		

Press the ↓ or ↑ button to select data in turn and ← or → button to decrease or increase data. Press the  button on the remote control or MAIN POWER SWITCH button on the TV to exit from the mode.

DS01 DS02 Door Turnover Control

DS01

DS02

	9	10	11	9	11
TV	H	H		L	H
AV1	H	H		L	H
AV2	L	L		L	L
AV3	L	L		H	L
S-VIDEO	L	L		H	L

CH04T1009 BUS DATA		
Item	Symbol Description	Bus Data
<i>MENU.00</i>		
V.POS /50H	VERTICAL POSITION /50Hz	34
H.PHSH /50H	HORIZONTAL PHASE /50Hz	8
V.SIZE /50H	VERTICAL SIZE /50Hz	84
V.POS /60H	VERTICAL POSITION /60Hz	37
V.PH /60H	HORIZONTAL PHASE /60Hz	13
V.SIZE /60H	VERTICAL SIZE /60Hz	55
V.SC	VERTICAL S-CORRECTION	4
V.LINE	VERTICAL LINE	18
V.SIZE CMP	VERTICAL SIZE COMPENSATION	7
<i>MENU.01</i>		
SUB.BIGHT	SUB-BRIGHT	59
SUB.CONT	SUB-CONTRAST	63
V.KILL	VERTICAL KILL	0
RF.AGC	RF AGC	15
R.BIAS	RED BIAS	32
G.BIAS	GREEN BIAS	60
B.BIAS	BLUE BIAS	16
R.DRIVE	RED DRIVE	72

SERVICE MANUAL

G.DRIVE	GREEN DRIVE	15
B.DRIVE	BLUE DRIVE	93
<i>MENU.02</i>		
H.AFC	HORIZONTAL APC GIAN	0
H.BLK.L	HORIZONTAL BLANKING LEFT	4
H.BLK.R	HORIZONTAL BLANKING RIGHT	4
CROS.B/W	CROSSHATCH BLACK/WHITE	0
VIDEO.LVL	VIDEO LEVEL	4
FM.LEVEL	FM LEVEL	1
<i>MENU.03</i>		
FM.MUTE	FM MUTE	0
AUDIO.MUTE	AUDIO MUIE	0
VIDEO.MUTE	VIDEO MUTE	0
SND.TRAP	SOUND TRAP	0
<i>MENU.04</i>		
SUB.COLOR	SUB COLOR	31
SUB.TINT	SUB TINT	24
S.SHARP	SUB SHARP	31
CORING.	CORING GAIN	1
C.EXT	EXTERNAL CHROMA	0
C.BYPASS	CHROMA BAND-PASS BYPASS	0
C.KILL ON	COLOR KILL ON	0
<i>MENU.05</i>		
BLANK.DEF	BLANK DEFEAT	0
BLK.ST.DEF		1
FBP.BLK.SW	FLYBACK PULSES (HORIZONTAL) BLANKING SWITCH	0
FILT.SYS	FILTER SYSTEM: SELECT Y/C FILTER MODE	0
VOL.FIL	VOLUME FILTER	0
VIF.SYS.SW	VIF SYSTEM SWITCH	0
VIDEO.SW	VIDEO SWITCH	0
<i>MENU.06</i>		
R/B ANGLE	R-Y/B-Y ANGLE	9
GREY MODE	GREY MODE	0
V.SETUP	VERTICAL SETUP	1
B.GAM.SEL		3

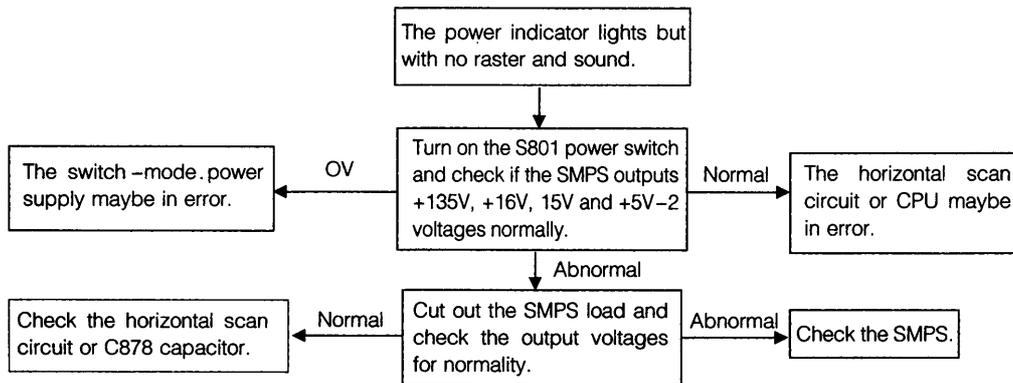
SERVICE MANUAL

RG.GAM.DEF		1
<i>MENU.07</i>		
BRT.ABL.TH	BRIGHT ABL THRESHOLD	7
EM.ABL.DEF		0
BRT.ABL.DF	BRIGHT ABL DEFEAT	1
MID.STP.DF	BRIGHT MID STOP DEFEAT	1
<i>MENU.08</i>		
DIGITAL.OSD	DIGITAL OSD MODE	0
OSD.CONT	OSD CONTRAST CONTROL	1
OSD.H.POS	OSD HORIZONTAL POSITION	22
<i>MENU.09</i>		
H.FREQ	HORIZONTAL FREQUENCY	27
C.KILL.OFF	COLOR KILL OFF	0
AUDIO.SW	AUDEO SWITCH	0
T.DISBLE	TEST MODE SWITCH DISABLE	1
OPT.LOGO	OPTION LOGO	0
OPT.VID SW	OPTION VIDEO SWITCH	0
<i>MENU.10</i>		
OPT.TV.AV	OPTION TV/AV	1
OPT.AV1/2	OPTION AV1/2	
OPT.AV3	OPTION AV3	
OPT.COLOR	OPTION COLOR	0
OPT.V-CHIP	OPTION V-CHIP	1
OPT.CCD	OPTION CCD	1
OPT.CLOCK	OPTION CLOCK	1
OPT.P-ON	OPTION P-ON	0
SRCH.SPEED	SEARCH SPEED	0
ROM.CORREC	ROM CORRECTION	0

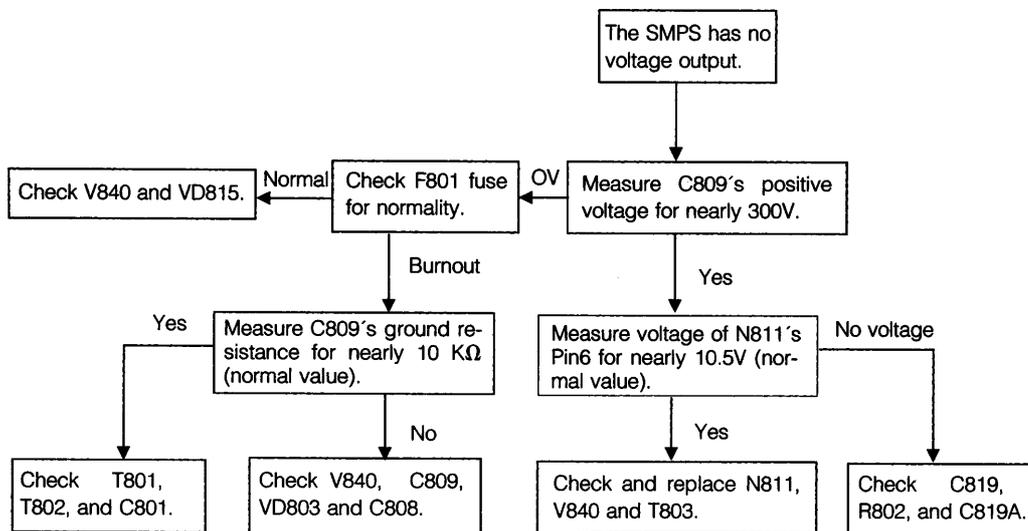
TROUBLESHOOTING FLOW CHARTS

1. Power

1.1 The power indicator lights but with no raster and sound.

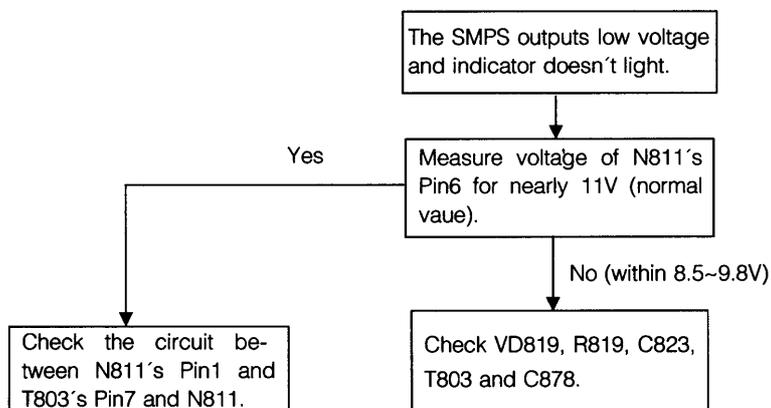


1.2 The SMPS has no voltage output.

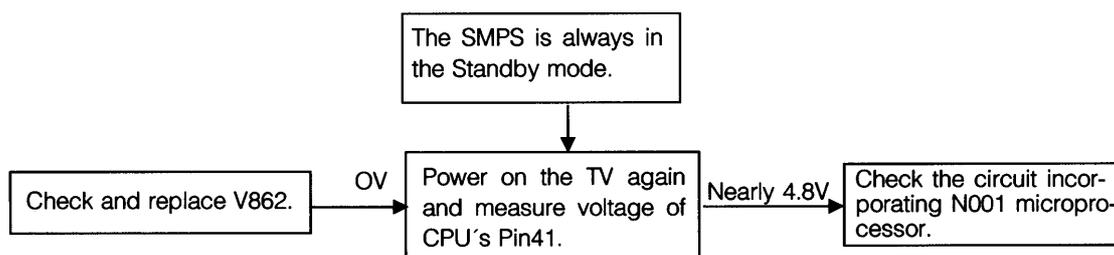


TROUBLESHOOTING FLOW CHARTS (continued)

1.3 The SMPS outputs low voltage and indicator doesn't light.

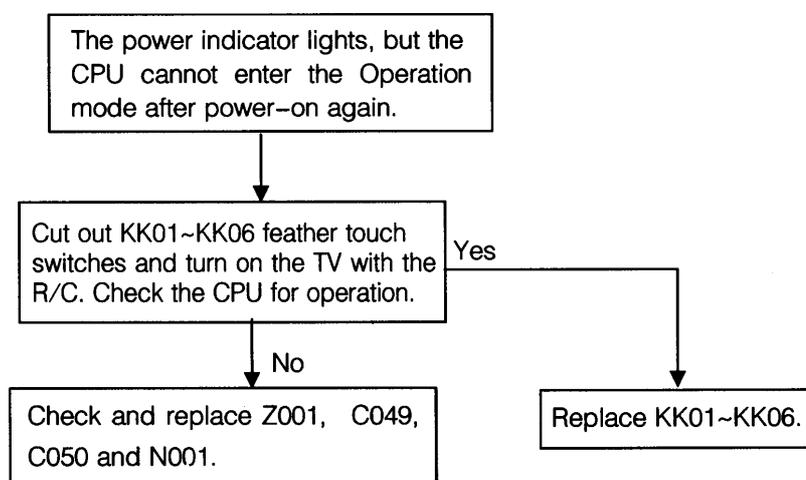


1.4 The power indicator lights but the SMPS is still in the Standby mode.



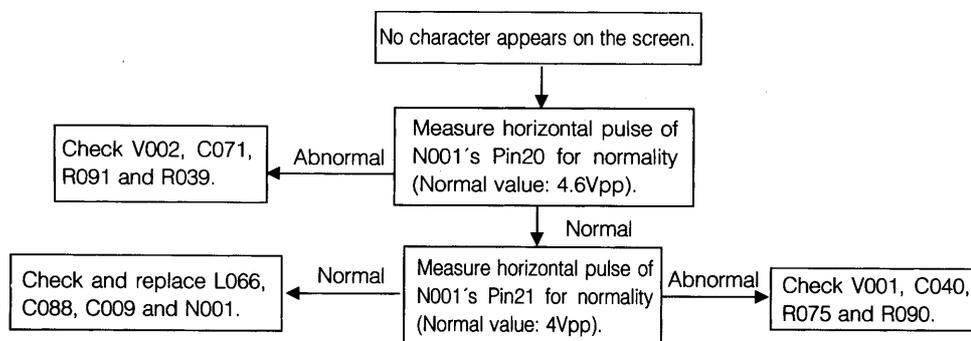
2. Control System

2.1 The power indicator lights, but the CPU cannot enter the Operation mode after power-on again.

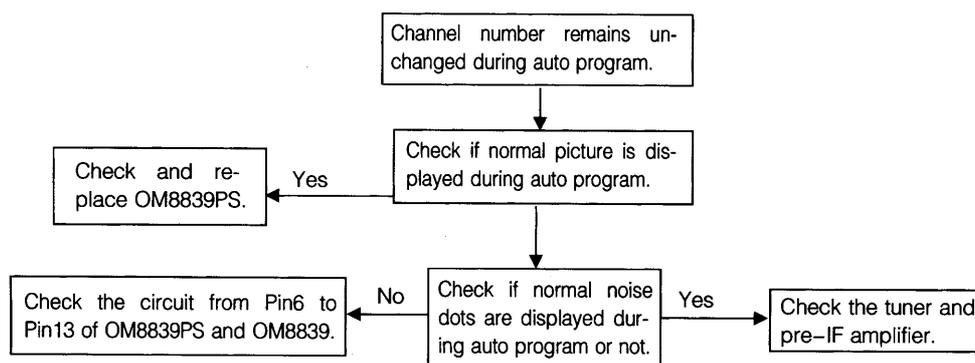


TROUBLESHOOTING FLOW CHARTS (continued)

2.2 No character appears on the screen.

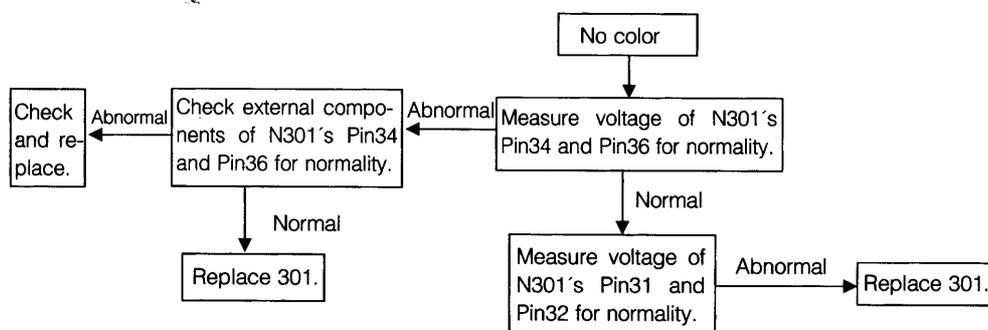


2.3 Channel number remains unchanged during auto program.



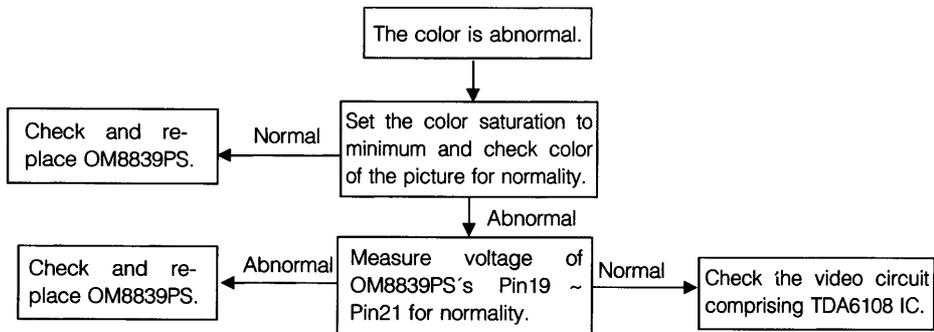
3. Video Signal Processor

3.1 No color



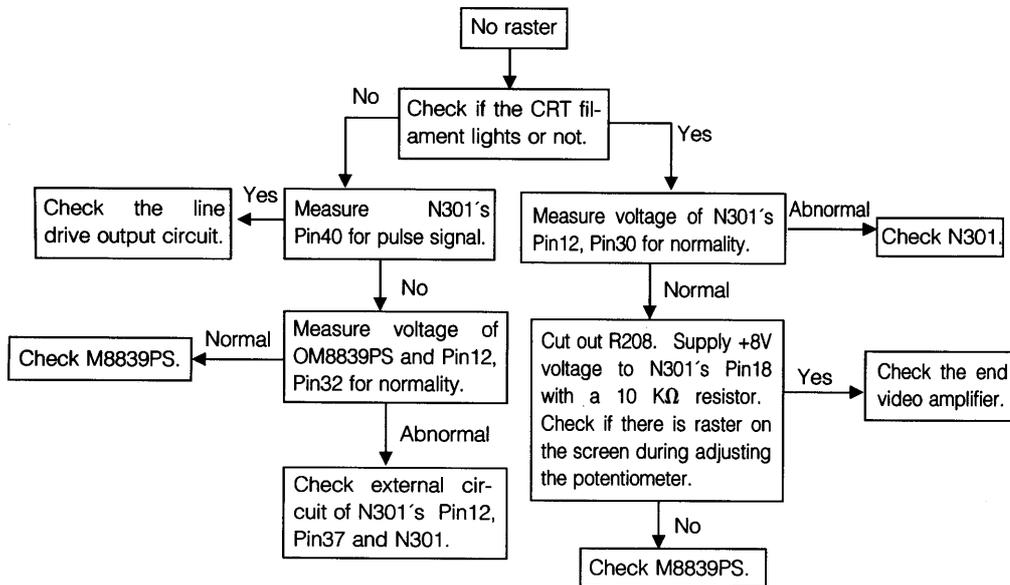
TROUBLESHOOTING FLOW CHARTS (continued)

3.2 The color is abnormal.



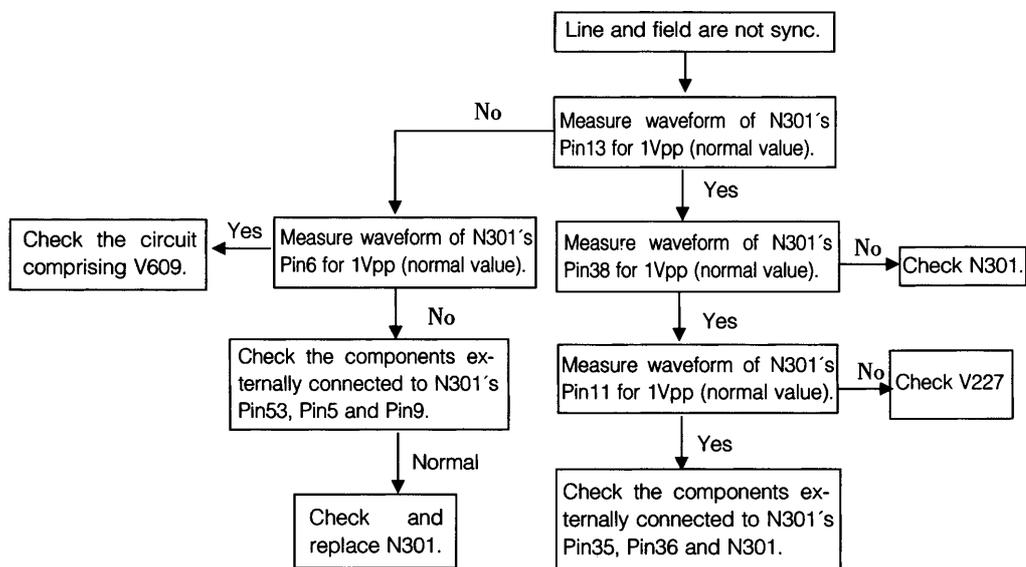
4. Horizontal/Vertical Scan Circuit

4.1 No raster

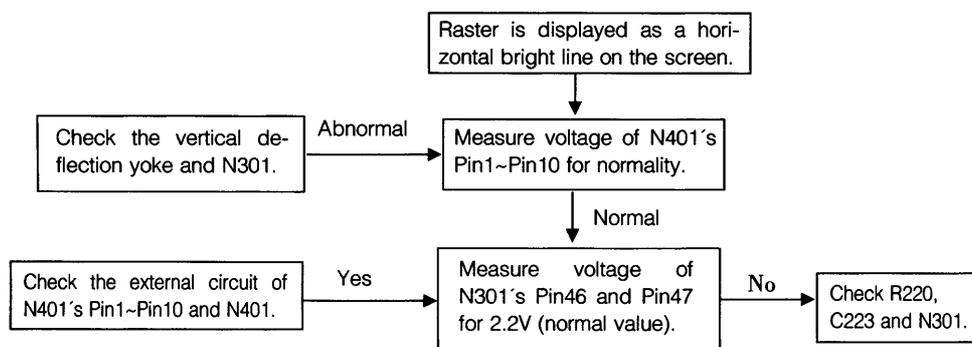


TROUBLESHOOTING FLOW CHARTS (continued)

4.2 Line and field are not sync.

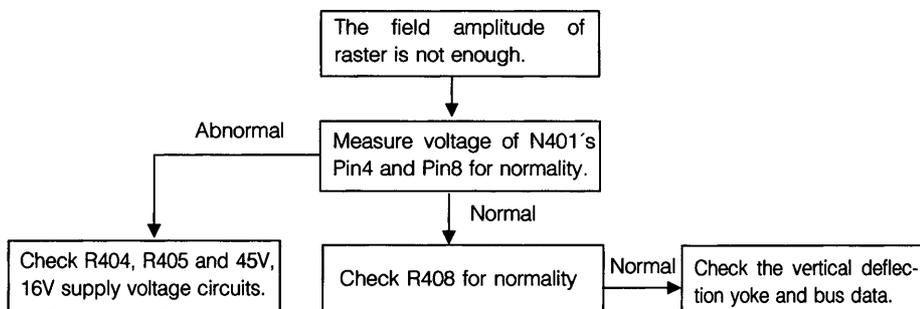


4.3 Raster is displayed as a horizontal bright line on the screen.

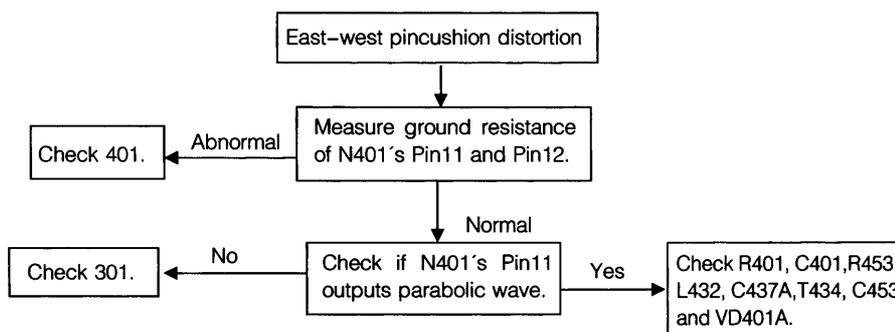


TROUBLESHOOTING FLOW CHARTS (continued)

4.4 The field amplitude of raster is not enough.

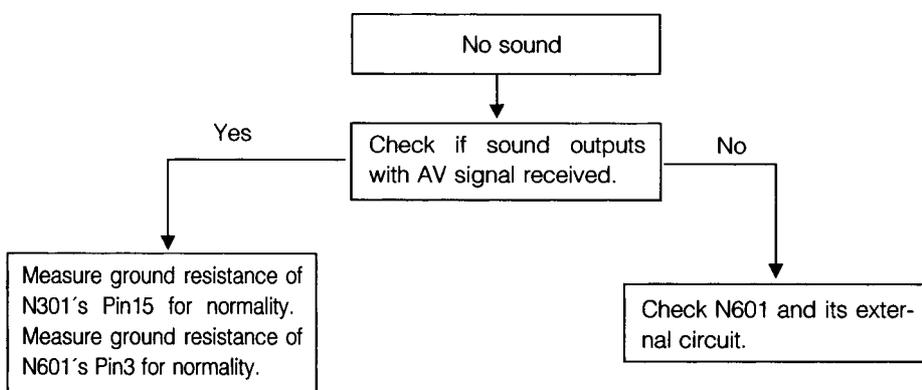


4.5 East-west pincushion distortion



5. Audio System

5.1 No sound

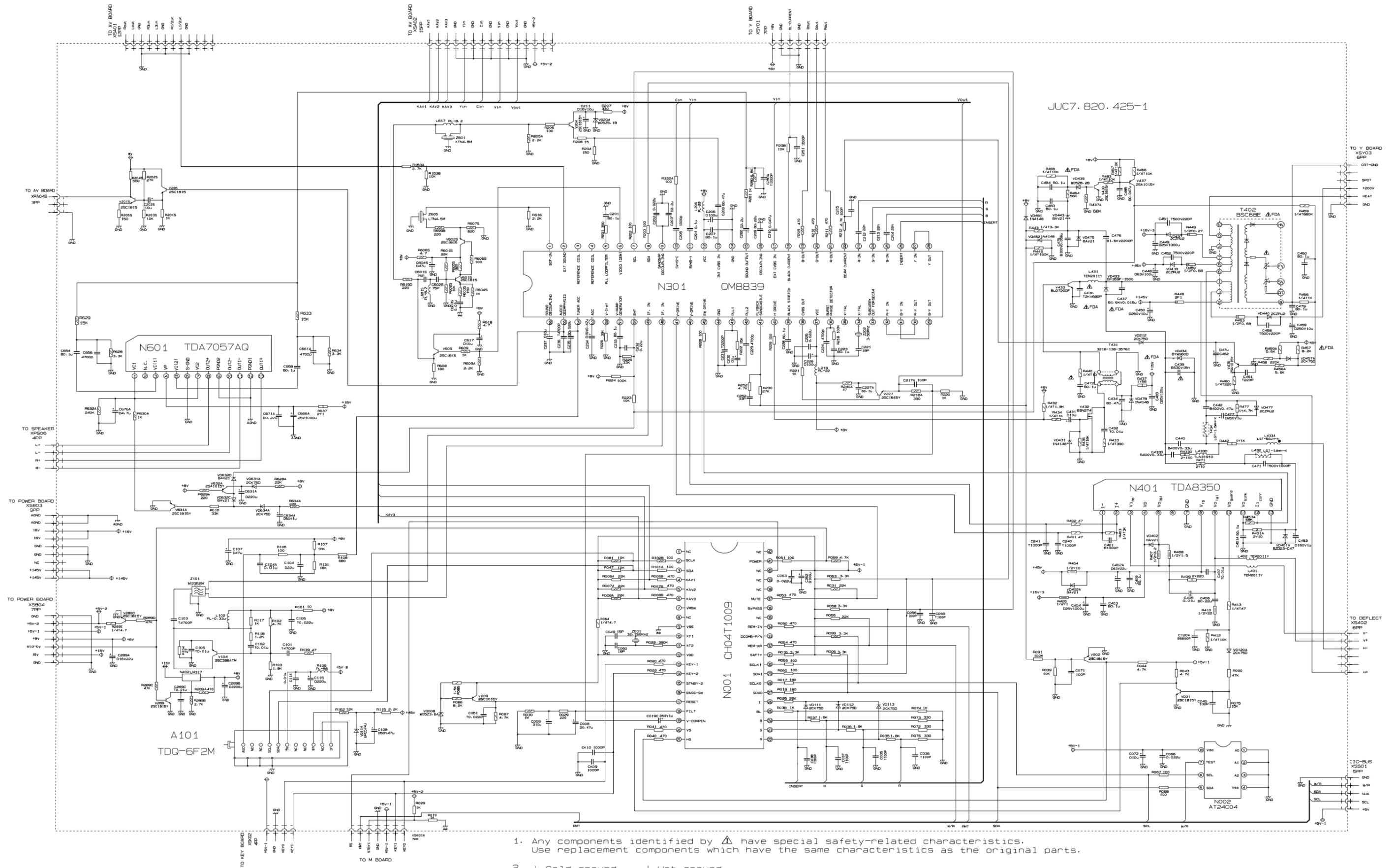


SERVICE SPARE PARTS LIST

APPENDIX

1. CIRCUIT DIAGRAM
2. FINAL WIRING DIAGRAM
3. FINAL ASSEMBLY DIAGRAM
4. PRINTED CIRCUIT BOARD DIAGRAMS

APPENDIX 1: CIRCUIT DIAGRAM OF AT2408 (1)

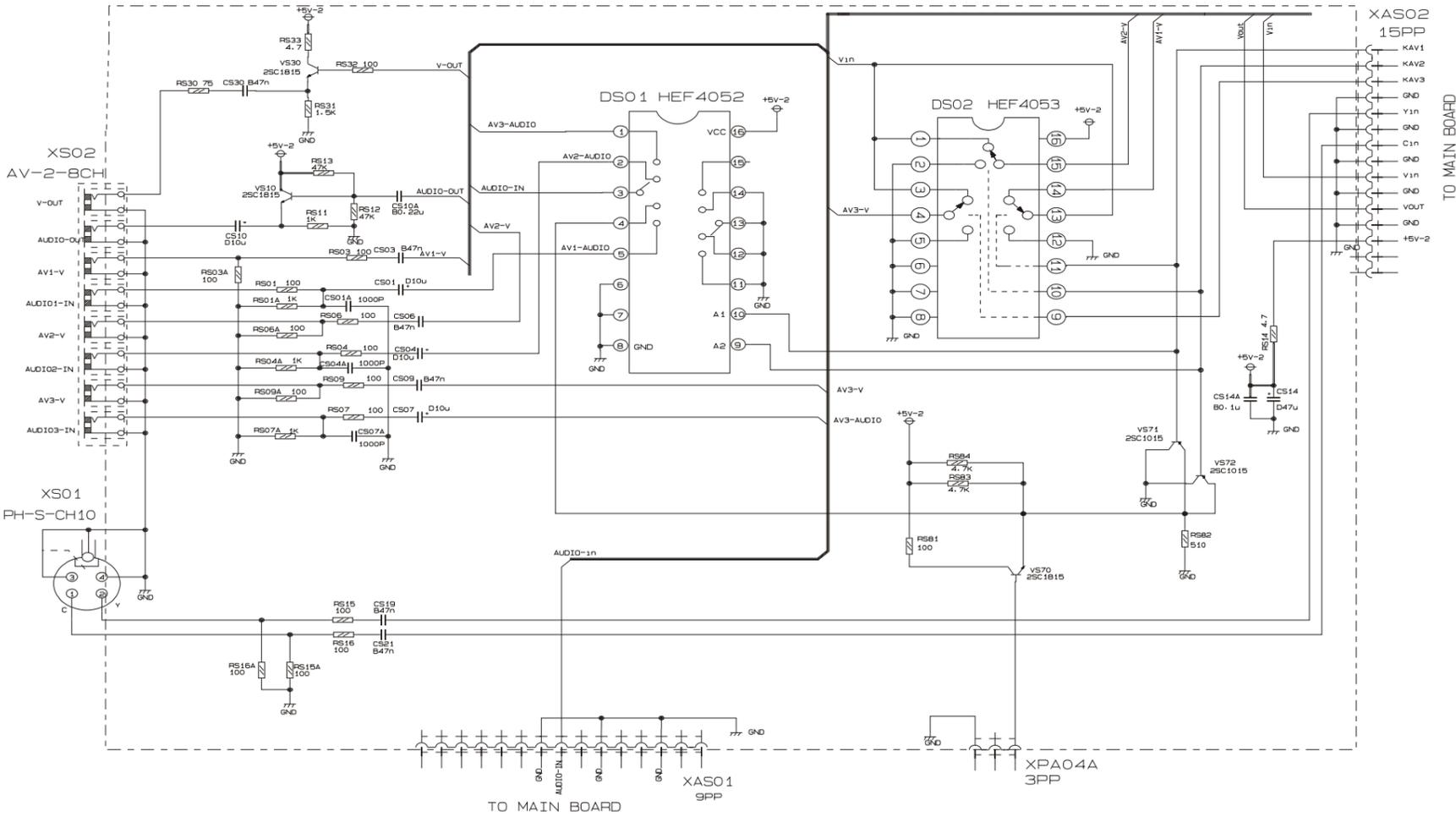


- Any components identified by \triangle have special safety-related characteristics. Use replacement components which have the same safety characteristics as the original parts.
- ∇ Cold ground \perp Hot ground
- \triangle FDA This symbol tells you that replacement components related to high voltage, beam current and X-ray radiation should not be made at will.

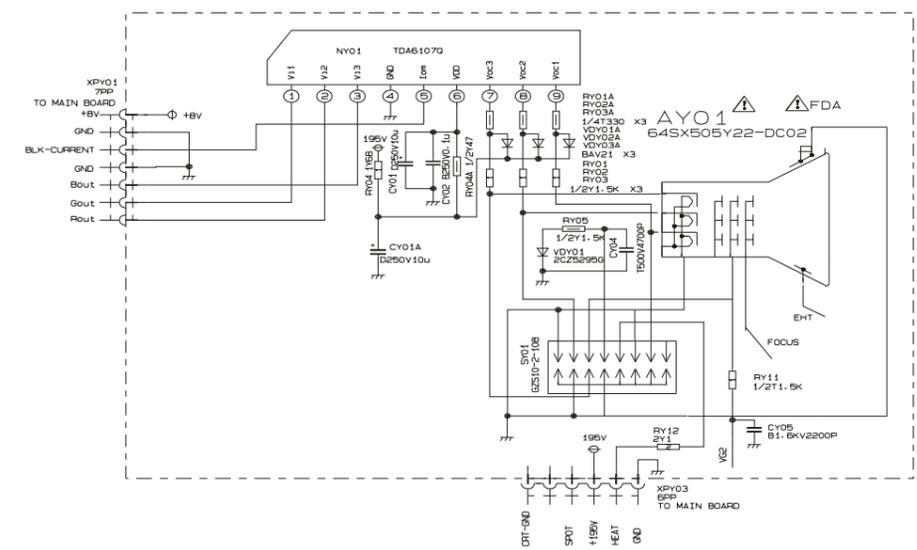
This circuit diagram is only for reference.
Specifications are subject to change without notice.

APPENDIX 1: CIRCUIT DIAGRAM OF AT2408 (2)

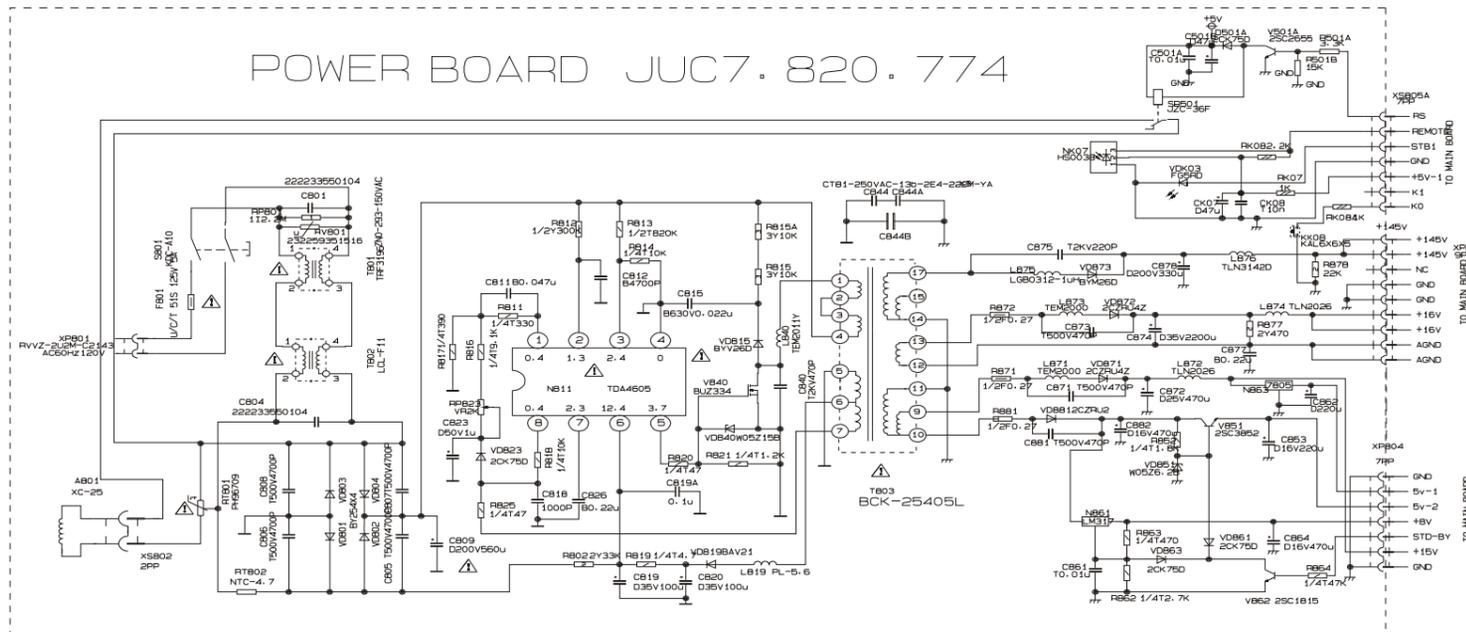
AV BOARD JUC7.820.426-1



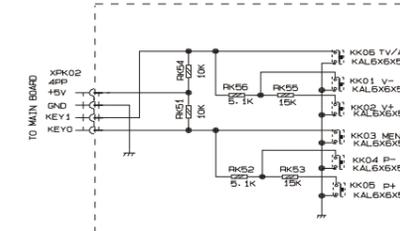
Y Board JUC7.820.428



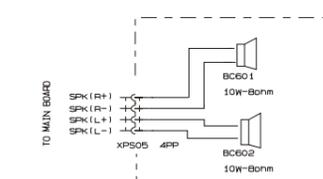
POWER BOARD JUC7.820.774



K Board JUC7.820.429



Speaker

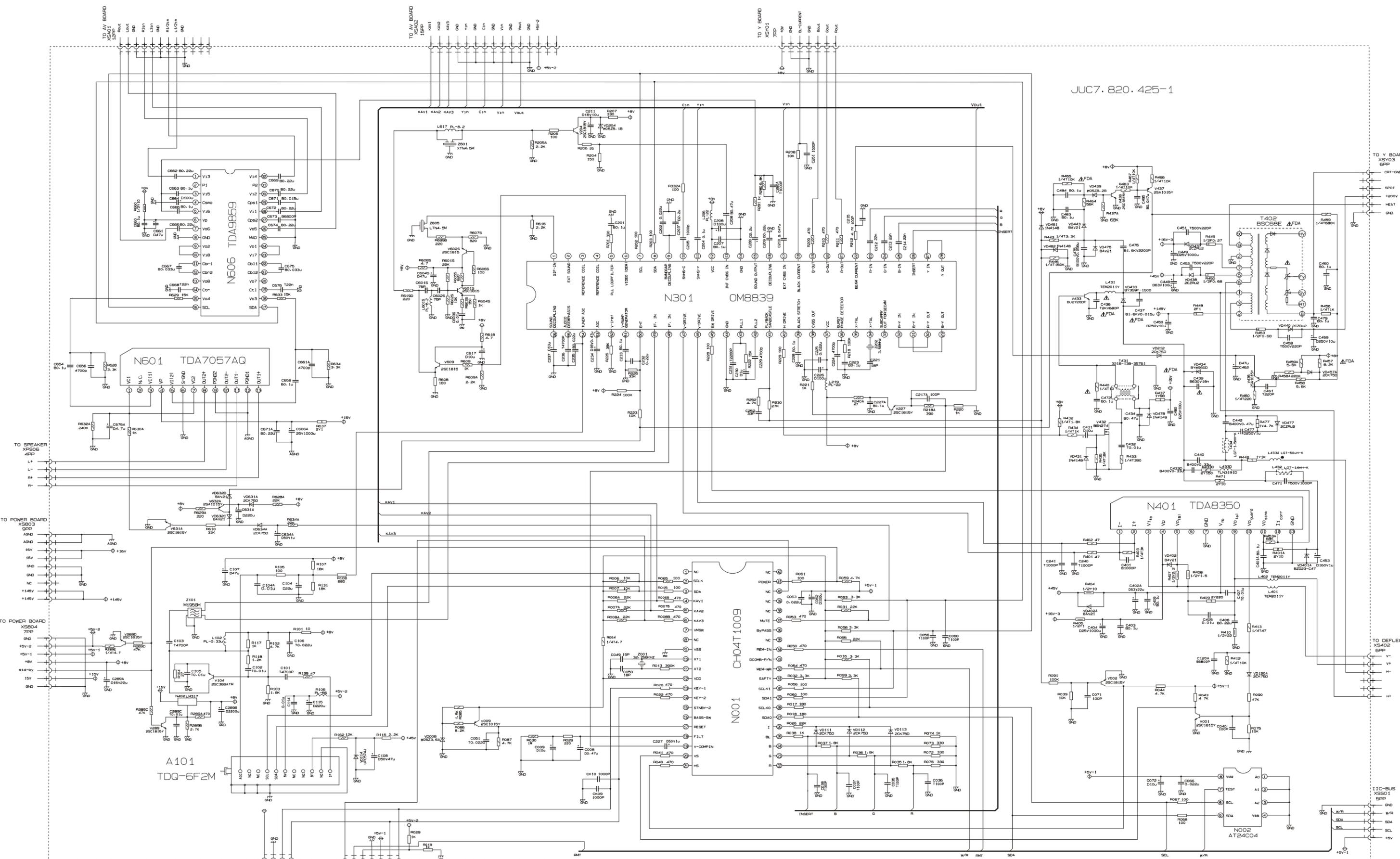


1. Any components identified by \triangle have special safety-related characteristics. Use replacement components which have the same characteristics as the original parts.
2. --- Cold ground \perp Hot ground
3. \triangle FDA This symbol tells you that replacement components related to high voltage, beam current and X-ray radiation should not be made at will.

This circuit diagram is only for reference.
Specifications are subject to change without notice.

APPENDIX 1: CIRCUIT DIAGRAM OF AT2408S (1)

JUC7.820.425-1



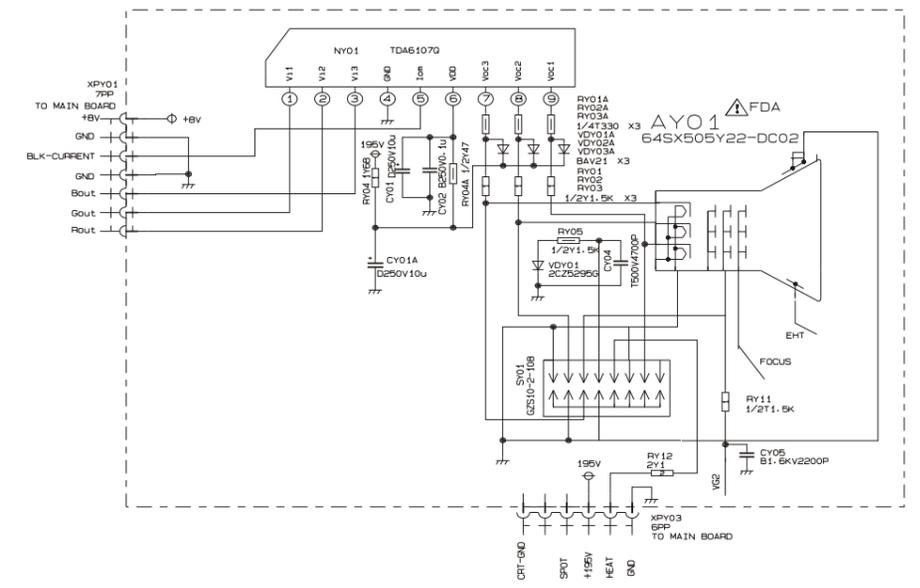
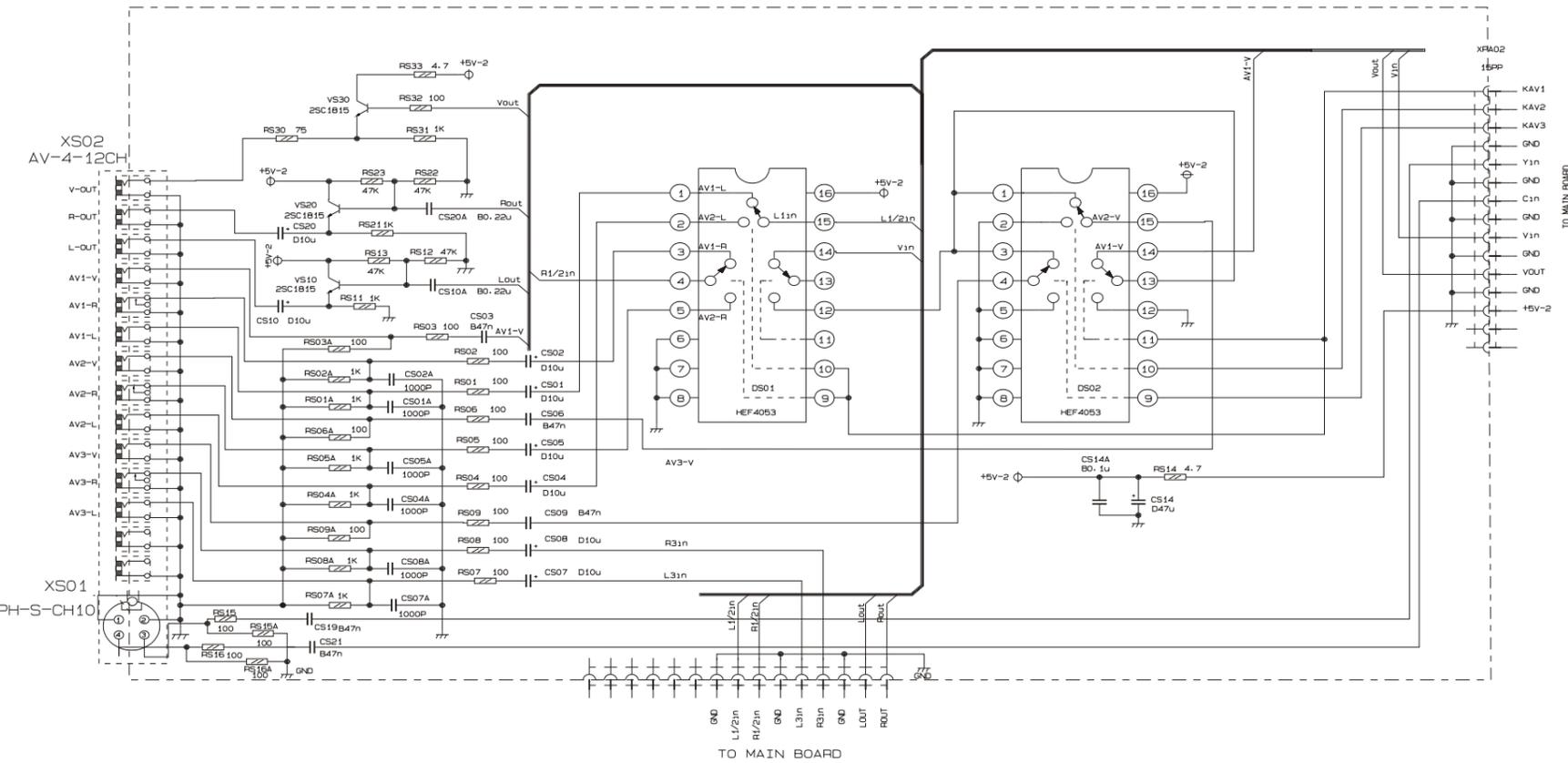
1. Any components identified by Δ have special safety-related characteristics. Use replacement components which have the same characteristics as the original parts.
2. ∇ Cold ground \perp Hot ground
3. Δ FDA This symbol tells you that replacement components related to high voltage, beam current and X-ray radiation should not be made at will.

This circuit diagram is only for reference. Specifications are subject to change without notice.

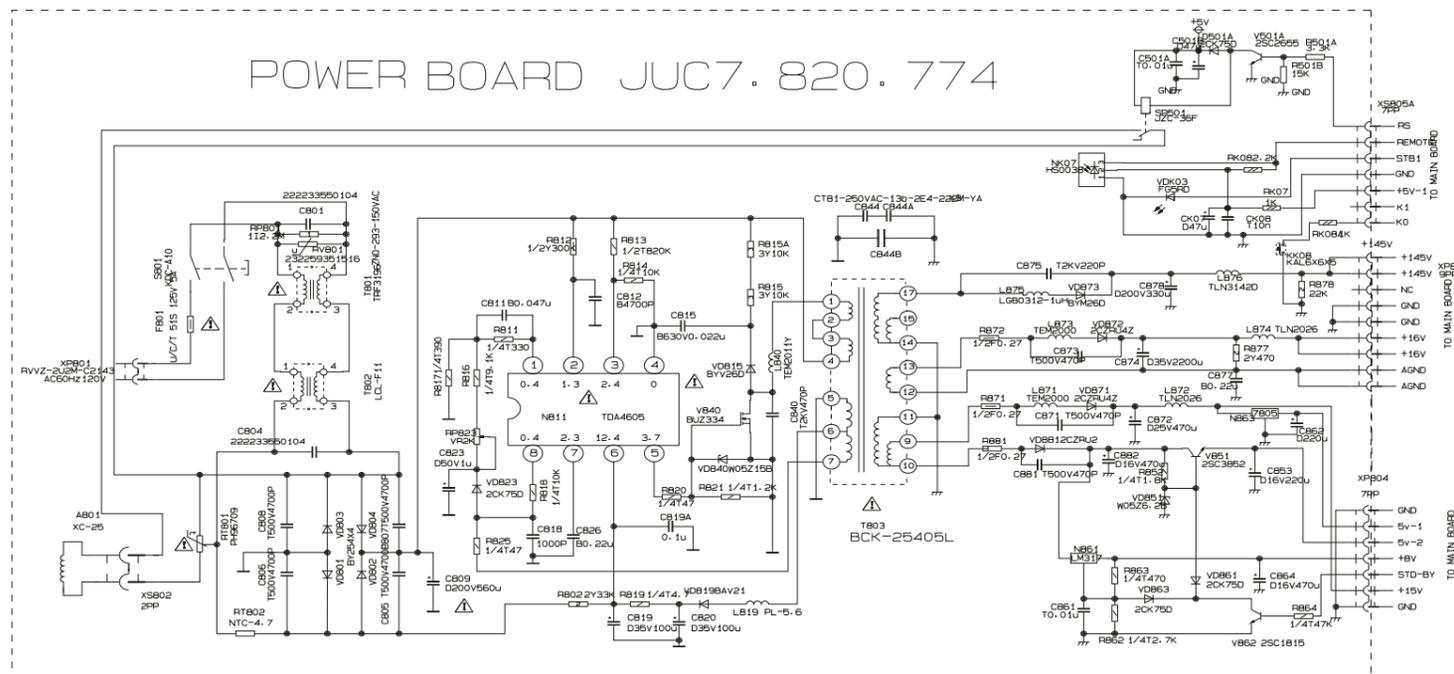
APPENDIX 1: CIRCUIT DIAGRAM OF AT2408S (2)

AV Board JUC7.820.426-1

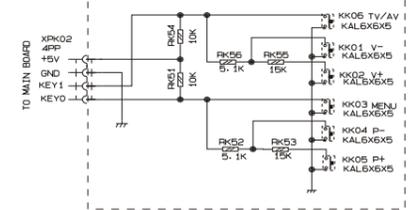
Y Board JUC7.820.428



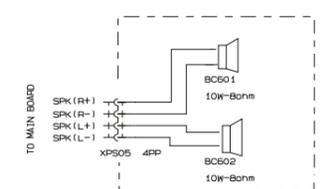
POWER BOARD JUC7.820.774



K Board JUC7.820.429



Speaker

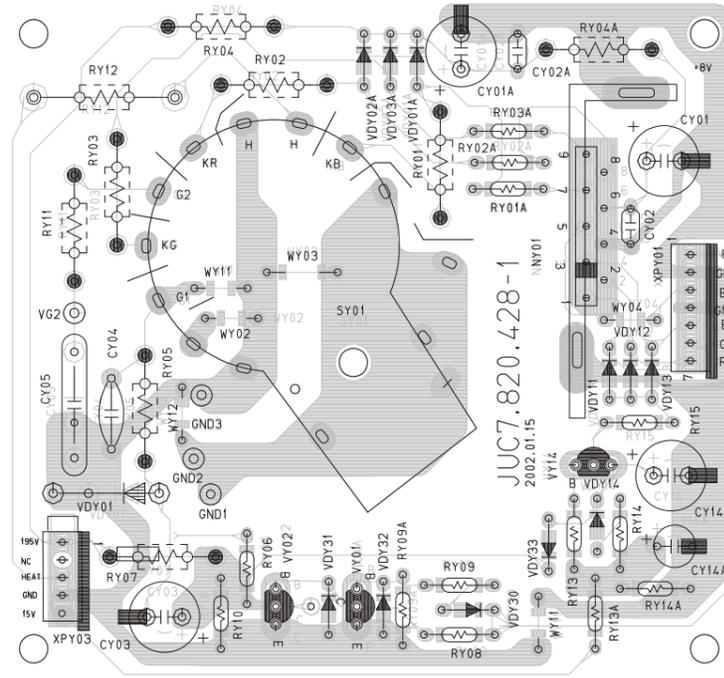


This circuit diagram is only for reference. Specifications are subject to change without notice.

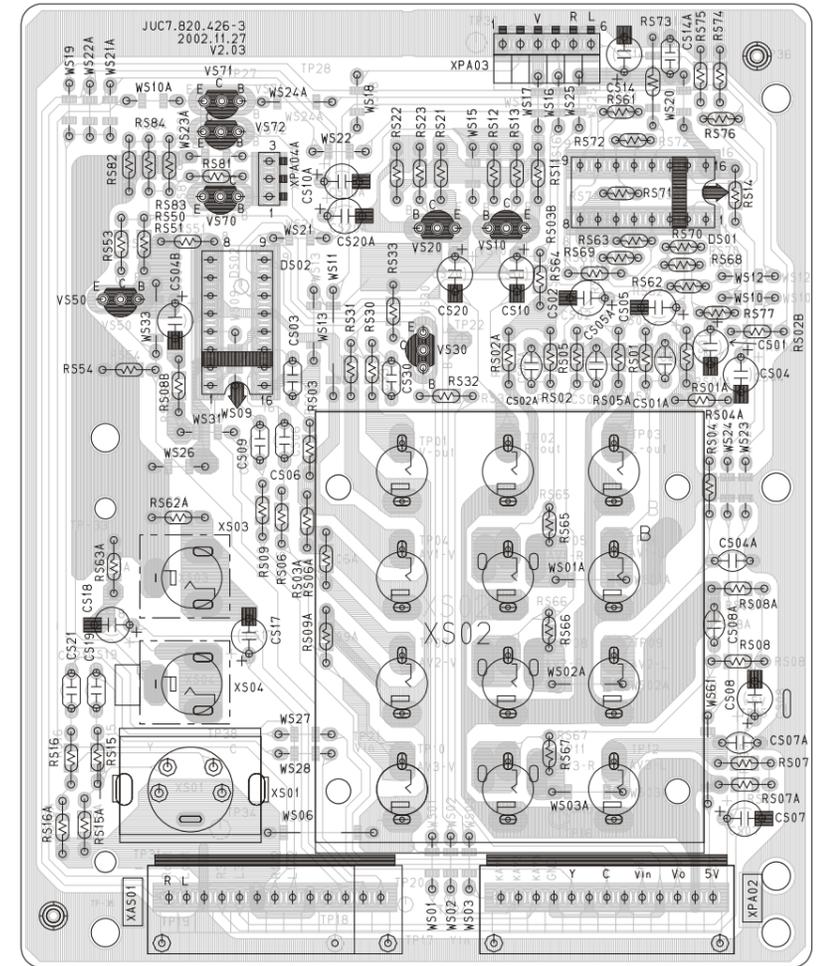
- Any components identified by Δ have special safety-related characteristics. Use replacement components which have the same characteristics as the original parts.
- --- Cold ground --- Hot ground
- Δ FDA This symbol tells you that replacement components related to high voltage, beam current and X-ray radiation should not be made at will.

APPENDIX 2: PCB OF AT2408

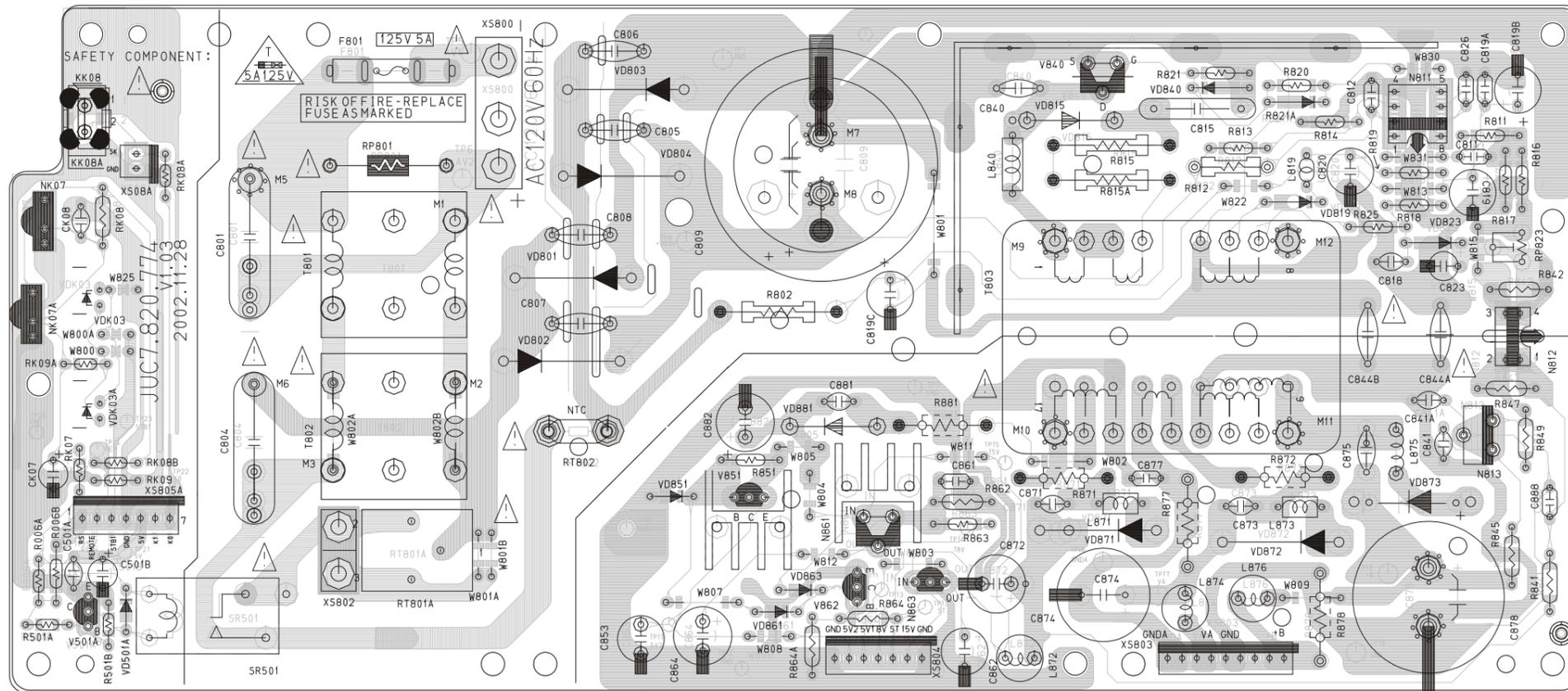
CRT RGB PCB



AV PCB

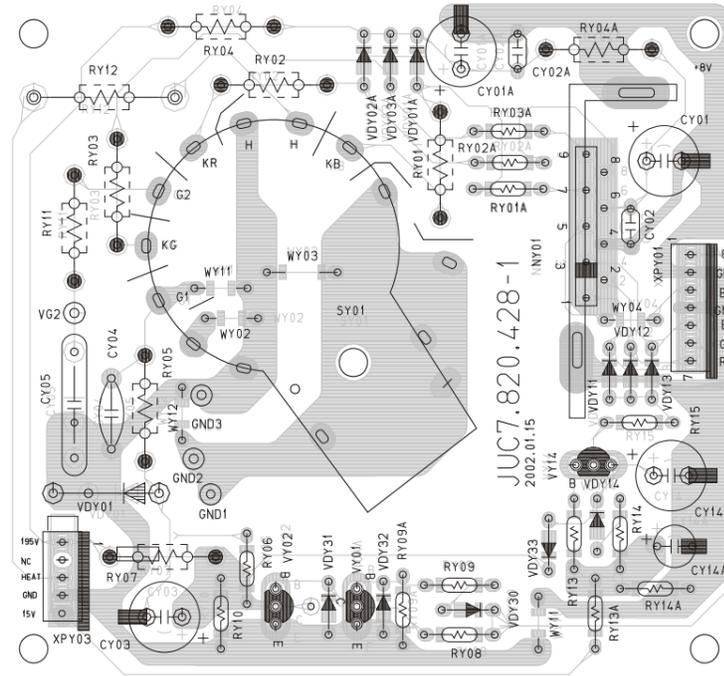


POWER PCB

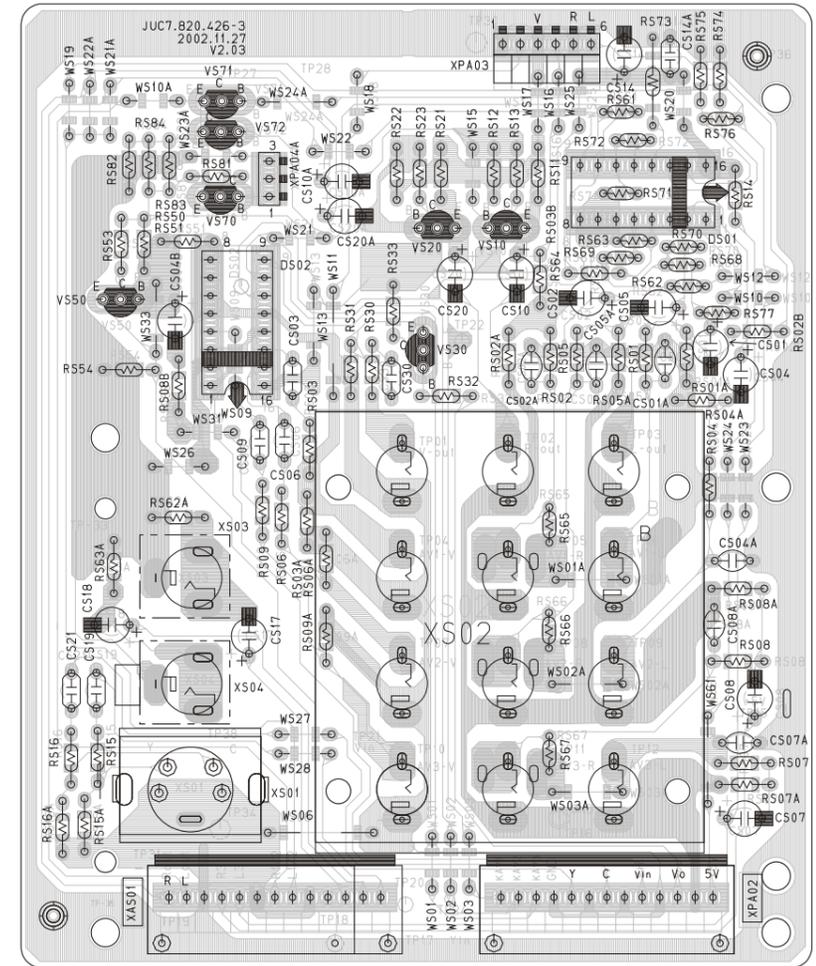


APPENDIX 2: PCB OF AT2408S

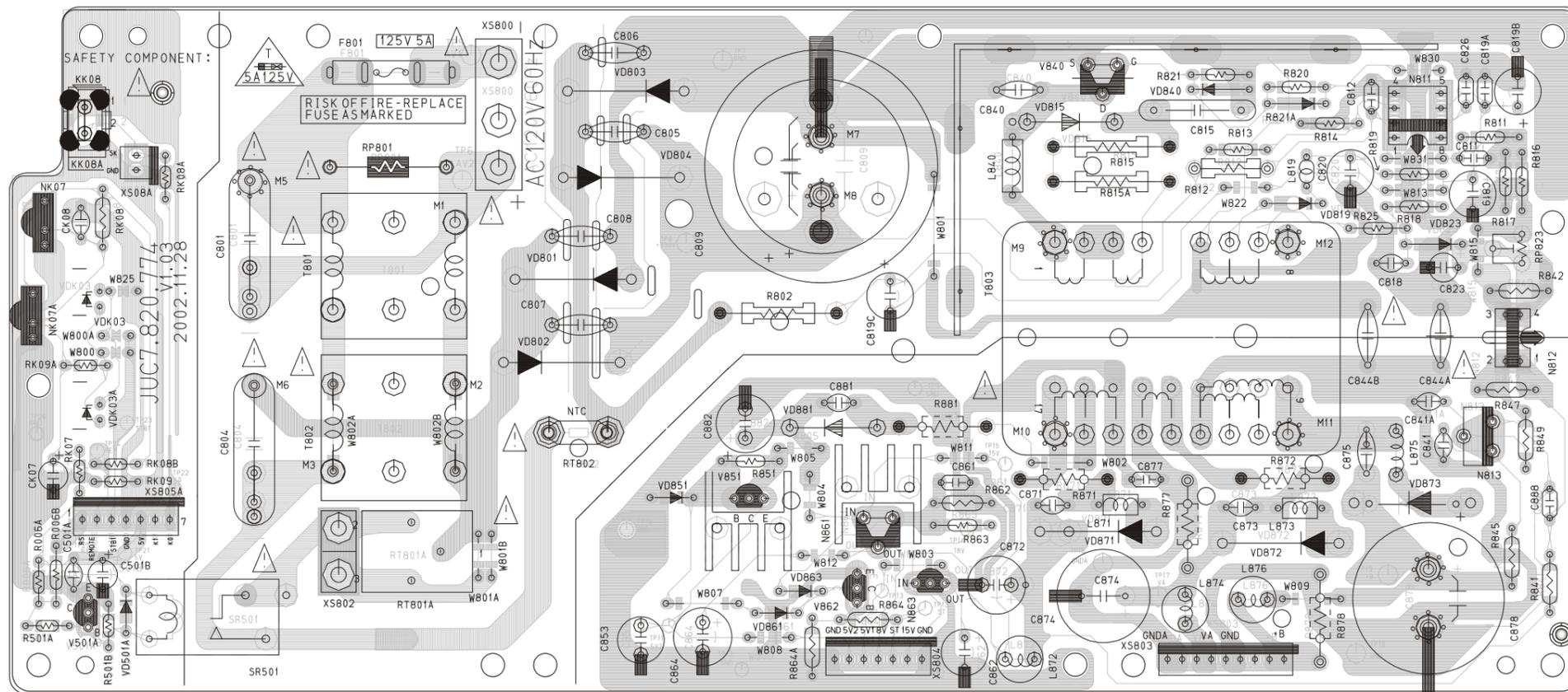
CRT RGB PCB



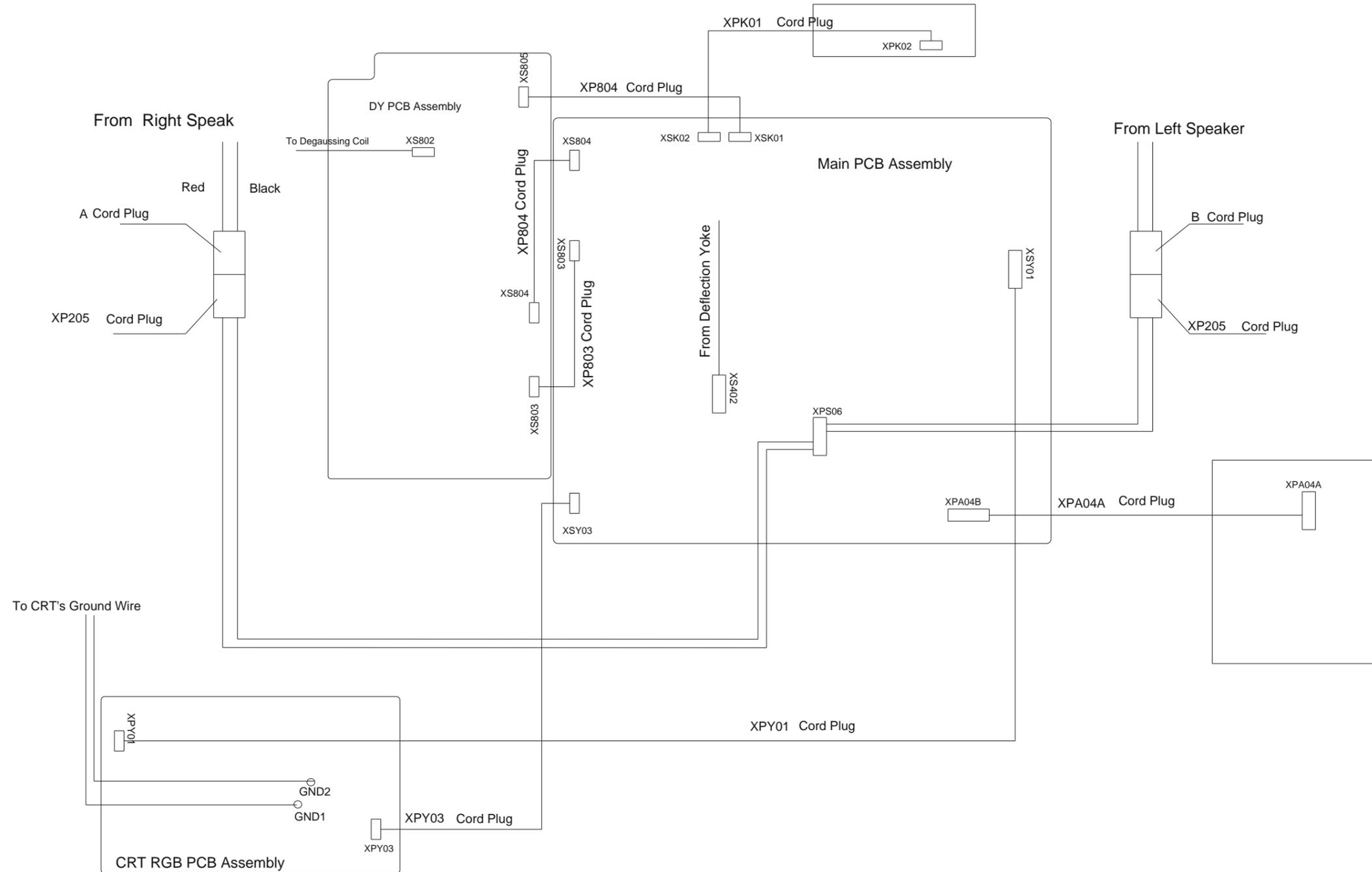
AV PCB



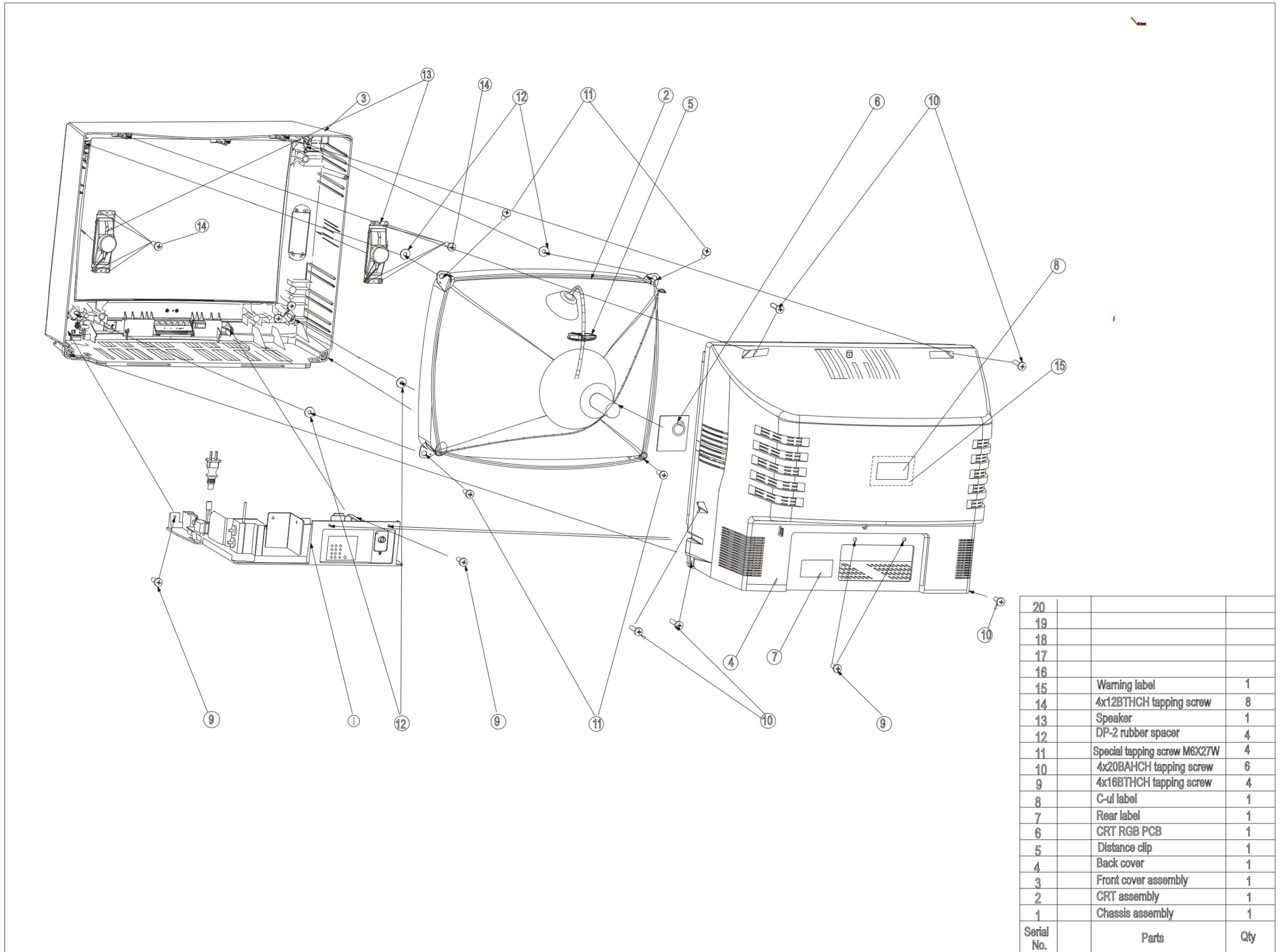
POWER PCB



APPENDIX 3: FINAL WIRING DIAGRAM OF AT2408

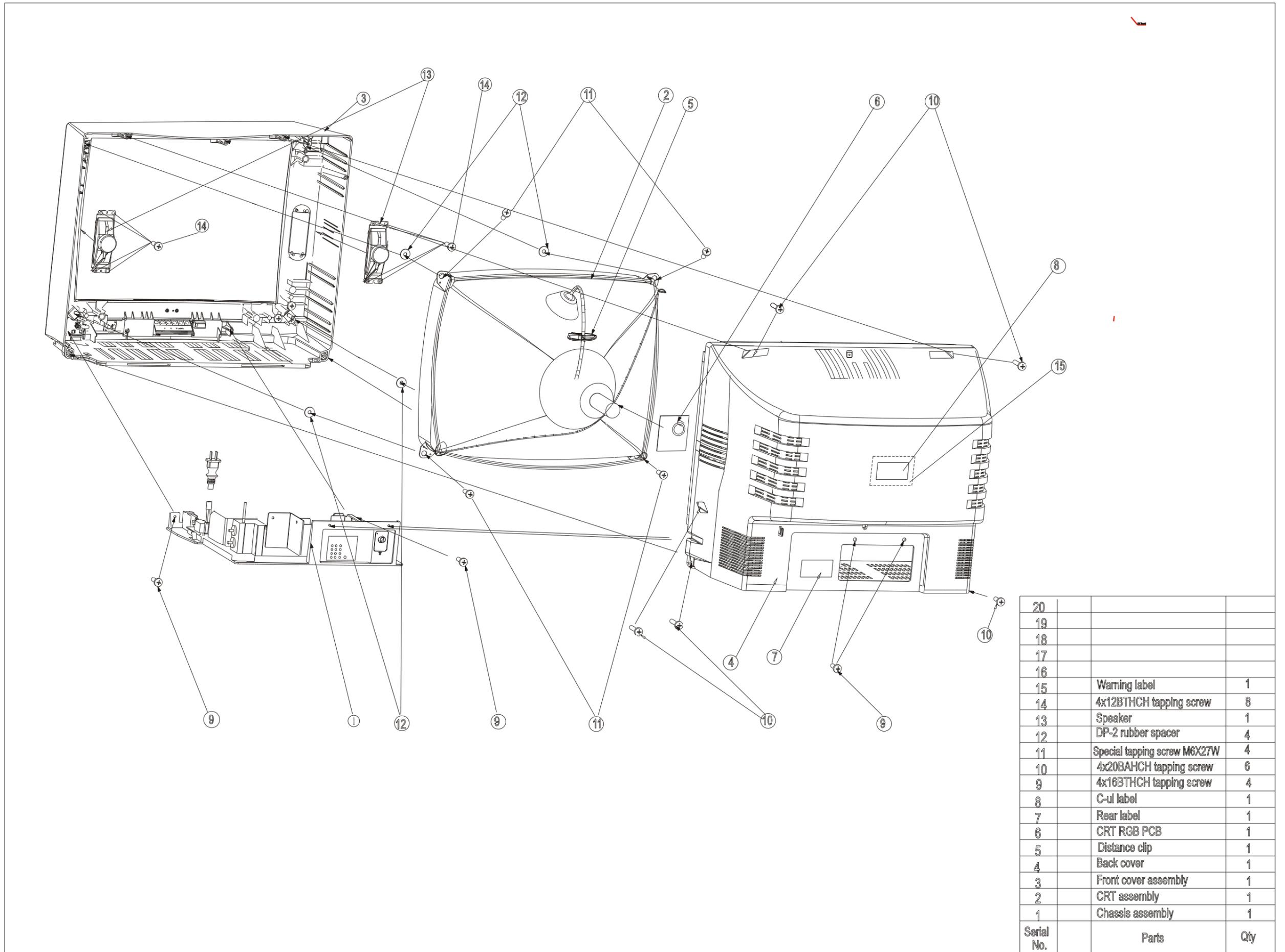


APPENDIX 4: FINAL ASSEMBLY OF AT2408



20		
19		
18		
17		
16		
15	Warning label	1
14	4x12BTCH tapping screw	8
13	Speaker	1
12	DP-2 rubber spacer	4
11	Special tapping screw M6X27W	4
10	4x20BAHCH tapping screw	6
9	4x16BTCH tapping screw	4
8	C-ui label	1
7	Rear label	1
6	CRT RGB PCB	1
5	Distance clip	1
4	Back cover	1
3	Front cover assembly	1
2	CRT assembly	1
1	Chassis assembly	1
Serial No.	Parts	Qty

APPENDIX 4: FINAL ASSEMBLY OF AT2408S



20		
19		
18		
17		
16		
15	Warning label	1
14	4x12BHCH tapping screw	8
13	Speaker	1
12	DP-2 rubber spacer	4
11	Special tapping screw M6X27W	4
10	4x20BAHCH tapping screw	6
9	4x16BHCH tapping screw	4
8	C-ul label	1
7	Rear label	1
6	CRT RGB PCB	1
5	Distance clip	1
4	Back cover	1
3	Front cover assembly	1
2	CRT assembly	1
1	Chassis assembly	1
Serial No.	Parts	Qty

Group component lists of AT2408&AT2408S

Part name	CRT Type	Old Part number
Remote control	TYPE:K12C-C1; When using CH04T1002 CPU (for AT2408S only)	K12C-C1
Remote control	TYPE:K12K-C2; When using CH04T1009 CPU (for AT2408S only)	K12K-C2
Remote control	TYPE:K12B-C2; When using CH04T1002 CPU (for AT2408 only)	K12B-C2
Remote control	TYPE:K12L-C1; When using CH04T1009 CPU (for AT2408 only)	K12L-C1
CRT assembly	For IRICO or Shanghai Novel CRT	64SX505Y22-DC02
CRT assembly	For LG CRT	A59KYL220X08
Front cover assembly		
Back cover		
Main PCB assembly	For AT2408 only	for AT2408 ONLY, JUC7.820.425-2, JUC7.820.775
Main PCB assembly	For AT2408S only	for AT2408S ONLY, JUC7.820.425-2, JUC7.820.775
Power PCB assembly	For AT2408/2408S and KT2406	JUC7.820.427-1, JUC7.820.774
AV PCB assembly	For AT2402S/AT2408S only	JUC.820.426-3
AV PCB assembly	For AT2408 only	JUC.820.426-3
CRT RGB PCB assembly		JUC7.820.428
Control PCB assembly		JUC7.820.429

New Part number List

8201800271L	\$15.00
8201801682L	\$15.00
8201800032L	\$15.00
8201800271L	\$15.00
8537000370C01	\$98.00
8537000370C02	\$98.00
8611604570C	\$43.26
8807400230C	\$11.88
8667206130C04	\$102.00
8667206130C05	\$102.00
8667206140C02	\$23.82
8667206160C01	\$11.88
8667206160C02	\$11.88
8667206150C01	\$11.88
8667206120C	\$28.80



APEX DIGITAL TELEVISION In-Warranty Schedule by Model

Product Model No.	LIMITED WARRANTY ¹				Carry-In Service	In Home	Stock Repair	REIMBURSEMENT RATES					
	Parts	Remote Control	Labor	CRT ³				Yes/No	Yes/No	Yes/No	Carry-In		Home Service
					Minor	Major	Minor				Major		

13 inch ²

AT1302	90	90	90	90	N	N	N	N/A	N/A	N/A	N/A	N/A
AT1308	90	90	90	90	N	N	N	N/A	N/A	N/A	N/A	N/A

20 inch ²

AT2002 / AT2002S	365	90	90	365	N	N	N	N/A	N/A	N/A	N/A	N/A
AT2008 / AT2008S	365	90	90	365	N	N	N	N/A	N/A	N/A	N/A	N/A
GT2011J	365	90	90		N	N	N	N/A	N/A	N/A	N/A	N/A
GT2011S	365	90	90	365	N	N	N	N/A	N/A	N/A	N/A	N/A
GT2015	365	90	90	365	N	N	N	N/A	N/A	N/A	N/A	N/A
GT2015DV	365	90	90	365	N	N	N	N/A	N/A	N/A	N/A	N/A
KT2006	1 YEAR STORE REPLACEMENT											

24 inch ^{2&3}

AT2402	365	90	90	365	N	N	N	N/A	N/A	N/A	N/A	N/A
AT2408 / AT2408S	365	90	90	365	N	N	N	N/A	N/A	N/A	N/A	N/A
GT2411S	365	90	90	365								
GT2415	365	90	90	365	N	N	N	N/A	N/A	N/A	N/A	N/A
PF2425	365	90	90	730	N	N	N	N/A	N/A	N/A	N/A	N/A
KT2406	365	90	90	365	Y	N	N	4	4	4	4	4

25 inch ²

AT2502	365	90	90	365	N	N	N	N/A	N/A	N/A	N/A	N/A
AT2502S	365	90	90	365	N	N	N	N/A	N/A	N/A	N/A	N/A

27 inch ³

AT2702	365	90	90	365	Y	Y	Y	4	4	4	4	4
AT2702S	365	90	90	365	Y	Y	Y	4	4	4	4	4
AT2708 / AT2708S	365	90	90	365	Y	Y	Y	4	4	4	4	4
GT2711S	365	90	90	365	Y	Y	Y	4	4	4	4	4
GT2715	365	90	90	365	Y	Y	Y	4	4	4	4	4
PF2725	365	90	90	730	Y	Y	Y	4	4	4	4	4
GT2715DV	365	90	90	365	Y	Y	Y	4	4	4	4	4

32 inch ³

AT3208S	365	90	90	365	Y	Y	Y	4	4	4	4	4
GT3215	365	90	90	365	Y	Y	Y	4	4	4	4	4
PF3225	365	90	90	730	Y	Y	Y	4	4	4	4	4
KT3226	365	90	90	730	Y	Y	Y	4	4	4	4	4

PROJECTION

GB4308	365	90	365	730	Y	Y	Y	4	4	4	4	4
GB43HD09	365	90	365	365	Y	Y	Y	4	4	4	4	4
GB5108	365	90	365	730	Y	Y	Y	4	4	4	4	4
GB51HD09	365	90	365	365	Y	Y	Y	4	4	4	4	4
GB55HD09W	365	90	365	365	Y	Y	Y	4	4	4	4	4
GB65HD09W	365	90	365	365	Y	Y	Y	4	4	4	4	4

¹ Limited Warranty is printed on the last page of the owner's manual

² All defective units 13" - 25" during the first 90 days of ownership will be exchanged at the original place of purchase. Dealer may contact APEX to receive a Return Authorization from Apex for credit or exchange.

³ Should the picture tube fail during the In-Warranty period the product will be exchanged. The customer is responsible for the Service Center diagnostic fee after the initial labor warranty period and for all packing, transportation and insurance charges.

⁴ See Master Dealer File for Rates for each Dealer