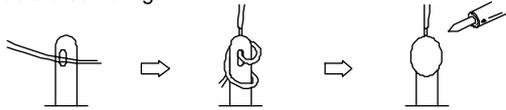


I. Safety Instructions

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 save 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 26.5 kV at zero beam 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.

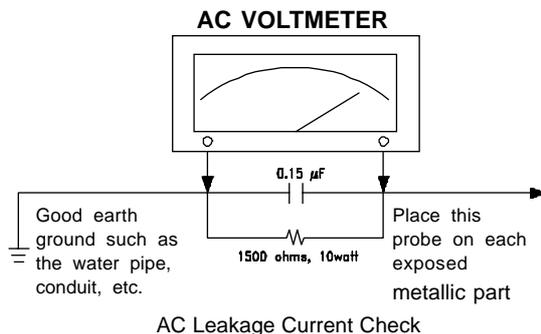
1. An isolation transformer should be connected in the power line between the receiver and the AC line when a service is performed on the primary of the converter transformer of the set.
2. Comply with all caution and safety related provided on the back of the cabinet, inside the cabinet, on the chassis 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 temperature 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 0.15 μ F 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 μ F 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.



PRODUCT SAFETY NOTICE

Many electrical and mechanical parts in this TV receiver have special safety-related characteristics. These characteristics are often passed unnoticed by visual specification and the protection afforded by them cannot necessarily be obtained by using replacement components rated for a higher voltage, wattage, etc. The replacement parts which have these special safety characteristics are identified by \triangle 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.

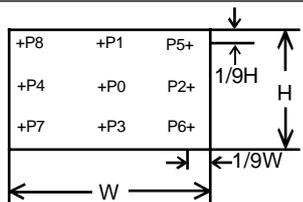
II. Specifications

1. Power supply TV: AC 240V, 50Hz
Remote controller 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. Socket Aerial input : 75 ohm unbalanced DIN jack
2AV input/1AV out: RCA sockets
Headphone output: Ø3. 5mm stereo jack
7. Color picture tube: North(2) hemisphere Bv=+0.2G ± 0.2G
8. Speaker : 2" ´ 5" 16 ohm 3W ´2 pcs
9. Operating temperature Fulfil all specifications : 15°C ~ 35°C
Accept picture/sound reproduction: 5°C ~ 45°C
10. Operating relative humidity Fulfil all specifications : 45% ~ 75%
Accept picture/sound reproduction: 15% ~ 90%
11. Electrical & optical specification:

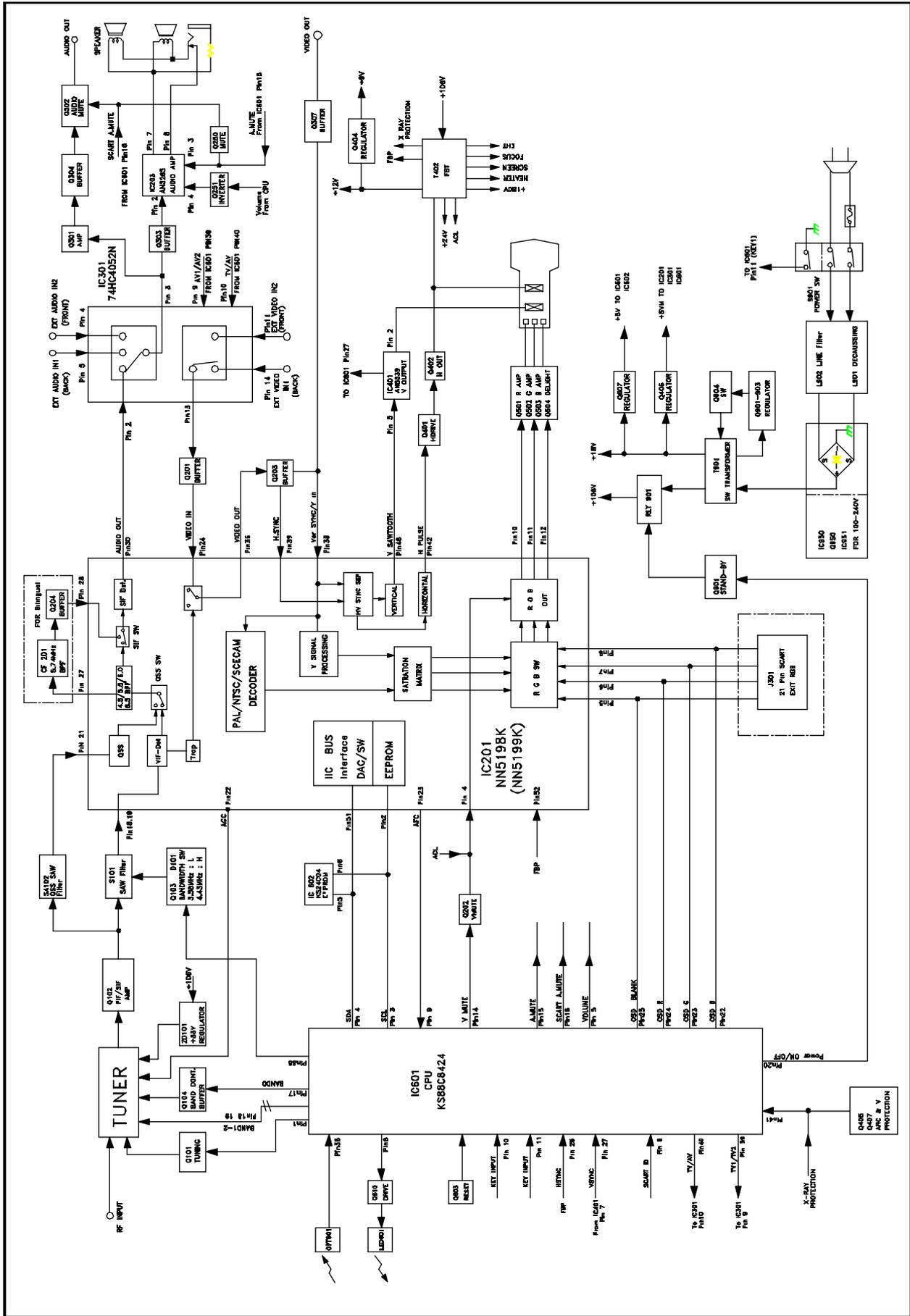
No.	Items	Instruction	Typical	Limit	Unit	
1	Video sensitivity	For 30dB S/N	VL	≤45	≤48	dBuV
			VH	≤45	≤48	dBuV
			U	≤48	≤51	dBuV
2	FM sound sensitivity	For 30dB S/N	30	≤35	dBuV	
3	Synchronizing sensitivity	For RF transmission	25	≤30	dBuV	
4	Color sensitivity	For RF transmission	32	≤40	dBuV	
5	Teletext sensitivity	TV screen refreshes 40 times number of mistakes £8	N/A	N/A	dBuV	
6	Minimum NICAM threshold	Without crackline noise	N/A	N/A	dBuV	
7	AGC static characteristic	Accept. Picture/Sound repr.	103	≥100	dBuV	
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	

No.	Items	Instruction	Typical	Limit	Unit
20	Raster rotation	In all direction	4	≤6	m m
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
24	H sync pull-in range		±500	≥ ±200	Hz
25	V sync pull-in range		7	≥6	Hz
26	Anode voltage		25	≤27.5	KV
27	Audio frequency response	±3dB ref. to 1KHz	0.2~8	0.2~8	KHz
28	Audio output power	1KHz 10% THD	2×1.6	≥2×1.6	W
29	Max audio output power	1KHz THD ≥20%	2×2	≥2×2	W
		50 KHz DEV.(BG/I/DK)			
		25 KHz DEV.(M/N)			
30	THD	Po=0.5W 1KHz	1	≤3	%
31	Signal to buzz ratio		42	≥40	dB
32	Minimum volume hum		6	≤10	mVrms
33	Maximum woofer output power		N/A	N/A	W
34	Woofer audio frequency response	±3dB ref. to 80Hz AV mode	N/A	N/A	Hz
35	Bass control range	100Hz ref. to 1KHz AV mode	N/A	N/A	dB
36	Treble control range	10KHz ref. to 1KHz AV mode	N/A	N/A	dB
37	Balance	Center	N/A	N/A	dB
		Max.	N/A	N/A	
		Min.	N/A	N/A	
38	Volume control curve			N/A	/
39	Video input level		1.0	1±0.2	Vpp
40	Audio input level		0.5	0.5±0.3	Vrms
41	Video output level		1.0	1±0.2	Vpp
42	Audio output level		0.5	0.5±0.2	Vrms
43	Power consumption	Operating	80	≤95	W
		Stand by	10	≤15	
44	IR receiving distance	±30°	6	≥5	m
45	X-ray radiation		≤0.1	≤0.5	mR/h
46	Dielectric strength	AC 3KVrms 2 sec.	3	≤5	mArms

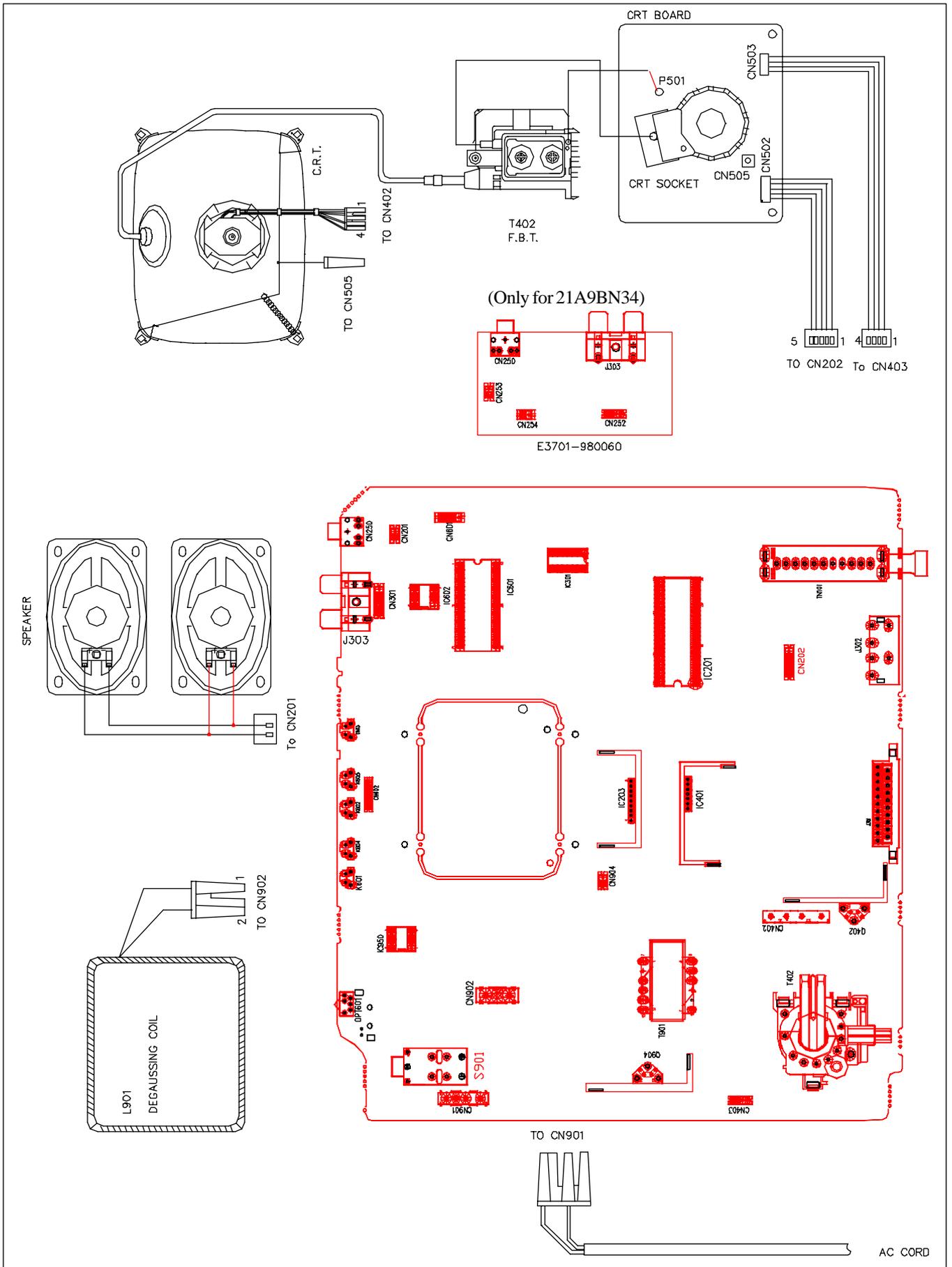
Test Condition

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	
7	<p>Conditions of the TV setting:</p> <p>A. Switch TV on and let it warm up for more than 30 minutes.</p> <p>B. Connect RMS volt meter to speaker terminals and adjust the TV volume to get 500mW RMS power at each terminal.</p> <p>C. Place the MINOLTA CA-100 test probe to white part of the screen, adjust the contrast until a reading of 80cd/m² is obtained.</p> <p>D. Place the MINOLTA CA-100 test probe to black part of the screen, adjust the brightness until a reading of 2cd/m² is obtained.</p> <p>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 referent.</p> <p>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.</p>		

III. Block Diagram



IV. Wiring Diagram

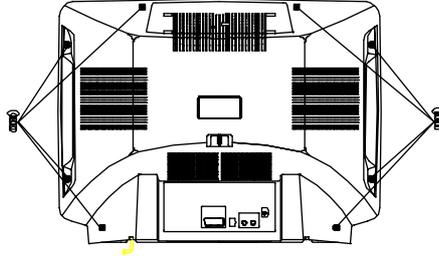


V. Disassembly

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

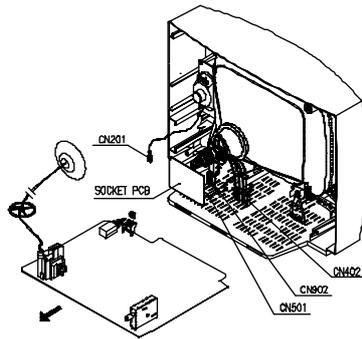
i. Removal of the Back Cover

- 1 Remove the screws as shown.
- 2 Pull out the back cover slightly.
- 3 Pull up the connector of the two lead wires (red black) connecting to the speakers on the cover from the MAIN PCB.



ii. Removal of the Main PCB

- 1 Remove the two screws.
- 2 Slide out the TV chassis slightly; pull up the connector of AC cord from PCB; Pull up the CRT PCB from CRT.
- 3 Remove the anode cap from the picture tube. To avoid a shock hazard, be sure to discharge the picture tube's anode to the chassis ground before removal.
- 4 Take out the TV chassis.



VI. Alignment Instructions

i. Before Adjustment and Maintenance

- A. Don't short any two soldering points or connect any component while TV set is power on.
- B. Pull out power plug before maintenance.
- C. In order to ensure safety all components replaced should be identical with originals.
(For further details, refer to the component name and component No. in PARTS LIST.)
- D. Must warm up for 30 minutes or more and degauss CRT thoroughly with demagnetiser before alignment.

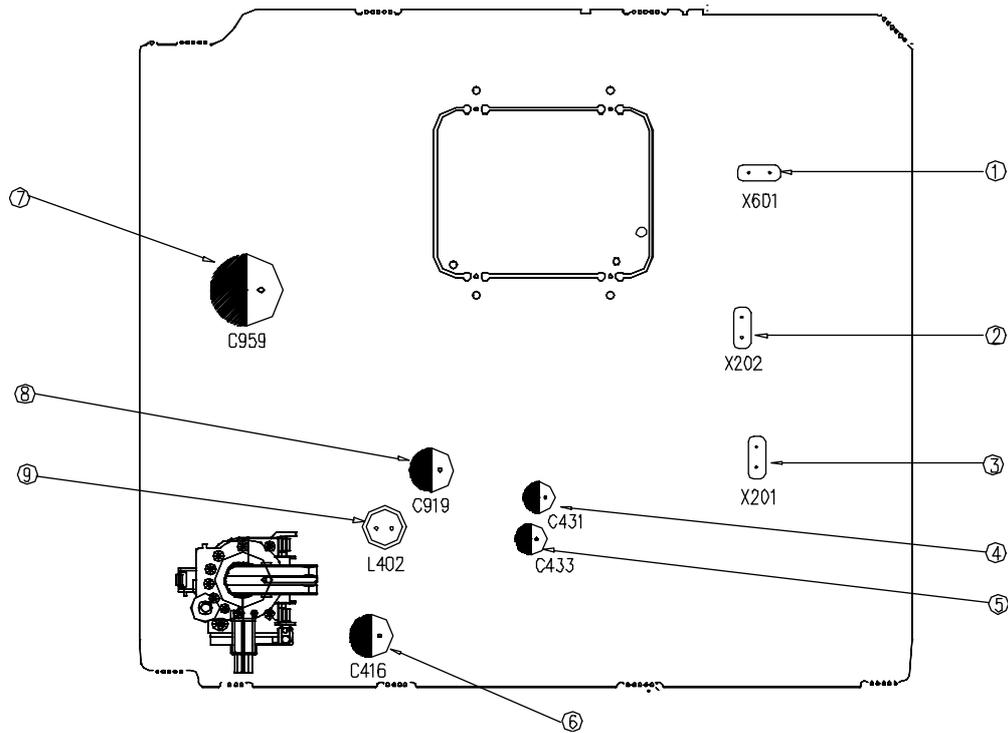
ii. Equipments for adjustment

- | | |
|---|-------------------------------|
| A. Pattern generator | B. Digital voltmeter |
| C. High voltage meter | D. Sine wave signal generator |
| E. Demagnetiser | F. Personal computer (486) |
| G. DC regulated power supply | H. Oscilloscope |
| I. CRT colour analyzer (MINOLTA CA-100) | |

iii. Input signals

- | | |
|----------------------|------------------------------|
| A. PHILIPS pattern | B. Color bar |
| C. Cross hatch | D. Grey scale bar |
| E. Monoscope pattern | F. Moving picture with sound |

iv. Adjustment Location



VII. EEPROM (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 "IV. Electrical Adjustment".

Model	Option code
21W3BN37/21A9BN34	5463122106

The option setup is as follows: 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 OSIFE 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	OCHAN2	OCHAN1	
		100	0	0	
		200	0	1	
		254	1	0	
	NU: NOT USED			RES: RESERVED	

ii. Data Setting

The data setting item B~D is the initialization data preset in the EEPROM before adjustments described in the following paragraph, 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**”.

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	
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	Remark2
SECAM BL	0		HOR.VCO	52	
RGB LIMIT	0		VIF.VCO	26	
HOR.POS	13		ISUD5	1	Remark3
VER.POS	0		ISUD4	1	
VER.HEI	84		ISUD3	1	
VER.LIN	40	Remark1	CONTR 32	0	
VER.S CUR	20	Remark1	RI CUTOF	1	

Remark1: For different CRT, the following data are recommended to be changed for better performance before alignment.

These data setting are listed as following:

	CRT	CRT Type No.	Value			
			VER.LIN	VER.SCUR	VER.LIN60	VER.SC60
21” IRICO	102-321001-03	54SX503Y22-DC01 N2	38	20	36	20

Remark2: C-Y: 0 For MFxx models (use NN5198K).

C-Y: 1 For other models (use NN5199K/NN5099K).

Remark3: ISUD5 must be set to “0” after. Please check ISUD5 after Read 5198.

iii. 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

iv. 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 and WITTIS tuner: UVS1051-CW /UVS1051-NEW.**

VIII. 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" Status.
 3. Connect digital voltmeter between ⊕ of C416 and GND.
 4. +B voltage

Model	CRT	CRT Type No.	+B
21" BN37/BN34	102-321001-03	54SX503Y22-DC01 N2	+106V

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 5S, the "KWUAA SERVICE" will be displayed on the screen.
- b. The "KWUAA SERVICE" menu is indicated with each item on the screen. The item can be selected by pressing channel " ^ " and " v " keys.

KWUAA SERVICE	
Adjustment	
Option	xxxxxxx
Read 5198	CNT: X
Other Adj.	

- c. Selecting "Read 5198", press "MENU/OK" key (or press "OK" key on the remote handset) to read IC NN5199K/NN5198K DATA in order to operate the TV set. On-screen display will be shown as follows:

KWUAA SERVICE	
Adjustment	
Option	xxxxxxx
Confirm Read ???	X
Other Adj.	

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 preset in the EEPROM inside IC NN5198K of 5099K by the IC manufacturer. During manufacturing the TV set, it is necessary to read those data that stored in EEPROM of IC 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 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: '9' , it means the data stored in the EEPROM of NN5198K or NN5099K has been read 9 times.

- d. Selecting "Option", press "OK" key then input the option code by number keys on the remote handset according to the **A. 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 " v " 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 follows:

KWUAA OTHER	
Production	off
AFT-Step	
IPC	

1. Production

Normal "Production" is set to "off", if "Production" is set to "on", the TV set can't standby and appeared BLUE BACK when no RF signal inputting, the top on the On-screen will display a "P" character when changing channel, this feature is for production use only. press volume "+" and "-" keys to set to "off" or "on", press "MENU" to EXIT.

2. AFT-Step

Selecting "AFT-Step" to set AFT DATA, press "OK" key to enter, On-screen display will be showed as follows:

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

Use channel " ^ " and " v " keys to select the parameter, the parameter value can be changed by pressing volume "+" and "-" keys. See "D. AFT data setting". Press "M" key to exit.

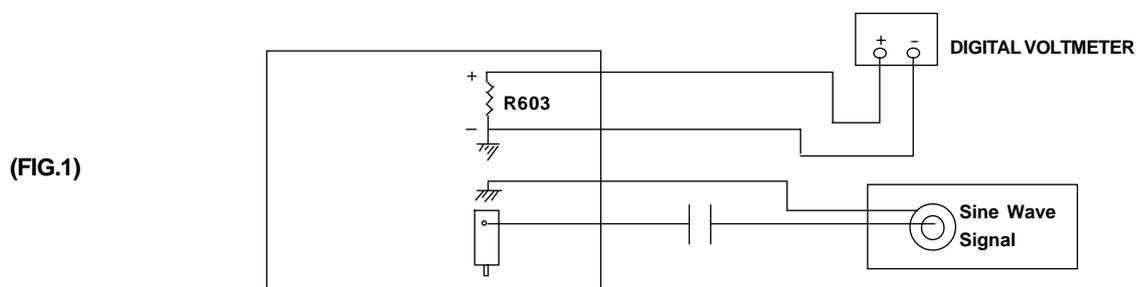
3. IPC

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.

iii. Adjustment of AFC

a. Preparation procedure

1. Turn on the main power switch.
2. Set digital voltmeter at DC, then connect its probes across of R603 and GND.
3. Add 100dBµV IF signal between IF 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 frequency of pattern generator (PM5518) by $\pm 0.1\text{MHz}$, the DC voltage should be as following:

RF FREQUENCY	DC VOLTMETER INDICATION
IF + 0.1MHz	$1.2 \pm 0.5\text{V}$
IF - 0.1MHz	$3.3 \pm 0.5\text{V}$

Remark: $IF=38.9\text{MHz}$.

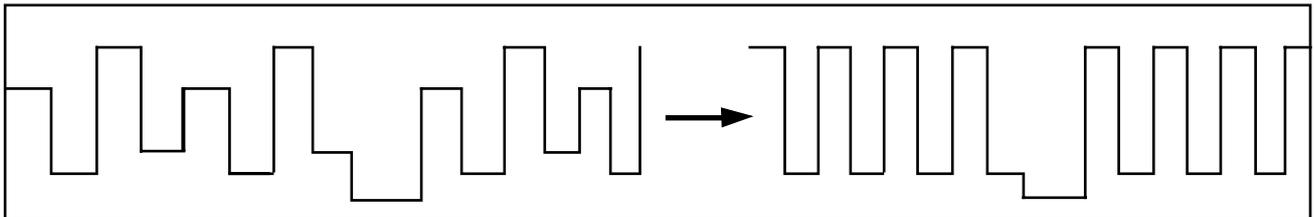
If Q.C. checked AFC voltage on the production, the AFC voltage should be $2.4\pm 0.5\text{V}$. If the result is not satisfactory, repeat adjustment step 'b. Adjustment step' until correct voltage is obtained.

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 isn't need adjust. If V linearity is not good, please adjust value of VER.LIN and VER.SCUR 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 isn't need adjust. If V linearity is not good, please adjust value of VER.LIN60 and VER.SC60 to get a good V linearity picture.

**v. Adjustment for TV TINT (TV picture) and AV TINT (AV picture)
(step a-d is only for MFxx models)**

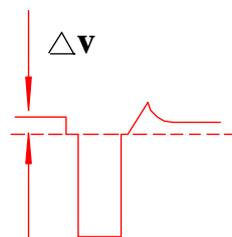
- a. Receive a NTSC color bar pattern signal from RF.
- b. Press key "I.P.C." to set contrast, Brightness, Color and Tint at normal position.
- c. Put the Probe of Oscilloscope to "B-out" Terminal of IC201 PIN 12.
- d. Enter ADJUST MEMU
Adjust Value of SUBTINT and Notice the Waveform Change Until the Waveform is shown as below:



- e. Receive a NTSC Color bar Signal from AV.
- f. Enter ADJUST MENU
Adjust the Value of AV S TINT until the Waveform of Oscilloscope is shown as above.

vi. Adjustment for SECAM BL (only for MFxx or use NN5198K models)

- 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 ΔV is smallest.



vii. Adjustment for RF AGC

- a. Receive RF signal (62±3dBμV).
- b. Enter into ADJUST MENU.
- c. Pressing channel “ ^ ” and “ v ” keys on the remote handset, and on-screen display will be shown as follows:

RFAGCDP XX

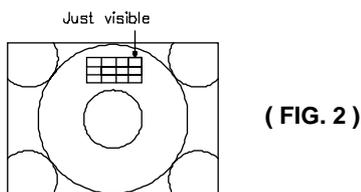
- d. Press Volume "+" or "-" on the remote handset to change the value of RFAGCDP until snow noise on the screen just disappears.
- e. Press "M" KEY to exit from ADJUST MENU.

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 “ v ” on the remote handset, the display on screen will be:

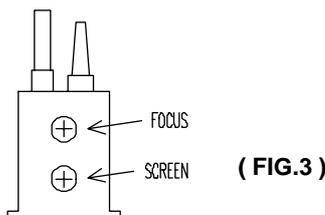
SUB BRI XX

- e. Press Volume "+" or "-" on the remote handset to change the value of SUB BRI until eight and half of portions indicated in FIG.2 is just visible. Press "M" key to exit ADJUST MENU.



ix. Adjustment for FOCUS (See FIG.3)

- 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.



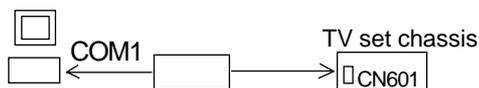
x. Adjustment with computer

INTRODUCTION

"UBM" is an adjustment program for colour TV set which use NN5199K/NN5198K as the chroma I.C.. This program controls the TV set 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 your computer.
3. Connect the computer and connect the adjustment cable from computer to the TV chassis at vocation CN601 as following:



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

CHOICE CPU PROGRAM

Use keys “ ← → ” in the computer to select the software program named UBM, then press 'ENTER' key in the computer, the screen will display:

ZHONG SHAN KAWA ELECTRONIC RESEARCH & DEVELOPMENT CENTER
AUTO ADJUSTMENT FOR COLOUR TV SET (VERSION V1.00 FOR)

CPU Program Name:
UBM UBMT

Your Computer is: PC/AT 80386 33MHz
If Information of Your Computer not Right, Please Run SELF TEST.
Use ↑, ↓ Key to Select Options, Enter to Confirm or Esc to Quit.

This is the main menu for adjustment and the different data can be changed and viewed.

It consists of following functions.

- | | |
|-----------------------------|----------------------------------|
| A. WHITE BALANCE ADJUSTMENT | D. PC SELF TEST |
| B. SETUP | E. WHITE BALANCE PARAMETER SETUP |
| C. READ EEPROM | F. EXIT |

ZHONG SHAN KAWA ELECTRONIC RESEARCH & DEVELOPMENT CENTER
AUTO ADJUSTMENT FOR COLOUR TV SET (VERSION V1.00 FOR)

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

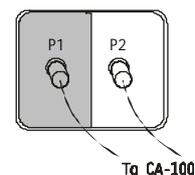
Your Computer is: PC/AT 80386 33MHz
If Information of Your Computer not Right, Please Run SELF TEST.
Use ↑, ↓ Key to Select Options, Enter to Confirm or Esc to Quit.

Function A: WB AUTO ADJUST

Before enter to WB AUTO ADJUST, make sure the WB setup (Function 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 set IIC interface
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 a dim line on the screen, then back to normal mode.
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.



Automatic White Balance Adjustment for UBM
 Parameter: COM1: 9600, E, 7, 2 / PAL / Probe1 = Low, Probe2 = High

<div style="border: 1px solid black; width: 40px; height: 40px; margin: 0 auto; display: flex; align-items: center; justify-content: center;"> <div style="border: 1px solid black; width: 20px; height: 20px; display: flex; align-items: center; justify-content: center;">+</div> </div> <p style="text-align: center;">LOW</p> <table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%;">STD</td> <td style="width: 50%;">TEST</td> </tr> <tr> <td>x = 288</td> <td>x =</td> </tr> <tr> <td>y = 298</td> <td>y =</td> </tr> <tr> <td>Y = 7.5</td> <td>Y =</td> </tr> </table>	STD	TEST	x = 288	x =	y = 298	y =	Y = 7.5	Y =	<div style="border: 1px solid black; width: 40px; height: 40px; margin: 0 auto; display: flex; align-items: center; justify-content: center;"> <div style="border: 1px solid black; width: 20px; height: 20px; display: flex; align-items: center; justify-content: center;">+</div> </div> <p style="text-align: center;">HIGH</p> <table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%;">STD</td> <td style="width: 50%;">TEST</td> </tr> <tr> <td>x = 288</td> <td>x =</td> </tr> <tr> <td>y = 298</td> <td>y =</td> </tr> <tr> <td>Y = 160</td> <td>Y =</td> </tr> </table>	STD	TEST	x = 288	x =	y = 298	y =	Y = 160	Y =
STD	TEST																
x = 288	x =																
y = 298	y =																
Y = 7.5	Y =																
STD	TEST																
x = 288	x =																
y = 298	y =																
Y = 160	Y =																

Press Space Bar to Continue.

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 preset 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.

Function 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.

Channel File not Found!
Press enter to Continue.

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.**

Colour TV Cahnnel Parameter Setup

Search: ST24C0X DATA FILE

Please Select What Kinds of EEPROM You Want to Setup

	(24C02)
UBM/UBMT	(24C04)
	(24C08)

INFORMATION

There are 1 kind in the disk only, so you have not choice to select another. If it is what you need, please press Enter, start to send DATA to EEPROM. Other-wise, please press ESC to quit, run READ EEPROM and get new channel DATA from good color TV.

Use Enter to Confirm, Esc to Quit, to Select

Function 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 or b) 24C04, then the program will ask for confirmation to read. After that, it will show the values of EEPROM, the user can save it by press «Enter» and enter the model name.

Colour TV Channel Parameter Gather

----- NOTE -----

This part is used to gather parameter of Colour TV channel.
The Colour TV you use must have been adjusted by technician and passed by EQ. Make sure the EEPROM in your Colour TV is 24C02 (BSAV02 W/O Name) or 24C04 (UBM). Please use - to select one and press Enter to Start or press Esc to Quit.

24C02
24C04 (UBM/UBMT)
24C08

Use Enter to Confirm, Esc to Quit, to Select

Function 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.

Computer and Output Test

Test Finished, Now Create Report

Your Computer is :
computer Name : IBM PC/AT
Main Processor : Intel 80486
CPU Speed : 332MHz

User Parameters Setup

SCL/SDA Pulse Width: 91 (4.7µS = 91)
IIC BUS Write Delay: 51 (1.5µS = 38)
IIC BUS Connected With: LPT1 (Total 1 port)
CA-100 Connected With: COM1 (Total 2 ports)
Serial Port Buad Rate: 9600 (Total 5 kinds)
<Buad Rate = 19200, 9600, 4800, 2400, 1200>

Use Enter to Confirm or Esc to Quit

Function E: WB PARMS SETUP

The function of "WB PARMS SETUP" is to preset a group of data which for the Function A "WB AUTO ADJUST" Chromatic 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) Δ X = Acceptable tolerance of x
 - e) Δ Y = Acceptable tolerance of y
 - f) Δ Y = Acceptable tolerance of Y
 - g) Max time = Max time for adjustment
 - h) Luminance level offer adjust = low Bright luminance
 - i) Color = Color of NN5198K/NN5199K
 - J) Tint = Tint of NN5198K/NN5199K
 - 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 NN5198K/NN5199K

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

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

Maximum time = 30 Sec

Luminance level after adjustment: 14

Model : UBM

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

Function F: EXIT TO DOS

Just exit the adjustment program and back to dos environment.

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

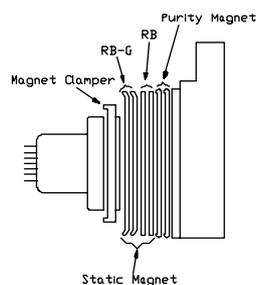
i. Colour Purity Adjustment (See FIG.4)

BEFORE ANY ADJUSTMENTS 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.4)

- a. Receive a dotted pattern.
- b. Unfix the convergence magnet clumper 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 clumper.
- 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.4)

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 C919 and GND. The read-out on the voltmeter should be $+B \pm 1V$. If the result is not satisfactory, adjust VR901 to make the voltage to be $+B \pm 1V$.

C. Important notice

THE AKAI MODELS TABLED BELOW MUST BE PRESET TO **PAL "BG" SOUND SYSTEM** AT FACTORY BEFORE SHIPMENT.

(THEY AREN'T AKAI MODELS NOW.)

PROCEDURE:

- (1) TO MAKE 'MASTER' EEPROM WITH 1-99 CHANNELS PRESET IN PAL 'BG' SOUND SYSTEM (1-99 CHANNELS CAN BE 'MEMORIZED, IN PAL 'BG' SOUND SYSTEM ONE BY HAND)
- (2) WITH THIS 'MASTER' EEPROM TO DUPLICATE OTHER EEPROM FOR ABOVE MODELS.

IN PRODUCTION LINE:

- (1) INSERT THE DUPLICATED EEPROM INTO MAIN PCB OF ABOVE MODEL.
- (2) ONLY USE THE FIRST 40 CHANNELS FOR TESTING AND EVALUATION WITH CENTRAL SYSTEM SIGNAL, CABLE CHANNELS OR SIGNAL FROM PATTERN GENERATOR.
- (3) AT FINAL STAGE, TO SET THE SOUND SYSTEM OF THE TV SET 'BG' SYSTEM AND FEED CENTRAL SYSTEM SIGNAL TO THE TV SET, PERFORM THE 'APS' TUNING AGAIN IN SAME PROCEDURE AS DESCRIBED IN THE OPERATION MANUAL. THIS CAN GUARANTEE ALL CHANNELS ARE 'BG' SYSTEM.

IX. Transistor and IC Identification

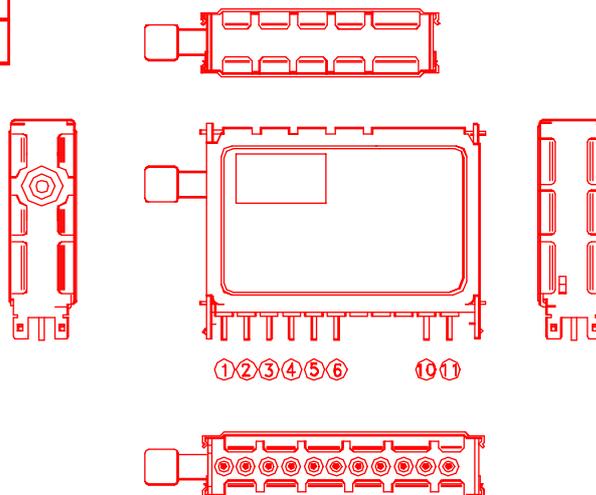
A. Main Unit

	AVS1BCP08 KS24C04		2SC2482 2SA1013 2SC1384 2SD400		AN5265		2SC1317 2SA1015 2SC1815Y		AVS08CB
	AN5198K AN5199K		KS88C8424		AN5539		SF5J42		2SD2498 2SD2499
	74HC4052N HCF4052BE								

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

KS51840 KS51850	2SC2001K/L

X. Schematic Diagram

(Please refer to 21W3-005.pdf)

IX. Component Diagrams

i. Main & CRT PCB Component Diagram (Top View)

(Please refer to E3701-980010A5&B5.pdf)

Main & CRT PCB Component Diagram (Bottom View)

(Please refer to E3701-980010A5&B5.pdf)

ii. AV PCB Component Diagram (For 21A9BN34)

(Please refer to E3701-980060.pdf)

Top View

Bottom View

iii. Remote Handset PCB Component Diagram

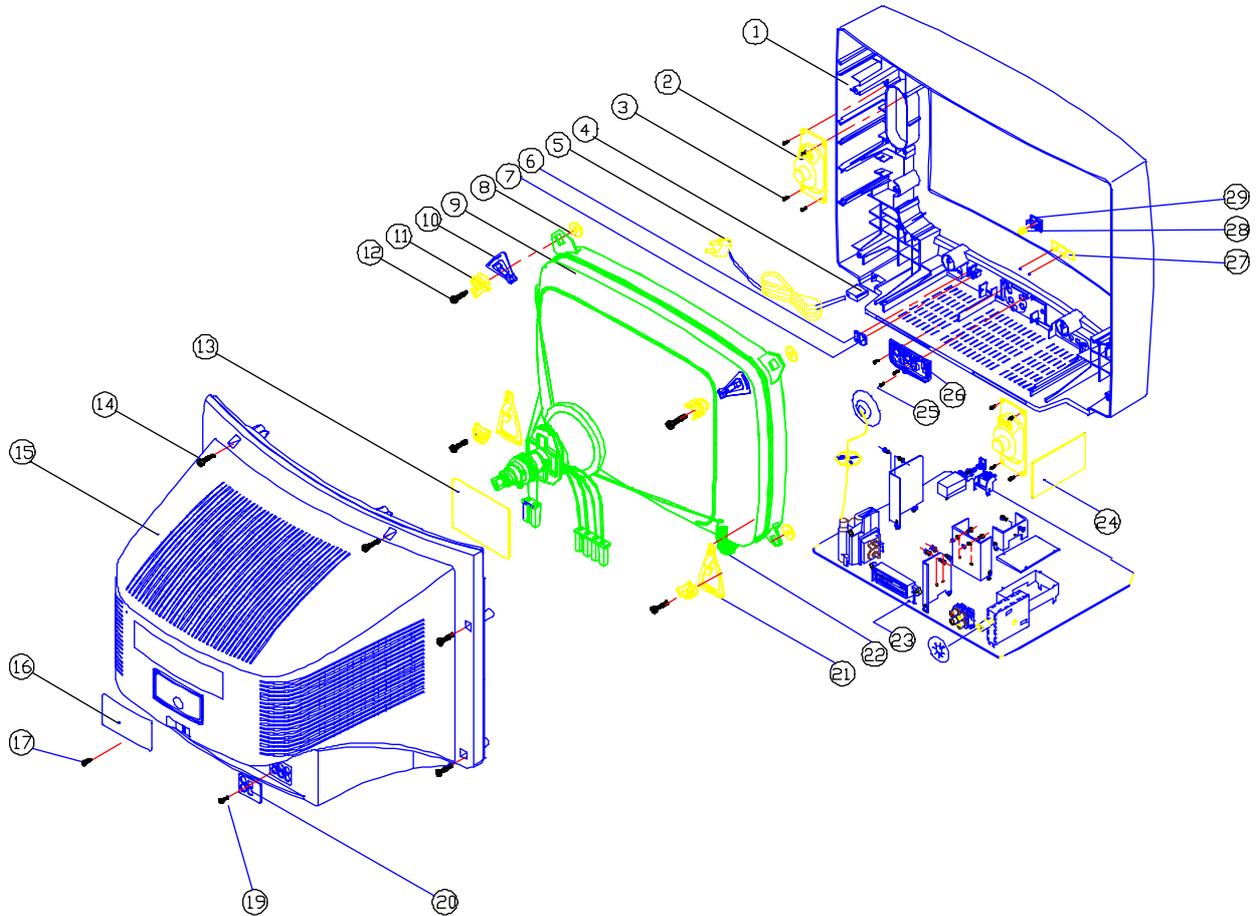
(Please refer to E3741-980040)

Top View

Bottom View

XII. Exploded View Diagram and parts list

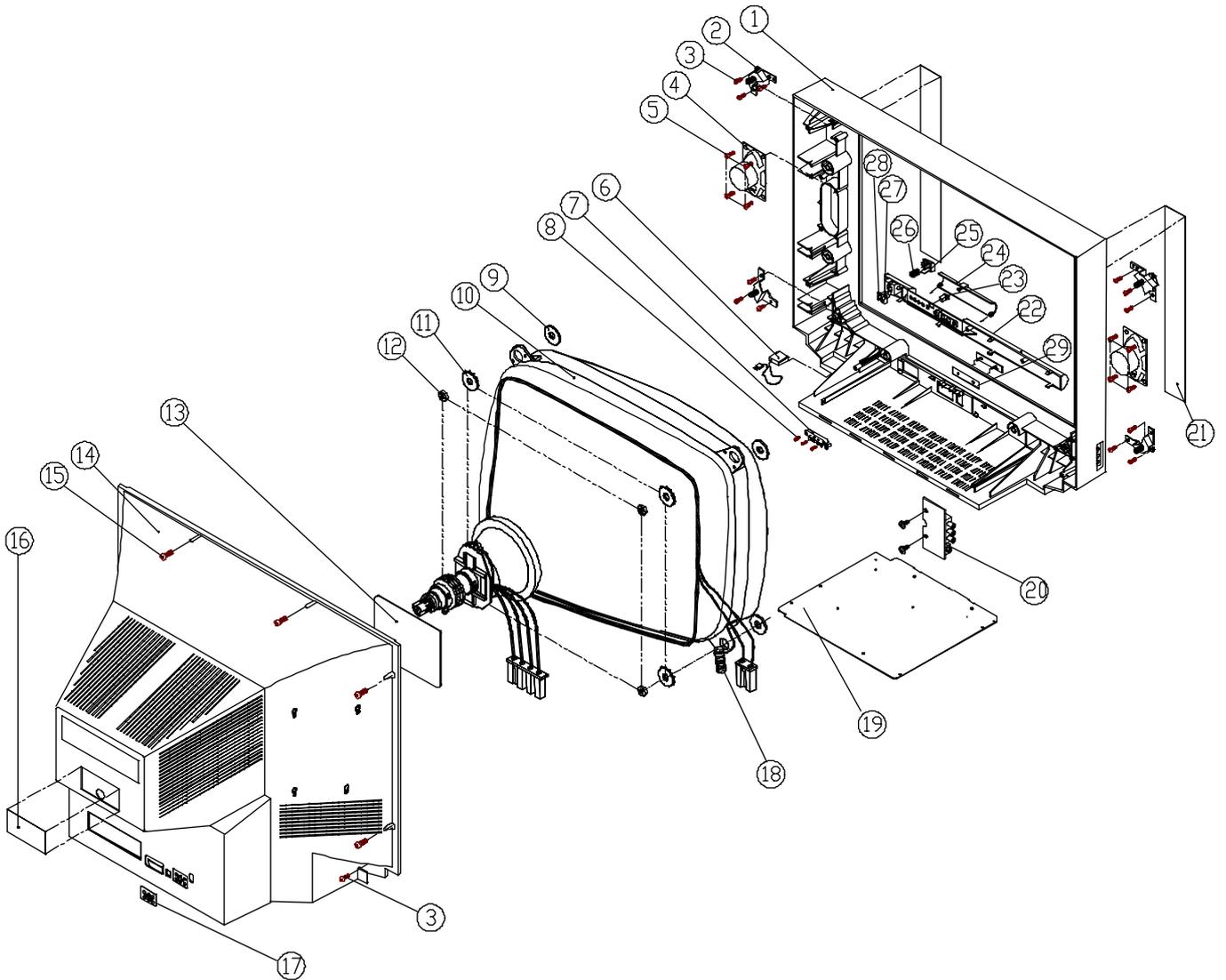
A. Unit set (for 21W3)



Parts List for Exploded View Diagram

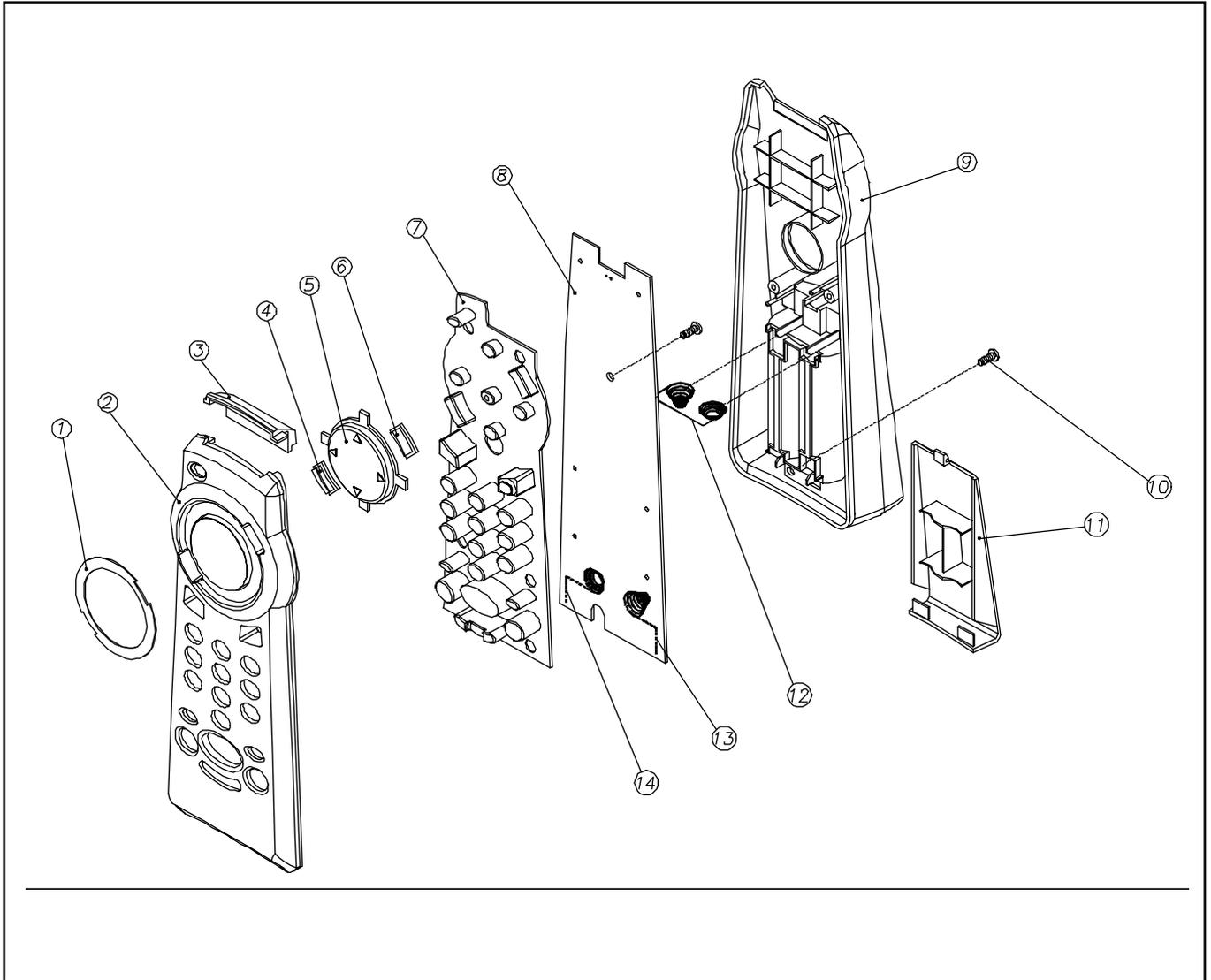
Item	Part NO.	Description	QTY.	Item	Part NO.	Description	QTY.
1	200-	CAB. Front BLK.	1	16	412-	Model Plate	1
2	E4801-	Speaker	2	17	614-	S-Tap Screw B/T 4X12MM	1
3	614-	S-Tap Screw B/T 4X10	8	19	611-	Screw	1
4	254-	Power Cord Clip Black HI-PS	1	20	389-	AV PVC Sheet	1
5		AC Power Line	1	21	259-	Degaussing Coil Clip Nylon	2
6	263-	Power Lens	1	22	477-	CRT Spring	1
7	263-	Sensor Lens	1	23	E3701-	Main PCB	1
8	334-	Rubber Ring (T=2.00MM)	4	24	E3701-	Power PCB	1
9	102-	CRT	1	25	612-	S-Tap Screw W/T 3X10MM	3
10	259-	Degaussing Coil Clip	2	26	277-	Function Key Black ABS	1
11	229-	CRT MTG Clip White Nylon	4	27	411-	N/P Aluminum	1
12	614-	S-Tap Screw B/T 5X30MM White	4	28	477-	Compression Spring	1
13	090-	CRT PCB	1	29	292-	Power Knob Black ABS	1
14	614-	S-Tap Screw B/T 5X25MM Black	6				
15	202	Black Cabinet Black HI-PS	1				

(for 21A9)



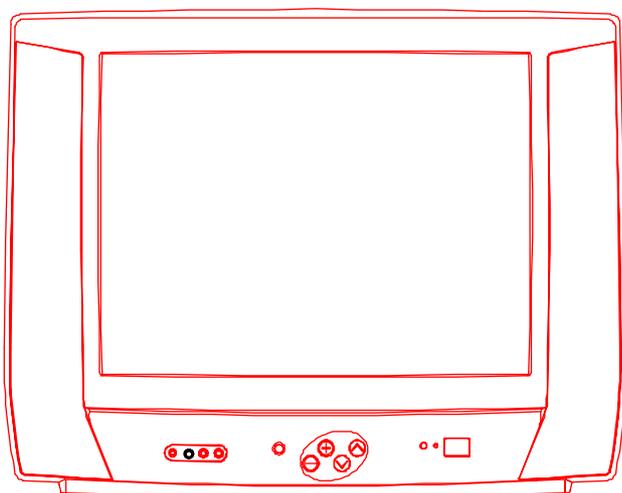
Item	Part No.	Description	Qty.	Item	Part No.	Description	Qty.
1	200-	Front CAB.	1	16	389-	Model Plate	1
2	423-	MTB. CRT	4	17	389-	Cover Plate	1
3	614-	S-TAP Screw 5X16MM	14	18	477-	SPG+CRT	2
4	E4801-	SPEAKER	2	19		Main PCB ASS'Y	1
5	614-	S-TAP Screw BID 4X8	8	20		RCA PCB	1
6	254-	CLP CRD PWR	1	21	832-	Speaker Net	2
7	277-	Function Key	1	22	230-	Front Panel	1
8	612-	S-TAP Screw WHR 3X10	3	23	702-	Door Lock	1
9	376-	Ring	4	24	237-	Push Door	1
10	102-	CRT	1	25	279-	Power Knob	1
11	639-	WHR+CRT 4D	4	26	477-	Compressing Spring	1
12	620-	Nut 6x10x5.4D	4	27	269-	Sensor Lens	1
13		CRT PCB ASS'Y	1	28	269-	Power Lens	1
14	202-	Cabinet Back	1	29	486-	Name Plate	1
15	614-	S-TAP Screw WHR 5X25	6				

B. Remote handset

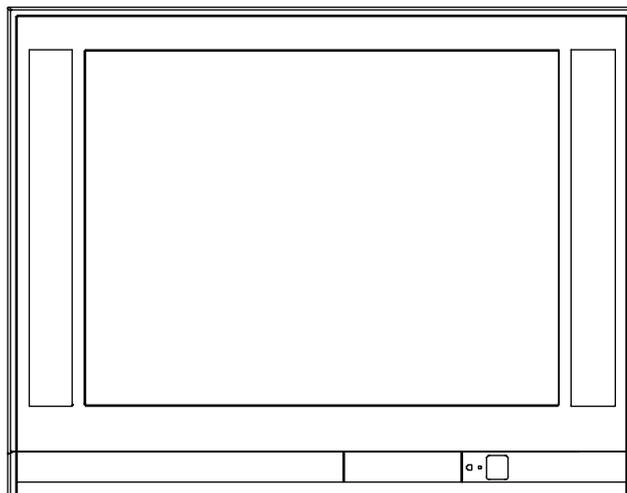


Item	Part No.	Description	Qty.
1	384-	Overlay RCN	1
2	201-	CAB. TP	1
3	263-	Lens FR	1
4	279-	KB	1
5	279-	KB	1
6	279-	KB	1
7	373-	Conductive Rubber	1
8	E3741-	PCB Handset	1
9	203-	CAB. BM	1
10	610-	TS RND2.6X8	2
11	210-	DR BAT	1
12	474-	SPG BAT AA+-	1
13	474-	SPG BAT AA-	1
14	474-	SPG BAT AA+	1

SERVICE MANUAL



21W3 BN37



21A9 BN34

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This manual is the latest at the time of printing, and does not include the modification which may be made after the printing, by the constant improvement of product.