# INTERNSHIP REPORT

# ON

# COLOR TELEVISION ASSEMBLY IN SHAHNOOR ELECTRONICS

By

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# Certificate

Awarded to Mir Mosharraf Hossain

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*For successful completion of the internship in Shahnoor Electronics (TCL)*

*Held from September 17, 2010 to December 03, 2010*

Mamunur Rashid Parvez

*General Manager*

SHAHNOOR ELECTRONICS (TCL)

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# Acknowledgment

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Last but not the least I would like to thank almighty Allah to reach the end of this report which in the end left me wiser than before.

# Executive Summary

This report is about assembling of a color television. The parts are imported from China and the assembling section of Shahnoor Electronics assemble those and if necessary color television is taken under servicing department.

The television is made up of four principal sets of parts: the exterior part or housing, the picture tube, the audio (sound) reception and stereo system, and the electronic components (parts). These electronics parts include cable and antenna input and output devices, a built-in antenna in most television sets, a remote control receiver, computer chips, and access buttons.

The color television (CTV) assembly section was under the supervision of my mentor. That is why I got the clear idea on assembling a CTV. I worked on attachment of felt sheet to the front panel, setting main PCB (Printed Circuit Board) inside the cabinet, and connecting the speakers. To ensure the better service for the customers, warranty sticker on the back side of the CRT was placed. I placed the CRT very carefully by tapping four screws at its four corners. Then I plugged on the wires of power cord, sensor, speakers etc. sequentially on the main PCB. Few adjustments like color, brightness, contrast etc. were performed by me. By using magnetic machine I also checked horizontal and vertical adjustments. Sound quality, channel tuning, A/V input output ports were checked by me before back cover docking. I performed ground test at the final stage of assembly. At servicing station I did not have hands-on experience rather observed technicians doing there jobs and for better understanding they provided me few flow charts so that I could follow their works.

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## 1.1 Company profile

As color television has become a part of everyday life even in the countries like Bangladesh, people like to have color television but not an expensive one rather wants that at low cost. Keeping that in mind Shahnoor electronics started its journey in Bangladesh in 1998 with its low cost and stylish color television. With the time they have expanded their business as the supplier of many low cost electronic home appliances. They became top 3 in the line within a very short period of time. In 2004, TCL air conditioner entered Bangladesh. CTV, mobile phone, air conditioner, computer and many kinds of other products of TCL were well accepted and quite popular in china. Depending on its wise and strategically sales channel and powerful distributors and agents, the sales volume increased rapidly and the market share hence expanded step by step. TCL is the leader of this line. Shahnoor electronics started as its business as an importer of television, later on it started to import only the parts of color television and assemble those parts in their own assembling plant located in Gandaria(9,Rajani,Chowdhury road,Gandaria,Dhaka). From the very beginning they were selling the television as the mother brand named TCL. Depending on the reliable quality, advanced technology, stylish looks, design and considerate after sales service, TCL now maintains a good reputation and remarkable market share in Bangladesh. Now they have 283 show rooms in different districts of Bangladesh. Their corporate office is located at Motijheel (54, Dilkusha commercial area, Prachi building 1$^{st}$ floor,Dhaka). The company started with only 5 employees and now they have more than 100 employees. Not only tv and air conditioner they have many other house hold products such as refrigerator, VCD and DVD player. Facing the future, TCL will continue to try its best to give customers the outstanding quality products and considerable after service to survive and win the more and more intense competition.

## 1.2 Objective of Internship

Internship is an academic activity that is to perform so that a student can relate the theoretical knowledge with the practical world through this program. The objective was initially to know about color television but later on job seemed more complex as assembling techniques were tough and so was the servicing as well. This report explains

the experience that I have obtained in the assembling plant. The main objective of the report is to present the proper sequential stages of assembling color television which I performed under Shahnoor Electronics (TCL).

## 1.3 Sources and Methods of Data Collection

I have collected from both the primary and secondary sources. In general, the company itself was the primary source of data collection whereas the internet was the secondary one. The primary source includes discussion with engineer in-charge, observing and consulting with the workers etc. The secondary sources are the system layouts provided by the exporter (Chinese company).I have also gone through different websites to collect the secondary information.

## 1.4. Benefit of study

The analysis of the report is based on the functions of electrical parts inside CTV assembly procedures. Finally this report also dictates few solutions to solve problems if there any problem occurs after completion of assembling a whole system. I anticipate that, this report will be helpful for those who have interests on color television.

## 1.5 Limitations

It is almost impossible to prepare a report without any limitation. This intern report also has certain limitations, which must be mentioned for the sake of reader's understandability and achieving transparency. As most of the secondary data were collected from the web sites, there are very few websites that contain information about Chinese television assembly details. Though the cross check was conducted; still the depth of reliability varies as by the nature of web sites. Lastly the limited knowledge of the analyst, who is conducting such report for the first time, has its effect on the paper.

# Chapter 2

## 2.1. The Internship Schedule

Though I had started going to the main factory of Shahnoor Electronics (which is at Gandaria) on Friday but later on because of changing the schedule of the office I finally started doing my job on Monday and on Wednesday in each week. On the very first Friday I had been there for about two hours but later on (Monday and Wednesday) I stayed there for about six hours each day in the office to serve my purpose. During my examination week (in the university) I did not work too long in the factory rather I worked there about three hours in the particular day.

## 2.2. Name of the parts to assemble the whole system

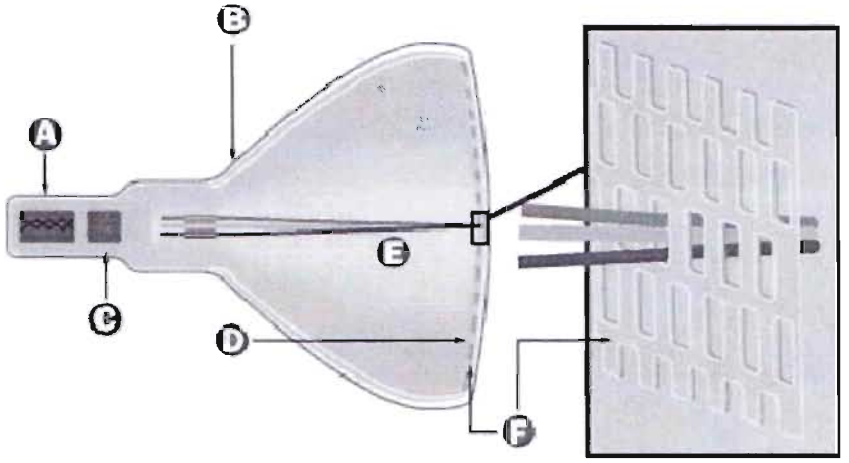
Cabinet, speaker, CRT (cathode ray tube), deflection yoke, PCB (printed circuit board like power PCB, A/V PCB, stereo PCB, main PCB), Flyback (Boost) transformer/generator, felt sheet, screws etc.

## 2.3 Functions of the electrical parts

### 2.3.1 CRT

The Cathode Ray Tube (CRT) is a vacuum tube which contains one or more electron guns (a source of electrons) and a fluorescent screen. In television sets and computer monitors, the entire front area of the tube is scanned repetitively and systematically in a fixed pattern called a raster. By controlling the intensity of each of the three electron beams (red, green and blue), an image is produced. In all modern CRT monitors and televisions, the beams are bent by magnetic deflection; a varying magnetic field generated by coils and driven by electronic circuits around the neck of the tube. The CRT uses an evacuated glass envelope which is large, deep, heavy, and also fragile.

CRTs have a cathode and a pair (or more) of anodes. Besides having Phosphor coated screen it also has a conductive coating inside the tube to soak up the electrons that pile up at the screen-end of the tube. A CRT is composed of several parts, all working together to form a coherent picture.




A Cathode
B Conductive coating
C Anode
D Phosphor-coated screen
E Electron beams
F Shadow mask

Figure 2.1: CRT

A CRT contains a cathode, or a negative electronic terminal. It consists of a thick, heated wire that is contained within a glass tube which is vacuum-sealed to eliminate resistance. The cathode emits a stream of electrons into the tube that travel down its length and are attracted and accelerated by an anode, a positive terminal. After speeding up to extremely high the electrons strike a phosphorescent screen at the end of the tube compelling it to glow. CRTs require steering coils that consist mainly of copper wire wrapped around the picture tube itself, and create magnetic fields that steer the electron beam to the desired pixel on the screen. These magnetic fields can be manipulated with extreme precision by changing the voltage of the wiring to focus the electron beam to any point on the screen.

A shadow mask or aperture grill a fraction of an inch (0.5" typical) is utilized by all color CRTs behind the phosphor screen to direct the electron beams for the red, green, and blue video signals to the proper phosphor dots. Since the electron beams for the R, G, and B phosphors originate from slightly different positions (individual electron guns for each) and thus arrive at slightly different angles, only the proper phosphors are excited when the purity is properly adjusted and the necessary magnetic field free region is maintained inside the CRT. The purity determines that the correct video signal excites the proper color while convergence determines the geometric alignment of the three colors where both are affected by magnetic fields. Bad convergence results in color fringing at edges of

characters or graphics whereas bad purity results in mottled or incorrect colors. It is important to note that the three beams in color CRTs would not strike at the same point without convergence calibration but to maintain color accuracy, the set may be needed to adjust manually to converge the three color beams together.

The shadow mask is made of thin steel which is basically a ferrous alloy with a fine array of holes - one for each trio of phosphor dots - positioned about a half inch behind the surface of the phosphor screen. The phosphors are arranged in triangular formations (which are called triads) with each of the color dots at the top of the triangle in the most CRTs but they are arranged as vertical slots with the phosphors in the most of the TVs (also in some computer monitors) for the sequential three colors.

**Degaussing:**

Modern CRT televisions and computer monitors have a built-in degaussing coil (also called demagnetizing coil) that creates a brief but alternating magnetic field which decays in strength over the course of a few seconds. To remove most cases of shadow mask magnetization, this degaussing field is strong enough.

## 2.3.2 Flyback Transformer (FBT)

A flyback transformer (FBT) can also be called a line output transformer (LOPT). It is a special transformer which is used to generate high voltage (HV) signals at a relatively high frequency. It was invented as a means to control the horizontal movement of the electron beam in a CRT. Receiving low voltages, step–up transformers transform them into high voltages at a relatively high frequency (specifically much faster than the vertical movement of the vertical scan rate or electron beam).

A FBT or LOPT is a type of transformer that is used in the power supply of a cathode ray tube that generates the high voltage needed to drive a CRT type monitor which essentially generates a voltage ranging from a few kilovolts for an oscilloscope tube to 20 to 30 kilovolts for a color TV tube. A FBT operates in the range of 17 kHz to 50 kHz with switched currents.

Figure 2.2: Flyback

### 2.3.3 Deflection Yoke

Deflection yoke can be defined as an assembly of one or more electromagnets that is placed around the neck of an electron-beam tube to produce a magnetic field for deflection of one or more electron beams, which is also known as scanning yoke or yoke.

It is a solenoid-shaped auxiliary coil arranged for a picture tube adjacent to a core of the deflection yoke with a center axis of the auxiliary coil being aligned to a center axis of the deflection yoke. An electron beam is deflected by a magnetic field generated by the current of the auxiliary coil so that a raster formed on a face plate of the picture tube is deformed. When it is projected on a screen the raster is deformed to such an extent that it has a correct shape. It is important to note that to the auxiliary coil a vertical deflection current or horizontal deflection current is supplied. Finally, it is nothing but the magnetic coils around a television tube used to control the position of the picture beam.

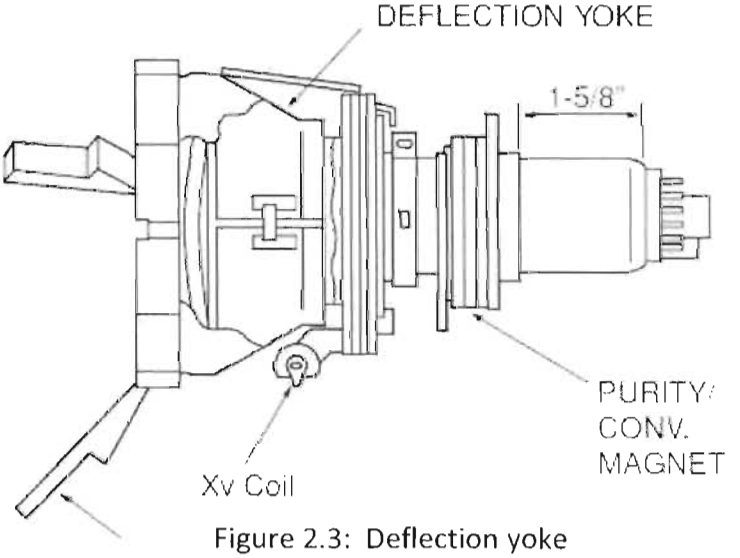



Figure 2.3: Deflection yoke

## 2.3.4 PCB

A PCB (printed circuit board) is a thin plate on which chips and other electronic components are placed. A PCB is used to support mechanically and to connect electronic components electrically using conductive pathways, tracks or signal traces etched from copper sheets laminated onto a non-conductive substrate. PCBs are used virtually but the simplest commercially-produced electronic devices. It is also referred to as printed wiring board (PWB) or etched wiring board. A PCB populated with electronic components is a printed circuit assembly (PCA), also known as a printed circuit board assembly (PCBA).

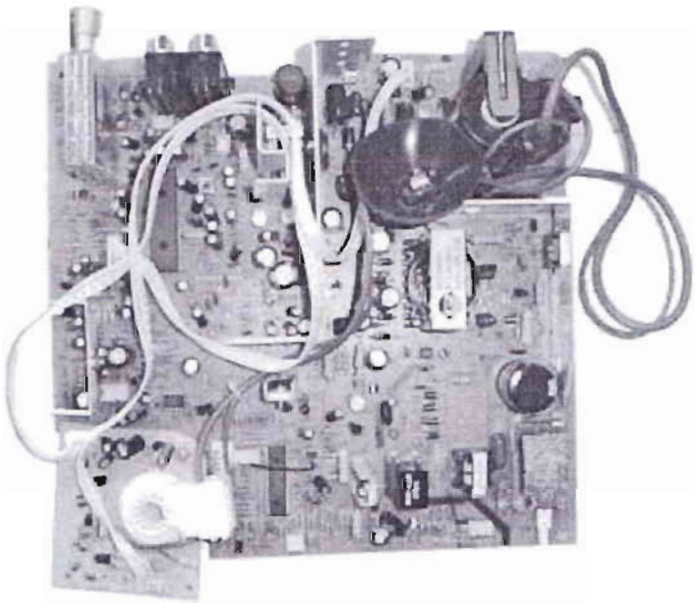


Figure 2.4: color TV PCB

Inside a television there are also few PCBs like CRT PCB, main PCB, and front jack PCB.

# Chapter 3

## 3.1. Safety Precautions

It was important for me to follow these safety, servicing and ESD (Electrostatically Sensitive Devices) precautions to prevent damage and to avoid potential hazards such as electrical shock and X-rays.

1. Must have to be sure that all of the built-in protective devices are placed. Remember to install any missing protective shields.

2. When installing the chassis and its assemblies, be sure to install all protective devices, including: nonmetallic control knobs and compartment covers.

3. Make sure that there are no cabinet openings through which people—particularly children—might insert fingers and contact dangerous voltages. Such openings include the spacing between the picture tube and the cabinet mask.

4. Leakage Current Hot Check:

Warning: Do not use an isolation transformer during this test.

With the unit completely reassembled, plug the AC line cord directly into the power outlet. With the unit's AC switch first in the 'ON' position and then 'OFF', measure the current between a known earth ground (metal water pipe, conduit, etc.) and all exposed metal parts, including: antennas, handle brackets, metal cabinets, screwheads and control shafts. The current measured should not exceed 0.5 milliamp. Reverse the powerplug prongs in the AC outlet and repeat the test.

5. Antenna Cold Check:

With the unit's AC plug disconnected from the AC source, connect an electrical jumper across the two AC prongs. Connect one lead of the ohmmeter to an AC prong. Connect the other lead to the coaxial connector.

6. X-ray Limits:

The picture tube is especially designed to prohibit X-ray emissions. To ensure continued X-ray protection, replace the picture tube only with one that is the same type as the original. Carefully reinstall the picture tube shields and mounting hardware; these also provide X-ray protection.

7. High Voltage Limits:

High voltage must be measured each time servicing is done on the B+, horizontal deflection or high voltage circuits. Correct operation of the X-ray protection circuits must be reconfirmed whenever they are serviced.

(X-ray protection circuits also may be called "horizontal disable" or "hold-down".)Heed the high voltage limits. These include the X–ray protection specifications label, and the product safety and X-ray warning note on the service data schematic.

8. High voltage is maintained within specified limits by close-tolerance, safety-related components and adjustments. If the high voltage exceeds the specified limits, check each of the special components.

9. Design Alteration Warning:

Never alter or add to the mechanical or electrical design of this unit. Example: Do not add auxiliary audio or video connectors. Such alterations might create a safety hazard. Also, any design changes or additions will void the manufacturer's warranty.

10. Hot Chassis Warning:

Some TV receiver chassis are electrically connected directly to one conductor of the AC power cord. If an isolation transformer is not used, these units may be safely serviced only if the AC power plug is inserted so that the chassis is connected to the ground side of the AC source. To confirm that the AC power plug is inserted correctly, do the following: Using an AC voltmeter, measure the voltage between the chassis and a known earth ground. If the reading is greater than 1.0V, remove the AC power plug, reverse its polarity and reinsert. Re-measure the voltage between the chassis and ground.

11. Some TV chassis are designed to operate with 85 volts AC between chassis and ground, regardless of the AC plug polarity. These units can be safely serviced only if an isolation transformer inserted between the receiver and the power source.

12. Some TV chassis have a secondary ground system in addition to the main chassis ground. This secondary ground system is not isolated from the AC power line. The two ground systems are electrically separated by insulating material that must not be defeated or altered.

13. Components, parts and wiring that appear to have overheated or that are otherwise damaged should be replaced with parts that meet the original specifications. Always determine the cause of damage or overheating, and correct any potential hazards.

14. Observe the original lead dress, especially near the following areas: Antenna wiring, sharp edges, and especially the AC and high voltage power supplies. Always inspect for pinched, out-of-place, or frayed wiring. Do not change the spacing between components and the printed circuit board. Check the AC power cord for damage. Make sure that leads and components do not touch thermally hot parts.

15. Picture Tube Implosion Warning:

The picture tube in this receiver employs "integral implosion" protection. To ensure continued implosion protection, make sure that the replacement picture tube is the same as the original.

16. Do not remove, install or handle the picture tube without first putting on shatterproof goggles equipped with side shields. Never handle the picture tube by its neck. Some "in-line" picture tubes are equipped with a permanently attached deflection yoke; do not try to remove such "permanently attached" yokes from the picture tube.

17. Product Safety Notice:

Some electrical and mechanical parts have special safety-related characteristics which might not be obvious from visual inspection. These safety features and the protection they give might be lost if the replacement component differs from the original—even if the replacement is rated for higher voltage, wattage, etc. Components that are critical for safety are indicated in the circuit diagram by shading, ( ⚠ ) or (⚠). Use replacement components that have the same ratings, especially for flame resistance and dielectric strength specifications. A replacement part that does not have the same safety characteristics as the original might create shock, fire or other hazards.

## 3.2. Servicing precautions

1. Servicing precautions are printed on the cabinet.

2. Always unplug the unit's AC power cord from the AC power source before attempting to:

(a) Remove or reinstall any component or assembly,

(b) Disconnect an electrical plug or connector,

(c) Connect a test component in parallel with an electrolytic capacitor.

3. Some components are raised above the printed circuit board for safety. An insulation tube or tape is sometimes used. The internal wiring is sometimes clamped to prevent contact with thermally hot components. Reinstall all such elements to their original position.

4. After servicing, always check that the screws, components and wiring have been correctly reinstalled. Make sure that the portion around the serviced part has not been damaged.

5. Check the insulation between the blades of the AC plug and accessible conductive parts (examples: metal panels, input terminals and earphone jacks).

6. Insulation Checking Procedure:

Disconnect the power cord from the AC source and turn the power switch on. Connect an insulation resistance meter (500V) to the blades of the AC plug. The insulation resistance between each blade of the AC plugs and accessible conductive parts (see above) should be greater than 1 megohm.

7. Never defeat any of the B+ voltage interlocks. Do not apply AC power to the unit (or any of its assemblies) unless all solid-state heat sinks are correctly installed.

8. Always connect a test instrument's ground lead to the instrument chassis ground before connecting the positive lead; always remove the instrument's ground lead last.

## Precautions for Electrostatically Sensitive Devices (ESDs):

1. Some semiconductor ('solid state') devices are easily damaged by static electricity. Such components are called 'Electrostatically Sensitive Devices' (ESDs); examples include integrated circuits and some field-effect transistors. The following techniques will reduce the occurrence of component damage caused by static electricity.

2. Immediately before handling any semiconductor components or assemblies, drain the electrostatic charge from your body by touching a known earth ground. Alternatively, wear a discharging wrist-strap device. (Be sure to remove it prior to applying power—this is an electric shock precaution.)

3. After removing an ESD-equipped assembly, place it on a conductive surface such as aluminum foil to prevent accumulation of electrostatic charge.

4. Do not use Freon-propelled chemicals. These can generate electrical charges that damage ESDs.

5. Use only a grounded-tip soldering iron when soldering or unsoldering ESDs.

6. Use only anti-static solder removal device. Many solder removal devices are not rated as "anti-static"; these can accumulate sufficient electrical charge to damage ESDs.

7. Do not remove a replacement ESD from its protective package until you are ready to install it. Most replacement ESDs are packaged with leads that are electrically shorted together by conductive foam, aluminum foil or other conductive materials.

8. Immediately before removing the protective material from the leads of a replacement ESD, touch the protective material to the chassis or circuit assembly into which the device will be installed.

9. Minimize body motions when handling unpackaged replacement ESDs. Motions such as brushing clothes together or lifting a foot from a carpeted floor can generate enough static electricity to damage an ESD.

## 3.3. Assembling steps

While performing my internship the company received a consignment of color television parts having different models. This part of the report describes the sequential steps of a specific model (T-21M83) although all the models require the same assembling process.

### Stage 1:

At first station I attached (raw) felt sheet to plastic made front panel in the three sides (left, right and top sides) so that the inner part gets isolated. Then I finished the step by setting door (keyboard on the front panel) on the front panel through screw tapping.

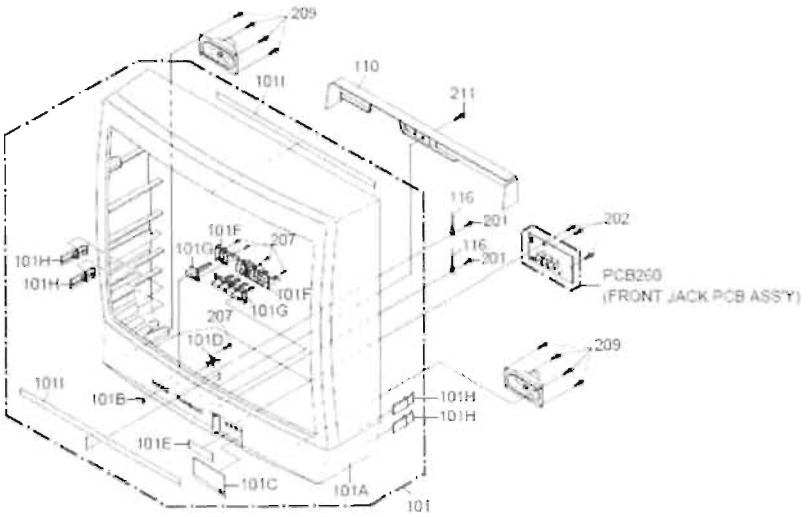



Figure 3.1: Front panel

**Stage 2**:

Main PCB was set by me inside the cabinet using Pneumetic for the perfect screw tapping.

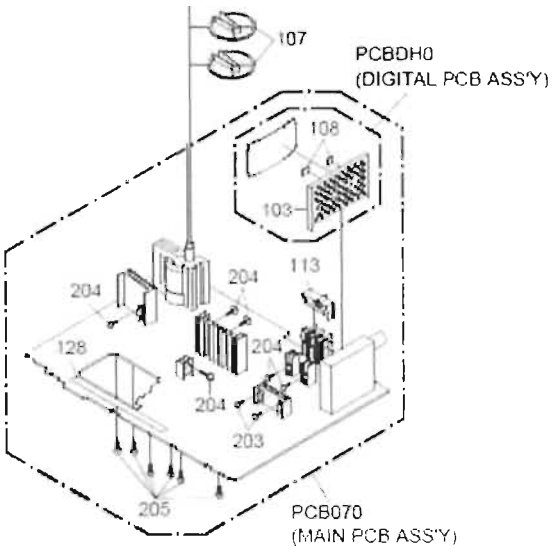



Figure 3.2: Main PCB

**Stage 3:**

Then I connected the speakers (wires) by proper screw tapping inside the cabinet. It is important to notice that speaker for the left side usually has two and right sided speaker has three pins.

**Stage 4:**

I attached TCL branded sticker mentioning a product number (this number is the warranty mark for the customer if he faces any trouble after purchasing) which carries a distinct identity for each individual product on the back side of the CRT .Then by tapping up four

screws at the four corners of CRT the picture tube was placed by me. Performing this step was very crucial for me because the picture tube is very sensitive and vulnerable.

Felt sheet was attached in between the CRT and the body of the cabinet for the safety of the picture tube.

In this step I fixed the screws at the four corners carefully so that the tapping gets neither too hard nor too loose so that they do no harm. Additionally sheet CRT support was used by me before tapping up the screws. It is highly recommended to use Pneumetic in adjusting the screws.

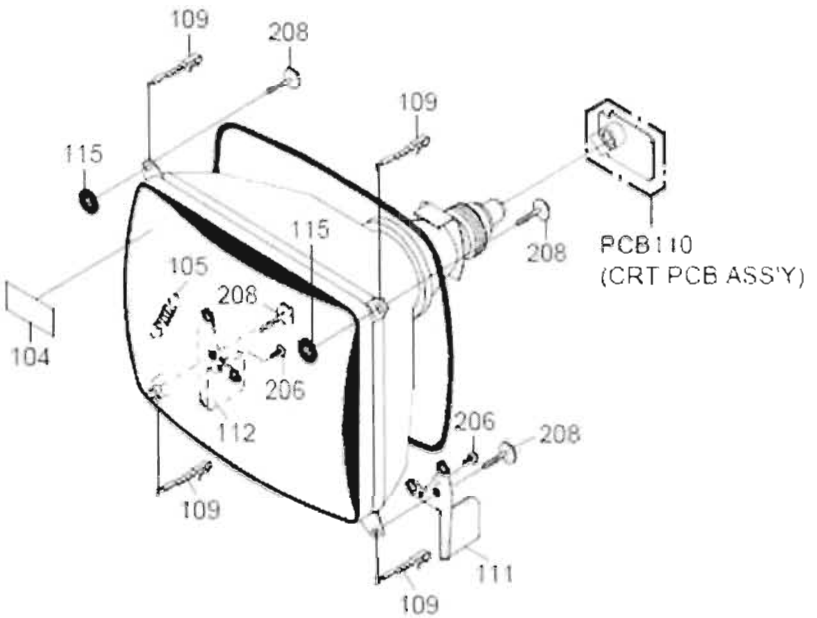



Figure 3.3: CRT

## Stage 5:

In this step I plugged on the wires of the power cord, sensor, speakers, yoke terminal, earthing wire and degaussing coil on the PCB board.

## Stage 6:

I connected CRT with CRT PCB whereas ST cap (named locally) was attached by glue and finally connected the CRT PCB to the ground.

## Stage 7:

In this level it is to check whether the assembled system up to the previous stage is functioning properly by taking the helps of magnet and the degaussing machines. If the assembly is perfect, degaussing machine confirms that by beeping.

With the help of master remote I adjusted the picture screen. The adjustments are of color, brightness, contrast etc.

Finally picture screen is needed to adjust to check whether the horizontal (ON) line is okay and both the high and low voltages of the fly back should be examined carefully. In this step I was asked to follow few things:

1) Single Focus CPT: Adjust the upper Focus volume of FBT for the best focus of horizontal line A, vertical line B.

2) Double Focus CPT:

a) Adjust the lower Focus volume of FBT for the best focus of vertical line B.

b) Adjust the upper Focus volume of FBT for the best focus of area A.

c) Repeat above step 1) and 2) for the best overall focus.

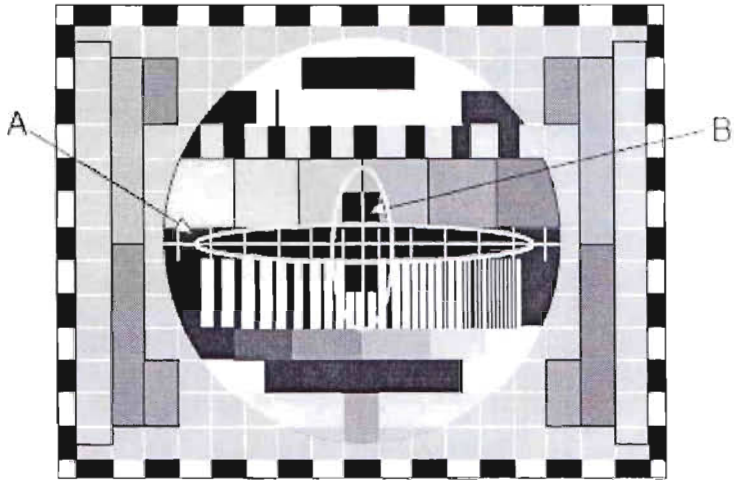



Figure 3.4: PAL digital pattern

**FOR COLOR PURITY ADJUSTMENT:**

**(1)** Demagnetize the CRT and cabinet using a degaussing coil.

**(2)** Set the brightness and contrast to maximum.

**(3)** Receive the green raster test pattern.

**(4)** Loosen the clamp screw holding the deflection yoke and slide it backward or forward to display vertical green belt (zone) on the screen.

**(5)** Remove the rubber wedge.

(6) Rotate and spread the tabs of the purity magnet around the neck of the CRT until the green belt is on the center of the screen.

(7) Slowly move the deflection yoke forward or backward until a uniform green screen is obtained. Tighten the clamp screw of the yoke temporarily.

(8) Check purity of the red and blue raster.

CONVERGENCE ADJUSTMENT:

Before attempting any convergence adjustment, make sure that the receiver has been powered ON for at least twenty minutes.

1. Input a crosshatch pattern from a color bar generator.
2. Adjust the brightness and contrast controls for a well defined pattern.
3. Adjust the two tabs of the 5-pole magnets. Change the angle between the tabs, and superimpose red and blue vertical lines in the center area of the picture screen.
4. Next, turn both tabs at the same time. Keep the angle between the tabs constant, and superimpose the red and blue horizontal lines at the center of the screen.
5. Adjust the two tabs of the 6-pole magnets. Superimpose the red/blue lines on the green. Adjusting the angle affects the horizontal lines.
6. Repeat adjustments 3, 4 and 5. The dot movement is complex because the 4-pole and 6-pole magnets interact.

## Stage 8:

There were a reference television (a monogram was set in the central position on the screen for an instance the starting monogram of channel BTV) and newly assembled television, they were connected together and another device called magnetic machine was interlinked with the reference to check whether both the horizontal and vertical alignments were perfect in the newly assembled television by comparing to the reference one. If the alignments were not identical to the reference television then the magnetic machine provided a beep as an indication that the alignments went wrong then to solve the problem I used a remote to make the alignments perfect. It was needed to follow the instructions:

**(I) VL** (Vertical Linearity) adjustment: Adjust the top & bottom size of inner circle to be equal.

(2) VA (Vertical Amplitude) adjustment: Adjust so that the circle of a digital circle pattern should be located in interval of 6~7mm from the effective screen of the CPT.

(3) SC (Vertical S correction) adjustment: Adjust so that all distance between each lattice width of top/center/bottom are to be the same.

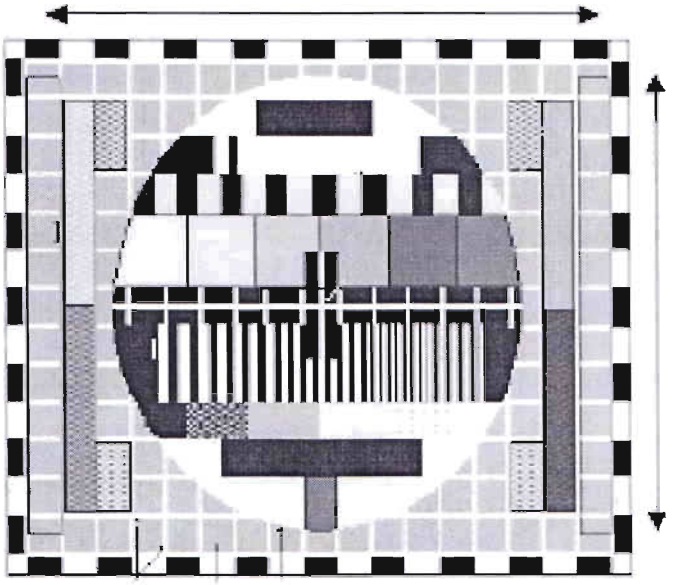


Figure 3.5: PAL digital pattern

(4) VS (Vertical Shift) adjustment: Adjust so that the geometric vertical center line is in accord with vertical center line of CPT.

(5) HS (Horizontal Shift) adjustment: Adjust so that the geometric horizontal center line is in accord with horizontal center line of CPT.

(6) EW (East-West Width) adjustment: Adjust until the outmost left and right lattice of received pattern is accord with 25% of other lattice width.

(7) ET (Trapezoidal) adjustment: Adjust to make the length of top horizontal line same with it of the bottom horizontal line.

(8) EP (Pin Cushion) adjustment: Adjust so that middle portion of the outermost left and right vertical line look like parallel with vertical lines of the CPT.

(9) ANGLE adjustment: When you adjust the angle, adjust correctly raster of left/right screen.

(10) BOW adjustment: A standard is not changing the default value.

(11) CRNU (Upper Corner Correction) adjustment: After finished EP adjustment, adjust vertical line of left top, right-top of screen to the best straight line.

(12) CRNL (Lower Corner Correction) adjustment: After finished EP adjustment, adjust vertical line of left bottom, right-bottom of screen to the best straight line.

### Stage 9:

This is the final stage of checking the sound quality, tuning the channels and adjusting the colors (RGB) and to check the A/V input output ports. Finally in this step I had to ensure that the front panel buttons worked properly.

### Stage 10:

Back cover docking (placement) was done here by tapping up the screws in this stage by me.

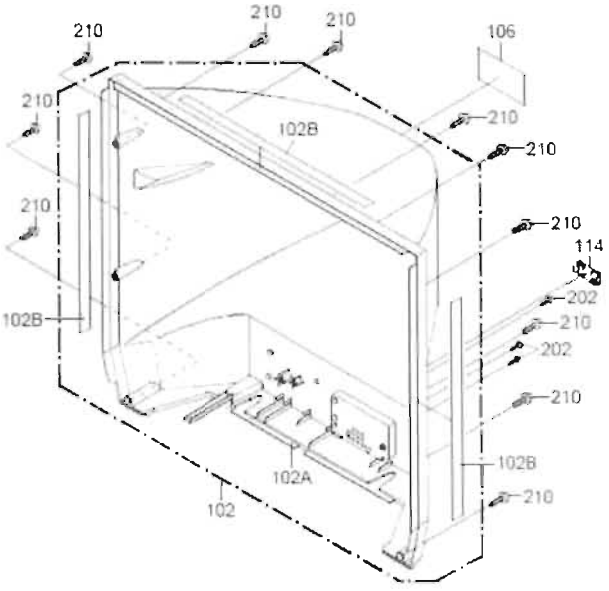



Figure 3.6: Back panel

### Stage 11:

This is called ground test by taking the help of ground machine (voltmeter). I connected a digital voltmeter to the second anode of the picture tube and kept the CTV on. It was needed to adjust the brightness and contrast controls to minimum. The high voltage should not be more than 27.5 KV under any conditions. This is also important that the power supply voltage must be set to +125/+135 Volts (B+ power supply).

### Stage 12:

Input Voltage: AC150V-AC264V

Output Voltage: 5V 16V 26V 52V 145V 190V 115V

Output Power: 100W

It is applied for color television of the parallel connection power supply which is above 25 inches and television or display of the series power supply which is below 25 inches.

It uses new switching power supply control IC that essentially provides high efficiency, voltage regulation of wide range, steady, compact circuit, good holistic capability, low failure rate. It also can be protected even though it is over voltage, over current or under pressure.

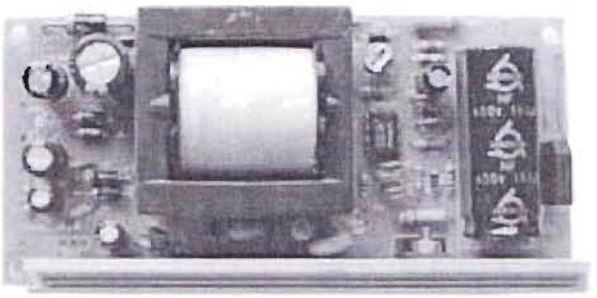
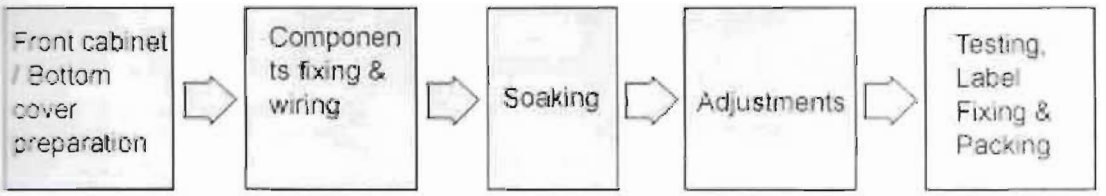


Figure 3.7: Power supply of CTV

Though TCL follows the sequential steps mentioned above but it is not mandatory for all exactly to follow the steps sequentially. Here the basic steps that every assembling station follows are given below:

Color TV assembly starts with preparation of Front cabinet with speaker and decoration panel. After the preparation of front cabinet, Color Picture Tube (CPT) is fitted on front cabinet and the same is wired with degaussing coil and earth wire. After this, chassis is put in the cabinet and the same is wired. After the fixing of various components and their wiring, soaking of the TV set is done. Soaking is necessary so that the system is stable before carrying out various adjustments. After soaking, all the adjustments such as B+, geometry, AGC, white balance, convergence etc to TV sets are done. At this stage, we do all kinds of functional testing of the CTV to make sure they meet all functional and quality parameters.

**Color TVs assembly Process (briefly in blocks):**



# Chapter 4:

There are different boards containing different transistors, diodes etc inside a color TV. Some ICs may vary for different models but few ICs like 201,901 are more or less common for all CTV systems. Table 4.1 shows the functions of different ICs, diodes etc in brief.

Table 4.1

| IC line up | | | |
|---|---|---|---|
| NO | Board | Location no. | Description |
| 1. | Main | IC201S | Video Processor |
| | | IC601 | Multi-standard Sound Processor |
| | | IC901 | MICOM, TTX(MTP) |
| | | IC902 | EEPROM |
| | | IC602 | Audio AMP |
| | | HIC201 | RGB Drive AMP Hybrid IC |
| | | HIC202 | |
| | | HIC203 | |
| | | HIC204 | |
| | | HIC401 | 100Hz Horizontal Pulse AMP |
| | | IC301 | Vertical IC |
| | | Q402 | Horizontal Drive IC |
| | | Q401 | |
| | | D414 | |
| | | IC401 | E/W Drive IC |
| | | Q404 | |
| | | IC801S | SPS Controller |
| | | D801S | Bridge Diode |
| | | PC801S | Photo Coupler |
| | | IC802 | 5V Controlled Regulator |
| | | D805 | Rectifier Diode |
| | | D806 | |
| | | D807 | |
| | | D802 | |
| | | IC201 | 3.3V Regulator |
| | | IC804 | 6V Regulator |
| | | IC803 | 8V Controlled Regulator |
| | | IC903 | 3.3V Regulator |
| | | IC904 | MICOM Reset IC |
| | | Q909 | IIC Level Shifter |
| | | Q910 | |
| | | TU01S | Main Tuner with IF Block |
| | | TU02S | Sub Tuner with IF Block |
| | | T801S | Trans Switching |
| | | T444S | Trans FBT |
| 2. | CRT | IC501 | Video Output AMP R.G.B Drive |
| | | IC502 | |
| | | IC503 | |
| | | QF04 | Push-Pull (VM) |
| | | QF05 | |

| NO | Board | Location no. | Description |
|---|---|---|---|
| 2. | CRT | QG02 | TR-Power (TILT) |
| | | QG03 | |
| | | ICG01 | OP-AMP (TILT) |
| 3. | Double focus | ICH01 | OP-AMP |
| | | QH01 | TR-Power |
| 4. | V-S/W | ICS01 | Video Switching IC with Adder Output |

This is not possible to show details of all ICs in this report. IC 901 (which is a microcomputer) is a very important IC for a CTV system. The pin layout of IC 901 is given below:

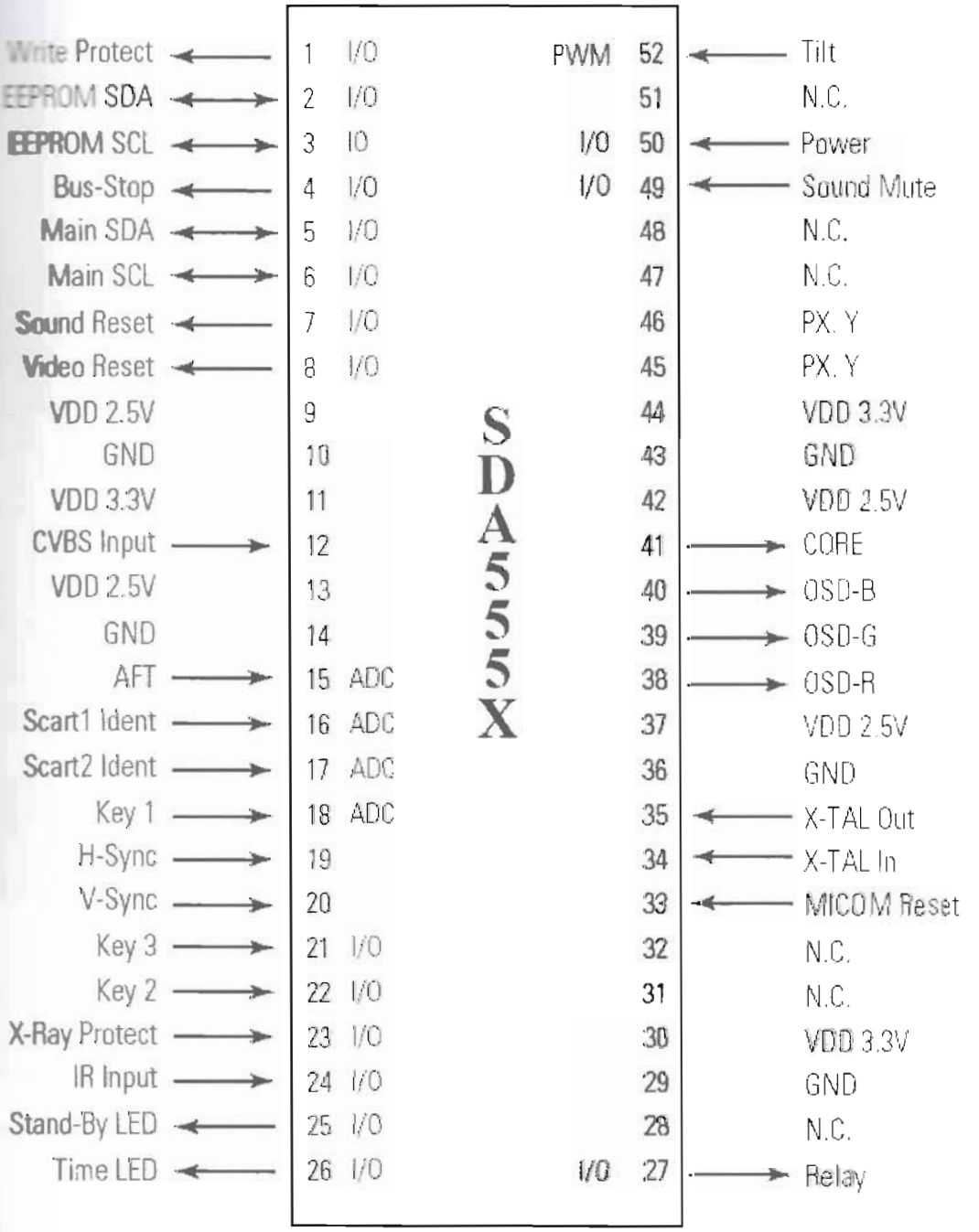



Figure 4.1: Pin Layout of IC 901

Each pin of any IC is assigned to perform a particular job. IC 901 has 52 pins as shown in the previous layout. Now, a table mentioning function, description in brief, input/output state is given:

**Table 4.2: IC 901 Pin Assignment Specifications**

| PIN NO | FUNCTION | ASSIGN | IN/OUT | ACTIVE H/L | DESCRIPTION |
|---|---|---|---|---|---|
| 1 | I/O | Write Protect | Out | Low | EEPROM Write Protection |
| 2 | I/O | ROM SDA | I/O | | EEPROM Serial Data Line |
| 3 | I/O | ROM SCL | I/O | | EEPROM Serial Clock Line |
| 4 | I/O | Bus Stop | In | Low | Disable Micom IIC |
| 5 | I/O | Main SDA | I/O | | Peripheral IC Serial Data Line |
| 6 | I/O | Main SCL | I/O | Low | Peripheral IC Serial Clock Line |
| 7 | I/O | Sound Reset | Out | Low | MSP IC Initial Control |
| 8 | I/O | Video Reset | Out | | VDP IC Initial Control |
| 9 | Vdd | VDD 2.5V | | | |
| 10 | GND | | | | |
| 11 | Vdd | VDD 3.3V | | | |
| 12 | CVBS | CVBS Input | In | | TTX CVBS Input |
| 13 | Vdd | VDD 2.5V | | | Analog B+ |
| 14 | GND | | | | Analog Ground |
| 15 | ADC | AFT | In | | Auto Fine Tuning Control |
| 16 | ADC | SC1-ID | In | | Scart1 Ident |
| 17 | ADC | SC2-ID | In | | Scart2 Ident |
| 18 | ADC | Key1 | In | | Key1 Input |
| 19 | HS | H-Sync | In | | Horizontal Sync Input |
| 20 | VS | V-Sync | In | | Vertical Sync Input |
| 21 | I/O | Key3 | In | | Key3 Input |
| 22 | I/O | Key2 | In | | Key2 Input |
| 23 | I/O | X-Ray | In | | X-Ray Protection |
| 24 | I/O | IR-In | In | | Remocon Signal Input |
| 25 | I/O | STD-LED | Out | | LED Drive Output(Red) |
| 26 | I/O | TIM-LED | Out | | LED Drive Output(Green) |
| 27 | I/O | Relay | Out | Low | Activate Degausssing Coil |
| 28 | N.C. | | | | Not Used (Programmed Gound Level) |
| 29 | GND | | | | Analog Ground |
| 30 | Vdd | VDD 3.3V | | | Not Used (Programmed Gound Level) |
| 31 | N.C. | | | | Not Used (Programmed Gound Level) |
| 32 | N.C. | | | | Micom Hardware Reset |
| 33 | Reset | Reset | In | Low | Crystal Oscillation Input |
| 34 | X-In | X-TAL In | In | 6MHz | Crystal Oscillation Output |
| 35 | X-Out | X-TAL Out | Out | 6MHz | Analog Ground |
| 36 | GND | | | | Analog B+ |
| 37 | Vdd | VDD 2.5V | | | OSD/TTX Output (Red) |
| 38 | R | OSD-R | Out | | OSD/TTX Output (Green) |
| 39 | G | OSD-G | Out | | OSD/TTX Output (Blue) |
| 40 | B | OSD-B | Out | | Fast Blank/Half Contrast Output |

| PIN NO | FUNCTION | ASSIGN | IN/OUT | ACTIVE H/L | DESCRIPTION |
|---|---|---|---|---|---|
| 41 | COR | CORE | Out | | |
| 42 | Vdd | VDD 2.5V | | | |
| 43 | GND | | | | |
| 44 | Vdd | VDD 3.3V | | | |
| 45 | I/O | PX.Y | In | | When The Caption Function Adopted, Used. |
| 46 | I/O | PX.Y | Out | | |
| 47 | N.C. | | | | Not Used (Programmed Gound Level) |
| 48 | N.C. | | | | |
| 49 | I/O | S-Mute | Out | High | Sound Amp Mute |
| 50 | I/O | Power | Out | Low | Picture On/Off Control |
| 51 | N.C. | | | | Not Used (Programmed Gound Level) |
| 52 | I/O | Tilt | Out | PWM | Tilt Control Output |

# Chapter 5

## 5.1. Disassembly and reassembly of color TV:

I did not perform the following works rather technicians did and I followed them. My mentor provided me few guidelines for better understanding. This servicing station was under the technicians' supervision. At servicing station at first it is to remove the back cabinet as the main electrical components are covered by it. The picture of the removal is shown below:

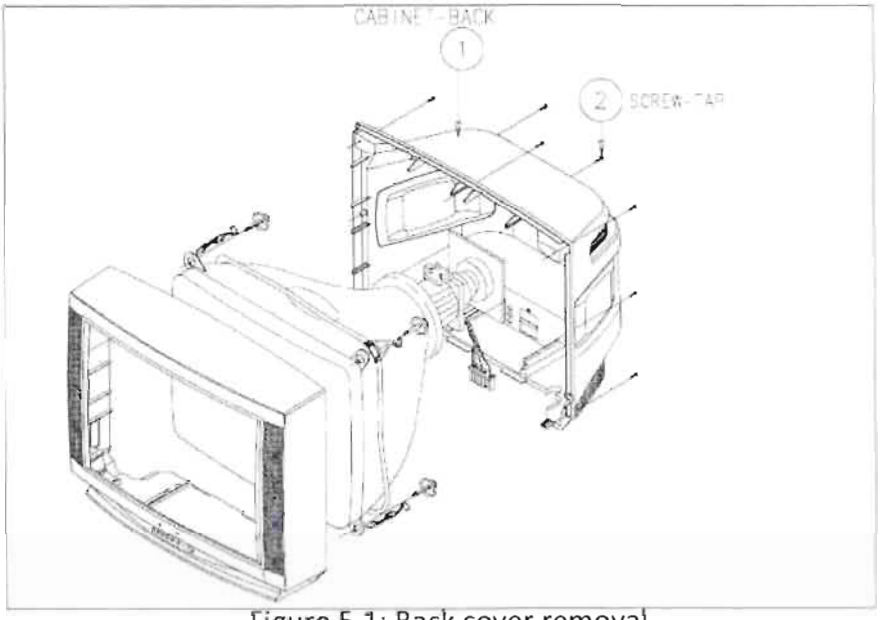



Figure 5.1: Back cover removal

If any problems occur in the main board it is necessary to solve that by taking the board out. The steps to do the work are mentioned below with a picture:

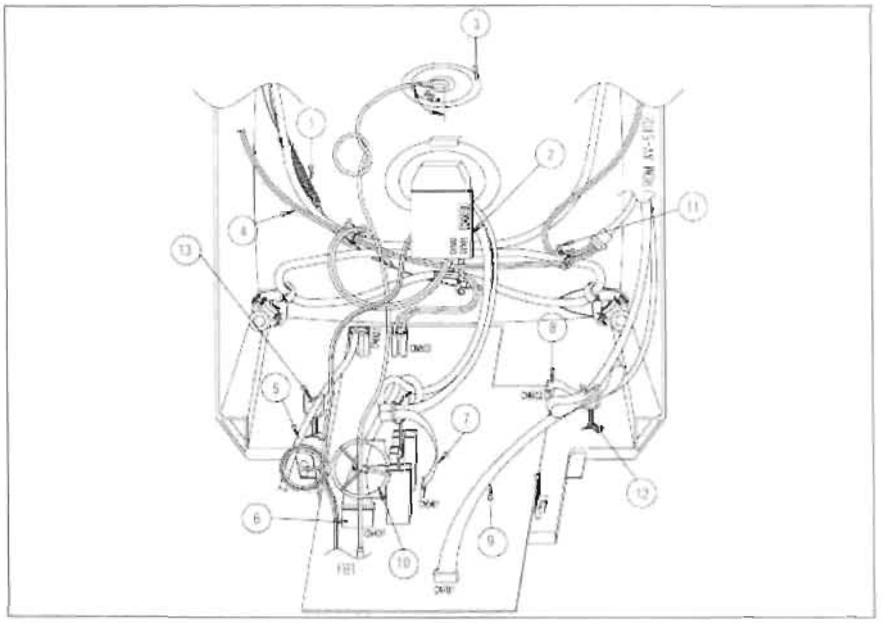


Figure 5.2: Main board removal

1. Separate the TBC-wire 2P connector from GT501,GT502.
2. Separate the CRT Assay from the CRT socket.
3. Remove the Anode Cap from the CRT.
4. Separate the D-Coil Connector from CN802.
5. Separate the AC cord from CN801.
6. Separate the DC connector from CN401.
7. Separate the CN501B 8P CRT connector from CN501.
8. Separate the CNA05 5P A/V side connector from CN602.
9. Separate the CNA01 8P CRT connector from CN701.
10. Separate the Focus screen Wire from the FBT clamper.
11. Separate the TBC wire 2P, speaker wires from the wire clamper.
12. Separate the CN701, CN602 connector from the wire clamper.
13. Separate the AC cord from the wire clamper.
14. Remove the main board by pulling it with both hands.

Sometimes for solving problems it is important to remove speakers so that a technician can work easily by getting a wider space. It is also possible that the speakers are needed to repair or replace. By pressing the tension rib and by separating the speaker wires from D. coil a technician removes those easily. Two pictures are given below to make a clear view:

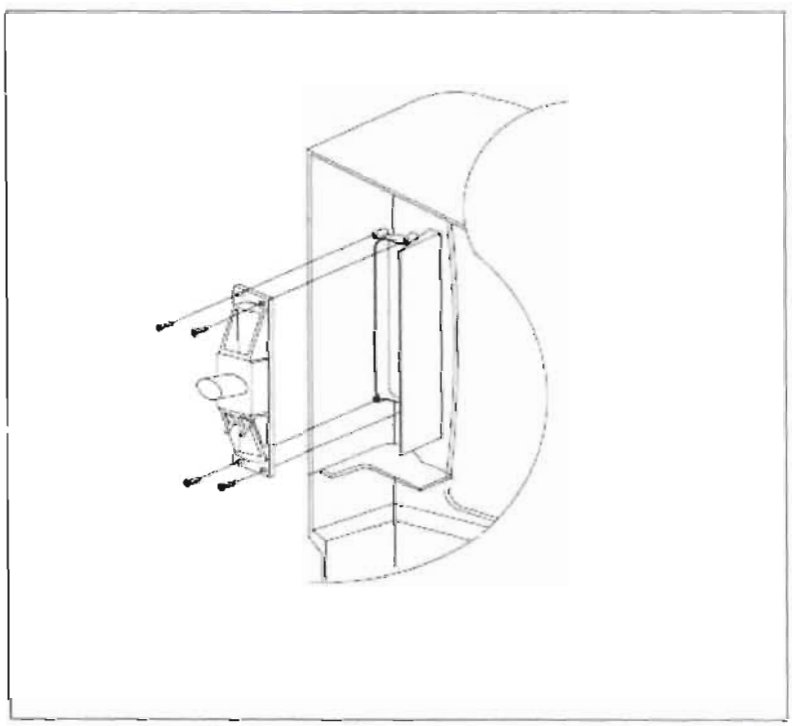


Figure 5.3: Speaker removal

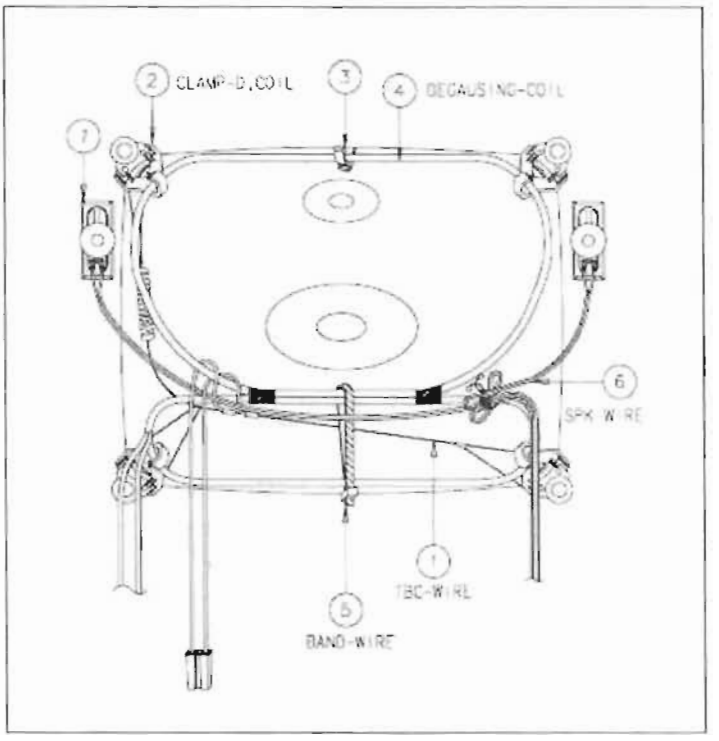



Figure 5.4: Speaker removal

To repair or to replace CRT from front cabinet during servicing is also very important as CRT is a very sophisticated part. A technician firstly removes the 4 nuts mounting the CRT to the front cabinet then pulls the CRT backwards.

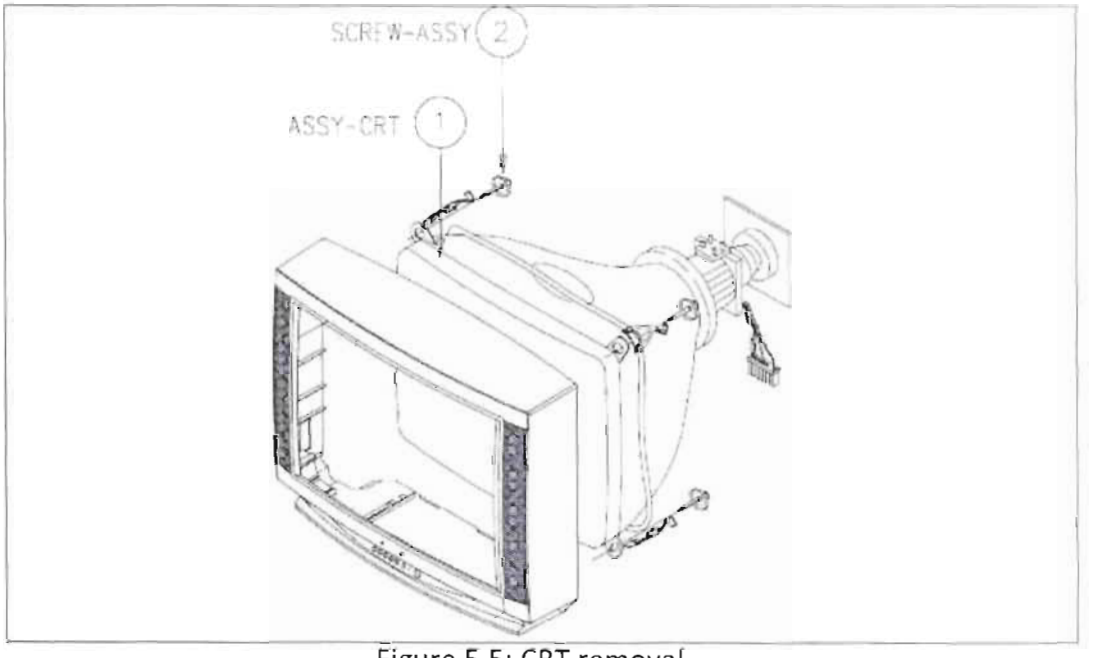



Figure 5.5: CRT removal

It is important to remember few things:

Because of the high vacuum and large surface area of the picture tube, be careful while handling it:

(a) Always lift the picture tube by grasping it firmly around the faceplate,

(b) Never lift the tube by its neck.

(c) Do not scratch the picture tube or apply excessive pressure. Fractures of the glass may cause an implosion.

## 5.2. IC Remove/Replacement:

Some chassis circuit boards have slotted holes (oblong) through which the IC leads are inserted and then bent flat against the circuit foil. When holes are the slotted type, the following technique should be used to remove and replace the IC. When working with boards using the familiar round hole, use the standard technique.

Removal:

1. Desolder and straighten each IC lead in one operation by gently prying up on the lead with the soldering iron tip as thesolder melts.
2. Draw away the melted solder with an anti-static suction type solder removal device (or with solder braid) before removing the IC.

Replacement:

1. Carefully insert the replacement IC in the circuit board.
2. Carefully bend each IC lead against the circuit foil pad and solder it.
3. Clean the soldered areas with a small wire-bristle brush. (It is not necessary to reapply acrylic coating to the areas).

## 5.3. "Small-Signal" Discrete Transistor Removal/Replacement

1. Remove the defective transistor by clipping its leads as close as possible to the component body.
2. Bend into a "U" shape the end of each of three leads remaining on the circuit board.
3. Bend into a "U" shape the replacement transistor leads.

4. Connect the replacement transistor leads to the corresponding leads extending from the circuit board and crimp the "U" with long nose pliers to insure metal to metal contact then solder each connection.

Power Output, Transistor Device Removal/Replacement

1. Heat and remove all solder from around the transistor leads.
2. Remove the heat sink mounting screw (if so equipped).
3. Carefully remove the transistor from the heat sink of the circuit board.
4. Insert new transistor in the circuit board.
5. Solder each transistor lead, and clip off excess lead.
6. Replace heat sink.

Diode Removal/Replacement

1. Remove defective diode by clipping its leads as close as possible to diode body.
2. Bend the two remaining leads perpendicular to the circuit board.
3. Observing diode polarity, wrap each lead of the new diode around the corresponding lead on the circuit board.
4. Securely crimp each connection and solder it.
5. Inspect (on the circuit board copper side) the solder joints of the two "original" leads. If they are not shiny, reheat them and if necessary, apply additional solder.

## 5.4. Fuse and Conventional Resistor Removal/Replacement

1. Clip each fuse or resistor lead at top of the circuit board hollow stake.
2. Securely crimp the leads of replacement component around notch at stake top.
3. Solder the connections.

CAUTION: Maintain original spacing between the replaced component and adjacent components and the circuit board to prevent excessive component temperatures.

Circuit Board Foil Repair

Excessive heat applied to the copper foil of any printed circuit board will weaken the adhesive that bonds the foil to the circuit board causing the foil to separate from or "lift-off" the board.

The following guidelines and procedures should be followed whenever this condition is encountered.

To repair a defective copper pattern at IC connections use the following procedure to install a jumper wire on the copper pattern side of the circuit board. (Use this technique only on IC connections).

1. Carefully remove the damaged copper pattern with a sharp knife. (Remove only as much copper as absolutely necessary).
2. Carefully scratch away the solder resist and acrylic coating (if used) from the end of the remaining copper pattern.
3. Bend a small "U" in one end of a small gauge jumper wire and carefully crimp it around the IC pin. Solder the IC connection.
4. Route the jumper wire along the path of the out-away copper pattern and let it overlap the previously scraped end of the good copper pattern. Solder the overlapped area and clip off any excess jumper wire.

At Other Connections

Use the following technique to repair the defective copper pattern at connections other than IC Pins. This technique involves the installation of a jumper wire on the component side of the circuit board.

1. Remove the defective copper pattern with a sharp knife.

Remove at least 1/4 inch of copper, to ensure that a hazardous condition will not exist if the jumper wire opens.

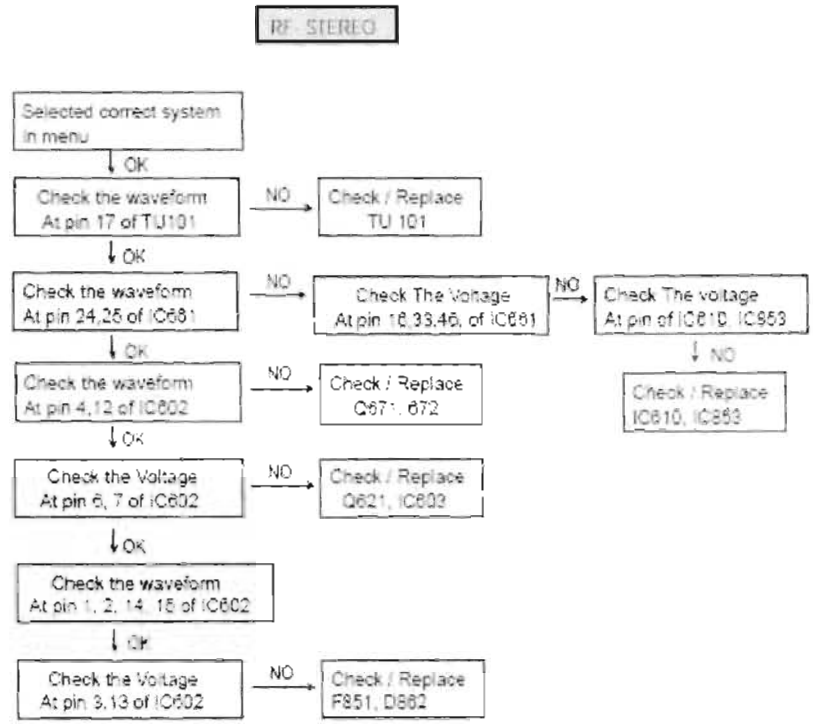
2. Trace along the copper pattern from both sides of the pattern break and locate the nearest component that is directly connected to the affected copper pattern.
3. Connect insulated 20-gauge jumper wire from the lead of the nearest component on one side of the pattern break to the lead of the nearest component on the other side.

Carefully crimp and solder the connections.

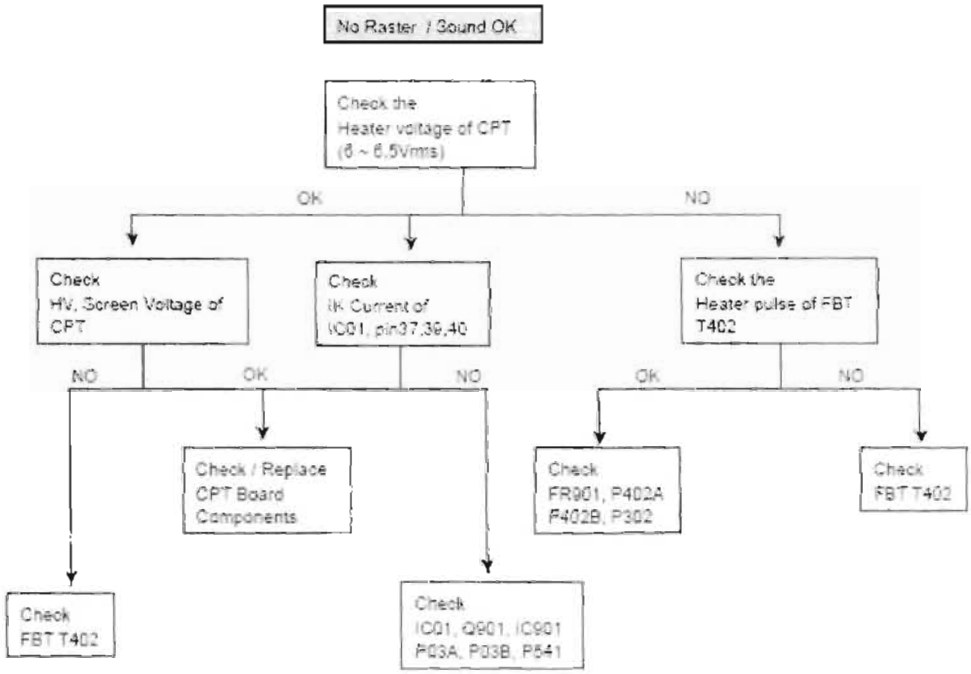
**CAUTION:** Be sure the insulated jumper wire is dressed so that it does not touch components or sharp edges.

## 5.5. Troubleshooting

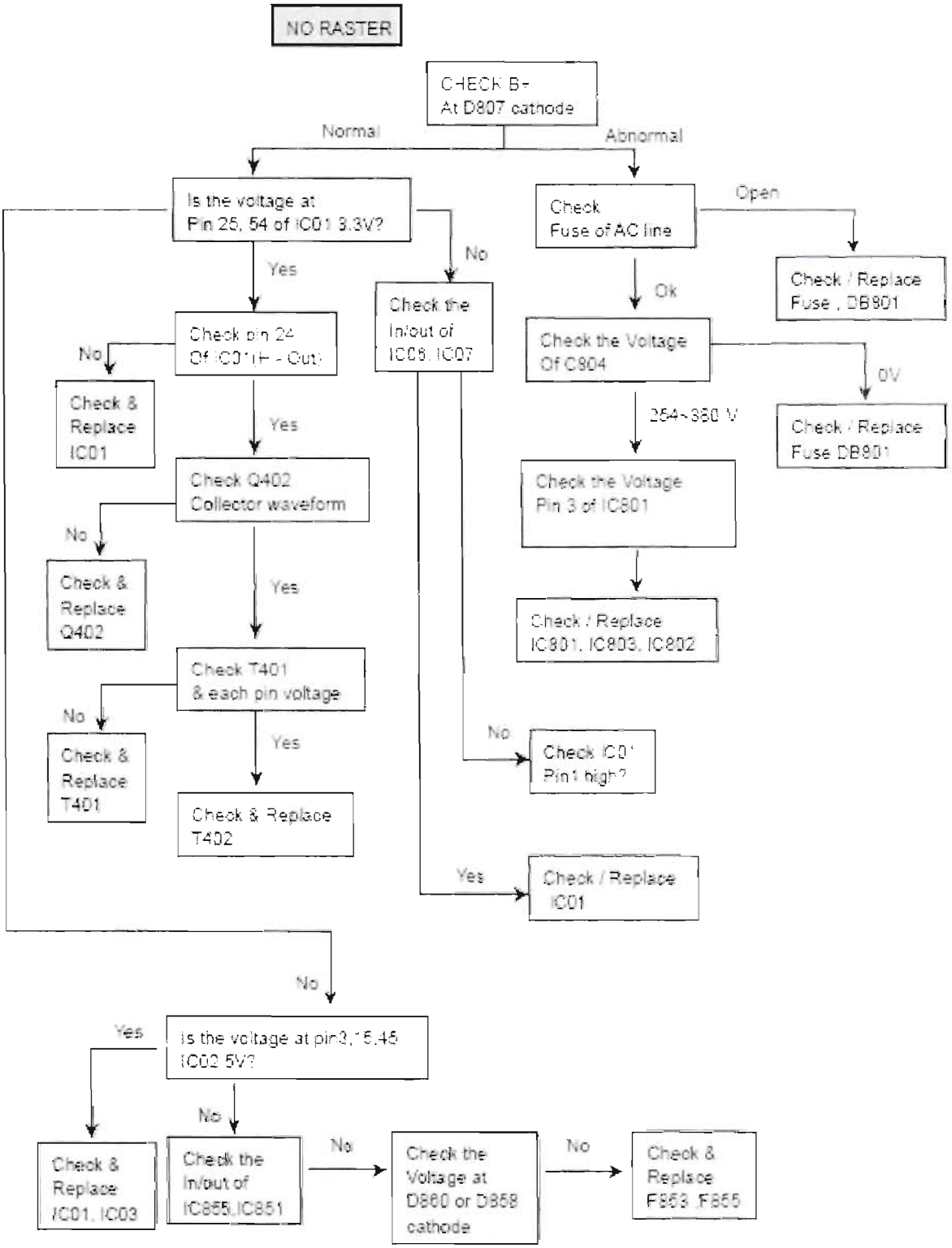
If there is any trouble in the sound system (stereo) after assembling a color TV then firstly turning the TV check the sound options in the menu by using a master remote. If no problem is found then hardware repairing should be performed. A flowchart can be followed to solve the stereo problem:



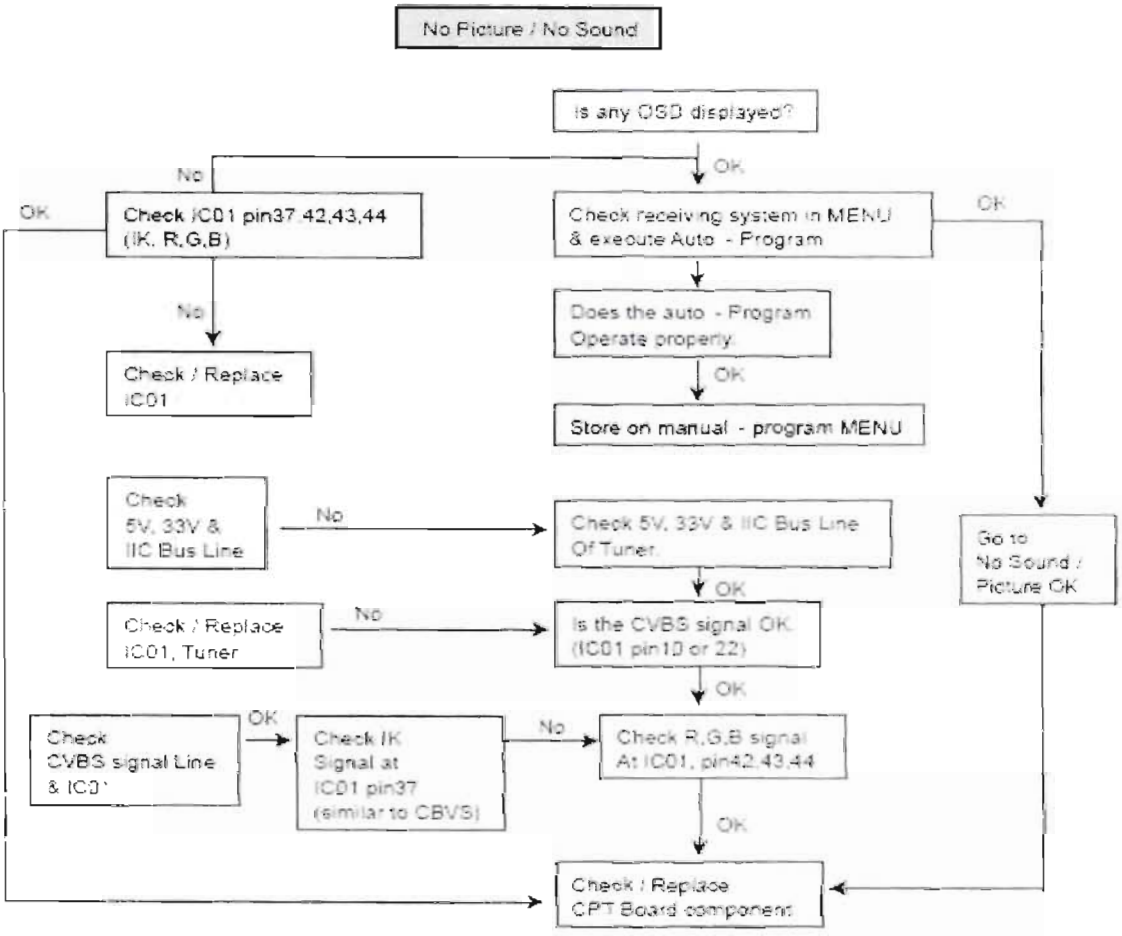

If there is no trouble with the sound system then one can check whether CTV has a deformed raster or not. The ways of checking can be:



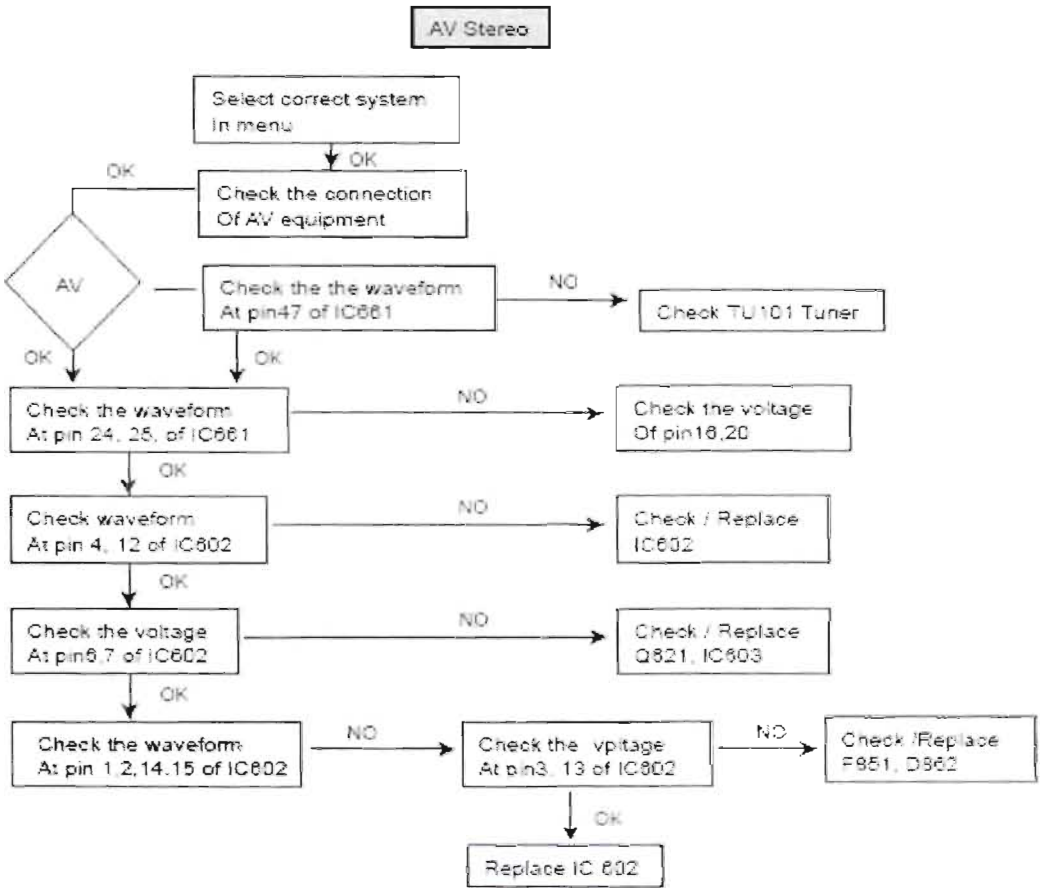
Though it is a complex and lengthy process to perform but to solve the previous problem a flowchart (given below) can be followed:



Facing such a problem like there is no picture, even the sound is missing then next flowchart needs to follow:



IF a technician finds a problem regarding AV stereo system then has to follow the steps:




The above mentioned pin no., IC no., fuse no. etc in the flowcharts are given for a particular model. It is not possible to cover all the possible IC nos. or pin nos. in this report. An oscilloscope, voltmeter etc. are needed to solve such problems shown above in the flowchart

# Chapter 6

## 6.1 Problems and Recommendations

1. It was really tough for me to know the few internationally named parts of color TV and of few instruments that technicians used in the assembling factory as they were using local names. Few of the senior technicians should get theoretical knowledge on CTV.
2. Working station was situated in the first floor which seemed to be a bit risky while after packaging labors used to carry those to the ground floor by using stairs. An elevated system can be established to avoid accidents or the working station can be shifted to the ground floor.
3. In the every step of assembling there is a manual system that is why the production at the end of the day seems to be slow. The production (total assembling packages) per day can be increased if automated machines in few stations are installed and even for better assembling.

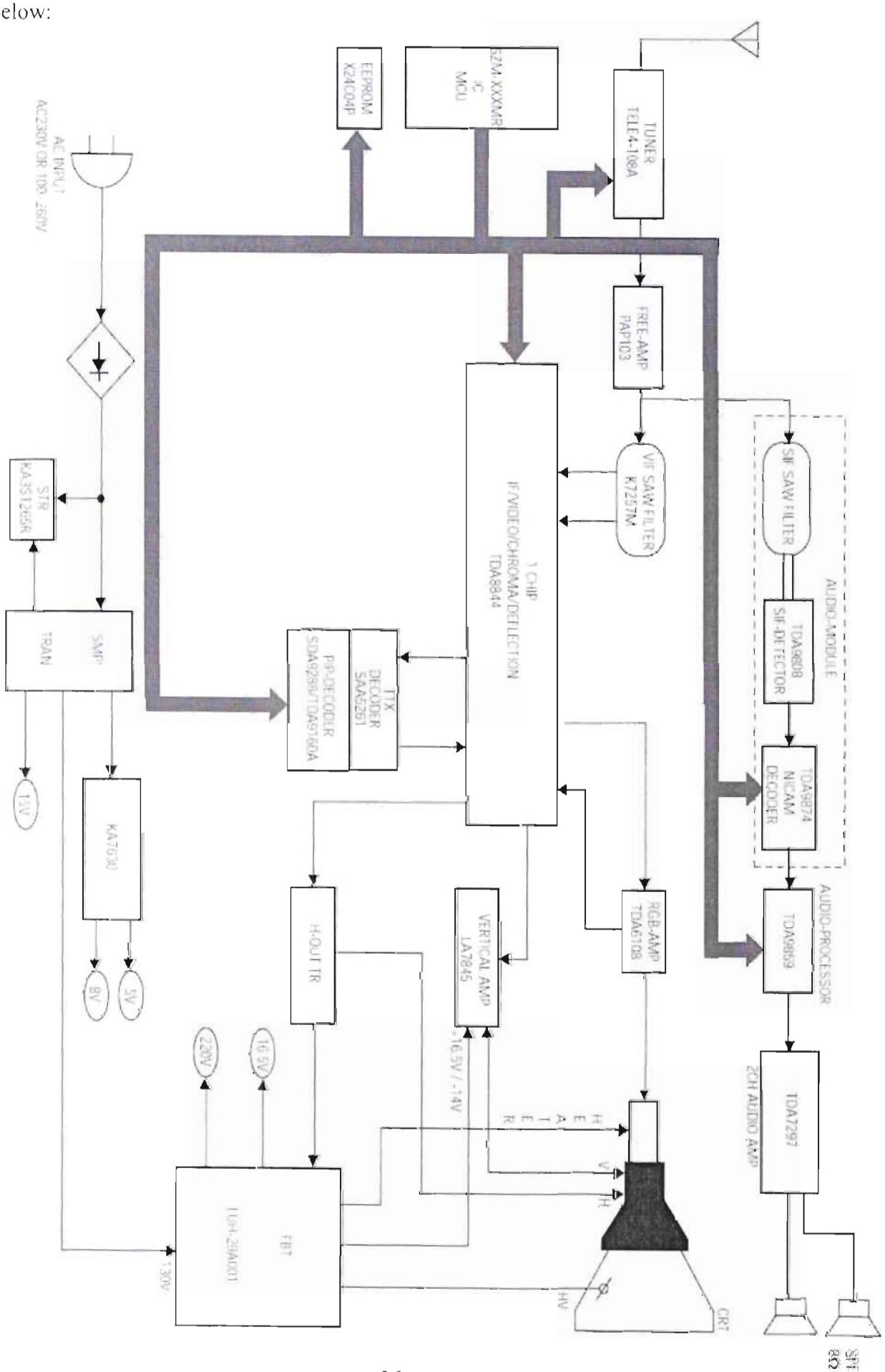
## 6.2 Conclusion

It was quite a nice experience working with some good people in the Shahnoor electronics. I was the first internee in the company so did face a lot of problems but the solutions were also there because my supervisor and few technicians helped me a lot to solve those. From the front cabinet to main PCB, speakers, CRT etc were connected in assembling section sequentially to form a new CTV. After connecting each part it was mandatory to check whether a newly connected part was set properly. At few stations it was checked that after connecting parts upto that specific level (upto that station) the system worked properly or not. If any trouble detected then from that station it was sent to the previous station. At the final station newly formed CTV set was tested finally to test that the new set worked appropriately. If there was any unusual result in the final station then the set immediately forwarded to the servicing section to solve the problem. The problem I faced while working through the program was unavailability of detailed (written) procedures on CTV assembly and servicing. If there were any books or articles on color TV then my job might be an easier task to complete but I could not manage any even from internet. However, I had an intension that I would gather some practical knowledge on latest TVs like HD TV or LCD but I was a bit unlucky because those were not available in the factory while I was doing the program. After that I am not dissatisfied with the program because it helped me a lot to know the basic things of a modern digital device (color TV).

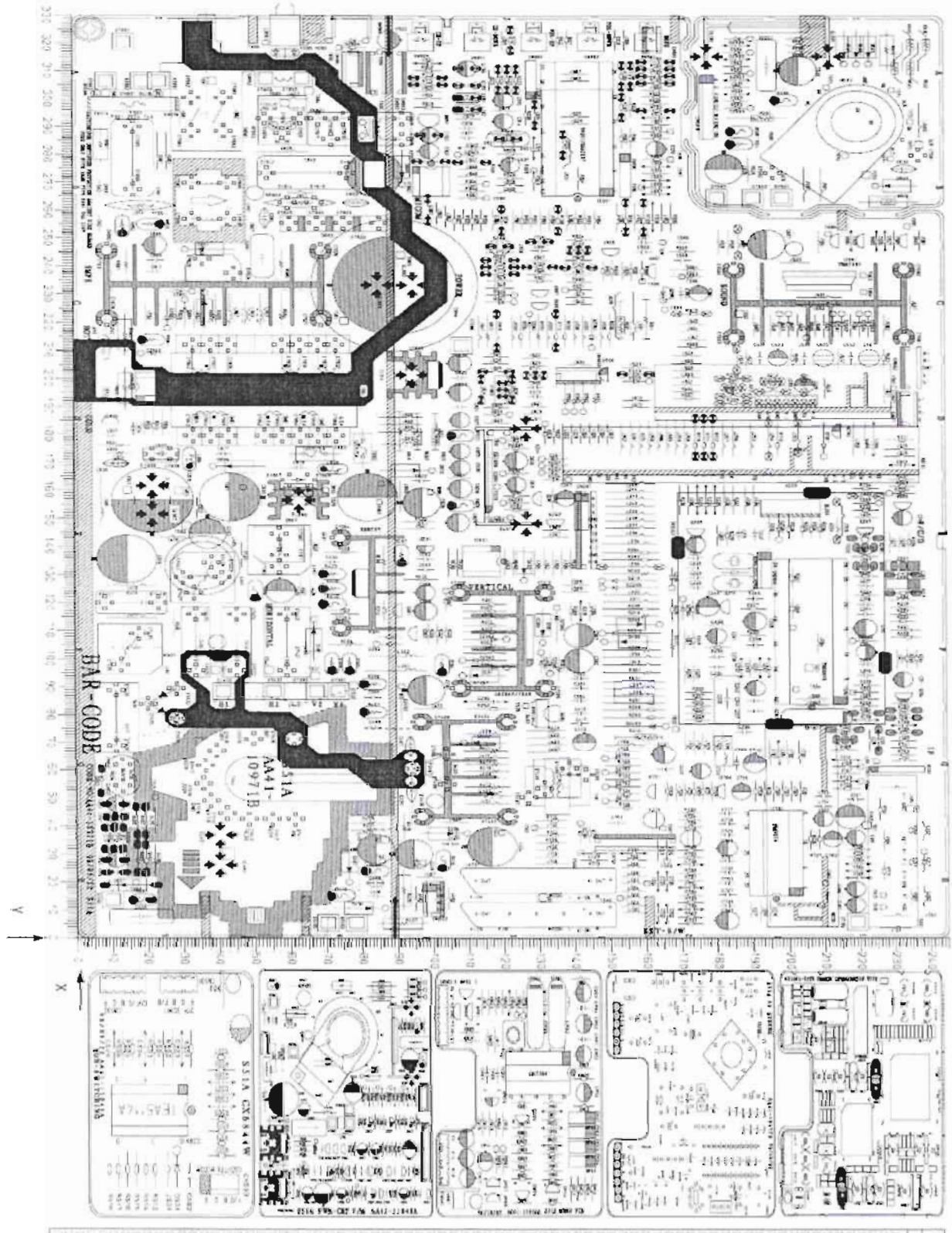
# APPENDIX

## Block diagram

A whole CTV can be represented by a block diagram .Such a block diagram is shown below:



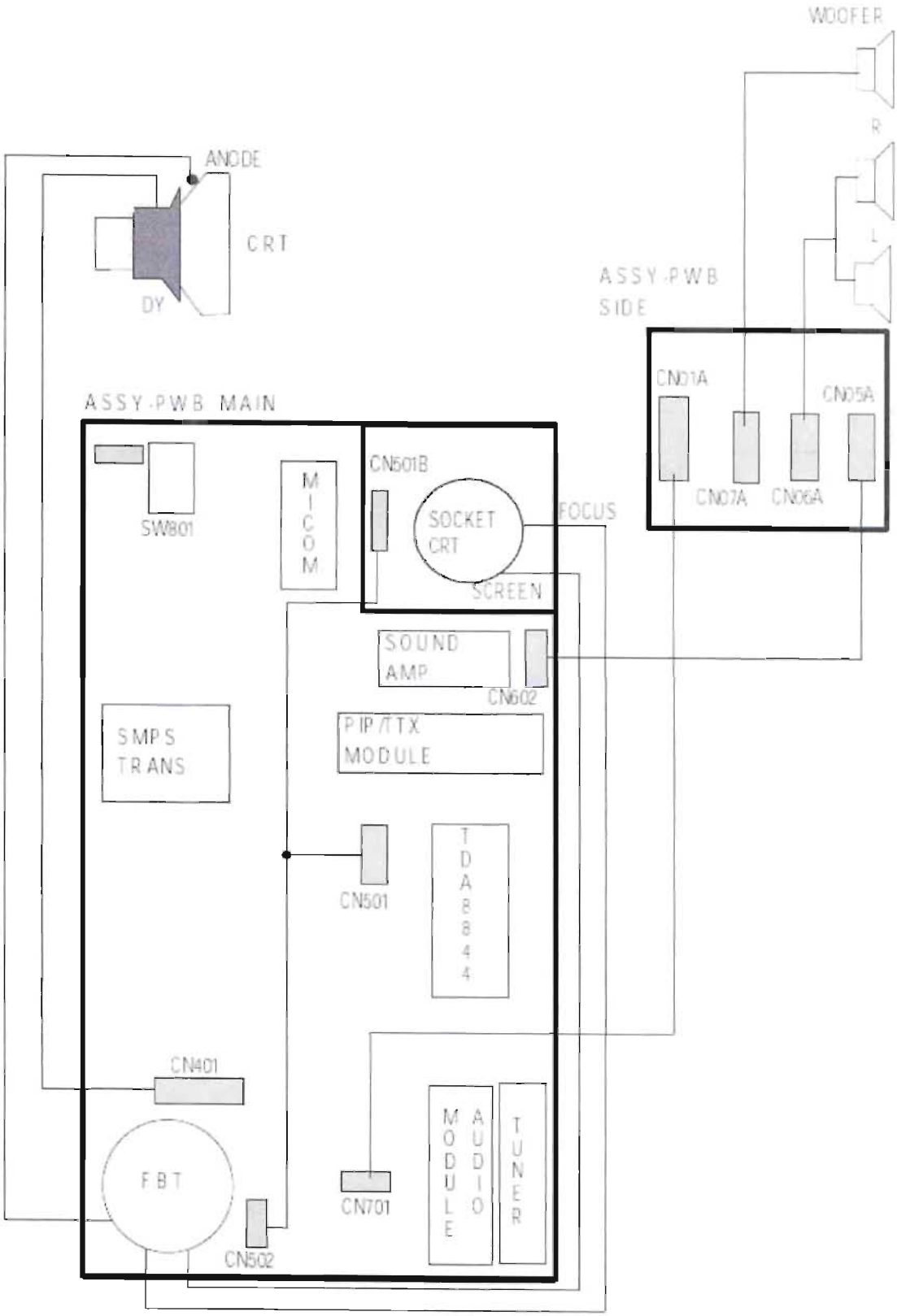
Here a PCB layout of a CTV is shown (diode, IC and transistor locations are also mentioned in the side table):



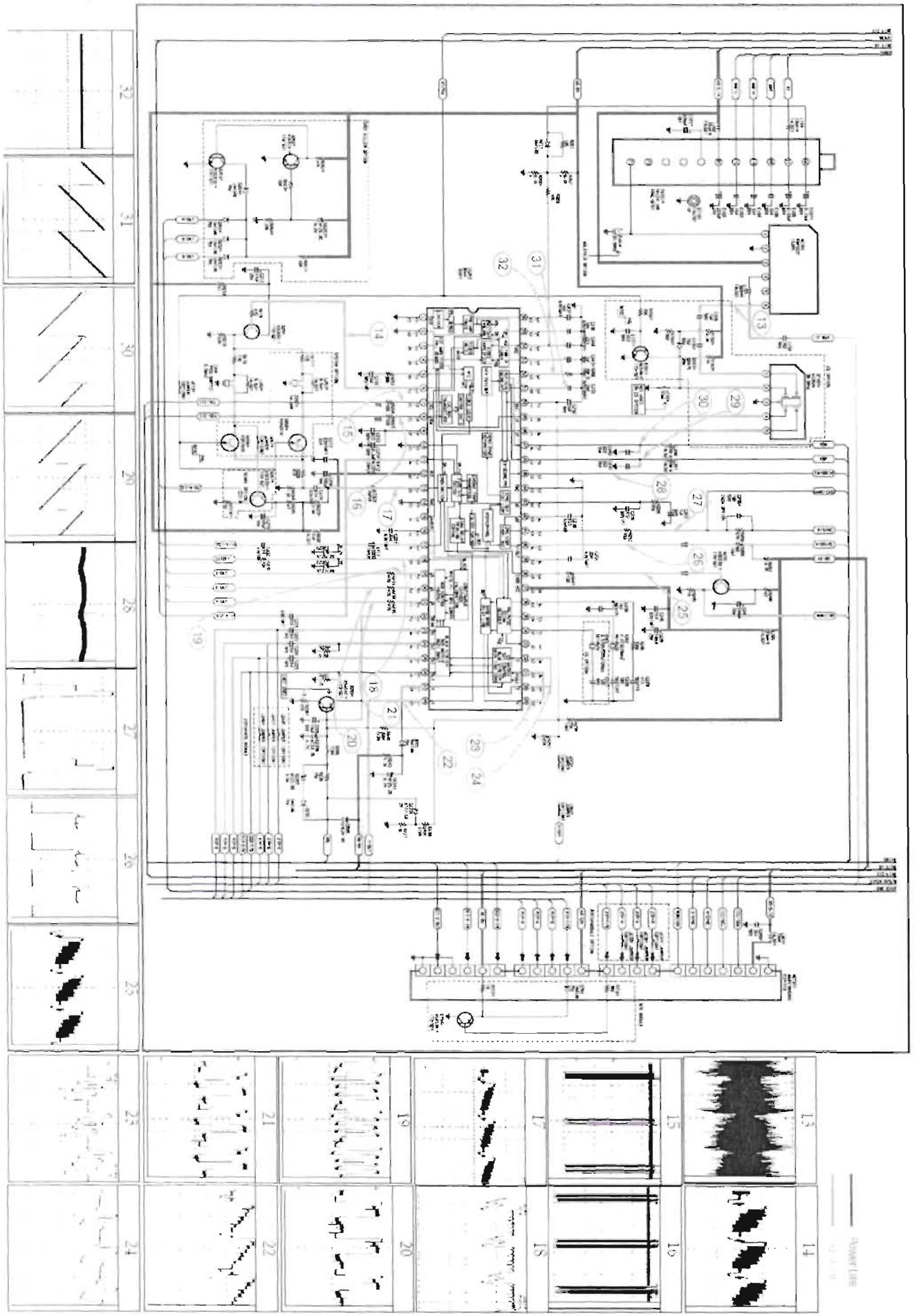

| DIODE | | | | TRANSISTOR | | | IC | | |
|---|---|---|---|---|---|---|---|---|---|
| Loc No | X | Y | | Loc No | X | Y | | Loc No | X | Y |
| | | | | | | | | | | |

## Wiring diagram

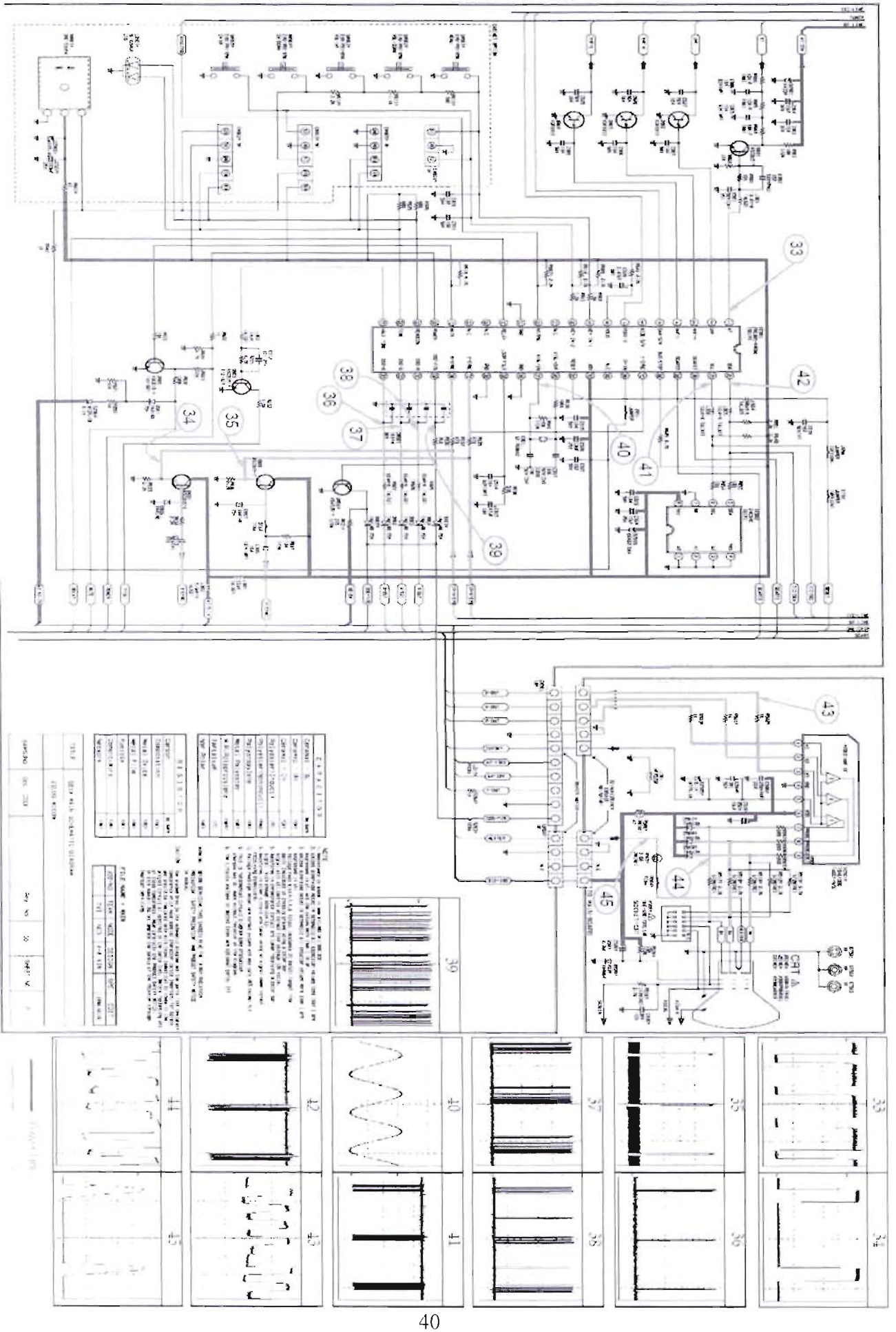
A wiring diagram inside a CTV can be shown below:



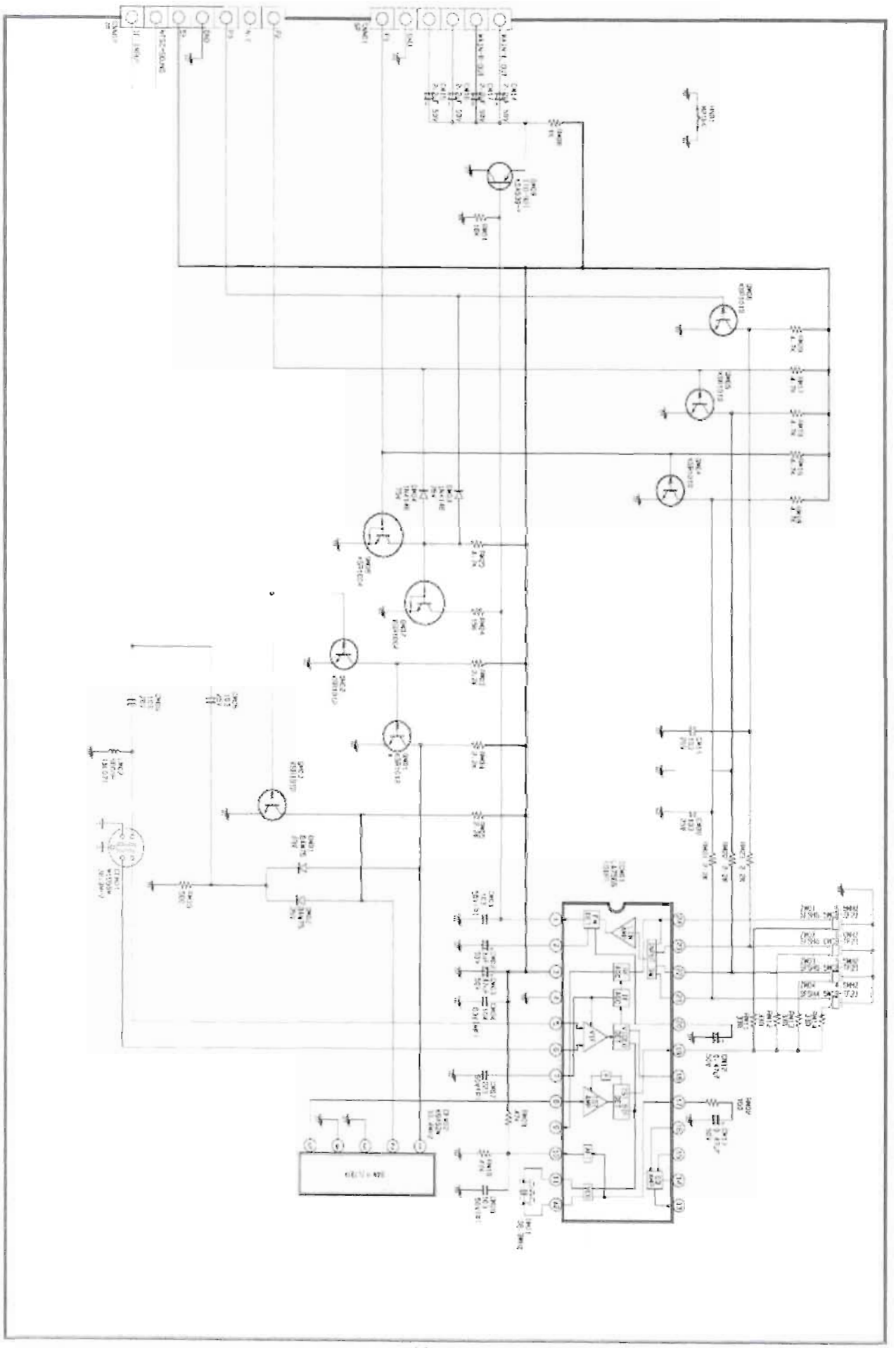
This PWB is based on one chip (IF/Video/Chroma/Deflection) with
filter then to TTX decoder, vertical amplifier etc. The wave shapes at different points (wires) are shown beside the schematic where the locations are marked with corresponding numbers (from 13 to 32).



This PWB is based on CRT where the wires are finally connected to CRT from FBT or from RGB amplifier. The waveforms are also shown beside the schematic mentioning the corresponding locations.



The PWB wiring for sound module is given below:



# Appendix: B

| Table of Acronyms | | | |
|---|---|---|---|
| ABL | Automatic Brightness Limiter | I/O | Input/output |
| AC | Alternating Current | L | Left |
| ACC | Automatic Chroma Control | L | Low |
| AF | Audio Frequency | LED | Light Emitting Diode |
| AFC | Automatic Frequency Control | LF | Low Frequency |
| AFT | Automatic Fine Tuning | MOSFET | Metal-Oxide-Semiconductor-Field-Effect-Tr |
| AGC | Automatic Gain Control | MTS | Multi-channel Television Sound |
| AM | Amplitude Modulation | NAB | National Association of Broadcasters |
| ANSI | American National Standards Institute | NEC | National Electric Code |
| APC | Automatic Phase Control | NTSC | National Television Systems Committee |
| APC | Automatic Picture Control | OSD | On Screen Display |
| A/V | Audio-Video | PCB | Printed Circuit Board |
| AVC | Automatic Volume Control | PLL | Phase-Locked Loop |
| BAL | Balance | PWM | Pulse Width Modulation |
| BPF | Bandpass Filter | QIF | Quadrature Intermediate Frequency |
| B-Y | Blue-Y | R | Right |
| CATV | Community Antenna Television (Cable TV) | RC | Resistor & Capacitor |
| CB | Citizens Band | RF | Radio Frequency |
| CCD | Charge Coupled Device | R-Y | Red-Y |
| CCTV | Closed Circuit Television | SAP | Second Audio Program |
| Ch | Channel | SAW | Surface Acoustic Wave(Filter) |
| CRT | Cathode Ray Tube | SIF | Sound Intermediate Frequency |
| CW | Continuous Wave | SMPS | Switching Mode Power Supply |
| DC | Direct Current | S/N | Signal/Noise |
| DVM | Digital Volt Meter | SW | Switch |
| EIA | Electronics Industries Association | TP | Test Point |
| ESD | Electrostatic Discharge | TTL | Transistor Transistor Logic |
| ESD | Electrostatically Sensitive Device | TV | Television |
| FBP | Feedback Pulse | UHF | Ultra High Frequency |
| FBT | Flyback Transformer | UL | Underwriters Laboratories |
| FF | Flip-Flop | UV | Ultraviolet |
| FM | Frequency Modulation | VCD | Variable-Capacitance Diode |
| FS | Fail Safe | VCO | Voltage Controlled Oscillator |
| GND | Ground | VCXO | Voltage Controlled Crystal Oscillator |
| G-Y | Green-Y | VHF | Very High Frequency |
| H | High | VIF | Video Intermediate Frequency |
| HF | High-Frequency | VR | Variable Resistor |
| HI-FI | High Fidelity | VTR | Video Tape Recorder |
| IC | Inductance-Capacitance | VTVM | Vacuum Tube Voltmeter |
| IC | Integrated Circuit | TR | Transistor |
| IF | Intermediate Frequency | | |

# Appendix: C

## Parts Location & Description:

| No. | Description |
|---|---|
| 104 | SUPPORTER,PCB |
| 112 | CPT ASSY |
| | CPT ASSY A68QCU759X LGPD DY S-FOCUS |
| | CPT ASSY A68QCU759X 66L7ND |
| 120 | SPEAKER |
| 121 | BRACKET,SPEKER |
| 150 | COIL,DEGAUSSING |
| | COIL,DEGAUSSING 29 FLAT (W) SELLA TECH |
| 153 | DY |
| | DY 6150Z-1247G DC29SFL3 29" |
| 170 | CPT EARTH |
| 300 | CABINET ASSY SET STEREO MC022A . |
| | CABINET ASSY 40AF STEREO LGEAP |
| | CABINET ASSY C/SKD STEREO MC022A . |
| 310 | BUTTON,CONTROL |
| 320 | SPRING,KNOB |
| 330 | BUTTON,POWER |
| 400 | BACK COVER ASSY 2PHONE |
| | BACK COVER ASSY 2PHONE 40AF LGEAP |
| | BACK COVER ASSY C/SKD 2PHONE |
| | BACK COVER ASSY 1SCART+1PH |
| 510 | PWB ASSY,CPT 022A (CPT/VM) |
| 520 | PWB ASSY,MAIN 022A RT-25/29FB30VX |
| | PWB ASSY,MAIN 022A RT-29FB30V |
| | PWB ASSY,MAIN 022A RT-29FB30R |
| | PWB ASSY,MAIN 022A RT-29FB30VX LGEAP |
| | PWB ASSY,MAIN 022A RT-29FB30VX |
| | PWB ASSY,MAIN 022A RT-29FB30VX SC+PH |
| 913 | SCREW ASSY HEXAGON HEAD |
| 943 | SCREW,TAP TITE(P) D4.0 L16.0 MSWR3/FZB |
| P801 | POWER CORD |
| | POWER CORD ASSY SAA L=2200MM 219A |

## IC

| LOCA. NO | DESCRIPTION |
|---|---|
| HIC920 | IC,STK396-110 11P ST SCAN VELOCIT |
| IC01 | IC,VCT3834B LG23 E/EU |
| " | IC,VCT3843B LG24 W/EU |
| " | IC,VCT3804B LG28 MIDDLE ASIA |
| IC03 | IC,AT24C16-10PI -2.7 ATMEL 8PIN |
| IC06 | IC,LD1117V33C 3SIP ST REGULATOR |
| IC07 | IC,LD1117V33C 3SIP ST REGULATOR |
| IC09 | IC,KA75270Z 3 TP RE-SET IC MC-007 |
| IC301 | IC,LA7845 7SIP V/OUT(1.5A) |
| IC602 | IC,TDA7297 15P,SIP BK 2CH 15W DUA |
| IC302 | IC,KIA4558 8DIP DUAL OP AMP |
| IC603 | IC,KA75420ZTA(KA7542ZTA) 3P,TO-92 |
| IC610 | IC,KIA7805API 3P TO-220 ST REGULA |
| IC661 | IC,MSP3460G V3 52P DIP ST SOUND P |
| " | IC,MSP3410G B8 V3 52P |
| IC662 | IC,KA75330ZTA(KA7533ZTA) 3P,TO-92 |
| IC801 | IC,STR-F6456R SANKEN 5PIN(LF1352) |
| IC802 | IC,LTV817M-VB 4P,DIP BK PHOTO COU |
| IC803 | IC,LTV817M-VB 4P,DIP BK PHOTO COU |
| IC851 | IC,KIA78L05BP(AT) 3P 5V,150MA |
| IC853 | IC,KIA78R09PI KEC 4PIN,TO220IS-4 |
| IC855 | IC,KIA278R05PI KEC TO220IS,4P ST |
| IC856 | IC,SE110N(LF12) 3P 110V ERROR AMP |
| IC901 | IC,TDA6109JF PHILIPS 9SIP ST RGB |

## DIODE

| LOCA. NO | DESCRIPTION | LOCA. NO | DESCRIPTION |
|---|---|---|---|
| D110 | DIODE,1N4148 TA | D864 | DIODE,RECTIFIERS RU4AM,LF-L1 |
| D180 | DIODE,1N4148 TA | D865 | DIODE,1N4148 TA |
| D181 | DIODE,RECTIFIERS RGP15J TP | D866 | DIODE,RECTIFIERS BAV21 DO35 200V 0.2 |
| D301 | DIODE,SWITCHING 1SS133 T-72 TP | D867 | DIODE,RECTIFIERS BAV21 DO35 200V 0.2 |
| D302 | DIODE,RECTIFIERS RS4FS BK R4 1500V | D901 | DIODE,RECTIFIERS BAV21 DO35 200V 0.2 |
| D401 | DIODE,RECTIFIERS RU4AM,LF-L1 | D902 | DIODE,RECTIFIERS 1N4004A T-81 TP |
| D402 | DIODE,RECTIFIERS RGP15J TP | D903 | DIODE,RECTIFIERS TVR06J |
| D403 | DIODE,RECTIFIERS RGP15J TP | D904 | DIODE,RECTIFIER D5SB60 BRIDGE(5A/600V) |
| D404 | DIODE,RECTIFIERS RGP15G TP | D920 | DIODE,RECTIFIERS RU4AM,LF-L1 |
| D405 | DIODE,RECTIFIERS RGP15G TP | DB801 | DIODE,1N4148 TA |
| D406 | DIODE,RECTIFIERS TVR06J GE | LD01 | HOLDER DIODE,LED ASSY |
| D408 | DIODE,1N4148 TA | ZD101 | DIODE,ZENERS GDZJ33B TP GRANDE DO34 0.5W |
| D505 | DIODE,1N4148 TA | ZD102 | DIODE,ZENERS MTZJ6.2B TP ROHM-K DO34 0.5W |
| D506 | DIODE,RECTIFIERS EU1ZV(1) | ZD302 | DIODE,ZENERS GDZ5.1B |
| D802 | DIODE,RECTIFIERS EU1ZV(1) | ZD303 | DIODE,ZENERS GDZJ18B TP |

| | | | |
|---|---|---|---|
| | | | GRANDE DO34 0.5W |
| D803 | DIODE,1N4148 TA | ZD401 | DIODE,ZENERS GDZ5.1B |
| D804 | DIODE,RECTIFIERS TVR06J | ZD402 | DIODE,ZENERS MTZJ11B TP ROHM-K DO34 - 11V |
| D815 | DIODE,1N4148 TA | ZD501 | DIODE,ZENERS GDZ5.1B |
| D857 | DIODE,RECTIFIERS RU2AMV(1) | ZD601 | DIODE,ZENERS GDZ5.1B |
| D858 | DIODE,D4L20U SHINDENGEN | ZD610 | DIODE,ZENERS GDZJ9.1B TP GRANDE DO34 0.5W |
| D860 | DIODE,RECTIFIERS TVR06J | ZD910 | DIODE,ZENERS GDZJ4.7B GRANDE TP DO34 0.5W |
| D861 | DIODE,D4L20U SHINDENGEN | ZD911 | DIODE,ZENERS GDZJ4.7B GRANDE TP DO34 0.5W |
| D862 | DIODE,1N4148 TA | ZD912 | DIODE,ZENERS GDZJ4.7B GRANDE TP DO34 0.5W |
| D863 | DIODE,1N4148 TA | | |

## TRANSISTOR

| LOCA. NO | DESCRIPTION |
|---|---|
| Q06 | TR,2SA1980Y TP AUK |
| Q108 | TR,2SC5343Y TP AUK |
| Q180 | TR,2SC5343Y TP AUK |
| Q181 | TR,2SA1980Y TP AUK |
| Q182 | TR,2SA1980Y TP AUK |
| Q183 | TR,2SC5343Y TP AUK |
| Q184 | TR,2SC5343Y TP AUK |
| Q185 | TR,2SA1980Y TP AUK |
| Q186 | TR,2SA1980Y TP AUK |
| Q187 | TR,2SC5343Y TP AUK |
| Q201 | TR,2SA1980Y TP AUK |
| Q202 | TR,2SA1980Y TP AUK |
| Q301 | TR,2SC5343Y TP AUK |
| Q302 | TR,KTD2059-Y TO-220IS KEC |
| Q303 | TR,KTA1274-Y TO-92L TP KEC |
| Q401 | TR,SGS-T(STM) ST2310HI ST TO220 |
| Q402 | TR,KTC2238A-Y |
| Q505 | TR,2SC5343Y TP AUK |
| Q506 | TR,2SA1980Y TP AUK |
| Q507 | TR,2SA1980Y TP AUK |
| Q508 | TR,2SA1980Y TP AUK |
| Q509 | TR,2SC5343Y TP AUK |
| Q621 | TR,2SC5343Y TP AUK |
| Q671 | TR,2SA1980Y TP AUK |
| Q672 | TR,2SA1980Y TP AUK |
| Q806 | TR,KRC102M,TP(KRC1202),KEC |
| Q807 | TR,KRC102M,TP(KRC1202),KEC |
| Q853 | TR,KTA1270-TP-Y (KTA562TM)KEC |
| Q855 | TR,BF421L(AMMO)TO-92 TP PHILIPS |
| Q856 | TR,KRC102M,TP(KRC1202),KEC |
| Q901 | TR,2SA1980Y TP AUK |

# CAPACITOR

| LOCA. NO | DESCRIPTION | LOCA. NO | DESCRIPTION |
|---|---|---|---|
| C01 | 5P 50V D NP0 TS | C242 | 10UF STD 16V M FL TP5 |
| C02 | 5P 50V D NP0 TS | C244 | 220P 50V K B TA52 |
| C03 | 3.3UF STD 50V 20% FL TP 5 | C245 | 470P 50V K B TA52 |
| C04 | 1000P 50V K B TA52 | C246 | 470P 50V K B TA52 |
| C06 | 100UF STD 16V M FL TP5 | C248 | 470P 50V K B TA52 |
| C07 | 10000P 16V M Y TA52 | C249 | 470P 50V K B TA52 |
| C08 | 10000P 16V M Y TA52 | C301 | 0.01U 100V K POLY TP |
| C10 | 82P 50V K B TA52 | C302 | 0.33U 100V J POLY F5 |
| C11 | 100UF STD 10V M FL TP5 | C303 | 100UF KME 50V M FL TP5 |
| C14 | 47UF STD 16V M FL TP5 | C304 | 0.0068U 100V K POLY TP |
| C16 | 4700P 16V K X TA52 | C305 | 0.001U 100V K POLY TP |
| C17 | 10UF STD 50V M FL TP5 | C306 | 0.033U 100V K POLY TP |
| C22 | 100UF STD 10V M FL TP5 | C308 | 47UF STD 50V M FL TP5 |
| C23 | 100UF STD 10V M FL TP5 | C309 | 470P 50V K B TA52 |
| C24 | 4.7UF STD 50V 20% FL TP 5 | C310 | 0.01U 100V K POLY TP |
| C25 | 0.1M 50V Z F TA52 | C311 | 0.01U 100V K POLY TP |
| C27 | 47UF STD 16V M FL TP5 | C401 | 1UF STD 50V M FL TP5 |
| C28 | 10000P 16V M Y TA52 | C402 | 4.7UF STD 50V 20% FL TP 5 |
| C29 | 100UF STD 10V M FL TP5 | C403 | 0.0015U 100V K POLY TP |
| C30 | 22UF STD 16V M FL TP5 | C405 | 0.02UF 1.6KV H M/PP NI FM20 |
| C102 | 47P 50V J SL TA52 | "(25") | 0.022UF 1.6KV H M/PP NI FM20 |
| C103 | 47P 50V J SL TA52 | C406 | R 680PF 2KV 10%,-10% R TP |
| C104 | 10000P 16V M Y TA52 | C407 | PP 400V 0.022UF J |
| C107 | 10000P 16V M Y TA52 | C408 | 6.8UF SM,SA 50V 20% FM7.5 |
| C108 | 47UF STD 10V 20% FL TP 5 | C409 | 2200P 500V K B TS |
| C110 | 47UF STD 50V M FL TP5 | C410 | 1UF SHL,SD 250V 20% BP(D) |
| C114 | 47UF STD 10V 20% FL TP 5 | C411 | 0.53UF D 400V 5% BULK M/PP |
| C121 | 0.4700UF STD 50V M FL TP5 | "(25") | MPP 200V 0.5UF J |
| C125 | 0.1M 50V Z F TA52 | C413 | 100UF STD 35V M FL TP5 |
| C130 | 10000P 16V M Y TA52 | C415 | 1000UF STD 25V M FL TP5 |
| C180 | 1000P 50V K B TA52 | C416 | PP 200V 0.022UF K |
| C181 | 220P 50V K B TA52 | C419 | 1000UF STD 25V M FL TP5 |
| C183 | 0.1M 50V Z F TA52 | C420 | PP 400V 0.056UF J |
| C184 | 1UF STD 50V M FL TP5 | C422 | 4.7UF STD 250V 20% FL TP 5 |
| C200 | 100P 50V K B TA52 | C501 | 100UF STD 10V M FL TP5 |
| C201 | 220UF STD 16V M FL TP5 | C502 | 0.1M 50V Z F TA52 |
| C202 | 100P 50V K B TA52 | C503 | 1UF D 50V 80%,-20% F(Y5V) |
| C205 | 100P 50V K B TA52 | C504 | 1UF D 50V 80%,-20% F(Y5V) |
| C206 | 100P 50V K B TA52 | C505 | 0.1M 50V Z F TA52 |
| C207 | 220P 50V K B TA52 | C506 | 0.1M 50V Z F TA52 |
| C209 | 1UF D 50V 80%,-20% F(Y5V) TA52 | C508 | 1UF D 50V 80%,-20% F(Y5V) |
| C210 | 220UF STD 16V M FL TP5 | C509 | 1UF D 50V 80%,-20% F(Y5V) |
| C211 | 470P 50V K B TA52 | C511 | 1UF D 50V 80%,-20% F(Y5V) |
| C213 | 470P 50V K B TA52 | C512 | 100P 50V K B TA52 |
| C215 | 470P 50V K B TA52 | C513 | 1UF D 50V 80%,-20% F(Y5V) |
| C216 | 470P 50V K B TA52 | C514 | 1UF D 50V 80%,-20% F(Y5V) |
| C227 | 22UF STD 16V M FL TP5 | C515 | 1UF D 50V 80%,-20% F(Y5V) |
| C228 | 22UF STD 16V M FL TP5 | C516 | 10000P 16V M Y TA52 |
| C229 | 22UF STD 16V M FL TP5 | C517 | 0.068U 100V K POLY TP |
| C230 | 22UF STD 16V M FL TP5 | C518 | 0.068U 100V K POLY TP |
| C232 | 220P 50V K B TA52 | C520 | 1000P 50V K B TA52 |
| C240 | 220P 50V K B TA52 | C521 | 100P 50V K B TA52 |
| C241 | 220P 50V K B TA52 | C522 | 100P 50V K B TA52 |

| LOCA. NO | DESCRIPTION | LOCA. NO | DESCRIPTION |
|---|---|---|---|
| C523 | 100P 50V K B TA52 | "(25") | 470UF STD 10V M FL TP5 |
| C559 | 0.068U 100V K POLY TP | C857 | 1000UF KME 16V M FL TP5 |
| C561 | 0.22UF S 50V 5% M/PE NI | C858 | 1000UF KME 16V M FL TP5 |
| C562 | 220P 50V K B TA52 | C860 | 1000UF KME 16V M FL TP5 |
| C563 | 220P 50V K B TA52 | C861 | 1000UF STD 16V M FL TP5 |
| C564 | 220P 50V K B TA52 | C862 | 4.7UF KME TYPE 50V 20% FL |
| C565 | 220P 50V K B TA52 | C864 | 1000UF KME 35V M FL TP5 |
| C568 | 100UF STD 16V M FL TP5 | C865 | 220P 1KV K B TP5 |
| C601 | 22UF STD 16V M FL TP5 | C867 | 220UF STD 50V M FL TP5 |
| C604 | 4.7UF STD 50V 20% FL TP 5 | C868 | 220UF STD 10V M FL TP5 |
| C605 | 0.0033U 100V K POLY TP | C871 | 220UF STD 160V 20% FL TP 7.5 |
| C606 | 0.22UF D 63V 5% TP 5 M/PE | C872 | 100U SHL 160V M FL TP5 |
| C612 | 470UF STD 25V M FL TP5 | C873 | 0.1U 100V K POLY TP |
| C621 | 0.0033U 100V K POLY TP | C874 | R 680PF 2KV 10%,-10% R/TP |
| C622 | 0.22UF D 63V 5% TP 5 M/PE | C880 | 10UF STD 25V M FL TP5 |
| C650 | 10000P 16V M Y TA52 | C901 | 4.7UF STD 250V 20% FL TP 5 |
| C651 | 10000P 16V M Y TA52 | C902 | 0.1UF TE 250V K M/PE NI TP5 |
| C663 | 100UF STD 10V M FL TP5 | C903 | 2KV B 122K TP7.5 |
| C666 | 3.3UF STD 50V 20% FL TP 5 | C904 | 4.7UF STD 250V 20% FL TP 5 |
| C667 | 3300P 16V K X TA52 | C920 | 10000P 16V M Y TA52 |
| C668 | 3300P 16V K X TA52 | C921 | 100UF STD 16V M FL TP5 |
| C670 | 1UF STD 50V M FL TP5 | C922 | 150P 50V K B TA52 |
| C671 | 100UF STD 10V M FL TP5 | C923 | 100UF STD 35V M FL TP5 |
| C672 | 1UF STD 50V M FL TP5 | C924 | 100UF STD 16V M FL TP5 |
| C673 | 0.33UF D 63V 5% TP 5 M/PE | C925 | 0.01U 500V K B S |
| C674 | 0.33UF D 63V 5% TP 5 M/PE | C926 | 10UF STD 160V M FL TP5 |
| C675 | 10UF STD 16V M FL TP5 | C927 | 100P 500V K B TS |
| C676 | 0.33UF D 63V 5% TP 5 M/PE | C928 | 100UF STD 16V M FL TP5 |
| C677 | 0.33UF D 63V 5% TP 5 M/PE | C929 | 0.01U 500V K B S |
| C678 | 0.33UF D 63V 5% TP 5 M/PE | C930 | 10UF STD 160V M FL TP5 |
| C679 | 0.33UF D 63V 5% TP 5 M/PE | | |
| C681 | 10UF STD 16V M FL TP5 | | |
| C685 | 10UF STD 16V M FL TP5 | | |
| C686 | 56P 50V J SL TA52 | | |
| C687 | 56P 50V J SL TA52 | | |
| C688 | 56P 50V J SL TA52 | | |
| C689 | 2P 50V D NP0 TS | | |
| C690 | 2P 50V D NP0 TS | | |
| C802 | A.C 275V 0.22UF K (S=22.5) | | |
| C803 | R 220PF 2KV 10%,-10% R/TP | | |
| C804 | 330UF SLT 450V M VNSN | | |
| "(25") | 470UF 450V 20% | | |
| C806 | MPP 1.6KV 0.0015UF J | | |
| C807 | 470PF 50V K B TR | | |
| C808 | 100UF KME 35V M FL TP5 | | |
| C809 | DEHR33A102KN2A 1000PF 1 | | |
| C813 | 1000P 1KV K B TS | | |
| C814 | A.C 275V 0.1UF M (S=15) | | |
| C815 | DEHR33A471KN2A 470PF | | |
| C816 | 1000P 1KV K B TS | | |
| C818 | 2200PF 4KV M E FMTW | | |
| C821 | 4700P 1KV K B S | | |
| C822 | 22UF STD 10V 20% FL TP 5 | | |
| C840 | 100P 50V K B TA52 | | |
| C854 | 100UF STD 16V M FL TP5 | | |
| C855 | 100UF STD 10V M FL TP5 | | |

## COIL & TRANSFORMER

| LOCA. NO | DESCRIPTION | LOCA. NO | DESCRIPTION |
|---|---|---|---|
| J134 | INDUCTOR,10UH K 4*10.5 TP | L243 | INDUCTOR,47UH K 2.3*3.4 TP |
| J225 | INDUCTOR,3.9UH K 2.3*3.4 TP | L244 | INDUCTOR,47UH K 2.3*3.4 TP |
| J347 | INDUCTOR,3.9UH K 2.3*3.4 TP | L245 | INDUCTOR,10UH K 4*10.5 TP |
| L01 | INDUCTOR,10UH K 2.3*3.4 TP | L401 | COIL,CHOKE 1.1UH PHY TURN |
| L04 | INDUCTOR,10UH K 2.3*3.4 TP | L402 | COIL,LINEARITY 20UH USTC0.12PHY 48.5TURN |
| L05 | INDUCTOR,10UH K 4*10.5 TP | "(25") | COIL,LINEARITY 20UH 1PHY 1TURN |
| L08 | INDUCTOR,10UH K 2.3*3.4 TP | L509 | INDUCTOR,10UH K 2.3*3.4 TP |
| L103 | INDUCTOR,10UH K 4*10.5 TP | L510 | INDUCTOR,10UH K 2.3*3.4 TP |
| L121 | INDUCTOR,10UH K 4*10.5 TP | L512 | INDUCTOR,10UH K 4*10.5 TP |
| L210 | INDUCTOR,10UH K 2.3*3.4 TP | L663 | INDUCTOR,10UH K 2.3*3.4 TP |
| L211 | INDUCTOR,10UH K 2.3*3.4 TP | L810 | INDUCTOR,10UH K 2.3*3.4 TP |
| L212 | INDUCTOR,10UH 10% TP 5.0X14 | L853 | COIL,CHOKE 82UH PHY TURN |
| L213 | INDUCTOR,10UH K 2.3*3.4 TP | R213 | INDUCTOR,3.9UH K 2.3*3.4 TP |
| L214 | INDUCTOR,10UH K 2.3*3.4 TP | R242 | INDUCTOR,3.9UH K 2.3*3.4 TP |
| L218 | INDUCTOR,10UH K 2.3*3.4 TP | T401 | TRANSFORMER,H-DRIVE,EI-19,BULK |
| L219 | INDUCTOR,10UH K 2.3*3.4 TP | T402 | FBT BSC28-N2325 29" YINYANG 6003LB |
| L241 | INDUCTOR,10UH K 2.3*3.4 TP | T802 | TRANSFORMER,SMPS EER5345 340UH 115V |
| L242 | INDUCTOR,10UH K 2.3*3.4 TP | | |

## CONNECTOR

| LOCA. NO | DESCRIPTION | LOCA. NO | DESCRIPTION |
|---|---|---|---|
| P03A | CONNECTOR (CIRC),2.5MM 10P GIL-G | P601 | CONNECTOR (CIRC),2.5MM 3P GIL-G |
| P03B | CONNECTOR ASSY,10P 500MM H-B UL 1007 | P602 | CONNECTOR (CIRC),2.5MM 4P GIL-G |
| P102 | CONNECTOR (CIRC),2.36PAI 1P | P801A | CONNECTOR (CIRC),2.36PAI |
| P180 | CONNECTOR (CIRC),2.5MM 3P GIL-G | P801B | CONNECTOR (CIRC),2.36PAI |
| P401 | CONNECTOR (CIRC),PLUG(4P) | P802A | CONNECTOR (CIRC),2.36PAI |
| P402A | CONNECTOR (CIRC),2.5MM 8P GIL-G | P802B | CONNECTOR (CIRC),2.36PAI |
| P402B | CONNECTOR ASSY,8P (L=450) | P901 | CONNECTOR (CIRC),2.36PAI |
| P501 | CONNECTOR (CIRC),2.5MM 3P GIL-G | P903 | CONNECTOR (CIRC),2.36PAI |
| P502 | CONNECTOR (CIRC),2.5MM 3P GIL-G | P920 | CONNECTOR (CIRC),2.5MM 3P GIL-G LG |

# RESISTOR

| LOCA. NO | DESCRIPTION | LOCA. NO | DESCRIPTION |
|---|---|---|---|
| F851 | 0.02 OHM 1 W 20% TA52 | R131 | 100 OHM 1/6 W 5.00% TA52 |
| F853 | 0.05 OHM 1/2 W 10% TA52 | R132 | 470 OHM 1/6 W 5.00% TA52 |
| F854 | 0.05 OHM 1/2 W 10% TA52 | R133 | 470 OHM 1/6 W 5.00% TA52 |
| F855 | 0.05 OHM 1/2 W 10% TA52 | R135 | 560 OHM 1/2 W 5.00% TA52 |
| FR401 | 0.68 OHM 2W 5 | R136 | 10K OHM 1/6 W 5.00% TA52 |
| FR402 | 1 OHM 2 W 5.00% TA62 | R137 | 10K OHM 1/6 W 5.00% TA52 |
| FR403 | 0.05 OHM 1/2 W 10% TA52 | R180 | 1K OHM 1/6 W 5.00% TA52 |
| FR406 | 1.2 OHM 2 W 5.00% TA62 | R181 | 30K OHM 1/6 W 5.00% TA52 |
| FR413 | 0.05 OHM 1/2 W 10% TA52 | R182 | 6.8K OHM 1/6 W 5.00% TA52 |
| FR901 | 1.2 OHM 2 W 5.00% TA62 | R183 | 100K OHM 1/6 W 5.00% TA52 |
| "(25") | 1 OHM 2 W 5.00% TA62 | R184 | 1.8K OHM 1/6 W 5.00% TA52 |
| J128 | 10K OHM 1/6 W 5.00% TA52 | R185 | 1.8K OHM 1/6 W 5.00% TA52 |
| J137 | 100 OHM 1/6 W 5.00% TA52 | R186 | 4.7K OHM 1/6 W 5.00% TA52 |
| J149 | 100 OHM 1/6 W 5.00% TA52 | R187 | 1.8K OHM 1/6 W 5.00% TA52 |
| J151 | 180 OHM 1/6 W 5.00% TA52 | R188 | 22K OHM 1/6 W 5.00% TA52 |
| J163 | 100 OHM 1/6 W 5.00% TA52 | R189 | 56K OHM 1/6 W 5.00% TA52 |
| J167 | 100 OHM 1/6 W 5.00% TA52 | R190 | 510K OHM 1/6 W 5.00% TA52 |
| J170 | 100 OHM 1/6 W 5.00% TA52 | R191 | 100 OHM 1/6 W 5.00% TA52 |
| J175 | 100 OHM 1/6 W 5.00% TA52 | R192 | 4.7K OHM 1/6 W 5.00% TA52 |
| J192 | 100 OHM 1/6 W 5.00% TA52 | R193 | 4.7K OHM 1/6 W 5.00% TA52 |
| J207 | 100 OHM 1/6 W 5.00% TA52 | R201 | 68 OHM 1/6W 5 TA52 |
| J210 | 47K OHM 1/6 W 5.00% TA52 | R202 | 220 OHM 1/2W 5 |
| J215 | 1K OHM 1/6 W 5.00% TA52 | R205 | 33K OHM 1/6W 5 |
| J216 | 1K OHM 1/6 W 5.00% TA52 | R206 | 75 OHM 1/6 W 5.00% TA52 |
| J317 | 100 OHM 1/6 W 5.00% TA52 | R207 | 75 OHM 1/6 W 5.00% TA52 |
| J318 | 100 OHM 1/6 W 5.00% TA52 | R208 | 75 OHM 1/6 W 5.00% TA52 |
| R01 | 100 OHM 1/6 W 5.00% TA52 | R209 | 75 OHM 1/6 W 5.00% TA52 |
| R02 | 100 OHM 1/6 W 5.00% TA52 | R210 | 68 OHM 1/6 W 5.00% TA52 |
| R06 | 3K OHM 1/6 W 5.00% TA52 | R211 | 100 OHM 1/6 W 5.00% TA52 |
| R07 | 10K OHM 1/6 W 5.00% TA52 | R212 | 3.9K OHM 1/6 W 5.00% TA52 |
| R08 | 2K OHM 1/6 W 5.00% TA52 | R215 | 220 OHM 1/6 W 5.00% TA52 |
| R09 | 2K OHM 1/6 W 5.00% TA52 | R218 | 75 OHM 1/6 W 5.00% TA52 |
| R10 | 100 OHM 1/6 W 5.00% TA52 | R219 | 75 OHM 1/6 W 5.00% TA52 |
| R11 | 100 OHM 1/6 W 5.00% TA52 | R220 | 75 OHM 1/6 W 5.00% TA52 |
| R18 | 100 OHM 1/6 W 5.00% TA52 | R230 | 120 OHM 1/2 W 5.00% TA52 |
| R24 | 10K OHM 1/6 W 5.00% TA52 | R231 | 120 OHM 1/2 W 5.00% TA52 |
| R43 | 330 OHM 1/6 W 5.00% TA52 | R301 | 2.2K OHM 1/6 W 5.00% TA52 |
| R44 | 4.7K OHM 1/6 W 5.00% TA52 | R302 | 1 OHM 1/2 W 5.00% TA52 |
| R45 | 1.2K OHM 1/6 W 5.00% TA52 | R305 | 470 OHM 1/6 W 1.00% TA52 |
| R46 | 820 OHM 1/6 W 5.00% TA52 | R306 | 10K OHM 1/6 W 5.00% TA52 |
| R47 | 360 OHM 1/6 W 5.00% TA52 | R307 | 22K OHM 1/6 W 5.00% TA52 |
| R48 | 430 OHM 1/6 W 5.00% TA52 | R309 | 4.7K OHM 1/6 W 5.00% TA52 |
| R49 | 560 OHM 1/6 W 5.00% TA52 | R310 | 39 OHM 1/6 W 5.00% TA52 |
| R50 | 1K OHM 1/6 W 5.00% TA52 | R311 | 1.5 OHM 1/2 W 5.00% TA52 |
| R51 | 3.3K OHM 1/6 W 5.00% TA52 | R312 | 4.7 OHM 1/2 W 5.00% TA52 |
| R90 | 100 OHM 1/6 W 5.00% TA52 | R313 | 390 OHM 1 W 5.00% TA62 |
| R94 | 100 OHM 1/6 W 5.00% TA52 | R315 | 100 OHM 1/6 W 5.00% TA52 |
| R95 | 1K OHM 1/6 W 5.00% TA52 | R316 | 27K OHM 1/6 W 5.00% TA52 |
| R102 | 510 OHM 1/6 W 5.00% TA52 | R317 | 2K OHM 1/6 W 5.00% TA52 |
| R119 | 10 OHM 1/6 W 5.00% TA52 | R319 | 82K OHM 1/6 W 1.00% TA52 |
| R126 | 1K OHM 1/6 W 5.00% TA52 | R320 | 1K OHM 1/6 W 5.00% TA52 |
| R127 | 1K OHM 1/6 W 5.00% TA52 | R321 | 5.6 OHM 2 W 5% TR |
| R128 | 22 OHM 1/6 W 5.00% TA52 | R322 | 1.5K OHM 1/6 W 5.00% TA52 |
| R129 | 100 OHM 1/6 W 5.00% TA52 | R323 | 27K OHM 1/6 W 5.00% TA52 |
| R130 | 100 OHM 1/6 W 5.00% TA52 | R324 | 470 OHM 1/6 W 5.00% TA52 |

| LOCA. NO | DESCRIPTION | LOCA. NO | DESCRIPTION |
|---|---|---|---|
| R325 | 2.7K OHM 1/2 W 5.00% TA52 | R572 | 82 OHM 1/6 W 5.00% TA52 |
| R326 | 1.5K OHM 1/2 W 5.00% TA52 | R601 | 1K OHM 1/6 W 5.00% TA52 |
| R327 | 1.5K OHM 1/2 W 5.00% TA52 | R602 | 10K OHM 1/6 W 5.00% TA52 |
| R328 | 8.2K OHM 1/6 W 5.00% TA52 | R603 | 1K OHM 1/6 W 5.00% TA52 |
| R330 | 3K OHM 1/6 W 5.00% TA52 | R604 | 3.3K OHM 1/6 W 5.00% TA52 |
| R331 | 2.4K OHM 1/6 W 5.00% TA52 | R607 | 6.8 OHM 1/2 W 5.00% TA52 |
| R402 | 1K OHM 1/6 W 5.00% TA52 | R608 | 3.3K OHM 1/6 W 5.00% TA52 |
| R403 | 560 OHM 1/2 W 5.00% TA52 | R609 | 6.2K OHM 1/6 W 5.00% TA52 |
| R404 | 33 OHM 1/2 W 5.00% TA52 | R610 | 47K OHM 1/6 W 5.00% TA52 |
| R405 | 100 OHM 2 W 5% TR | R611 | 47K OHM 1/6 W 5.00% TA52 |
| R408 | 2.2 OHM 2 W 5.00% TA62 | R624 | 6.2K OHM 1/6 W 5.00% TA52 |
| R409 | 1.8K OHM 1/2 W 5.00% TA52 | R629 | 91 OHM 1/6 W 5.00% TA52 |
| R410 | 15K OHM 5W +/-5% RSR V | R662 | 100 OHM 1/6 W 5.00% TA52 |
| R411 | 51K OHM 1/2 W 5.00% TA52 | R663 | 100 OHM 1/6 W 5.00% TA52 |
| R413 | 22K OHM 1/2 W 5.00% TA52 | R664 | 10K OHM 1/6 W 5.00% TA52 |
| R414 | 1K OHM 1/2 W 5.00% TA52 | R801 | 0.47M OHM 1/2 W 5% TA52 P |
| R415 | 10K OHM 1/6 W 5.00% TA52 | R802 | RWR 15W 1.0 OHM J PD |
| R416 | 1K OHM 1/6 W 5.00% TA52 | R803 | 10 OHM 1/2 W 5.00% TA52 |
| R417 | 820K OHM 1/6 W 5.00% TA52 | R804 | 4.7K OHM 1/6 W 5.00% TA52 |
| R419 | 7.5K OHM 1/2 W 5.00% TA52 | R805 | 1K OHM 1/6 W 5.00% TA52 |
| R420 | 47 OHM 2 W 5.00% TA62 | R806 | 2 W RWR G 2W 0.12 J TA31 |
| R509 | 75 OHM 1/6 W 5.00% TA52 | R807 | 8.2M OHM 1/2 W 5% TA52 UL |
| R512 | 75 OHM 1/6 W 5.00% TA52 | R808 | 3.3K OHM 1/6 W 5.00% TA52 |
| R517 | 300 OHM 1/6 W 5.00% TA52 | R809 | 27K OHM 2 W 5.00% TR |
| R519 | 1K OHM 1/6 W 5.00% TA52 | R811 | 27K OHM 2 W 5.00% TR |
| R523 | 10K OHM 1/6 W 5.00% TA52 | R813 | 10K OHM 1/6 W 5.00% TA52 |
| R525 | 6.8K OHM 1/6 W 5.00% TA52 | R821 | 3.6K OHM 1/6 W 5.00% TA52 |
| R526 | 27K OHM 1/6 W 5.00% TA52 | R822 | 3.3K OHM 1/6 W 5.00% TA52 |
| R528 | 6.8K OHM 1/6 W 5.00% TA52 | R850 | 4.7 OHM 1/6 W 5.00% TA52 |
| R531 | 1.2K OHM 1/6 W 5.00% TA52 | R852 | 10 OHM 2 W 5% TR |
| R532 | 120 OHM 1/6 W 5.00% TA52 | R858 | 4.7 OHM 1/6 W 5.00% TA52 |
| R533 | 2.2K OHM 1/6 W 5.00% TA52 | R861 | 2K OHM 1/6W 5 |
| R534 | 100 OHM 1/6 W 5.00% TA52 | R862 | 5.6K OHM 1/6 W 5.00% TA52 |
| R537 | 22K OHM 1/6 W 5.00% TA52 | R863 | 2K OHM 1/6 W 5.00% TA52 |
| R541 | 270 OHM 1/6 W 5.00% TA52 | R864 | 1.6 OHM 2 W 5.00% TA62 |
| R542 | 220 OHM 1/6 W 5.00% TA52 | R865 | 1.6 OHM 2 W 5.00% TA62 |
| R543 | 22K OHM 1/6 W 5.00% TA52 | R866 | 10K OHM 1/2 W 5.00% TA52 |
| R544 | 33 OHM 1/6 W 5.00% TA52 | R867 | 75K OHM 1/6 W 5.00% TA52 |
| R545 | 180 OHM 1/6 W 5.00% TA52 | R868 | 10K OHM 1/6 W 5.00% TA52 |
| "(25") | 200 OHM 1/6 W 5.00% TA52 | R869 | 4.7K OHM 1/6 W 5.00% TA52 |
| R546 | 47 OHM 1/6 W 5.00% TA52 | R871 | 240 OHM 1/6 W 5.00% TA52 |
| R548 | 430 OHM 1/6 W 5.00% TA52 | R872 | 220K OHM 1/2 W 5.00% TA52 |
| R549 | 180 OHM 1/6 W 5.00% TA52 | R873 | 4.7K OHM 1/6 W 5.00% TA52 |
| "(25") | 200 OHM 1/6 W 5.00% TA52 | R901 | 220 OHM 1/6 W 5.00% TA52 |
| R550 | 47 OHM 1/6 W 5.00% TA52 | R902 | 220 OHM 1/6 W 5.00% TA52 |
| R552 | 430 OHM 1/6 W 5.00% TA52 | R903 | 220 OHM 1/6 W 5.00% TA52 |
| R553 | 180 OHM 1/6 W 5.00% TA52 | R904 | 470 OHM 1/6 W 5.00% TA52 |
| "(25") | 200 OHM 1/6 W 5.00% TA52 | R905 | 7.5K OHM 1/6 W 5.00% TA52 |
| R554 | 47 OHM 1/6 W 5.00% TA52 | R906 | 100 OHM 1/6 W 5.00% TA52 |
| R556 | 430 OHM 1/6 W 5.00% TA52 | R907 | 100 OHM 1/6 W 5.00% TA52 |
| R557 | 2.7K OHM 1/6 W 5.00% TA52 | R908 | 100 OHM 1/6 W 5.00% TA52 |
| R558 | 22 OHM 1/6 W 5.00% TA52 | R909 | 1/2 W 1.5K,10%,PLIKOR |
| R559 | 1K OHM 1/6 W 5.00% TA52 | R910 | 1/2 W 1.5K,10%,PLIKOR |
| R560 | 4.3K OHM 1/6 W 5.00% TA52 | R911 | 1/2 W 1.5K,10%,PLIKOR |
| R570 | 180 OHM 1/6 W 5.00% TA52 | R912 | 2.2M OHM 1/2 W 5.00% TA52 |
| R571 | 3.9K OHM 1/6 W 5.00% TA52 | R913 | 4.7K OHM 1/6 W 5.00% TA52 |

| LOCA. NO | DESCRIPTION | LOCA. NO | DESCRIPTION |
|---|---|---|---|
| R921 | 100 OHM 1/6 W 5.00% TA52 | R925 | 430 OHM 1 W 5.00% TA62 |
| R922 | 62 OHM 1/6 W 5.00% TA52 | R926 | 680 OHM 2 W 5.00% TA62 |
| R923 | 10 OHM 1 W 5.00% TA62 | "(25") | 390 OHM 2 W 5.00% TA62 |
| R924 | 330 OHM 1 W 5.00% TA62 | | |

## SWITCH

| LOCA. NO | DESCRIPTION | LOCA. NO | DESCRIPTION |
|---|---|---|---|
| SW01 | SWITCH,TACT SKHV17910B LG C&D NON 12V | SW05 | SWITCH,TACT SKHV17910B LG C&D NON 12V |
| SW02 | SWITCH,TACT SKHV17910B LG C&D NON 12V | SW06 | SWITCH,TACT SKHV17910B LG C&D NON 12V |
| SW03 | SWITCH,TACT SKHV17910B LG C&D NON 12V | SW801 | SWITCH,PUSH SDKEA3 IEC 250V 8A HORIZO |
| SW04 | SWITCH,TACT SKHV17910B LG C&D NON 12V | | |

## FILTER & CRYSTAL

| LOCA. NO | DESCRIPTION | LOCA. NO | DESCRIPTION |
|---|---|---|---|
| FB202 | FILTER(CIRC),EMC FERRITE BFD3565R2F | FB803 | FILTER(CIRC),EMC FERRITE 1UH TAPING |
| FB220 | FILTER(CIRC),EMC FERRITE BFD3565R2F | L920 | FILTER(CIRC),EMC FERRITE 1UH TAPING |
| FB241 | FILTER(CIRC),EMC FERRITE BFD3565R2F | T801 | FILTER(CIRC),EMC SQE3535 20MH |
| FB401 | FILTER(CIRC),EMC FERRITE 1UH TAPING | X01 | RESONATOR,CRYSTALHC49U SUNNY RADIAL 20.250MHZ |
| FB801 | FILTER(CIRC),EMC FERRITE 1UH TAPING | X661 | RESONATOR,CRYSTALHC49U KJE RADIAL 18.432MHZ 30P |
| FB802 | FILTER(CIRC),EMC FERRITE 1UH TAPING | | |

## ACCESSORIES

| LOCA. NO | DESCRIPTION |
|---|---|
| A1 | MANUAL,OWNERS 022A RUS/BZ03 LG RU/EN 077V/ |
| A2 | REMOTE CONTROLLER MC-022A W/O TEXT,W/O PIP |
| A2 | REMOTE CONTROLLER MC-022A WITH TEXT 48K |

## MISCELLANEOUS

| LOCA. NO | DESCRIPTION |
|---|---|
| F801 | FUSE,SLOW BLOW 4000MA 250V 5.2X20 |
| JK201 | JACK,RCA PPJ109K A/V I/O 6P |
| " | JACK,SCART UPJ-R1-018 |
| JK202 | JACK,RCA PPJ109L A/V I/O 6P |
| " | JACK,RCA PPJ109C |
| JK203 | JACK ASSY,3P+EAR(PJ6062A) |
| PA01 | REMOTE CONTROLLER RECEIVER 38KHZ |
| RL801 | RELAY SDT-S-105LMR OEG 5V 0.05A 250V |
| SK901 | SOCKET (CIRC), CPT PCS030A 8PIN 14/360 |
| TH801 | THERMISTOR,03-07MX 7 OHM 20% 80/60 |
| TU101 | TUNER,TAFD-Z242D LG MULTI FS 4SYS,DI |
| VD801 | VARISTOR,SVC621D-14A 620V 0% UL/C |

# REFERENCES


1. www.novelguide.com
2. www.wikipedia.org
3. www.fixya.com
4. www.e-repair.co.uk
5. www.tcl-shahnoor.com
6. Materials provided by the company