Contents

I. Safety Instructions

CAUTION

RISK OF ELECTRIC SHOCK DO NOT OPEN

CAUTION: TO REDUCE THE RISK OF ELECTRIC SHOCK, DO NOT REMOVE COVER (OR BACK). NO USER-SERVICEABLE PARTS INSIDE. REFER SERVICING TO QUALIFIED SERVICE PERSONNEL ONLY.

The lightning flash with arrowhead symbol, within an equilateral triangle, is intended to alert the user to the presence of uninsulated "dangerous voltage" within the product's enclosure that may be of sufficient magnitude to constitute a risk of electric shock to persons.

The exclamation point within an equilateral triangle is intended to alert the user to the presence of important operating and maintenance (servicing) instructions in the literature accompanying the appliance.

PRECAUTIONS DURING SERVICING

1. In addition to safety, other parts and assemblies are specified for conformance with such regulations as those applying to spurious radiation. These must also be replaced only with specified replacements. Examples: RF converters, tuner units, antenna selection switches, RF cables, noise-blocking capacitors, noise-blocking filters, etc.
2. Use specified internal Wiring. Note especially:
   1) Wires covered with PVC tubing
   2) Double insulated wires
   3) High voltage leads
3. Use specified insulating materials for hazardous live parts. Note especially:
   1) Insulating Tape
   2) PVC tubing
   3) Spacers (insulating barriers)
   4) Insulating sheets for transistors
   5) Plastic screws for fixing micro switches
4. When replacing AC primary side components (transformers, power cords, noise blocking capacitors, etc.), wrap ends of wires securely about the terminals before soldering.

5. Make sure that wires do not contact heat generating parts (heat sinks, oxide metal film resistors, fusible resistors, etc.)
6. Check if replaced wires do not contact sharply edged or pointed parts.
7. Make sure that foreign objects (screws, solder droplets, etc.) do not remain inside the set.

MAKE YOUR CONTRIBUTION TO PROTECT THE ENVIRONMENT

Used batteries with the ISO symbol for recycling as well as small accumulators (rechargeable batteries), mini-batteries (cells) and starter batteries should not be thrown into the garbage can.
Please leave them at an appropriate depot.

WARNING:

Before servicing this TV receiver, read the X-RAY RADIATION PRECAUTION, SAFETY INSTRUCTION and PRODUCT SAFETY NOTICE.

X-RAY RADIATION PRECAUTION

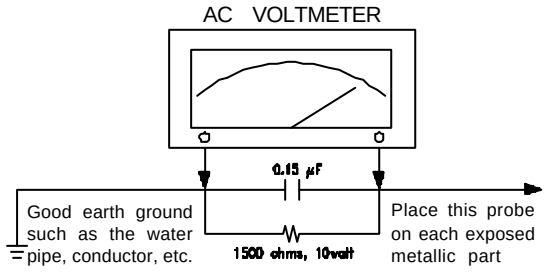
1. Excessively high can produce potentially hazardous X-RAY RADIATION. To avoid such hazards, the high voltage must not exceed the specified limit. The normal value of the high voltage of this TV receiver is 27 KV at zero bean current (minimum brightness). The high voltage must not exceed 30 KV under any circumstances. Each time when a receiver requires servicing, the high voltage should be checked. The reading of the high voltage is recommended to be recorded as a part of the service record, It is important to use an accurate and reliable high voltage meter.
2. The only source of X-RAY RADIATION in this TV receiver is the picture tube. For continued X-RAY RADIATION protection, the replacement tube must be exactly the same type as specified in the parts list.
3. Some parts in this TV receiver have special safety related characteristics for X-RADIATION protection. For continued safety, the parts replacement should be under taken only after referring the PRODUCT SAFETY NOTICE.

SAFETY INSTRUCTION

The service should not be attempted by anyone unfamiliar with the necessary instructions on this TV receiver. The following are the necessary instructions to be observed before servicing.

1. An isolation transformer should be connected in the power line between the receiver and the AC line when a service is performed on the primary of the converter transformer of the set.
2. Comply with all caution and safety related provided on the back of the cabinet, inside the cabinet, on the chassis or picture tube.

3. To avoid a shock hazard, always discharge the picture tube's anode to the chassis ground before removing the anode cap.
4. Completely discharge the high potential voltage of the picture tube before handling. The picture tube is a vacuum and if broken, the glass will explode.
5. When replacing a MAIN PCB in the cabinet, always be certain that all protective are installed properly such as control knobs, adjustment covers or shields, barriers, isolation resistor networks etc.
6. When servicing is required, observe the original lead dressing. Extra precaution should be given to assure correct lead dressing in the high voltage area.
7. Keep wires away from high voltage or high tempera ture components.
8. Before returning the set to the customer, always perform an AC leakage current check on the exposed metallic parts of the cabinet, such as antennas, terminals, screwheads, metal overlay, control shafts, etc., to be sure the set is safe to operate without danger of electrical shock. Plug the AC line cord directly to the AC outlet (do not use a line isolation transformer during this check). Use an AC voltmeter having 5K ohms volt sensitivity or more in the following manner.
   Connect a 1.5K ohm 10 watt resistor paralleled by a 0.15µF AC type capacitor, between a good earth ground (water pipe, conductor etc.,) and the exposed metallic parts, one at a time.
   Measure the AC voltage across the combination of the 1.5K ohm resistor and 0.15 uF capacitor. Reverse the AC plug at the AC outlet and repeat the AC voltage measurements for each exposed metallic part.
   The measured voltage must not exceed 0.3V RMS. This corresponds to 0.5mA AC. Any value exceeding this limit constitutes a potential shock hazard and must be corrected immediately.
   The resistance measurement should be done between accessible exposed metal parts and power cord plug prongs with the power switch "ON". The resistance should be more than 6M ohms.



AC Leakage Current Check

PRODUCT SAFETY NOTICE

Many electrical and mechanical parts in this TV receiver have special safety-related characteristics. These characteristics are offer passed unnoticed by visual spection and the protection afforded by them cannot necessarily be obtained by using replacement components rates for a higher voltage, wattage, etc. The replacement parts which have these special safety characteristics are identified by ⚠ marks on the schematic diagram and on the parts list.
Before replacing any of these components, read the parts list in this manual carefully. The use of substitute replacement parts which do not have the same safety characteristics as specified in the parts list may create shock, fire, X-RAY RADIATION or other hazards.

II. Specifications

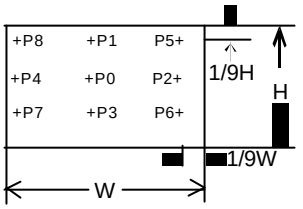
1. Power supply TV: AC 220 V, 50Hz
   Remote control battery: 3V (UM-3X2)
2. TV system RF input : PAL BG/DK, SECAM BG/DK
   Video input : PAL/SECAM/NTSC 3.58/NTSC 4.43
3. Receiving channels VHF-L : E2-S10
   VHF-H : E5-S41
   UHF : E21-E69
4. Intermediate frequencies Picture : 38.9MHz
5. Scanning Horizontal (Hz) : 15625/15750
   Vertical (Hz) : 50/60
6. Color picture tube: 21" 25" 29" 90 degree North(1) hemisphere Bv=+0.35G±0.2G
7. Operating temperature Fulfil all specifications: 15°C ~ 35°C
   Accept picture/tone reproduction: 5°C ~ 45°C
8. Operating relative humidity Fulfil all specifications: 45% ~ 75%
   Accept picture/tone reproduction: 15% ~ 90%
9. Electrical & Optical Specification:

No.	Items	Instruction		Typical	Limit	Unit
1	Video sensitivity	For 30dB S/N	VL	≤45	≤48	dBuV
			VH	≤45	≤48	
			U	≤48	≤51	
2	FM sound sensitivity	For 30dB S/N		30	≤35	dBuV
3	Synchronizing sensitivity	For RF transmission		25	≤30	dBuV
4	Color sensitivity	For RF transmission		32	≤40	dBuV
5	Teletext sensitivity	TV screen refreshes 40 times number of mistakes ≤8		N/A	N/A	dBu
6	Minimum NICAM threshold	Without crackline noise		N/A	N/A	dBu
7	AGC static characteristic	Accept. Picture/tone repr.		103	≥100	dBu
8	Selectivity	Adjacent sound carrier		40	≥35	dB
		Below adjacent sound carrier		35	≥30	
		Adjacent picture carrier		50	≥40	
		Up adjacent picture carrier		45	≥30	
9	IF rejection			55	≥50	dB
10	Image rejection	VHF		55	≥50	dB
		UHF		50	≥45	
11	AFT pull-in range	M/N		N/A	N/A	MHz
		DK/I/BG		±1.5	≥|±1.0|	
12	Chroma sync pull-in range			±500	≥|±200|	Hz
13	Color killer function			-25	≤-16	dB
14	DC restoration			3	≤10	%
15	Resolution	Horizontal	PAL/SECAM	320	≥300	lines
			NTSC	270	≥250	
		Vertical	PAL/SECAM	410	≥400	
			NTSC	320	≥300	
16	Overscan	Cross hatch signal		93	90~96	%
17	Linearity	Horizontal		7	≤10	%
		Vertical		6	≤8	%
18	Pattern distortion			1.5	≤3	%
19	Picture position	In all direction		±3	≤|±6|	mm
20	Raster rotation	In all direction		4	≤6	mm
21	Convergence error			0.4	≤0.6	%
22	White balance (8700°K)	X		0.288	0.288±0.015	/
		Y		0.298	0.298±0.015	
23	Maximum full white	At picture tube center		110	≥100	cd/m^2 [For 21"]
				90	≥80	cd/m^2 [For 25A9ABN87]
				80	≥70	cd/m^2 [For 29A9ABN87]
24	H sync pull-in range			±500	≥|±200|	Hz
25	V sync pull-in range			7	≥6	Hz
26	Anode voltage			29	≤32	KV [For 21A8/21B8/29A9 ABN87]
				25	≤27.5	KV [For 2109BN37]
				27.5	≤30	KV [For 25A9ABN87/21A9BN37]
27	Audio frequence response	±3dB ref. to 1KHz		0.2~8	0.2~8	KHz
28	Audio output power	1KHz 10% THD		2x3	≥2x3	W [For 25A9/29A9ABN87]
		50KHz DEV. (BG/I/DK)		2x1.5	≥2x1.5	W [For 21"]
		25KHz DEV. (M/N)				

No.	Items	Instruction	Typical	Limit	Unit
29	THD	Po=0.5W 1KHz	1	≤3	%
30	Signal to buzz ratio		42	≥40	dB
31	Minimum volume hum		6	≤10	mVrms
32	Maximum woofer output power		N/A	N/A	W
33	Woofer audio freqency response	±3dB ref. to 80Hz AV mode	N/A	N/A	Hz
34	Bass control range	100Hz ref. to 1KHz AV mode	N/A	N/A	dB
35	Treble control range	10KHz ref. to 1KHz AV mode	N/A	N/A	dB
36	Balance	Center	N/A	N/A	dB
		Max.	N/A	N/A	
		Min.	N/A	N/A	
37	Volume control curve			N/A	/
38	Video input level		1.0	1±0.2	Vpp
39	Audio input level		0.5	0.5±0.3	Vrms
40	Video output level		1.0	1±0.2	Vpp
41	Audio output level		0.5	0.5±0.2	Vrms
42	Power consumption	Operating	80	≤95	W **[For 2109/A9BN37]**
			100	≥100	W **[For 21A8/B8BN87]**
			110	≤150	W **[For 25A9ABN87]**
			120	≤160	W **[For 29A9ABN87]**
		Stand by	10	≤15	W
43	IR receiving distance	±30°	6	≥4	m
44	X-ray radiation		<0.1	≤0.5	mR/h
45	Dielectric strength	AC 3KVrms 2 sec.	3	≤5	mArms

Test Condition

1	Picture Modulation	87.5%
2	Sound Modulation	27KHz Dev. For DK/I/BG 15KHz Dev. For M/N
3	Picture to Sound Ration	10dB
4	Sound Artificial Load Resistor	8 ohm
5	Video signal	White and black (three white & two black)
6	Audio signal	1KHz sine wave 0.5Wrms



Convergence error test point on

7 Conditions of the TV setting:screen

A. Switch TV on and let it warm up for more than 30 minutes.

B. Connect RMS volt meter to speaker terminals and adjust theTV volume to get 500mW RMS power at each terminal.

C. Place the MINOLTA CA-100 test probe to white part of the screen,adjust the contrast until a reading of 80cd/m^2 is obtained.

D. Place the MINOLTA CA-100 test probe to black part of the screen,adjust the brightness until a reading of 2cd/m^2 is obtained.

E. Repeat step C & D until the exact luminance values is obtained or the nearest possible values you can get.then record the luminance values & R.G.B gun voltage values at the same time. and take the largest values for measurement referenct.

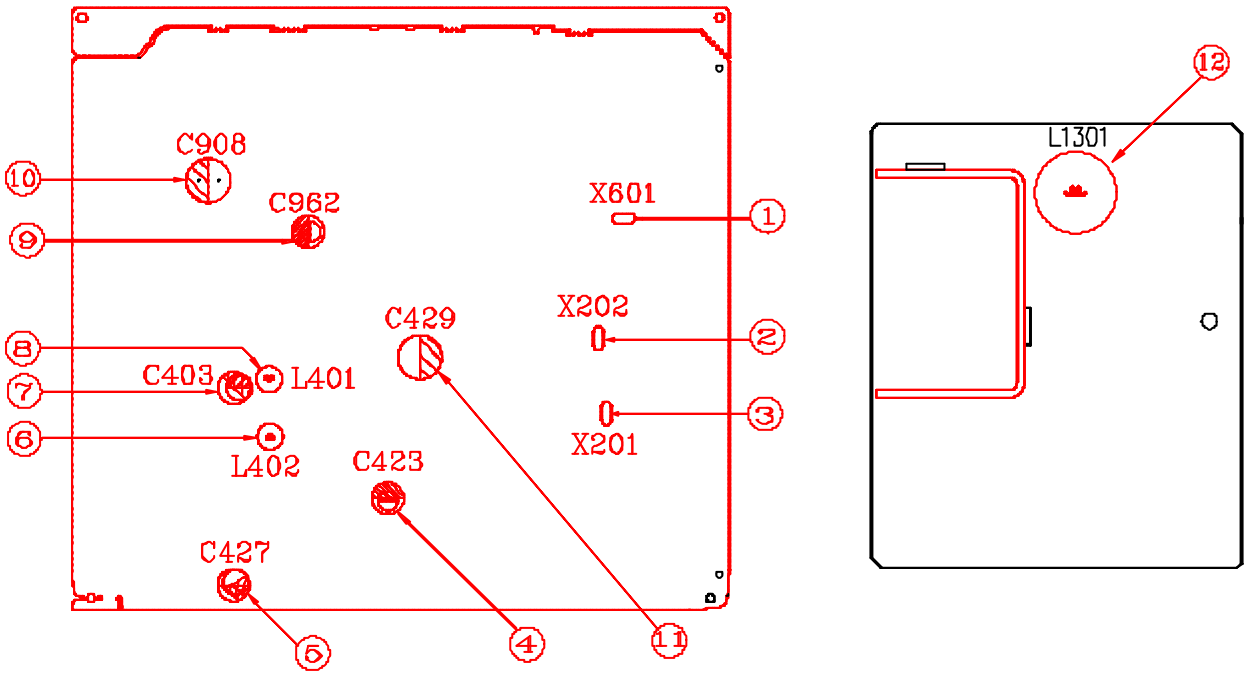
F. Input standard color bar(100/0/75/0),then adjust the colour.until the waveforms at the blue gun of same level is obtained.

III. Level List of Equipments & Instruments Required for Production

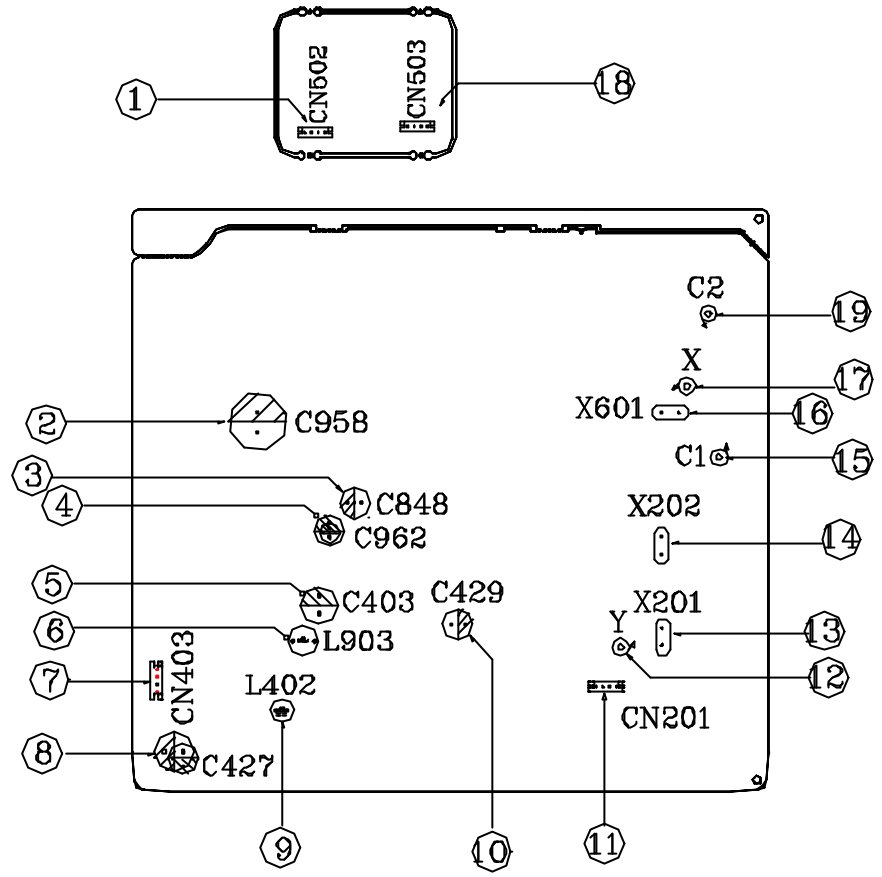
No.	Designation	Requirement	Reference Model	Remark
1	Pattern Generator	System of output signal: RF out: PAL BG/SUB/DK/I, SECAM B/G/D/K, NTSC M Video out: NTSC 4.43/3.58 PAL 60Hz	PHILIPS PM5518-TN PM5418-TN	
2	Digital voltmeter	Input Resistance ≥10MΩ	FLUKE 45	
3	Withstanding Voltage Tester	Withstanding Voltage: AC 1.5KV, 5KV/0-5KV ± 3% Cut-off current: AC 0-2mA, 20mA / continuously Adjustable	KIKUSUI TOS 8650	Irresistible Voltage Measure
4	Insulation Tester	Test voltage:1000V. 500V	KIKUSUI TOS 7100L	
5	Sine wave Signal Generator	Frequency Range: 0.1~140MHz (Precision:10KHz) Level Range: -20~126dB	LEADER 3216	For generating IF Signal
6	Oscilloscope	Frequency response: 20MHz or above		
7	CRT Color Analyzer		MINOLTA CA-100	For White Balance Adjustment
8	DC Regulated Power Supply	Max output Voltage≥14V		Supply DC power
9	Color Monitor	AV receiving system: Should include all the AV output system of the products at least.	Same model (of TV set) as the products	For operation check For resolution check For Skew Check
10	Audio Signal Generator	Frequency of output signal: 20Hz-20kHz	KENWOOD AG-203A	For generating audio signal

IV. Applying Adhesive on Main PCB

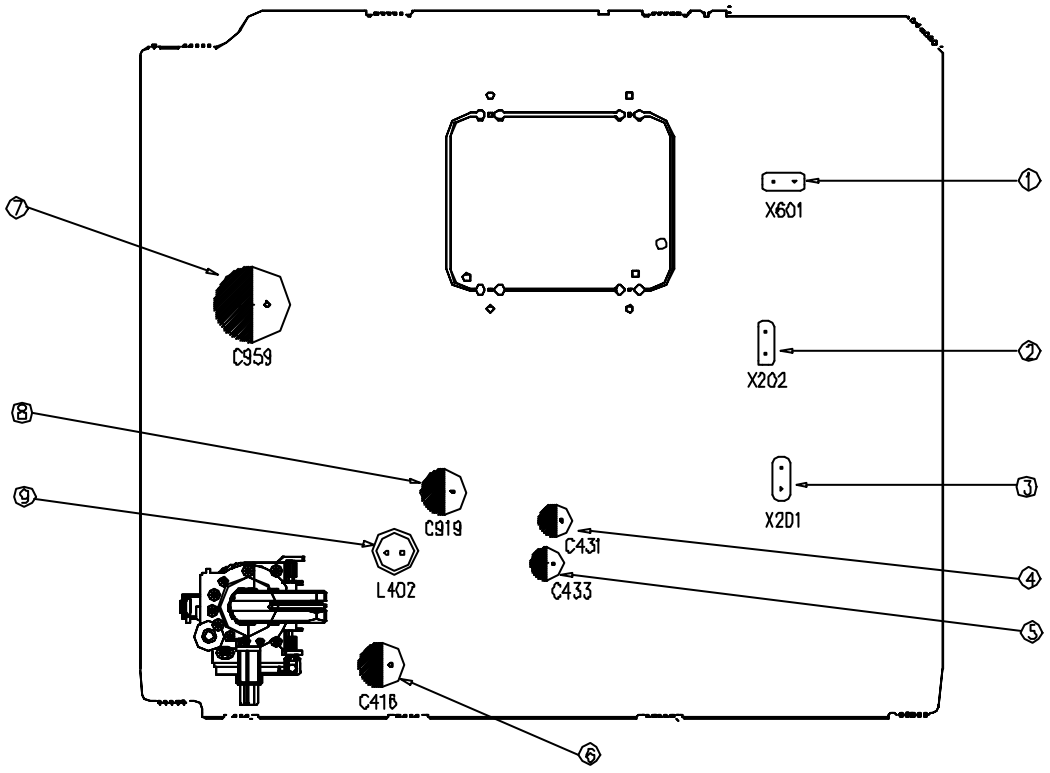
i. For 25A9/29A9 models



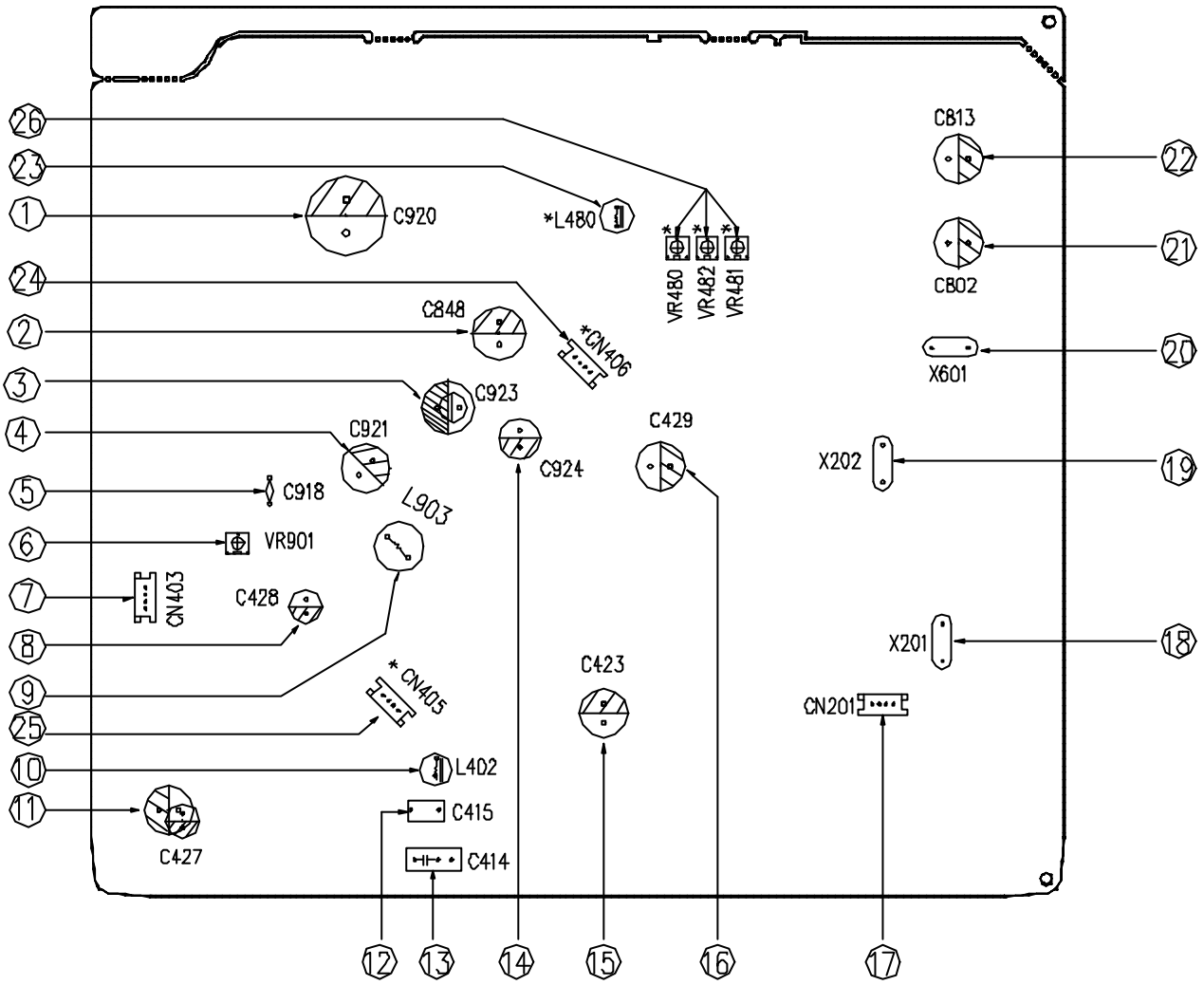
ii. For 21A8 model



iii. For 2109/A9 models

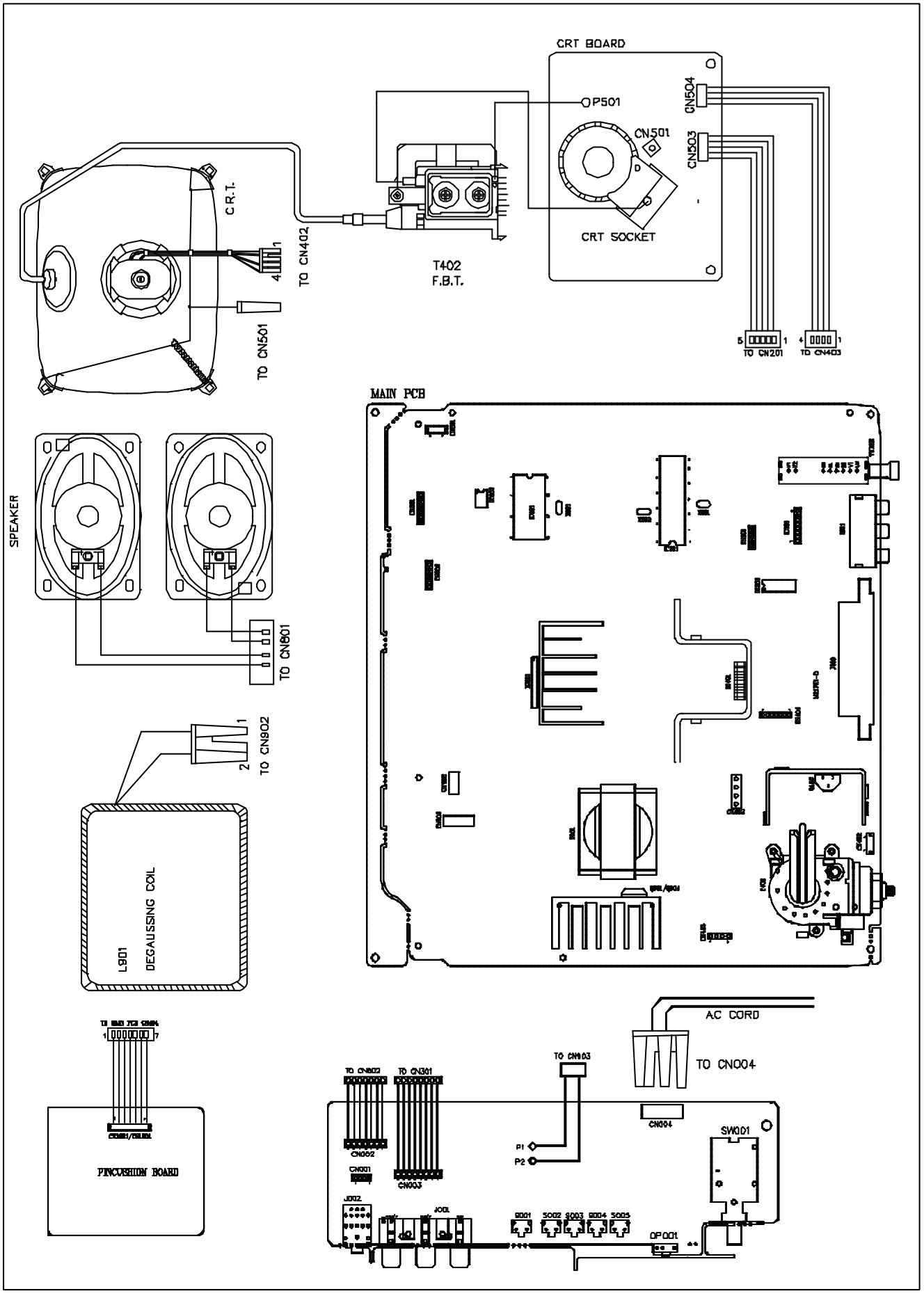


iv. For 21B8 model

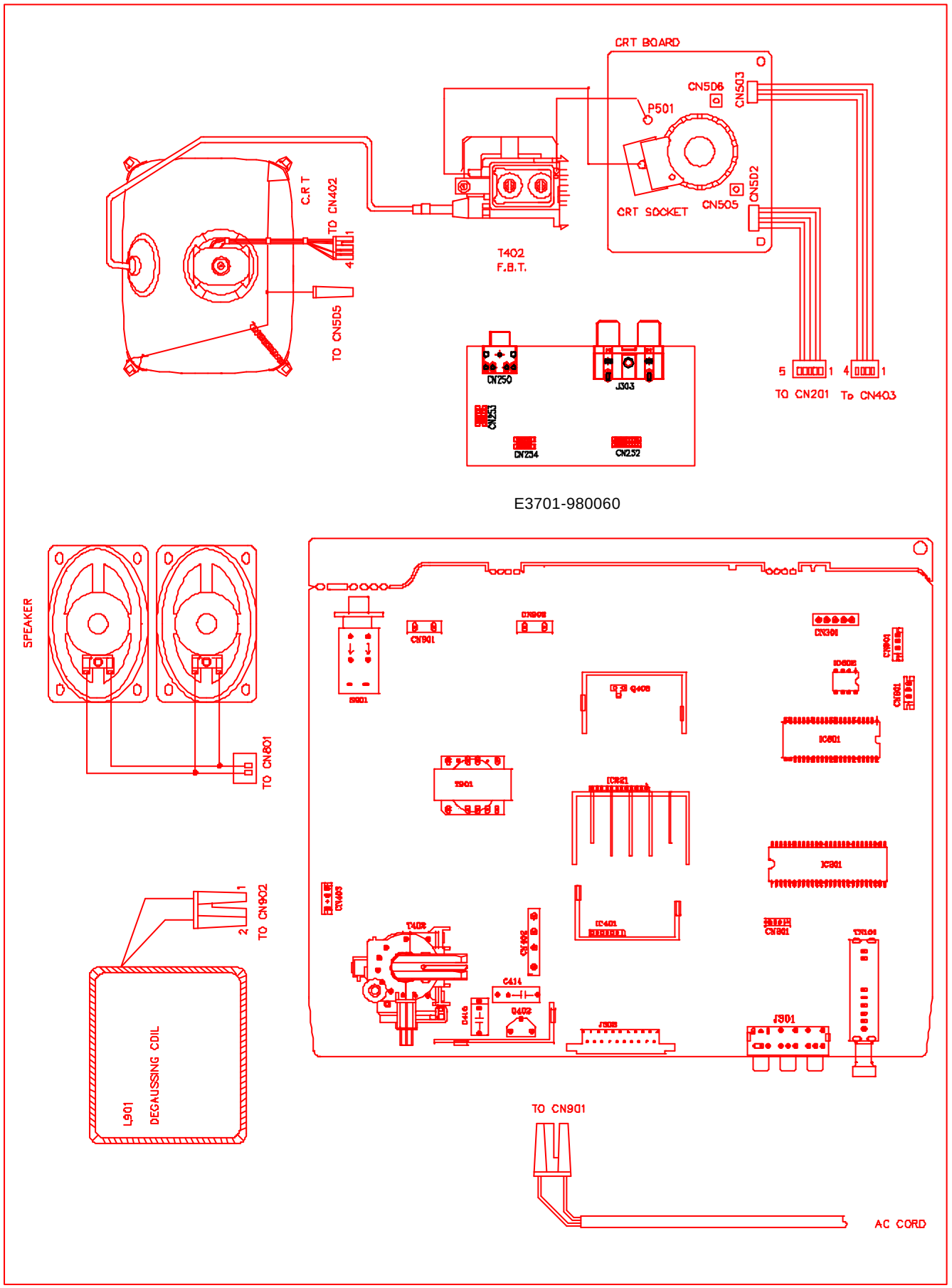


V. Wiring Diagram

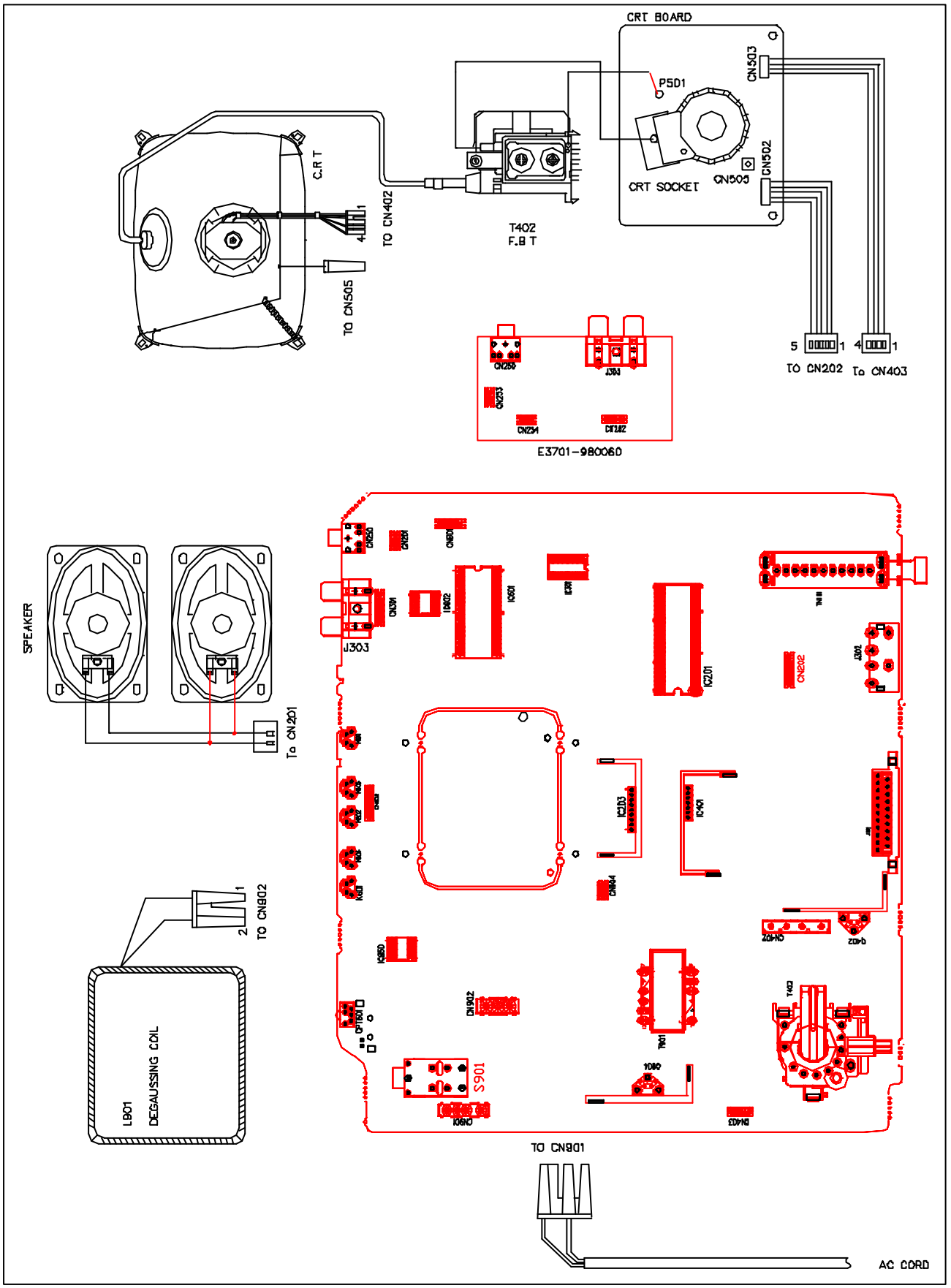
i. For 25A9/29A9ABN87(B) models



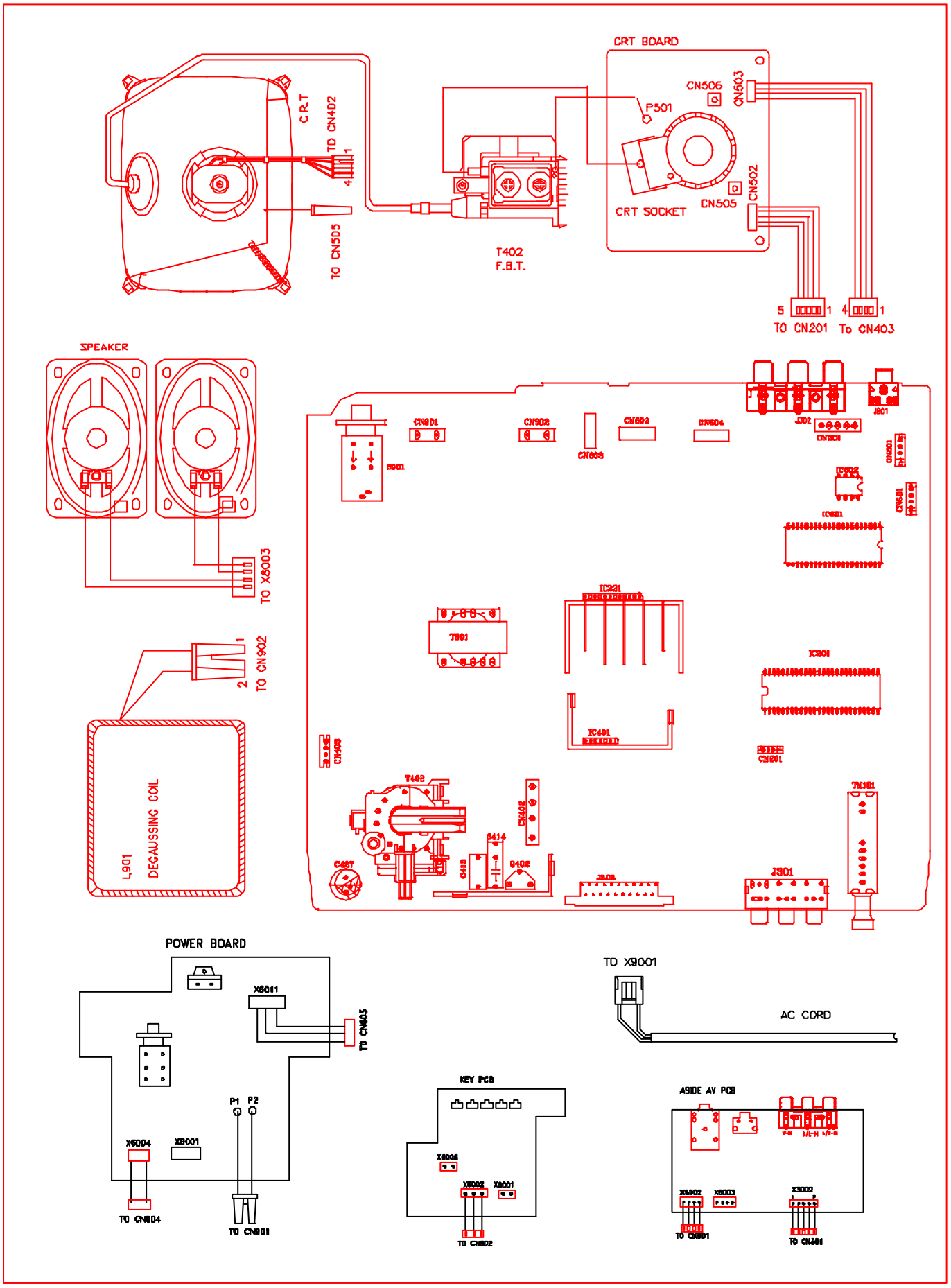
ii. For 21A8BN87(A) model



iii. For 21A9BN37(B)/2109bn37(D) the models

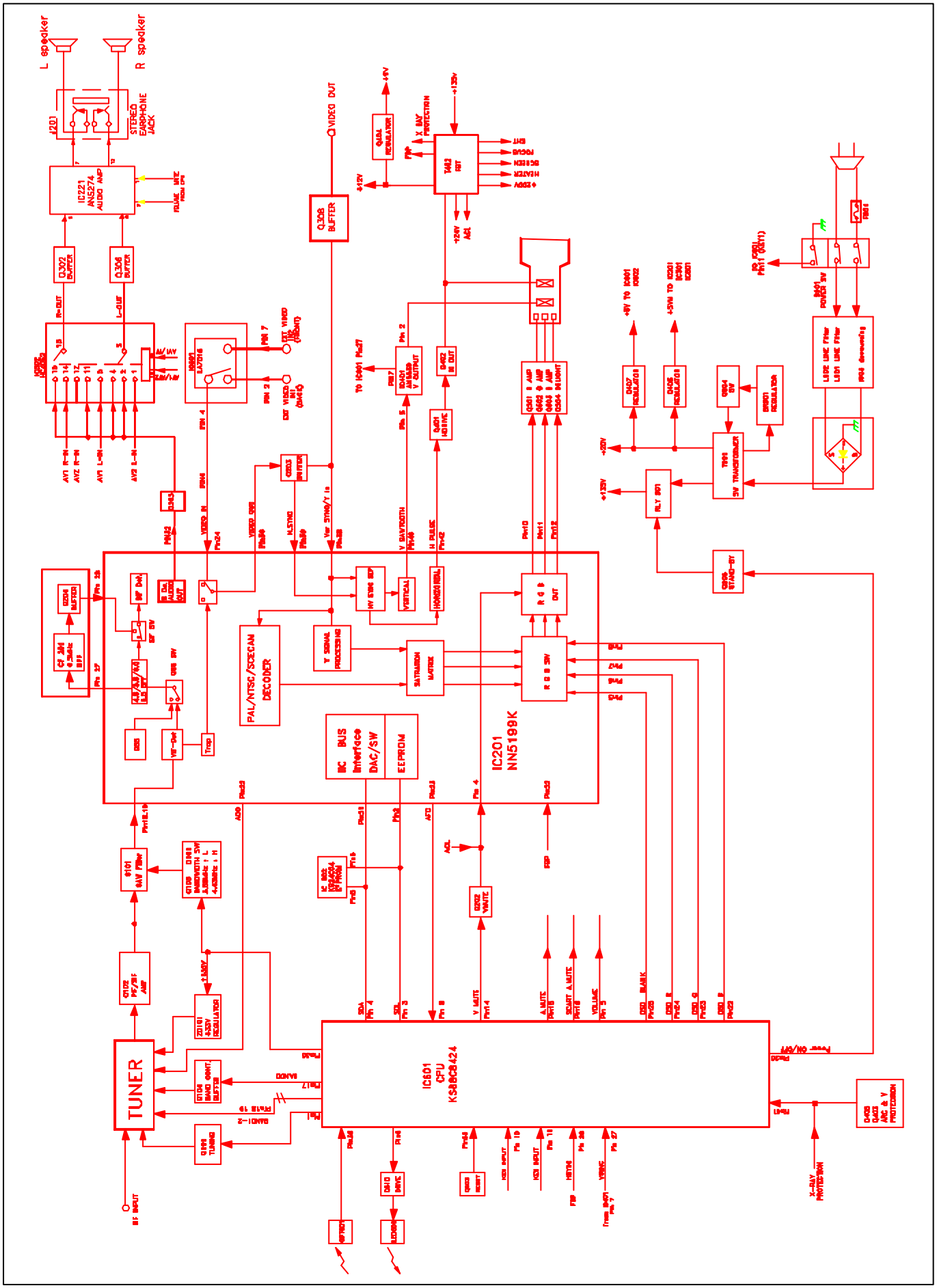


iv. For 21B8BN87(A) the model

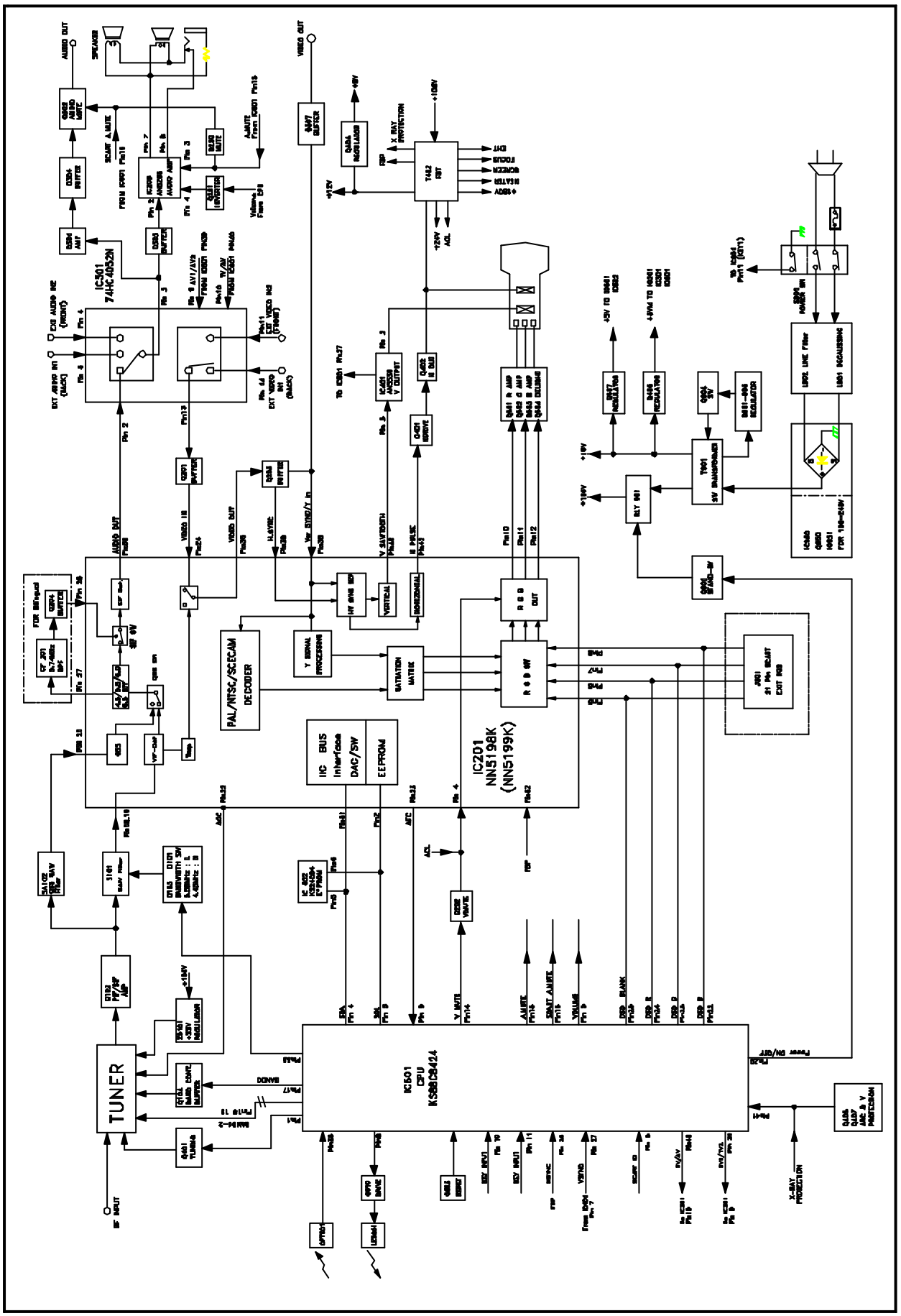


VI. Block Diagram

i. For 25A9/29A9ABN87(B)/ 21A8/21B8BN87(A) models



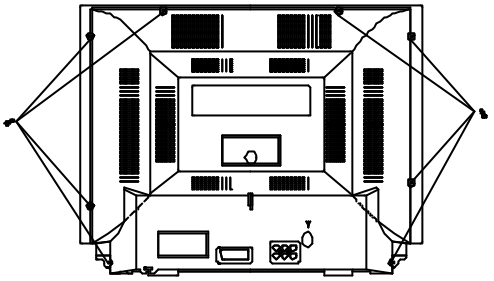
ii. For 21A9BN37(B)/2109BN37(A) models



VII. Disassembly

In case of trouble, etc., necessitating disassemble, please disassemble in the order shown in the illustrations. Reassemble in the reverse order.

1. Removal of the Back Cover



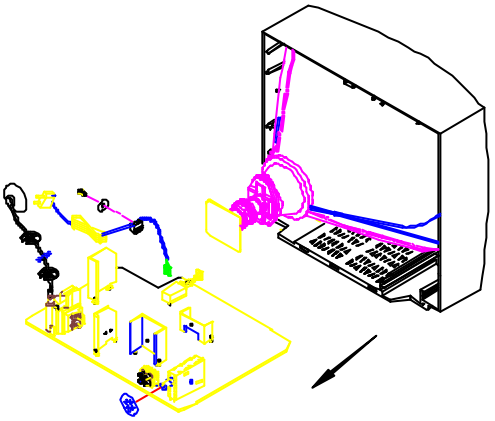
2. Removal of the MAIN PCB

a. Remove the screws.

b. Slide out the TV chassis slightly; pull up the connector of AC cord from PCB; pull up the CRT PCB from CRT.

c. Remove the anode cap from the picture tube. To avaid a shock hazard, be sure to discharge the picture tube's anode to the chassis ground before removal.

d. Take out the TV chassis.



VIII. Input Signals & Equipments List for Alignment

A. Equipments List

1. Pattern Generator	2. Digital Voltmeter	3. High Voltage Meter
4. Sine Wave Signal Generator	5. Demagnetizer	6. Personal Computer (486)
7. DC Regulated Power Supply	8. Oscilloscope	9. CRT Colour Analyzer

B. Input Signals

1. Philips Pattern	2. Color Bar	3. Cross Hatch
4. Grey Scale Bar	5. Monoscope Pattern	6. Moving Picture With Sound

IX. E²PROM (IC602) Setting

A. Option Code

The option code listed below is for selection of different TV systems, features and functions, the code is preset in factory, in case of changing the EEPROM, the option code will not be the same as before. In this case, it is necessary to adjust the option code again. How to set the option code by hand is described in “method to enter into SERVICE MENU and ADJUST MENU”. Please refer to “**V. Electrical Adjustment**”.

Model	Option code
21A8/B8BN87(A) 21A9BN37(B)/2109BN37(D) 25A9/29A9ABN87(B)	5463126706

The “option setup” is shown as following:

OPTION MENU

0123456789
0123456789

Every digit represents the lower 3 bits of a nibble of 4 bytes in EEPROM, and each of the bits stands for an option function, the option bits listed below:

	BIT7	BIT6	BIT5	BIT4	BIT3	BIT2	BIT1	BIT0
BYTE1	NU	OQSS	OSVD	OAV2	NU	OCHIL	OWOO	OUHF
BYTE2	NU	OSYS1	OSYS2	OSYS3	NU	OTUN1	OTUN2	OTUN3
BYTE3	NU	OBL	OSND1	OSNDB	NU	OSNDI	OSNDD	OSNDM
BYTE4	NU	ORUSS	OBB	OTVO	NU	OCHIT	OCHIS	OENG
BYTE5	NU	OMSIF	OBGSIF	OISIF	NU	ODKSIF	OCHAN2	OCHAN1

DIGIT 1:

1 OQSS 0 = QSS OFF
1 = QSS ON

2/3 MODE OSVD OAV2
TV/AV 0 0
TV/AV1/AV2 0 1
TV/AV1/AV2/SVD 1 1

Digit 2:

4 OCHIL 0 = CHILD LOCK NOT AVAILABLE
1 = CHILD LOCK AVAILABLE

5 OWOO 0 = WOOFER NOT AVAILABLE
1 = WOOFER AVAILABLE

6 OUHF 0 = ALL BAND (VL, VH, UHF)
1 = UHF ONLY

Digit 3:

7 OSYS1 0 = SINGLE COLOR SYSTEM (PAL) AVAILABLE
1 = MULTI COLOR SYSTEM (AUTO/PAL) AVAILABLE

8 OSYS2 0 = MULTI SYSTEM SECAM NOT AVAILABLE (TV & AV)
1 = MULTI SYSTEM SECAM AVAILABLE (TV & AV)

9 OSYS3 0 = MULTI SYSTEM NTSC NOT AVAILABLE (TV)
1 = MULTI SYSTEM NTSC AVAILABLE (TV)

Digit 4:

TUNER IF	SETUP:	OTUN1	OTUN2	OTUN3
34.47	MHz	0	0	0
36.875	MHz	0	0	1
38	MHz	0	1	0
38.9	MHz	0	1	1
39.5	MHz	1	0	0
45.75	MHz	1	0	1

Digit 5:

13 OBL 0 = BILINGUAL (MAIN/SUB) NOT AVAILABLE
1 = BILINGUAL (MAIN/SUB) AVAILABLE

14 OSND1 0 = MULTI SIF SYSTEM AVAILABLE
1 = SINGLE SIF SYSTEM AVAILABLE
-- THIS OPTION IS NOT COUNT BILINGUAL

15 OSNDB 0 = SIF [BG] NOT AVAILABLE
1 = SIF [BG] AVAILABLE

Digit 6:

16	OSNDI	0	= SIF [I] NOT AVAILABLE
		1	= SIF [I] AVAILABLE
17	OSNDD	0	= SIF [DK] NOT AVAILABLE
		1	= SIF [DK] AVAILABLE
18	OSNDM	0	= SIF [M] NOT AVAILABLE
		1	= SIF [M] AVAILABLE

Digit 7:

19	ORUSS	0	= RUSSIAN OSD NOT AVAILABLE
		1	= RUSSIAN OSD AVAILABLE
20	OBB	0	= BLUE BACK NOT AVAILABLE
		1	= BLUE BACK AVAILABLE
21	OTVO	0	= SCART MONITOR OUTPUT
		1	= SCART TV OUTPUT

Digit 8:

22	OCHIT	0	= TRADITIONAL CHINESE (HK) OSD NOT AVAILABLE
		1	= TRADITIONAL CHINESE (HK) OSD AVAILABLE
23	OCHIS	0	= SIMPLE CHINESE (CHINA) OSD NOT AVAILABLE
		1	= SIMPLE CHINESE (CHINA) OSD AVAILABLE
24	OENG	0	= ENGLISH OSD NOT AVAILABLE
		1	= ENGLISH OSD AVAILABLE

Digit 9:

25	OMSIF	0	= M SIF INTERNAL
		1	= M SIF EXTERNAL
26	OBGSIF	0	= BG SIF INTERNAL
		1	= BG SIF EXTERNAL
27	OISIF	0	= I SIF INTERNAL
		1	= I SIF EXTERNAL

Digit 10:

28	ODKSIF	0	= DK SIF INTERNAL	
		1	= DK SIF EXTERNAL	
29/30	CHANNEL	NUMBER	0CHAN2	0CHAN1
		100	0	0
		200	0	1
		254	1	0

NU: NOT USED RES: RESERVED

B. Data Setting

The data setting item B~D is the initialization data preset in the EEPROM before adjustment in case of changing the EEPROM, please set the data to initialization data listed below before adjustment. How to set the data by hand is described in “method to enter into SERVICE MENU and ADJUST MENU”. Please refer to “**V. Electrical Adjustment**”.

Parameter	Value(DEC)	Remark	Parameter	Value(DEC)	Remark
SUB BRI	63		HOR.POS60	13	
CUTOFF R	63		VER.POS60	0	
CUTOFF G	63		VER.H60	81	*Remark6*
CUTOFF B	63		VER.LIN60	40	*Remark1*
DRIVE R	63		VER.S C60	20	*Remark1*
DRIVE B	63		SUBTINT	16	
AFT ADJ	55		AV S TINT	16	
RFAGCDP	45		C-Y	1	*Remark5*
SECAM BL	0		HOR.VCO	52	
RGB LIMIT	0		VIF.VCO	26	
HOR.POS	18		ISUD5	0	*Remark2*
VER.POS	0	*Remark4*	ISUD4	0	
VER.HEI	84	*Remark6*	ISUD3	0	
VER.LIN	40	*Remark1*	CONTR 32	0	
VER.S CUR	20	*Remark1*	RI CUTOF	1	*Remark3*

Remark1: *For different CRT, the following data are recommended to change for better performance before alignment. These Data Settings are listed as following:*

	CRT	CRT Type No.	Value			
			VER.LIN	VER.SCUR	VER.LIN60	VER.SC60
21" PF SAMSUNG	E6120-007001	A51QDX992X001(H) N1	38	20	36	20
21" IRICO	E6101@007001	A51JSY63x13(C) N1	37	24	38	26
25" LG	E6101-104001	A59KYL520X08B N1	40	20	40	20
29" BMCC	E6101-103001	M68LWF188X50 N1	40	20	40	20
21" BMCC	E6120-005001	A51LSK195X91 N1	37	24	38	26

Remark2: *ISUD5 must set to "0". Please check ISUD5 after read 5198. If ISUD5 is "1", please set to "0".*

Remark3: *Some version MCU has not this item.*

Remark4: *PAL or NTSC VER.POS only can select 0 or 1.*

Remark5: *C-Y=0 For AMFxx models (use NN5198K)*
C-Y=1 For other models (use NN5199K or NN5099K)

Remark6: *VER.HEI 20 (use E6120-005001 or E6120-005003)*

C. Intelligent picture control (I.P.C) DATA SETTING

Control	Value			
	Natural	**Sharp**	**Cinema**	**Personal**
Brightness	16	24	12	16
Contrast	24	32	16	24
Colour	16	20	16	16
Sharpness	16	24	16	16
Tint	16	16	16	16

D. AFT Data Setting

Description	Value		
	VHFL	**VHFH**	**UHF**
Low	120	56	35
Middle	97	40	31
High	131	76	90

Remark: *This table of AFT DATA setting is only for:*
SAMSUNG tuner: TECC0949VG28B, TECC7949VG28B and WITTIS tuner: UVS1051-CW1/UVS1051-NEW.

X. Electrical Adjustment

A. Chassis Adjustment

i. +B Voltage Alignment

a. Preparation Procedure

1). Receive standard colour bar signal.

2). Press key "I.P.C." to select “Natural” mode.

3). Connect digital voltmeter between ⊕ of C403 (For 21A8/25A9/29A9) or C416 (For 21A9) and GND.

4). +B voltage.

Model	CRT	CRT Type No.	+B
21A8BN87(A)	E6120-007001	A51QDX992X001(H) N1 SAMSUNG	108V
21A9/2109BN37(B)	E6101@007001	A51JSY63X13(C) N1 BMCC	107V
25A9ABN87	E6101-104001	A59KYL520X08B N1 LG	135V
29A9ABN87(B)	E6101-103001	M68LWF188X50 N1	135V
21B8BN87(A)	E6120-005001	A51LSK195X91 N1 BMCC	135V

Note: Please refer to the CRT conversion table for other CRT.

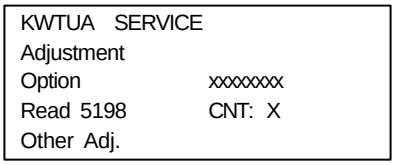
b. Adjustment Step

Adjust VR901 to make the read-out on the Voltmeter to be **+B±0.3V**.

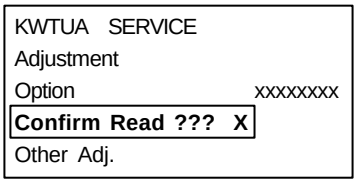
ii. Method to enter into SERVICE MENU and ADJUST MENU

a. Turn on the Main Power Switch, then press volume buttons both "+" and "-" simultaneously for over 5 seconds, the "KWTUA SERVICE" will be displayed on the screen.

b. The “KWTUA SERVICE” menu is indicated with each item on the screen. The item can be selected by pressing channel “∧ ” and “ ∨ ” keys.



c. Selecting “Read 5198”, press “MENU/OK” key (or press “OK” key on the remote handset) to read IC NN5099K/NN5198K DATA in order to operate the TV set. On-screen display will be shown as :



Press “MENU/OK” key (or press “OK” key on the remote handset) to confirm Read 5198. Press “M” key on the remote handset to exit.

Note: ***1.*** *Many standard data are already pre-set in the EEPROM inside IC NN5198K or NN5099K by the IC manufacturer. During manufacturing the TV set, it is necessary to read those data stored in EEPROM of IC NN5198K or NN5099K and memorize it in external EEPROM. By doing so, some alignment can be omitted, or the data memorized in the external EEPROM can be changed according to the situation. Please note that according to the specification, the operation of “reading” data from the EEPROM inside NN5198K or NN5099K only can be done 1000 times. When changing IC201 (NN5198K or NN5099K)/ IC602 (EEPROM) or before adjusting, it is necessary to read NN5198K or 5099K data one time.*

2. *“CNT:X” means number of times that the data stored in the EEPROM of NN5198K or NN5099K has been read. For example, CNT:19, it means the data stored in the EEPROM of NN5198K or NN5099K has been read 19 times.*

d. Selecting “Option”, press “OK” key then input the option code by number keys on the remote handset according to the **“Option code”**. After changing “OPTION”, the TV set must be set to standby and power on again, then enter into “SERVICE MENU”.

e. Select “Adjustment”, press “OK” key on the remote handset. The “ADJUST MENU” is indicated with each parameter on the screen. Pressing channel “ ∧ ” and “ ∨ ” keys can select the responding parameter. The parameter value can be changed by pressing volume “+” and “-” keys. Press “OK” key to exit.

f. Select “Other Adj.”, press “MENU/OK” (or press “OK” key on the remote handset), On-screen display will be shown as following:

1). Production

The function of ”Production” is for production aging purpose. When no RF signal input and if it is set to “on”, the TV set will not be blue back and standby shortly. When the TV set is finished, it must be set to “off”. If it is set to “on”, a character “P” will appear on the top of the screen when changing channel, this means that it is set for production purpose. By pressing the volume “+” and “-” keys, “Production” can be set to “off” or “on”. By pressing the “MENU/OK” in the TV set or “M” key on the remote handset, it will exit the menu.

2). AFT-Step

Selecting “AFT-Step” to set AFT DATA, press “OK” key to enter, On-screen display will be shown as:

KWTVA OTHER	
Production	off
AFT-Step	
IPC	

Use channel “ ∧ ” and “ ∨ ” keys to select the parameter, the parameter value can be changed by pressing volume “+” and “-” keys. See **“AFT data setting”**. Press “M” key on the remote handset or “MENU/OK” key in TV set to exit.

3). IPC

Selecting “IPC” to set picture mode data, press “OK” key to enter, the picture mode data is indicated with each parameter on the screen. Press “I.P.C.” key to select picture mode, select the parameter and change the parameter value. When this picture mode data is ok, press “OK” key to store, the parameter value below will display “Stored”. When all picture mode data is being stored, press “MENU” key to exit.

KWTVA AFT-STEP	09-08
Band	VHFL
Low	120
Middle	97
High	131

iii. Adjustment of T101(31.9MHz trap) and AFC

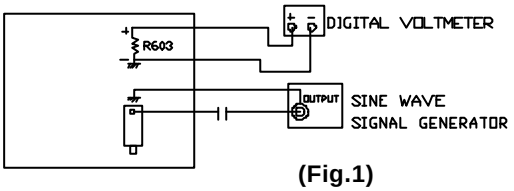
A. Adjustment for T101(31.9MHz trap) (for using T101 models)

1. Turn on the main power switch.
2. Apply 100dBμv 31.9MHz signal between IF input pin and GND of the TUNER on main PC board.
3. Put the probe of oscilloscope to SA102 pin1 and GND.
4. Adjust T101 until the waveform in oscilloscope to minimum.

B. Adjustment of AFC

a. Preparation procedure

1. Turn on the main power switch.
2. Set digital voltmeter at DC, then connect it’s probe across of R603 and GND.



(Fig.1)

3. Apply 100dBμV IF signal between IF input pin and GND of the TUNER on main PC board (see Fig.1).

b. Adjustment Step

Adjust the “AFT ADJ” DATA until the meter indicates **2.4±0.1V**.

c. AFC Check.

After adjustment, it is necessary to confirm the DC voltage across R603 when Changing the RF output frequencyof pattern generator (PM5518) by **±o.1MHz**, the DC voltage shoud be as:

RF FREQUENCY	DC VOLTMETER INDICATION
IF+0.1MHz	1.2±0.5V
IF-0.1MHz	3.3±0.5V

Remark: IF=38.0MHz

If the result is not satisfactory, repeat adjustment step '**b. Adjustment Step**" until correct voltage is obtained.

d. Press “OK” key to store.

e. press “MENU” key to exit.

iv. Adjustment for H position and V position, V-height and V linearity.

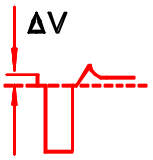
a. Receive ⊟ pattern signal (PAL).
b. Enter ADJUST MENU.
   1. Adjust value of HOR.POS to get a good H position picture.
   2. Adjust value of VER.HEI to get a normal picture.
   3. Adjust value of VER.POS to get a good V position picture.
   4. Normal VER.LIN and VER.S CUR doesn't need adjustment. If V linearity is not good, please adjust value of VER.LIN and VER.S CUR to get a good V linearity picture.
c. Receive ⊟ pattern signal (NTSC).
d. Enter ADJUST MENU
   1. Adjust value of HOR.POS60 to get a good H position picture.
   2. Adjust value of VER.H60 to get a normal picture.
   3. Adjust value of VER.POS60 to get a good V position picture.
   4. Normal VER.LIN60 and VER.SC60 doesn't need adjustment. If V linearity is not good, please adjust value of VER.LIN60 and VER.SC60 to get a good V linearity picture.
e. Press "OK" key to store.
f. press "MENU" key to exit.

v. Adjustment for TV TINT (TV picture) and AV TINT (AV picture)

a. Receive a NTSC color bar Signal from AV.
b. Enter ADJUST MENU
   Adjust the value of AV S TINT until the waveform of Oscilloscope is shown as above.

vi Adjustment for SECAM BL (for use NN5198K model)

a. Receive a SECAM dot pattern signal from RF.
b. Press key "I.P.C" to select "NATURAL" status.
c. Put the Probe of Oscilloscope to "B-out" Terminal of IC201 Pin12 and GND.
   (Probe: 10:1, Oscilloscope VOLTS / DIV: 20mv / DIV.)
d. Enter ADJUST MENU.
   Adjust Value of SECAM BL until △V is smallest (see Fig.2).
e. Press "OK" key to store.
f. press "MENU" key to exit.



(Fig.2)

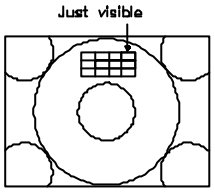
vii. Adjustment for RF AGC

a. Receive RF signal (62±3dBμV).
b. Enter into ADJUST MENU.
c. Pressing channel "∧ " and " ∨ " keys on the remote handset and on-screen display will be shown as following: **RFAGCDP XX**
d. Press volume "+" or "-" on the remote handset to change the value of RFAGCDP until snow noise on the screen just disappears.
e. Press "OK" key to store.
f. press "MENU" key to exit.

viii. Adjustment for Sub-brightness

a. Receive MONOSCOPE pattern.
b. Press key "I.P.C" on the remote handset to set Brightness and Contrast at natural state.
c. Enter into ADJUST MENU.
d. Pressing channel "∧ " and " ∨ " on the remote handset, the display on screen will be: **SUB BRI XX**
e. Press volume "+" or "-" on the remote handset to change the value of SUB BRI until eight and half of portions indicated in Fig.3 is just visible.

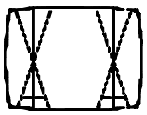
f. Press “OK” key to store.
g. press “MENU” key to exit.



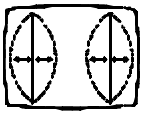
(Fig.3)

ix. Pincushion Correction

1. Receive crosshatch pattern. (croix centrale pattern).
2. Adjust keystone correction control VR1303/VR480 to obtain symmetrical pattern about horizontal center as shown in Fig.4a.
3. Adjust pillow correction control VR1301/VR482 to obtain vertical straight lines on screen as shown in Fig.4b.
4. Adjust horizontal width control VR1302/VR481 to desired picture width.
5. Adjust top correction control VR483 to obtain proper top picture on the screen.
6. Control contrast brightness from mini to maxi, check the picture of pattern, repeat step 3-5 until a desired picture is obtained.



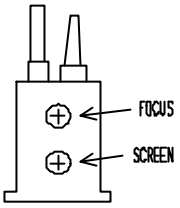
(Fig.4a)



(Fig.4b)

x. Adjustment for FOCUS (See Fig.5)

a. Press key "I.P.C." on the remote handset to set Brightness and Contrast both at normal position.
b. Adjust knob "FOCUS" on FBT to make the picture on the screen to be the most distinct.



(Fig.5)

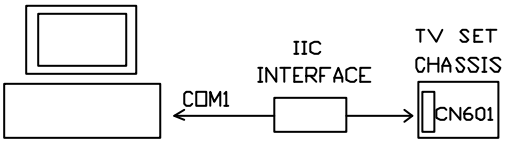
xi. Adjustment with computer.

INTRODUCTION

"UBM" is an adjustment program for colour TV set which use NN5099K/NN5198K as the chroma processing IC. This program can change the TV set data of different function though IIC interface and provides Auto Adjustment of the White-Balance by using the Colour Analyzer (MINOLTA CA-100).

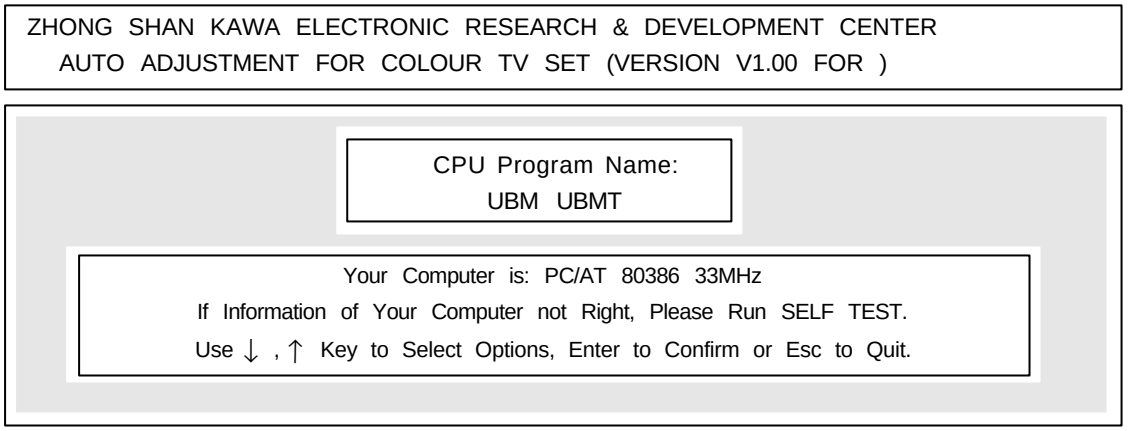
SET UP

1. The computer must be installed with the software program named UBM.
2. Power on the TV set and the computer.
3. Connect the computer and connect the adjustment cable from the computer to the TV chassis at location CN601 as following:

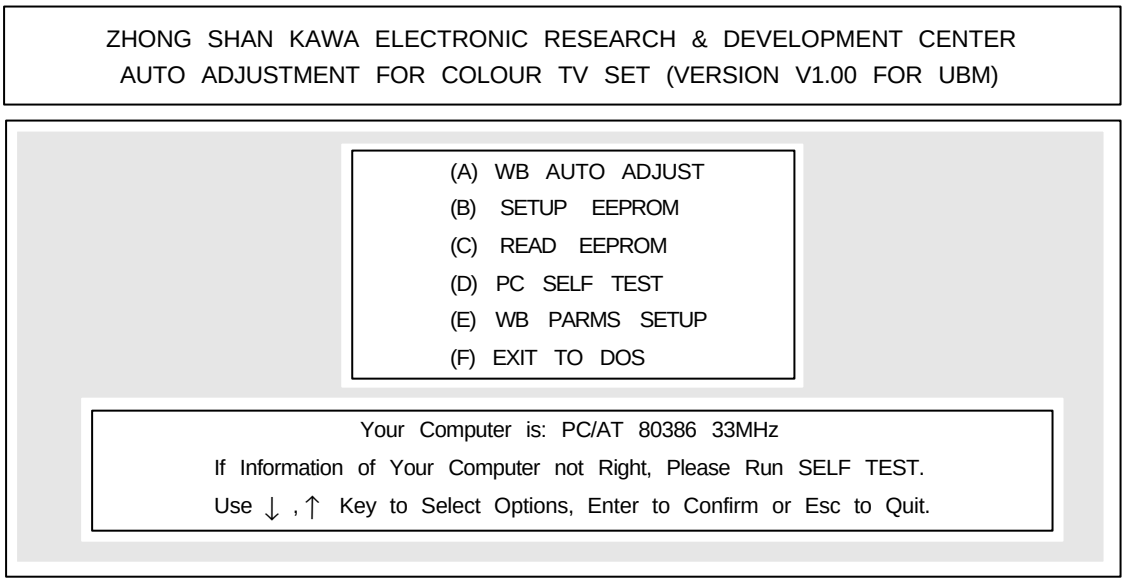


4. C:\ cd UBM ENTER
5. C:\ cd UBM >UBM ENTER

The screen will display:



6. Use keys ← →in the computer to select the software program named UBM, then press “enter” key in the computer. The screen will display:



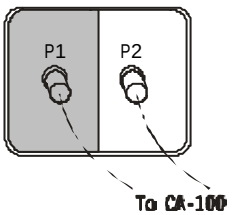
This is the main menu for adjustment and the different data can be changed and viewed. It consists of following functions.

(A) WB AUTO ADJUST
(B) SETUP EEPROM
(C) READ EEPROM
(D) PC SELF TEST
(E) WB PARMS SETUP
(F) EXIT TO DOS

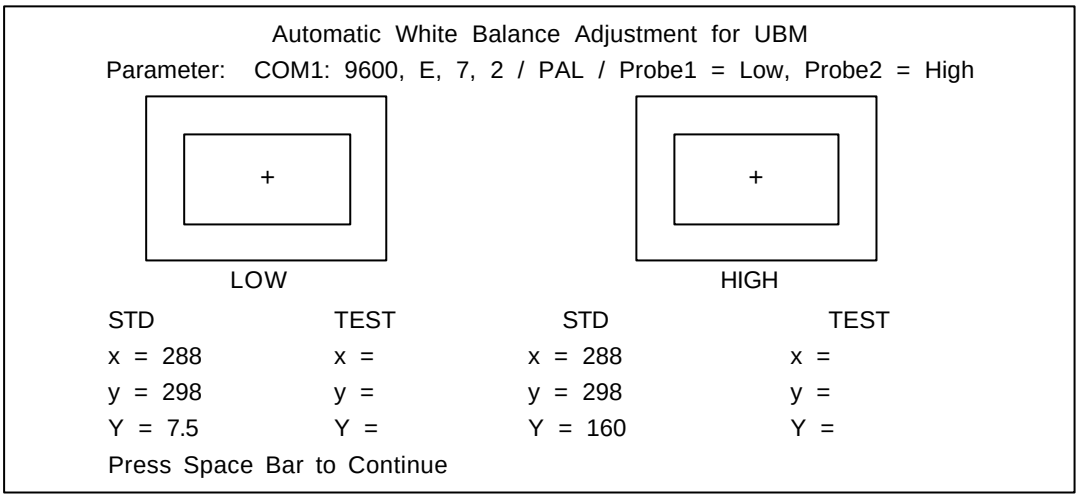
(A). WB AUTO ADJUST

Before enter to WB AUTO ADJUST, make sure the WB PARMS SETUP (E) is fulfil your adjustment requirement.

Procedure:



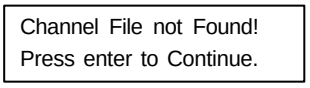
1. Check WB setup and to define standard and tolerance.
2. Connect the colour Analyzer (Minolta CA-100) to the computer (COM 1).
3. Turn on the TV set and receive the White-Grey signal.
4. Connect the adjustment cable to the TV at location CN601.
5. Press Space Bar, the computer will display "Please adjust screen Voltage, space Bar to continue". Now change to TV service mode and adjust the screen voltage until ahorizontal line is just visible on the screen, then back to normal mode by pressing “Space” bar in the computer.
6. Put the colour probe 1 to the low luminance side and colour probe 2 to the high luminance side of the screen. (It is better to place near the center of the screen.)
7. Press Space Bar to start WB adjustment.



If the WB adjustment is success, the computer will display "Finished to adjust white Balance and show all value and adjustment time used. Then the user must put off the adjustment cable from the TV IIC interface now. Then repeat from the step 3 for another TV set adjustment.
If the adjustment cannot be finished within your presetted time limit, the computer will display "Sorry, adjustment stopped!" and the adjustment is failed. It is better to call technician to check the TV hardware if the adjustment failed several times.

(B). SETUP EEPROM

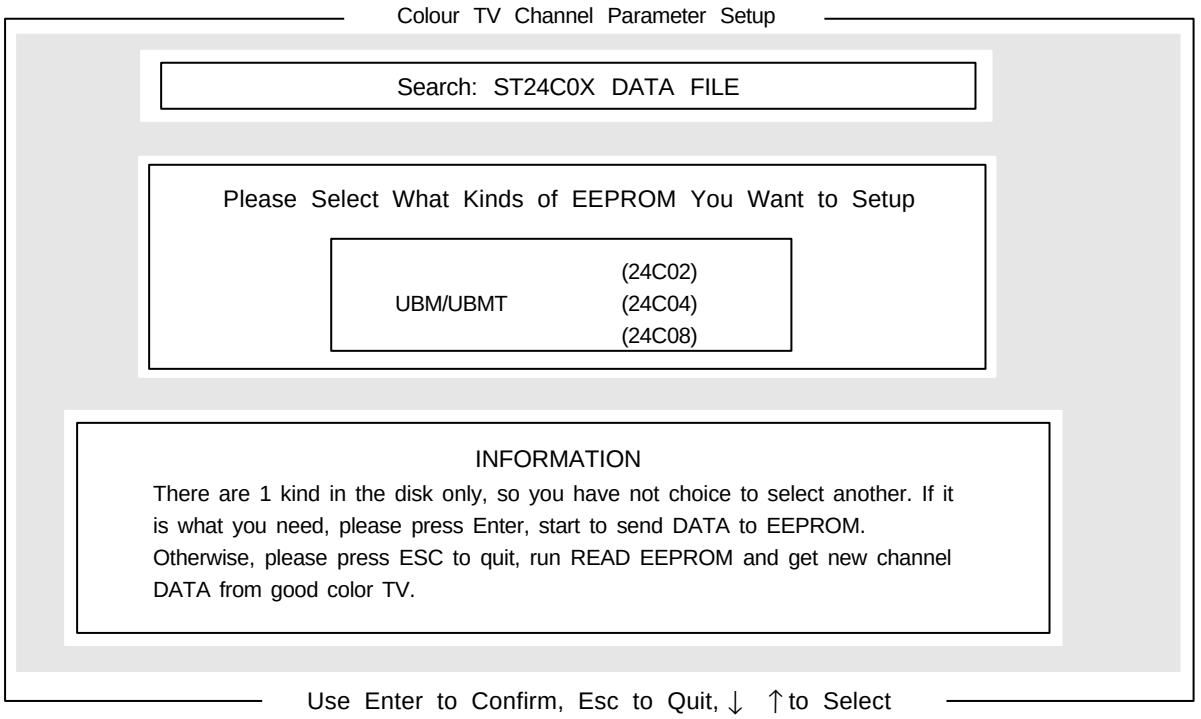
The function: "SETUP EEPROM" is used for writing a date file to the TV set's EEPROM.
Before to do this process, it is needed to read the date file from a TV set first, otherwise the computer will display the warning message and back to main menu.



If you already have had Previous EEPROM file, the program will ask for select:
a) (24C02) b) UBM/UBMT (24C04) c) (24C08)

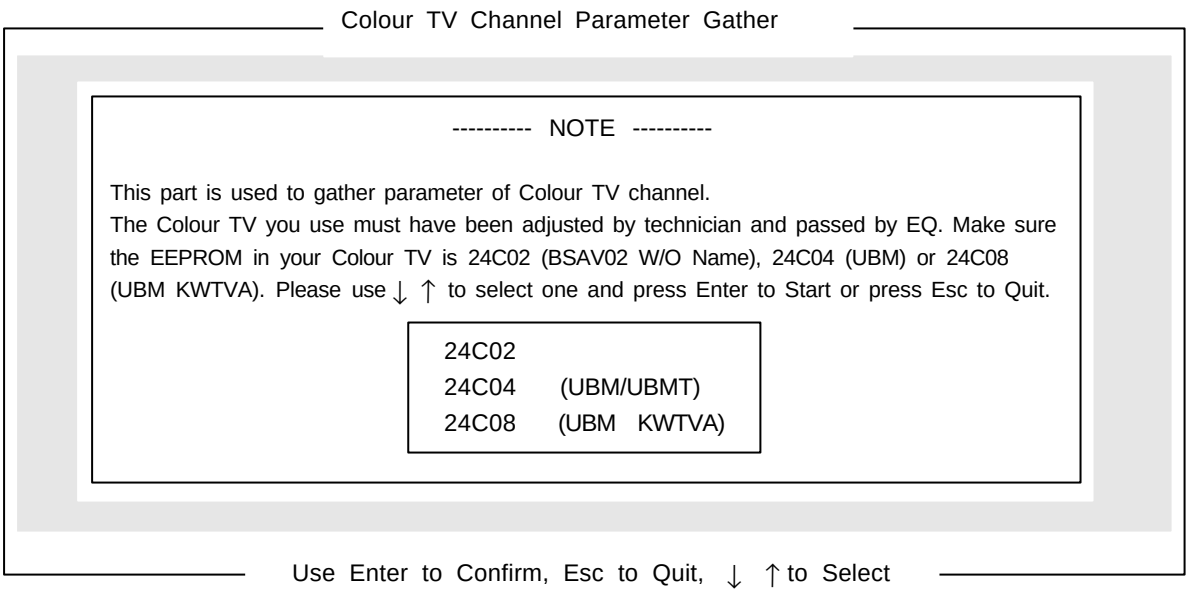
After EEPROM SIZE selection, it will list the data files which are the same size as the user select, the user now need to select one of the files, and press «Enter» to confirm writing the data to TV set's EEPROM.

*** Remark:** "SETUP EEPROM" will overwrite all the data in EEPROM. Please make a data backup before to do this process.



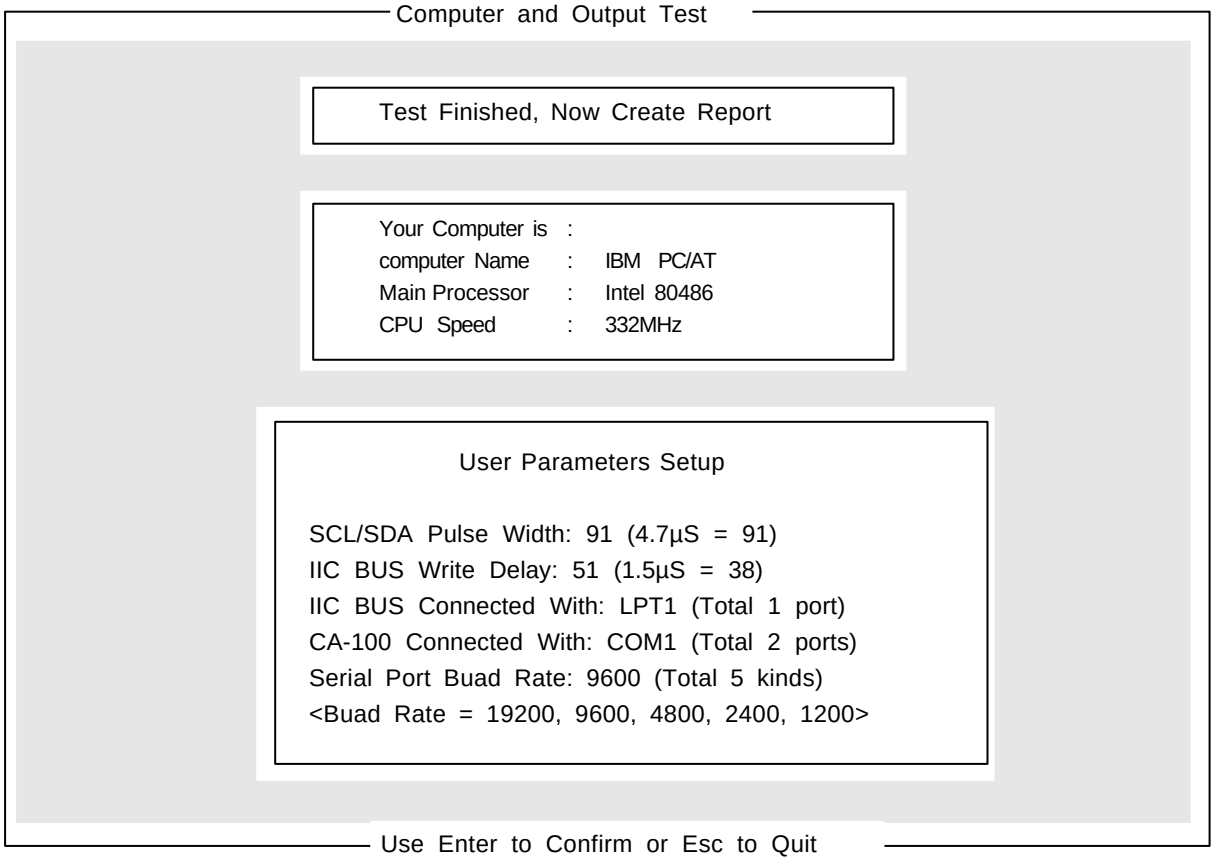
(C). READ EEPROM

The function "READ EEPROM" is to read full data from a TV set's EEPROM. First the user must check the TV's EEPROM number for select a) 24C02, b) 24C04 or c) 24C08. Then the program will ask for confirmation to read. After that, it will show the values of EEPROM, the user can save it by pressing «Enter» and enter the model name.



(D). PC SELF TEST

The user are allowed to run the PC SELF TEST by selecting this option and press «Enter». The computer will show the system details such as Processor Name, CPU Speed of your computer.
Further more, the user can adjust the high level and low level period length of data transfer.



(E). WB PARMS SETUP

The function of "WB PARMS SETUP" is to preset a group of data which for the "(A) WB AUTO ADJUST" Chrominance and Luminance Standard and Tolerance.

First the computer ask for select WB configuration file, then the user can set the WB data:

a) x = x coordinate of colour
b) y = y coordinate of colour
c) Y = luminance
d) X = Acceptable tolerance of x
e) Δ Y = Acceptable tolerance of y
f) Δ Y = Acceptable tolerance of Y
g) Δ Max time = Max time for adjustment
h) Luminance level offer adjust = low Bright luminance
i) Color = Color of NN5198K/NN5099K
J) Tint = Tint of NN5198K/NN5099K
k) S-Bright = S-Bright
l) U-Bright = U-Bright
m) Contrast = Contrast
n) Cut off R =Cut off R
o) Cut off G =Cut off G
p) Cut off B =Cut off B
q) Drive R = Drive R
r) Drive B = Drive B

> of NN5099K

The following data is recommended to use in UBM chassis.

Low Bright Standard	
x =	288
y =	298
Y =	3.5
x =	± 5
y =	± 5
Y =	± 1

High Bright Standard	
x =	288
y =	298
Y =	160
x =	± 5
y =	± 5
Y =	± 10

Maximum time = 30 Sec

Luminance level after adjustment: 14

AN5195K Initialize:	
Color = 63	Cut off R = 31
Tint = 63	Cut off G = 31
S-Bright = 127	Cut off B = 31
U-Bright = 127	Drive R = 63
Contrast = 63	Drive B = 63

Model : UBM

After finishing setup, press «Esc» and confirm to save setup or leave the menu.

(F). EXIT TO DOS

Just exit the adjustment program and back to dos environment.

B. Colour Purity, Convergence Adjustment and +B Voltage Check

i. Colour Purity Adjustment (See Fig.6)

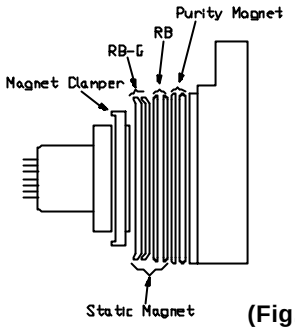
BEFORE ANY ADJUSTMENT DESCRIBED BELOW ARE ATTEMPTED, V-HIGH, B+ VOLTAGE AND FOCUSING ADJUSTMENT MUST BE COMPLETED.

a. Place the TV receiver facing NORTH or SOUTH.
b. Plug in TV receiver and turn it on.
c. Operate the TV receiver over 30 minutes.
d. Fully degauss the TV receiver by using an external degaussing coil.
e. Receive a crosshatch pattern and adjust the static convergence control roughly.

f. Loosen the clamp screw of the deflection yoke and pull the deflection yoke towards you.
g. Enter into ADJUST MENU. Set the values of C-R, C-G, C-B to "00".
h. Adjust the purity magnets until green field is obtained at the center of the screen.
i. Slowly push the deflection yoke toward cone of CRT and set it where a uniform green field is obtained.
j. Tighten the clamp screw of the deflection yoke.
k. After COLOUR PURITY ADJUSTMENT, you must adjust the WHITE BALANCE again.

ii. Convergence Adjustment (See Fig.6)

a. Receive a dotted pattern.
b. Unfix the convergence magnet clamper and align red with blue dots at the center of the screen by rotating (R,B) static convergence magnets.
c. Align Red/Blue with green dots at the center of the screen by rotating (RB-G) static convergence magnets.
d. Fix the convergence magnets by turning the clamper.
e. Remove the deflection yoke wedges and slightly tilt the deflection yoke horizontally and vertically to obtain the good overall convergence.
f. Fix the deflection yoke by wedges.
g. If purity error is found, follow "PURITY ADJUSTMENT".



(Fig.6)

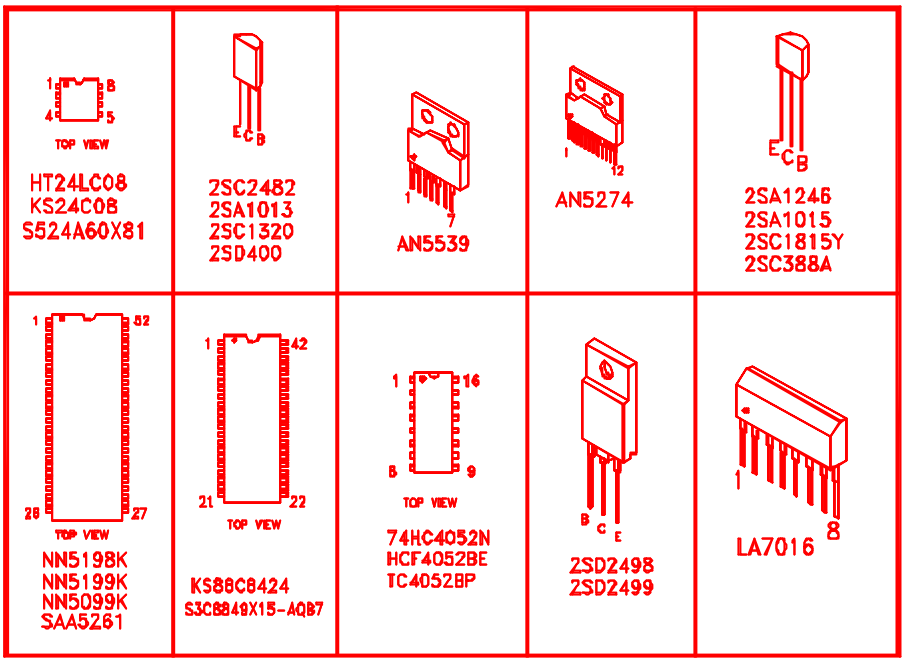
iii. +B Voltage check

After production aging, it is necessary to check +B voltage.

a. Receive standard colour bar signal.
b. Press key “I.P.C” to select “Natural” mode.
c. Connect digital voltmeter between JP430 (For 21A9BN37) or C403(For other models) and GND. the read-out on the voltmeter should be +B±1V. if the result is not satisfactory, adjust VR901 to make the correct voltage to be +B±1V.

XI. Transistor and IC Identification

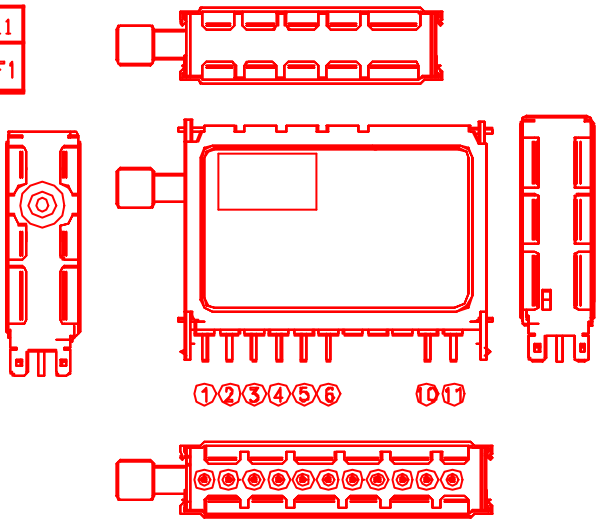
A. Main Unit:



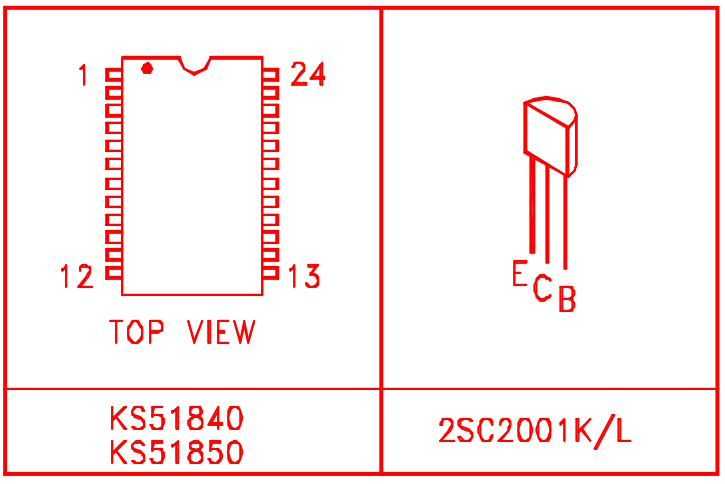
PICTORIAL VIEW OF TUNER

TERMINAL NO.	1	2	3	4	5	6	10	11
TERMINAL NAME	AGC	VT	BU	BH	BL	BM	IF2	IF1

SUPPLY VOLTAGE (V)				
TERM.	ch.	VHF LO	VHF HI	UHF
3	BU	0	0	5
4	BH	0	5	0
5	BL	5	0	0
6	BM	5	5	5



B. Remote Control Handset:



XII. Schematic Diagram

(Please refer to ****.pdf)

Models	refer to	****.pdf
21A8/21B8BN87	----------	21A8-001.pdf
21A9/2109BN37	----------	21W3-005.pdf
25A9/29A9ABN87	----------	29A9-001.pdf

XIII. Component Diagrams

i. PCB Main Component Diagram (Top view)/(Bottom view)

(Please refer to ****.pdf)

Models	refer to	****.pdf
21A8/B8BN87	----------	E3701-011050-2.pdf
25A9/29A9ABN87	----------	E3701-003010-5.pdf

XIII. Component Diagrams

i. PCB Main & CRT Component Diagram (Top view)/(Bottom view)

(Please refer to ****.pdf)

Model	refer to	****.pdf
21A9/09BN37	----------	E3701-980010A6&B6.pdf

ii. PCB CRT Component Diagram (Top view)/(Bottom view)

(Please refer to ****.pdf)

Models	refer to	****.pdf
21A8/B8BN87	----------	090-962523-02.pdf
25A9/29A9ABN87	----------	090-962523-02.pdf
21A9/09BN37	----------	E3701-011030.pdf

iii. PCB AV Component Diagram(Top view)/(Bottom view)

(Please refer to ****.pdf)

Models	refer to	****.pdf
21A9/09BN37	----------	E3701-980060.pdf
21A8BN87	----------	E3701-980060.pdf

iv. PCB PINCUSHION Component Diagram (Top view)/(Bottom view)

(Please refer to ****.pdf)

Models	refer to	****.pdf
25A9/29A9ABN87	----------	E3701-003030-3.pdf

v. PCB LED and PANEL Component Diagram (Top view)/(Bottom view)

(Please refer to ****.pdf)

Models	refer to	****.pdf
25A9/29A9ABN87	----------	E3701-002050A4/B4.pdf

vi. PCB POWER, KEY and AVSIDE Component Diagram (Top view)/(Bottom view)

(Please refer to ****.pdf)

Models	refer to	****.pdf
21B8BN87	----------	E3701-011090A1/B1/C1.pdf

vii. PCB Handset Component Diagram (Top view)/(Bottom view)

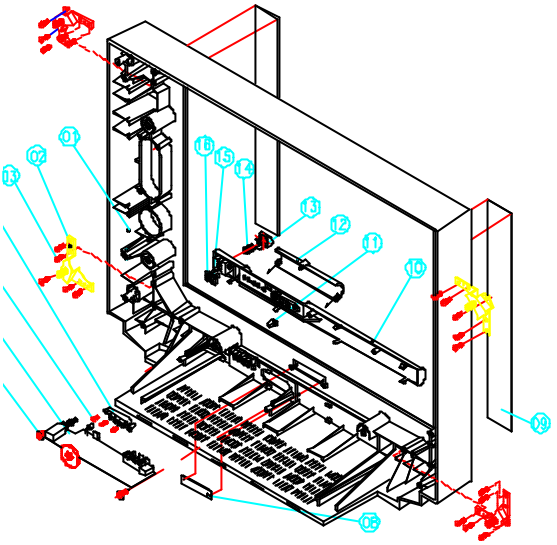
(Please refer to ****.pdf)

Models	refer to	****.pdf
21A8/B8BN87	----------	E3741-980040.pdf
21A9/09BN37	----------	E3741-980040.pdf
25A9/29A9ABN87	----------	E3741-980040.pdf

XIV. Assembly Instruction

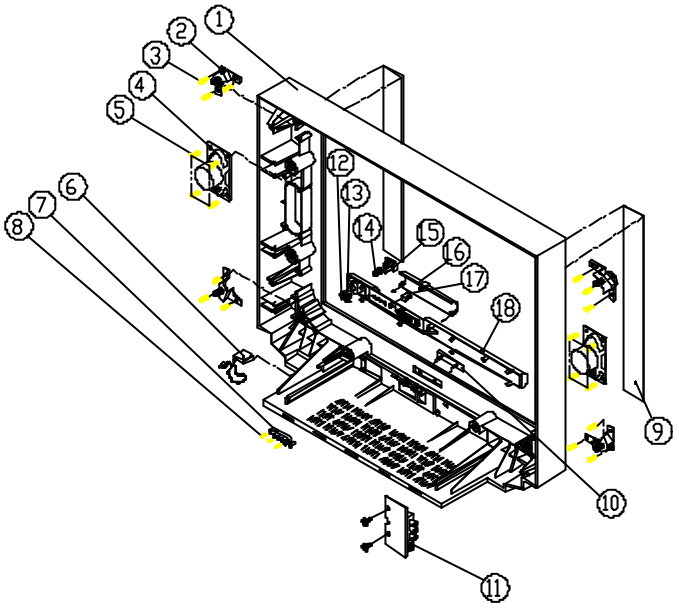
A. Front cabinet block

i. 25A9/29A9 models



No.	Description	QTY	Action	No.	Description	QTY	Action
1	CAB FR	1	Place	9	Speaker	2	Shut
2	MTB CRT.	4	Fit on	10	Front Panel	1	Buckle on
3	Screw 6X16mm	20	Tighten	11	Door Lock	1	Fit on
4	FUN. Key	1	Fit on	12	Push Door	1	Buckle on
5	Screw 3X10	3	Tighten	13	Power Knob	1	Insert
6	Key Board Ass'y	1	Fit on	14	Compress Spring	1	Put into
7	Screw 4X20	2	Tighten	15	Sensor Lens	1	Insert
8	Name Plate	1	Fit on	16	Power Lens	1	Insert

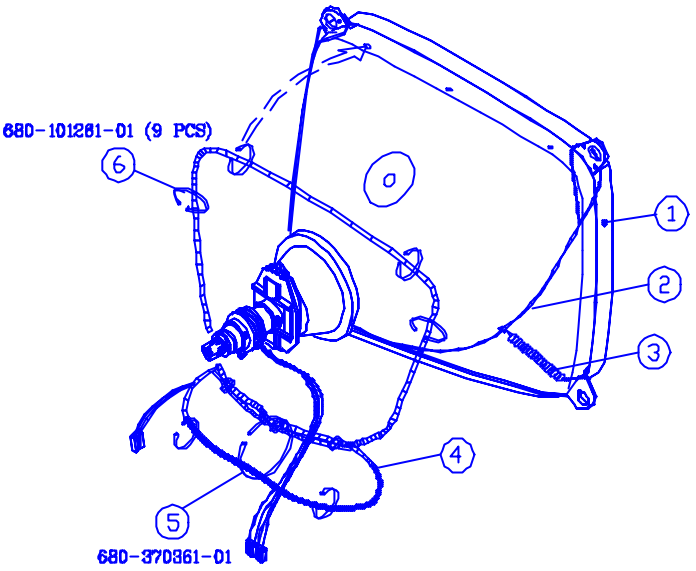
ii. 21A8/21A9 models



No.	Description	QTY	Action	No.	Description	QTY	Action
1	CAB Front	1	Place	10	Name Plate	1	Fit on
2	MTB CRT.	4	Fit on	11	RCA PCB	1	Buckle on
3	Screw 6X10mm	12	Tighten	12	Power Lens	1	Buckle on
4	Speaker	2	Shut	13	Sensor Lens	1	Insert
5	Screw 4X8	3	Tighten	14	Compress Spring	1	Put into
6	CLP CRD PWR	1	Fit on	15	Power Knob	1	Put into
7	Function Key	1	Fit on	16	Push Door	1	Buckle on
8	Screw WHR 3X10	3	Tighten	17	Door Lock	1	Fit on
9	Speaker Net	1	Fit on	18	Front Panel	1	Buckle on

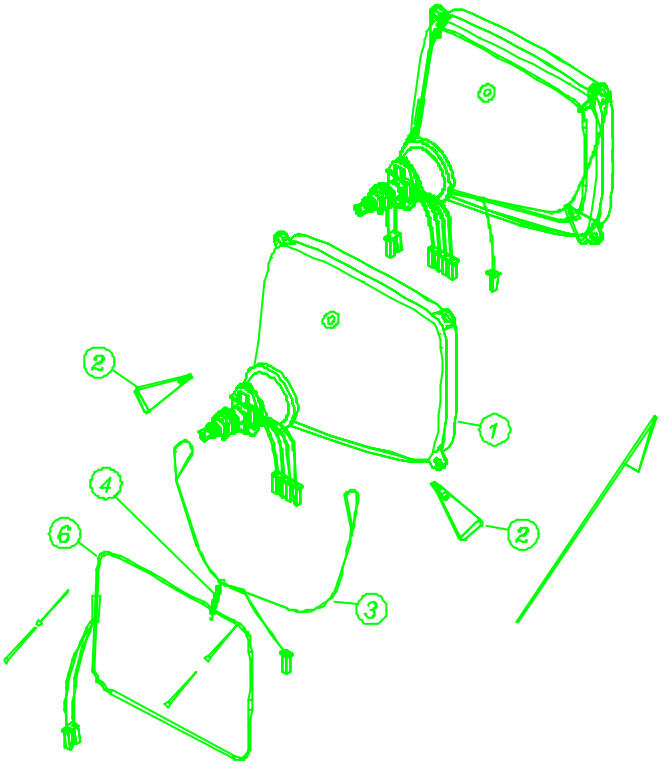
B. CRT block

i. 25A9/29A9 models



No.	Description	Qty.	Action	Remark
1.	CRT	1	Place	
2.	CRT Earth Line	1	Hang	
3.	CRT Spring	2	Hook	
4.	Degaussing Coil Ass'y	1	Bind	
5.	Cable Tie	1	Bind	
6.	Cable Tie	9	Bind	Bind the degaussing coil to CRT with cable ties.

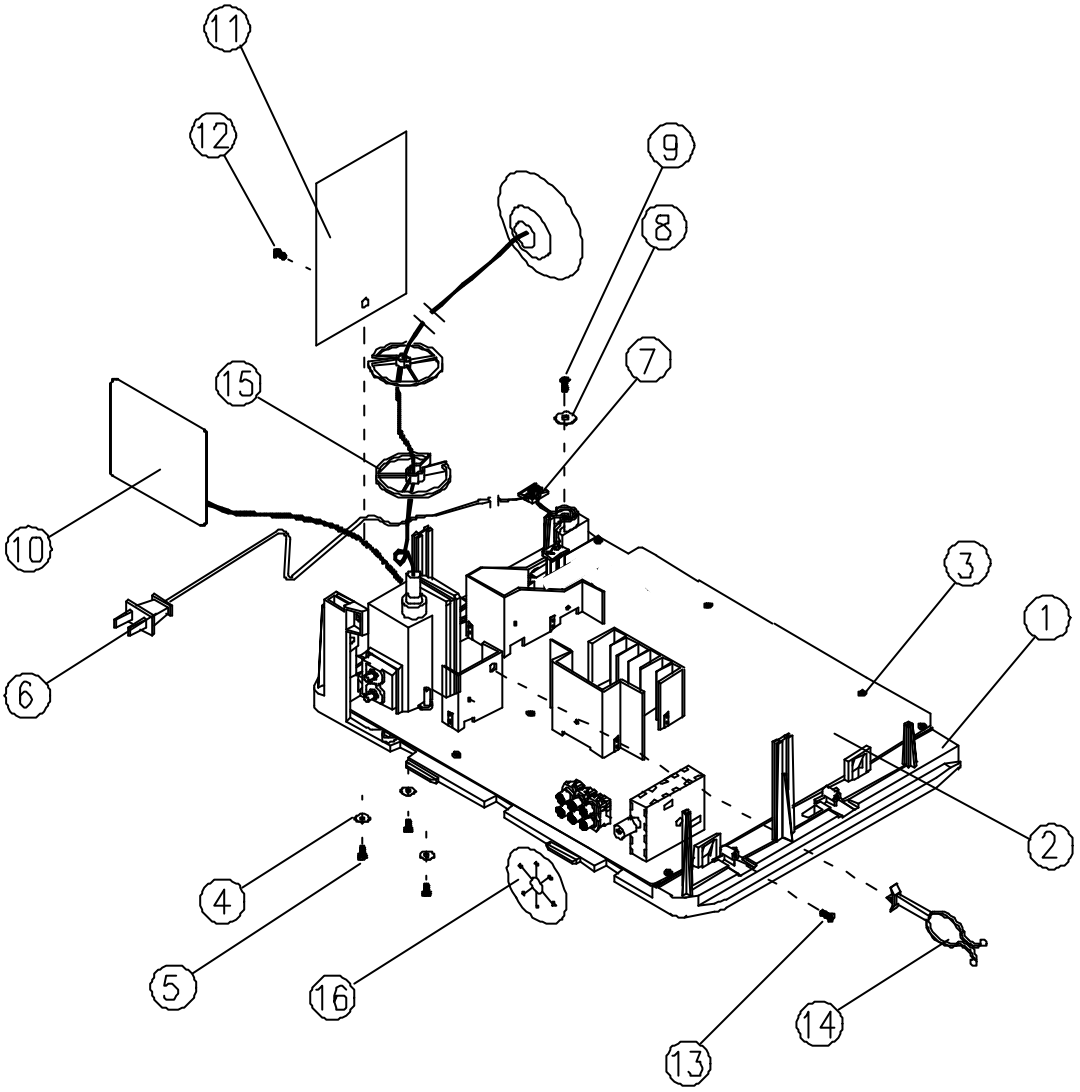
ii. 21A8/21A9 models



No.	Description	QTY.	Action	Remark
1	CRT	1	Place	
2	Degaussing Coil Clip	2	Hang on CRT ears	
3	CRT Earth Line	1	Hang on CRT ear and degaussing coil clips	
4	CRT Spring	1	Hang on CRT ear and tight CRT earth line	
5	Degaussing Coil	1	Buckle on degaussing coil clips	
6	CRT. Ass'y	1		

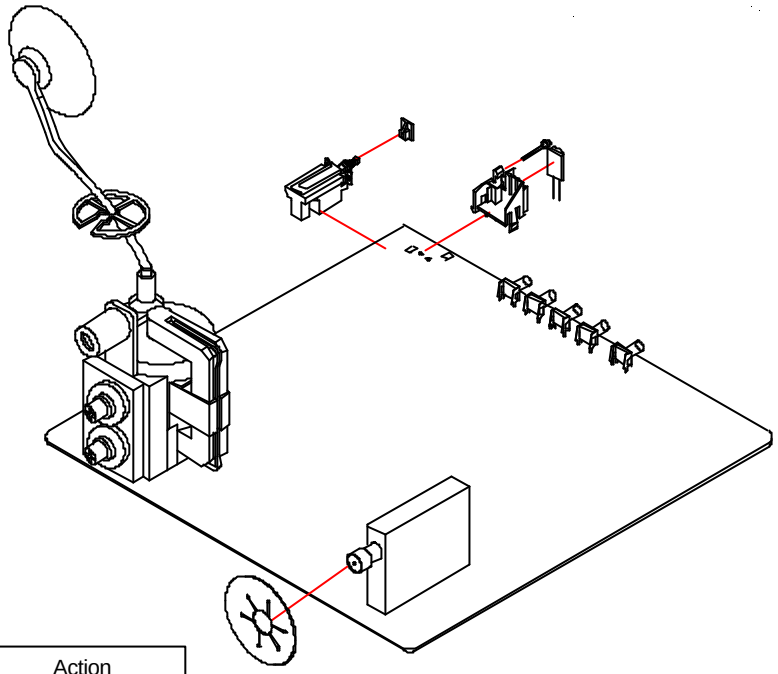
C. Assembly of chassis block

i. 25A9/29A9 models



No.	Description	Qty.	Action	Remark
1	Chassis Bracket	1	Place	
2	Main PCB Ass'y	1	Fit on	Fit Main PCB Ass'y onto Chassis Bracket.
3	Self-tapping Screw 3x10mm	12	Tighten	
4	FBP WHR 3x8x0.8	3	Fit on	
5	Self-tapping Screw	3	Tighten	
6	Power Cord Ass'y	1	Connect	Connect the AC cord to main PCB.
7	Power Cord Clip	1	Fit on	
8	FBP WHR 3.3x14x1.6	1	Fit on	
9	Self-tapping Screw	1	Tighten	
10	CRT PCB Ass'y	1	Connect	Connect CRT PCB Ass'y to main PCB.
11	Pin Cushion PCB Ass'y	1	Insert	
12	Self-tapping Screw	1	Tighten	
13	Self-tapping Screw	1	Tighten	
14	HTWT 6913	1	Insert	
15	RNG +PRTOT 9128	2	Fit on	
16	Tuner Plate	1	Fit on	

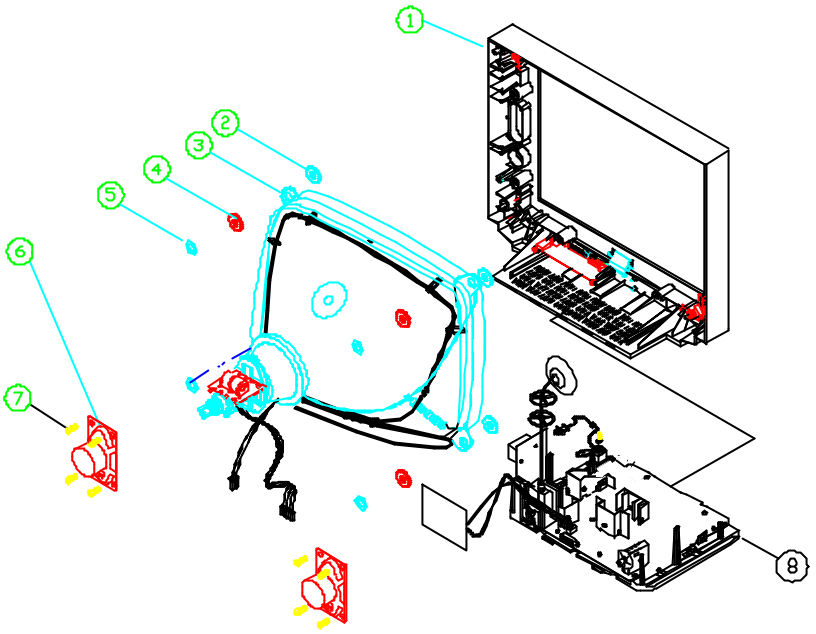
ii. 21A8/21A9 models



No.	Description	QTY.	Action
1	Main PCB	1	
2	Tuner Plate	1	Fit on
3	RNG +PRTOT 9128	1	Fit on
4	ADPTR SW PWR 3912	1	Fit on

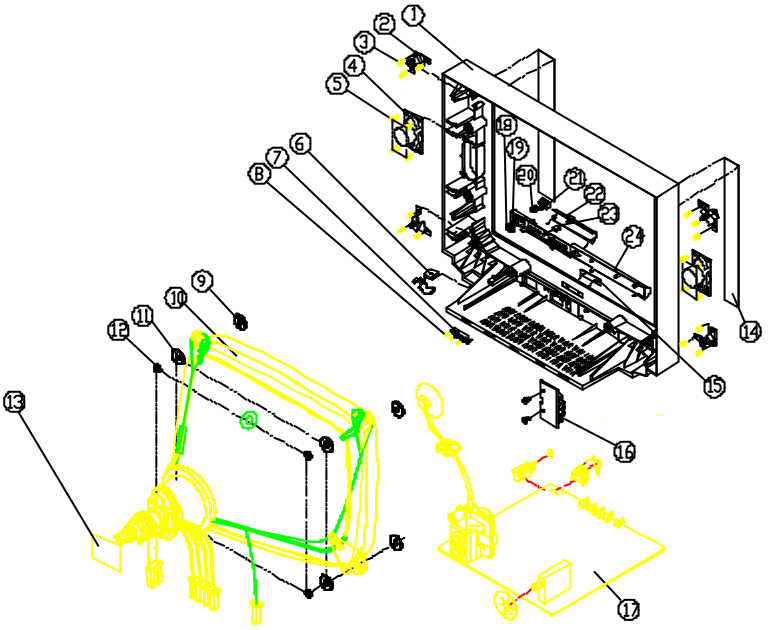
D. Whole unit without rear cabinet block

i. 25A9/29A9 models



No.	Description	QTY	Action
1	Front Block	1	Place
2	RP + RNG 3716	4	Fit on
3	29" CRT Ass'y	1	Fit on
4	WHR + CRT 9129	4	Put on
5	Nut 8X13X6.3	4	Tighten
6	Speaker	2	Fit on
7	Screw 4X8	8	Tighten
8	Main PCB Ass'y	1	Insert

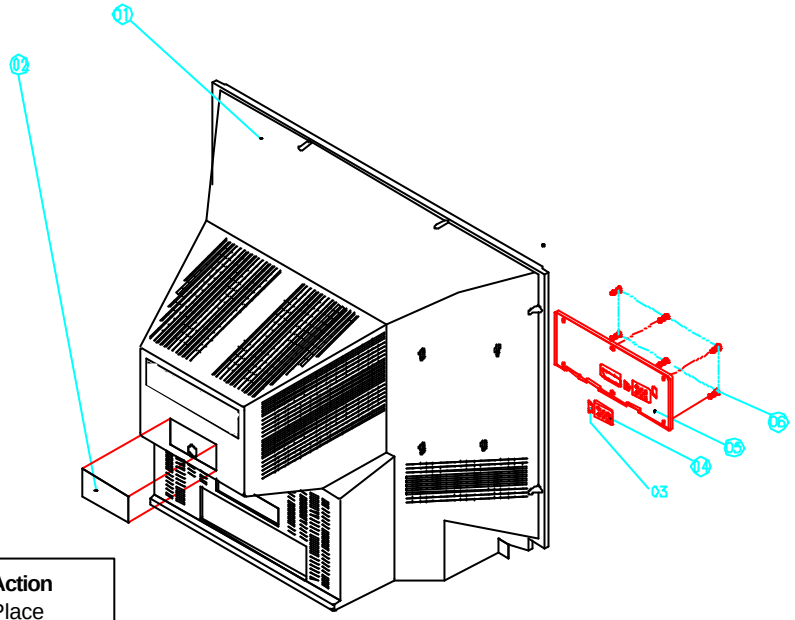
ii. 21A8/21A9 models



No.	Description	QTY	Action
1	Front Block	1	Place
2	Ring	4	Fit on
3	21" CRT Ass'y	1	Fit on
4	WHR + CRT 4D	4	Put on
5	Nut 6x10x5 4D	4	Tighten
6	CRT PCB ASS'Y	1	Fit on
7	Main PCB Ass'y	1	Insert

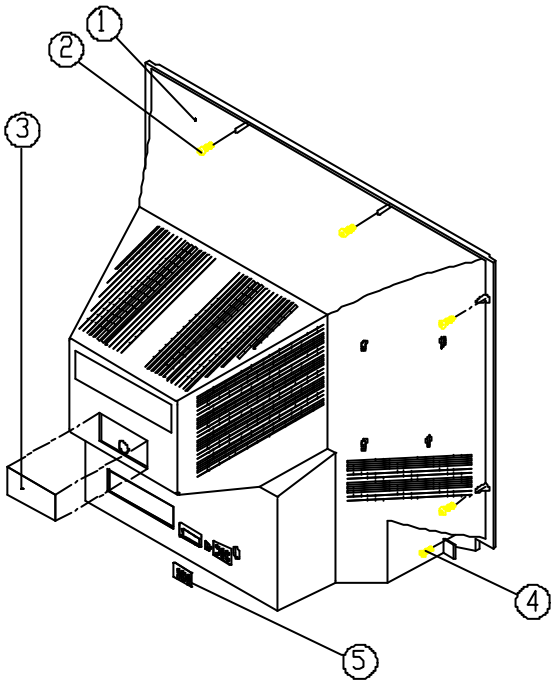
E. Rear cabinet block

i. 25A9/29A9 models



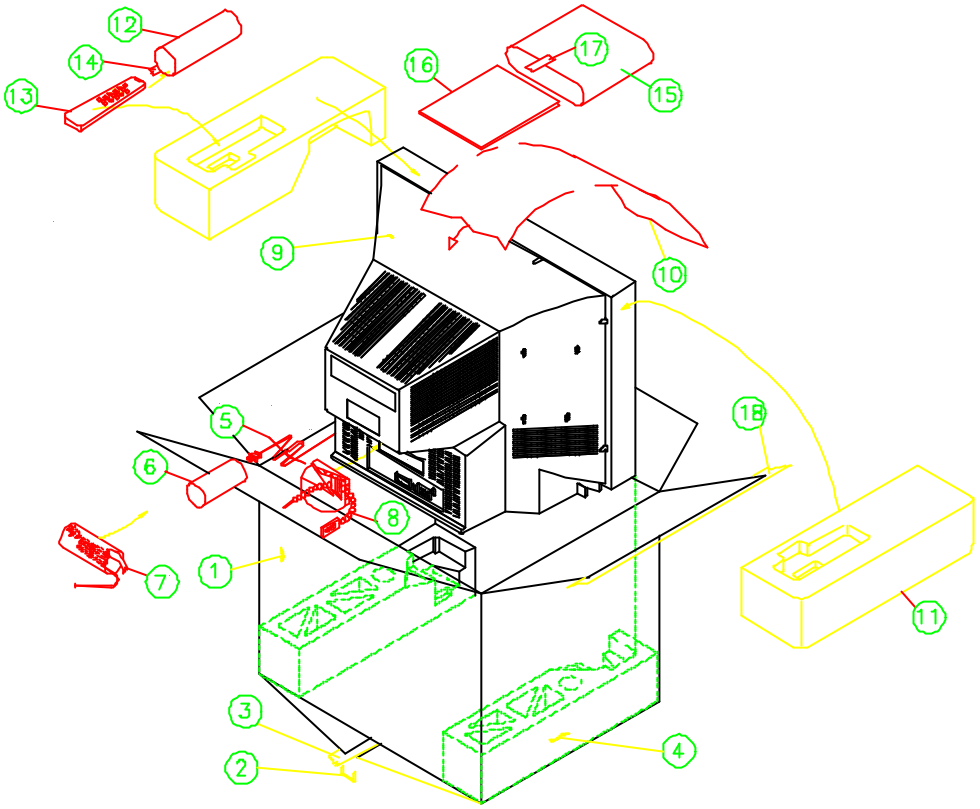
No.	Description	QTY	Action
1	CAB BK	1	Place
2	Model Plate	1	Place
3	Cover Plate	1	Fit on
4	AV Cover Plate	1	Fit on
5	Back Panel	1	Takex
6	TS BID4X10	6	Tighten

ii. 21A8/21A9 models



No.	Description	QTY	Action
1	Cabinet Back	1	Place
2	Screw WHR 5x25	6	Tighten
3	Model Plate	1	Place
4	Screw 5x16mm	2	Tighten
5	Cover Plate	1	Fit on

XV. Packing

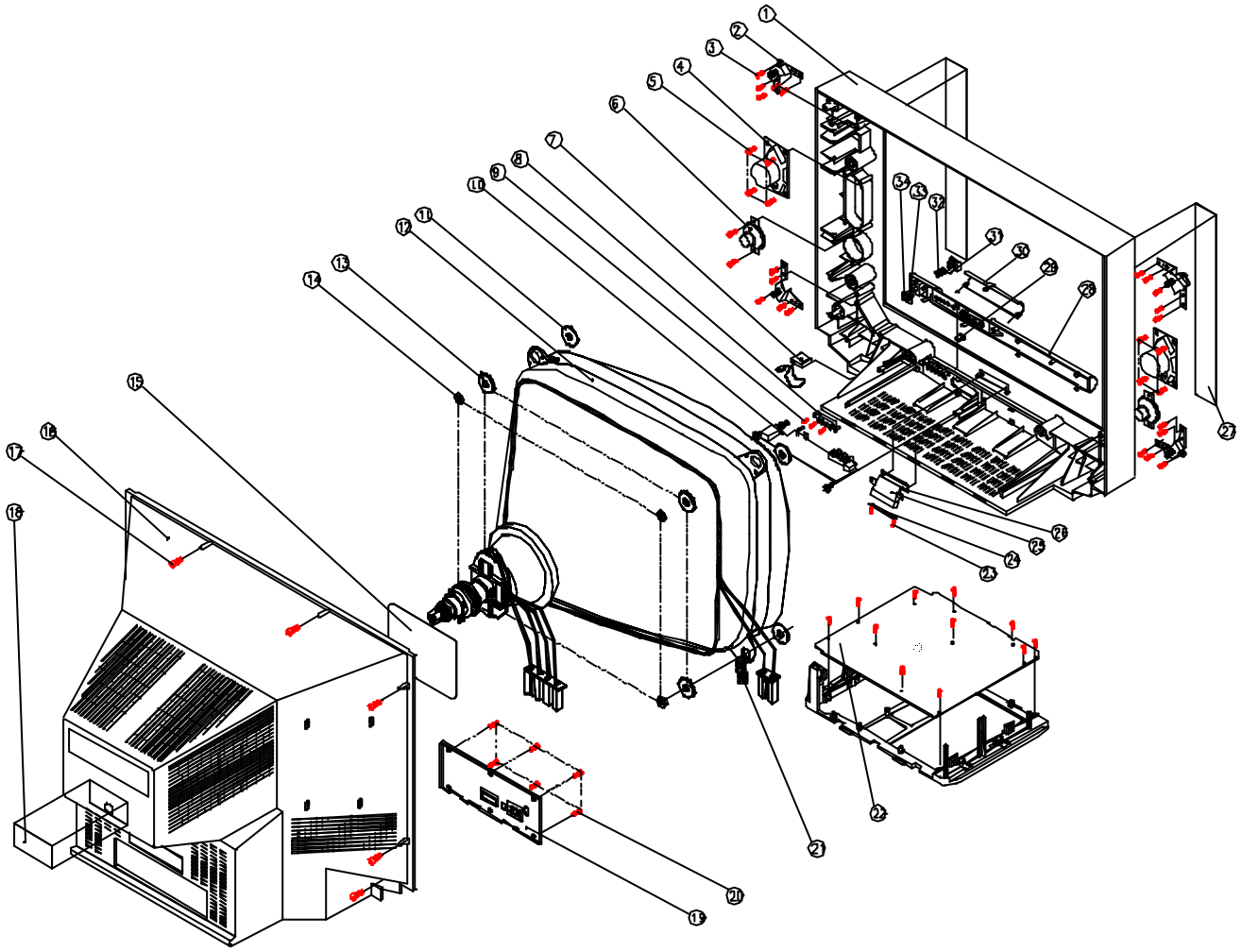


No.	Description	Qty.	Action	Remark
1	Gift box	1	Place	Take a giftbox and place it on working table.
2	Nail	8	Nail	
3	Masking Tape		Affix	
4	Polyfoam End CAP (Bottom)	1	Place	On the bottom of the giftbox.
5	Wire Tie	1	Bind	
6	Polybag for AC CORD	1	Take	
7	Masking Tape		Affix	
8	Cable Tie	1	tie	
9	TV Set	1	Put on	Into the giftbox.
10	Expanded Polyethylene Foam Paper	1	Cover	Above the TV set .
11	Polyfoam End CAP (Top)	1	Place	Above the TV set .
12	Polybag for Remote	1	Take	
13	Remote Handset ASS'Y	1	Put on	Into the polybag.
14	Masking Tape		Affix	
15	Polybag for I/B	1	Take	
16	I/B	1	Put on	Into the polybag and put the polybag with I/B into the giftbox.
17	Masking Tape		Affix	
18	Masking Tape		Affix	

XVI. Exploded View Diagram and Parts List

A. TV unit

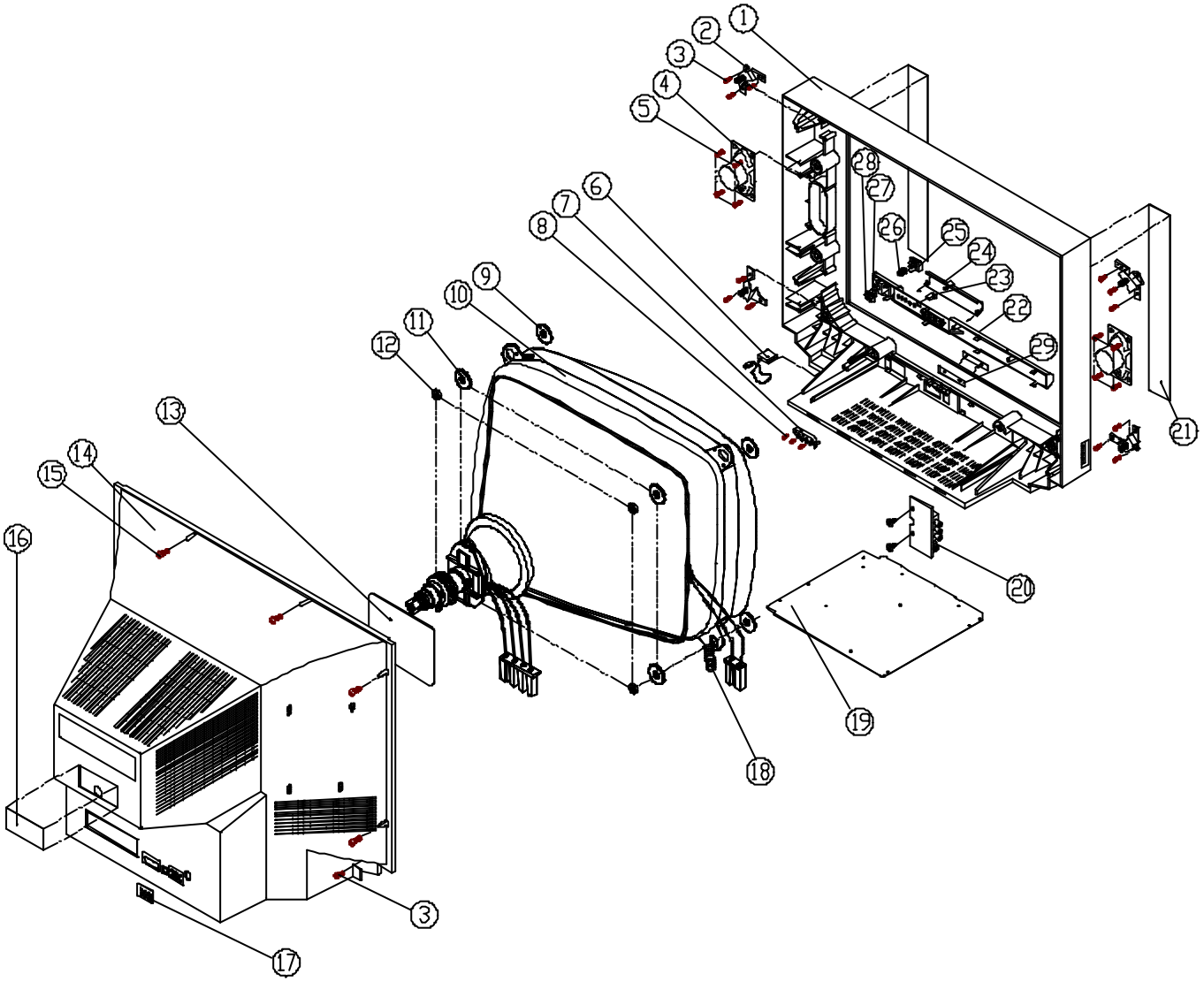
i. 25A9/29A9 models



Item	Part No.	Description	Qty.
1	200-	Front CAB.	1
2	423-	MTB. CRT	4
3	614-	S-TAP Screw 5X6MM	20
4	E4801-	SPEAKER	2
5	614-	S-TAP Screw BID 4X8	12
6	254-	CLP CRD PWR	1
7	277-	Function Key	1
8	612-	S-TAP Screw WHR 3X10	3
9	E3701-	Key Board	1
10	615-	S-TAP Screw 4X20	2
11	E6120-	CRT (FD)	1
12	639-	WHR+CRT 4D	4
13	660-	Nut 8X13X6.3 4D	4
14	E3701-	CRT PCB	1
15	202-	CAB. Back	1
16	614-	S-TAP Screw 5X25	8
17	560-	Model Plate	1

Item	Part No.	Description	Qty.
18	389-	Cover Plate	1
19	236-	Back Panel	1
20	614-	S-TAP Screw BID 4X10	6
21	477-	SPG+CRT 9128	2
22	E3701-	Main PCB	1
23	612-	S-TAP Screw WHR 3X10	2
24	E3701-	N.P. Led PCB	1
25	250-	N.P. Led Holder	1
26	286-	Name Plate	1
27	832-	Speaker Net	2
28	230-	Front Panel	1
29	702-	Door Lock	1
30	237-	Push Door	1
31	279-	Power Knob	1
32	477-	Compressing Spring	1
33	269-	Sensor Lens	1
34	269-	Power Lens	1

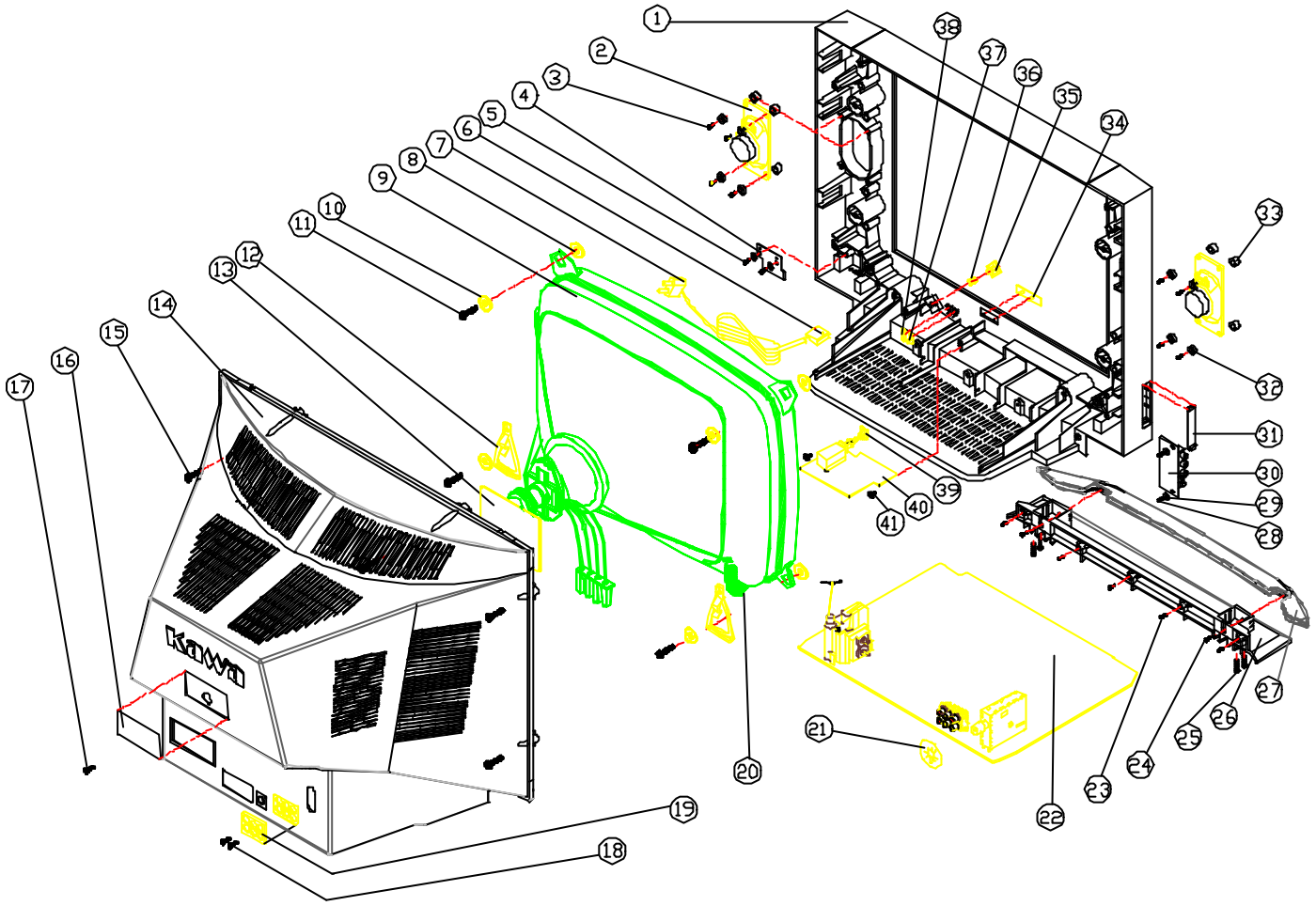
ii. 21A8/21A9/2109 models



Item	Part No.	Description	Qty.
1	200-	Front CAB.	1
2	423-	MTB. CRT	4
3	614-	S-TAP Screw 5X16MM	14
4	E4801-	SPeaker	2
5	614-	S-TAP Screw BID 4X8	8
6	254-	CLP CRD PWR	1
7	277-	Function Key	1
8	612-	S-TAP Screw WHR 3X10	3
9	376-	Ring	4
10	102-	CRT	1
11	639-	WHR+CRT 4D	4
12	620-	Nut 6x10x5 4D	4
13		CRT PCB ASS'Y	1
14	202-	Cabinet Back	1
15	614-	S-TAP Screw WHR 5X25	6

Item	Part No.	Description	Qty.
16	389-	Model Plate	1
17	389-	Cover Plate	1
18	477-	SPG+CRT	2
19		Main PCB ASS'Y	1
20		RCA PCB	1
21	832-	Speaker Net	2
22	230-	Front Panel	1
23	702-	Door Lock	1
24	237-	Push Door	1
25	279-	Power Knob	1
26	477-	Compressing Spring	1
27	269-	Sensor Lens	1
28	269-	Power Lens	1
29	486-	Name Plate	1

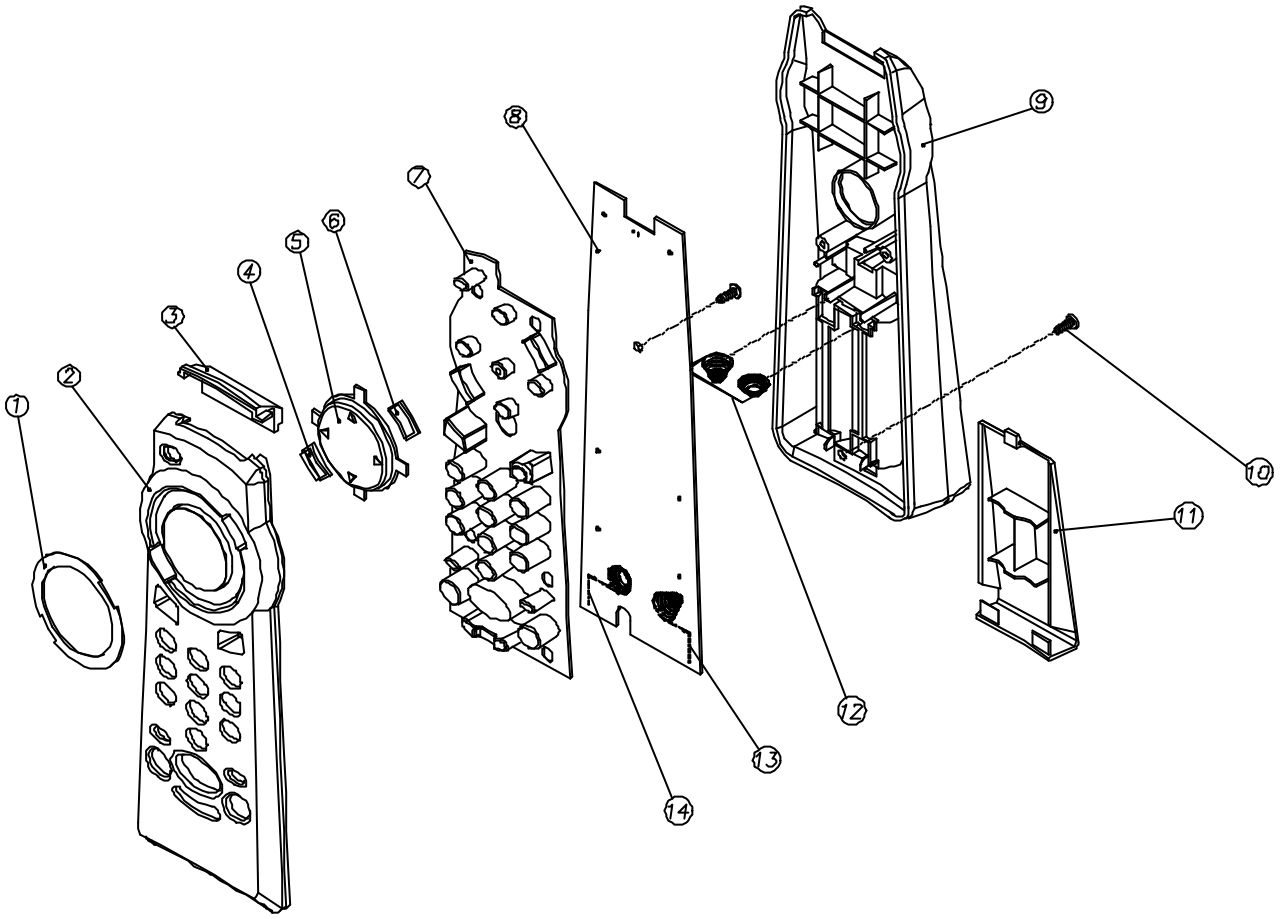
iii. For 21B8BN87



Item	Part No.	Description	Qty.
1	200-	CAB. Front Blk	1
2		Speaker	2
3	615-	S-TAP Screw BWH 4x14	8
4	E3701-	KEY PCB Ass'y	1
5	614-	S-TAP Screw BID 4x10	2
6	254-	CLP CRD PER 8714	1
7		AC Power Line	1
8	376-	Rubber Ring (T=2.0mm)	4
9		21" Colour CRT	1
10	639-	Special Washer CRT	4
11	614-	S-TAP Screw BID 4x30	4
12	249-	Special Plastic Part	2
13	E3701-	CRT PCB	1
14	202-	Back Cabinet Black HI-PS	1
15	614-	S-TAP Screw B/T 5x25mm Black	6
16	560-	Model Label	1
17	614-	S-TAP Screw B/T 4x12mm White	1
18	611-	S-TAP Screw FLT 3x10	2
19	389-	RCA Plate	1
20	477-	SPG+CRT	1
21	389-	Protect Ring	1

Item	Part No.	Description	Qty.
22	E3701-	Mian PCB	1
23	614-	S-TAP Screw BID 4x16	3
24	614-	S-TAP Screw BID 4x10	4
25	614-	S-TAP Screw BID 5x20	4
26	230-	Front Panel (B)	1
27	234-	SUB Panel	1
28	614-	S-TAP Screw BID 4x10	
29	530-	Fiber Paper	4
30	E3701-	AV PCB	1
31	237-	AV Cover Plate	1
32	379-	Special Rubber Parts SPK	8
33	379-	Special Rubber Parts SPK	8
34	486-	Name Plate	1
35	279-	Power Knob	1
36	477-	SPG+ CRT	1
37	269-	Sensor Lens	1
38	269-	Led Lens	1
39	241-	Power Adapter	1
40	E3701-	Power PCB	1
41	615-	Screw 4x14	2

B. Remote handset unit

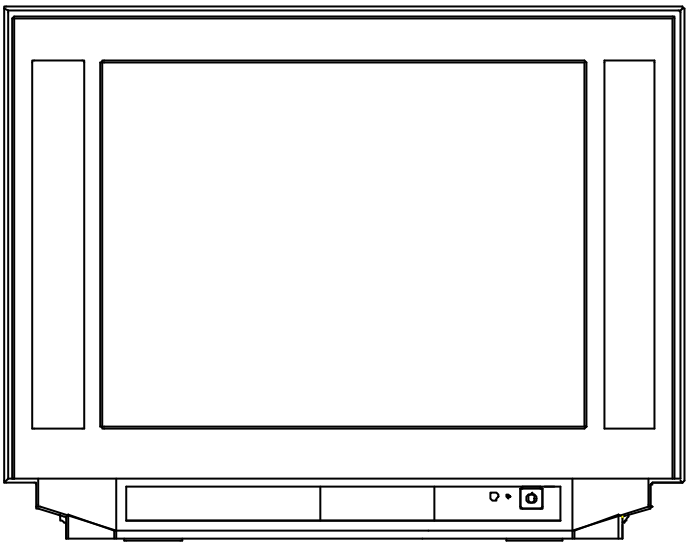


Item	Part No.	Description	Qty.
1	384-	Overlay RCN	1
2	201-	CAB. TP	1
3	263-	Lens FR	1
4	279-	KB	1
5	279-	KB	1
6	279-	KB	1
7	373-	Conductive Rubber	1
8	E3741-	PCB Handset	1
9	203-	CAB. BM	1
10	610-	TS RND2.6X8	2
11	210-	DR BAT	1
12	474-	SPG BAT AA+-	1
13	474-	SPG BAT AA-	1
14	474-	SPG BAT AA+	1

SERVICE MANUAL

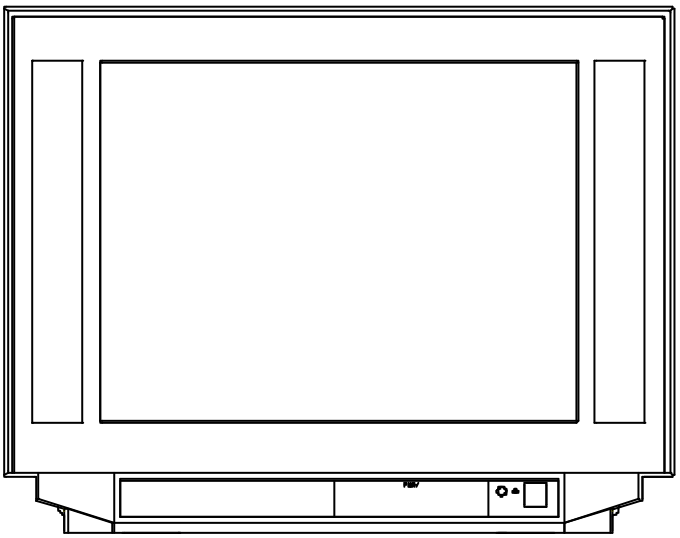
Colour Television Receiver

(UBM CHASSIS)



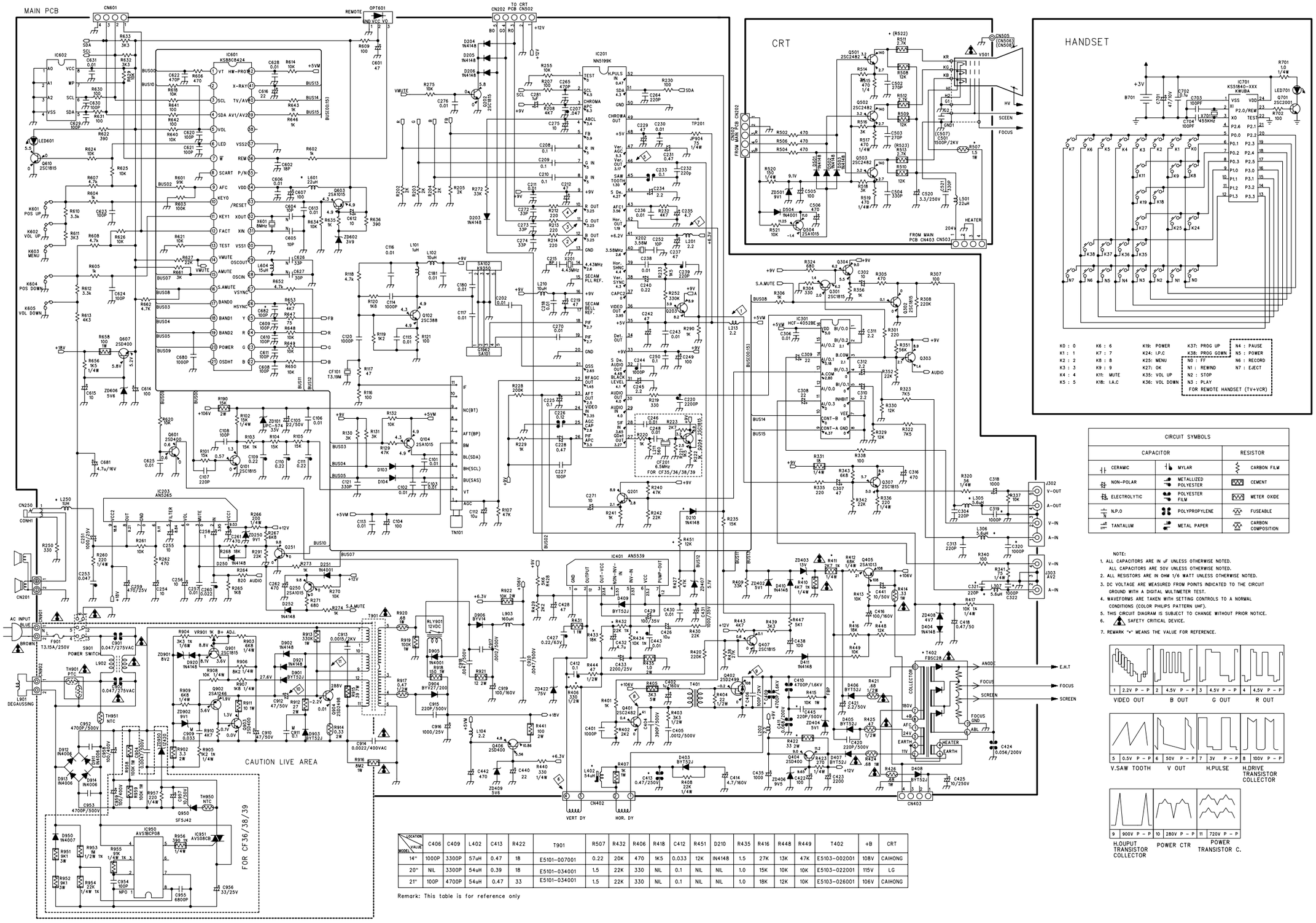
MODEL: 21F1[21A8BN87(A)]/21F2[21B8BN87(A)]

2102[21A9BN37(B)]/2103[2109BN37(D)]



MODEL: 2515[25A9ABN87(B)]

2915[29A9ABN87(B)]



CIRCUIT SYMBOLS			
CAPACITOR		RESISTOR	
CERAMIC	MYLAR	CARBON FILM	
NON-POLAR	METALLIZED POLYESTER	CEMENT	
ELECTROLYTIC	POLYESTER FILM	METER OXIDE	
N.P.O	POLYPROPYLENE	FUSEABLE	
TANTALUM	METAL PAPER	CARBON COMPOSITION	

NOTE:
1. ALL CAPACITORS ARE IN uF UNLESS OTHERWISE NOTED.
   ALL CAPACITORS ARE 50V UNLESS OTHERWISE NOTED.
2. ALL RESISTORS ARE IN OHM 1/6 WATT UNLESS OTHERWISE NOTED.
3. DC VOLTAGE ARE MEASURED FROM POINTS INDICATED TO THE CIRCUIT GROUND WITH A DIGITAL MULTIMETER TEST.
4. WAVEFORMS ARE TAKEN WITH SETTING CONTROLS TO A NORMAL CONDITIONS (COLOR PHILIPS PATTERN UHF).
5. THIS CIRCUIT DIAGRAM IS SUBJECT TO CHANGE WITHOUT PRIOR NOTICE.
6. ⚠ SAFETY CRITICAL DEVICE.
7. REMARK "+" MEANS THE VALUE FOR REFERENCE.

LOCATION / VALUE / MODEL	C406	C409	L402	C413	R422	T901	R507	R432	R406	R418	C412	R451	D210	R435	R416	R448	R449	T402	+B	CRT
14"	1000P	3300P	57uH	0.47	18	E5101-007001	0.22	20K	470	1K5	0.033	12K	IN4148	1.5	27K	13K	47K	E5103-002001	108V	CAIHONG
20"	NIL	3300P	54uH	0.39	18	E5101-034001	1.5	22K	330	NIL	0.1	NIL	NIL	1.0	15K	10K	10K	E5103-022001	115V	LG
21"	100P	4700P	54uH	0.47	33	E5101-034001	1.5	22K	330	NIL	0.1	NIL	NIL	1.0	18K	12K	10K	E5103-026001	106V	CAIHONG

Remark: This table is for reference only