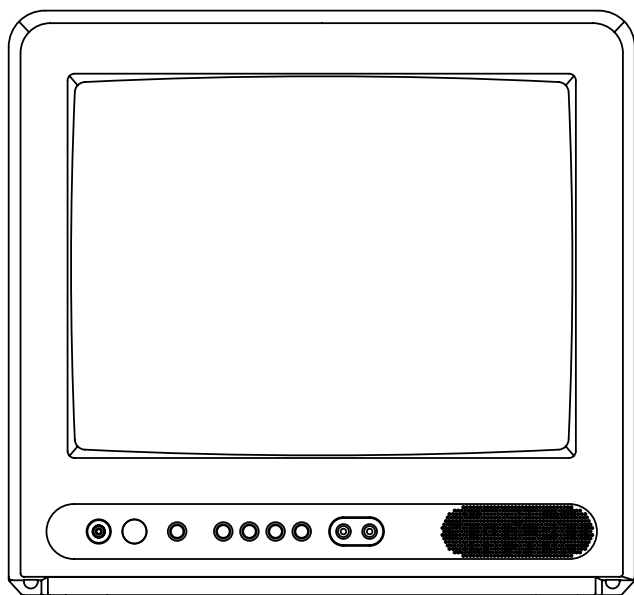


# Service Manual

Color Television

Main Manual



Panasonic

Models

CT-13R17B

CT-13R27W

CT-13R37S

Chassis

TMB535

TMB535

TMB535

This service manual is issued as a service guide for the models listed above. Included in this manual are a set of schematic, block diagrams, functional descriptions, alignment procedures, disassembly procedures and a complete parts list.

**“WARNING!** This Service Manual is designed for experienced repair technicians only and is not designed for use by the general public. It does not contain warnings or cautions to advise non-technical individuals of potential dangers in attempting to service a product. **Products powered by electricity should be serviced or repaired only by experienced professional technicians.** Any attempt to service or repair the product or products dealt with in this Service Manual by anyone else could result in serious injury or death.”

The service technician is required to read and follow the “**Safety Precautions**” and “**Important Safety Notice**” in this Main Manual.


# Panasonic®

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# Important Safety Notice

Special components are used in this television set which are important for safety. These parts are identified on the schematic diagram by the symbol  and printed in **BOLD TYPE** on the replacement part list. It is essential that these critical parts are replaced with the manufacturer's specified replacement part to prevent X-ray radiation, shock, fire or other hazards. Do not modify the original design without the manufacturer's permission.

## Safety Precautions

### General Guidelines

An **Isolation Transformer** should always be used during the servicing of a receiver whose chassis is not isolated from AC power line. Use a transformer of adequate power rating as this protects the technician from accidents resulting in personal injury from electrical shocks. It will also protect the Receiver from being damaged by accidental shorting that may occur during servicing.

When servicing, observe the original lead dress, especially in the high voltage circuit. Replace all damaged parts (also parts that show signs of overheating.)

**Always Replace Protective Devices**, such as fishpaper, isolation resistors and capacitors, and shields after servicing the Receiver. Use only manufacturer's recommended rating for fuses, circuits breakers, etc. High potentials are present when this Receiver is operating. Operation of the Receiver without the rear cover introduces danger for electrical shock. Servicing should not be performed by anyone who is not thoroughly familiar with the necessary precautions when servicing high-voltage equipment.

**Extreme care** should be practiced when **Handling the Picture Tube**. Rough handling may cause it to implode due to atmospheric pressure. (14.7 lbs per sq. in.). Do not nick or scratch the glass or subject it to any undue pressure. When handling, use safety goggles and heavy gloves for protection. **Discharge the picture tube** by shorting the anode to chassis ground (not to the cabinet or to other mounting hardware). When discharging connect cold ground (i.e. dag ground lead) to the anode with a well insulated wire or use a grounding probe. Avoid prolonged exposure at close range to unshielded areas of the picture tube to prevent exposure to X-ray radiation.

The **Test Picture Tube** used for servicing the chassis at the bench should incorporate safety glass and magnetic shielding. The safety glass provide shielding for the tube viewing area against X-ray radiation as well as implosion. The magnetic shield limits the X-ray radiation around the bell of the picture tube in addition to the restricting magnetic effects. When using a picture tube test jig for service, ensure that the jig is capable of handling **50kV** without causing X-ray radiation.

**Before returning a serviced receiver to the owner**, the service technician must thoroughly test the unit to ensure that is completely safe to operate. **Do not use a line isolation transformer when testing.**

### Leakage Current Cold Check

Unplug the AC cord and connect a jumper between the two plug prongs.

Measure the resistance between the jumpered AC plug and expose metallic parts such as screwheads, antenna terminals, control shafts, etc. If the exposed metallic part has a return path to the chassis, the reading should be between 240k $\Omega$  and 5.2M $\Omega$ . If the exposed metallic part does not have a return path to the chassis, the reading should be infinite.

### Leakage Current Hot Check (Fig. 1)

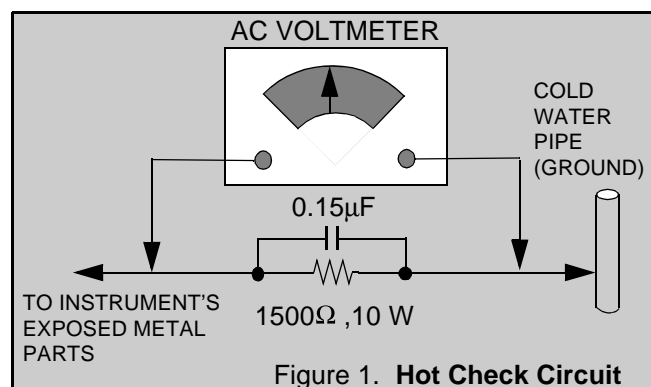
Plug the AC cord directly into the AC outlet. Do not use an isolation transformer during the check.

Connect a 1.5k $\Omega$  10 watt resistor in parallel with a 0.15 $\mu$ F capacitor between an exposed metallic part and ground. Use earth ground, for example a water pipe.

Using a DVM with a 1000 ohms/volt sensitivity or higher, measure the AC potential across the resistor.

Repeat the procedure and measure the voltage present with all other exposed metallic parts.

Verify that any potential does not exceed 0.75 volt RMS. A leakage current tester (such a Simpson Model 229, Sencore Model PR57 or equivalent) may be used in the above procedure, in which case any current measure must not exceed 0.5 milliamp. If any measurement is out of the specified limits, there is a possibility of a shock hazard and the Receiver must be repaired and rechecked before it is returned to the customer.



### X-ray Radiation

**WARNING:** The potential source of X-ray radiation in the TV set is in the High Voltage section and the picture

**Note:** It is important to use an accurate, calibrated high voltage meter.

Set the **brightness and picture** controls to Minimum. Measure the High Voltage. The high voltage should be **24.5  $\pm$  1.0kV**. If the upper limit is out of tolerance, immediate service and correction is required to insure safe operation and to prevent the possibility of premature component failure.

# Service Notes

**Note: These components are affixed with glue. Be careful not to break or damage any foil under the component or at the pins of the ICs when removing. Usually applying heat to the component for a short time while twisting with tweezers will break the component loose.**

## Leadless Chip Component (surface mount)

Chip components must be replaced with identical chips due to critical foil track spacing. There are no holes in the board to mount standard transistors or diodes. Some chips capacitor or resistor board solder pads may have holes through the board, however the hole diameter limits standard resistor replacement to 1/8 watt. Standard capacitor may also be limited for the same reason. It is recommended that identical components be used.

Chip resistor have a three digit numerical resistance code - 1st and 2nd significant digits and a multiplier.

Example: 162 = 1600 or 1.6k $\Omega$  resistor, 0 = 0 $\Omega$  (jumper). Chip capacitors generally do not have the value indicated on the capacitor. The color of the component indicates the general range of the capacitance.

Chip transistors are identified by a two letter code. The first letter indicates the type and the second letter, the grade of transistor.

Chip diodes have a two letter identification code as per the code chart and are a dual diode pack with either common anode or common cathode. Check the parts list for correct diode number.

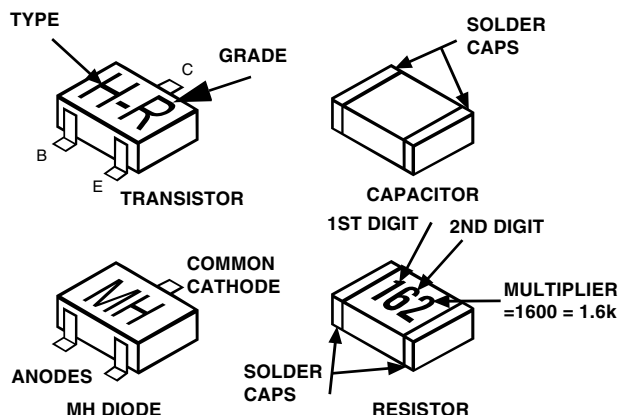
## Component Removal

1. Use solder wick to remove solder from component end caps or terminal.
2. Without pulling up, carefully twist the component with tweezers to break the adhesive.
3. Do not reuse removed leadless or chip components since they are subject to stress fracture during removal.

## Chip Component Installation

1. Put a small amount of solder on the board soldering pads.
2. Hold the chip component against the soldering pads with tweezers or with a miniature alligator clip and apply heat to the pad area with a 30 watt iron until solder flows. Do not apply heat for more than 3 seconds.

### Chip Components

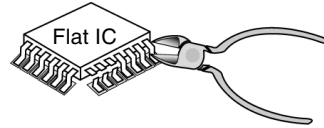


## How to Replace Flat-IC

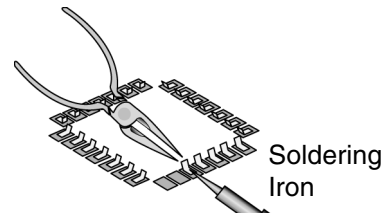
### - Required Tools -

- Soldering iron
- Needle nose pliers
- Wire cutters (sharp & small)
- De-solder braids
- Magnifier

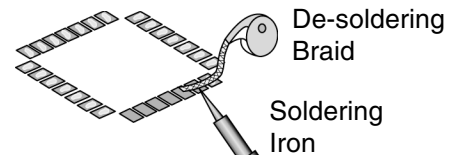
1. Cut the pins of a defective IC with wire cutters. Remove IC from board. If IC is glued to the board, heat the IC and release the IC. See Note above.



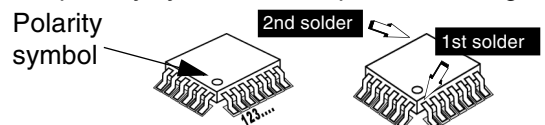
2. Using soldering iron and needle nose pliers remove the IC pins from the board.



3. Using de-soldering braid and soldering iron remove solder from affected area on board (pads).

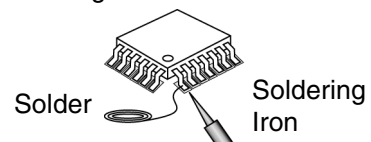


4. Position the new Flat-IC in place (apply the pins of the Flat-IC to the soldering pads where the pins need to be soldered). Determine the positions of the soldering pads and pins by correctly aligning the polarity symbol. Solder pin #1 first, align the IC.

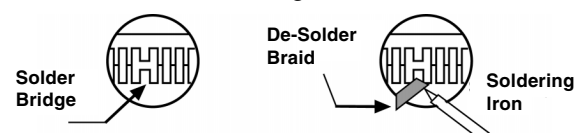


Solder the pin opposite to pin #1. This will assist positioning the IC.

5. Solder all pins to the soldering pads using a fine tipped soldering iron.



6. Check with a magnifier for solder bridge between the pins or for dry joint between pins and soldering pads. To remove a solder bridge, use a de-solder braid as shown in the figure below.



## Service Notes (Continued)

**IMPORTANT:** To protect against possible damage to the solid state devices due to arcing or static discharge, make certain that all ground wires and CTR DAG wire are securely connected.

**CAUTION:** The power supply circuit is above earth ground and the chassis cannot be polarized. Use an isolation transformer when servicing the Receiver to avoid damage to the test equipment or to the chassis. Connect the test equipment to the proper ground (  $\nabla$  ) or (  $\nearrow$  ) when servicing, or incorrect voltages will be measured.

**WARNING:** This Receiver has been designed to meet or exceed applicable safety and X-ray radiation protection as specified by government agencies and independent testing laboratories.

To maintain original product safety design standards relative to X-ray radiation and shock and fire hazard, parts indicated with the symbol  $\triangle$  on the schematic must be replaced with identical parts. Order parts from the manufacturer's parts center using the parts numbers shown in this service manual, or provide the chassis number and the part reference number.

For optimum performance and reliability, all other parts should be replaced with components of identical specification.

## GENERAL SPECIFICATIONS

G-1	TV System	CRT	CRT Size / Visual Size	13 inch / 335.4mmV
			CRT Type	Normal
			Deflection	90 degree
			Magnetic Field BV/BH	+0.45G/0.18G
		Color System		NTSC
		Speaker		1Speaker
			Position	Bottom
			Size	1.5X2.5 Inch
			Impedance	8 ohm
			Sound Output	MAX 1.0 W 10%(Typical) 0.8 W
	NTSC3.58+4.43 /PAL60Hz		No	
G-2	Tuning System	Broadcasting System		US System M
		Tuner and Receive CH	System	1Tuner
			Destination	Others
			Tuning System	F-Synth
			Input Impedance	VHF/UHF 75 ohm
			CH Coverage	2 - 69, 4A, A-5 - A-1, A - I, J - W, W+1 - W+84
		Intermediate Frequency	Picture(FP) Sound(FS) FP-FS	45.75MHz 41.25MHz 4.50MHz
		Preset CH		No
		Stereo/Dual TV Sound		No
			Tuner Sound Muting	Yes
G-3	Power	Power Source	AC DC	120V AC 60Hz -
		Power Consumption		at AC  54 W at AC 120 V 60 Hz 3 W at AC 120 V 60 Hz -- kWh/Year
			Stand by (at AC) Per Year	
		Protector	Power Fuse	Yes
G-4	Regulation	Safety		UL
		Radiation		FCC
		X-Radiation		DHHS
G-5	Temperature	Operation		0oC ~ +40oC
		Storage		-20oC ~ +60oC
G-6	Operating Humidity			Less then 80% RH
G-7	On Screen Display	Menu		Yes
		Menu Type		Picture(Matsusita Type)
		Picture		Yes
			Contrast(Picture)	Yes
			Brightness	Yes
			Color	Yes
			Tint	Yes
			Sharpness	Yes
			Normal	Yes
		Audio		No
			Bass	No
			Treble	No
			Balance	No
			BBE On/Off	No
			Stable Sound On/Off	No
		SET UP		Yes
			Language	Yes
			Mode	Yes
			Auto Program	Yes
			Manual Program	Yes
			CC	Yes
		Timer		Yes
		Lock		Yes
		Exit		Yes
			CH Label	No
			Favorite CH	No
			Color Stream DVD/DTV	No
		Control Level		Yes
			Sound	Yes
			Brightness	Yes
			Contrast(Picture)	Yes
			Color	Yes
			Tint (NTSC Only)	Yes
			Sharpness	Yes
			Tuning	No
			Bass	No
			Treble	No
			Balance	No
			Back Light	No
			Stereo,Audio Output,SAP	No
	Video(Aux)	Yes		
	Color Stream	No		
	Channel(TV/Cable)	Yes		
	CH Label	No		
	Sound Mute	Yes		
	V-chip Rating	Yes		

# GENERAL SPECIFICATIONS

G-8	OSD Language	OSD Language Setting		English	French	Spanish
G-9	Clock and Timer	Sleep Timer	Max Time	120 Min		
		On/Off Timer	Step	10 Min		
		Wake Up Timer	Program(On Tim / Off Tim)	No		
		Timer Back-up (at Power Off Mode)	more than	No		
G-10	Remote Control	Unit		--	Min	Sec
		Glow in Dark Remocon		RC-FF		
		Format		No		
		Custom Code		KASEIKYO		
		Power Source	Voltage(D.C)	08-00 h		
			UM size x pcs	3V		
		Total Keys		UM-3(AA) x 2 pcs		
		Keys		20 Keys		
			Power	Yes		
			1	Yes		
			2	Yes		
			3	Yes		
			4	Yes		
			5	Yes		
			6	Yes		
			7	Yes		
			8	Yes		
			9	Yes		
			0	Yes		
			100	No		
			CH Up(UP)	Yes		
			CH Down(DOWN)	Yes		
			Volume Up(Right)	Yes		
			Volume Down(Left)	Yes		
			TV/Caption/Text	No		
			CH1/CH2	No		
			TV/Video(TV/AV)	Yes		
			CH RTN/CH ENT(Quick View)	Yes		
			Sleep	No		
			RE Call(Call)	Yes		
			Reset	No		
			Menu	No		
			Enter	No		
			Mute	Yes		
			Action	Yes		
			Exit	No		
			MTS(Audio Select)	No		
			Set +	No		
			Set -	No		
G-11	Features	Auto Degauss		Yes		
		Auto Shut Off		Yes		
		Canal+		No		
		CATV		Yes		
		Anti-theft		No		
		Rental		No		
		Memory(Last CH)		Yes		
		Memory(Last Volume)		Yes		
		V-Chip		Yes		
			Type	USA,ORION Type		
		BBE		No		
		Auto Search		No		
		CH Allocation		No		
		SAP		No		
		Just Clock Function		No		
		CH Label		No		
		VM Circuit		No		
		Full OSD		No		
		Premiere		No		
		Comb Filter		No		
				Lines		
		Auto CH Memory		Yes		
		Hotel Lock		No		
		Closed Caption		Yes		
		Stable Sound		No		
		FBT Leak Test Protect		Yes		
		CH Lock		No		
		Video Lock		No		
		Game Timer		No		
		Power On Memory		Yes		
		Energy Star		Yes(Buyer's Responsibility)		
		Favorite CH		No		

## GENERAL SPECIFICATIONS

G-12	Accessories	Owner's Manual		Language	English/Spanish	
				W/ Warranty	Yes	
		Remote Control Unit			Yes	
		Rod Antenna			Yes	
				Poles	1Poles	
				Terminal		
		Loop Antenna			No	
				Terminal	-	
		U/V Mixer			No	
		DC Car Cord (Center+)			No	
		Guarantee Card			No	
		Warning Sheet			No	
		Circuit Diagram			No	
		Antenna Change Plug			No	
		Service Facility List			No	
		Important Safety Instruction			Yes	
		Dew/AHC Caution Sheet			No	
		AC Plug Adapter			No	
		Quick Set-up Sheet			No	
		Battery			Yes	
				UM size x pcs	UM3(AA) x 2	
				OEM Brand	Yes	
		AC Cord			No	
		AV Cord (2Pin-1Pin)			No	
		Registration Card (NDL Card)			No	
		ESP Card			No	
		PTB Sheet			No	
		300 ohm to 75 ohm Antenna Adapter			No	
G-13	Interface	Switch	Front	Power	Yes	
				System Select	No	
		Main Power SW	No			
		Sub Power	No			
		CH Up(UP)	Yes			
		CH Down(DOWN)	Yes			
		Volume Up(Right)	Yes			
		Volume Down(Left)	Yes			
		ACTION=Volume Up+Volume Down	Yes			
		Rear	AC/DC	No		
			TV/CATV Selector	No		
			Degauss	No		
			Main Power SW	No		
		Indicator	Power	No		
			Stand-by	No		
			On Timer	No		
		Terminals	Front	Video Input	RCA RCA x 1 Ear Phone	
				Audio Input		
		Other Terminal				
		Rear	Video Input(Rear1)	No		
			Video Input(Rear2)	No		
			Audio Input(Rear1)	No		
			Audio Input(Rear2)	No		
			Video Output	No		
			Audio Output	No		
			Euro Scart	No		
			Color Stream	No		
			Diversity	No		
			Ext Speaker	No		
			DC Jack 12V(Center +)	No		
			VHF/UHF Antenna Input	F Type		
			AC Outlet	No		
G-14	Set Size		Approx. W x D x H (mm)			359.4 x 354 x 337
G-15	Weight	Net (Approx.)			9.5 kg ( 20.9 lbs)	
		Gross (Approx.)			11.0kg ( 24.4lbs)	
G-16	Carton	Master Carton				No
			Content			---- Sets
			Material			-- /--
			Dimensions W x D x H(mm)			-- x -- x --
			Description of Origin			No
		Gift Box				Yes
			Material			Double/White
			Dimensions W x D x H(mm)			440 x 408 x 396
			Design			As per Buyer's
			Description of Origin			Yes
		Drop Test				Natural Dropping At 1 Corner / 3 Edges / 6 Surfaces
			Height (cm)			62
		Container Stuffing			725	Sets/40' container
G-17	Cabinet Material	Cabinet Front			PS 94V0 DECABROM	
		Cabinet Rear			PS 94V0 DECABROM	



# DISASSEMBLY INSTRUCTIONS

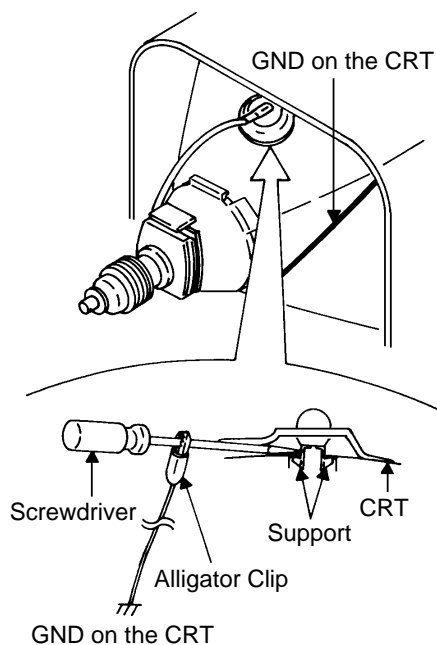
## 1. REMOVAL OF ANODE CAP

Read the following **NOTED** items before starting work.

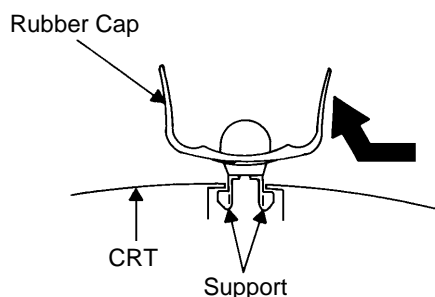
- \* After turning the power off there might still be a potential voltage that is very dangerous. When removing the Anode Cap, make sure to discharge the Anode Cap's potential voltage.
- \* Do not use pliers to loosen or tighten the Anode Cap terminal, this may cause the spring to be damaged.

### REMOVAL

1. Follow the steps as follows to discharge the Anode Cap.  
Connect one end of an Alligator Clip to the metal part of a flat-blade screwdriver and the other end to ground. While holding the plastic part of the insulated Screwdriver, touch the support of the Anode with the tip of the Screwdriver.  
A cracking noise will be heard as the voltage is discharged.



2. Flip up the sides of the Rubber Cap in the direction of the arrow and remove one side of the support.



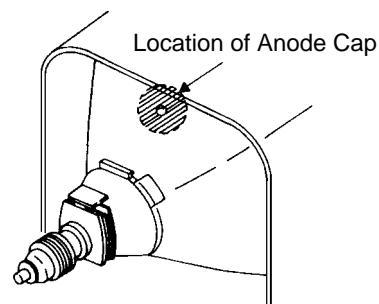
3. After one side is removed, pull in the opposite direction to remove the other.

### NOTE

Take care not to damage the Rubber Cap.

## INSTALLATION

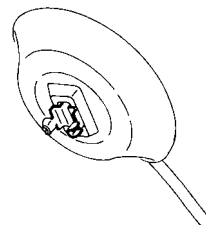
1. Clean the spot where the cap was located with a small amount of alcohol.



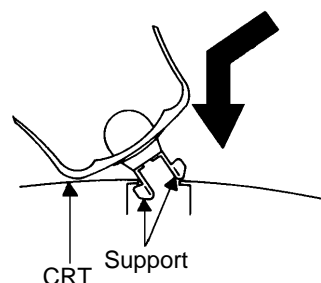
### NOTE

Confirm that there is no dirt, dust, etc. at the spot where the cap was located.

2. Arrange the wire of the Anode Cap and make sure the wire is not twisted.
3. Turn over the Rubber Cap.



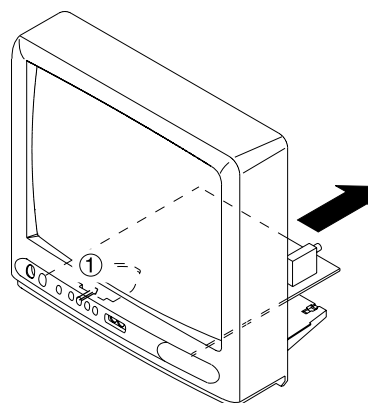
4. Insert one end of the Anode Support into the anode button, then the other as shown in the figure below.



5. Confirm that the Support is securely connected.
6. Put on the Rubber Cap without moving any parts.

## 2. NOTE FOR THE REMOVAL OF THE MAIN PCB

When the removal of the Main PCB, remove the hook ① first, then draw it in the direction of the arrow.



## SERVICE MODE LIST

This unit provided with the following SERVICE MODES so you can repair, examine and adjust easily.  
To enter the Service Mode, press both set key and remote control key for more than 1 second.

Set Key	Remocon Key	Operations
VOL. (-) MIN	0	Releasing of V-CHIP PASSWORD.
VOL. (-) MIN	1	User Reset. NOTE: If you set a factory initialization, the memories are reset such as the channel setting, and the POWER ON total hours.
VOL. (-) MIN	3	Remocon code selection. NOTE: If you perform the remocon code selection, the remocon cannot be used. So, do not select the remocon code for the normal servicing.
VOL. (-) MIN	6	POWER ON total hours is displayed on the screen. Refer to the "CONFIRMATION OF HOURS USED".  Can be checked of the INITIAL DATA of MEMORY IC. Refer to the "WHEN REPLACING EEPROM (MEMORY) IC".
VOL. (-) MIN	9	Display of the Adjustment MENU on the screen. Refer to the "ELECTRICAL ADJUSTMENT" (On-Screen Display Adjustment).

## CONFIRMATION OF HOURS USED

POWER ON total hours can be checked on the screen. Total hours are displayed in 16 system of notation.

**NOTE: If you set a factory initialization, the total hours is reset to "0".**

1. Set the VOLUME to minimum.
2. Press both VOL. DOWN button on the set and Channel button **(6)** on the remote control for more than 1 second.
3. After the confirmation of using hours, turn off the power.

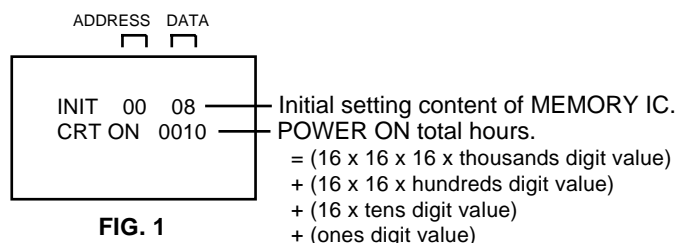


FIG. 1

## WHEN REPLACING EEPROM (MEMORY) IC

If a service repair is undertaken where it has been required to change the MEMORY IC, the following steps should be taken to ensure correct data settings while making reference to TABLE 1.

INI	+0	+1	+2	+3	+4	+5	+6	+7	+8	+9	+A	+B	+C	+D	+E	+F
00	08	60	98	13	1B	BD	24	09	09	0A	44	25	00	D5	FF	A5

Table 1

1. Enter DATA SET mode by setting VOLUME to minimum.
2. Press both VOL. DOWN button on the set and Channel button **(6)** on the remote control for more than 1 second. ADDRESS and DATA should appear as FIG 1.
3. ADDRESS is now selected and should "blink". Using the CH. UP/DOWN button on the remote, step through the ADDRESS until required ADDRESS to be changed is reached.
4. Press VOL. UP/DOWN button to select DATA. When DATA is selected, it will "blink".
5. Again, step through the DATA using VOL. UP/DOWN button until required DATA value has been selected.
6. Pressing CH. UP/DOWN button will take you back to ADDRESS for further selection if necessary.
7. Repeat steps 3 to 6 until all data has been checked.
8. When satisfied correct DATA has been entered, turn POWER off (return to STANDBY MODE) to finish DATA input. The unit will now have the correct DATA for the new MEMORY IC.

# ELECTRICAL ADJUSTMENTS

## 1. BEFORE MAKING ELECTRICAL ADJUSTMENTS

Read and perform these adjustments when repairing the circuits or replacing electrical parts or PCB assemblies.

### CAUTION

- Use an isolation transformer when performing any service on this chassis.
- Before removing the anode cap, discharge electricity because it contains high voltage.
- When removing a PCB or related component, after unfastening or changing a wire, be sure to put the wire back in its original position.
- When you exchange IC and Transistor for a heat sink, apply the silicon grease (**YG6260M**) on the contact section of the heat sink. Before applying new silicon grease, remove all the old silicon grease. (Old grease may cause damages to the IC and Transistor.)
- **The adjustments are needed for each mode, RF mode and AV mode. Perform the adjustments referring each adjustment items.**

Prepare the following measurement tools for electrical adjustments.

1. Oscilloscope
2. Digital Voltmeter
3. Pattern Generator

### On-Screen Display Adjustment

1. In the condition of NO indication on the screen.  
Press the VOL. DOWN button on the set and the Channel button (**9**) on the remote control for more than 1 second to appear the adjustment mode on the screen as shown in **Fig. 1-1**.

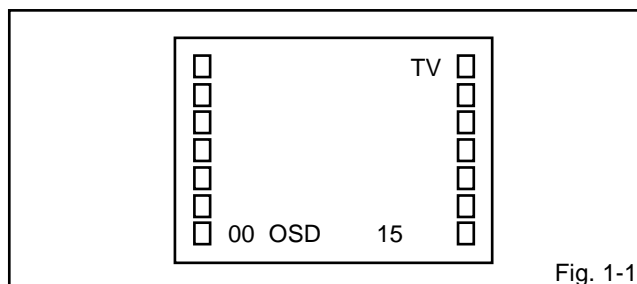


Fig. 1-1

2. Use the Channel UP/DOWN button or Channel button (**0-9**) on the remote control to select the options shown in **Fig. 1-2**.
3. Press the ACTION button on the remote control to end the adjustments.

NO.	FUNCTION	NO.	FUNCTION
00	OSD H	16	CONTRAST CENT
01	CUT OFF	17	CONTRAST MAX
02	RF AGC	18	CONTRAST MIN
03	VIF VCO	19	COLOR CENT
04	H.VCO	20	COLOR MAX
05	H.PHASE	21	COLOR MIN
06	V.SIZE	22	TINT
07	V.SHIFT	23	SHARPNESS
08	R.DRIVE	24	FM LEVEL
09	B.DRIVE	25	LEVEL
10	R.BIAS	26	SEPARATION 1
11	G.BIAS	27	SEPARATION 2
12	B.BIAS	28	TEST MONO
13	BRIGHT CENT	29	TEST STEREO
14	BRIGHT MAX	30	X-RAY TEST
15	BRIGHT MIN		

Fig. 1-2

## 2. BASIC ADJUSTMENTS

### 2-1: RF AGC (RF)

1. Place the set with Aging Test for more than 15 minutes.
2. Receive the VHF HIGH (63dB).
3. Connect the digital voltmeter to the **W043**.
4. Activate the adjustment mode display of **Fig. 1-1** and press the channel button (**02**) on the remote control to select "RF.AGC".
5. Press the VOL. UP/DOWN button on the remote control until the digital voltmeter is  $2.50 \pm 0.05V$ .

### 2-2: CUT OFF (RF)

1. Adjust the unit to the following settings.  
R.DRIVE=10, B.DRIVE=10, R.BIAS=64, G.BIAS=64, B.BIAS=64, BRIGHTNESS=120, CONTRAST=40.
2. Place the set with Aging Test for more than 15 minutes.
3. Activate the adjustment mode display of **Fig. 1-1** and press the channel button (**01**) on the remote control to select "CUT OFF".
4. Adjust the **Screen Volume** until a dim raster is obtained.

### 2-3: WHITE BALANCE (RF)

**NOTE:** Adjust after performing CUT OFF adjustment.

1. Place the set with Aging Test for more than 10 minutes.
2. Receive the gray scale pattern from the Pattern Generator.
3. Using the remote control, set the brightness and contrast to normal position.
4. Activate the adjustment mode display of **Fig. 1-1** and press the channel button (**10**) on the remote control to select "R. BIAS".
5. Press the CH. UP/DOWN button on the remote control to select the "R. BIAS", "G. BIAS", "B. BIAS", "R. DRIVE" or "B. DRIVE".
6. Adjust the VOL. UP/DOWN button on the remote control to whiten the R. BIAS, G. BIAS, B. BIAS, R. DRIVE, and B. DRIVE at each step tone sections equally.
7. Perform the above adjustments 5 and 6 until the white color is looked like a white.

### 2-4: FOCUS (RF)

1. Receive a broadcast.
2. Turn the Focus Volume fully counterclockwise once.
3. Adjust the **Focus Volume** until picture is distinct.

### 2-5: VIF VCO (RF)

1. Place the set with Aging Test for more than 10 minutes.
2. Receive the cross hatch signal from the Pattern Generator.
3. Connect the digital voltmeter between the **pin 5 of CP601** and the **GND**.
4. Activate the adjustment mode display of **Fig. 1-1** and press the channel button (**03**) on the remote control to select "V.VCO".
5. Press the VOL. UP/DOWN button on the remote control until the digital voltmeter is 2.5V.

## ELECTRICAL ADJUSTMENTS

### 2-6: HORIZONTAL PHASE (RF)

1. Receive the center cross signal from the Pattern Generator.
2. Activate the adjustment mode display of **Fig. 1-1** and press the channel button **(05)** on the remote control to select "H.PHAS".
3. Press the VOL. UP/DOWN button on the remote control until the right and left screen size of the vertical line becomes the same.

### 2-7: VERTICAL SIZE (RF)

1. Receive the cross hatch signal from the Pattern Generator.
2. Using the adjustment control, set the brightness and contrast to normal position.
3. Activate the adjustment mode display of **Fig. 1-1** and press the channel button **(06)** on the remote control to select "V.SIZE".
4. Press the VOL. UP/DOWN button on the remote control until the rectangle on the center of the screen becomes square.
5. Receive a broadcast and check if the picture is normal.

### 2-8: VERTICAL SHIFT (RF)

1. Receive the center cross signal from the Pattern Generator.
2. Activate the adjustment mode display of **Fig. 1-1** and press the channel button **(07)** on the remote control to select "V.SFT".
3. Press the VOL. UP/DOWN button on the remote control until the horizontal line becomes fit to the notch of the shadow mask.

### 2-9: OSD HORIZONTAL (RF)

1. Activate the adjustment mode display of **Fig. 1-1**.
2. Press the VOL. UP/DOWN button on the remote control until the difference of A and B becomes minimum. **(Refer to Fig. 2-3)**

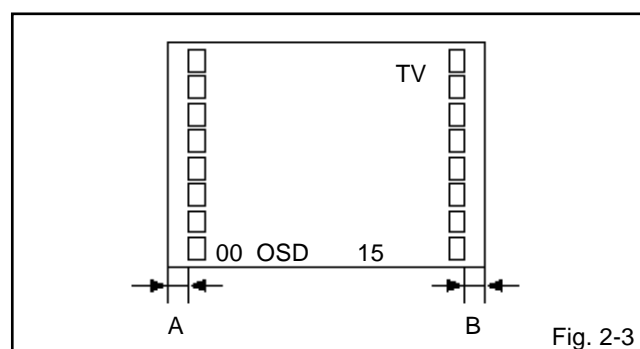


Fig. 2-3

### 2-10: BRIGHTNESS MANUAL (RF, AV)

1. Activate the adjustment mode display of **Fig. 1-1** and press the channel button **(13)** on the remote control to select "BRI.CENT".
2. Press the VOL. UP/DOWN button on the remote control until the brightness step No. becomes "120".
3. Receive a broadcast and check if the picture is normal.
4. Press the TV/VIDEO button on the remote to set to the AV mode. Then perform the above adjustment 2~3.

### 2-11: SUB TINT/SUB COLOR (RF, AV)

1. Receive the color bar pattern. (RF Input)
2. Activate the adjustment mode display of **Fig. 1-1** and press the channel button **(22)** on the remote control to select "TINT".
3. Connect the oscilloscope to **TP023**.
4. Press the VOL. UP/DOWN button on the remote control until the section "A" becomes as straight line. **(Refer to Fig. 2-1)**
5. Press the channel button **(19)** on the remote control to select "COL. CENT".
6. Connect the oscilloscope to **TP022**.
7. Adjust the VOLTS RANGE VARIABLE knob of the oscilloscope until the range between white 100% and 0% is set to 5 scales on the screen of the oscilloscope.
8. Press the VOL. UP/DOWN button on the remote control until the red color level is adjusted to 110% of the white level. **(Refer to Fig. 2-2)**
9. Receive the color bar pattern. (Audio Video Input)
10. Press the TV/VIDEO button on the remote control to set to the AV mode. Then perform the above adjustments 2~8.

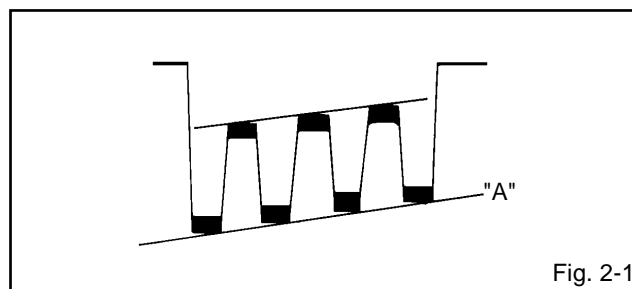


Fig. 2-1

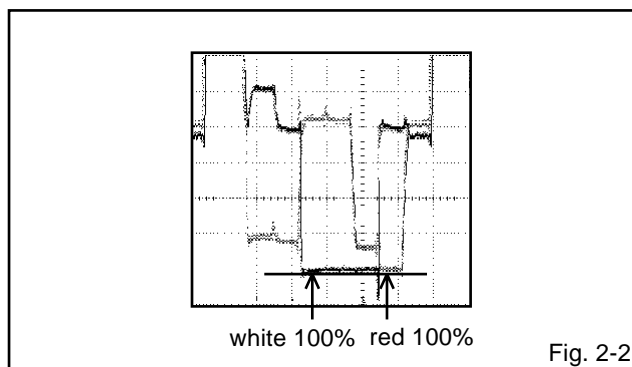


Fig. 2-2

### 2-12: SUB CONTRAST (RF, AV)

1. Activate the adjustment mode display of **Fig. 1-1** and press the channel button **(17)** on the remote control to select "CONT.MAX".
2. Press the VOL. UP/DOWN button on the remote control until the contrast step No. becomes "44".
3. Receive a broadcast and check if the picture is normal.
4. Press the TV/VIDEO button on the remote to set to the AV mode. Then perform the above adjustment 2~3.

# ELECTRICAL ADJUSTMENTS

## 3. PURITY AND CONVERGENCE ADJUSTMENTS

### NOTE

1. Turn the unit on and let it warm up for at least 30 minutes before performing the following adjustments.
2. Place the CRT surface facing east or west to reduce the terrestrial magnetism.
3. Turn ON the unit and demagnetize with a Degauss Coil.

### 3-1: STATIC CONVERGENCE (ROUGH ADJUSTMENT)

1. Tighten the screw for the magnet. Refer to the adjusted CRT for the position. **(Refer to Fig. 3-1)**  
If the deflection yoke and magnet are in one body, untighten the screw for the body.
2. Receive the green raster pattern from the color bar generator.
3. Slide the deflection yoke until it touches the funnel side of the CRT.
4. Adjust center of screen to green, with red and blue on the sides, using the pair of purity magnets.
5. Switch the color bar generator from the green raster pattern to the crosshatch pattern.
6. Combine red and blue of the 3 color crosshatch pattern on the center of the screen by adjusting the pair of 4 pole magnets.
7. Combine red/blue (magenta) and green by adjusting the pair of 6 pole magnets.
8. Adjust the crosshatch pattern to change to white by repeating steps 6 and 7.

### 3-2: PURITY

### NOTE

Adjust after performing adjustments in section 3-1.

1. Receive the green raster pattern from color bar generator.
2. Adjust the pair of purity magnets to center the color on the screen.  
Adjust the pair of purity magnets so the color at the ends are equally wide.
3. Move the deflection yoke backward (to neck side) slowly, and stop it at the position when the whole screen is green.
4. Confirm red and blue color.
5. Adjust the slant of the deflection yoke while watching the screen, then tighten the fixing screw.

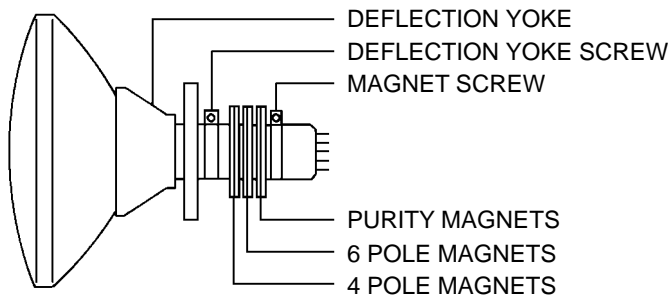


Fig. 3-1

### 3-3: STATIC CONVERGENCE

### NOTE

Adjust after performing adjustments in section 3-2.

1. Receive the crosshatch pattern from the color bar generator.
2. Combine red and blue of the 3 color crosshatch pattern on the center of the screen by adjusting the pair of 4 pole magnets.
3. Combine red/blue (magenta) and green by adjusting the pair of 6 pole magnets.

### 3-4: DYNAMIC CONVERGENCE

### NOTE

Adjust after performing adjustments in section 3-3.

1. Adjust the differences around the screen by moving the deflection yoke upward/downward and right/left.  
**(Refer to Fig. 3-2-a)**
2. Insert three wedges between the deflection yoke and CRT funnel to fix the deflection yoke.  
**(Refer to Fig. 3-2-b)**

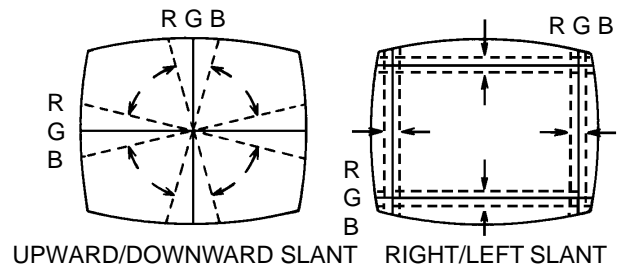
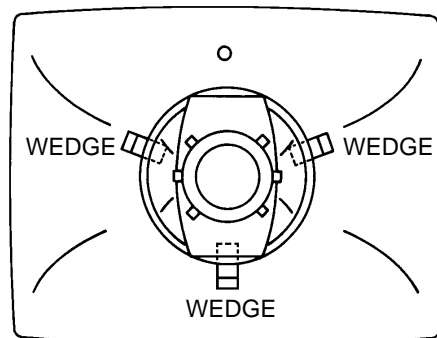


Fig. 3-2-a

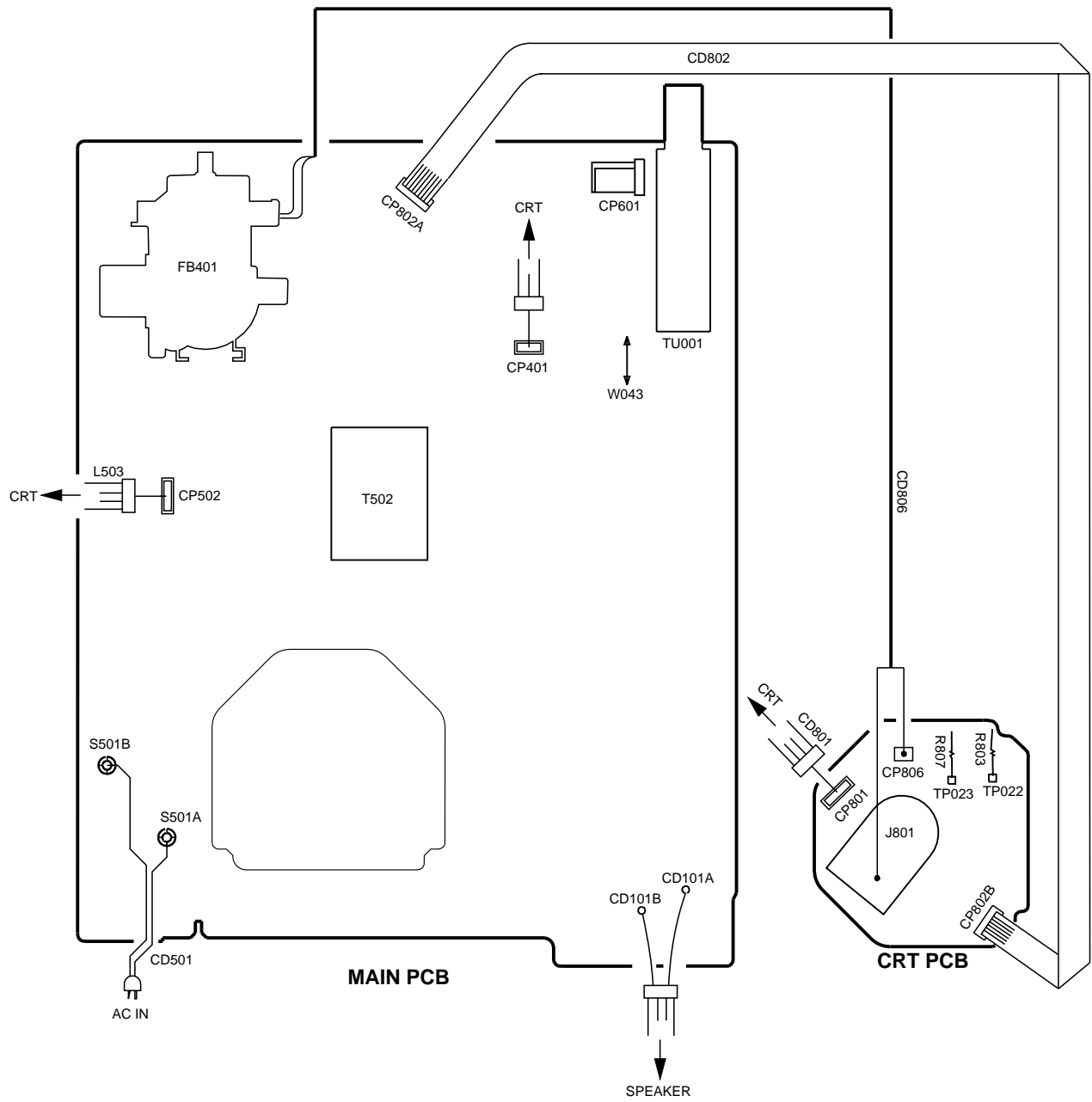


WEDGE POSITION

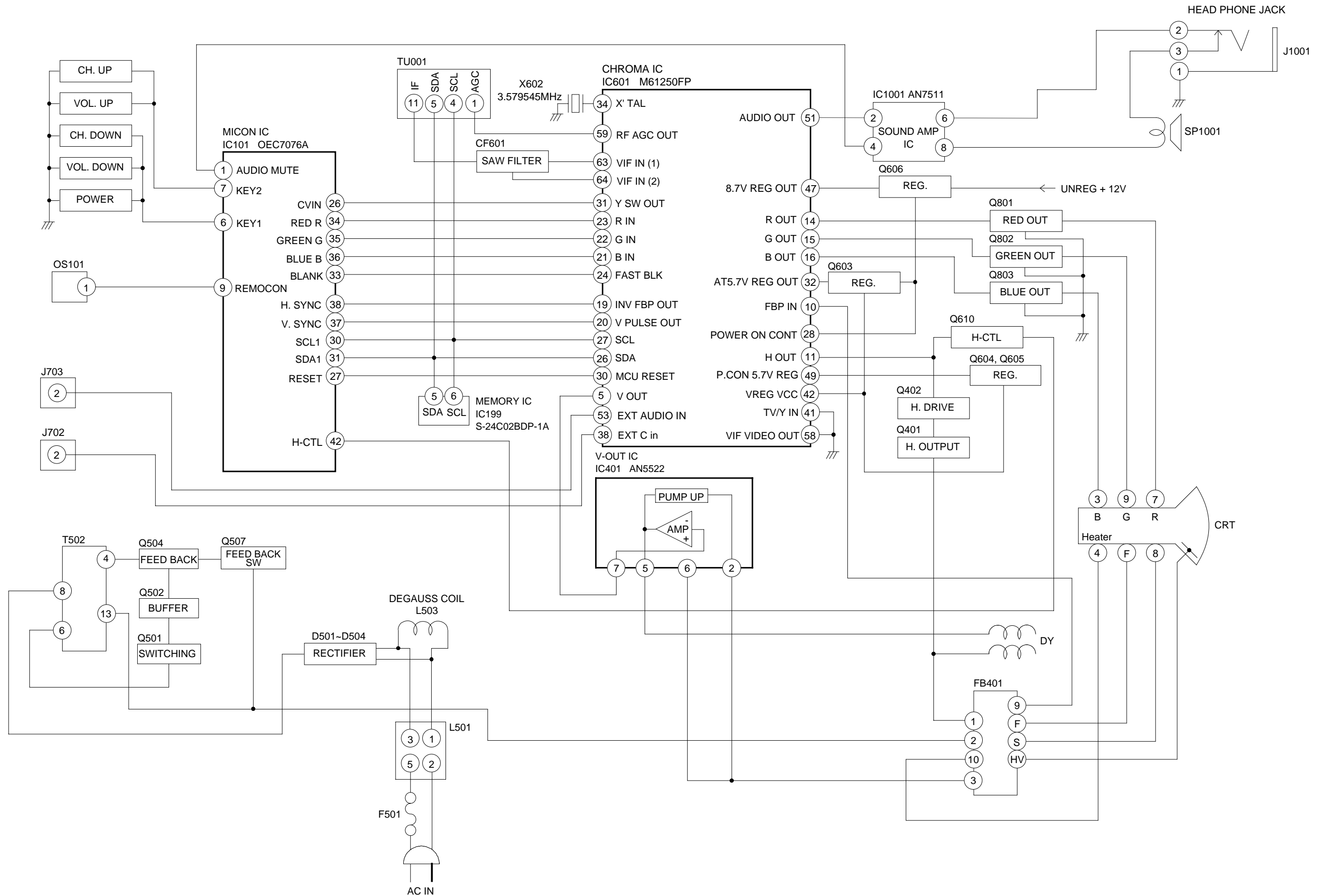
Fig. 3-2-b

# ELECTRICAL ADJUSTMENTS

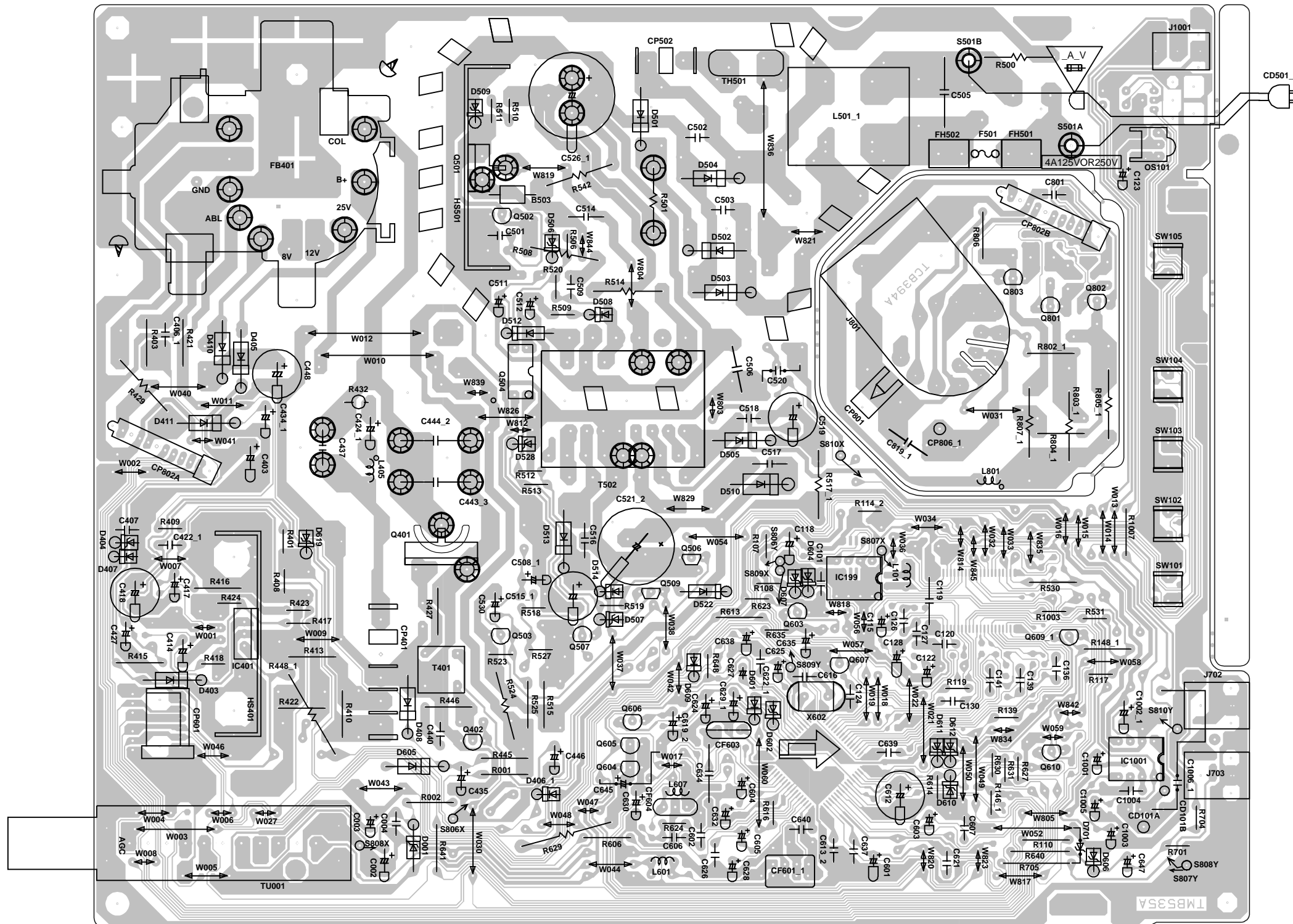
## 4. ELECTRICAL ADJUSTMENT PARTS LOCATION GUIDE (WIRING CONNECTION)



# BLOCK DIAGRAM

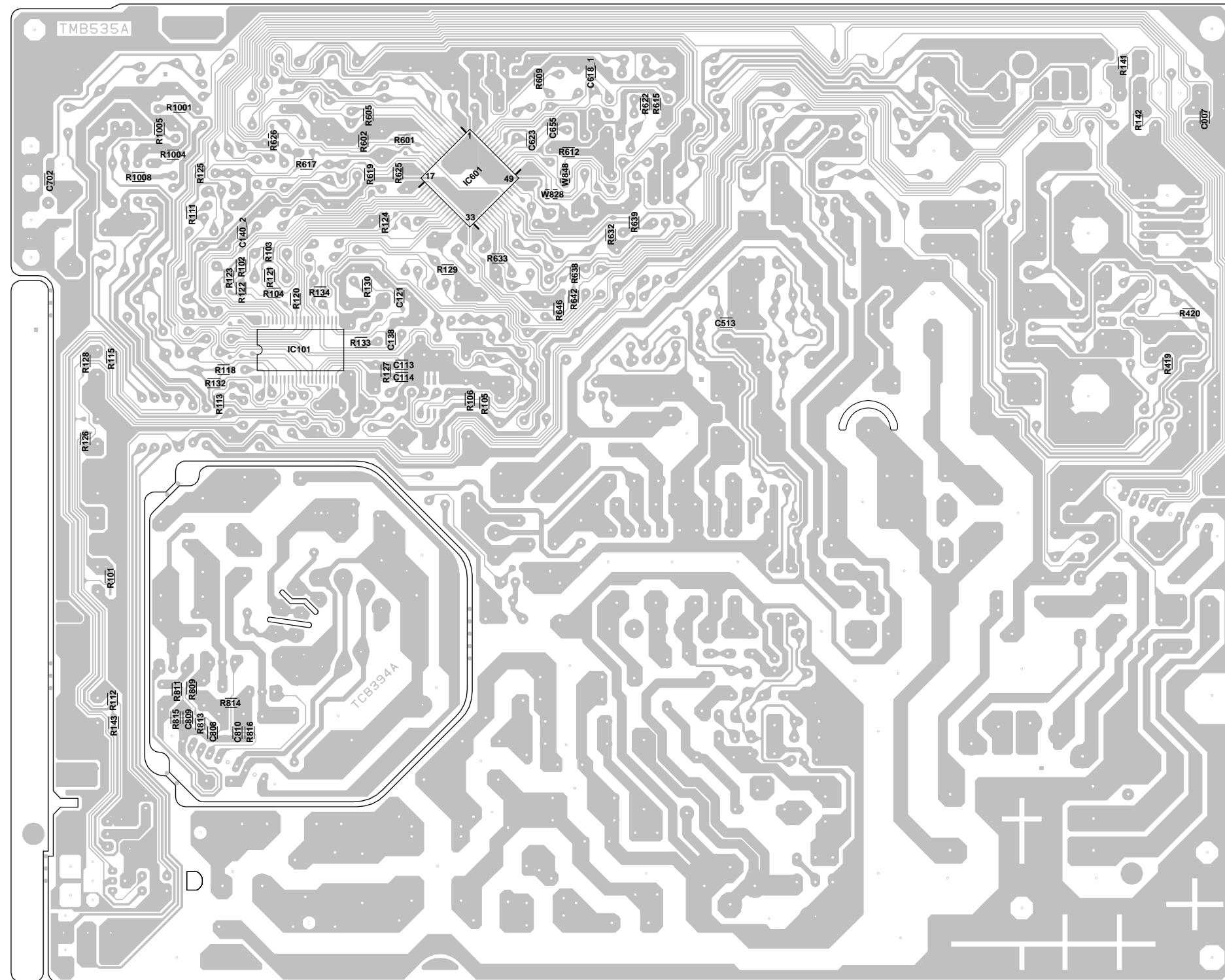


**PRINTED CIRCUIT BOARDS  
MAIN/CRT (INSERTED PARTS)  
SOLDER SIDE**

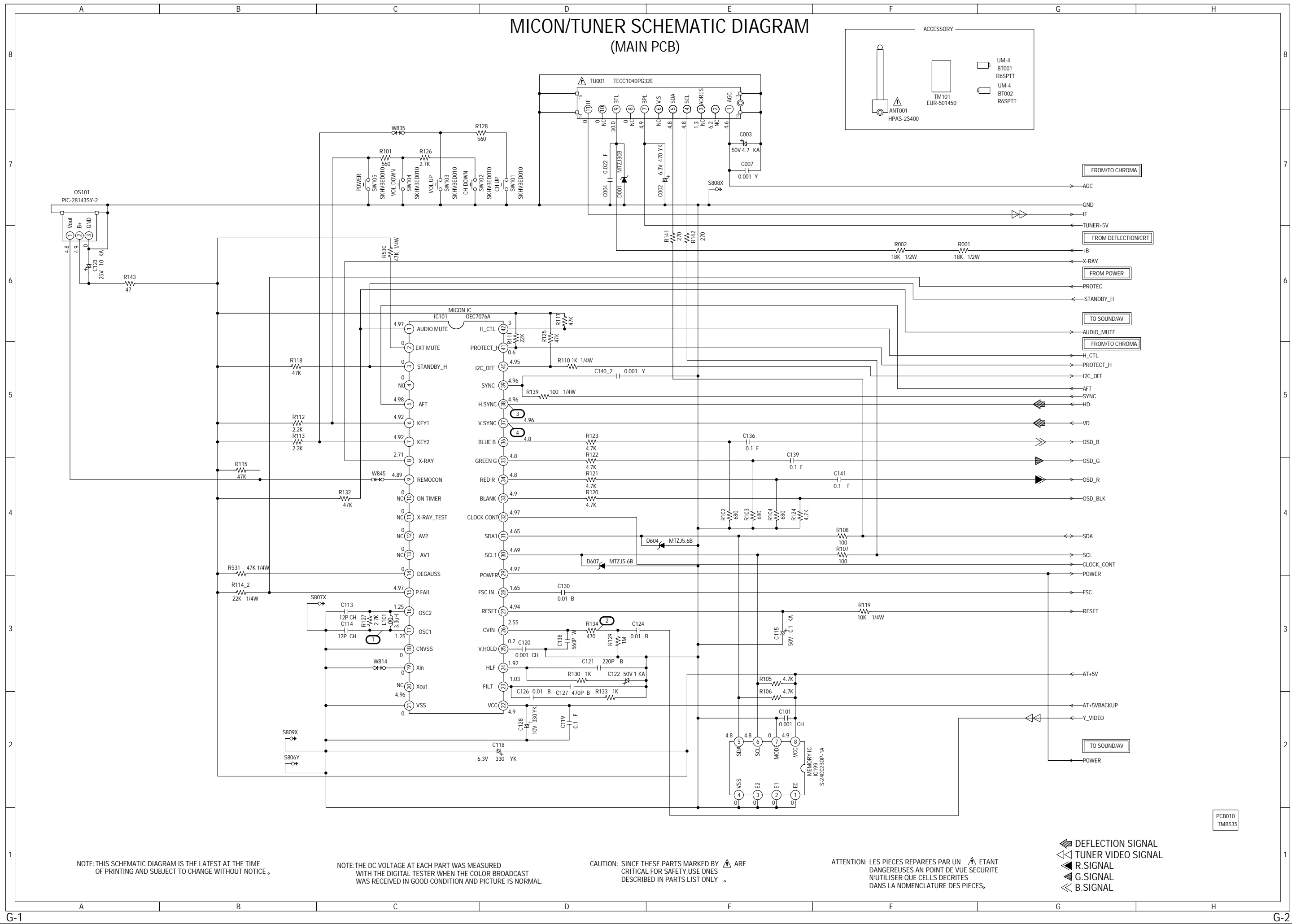




PRINTED CIRCUIT BOARDS  
MAIN/CRT (CHIP MOUNTED PARTS)  
SOLDER SIDE





## MICON/TUNER SCHEMATIC DIAGRAM (MAIN PCB)



NOTE: THIS SCHEMATIC DIAGRAM IS THE LATEST AT THE TIME OF PRINTING AND SUBJECT TO CHANGE WITHOUT NOTICE.

NOTE: THE DC VOLTAGE AT EACH PART WAS MEASURED WITH THE DIGITAL TESTER WHEN THE COLOR BROADCAST WAS RECEIVED IN GOOD CONDITION AND PICTURE IS NORMAL.

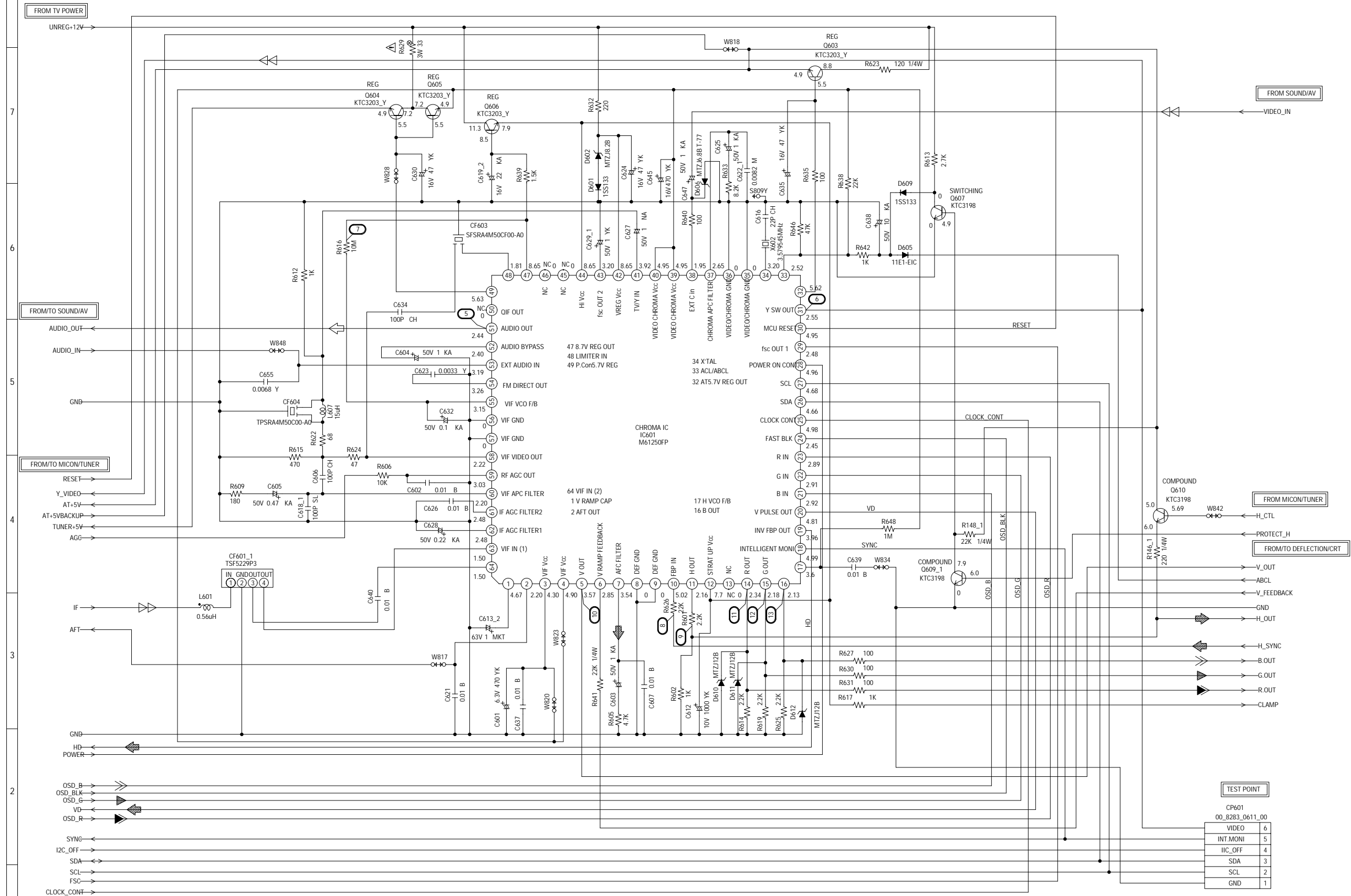
CAUTION: SINCE THESE PARTS MARKED BY  ARE CRITICAL FOR SAFETY, USE ONES DESCRIBED IN PARTS LIST ONLY .

ATTENTION: LES PIÈCES RÉPARÉES PAR UN  ÉTANT DANGEREUSES AU POINT DE VUE SÉCURITÉ N'UTILISER QUE CELLES DÉCRITES DANS LA NOMENCLATURE DES PIÈCES.

- DEFLECTION SIGNAL
- TUNER VIDEO SIGNAL
- R.SIGNAL
- G.SIGNAL
- B.SIGNAL


PCB010  
TMB535

## (MAIN PCB)



NOTE: THIS SCHEMATIC DIAGRAM IS THE LATEST AT THE TIME OF PRINTING AND SUBJECT TO CHANGE WITHOUT NOTICE.

NOTE: THE DC VOLTAGE AT EACH PART WAS MEASURED WITH THE DIGITAL TESTER WHEN THE COLOR BROADCAST WAS RECEIVED IN GOOD CONDITION AND PICTURE IS NORMAL.

ATTENTION: LES PIECES REPARÉES PAR UN  ÉTANT DANGEREUSES AN POINT DE VUE SECURITE N'UTILISER QUE CELLS DECRITES DANS LA NOMENCLATURE DES PIECES.

CAUTION: SINCE THESE PARTS MARKED BY  ARE CRITICAL FOR SAFETY, USE ONES DESCRIBED IN PARTS LIST ONLY .

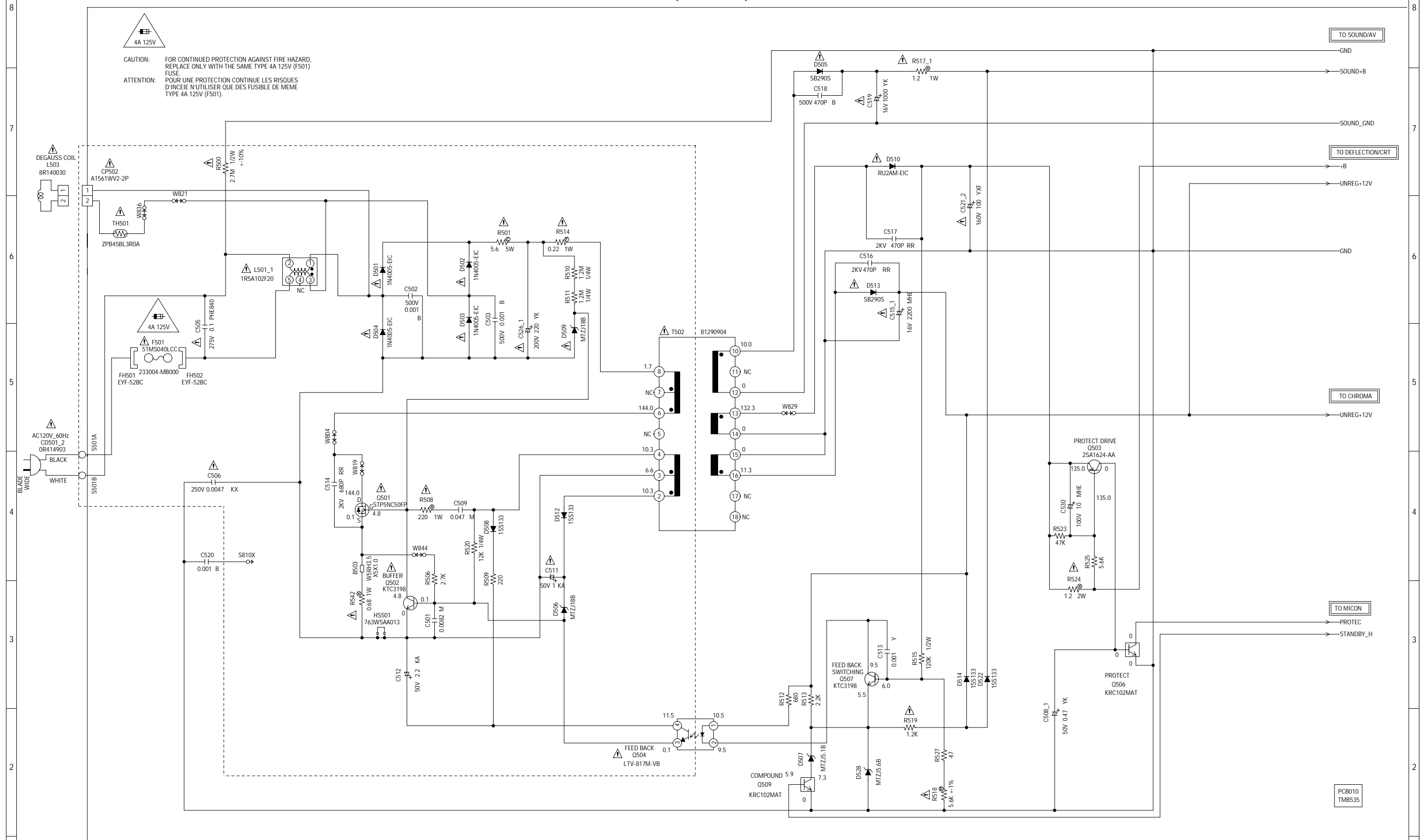
- ◀ DEFLECTION SIGNAL
- ◀ AUDIO SIGNAL
- ◀◀ TUNER VIDEO SIGNAL

- ◀ R.SIGNAL
- ◀ G.SIGNAL
- ◀ B.SIGNAL

CP601		
00_8283_0611_00		
VIDEO		6
INT.MONI		5
IIC_OFF		4
SDA		3
SCL		2
GND		1

PCB010  
TMB535


## TV POWER SCHEMATIC DIAGRAM (MAIN PCB)



NOTE: THIS SCHEMATIC DIAGRAM IS THE LATEST AT THE TIME OF PRINTING AND SUBJECT TO CHANGE WITHOUT NOTICE.

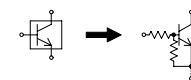
NOTE: THE DC VOLTAGE AT EACH PART WAS MEASURED  
WITH THE DIGITAL TESTER WHEN THE COLOR BROADCAST  
WAS RECEIVED IN GOOD CONDITION AND PICTURE IS NORMAL.

CAUTION: SINCE THESE PARTS MARKED BY  ARE CRITICAL FOR SAFETY, USE ONES DESCRIBED IN PARTS LIST ONLY .

ATTENTION: LES PIÈCES RÉPARÉES PAR UN  ÉTANT DANGEREUSES AU POINT DE VUE SÉCURITÉ N'UTILISER QUE CELLES DÉCRITES DANS LA NOMENCLATURE DES PIÈCES.

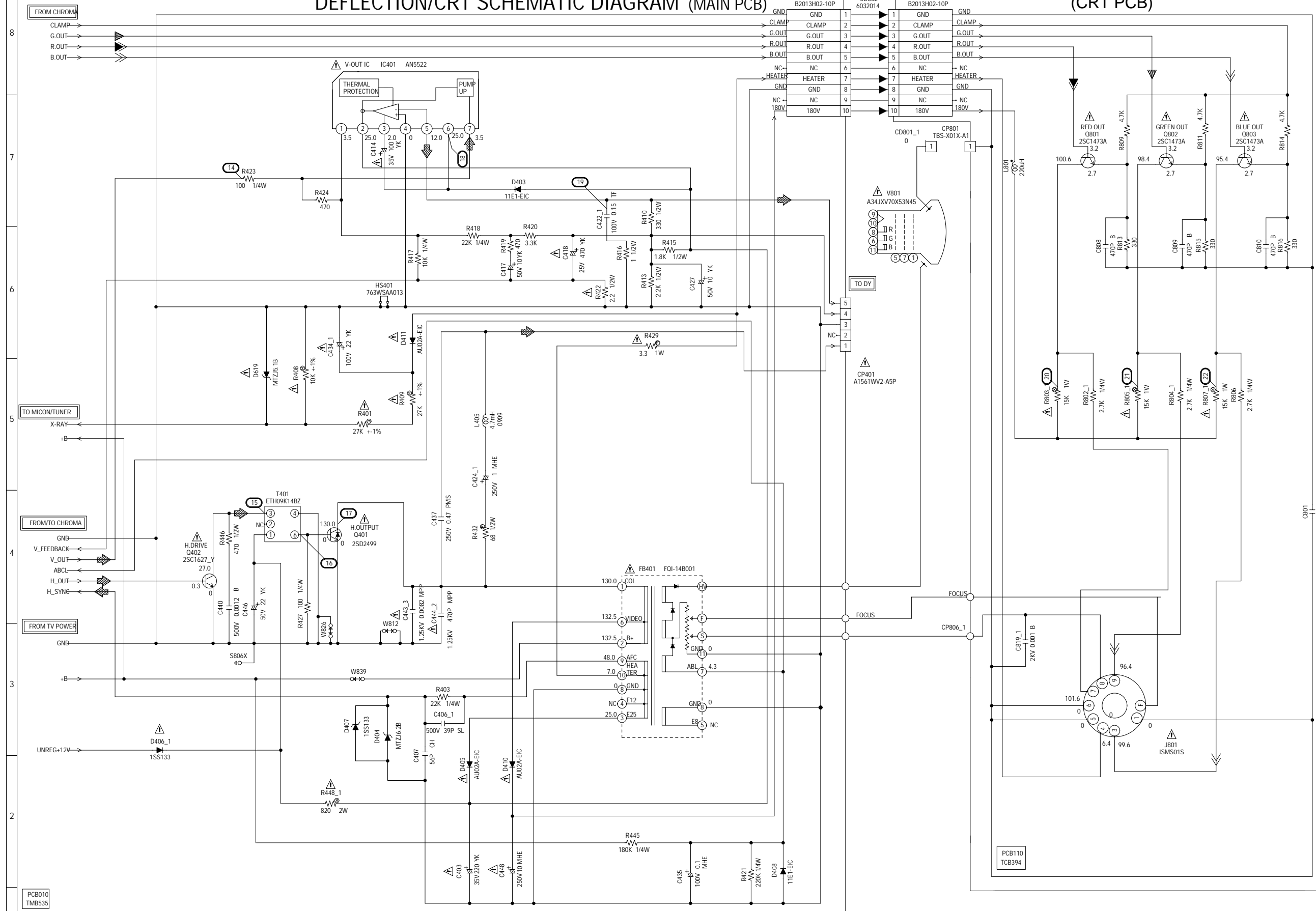
NOTE: THE RESISTOR MARKED F IS FUSE RESISTOR.  
THE ALUMI ELECTROLYTIC CAPACITOR MARKED NP  
IS NON POLAR ONE.

CAUTION: DIGITAL TRANSISTOR



# DEFLECTION/CRT SCHEMATIC DIAGRAM (MAIN PCB)

# (CRT PCB)



NOTE: THIS SCHEMATIC DIAGRAM IS THE LATEST AT THE TIME OF PRINTING AND SUBJECT TO CHANGE WITHOUT NOTICE.

ATTENTION: LES PIÈCES RÉPARÉES PAR UN ÉTANT DANGEREUSES AN POINT DE VUE SÉCURITÉ N'UTILISER QUE CELLS DÉCRITES DANS LA NOMENCLATURE DES PIÈCES.

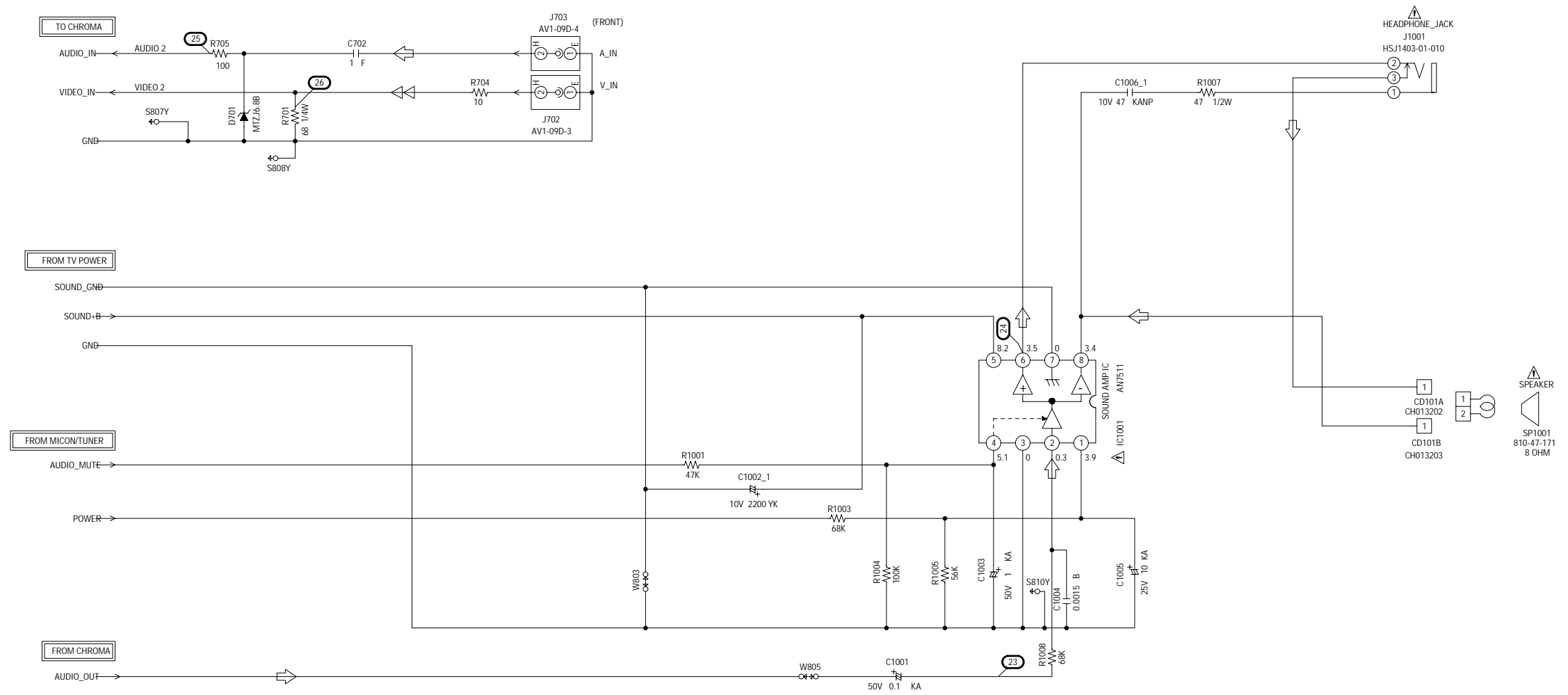
CAUTION: SINCE THESE PARTS MARKED BY ARE CRITICAL FOR SAFETY, USE ONES DESCRIBED IN PARTS LIST ONLY.

NOTE: THE DC VOLTAGE AT EACH PART WAS MEASURED WITH THE DIGITAL TESTER WHEN THE COLOR BROADCAST WAS RECEIVED IN GOOD CONDITION AND PICTURE IS NORMAL.

NOTE: THE RESISTOR MARKED F IS FUSE RESISTOR. THE ALUMI ELECTROLYTIC CAPACITOR MARKED NP IS NON POLAR ONE.


R.SIGNAL  
 G.SIGNAL  
 B.SIGNAL  
 DEFLECTION SIGNAL


SOUND/AV SCHEMATIC DIAGRAM  
(MAIN PCB)





NOTE: THE DC VOLTAGE AT EACH PART WAS MEASURED WITH THE DIGITAL TESTER WHEN THE COLOR BROADCAST WAS RECEIVED IN GOOD CONDITION AND PICTURE IS NORMAL.

NOTE: THIS SCHEMATIC DIAGRAM IS THE LATEST AT THE TIME OF PRINTING AND SUBJECT TO CHANGE WITHOUT NOTICE .

CAUTION: SINCE THESE PARTS MARKED BY  ARE CRITICAL FOR SAFETY, USE ONES DESCRIBED IN PARTS LIST ONLY .

ATTENTION: LES PIECES REPARÉES PAR UN  ÉTANT DANGEREUSES AU POINT DE VUE SÉCURITÉ, N'UTILISER QUE CELLES DÉCRITES DANS LA NOMENCLATURE DES PIÈCES.

 TUNER VIDEO SIGNAL  
 AUDIO SIGNAL

PCB010  
TMB535

# VOLTAGE LIST

## IC

IC101			
Pin	Volt.	Pin	Volt.
1	4.97	22	4.9
2	0	23	1.03
3	0	24	1.92
4	0	25	0.2
5	4.98	26	2.55
6	4.92	27	4.49
7	4.92	28	1.65
8	2.71	29	4.97
9	4.89	30	4.65
10	0	31	4.65
11	0	32	4.97
12	0	33	4.9
13	0	34	4.8
14	0	35	4.8
15	4.97	36	4.8
16	1.25	37	4.96
17	1.25	38	4.96
18	0	39	4.96
19	0	40	4.95
20	4.96	41	0.6
21	0	42	3

IC199	
Pin	Volt.
1	0
2	0
3	0
4	0
5	4.8
6	4.8
7	0
8	4.9

IC601			
Pin	Volt.	Pin	Volt.
1	4.62	33	2.52
2	2.2	34	3.2
3	4.3	35	0
4	4.9	36	0
5	3.57	37	2.65
6	2.85	38	1.95
7	3.54	39	4.95
8	0	40	4.95
9	0	41	3.92
10	5.02	42	8.65
11	2.16	43	3.2
12	7.7	44	8.65
13	0	45	0
14	2.34	46	0
15	2.18	47	8.65
16	2.13	48	1.81
17	3.6	49	5.63
18	4.99	50	0
19	3.96	51	2.44
20	4.81	52	2.4
21	2.92	53	3.19
22	2.91	54	3.26
23	2.89	55	3.15
24	2.45	56	0
25	4.98	57	0
26	4.66	58	2.22
27	4.68	59	3.03
28	4.96	60	2.2
29	4.24	61	2.48
30	4.95	62	2.4
31	2.55	63	1.5
32	5.62	64	1.5

IC401	
Pin	Volt.
1	3.5
2	25
3	2
4	0
5	12
6	25
7	3.5

IC1001	
Pin	Volt.
1	3.9
2	0.3
3	0
4	5.1
5	8.2
6	3.5
7	0
8	3.4

## TRANSISTOR

Q401	
Pin	Volt.
B	0
C	130
E	0

Q402	
Pin	Volt.
B	0.3
C	27
E	0

Q501	
Pin	Volt.
G	4.8
S	0.1
D	144

Q502	
Pin	Volt.
B	0.1
C	4.8
E	0

Q503	
Pin	Volt.
B	135
C	0
E	135

Q506	
Pin	Volt.
B	0
C	0
E	0

Q507	
Pin	Volt.
B	6
C	9.5
E	5.5

Q509	
Pin	Volt.
B	5.9
C	7.3
E	0

Q603	
Pin	Volt.
B	5.5
C	8.8
E	4.9

Q604	
Pin	Volt.
B	5.5
C	7.2
E	4.9

Q605	
Pin	Volt.
B	5.5
C	7.2
E	4.9

Q606	
Pin	Volt.
B	8.5
C	11.3
E	7.9

Q607	
Pin	Volt.
B	4.9
C	0
E	0

Q609	
Pin	Volt.
B	6
C	7.9
E	0

Q610	
Pin	Volt.
B	5.69
C	5
E	6

Q801	
Pin	Volt.
B	3.2
C	100.6
E	2.7

Q802	
Pin	Volt.
B	3.2
C	98.4
E	2.7

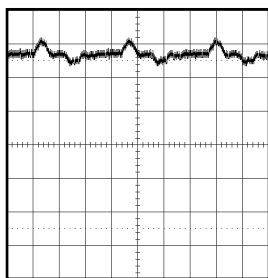
Q803	
Pin	Volt.
B	3.2
C	95.4
E	2.7

Q504	
Pin	Volt.
1	10.5
2	9.5
3	0.1
4	11.5

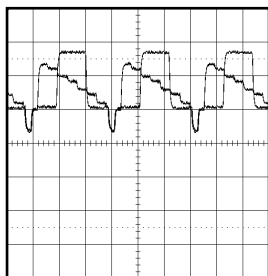
B ..... BASE  
 C ..... COLLECTOR  
 E ..... EMITTER  
 G ..... GATE  
 S ..... SOURCE  
 D ..... DRAIN

## WAVEFORMS

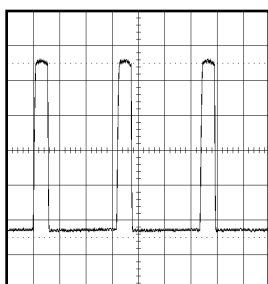
### MICON/TUNER



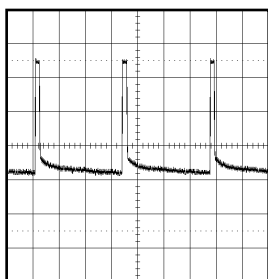
① 200mV 5ms/div  
IC101 PIN 17(OSC1)



② 0.5V 20μs/div  
R134

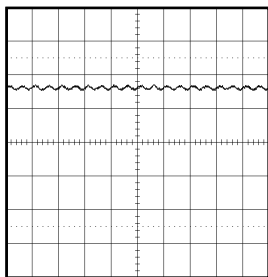


③ 200mV 20μs/div  
IC101 PIN 38(H.SYNC)

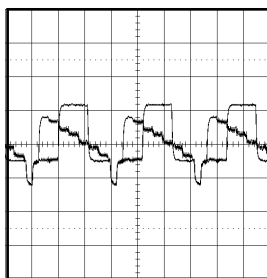


④ 200mV 5ms/div  
IC101 PIN 37(V.SYNC)

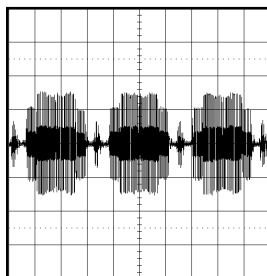
### CHROMA



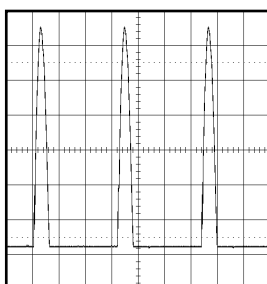
⑤ 0.5V 2ms/div  
IC601 PIN 51(AUDIO OUT)



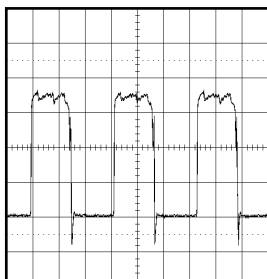
⑥ 0.5V 2μs/div  
IC601 PIN 31(Y SW OUT)



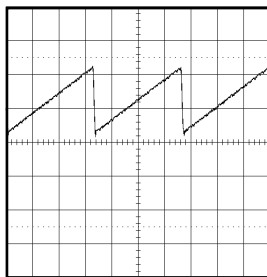
⑦ 200mV 20μs/div  
R616



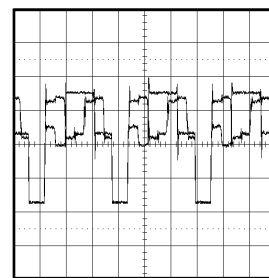
⑧ 20V 20μs/div  
R626



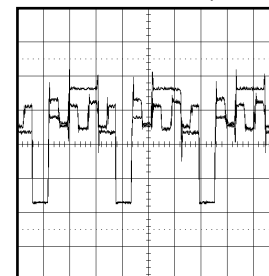
⑨ 200mV 20μs/div  
R601



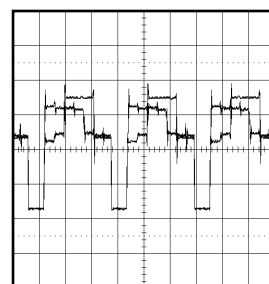
⑩ 0.5V 5ms/div  
IC601 PIN 5(V OUT)



⑪ 1V 20μs/div  
IC601 PIN 14(R OUT)

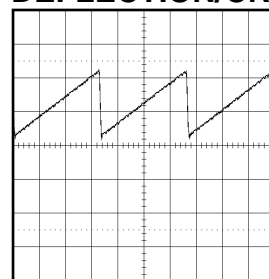


⑫ 1V 20μs/div  
IC601 PIN 15(G OUT)

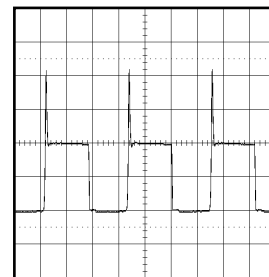


⑬ 1V 20μs/div  
IC601 PIN 16(B OUT)

### DEFLECTION/CRT



⑭ 0.5V 5ms/div  
R423



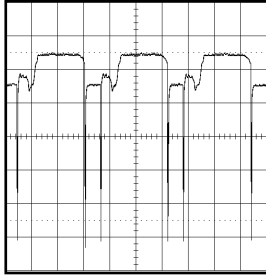
⑮ 20V 20μs/div  
T401 PIN 3

NOTE: The following waveforms were measured at the point of the corresponding balloon number in the schematic diagram.

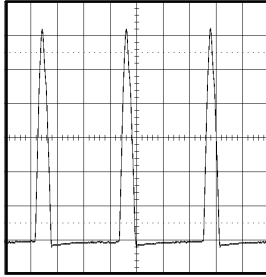


## WAVEFORMS

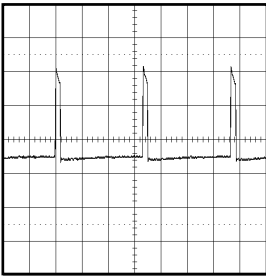
### SOUND/AV



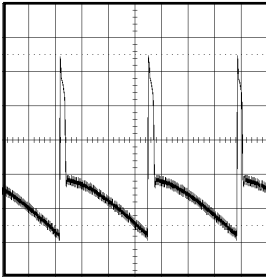
①⑥ 2V 20μs/div  
T401 PIN 6



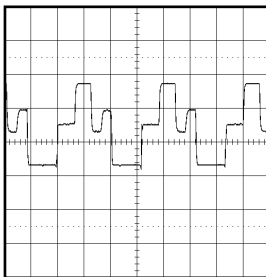
①⑦ 200V 20μs/div  
Q401 Collector



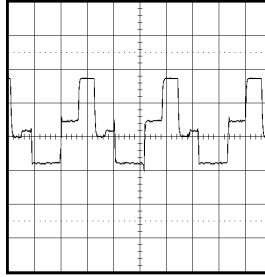
①⑧ 10V 5ms/div  
IC401 PIN 6



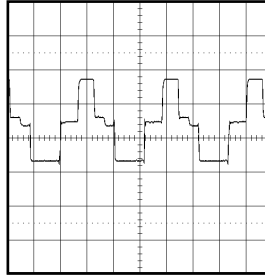
①⑨ 10V 5ms/div  
R410



②⑩ 50V 20μs/div  
R803

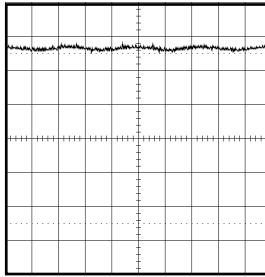


②① 50V 20μs/div  
R805

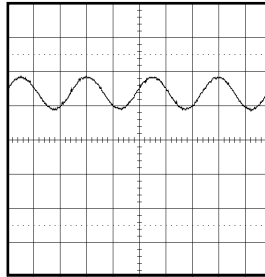


②② 50V 20μs/div  
R807

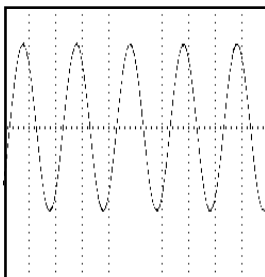
### SOUND/AV



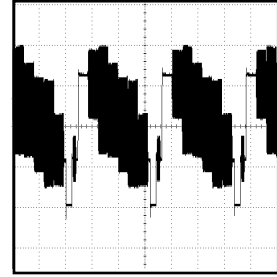
②③ 0.5V 1ms/div  
R1008



②④ 1V 1ms/div  
IC1001 PIN 6



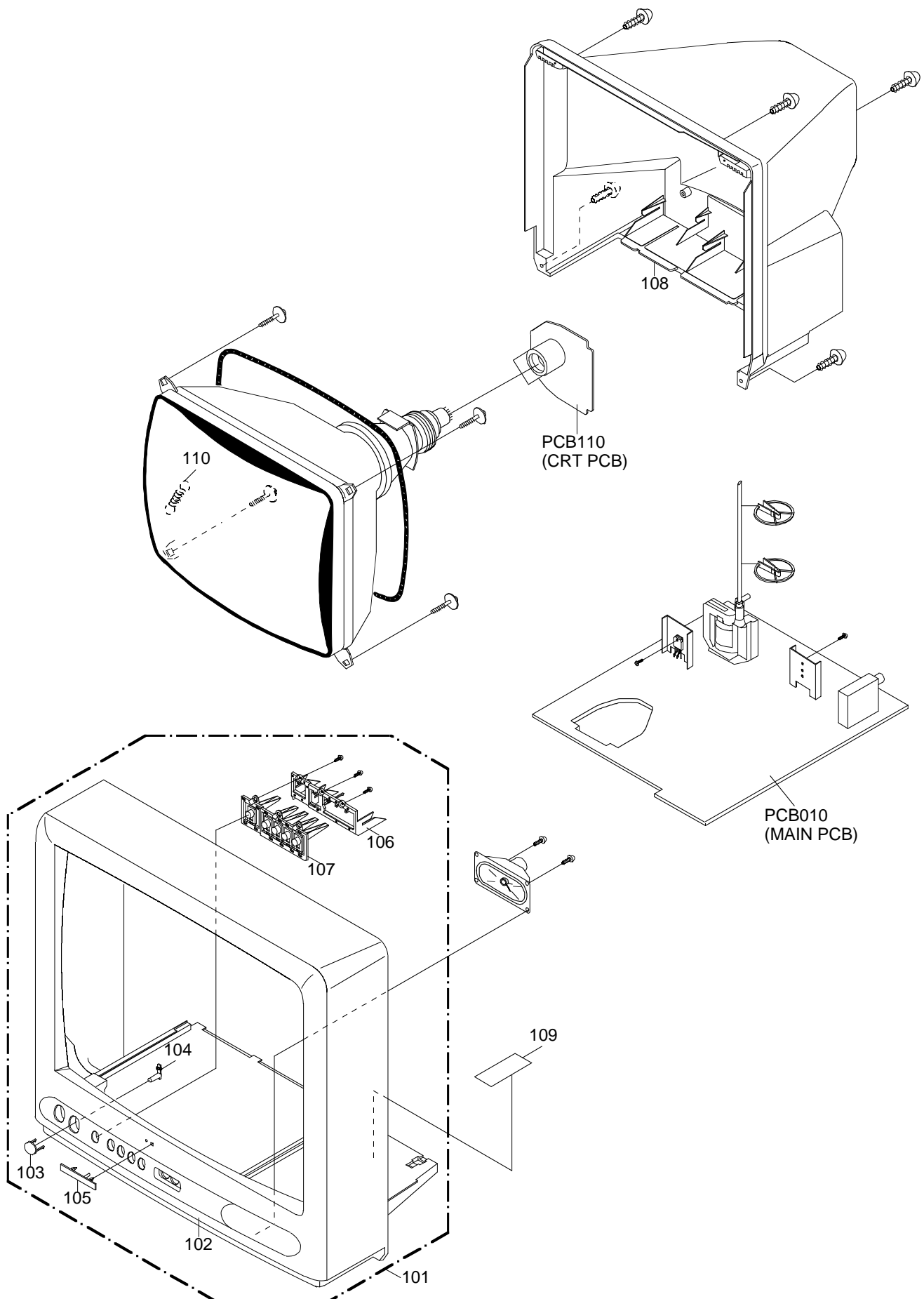
②⑤ 200mV 500μs/div  
R705



②⑥ 500mV 20μs/div  
R701

NOTE: The following waveforms were measured at the point of the corresponding balloon number in the schematic diagram.

## MECHANICAL EXPLODED VIEW



## MECHANICAL REPLACEMENT PARTS LIST

Location No.	Part No.	Description	Reference No.
101	A3L116C720	CABINET,FRONT ASSY (CT-13R17B)	
	A3L124C720	CABINET,FRONT ASSY (CT-13R37S)	
	A3L125C720	CABINET,FRONT ASSY (CT-13R27W)	
102	701WPJB673	CABINET,FRONT (CT-13R17B)	
	701WPJB759	CABINET,FRONT (CT-13R37S)	
	701WPJB760	CABINET,FRONT (CT-13R27W)	
103	711WPA0169	PLATE,FRONT	
104	713WPA0203	GUIDE,REMOCON	
105	7235760005	BADGE,BRAND (CT-13R17B)	
	7235760004	BADGE,BRAND (CT-13R37S, CT-13R27W)	
106	735WPA0650	BUTTON,BASE (CT-13R17B)	
	735WPA0687	BUTTON,BASE (CT-13R37S)	
	735WPA0688	BUTTON,BASE (CT-13R27W)	
107	735WPA0662	BUTTON,FRAME (CT-13R17B)	
	735WPA0685	BUTTON,FRAME (CT-13R37S)	
	735WPA0686	BUTTON,FRAME (CT-13R27W)	
108	702WPA0870	CABINET,BACK (CT-13R17B, CT-13R37S)	
	702WPBA073	CABINET,BACK (CT-13R27W)	
109	7230006755	SHEET,CAUTION	
110	741WUA0019	SPRING,EARTH	
---	TQB2AA0428	INSTRUCTION BOOK	J3L11601

# ELECTRICAL REPLACEMENT PARTS LIST

Location No.	Part No.	Description	Reference No.	Location No.	Part No.	Description	Reference No.
RESISTORS				RESISTORS			
R001	R002T2183J	RC	18K OHM 1/2W	R525	R001T6562J	RC	5.6K OHM 1/6W
R002	R002T2183J	RC	18K OHM 1/2W	R527	R001T6470J	RC	47 OHM 1/6W
R101	R903N8561J	RC	560 OHM 1/8W	R530	R002T4473J	RC	47K OHM 1/4W
R102	R903N8681J	RC	680 OHM 1/8W	R531	R002T4473J	RC	47K OHM 1/4W
R103	R903N8681J	RC	680 OHM 1/8W	△ R542	R3X181R68J	R,METAL OXIDE	0.68 OHM 1W
R104	R903N8681J	RC	680 OHM 1/8W	R601	R903N8222J	RC	2.2K OHM 1/8W
R105	R903N8472J	RC	4.7K OHM 1/8W	R602	R903N8102J	RC	1K OHM 1/8W
R106	R903N8472J	RC	4.7K OHM 1/8W	R605	R903N8472J	RC	4.7K OHM 1/8W
R107	R001T6101J	RC	100 OHM 1/6W	R606	R001T6103J	RC	10K OHM 1/6W
R108	R001T6101J	RC	100 OHM 1/6W	R609	R903N8181J	RC	180 OHM 1/8W
R110	R002T4102J	RC	1K OHM 1/4W	R612	R903N8102J	RC	1K OHM 1/8W
R111	R903N8223J	RC	22K OHM 1/8W	R613	R001T6272J	RC	2.7K OHM 1/6W
R112	R903N8222J	RC	2.2K OHM 1/8W	R614	R001T6222J	RC	2.2K OHM 1/6W
R113	R903N8222J	RC	2.2K OHM 1/8W	R615	R903N8471J	RC	470 OHM 1/8W
R114	R002T4223J	RC	22K OHM 1/4W	R616	R001T6106J	RC	10M OHM 1/6W
R115	R903N8473J	RC	47K OHM 1/8W	R617	R903N8102J	RC	1K OHM 1/8W
R117	R001T6473J	RC	47K OHM 1/6W	R619	R903N8222J	RC	2.2K OHM 1/8W
R118	R903N8473J	RC	47K OHM 1/8W	R622	R903N8680J	RC	68 OHM 1/8W
R120	R903N8472J	RC	4.7K OHM 1/8W	R623	R002T4121J	RC	120 OHM 1/4W
R121	R903N8472J	RC	4.7K OHM 1/8W	R624	R001T6470J	RC	47 OHM 1/6W
R122	R903N8472J	RC	4.7K OHM 1/8W	R625	R903N8222J	RC	2.2K OHM 1/8W
R123	R903N8472J	RC	4.7K OHM 1/8W	R626	R903N8223J	RC	22K OHM 1/8W
R124	R903N8472J	RC	4.7K OHM 1/8W	R627	R001T6101J	RC	100 OHM 1/6W
R125	R903N8473J	RC	47K OHM 1/8W	△ R629	R3X28B330J	R,METAL OXIDE	33 OHM 3W
R126	R903N8272J	RC	2.7K OHM 1/8W	R630	R001T6101J	RC	100 OHM 1/6W
R127	R903N8272J	RC	2.7K OHM 1/8W	R631	R001T6101J	RC	100 OHM 1/6W
R128	R903N8561J	RC	560 OHM 1/8W	R632	R903N8221J	RC	220 OHM 1/8W
R129	R903N8105J	RC	1M OHM 1/8W	R633	R903N8822J	RC	8.2K OHM 1/8W
R130	R903N8102J	RC	1K OHM 1/8W	R635	R001T6101J	RC	100 OHM 1/6W
R132	R903N8473J	RC	47K OHM 1/8W	R638	R903N8223J	RC	22K OHM 1/8W
R133	R903N8102J	RC	1K OHM 1/8W	R639	R903N8152J	RC	1.5K OHM 1/8W
R134	R903N8471J	RC	470 OHM 1/8W	R640	R001T6101J	RC	100 OHM 1/6W
R139	R002T4101J	RC	100 OHM 1/4W	R641	R002T4223J	RC	22K OHM 1/4W
R141	R903N8271J	RC	270 OHM 1/8W	R642	R903N8102J	RC	1K OHM 1/8W
R142	R903N8271J	RC	270 OHM 1/8W	R646	R903N8473J	RC	47K OHM 1/8W
R143	R903N8470J	RC	47 OHM 1/8W	R648	R001T6105J	RC	1M OHM 1/6W
R146	R002T4221J	RC	220 OHM 1/4W	R701	R002T4680J	RC	68 OHM 1/4W
R148	R002T4223J	RC	22K OHM 1/4W	R704	R001T6100J	RC	10 OHM 1/6W
△ R401	R4X5T6273F	R,METAL	27K OHM 1/6W	R705	R001T6101J	RC	100 OHM 1/6W
R403	R002T4223J	RC	22K OHM 1/4W	R802	R002T4272J	RC	2.7K OHM 1/4W
△ R408	R4X5T6103F	R,METAL	10K OHM 1/6W	△ R803	R3X181153J	R,METAL OXIDE	15K OHM 1W
△ R409	R4X5T6273F	R,METAL	27K OHM 1/6W	R804	R002T4272J	RC	2.7K OHM 1/4W
R410	R002T2331J	RC	330 OHM 1/2W	△ R805	R3X181153J	R,METAL OXIDE	15K OHM 1W
R413	R002T2222J	RC	2.2K OHM 1/2W	R806	R002T4272J	RC	2.7K OHM 1/4W
R415	R002T2182J	RC	1.8K OHM 1/2W	△ R807	R3X181153J	R,METAL OXIDE	15K OHM 1W
R416	R002T2010J	RC	1 OHM 1/2W	R809	R903N8472J	RC	4.7K OHM 1/8W
R417	R002T4103J	RC	10K OHM 1/4W	R811	R903N8472J	RC	4.7K OHM 1/8W
R418	R002T4223J	RC	22K OHM 1/4W	R813	R903N8331J	RC	330 OHM 1/8W
R419	R903N8471J	RC	470 OHM 1/8W	R814	R903N8472J	RC	4.7K OHM 1/8W
R420	R903N8332J	RC	3.3K OHM 1/8W	R815	R903N8331J	RC	330 OHM 1/8W
R421	R002T4224J	RC	220K OHM 1/4W	R816	R903N8331J	RC	330 OHM 1/8W
R422	R002T222R2J	RC	2.2 OHM 1/2W	R1001	R903N8473J	RC	47K OHM 1/8W
R423	R002T4101J	RC	100 OHM 1/4W	R1003	R001T6683J	RC	68K OHM 1/6W
R424	R001T6471J	RC	470 OHM 1/6W	R1004	R903N8104J	RC	100K OHM 1/8W
R427	R002T4101J	RC	100 OHM 1/4W	R1005	R903N8563J	RC	56K OHM 1/8W
△ R429	R655813R3J	R,FUSE	3.3 OHM 1W	R1007	R002T2470J	RC	47 OHM 1/2W
R432	R615U2680J	R,FUSE	68 OHM 1/2W	R1008	R903N8683J	RC	68K OHM 1/8W
R445	R002T4184J	RC	180K OHM 1/4W	CAPACITORS			
R446	R002T2471J	RC	470 OHM 1/2W	C002	E02LT0471M	CE	470 UF 6.3V
R448	R3X18A821J	R,METAL OXIDE	820 OHM 2W	C003	E50HU54R7M	CE	4.7 UF 50V
△ R500	R0G3K2275K	RC	2.7M OHM 1/2W	C004	C0JTF04H4Z	CC	0.022 UF 50V F
△ R501	R5Y2CD5R6J	R,CEMENT	5.6 OHM 5W	C007	CS0KY0313M	CC	0.001 UF 25V Y
R506	R001T6272J	RC	2.7K OHM 1/6W	C101	CQGTCH413J	CC	0.001 UF 50V CH
△ R508	R3X181221J	R,METAL OXIDE	220 OHM 1W	C113	CS0KCH4B1J	CC	12 PF 50V CH
△ R509	R001T6221J	RC	220 OHM 1/6W	C114	CS0KCH4B1J	CC	12 PF 50V CH
R510	R002T4125J	RC	1.2M OHM 1/4W	C115	E50HU50R1M	CE	0.1 UF 50 V
R511	R002T4125J	RC	1.2M OHM 1/4W	C118	E02LT0331M	CE	330 UF 6.3V
R512	R001T6681J	RC	680 OHM 1/6W	C119	CQGTFO415Z	CC	0.1 UF 50V F
R513	R001T6222J	RC	2.2K OHM 1/6W	C120	CQGTCH413J	CC	0.001 UF 50V CH
△ R514	R63581R22J	R,FUSE	0.22 OHM 1W	C121	CS0KB04H2K	CC	220 PF 50V B
△ R515	R002T2124J	RC	120K OHM 1/2W	C122	E50HU5010M	CE	1 UF 50V
△ R517	R3X1811R2J	R,METAL OXIDE	1.2 OHM 1W	C123	E50HU3100M	CE	10 UF 25 V
△ R518	R4X5T6562F	R,METAL	5.6K OHM 1/6W	C124	CQGTB0414K	CC	0.01 UF 50V B
△ R519	R001T6122J	RC	1.2K OHM 1/6W	C126	CQGTB0414K	CC	0.01 UF 50V B
R520	R002T4123J	RC	12K OHM 1/4W	C127	C0JTB05Q2K	CC	470 PF 500V B
R523	R001T6473J	RC	47K OHM 1/6W	C128	E02LU1331M	CE	330 UF 10V
R524	R3X18A1R2J	R,METAL OXIDE	1.2 OHM 2W	C130	CQGTB0414K	CC	0.01 UF 50V B

# ELECTRICAL REPLACEMENT PARTS LIST

Location No.	Part No.	Description	Reference No.	Location No.	Part No.	Description	Reference No.
CAPACITORS				CAPACITORS			
C136	CQGTFO415Z	CC	0.1 UF 50V F	C808	CS0KB04Q2K	CC	470 PF 50V B
C138	CS0KW04S2M	CC	560 PF 50V W	C809	CS0KB04Q2K	CC	470 PF 50V B
C139	CQGTFO415Z	CC	0.1 UF 50V F	C810	CS0KB04Q2K	CC	470 PF 50V B
C140	CS0KY0313M	CC	0.001 UF 25V Y	C819	C0JBB0713K	CC	0.001 UF 2KV B
C141	CQGTFO415Z	CC	0.1 UF 50V F	C1001	E50HU50R1M	CE	0.1 UF 50 V
▲ C403	E02LT4221M	CE	220 UF 35V	C1002	E02LT1222M	CE	2200 UF 10V
C406	C0JTSLSN1J	CC	39 PF 500V SL	C1003	E50HU5010M	CE	1 UF 50V
C407	CQGTCH4S1J	CC	56 PF 50V CH	C1004	CQGTB04E3K	CC	0.0015UF 50V B
▲ C414	E02LT4101M	CE	100 UF 35V	C1005	E50HU3100M	CE	10 UF 25 V
C417	E02LT5100M	CE	10 UF 50V	C1006	E00NU1470M	CE	47 UF 10 V
▲ C418	E02LT3471M	CE	470 UF 25V	DIODES			
C422	P611T1154J	CMPL	0.15 UF 100V TF	D001	D97U03001B	DIODE,ZENER	MTZJ30B T-77
C424	E5EZTD010M	CE	1 UF 250V	D403	D2WT011E10	DIODE,SILICON	11E1-EIC
C427	E02LT5100M	CE	10 UF 50V	D404	MTZJ6.2B T-77	DIODE,ZENER	MTZJ6.2B T-77
▲ C434	E02LT8220M	CE	22 UF 100V	▲ D405	D2WTAU02A0	DIODE,SILICON	AU02A-EIC
C435	E5EZT80R1M	CE	0.1 UF 100V	D406	1SS133T-77	DIODE,SILICON	1SS133T-77
C437	P4J7F3474J	CMPP	0.47 UF 250V PMS	D407	1SS133T-77	DIODE,SILICON	1SS133T-77
C440	C0JTB05B3K	CC	0.0012UF 500V B	D408	D2WT011E10	DIODE,SILICON	11E1-EIC
▲ C443	P4N8FJ822H	CMPP	0.0082UF 1.25KV	▲ D410	D2WTAU02A0	DIODE,SILICON	AU02A-EIC
C444	P4N8FJ471J	CMPP	470 PF 1.25KV	▲ D411	D2WTAU02A0	DIODE,SILICON	AU02A-EIC
▲ C446	E02LT5220M	CE	22 UF 50V	D501	D2WXN40050	DIODE,SILICON	1N4005-EIC
▲ C448	E5EZ0D100M	CE	10 UF 250V	▲ D502	D2WXN40050	DIODE,SILICON	1N4005-EIC
C501	P1S3T0822J	CP	0.0082UF 50V	▲ D503	D2WXN40050	DIODE,SILICON	1N4005-EIC
C502	C0JTB0513K	CC	0.001 UF 500V B	D504	D2WXN40050	DIODE,SILICON	1N4005-EIC
▲ C503	C0JTB0513K	CC	0.001 UF 500V B	▲ D505	D2WXB290S0	DIODE,SILICON	SB290S
▲ C505	P2472B104M	CMP	0.1 UF 275V PHE840	D506	D97U01801B	DIODE,ZENER	MTZJ18B T-77
C506	CD39E0MQ3M	CC	0.0047UF 250V	D507	MTZJ5.1B T-77	DIODE,ZENER	MTZJ5.1B T-77
C508	E02LT5R47M	CE	0.47 UF 50V	D508	1SS133T-77	DIODE,SILICON	1SS133T-77
C509	P1S3T0473J	CP	0.047 UF 50V	▲ D509	D97U01801B	DIODE,ZENER	MTZJ18B T-77
C511	E50HU5010M	CE	1 UF 50V	▲ D510	D2WXR02AM0	DIODE,SILICON	RUZAM-EIC
C512	E50HU52R2M	CE	2.2 UF 50V	D512	1SS133T-77	DIODE,SILICON	1SS133T-77
C513	CS0KY0313M	CC	0.001 UF 25V Y	▲ D513	D2WXB290S0	DIODE,SILICON	SB290S
C514	C0PLRR7U2K	CC	680 PF 2KV RR	D514	1SS133T-77	DIODE,SILICON	1SS133T-77
▲ C515	E5EZF2222M	CE	2200 UF 16V	D522	D1VT001330	DIODE,SILICON	1SS133T-77
C516	C0PLRR7Q2K	CC	470 PF 2KV RR	D528	D97U05R61B	DIODE,ZENER	MTZJ5.6B T-77
C517	C0PLRR7Q2K	CC	470 PF 2KV RR	D601	1SS133T-77	DIODE,SILICON	1SS133T-77
C518	C0JTB05Q2K	CC	470 PF 500V B	D602	MTZJ8.2B T-77	DIODE,ZENER	MTZJ8.2B T-77
▲ C519	E02LT2102M	CE	1000 UF 16V	D604	D97U05R61B	DIODE,ZENER	MTZJ5.6B T-77
C520	C0J0B0413K	CC	0.001 UF 50V B	D605	D2WT011E10	DIODE,SILICON	11E1-EIC
C521	E62NFB101M	CE	100 UF 160V	D606	D97U06R81B	DIODE,ZENER	MTZJ6.8B T-77
▲ C526	E02LFC221M	CE	220 UF 200V	D607	D97U05R61B	DIODE,ZENER	MTZJ5.6B T-77
C530	E5EZT8100M	CE	10 UF 100V	D609	1SS133T-77	DIODE,SILICON	1SS133T-77
C601	E02LU0471M	CE	470 UF 6.3V	D610	D97U01201B	DIODE,ZENER	MTZJ12B T-77
C602	CQGTB0414K	CC	0.01 UF 50V B	D611	D97U01201B	DIODE,ZENER	MTZJ12B T-77
C603	E50HU5010M	CE	1 UF 50V	D612	D97U01201B	DIODE,ZENER	MTZJ12B T-77
C604	E50HU5010M	CE	1 UF 50V	▲ D619	MTZJ5.1B T-77	DIODE,ZENER	MTZJ5.1B T-77
C605	E50HU5R47M	CE	0.47 UF 50V	D701	D97U06R81B	DIODE,ZENER	MTZJ6.8B T-77
C606	CQGTCH412J	CC	100 PF 50V CH	ICS			
C607	CQGTB0414K	CC	0.01 UF 50V B	IC101	I56F07076A	IC	OEC7076A
C612	E02LT1102M	CE	1000 UF 10V	IC199	A3L116C015	IC	S-24C02BDP-1A
C613	P235WE105J	CMP	1 UF 63V MKT	▲ IC401	I01TD55220	IC	AN5522
C616	CHGTC4H41J	CC	22 PF 50V CH	IC601	I06FC61250	IC	M61250FP
C618	CS0KSL412K	CC	100 PF 50V SL	IC1001	I01DP75110	IC	AN7511
C619	E50HT2220M	CE	22 UF 16 V	TRANSISTORS			
C621	CQGTB0414K	CC	0.01 UF 50V B	▲ Q401	TDUF024990	TRANSISTOR,SILICON	2SD2499
C622	P1S3T0822J	CP	0.0082UF 50V	▲ Q402	TC5T01627Y	TRANSISTOR,SILICON	2SC1627_Y(TPE2)
C623	CS0KY03L3M	CC	0.0033UF 25V Y	▲ Q501	TJXG5NC500	FET	STP5NC50FP
C624	E02LT2470M	CE	47 UF 16V	▲ Q502	TCATC31980	TRANSISTOR,SILICON	KTC3198-AT(Y,GR)
C625	E50HU5010M	CE	1 UF 50V	Q503	TA3T016240	TRANSISTOR,SILICON	2SA1624-AA
C626	CQGTB0414K	CC	0.01 UF 50V B	▲ Q504	0002E00610	PHOTO COUPLER	LTV-817M-VB
C627	E62KU5010M	CE	1 UF 50V	Q506	TNATB03005	COMPOUND TRANSISTOR	KRC102MAT
C628	E50HU5R22M	CE	0.22 UF 50 V	Q507	TCATC31980	TRANSISTOR,SILICON	KTC3198-AT(Y,GR)
C629	E02LT5010M	CE	1 UF 50V	Q509	TNATB03005	COMPOUND TRANSISTOR	KRC102MAT
C630	E02LT2470M	CE	47 UF 16V	Q603	TCAT032034	TRANSISTOR,SILICON	KTC3203_Y-AT
C632	E50HU50R1M	CE	0.1 UF 50 V	Q604	TCAT032034	TRANSISTOR,SILICON	KTC3203_Y-AT
C634	CQGOCH412J	CC	100 PF 50V CH	Q605	TCAT032034	TRANSISTOR,SILICON	KTC3203_Y-AT
C635	E02LT2470M	CE	47 UF 16V	Q606	TCAT032034	TRANSISTOR,SILICON	KTC3203_Y-AT
C637	CQGTB0414K	CC	0.01 UF 50V B	Q607	TCATC31980	TRANSISTOR,SILICON	KTC3198-AT(Y,GR)
C638	E50HU5100M	CE	10 UF 50V	Q609	TCATC31980	TRANSISTOR,SILICON	KTC3198-AT(Y,GR)
C639	CQGTB0414K	CC	0.01 UF 50V B	Q610	TCATC31980	TRANSISTOR,SILICON	KTC3198-AT(Y,GR)
C640	CQGTB0414K	CC	0.01 UF 50V B	▲ Q801	2SC1473QRTA	TRANSISTOR,SILICON	2SC1473A-TA-(RQ)
C645	E0EL02470M	CE	47 UF 16V	▲ Q802	2SC1473QRTA	TRANSISTOR,SILICON	2SC1473A-TA-(RQ)
C647	E50HU5010M	CE	1 UF 50V	▲ Q803	2SC1473QRTA	TRANSISTOR,SILICON	2SC1473A-TA-(RQ)
C655	CS0KY02U3M	CC	0.0068UF 16V Y	COILS & TRANSFORMERS			
C702	CS0RF0316Z	CC	1 UF 25V F	L101	021LA63R3K	COIL	3.3 UH
C703	C0JTB0413K	CC	0.001 UF 50V B	L405	021679472K	COIL	4.7 MH
C801	CHGTB04L2K	CC	330 PF 50V B	▲ L501	029T00A7M1	COIL,LINE FILTER	1R5A102F20

# ELECTRICAL REPLACEMENT PARTS LIST

Location No.	Part No.	Description	Reference No.
<b>COILS &amp; TRANSFORMERS</b>			
△ L503	028R140030	COIL,DEGAUSS	8R140030
L601	021LA6R56M	COIL	0.56 UH
L607	021LA6150K	COIL	15 UH
L801	021673221K	COIL	220 UH
T401	045009003J	TRANS,HORIZONTAL DRIVE	ETH09K14BZ
△ T502	0481290904	TRANSFORMER,SWITCHING	81290904
<b>JACKS</b>			
J702	060Q401077	RCA JACK	AV1-09D-3
J703	060Q401076	RCA JACK	AV1-09D-4
△ J801	066F120018	SOCKET,CATHODE RAY TUBE	ISMS01S
J1001	0602121012	JACK,RCA 3.5	HSJ1403-01-010
<b>SWITCHES</b>			
SW101	0504201T31	SWITCH,TACT	SKHVBED010
SW102	0504201T31	SWITCH,TACT	SKHVBED010
SW103	0504201T31	SWITCH,TACT	SKHVBED010
SW104	0504201T31	SWITCH,TACT	SKHVBED010
SW105	0504201T31	SWITCH,TACT	SKHVBED010
<b>P.C. BOARD ASSEMBLIES</b>			
PCB010	A3L116C010	PCB ASS'Y	TMB535A
PCB110	A3L116C110	PCB ASS'Y	TCB394A
<b>MISCELLANEOUS</b>			
ANT001	125C104001	ANTENNA,ROD	HPAS-2S400
B503	024HT03553	CORE,BEADS	W5RH3.5X5X1.0
△ CD501	120R414903	CORD,AC BUSH	0R414903
CF601	1029045R7G	FILTER,SAW	TSF5229P3
CF603	1012T4R520	FILTER,CERAMIC	SFSRA4M50CF00-A0
CF604	1012T4R519	FILTER,CERAMIC TRAP	TPSRA4M50C00-A0
△ F501	081PC04004	FUSE	51MS040LCC
△ FB401	043214033F	TRANSFORMER,FLYBACK	FQI-14B001
OS101	077Q014003	REMOTE RECEIVER	PIC-28143SY-2
S101	WHL6032014	FLAT CABLE AWM2468 AWG26	10C BLACK 320MM
SP1001	070C533008	SPEAKER	810-47-171
△ TH501	DF5EL3R0A0	DEGAUSS ELEMENT	ZPB45BL3R0A
TM101	EUR501450	TRANSMITTER	EUR-501450
△ TU001	0145K00056	TUNER,VHF-UHF	TECC1040PG32E
△ V801	098Y1404B9	CRT W/DY	A34JXV70X53N45
X602	100CT3R505	CRYSTAL	HC-49/C

## RESISTOR

RC..... CARBON RESISTOR

## CAPACITORS

CC..... CERAMIC CAPACITOR  
CE..... ALUMI ELECTROLYTIC CAPACITOR  
CP..... POLYESTER CAPACITOR  
CPP..... POLYPROPYLENE CAPACITOR  
CPL..... PLASTIC CAPACITOR  
CMP..... METAL POLYESTER CAPACITOR  
CMPL..... METAL PLASTIC CAPACITOR  
CMPP..... METAL POLYPROPYLENE CAPACITOR

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