

*USOC(LA76931) SERIES*

**SERVICE MANUAL**

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### **WARNING:**

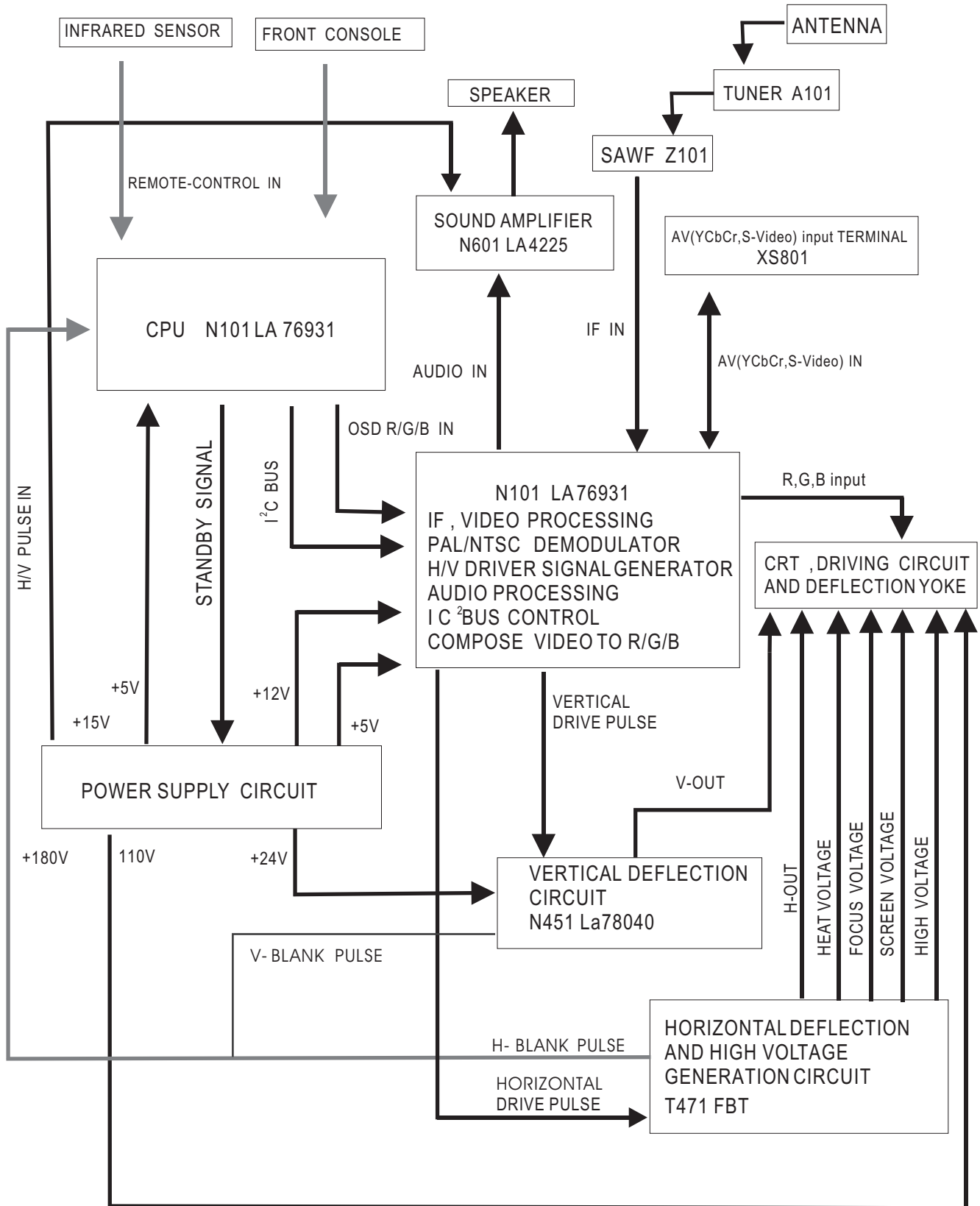
even with an isolation transformer , a live chassis should **\*\*not\*\*** be considered a safe ground point. This applies mostly to TV s, computer and video monitors, some AC operated strobe lights, and other line connected devices. You should not be touching components with the device powered and plugged in ( at least , not until you really know what you are doing!). Once unplugged, sheet metal shields or other ground points should be safe and effective.

## PREFACE Some Rules Of Troubleshooting

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1. Safety first - know the hazards associated with the equipment you are troubleshooting. Take all safety precautions. Expect the unexpected. Take your time.
2. Always think < what if > . This is applied both to the analytic procedures as well as to precautions with respect to probing the equipment . When probing, insulate all but the last 1/8 inch of the probe tip to prevent costly shorts.
3. Learn from your mistake . We all make mistakes - some of them can be quite costly. A simple problem can turn into an expensive one due to a slip of the probe or being over eager to try something before thinking it through. While stating that your experience in these endeavors is measured by the number of scars you have may be stretching the point, expect to screw up - we all can point to that disaster due to inexperience or carelessness. Just make it a point not to make the same mistake again.
4. Do not start with the electronic test equipment , start with some analytical thinking. Many problems associated with consumer electronic equipment do not require a schematic ( though one may be useful). The majority of problems with VCRs, CD player etc. can be dealt with using nothing more than a good set of precision hand tools ; you built in senses and stuff between your ears represents the most important test equipment you have.
5. If you get stuck , sleep on it . Sometimes , just letting the problem bounce around in your head, will lead to a different more successful approach or solution. Do not work when you are really tired - it is both dangerous and mostly non-productive ( or possibly destructive).
6. Many problems have simple solutions. Do not immediately assume that your problem is some combination of esoteric complex convoluted failures. For a TV, it may just be a bad connection or failed diode. Try to remember that the problems with the most catastrophic impact on operation- a dead TV usually have the simplest solutions . The kind of problems we would like to avoid at all costs are the ones that are intermittent or difficult to reproduce: subtle colour noise, the occasion interference, or the dreaded horizontal output transistor blowing out every a few months syndrome.
7. Whenever possible, try to substitute a working unit. With modular systems like component stereos and computers, narrowing down a problem to a single unit should be the first priority. This is usually safe to do in such case and will quickly identify which unit need work. This same principle applies at the electronic. Note that there is the possibility of damaging the known good part by putting it into a non-working device or vice versa. This risk is most likely with the power circuitry in amplifiers, TV s and monitors, or low level circuits in VCRs). Your frequency counter may be double triggering due to noise or imperfect signal shape.
8. Do not blindly trust your instruments. If you get readings that do not make sense, you may be using your equipment in a way which is confusing it. DMMs are not good at checking semiconductors in -circuit or the power transistor you are testing may have a built in damper diode and /or base resistor. Your scope may be picking up interference which is swamping the low level signal your are searching for. Your frequency counter may be double triggering due to noise or imperfect signal shape.
9. Realize the coincidences do happen but are relatively rare. Usually ,there is a common cause. For example , if a TV has no vertical deflection and no picture it is much more likely that a common power supply output has failed than for parts in both the deflection and video subsystems to be bad.
10. Confirm the problem before diving into the repair. It is amazing how many complaints turn out to be impossible to reproduce or are simple cockpit error. It also makes sense to identify exactly what is and is not working so that you will know whether some fault that just appeared was actually a preexisting problem or was caused by your poking. Try to get as much information as possible about the problem from the owner.
11. Get used to the idea of working without a schematic. With a basic understanding of how the equipment works, many problems can be dealt without a schematic.
12. Whenever working on precision equipment , make copious notes and diagrams. You will be eternally grateful when the time comes to reassemble the unit.  
Most connectors are keyed against incorrect insertion or interchange lengths or have slightly different thread types. Little parts may fit in more than one place orientation. Etc.
13. Select a work area which is wide open, well lighted and where dropped parts can be located - not on a deep pile shag rug. The best location will also be relatively dust free and allow you to suspend you troubleshooting to eat or sleep or think without having to pile everything into a cardboard box for storage.
14. We should get into the habit of touching a \*\*safe\*\* ground point first.

# LA 76931 Series Fundamental Circuit Diagram Block



## CHAPTER ONE Power Supply

TV require a variety of voltage ( at various power levels) to work normally. The function of the voltage power supply is to take the AC line input and produce various DC voltages. In all case ,the power to the horizontal output transistor (HOT) of the horizontal deflection system is obtained directly from the DC voltage power supply. In the power design of LA 76931 series , there is a separate switch mode power supply that provides all of the DC voltage.

There will be always be:

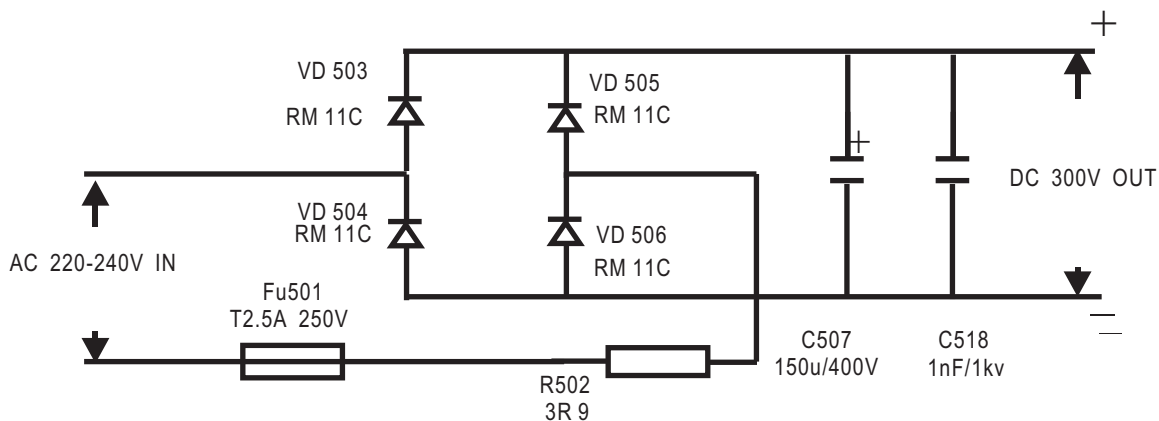
- A. A power switch .It enable to turn on or off the main power.
- B. A set of rectifiers- in a bridge configuration -to turn the AC into DC. Small ceramic capacitors are place across the diodes to reduce RF interference.
- C. One large filter capacitor to smooth the unregulated DC. In countries with 220 -240VAC power ,it will typically be around 400V DC.
- D. In TV , it need switching typical power to provide stable DC .
- E. A degauss control circuit including a Posistor (a combination of heater disk and Positive Temperature Coefficient (PTC) thermistor in a single package). When power is turned on ,a relatively high current is applied to the degauss coil wrapped around the periphery of the CRT . The PTC thermistor heats up, increase in resistance, and smoothly decrease to nearly zero over a couple of seconds.

F. A standby power supply for the microcontroller and remote sensor. It derives from the DC voltage power supply.

Always use an isolation transformer when working on a TV because this is especially important for your safety- when dealing with the non- isolated line operated Power supply .

### 1.1 Typical power rectifier

The partial schematic below is founded in the LA76931 series TV, some parts are not shown including the power switch, bypass capacitors across the rectified diodes (C503-C506) and the RFI line filter (L501, L502).



The line fuse F501 is typically 2.5A, usually a normal fast blow type .Even so, it may not blow as a result of faults down the line -the fusible resistor or regulator may fail first. The main bridge rectifier is composed of 4 discrete diodes (VD503-VD506) but may also be a single unit. Failures -usually shorted diodes-are common. The main filter capacitor (C507) is very important . A typical TV continue to work at normal line voltage without any noticeable degradation in performance (hum bars, hum in sound or shutdown) even if this capacitor is reduced in value by 75%. Its value is therefore not critical.



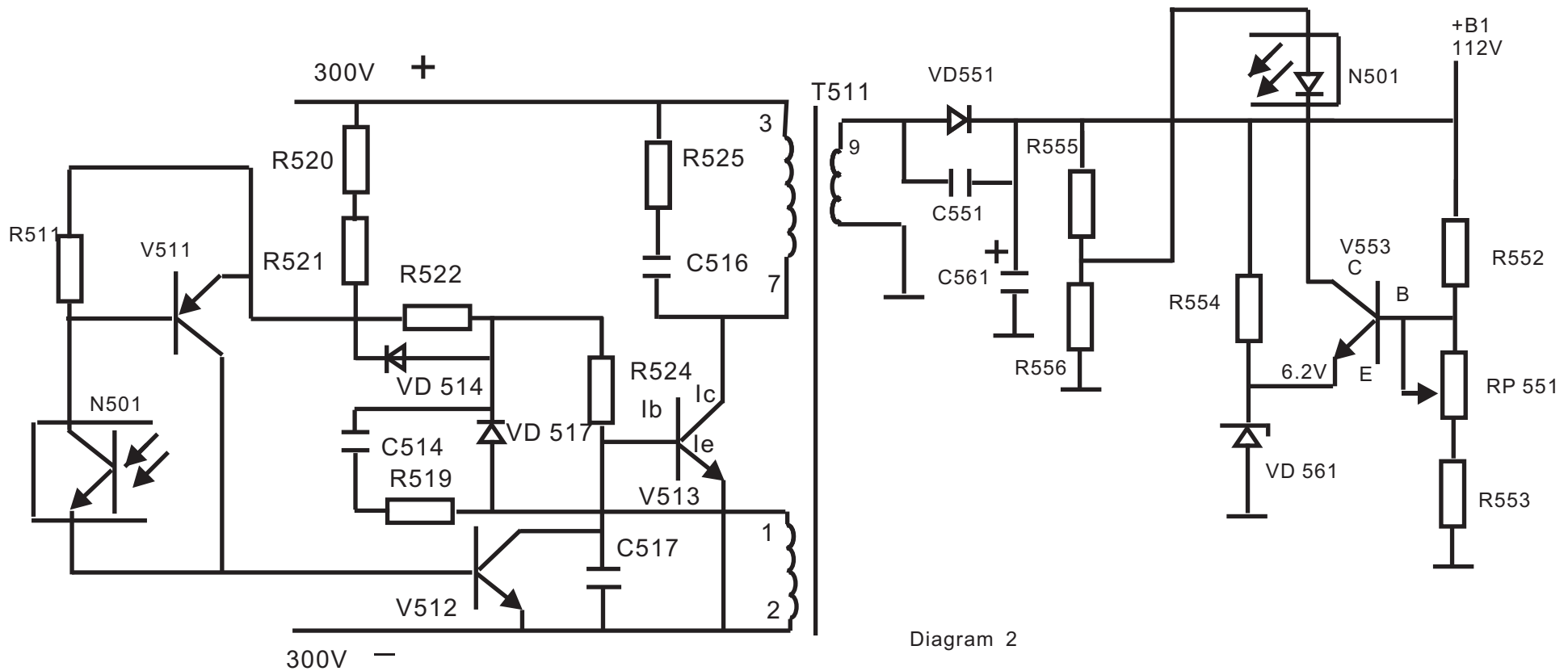


Diagram 2

In the circuit of LA 76931 series, the main output voltage is 112V. The safety of the television will be effected while the voltage was changed. So we must adopt regulative circuit to ensure the stabilization of the output voltage.

When V513 is on, the current flows through pin3 and pin7 of T511, then be converted magnetic energy to be stored. The magnetic energy's strength corresponds with the V513's condition. The switch on time more longer, the energy magnetic stored in T511 will be more stronger. The induced voltage (pin10 - pin16) will be more higher. On the contrary condition, it just reverse. So the output will be controlled only via controlling the on/off time of the switch transistor.

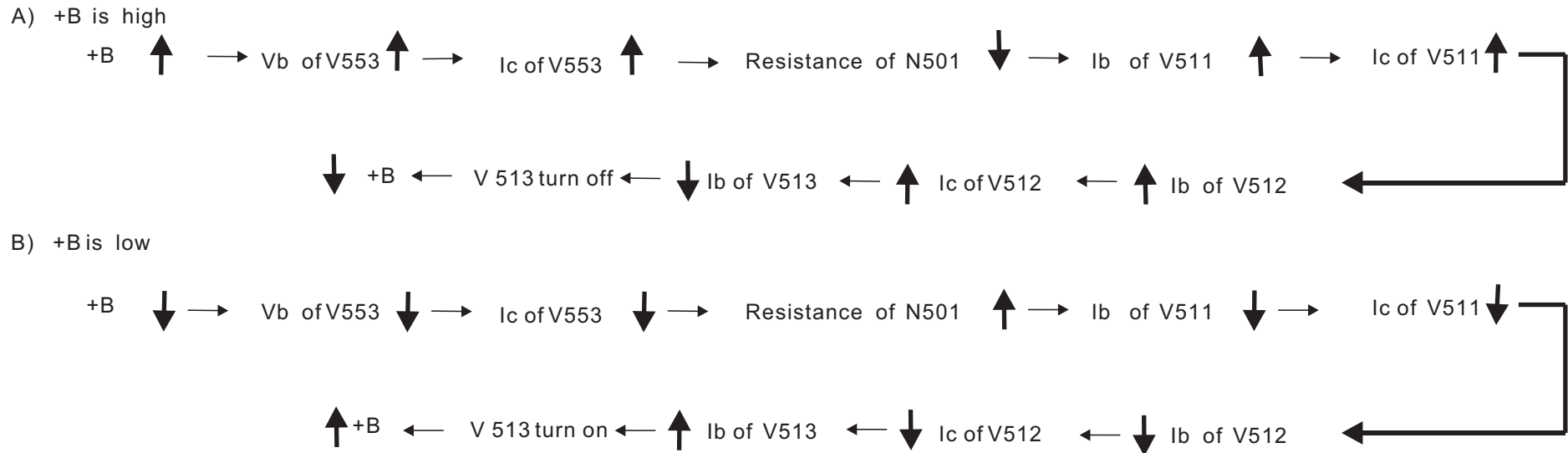
Regulator is based on the above theory. We can use V512 to bypass the current flowing into base of V513 in order to control the on-off time of V513.

The switchmode power supply automatic regulates the current in the base of switch transistor to keep the out stable. By diagram2, let us analyse the regulation process.

R552, RP 551, R553 connect in series. The sample voltage is taken from RP 551. Obviously, the voltage directly reflects the variety of "+B". If the Voltage of "+B" is high, the voltage on the base of V513 is high. If the voltage of "+B" is low, the voltage on the base of V513 is low. At the same time "+B" offers the breakdown current on VD 561 through R554 to keep 6.2V on the emitter of V553. So Vbe vary with "+B". The error current that flow across b-e of V553 is determined by "+B". "+B" also add VD 515 through R555, R556 and produce the current flowing back to the collector of V553.

N501 is an photocoupler that implements light - electric conversion. By this photocoupler, first the "+B" error is converted into light error, then the light error is converted into resistant error. The final voltage regulated depends on V511, V512 etc. The resistant error just reflect s the "+B" error. It is connected with the base of V511 and controls the degree that V511 turns on. This will cause the current variety in the collector of V511, this various current is amplified by V512 and controls the b-e current in of V513 (Ib). So the working condition of V513 can be controlled.

The flow chart is as follows:

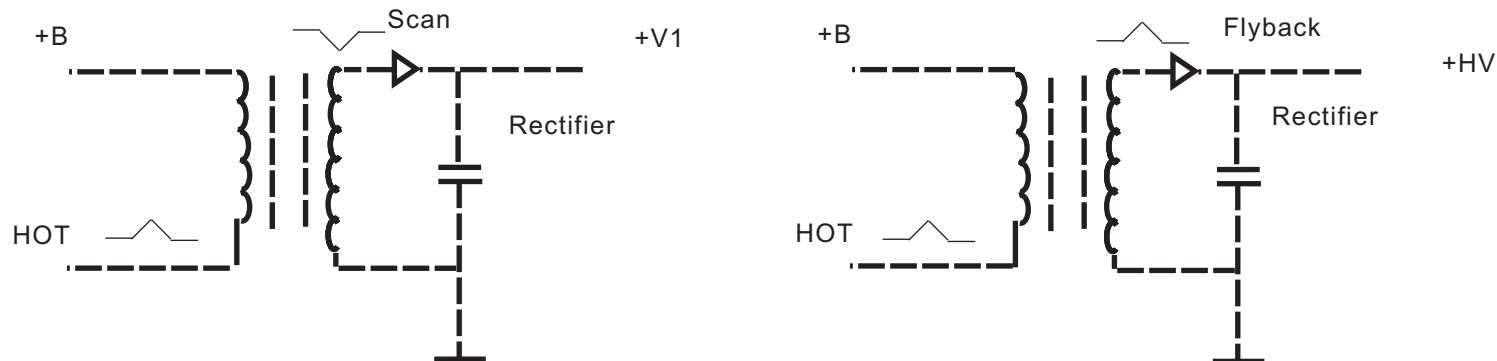


## Chapter Two Horizontal Deflection

### 2.1 How does the horizontal deflection circuit work

Although there are many variations, the basic operation of the horizontal deflection /high voltage power supplies in most TVs, and other CRT displays is very similar.

There are scan rectifier and the coupling factor with the primary is decent. But they make no use of the stored magnetic energy, they load the primary directly during the scan part. They do not cause an increase of the stored magnetic energy so a heavy load is not a problem. The flyback rectifiers (esp. the EHT) draw from the stored magnetic energy. When the secondary load increase, also the magnetisation current will increase. Ultimately this will cause saturation of the ferrite core. Excess beam current is a common cause for this and should be avoided by the beam current limiter. The advantage of a flyback rectifier is that it provides 7 times more volts per winding than a scan rectifier.



Here, V1 is just a typical example of an auxiliary supply derived from a scan rectifier and HV is the best known example of use of a flyback rectifier.

For understanding the working of the deflection circuit regard the flyback transformer as an inductor. The air gap stores energy, some of which may be tapped off during flyback by secondary rectifiers (e.g. Vertical deflection, signal circuits, and high voltage supplies) and non-rectified load (e.g., Filament supply) but these have hardly any influence on the basic working principles.



The scenario described below is only true in the steady state- the first few scans are different because the picture tube capacitance is still discharged. This represents a short-circuit at the secondary side of the flyback. It prevents proper demagnetizing, hence the core will go into saturation (unless special soft start measures have been taken, like a V1 supply that comes up slowly). Generally, a hard start of the line deflection circuit represents a very heavy load on the HOT. This will happen after a picture tube flashover or if the +B is connected suddenly (due to intermittent contact) and can mean instant death to the HOT due secondary breakdown.

## 2.2 Basic deflection circuit operation

A very simplified circuit is shown below - many components needed to create a practical design have been omitted for clarity. First concentrate only the portion of the schematic shown below to the left of the yoke components:

The current in the flyback primary and collector of the hot are not equal. The horizontal deflection yoke, damper diode, Hot collector, snubber HV capacitor(s), and flyback primary all connect to the same point. We begin our adventure at the end of the scan-retrace-when the flyback period begins:

At the end of scan, current is flowing through the flyback primary to the HOT, V432. At the start of the flyback period, V432 turns off. (This must be done in a controlled manner- not just a hard shutoff to minimize stress on the HOT-but that is another story). Since current in an inductor (the primary of the flyback has inductance) can not change instantaneously, the current is diverted into the snubber capacitor, C435, C437. The inductance of the flyback primary (T401) and C438, C436 forms a resonant circuit so that the voltage climbs on C438, C436 as the current goes down. At its peak, this voltage will be 1000V to 1500V.

C438, C436 now begins to discharge in reverse through the primary of T401 (back into the +B supply-the filter capacitor will stabilize the +B output) until its voltage (also C-E of V432) reaches 0.

If there were no damper diode (D1), this voltage would go negative and continue to oscillate as a damped sinusoid due to the resonant circuit formed by T401 and C438, C436 (and the other components). However, D1 turns on as the voltage negative and diverts the current through it clamping the voltage near 0 (-V<sub>f</sub> for the diodes).

Note that the damper diode D1 is built into the HOT V432.

Above steps have accomplished the flyback function of quickly and cleanly reversing the current in T401 (and, as we will see, the deflection yoke as well). The full flyback (and yoke current) are now flowing through the forward biased damper diode, D1.

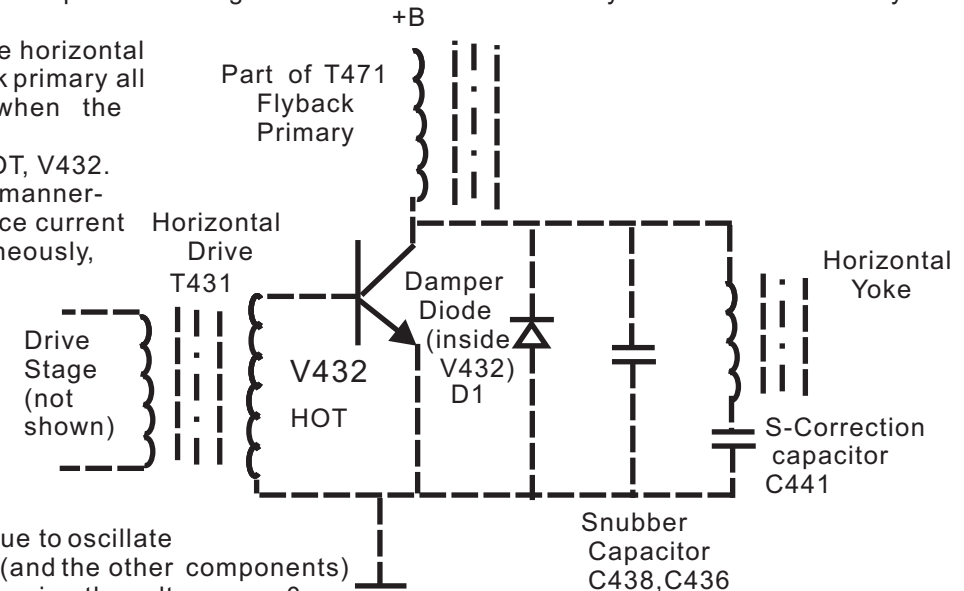
At the beginning of scan, the damper diode (forward biased) carries the bulk of the current from the yoke and flyback. The nearly constant voltage of the +B across T401 results in a linear ramp of current now through the damper diode since it is still negative and decreasing in magnitude.

At approximately mid-scan, the current passes through zero and changes polarity from minus to plus. As it does so, the damper diode cuts off and the HOT picks up the current (with a voltage drop of +V<sub>CE</sub>). Current is now flowing out of the +B supply.

The base-drive to the HOT must have been switched on before this point! Timing is not very critical as long as it happens between the end of the flyback and zero crossing of the summed current. The location of the zero crossing depends on the secondary load, notably the beam current. Larger beam current requires that the HOT be switched on earlier. The designer has to do some optimizing here...

During the second half of the scan, the HOT current ramps up approximately linearly. This is again due to the nearly constant voltage of +B across the inductance of the flyback primary.

Near the end of scan, the HOT turns off and the cycle repeats.



The HOT has a storage time between 3 $\mu$ s and 7 $\mu$ s, thus the base -drive is switched off earlier, in a controlled way to properly remove the charge carriers from the collector region in the HOT. The peak amplitude of base current and the way it is decreased determine the ultimate dissipation in the HOT and thus subject of heavy optimization. This is hampered by the fact that there is much spread in HOT parameters.

Thus, the current in the flyback (ignoring the yoke components) is a nearly perfect sawtooth. The ramp portion is quite linear due to the essentially constant +B across the flyback primary inductance. The current waveform can be easily viewed on an oscilloscope with a high frequency current probe.

The voltage across the C-E of the HOT is a half sinusoid pulse during the flyback (scan retrace) period and close to zero at all other times (-V<sub>f</sub> of the damper diode during the first half of scan; +V<sub>CE</sub> for the HOT during second half of scan).

Caution: without a proper high frequency high voltage probe, it is not possible or safe to observe this point on an oscilloscope with full +B. Excessive ringing or other corruption would indicate a problem in the flyback, yoke, or elsewhere.

## 2.3 The deflection yoke connection

So, you ask : “ Why can’ t the yoke just be placed in series or parallel with the flyback primary? ”

There are several reasons including:

- A The desired yoke current is not quite a sawtooth but includes two major corrections: S and E/W( described below). These cannot be applied easily with such a configuration .
- B The flyback also generates the HV and secondary output voltages and the primary current might then be affected by these and change as a function of beam current (picture brightness) or audio level (although feeding the audio amplifiers from LOT windings is not common anymore).

## 2.4 S-correction circuit operation

The first correction to apply, in both directions, is S-correction. By simply putting a capacitor in series with each coil, the sawtooth waveform is modified into a slightly sine-wave shape (the top and bottom are somewhat squashed). This reduces the scanning speed near the edges. Linearity over the two main axis should now be good.

When we add in the yoke components (only the horizontal deflection coil and S-correction capacitor or S-cap are actually shown above ) conditions are only slightly more complex:

First , consider what would happen if instead of the S-cap, the yoke were connected to +B like the flyback. In this case, the total current would divide between the flyback primary and the yoke . It would still be a sawtooth as described above . Of course , component values would need to be changed to provide the proper resonant circuit behavior. .

That is called ‘tuning of the flyback capacitor’ , to achieve the proper duration of the flyback pulse, matching the blanking time of the video signal, and to achieve the proper peak flyback voltage, matching the V<sub>ce</sub> specification of V432 with a reserve of about 20%. That is two conditions, requiring two degrees of design freedom . There are 3 freedoms : supply voltage, flyback capacitor and yoke inductance.

With the s-cap and yoke wired as shown as above, the inductance of the yoke and S-cap form a low pass filter such that voltage on the S-cap will be a smoothed version of the pulses on the HOT collector (similar in effect to the +B feeding the flyback but not a constant value). The average value of the S-cap voltage will be positive.

The S-capacitor together with the yoke inductance forms a resonant circuit whose frequency is tuned lower than the line frequency. It has the effect of modifying the sawtooth current into a sine-wave shape. This is called ‘S-correction’ . It reduces the scanning speed at the left and right edges of the screen.

Think of it this way : When the scan begins, the yoke current is at the maximum value in the direction to charge the S-cap. The voltage across the S-cap is causing the current to decrease but the S-cap is also gaining charge so the rate of decrease is increasing. At the time the current passes through 0, the S-cap

Is charged to its maximum. The current now reverses direction retracing its steps. The voltage on the S-cap is varying by just the right amount to compensate for the geometry error.

## 2.5 S-correction problems

A: An open s-cap will result in no horizontal deflection - a vertical line.

B: A shorted S-cap will likely load down the +B possibly resulting in a blown fuse or other power supply components.

C: An S-cap that changed value (or selected to be the wrong value) will result in distortion at the left and right sides of the screen:

- Too low: picture will be squashed towards edges.
- Too high: picture will be stretched towards edges.

Note that this is not be the same as what is commonly called linearity which would likely affect only one side or gradually change across the screen.

## 2.6 EHT (high voltage) generation

The EHT is generated from a flyback rectifier on a secondary winding of the line transformer with many many turns of very thin wire. Because the flyback pulse is so narrow, the rectifier diode will conduct only a short time. Thus the peak current in the winding will be quite high, resulting in a significant voltage drop when loaded. The internal impedance of the EHT source is in the order of 1 Mohm, so with a load e.g. 1 mA the EHT will drop 1000V = 3%. Usually the EHT voltage is far from stable, 10% drop is quite normal.

If the EHT voltage drops, then the electrons will be accelerated less and will move through the deflection field at a lower velocity. As a result they will be easier to deflect by the magnetic field, and the picture size will grow. Without special measures, brighter pictures will be larger. The measure is to feed some EHT information or beam current information to the deflection circuits, reducing the deflection current amplitude a bit for bright pictures. For horizontal deflection this is done by the E/W modulator. This is called anti-breathing.

Sets with raster correction free picture tubes do not have an E/W modulator. There the correction may be done by means of a power resistor in series with +B supply. A large beam current causes more power consumption, this lowers the +B supply voltage and thus reduces the line deflection current. That also reduces the EHT even further, but the deflection current has a stronger effect on the picture width than the EHT. Better methods exist too.

The EHT information is also used to protect the flyback transformer from overload. As the load increases, the average primary current rises. Ultimately it may reach a level where the transformer core may go into saturation. This causes large peak currents in the HOT which might lead to destruction. To prevent this, some EHT information is fed to the contrast controller, to automatically reduce the picture brightness whenever the white content is too much. This is called the average beam current limiter.

A failure in the video path, like a video output amplifier stuck at 0V, causes a high beam current that will not react to the contrast controller. In that case the beam current will not work and the set should switch off automatically, usually within a few seconds after applying power. When the cathodes heat up, you will see an even picture with diagonal retrace lines and then it will switch off.

Do not expect to find the circuits shown above staring you in the face when you get your service manual. There are a semi-infinite number of variations on this basic theme. Some of them will, to put it mildly, appear quite obscure (or to put it more positively, creative) at first.

You may see all sorts of additional passive components as well as transformers for generating additional voltages not provided by the flyback. There may be diodes in places you would think would be impossible. Therefore, to really understand even approximately how each design works may require some head scratching but the basic operation of them all seems to be very similar.

## 2.7 Horizontal Output Transistors

Most deflection processors generate a base-drive pulse with a constant duty-cycle. This means that also the switch -on moment of the HOT will vary with the load. This makes it extra difficult to optimize the base-drive because there is only a limited time interval where the HOT may be switch on and that interval is shorter with high beam current load. On-time is typically between 50% and 55%, depending on the IC.

A more important rational is that a transformer is nice easy way of impedance matching the horizontal driver circuit to the few ohm input impedance of the horizontal output transistor base which requires upwards of several amps for proper drive. A typical driver transformer may be in the 5-10:1 turns ratio representing 25-100:1 impedance ratio.

Usually, the primary voltage is \* constant\* when the driver transistor is ON and thus the HOT is OFF. Then when the driver switches OFF, the stored magnetic energy switches the HOT to ON. This is called non-simultaneous base drive, which is most common. The primary voltage that you see then is mostly a transformed version of the secondary voltage, over the series base impedance. The voltage at HOT=ON is not forced from the primary side.

Horizontal output transistor specs and substitution:

Every line transistor has its own requirements for:

- \* Amount of base drive current, especially the  $I_b$  at end-of-scan.
- \* Waveform of base drive current (rising, steady, falling)
- \* Speed of reduction base drive current at switch-off.

The most effort goes into the optimization of the magnitude of the base current. The problem is : gain spread. There used to be other spread factors influencing the dynamic transistor parameters but these have been mostly eliminated by better process control at P.S. . You have to find \*one\* optimum drive so that neither the high-gain nor the low-gain type will dissipate too much.

With horizontal output transistor, it is \*not\* true that 'bigger is better' . If you substitute a heavier transistor (more amps, more volts, more watts, faster switching, whatever ) for a lighter one, then there is a very big chance that it will fail earlier, not later. The reason is that the drive conditions will now be wrong( most likely underdrive) and the transistor will overheat from too high conduction losses . So do yourselves a favour and get a correct replacement type.

# SUSOC™ (LA76931) Application Note Ver.e1.0 (2003.11.11)

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## The BUS Control Functions of LA76931 (Tentative)

Register Name	Bits	General Description
T Disable	1 bits	Disable the Test SW & enable Audio / Video Mute SW

This is a Test Mode Switch, which is used in IC production (in case of using IC tester for measuring).

\*If the bit of BUS is set as '0', it becomes Test Mode. Then the test functions below will take active.

- Vertical Test
- Drive Test
- Contrast Test

Also, audio / video is muted forcibly.

\*Usually, this bit is set as '1' when the television is operating normally.

AFC Gain & gate	1	Select horizontal first loop gain & H-sync gating on/off
-----------------	---	--

This function is used for keeping the stability of H sync. signal when there is no input signal or when a special VCR signal (VCR AGC Micro-vision) is input.

### **0 = Automatic mode**

There is a gate signal for 1<sup>st</sup> AFC gain control and sync signal to protect them from variety special signals and guarantee the stability of horizontal output in all our products before. The level of the gain control can only be set as HIGH, MIDDLE & LOW.

When "no input signal" (conditions are: no V sync and 'H LOCK' is unlocked) is detected, "LOW" mode will be set to keep the horizontal deflection stable so that the H & V position of OSD will not be interrupted.

In addition, the improved operation of gain control and gating control in this IC contribute to stabilize horizontal output of VCR signal in automatic mode.

### **1 = Enforce High Gain Mode (Gain = High, Gate = Non gate)**

This mode is prior to pull-in operation, that's why the stability is comparative weak. This mode is used when tuning or some unexpected conditions.

H Freq.	6	Align ES Sample horizontal frequency (MP is adjusted in the wafer line.)
---------	---	---

Adjustment has done for mass production products. Although it's no need any adjustment at TV production line, set the register as "111111". (But it needs adjustment at engineering sample stage).

V TRANCE	1	Enable data transmission between vertical retrace period
----------	---	--

0 = random transmission

1 = transmission between vertical retrace period

V Reset Timing	1	Select Vertical Reset Timing
----------------	---	------------------------------

Select Vertical output start timing.

0 = Normal

1 = 0.25H shifted

Audio Mute	1	Disable audio outputs
------------	---	-----------------------

Mute the audio output.

0 = Mute OFF

1 = Mute ON

Video Mute	1	Disable video outputs
------------	---	-----------------------

Mute the RGB output.(The blanking output level of RGB is about 1.6Vdc)

0 = Mute OFF

1 = Mute ON

H PHASE	5	Align sync to flyback phase
---------	---	-----------------------------

Adjust the center of H.

Sync Kill	1	Force free-run mode
-----------	---	---------------------

Whatever there is a synchronization signal or not, the frequency of horizontal oscillator is in free-run situation.

Set this function in active if “no signal” is detected by CPU, then the rolling of OSD can almost be reduced.

0 = TV operating mode

1 = Sync Kill mode

Vertical Size	7	Align vertical amplitude
---------------	---	--------------------------

Adjust the size of V.

V-sync Separation Up	1	Select vertical sync. separation sensitivity
----------------------	---	--

Improved the sensitivity of the vertical separation circuit.

0 = Normal mode

1 = Sensitivity up mode



Vertical Kill	1	Disable vertical output
---------------	---	-------------------------

Defeat the vertical output. Please use this function when adjust RGB Bias.。

0 = TV operation mode

1 = Defeat the vertical output

V Shift ( V POSI )	4	Align vertical Position
--------------------	---	-------------------------

Adjust the position of V

V LIN ( Vertical Linearity )	5	Align vertical linearity
---------------------------------	---	--------------------------

Compensation for vertical linearity

Vertical S-Correction	5	Align vertical S-correction
-----------------------	---	-----------------------------

Compensation for vertical S characteristic.

H BLK L	3	Left H-Blanking Control
---------	---	-------------------------

The blanking of the left side of screen can be adjusted

\*The design of FBP input circuit become simple because of the blanking of screen can be adjusted independently).

H BLK R	3	Right H-Blanking Control
---------	---	--------------------------

The blanking of the right side of screen can be adjusted

\*The design of FBP input circuit become simple because of the blanking of screen can be adjusted independently).

V.TEST	2	Select vertical DAC test mode
--------	---	-------------------------------

Vertical test mode

01 ~ 11 = Test mode

00 = Normal mode

V.COMP	3	Align vertical size compensation
--------	---	----------------------------------

Compensate vertical size due to the variation of contrast.

Count Down Mode	3	Select vertical countdown mode
-----------------	---	--------------------------------

This function is used to switch 50Hz/60Hz mode and standard/non-standard mode of countdown circuit.

\* Switch for standard/non-standard mode

0\*\* : Automatic discriminate standard/non-standard mode

1\*\* : Non-standard mode

### Standard mode:

Using the dividing pulse of V countdown to reset the countdown circuit. A stable synchronization signal can be achieved because it is not interfered by the external vertical trigger. It becomes standard mode if it is synchronize with the standard signal(262.5H or 312.5H).

### Non-standard mode:

Using external vertical trigger to reset countdown circuit. In this case, the stability of the sync signal is depended on external signal. This mode is used when the sync signal cannot achieved or the frequency of sync signal is not 262.5H or 312.5H.

\*Switch for 50/60 mode

00 : Automatic discriminate 50Hz/60Hz mode

01 : 50Hz mode

10 : 60Hz mode

11 : 50/60Hz automatic discriminate mode

60Hz mode : Vertical trigger is accepted during 225H ~ 297H

50Hz mode : Vertical trigger is accepted during 288H ~ 357H

50Hz/60Hz automatic discriminate mode : 50Hz/60Hz mode is selected automatically.

VN Sync	1	Enable IC Test Mode
---------	---	---------------------

This is only for IC test. Don't Set this "1".

Red Bias	8	Align Red OUT DC level
Green Bias	8	Align Green OUT DC level
Blue Bias	8	Align Blue OUT DC level

Adjust the DC (cutoff) level of RGB.

Red Drive	7	Align Red OUT AC level
Green Drive	4	Align Green OUT AC level
Blue Drive	7	Align Blue OUT AC level

Adjust the output gain of RGB.

RGB Test4	1	Enable RGB test mode
-----------	---	----------------------

RGB control test mode

1 = Test mode.

0 = Nomal mode

Drive Test mode	1	Enable Drive test mode
-----------------	---	------------------------

Drive control test mode

1 = Test mode.

0 = Nomal mode

Half Tone	2	Adjust half tone level
-----------	---	------------------------

Adjust the half tone level

Half Tone Defeat	1	Half tone ON/OFF SW
------------------	---	---------------------

0 = Half tone ON

1 = Half tone OFF

A2.SW	1	West germany stereo mode
-------	---	--------------------------

West germany stereo mode select

0 = Nomal mode

1 = W-G stereo mode.(need SIF system set=1)

Blank Defeat	1	Disable RGB output blanking
--------------	---	-----------------------------

Switch ON/OFF the H/V blanking of RGB output.

0 = blanking ON (Normally mode)

1 = blanking off

A.MONI.SW	1	Select pin 5 output SAO at External audio input.
-----------	---	--

Select pin 5 output.

0 = Normal mode (de-empasis FM-Detector).

1 = SAO mode at External audio input mode.

This function works with set "Audio SW" to "1".

This funktion doesn't work(pin 5 is always FM out) with set "Audio SW" to "0".

S.TRAP.SW	1	Select sound trap ON/OFF.
-----------	---	---------------------------

Select sound trap ON/OFF.

0 = Sound trap OFF mode.(need external trap)

1 = Nomal mode.(Sound trap ON)

Sub Bias (sub-bright)	7	Align common RGB DC level
-----------------------	---	---------------------------

Sub-adjust the DC level of RGB output.

Even the setting of the RGB drive are different, the variation of the DC level of RGB output can be adjusted to be same by this function.

Brightness Control	7	Customer brightness control
--------------------	---	-----------------------------

Control brightness.

Contrast Control	7	Customer contrast control
------------------	---	---------------------------

Control contrast

Ext RGB Cnt Test	1	Enable IC Test Mode
------------------	---	---------------------

This is only for IC Test. Always set this "0".

Ext RGB Contrast	4	Align Ext. RGB amplitude
------------------	---	--------------------------

Control contrast when input from Ext RGB IN.

OSD Cnt.Test	1	OSD contrast control DAC test mode
--------------	---	------------------------------------

0 = normal mode.

1 = OSD contrast test mode.

OSD Contrast Control	7	Align OSD AC level
----------------------	---	--------------------

Adjust the gain of OSD signal.

Coring Gain Select	2	Select Coring Gain
--------------------	---	--------------------

Select Coring Gain.

00 = Coring OFF

01 = Coring Gain1(minimum)

11 = Coring Gain2(maximum)

Sharpness Control	6	Customer sharpness control
-------------------	---	----------------------------

Control sharpness

Tint Test	1	Enable tint DAC test mode
-----------	---	---------------------------

Tint control Test mode.

1 = Test mode

0 = Nomal mode

Tint Control	7	Customer tint control
--------------	---	-----------------------

Control tint

Color Test	1	Enable color DAC test mode
------------	---	----------------------------

Color control Test mode.

1 = Test mode

0 = Normal mode

Color Control	7	Customer color control
---------------	---	------------------------

Control color

Video SW	1	Video signal selector
----------	---	-----------------------

The switch of Int./Ext. video input

0 = Internal

1 = External

S Trap Test	3	Sound trap control for testing
-------------	---	--------------------------------

Sound trap control.

Filter System	3	Select Y/C Filter mode
---------------	---	------------------------

Select the trap frequency and the peaking frequency of color trap filter of Y.

- 3.58MHz Trap Mode / peaking at 2.2MHz
- 4.43MHz Trap Mode / peaking at 2.7MHz
- 6MHz Trap (High band mode) / peaking at 3.0MHz
- 4.286MHz Trap Mode / peaking at 2.3 MHz

	Y Block	Chroma Block
0	3.58MHz Trap	3.58MHz unsymmetrical
1	3.58MHz Trap	3.58MHz symmetrical
2	4.43MHz Trap	4.43MHz unsymmetrical
3	4.43MHz Trap	4.43MHz symmetrical
4	6MHz Trap	3.58MHz unsymmetrical
5	6MHz Trap	3.58MHz symmetrical
6	6MHz Trap	4.43MHz unsymmetrical
7	6MHz Trap	4.43MHz symmetrical
8 ~ 15	4.286MHz Trap	4.43MHz symmetrical

The switch of chroma band-pass filter.

Unsymmetrical Mode

Symmetrical Mode

Gray Mode	1	Service Test Mode (White/Gray)
-----------	---	--------------------------------

Switch to white level when Cross B/W is set as '10' or '11'.

0 = White(70%)

1 = Gray (15%)

C.Trap Test	3	Chroma Trap Control for Testing
-------------	---	---------------------------------

C.BPF Test	2	Chroma BPF Control for Testing
------------	---	--------------------------------

Cross B/W	2	Service Test Mode ( normal/Cross/Black/White)
-----------	---	---

It is possible to generate crosshatch, white level, black level pattern.

00 = TV operating mode

01 = Black pattern

10 = White pattern

11 = Crosshatch pattern

- Set the Cross B/W function as “black pattern” and input a chroma signal, then a differential RGB output can be achieved. (Switch on the BLK Defeat SW, the blanking pulse can also be defeated.)
- Set the Cross B/W function as “black pattern” and minimize color level, then the DC level of RGB can be used for adjusting the cutoff of CRT.

CbCr IN	1	Select YcbCr Input.
---------	---	---------------------

Select Video Input or YcbCr Input.

0 = Video

1 = CbCr

PAL APC SW	1	Enable PAL APC system
------------	---	-----------------------

This is only for test mode. Always set “0”.

G-Y Angle	4	Select G-Y angle
-----------	---	------------------

Select the demodulation angle of G-Y.

0 = 240 deg.

1 = 253 deg.

G-Y Amp	4	Select G-Y amp
---------	---	----------------

Adjust the G-Y amplitude.

Color Killer Operational Point Select	3	Select color killer operational level
---------------------------------------	---	---------------------------------------

Color killer operational point can be selected depend on the input signal (etc. RF input or Y/C input).

000 = -30dB

111 = -40dB

VBLK SW	1	V blanking control SW
---------	---	-----------------------

The SW of V blanking.

0(nomal mode) = video signal period 24H ~ 262H(NTSC) 25H~309H(PAL)

1(wide mode) = video signal period 29H ~ 257H(NTSC) 30H~304H(PAL)

FBP Blanking OR SW	1	Select Horizontal blanking operation
--------------------	---	--------------------------------------

The “OR” of the H blanking (produced inside IC) and external input FBP signal

0 = Horizontal blanking is created by the internal logic.

1 = Horizontal blanking is the “OR” of the FBP & internal logic.

SVO or fsc Output	1	Select 52pin output.
-------------------	---	----------------------

Select 52pin output. It need pull-up or pull-down resistor.

0 = Selected Video Out

1 = fsc

Y APF Select	1	Select Chroma Trap ON/OFF.
--------------	---	----------------------------

Use YcbCr input mode and YC input mode.

0 = Chroma Trap ON

1 = All Pass Filter mode(Chroma Trap OFF):YcbCr mode and YC mode.

Pre-shoot adjustment	2	Select pre-shoot width
----------------------	---	------------------------

This function can adjust the pre-shoot component of the Y signal.

00 = Narrow

11 = Wide

Over-shoot adjustment	2	Select Pre/Over-shoot adjustment.
-----------------------	---	-----------------------------------

This function can adjust the Over –shoot component of the Y signal.

00 = Narrow

11 = Wide

White Peak Limiter Opelating Point	2	Select White Peak Limiter level.(with Defeat)
------------------------------------	---	---

When there is a bright spot signal in a low APL picture, ABL/ ACL does not operate and this will cause blooming problem. To avoid this, when APL is low, white peak limiter will operate to cut the abnormal bright

signal.

00 = WPL OFF

01 = WPL ON(High operating point)

11 = WPL ON(Low operating point)

Y Gamma start point Select	2	Select Y Gamma start point.(with Defeat)
-------------------------------	---	--

00 = Y Gamma OFF

01 = Y Gamma ON(High operating point)

11 = Y Gamma ON(Low operating point)

DC Restoration Select	2	Select luma DC restoration
-----------------------	---	----------------------------

When the Black Stretch function is used during Y signal processing, the pedestal level will shift according to the APL of signal. Therefore, to avoid this problem, DC renewal rate can be selected in this IC.

00 = 100%

01 = 107%

10 = 113%

11 = 129%

Black Stretch Start Point Select(w/Defeat)	2	Select Black Stretch Start Point(w/Defeat).
---	---	---

Select Black Stretch Start Point(with Defeat).

11 = Black Stretch OFF

00 = Black Stretch ON(40IRE)

10 = Black Stretch ON(60IRE)

Black Stretch Gain Select	2	Select black stretch gain
------------------------------	---	---------------------------

00 = MIN.

10 = MAX



Auto-Flesh	1	Enable auto-flesh function
------------	---	----------------------------

Switch ON / OFF the automatic flesh function.

0 = OFF

1 = ON

The characteristic of Automatic Flesh ( exclusive use for NTSC )

At the center point of tint, the axis of Flesh is 118 degree, and the maximum compensation is about 10 degree (7 ~ 20deg).

(Set this function off in PAL system.)

C Ext.	1	Selected-C In SW on
--------	---	---------------------

0 = select the chroma signal of internal composite video signal.

1 = select the chroma signal that input from pin 56.

C Bypass	1	Select chroma BPF bypass
----------	---	--------------------------

Bypass switch of chroma band-pass filter.

0 = bypass OFF

1 = bypass ON

C Kill On	1	C Kill Mode ( 0: Enable Killer circuit )
-----------	---	--

Even when the color control is minimized, but maybe there is still has little color left in the picture. In this case, we can set Col\_Kill as '1' together with the minimum color setting to get rid of the residual color.

0 = Automatic Mode (Normally using this mode when TV in operation)

1 = Enforce killer ON when color control is minimized.

C Kill Off	1	Disable Killer circuit ( for IC Test )
------------	---	--

This mode is used when using IC tester for measurement.

1 = Test mode, in this case, killer circuit is not in operation.

0 = TV operating mode

Color System	3	Select Color System
--------------	---	---------------------

The color system can be set to automatic mode (000/001) or manual mode (010 ~ 111) by CPU.

Setting of BUS bit:

000 = Automatic mode 1 PAL/NTSC/4.43NTSC

001 = Automatic mode 2 PAL-M/PAL-N/NTSC

010 = PAL

011 = PAL-M

100 = PAL-N

101 = NTSC

110 = 4.43NTSC

111 = Not Available

Cont Test	1	Enable contrast DAC test mode
-----------	---	-------------------------------

Contrast control Test mode.

1 = Test mode

0 = Nomal mode

Digital OSD	1	Select Digital OSD mode/Analogue OSD mode
-------------	---	---

0 = Analogue OSD mode(Clamp circuit ON).

1 = Digital OSD mode(Clamp circuit OFF)

Bright ABL Defeat	1	Disable brightness ABL
Bright ABL Threshold	3	Align brightness ABL threshold
Bright Mid Stop Defeat	1	Disable brightness mid stop

In order to make the design of TV chassis more easier, ABL(Auto Beam Limiter)function can be controlled by BUS.

Bright ABL Defeat : The defeat SW of Brightness ABL

0 = ABL Defeat OFF

1 = ABL Defeat ON

Bright ABL Threshold: Adjust the start operating point of Brightness ABL

Bright Mid Stop Defeat: The defeat switch for the limit operation of brightness ABL by brightness control

0 = Enable limit operation

1 = Disable limit operation

RGB Temp. SW	1	Select the temperature characteristics for RGB DC output.
--------------	---	---

0 = -1VBE.

1 = Flat

R/B Gain Balance	4	R-Y/B-Y Gain Balance
------------------	---	----------------------

Adjust the demodulation ratio of R-Y and B-Y.

R/B Angle	4	R-Y/B-Y Angle
-----------	---	---------------

Adjust the demodulation angle of R-Y and B-Y.

B-Y DC Level	4	B-Y DC Level ( White-Balance )
R-Y DC Level	4	R-Y DC Level ( White-Balance )

\*Fine adjust the offset of the DC level (white balance) when switch PAL/SECAM system. SECAM decoder is using external IC.

Audio SW	1	
----------	---	--

The switch of Int./Ext. audio input.

0 = Internal

1 = External

Volume	7	Customer volume control
--------	---	-------------------------

Sound volume control (attenuation mode)

Maximum gain = 0dB, step = 0.5dB

OVER.MOD.SW	1	Select over modulation function
-------------	---	---------------------------------

Drive control over modulation measure circuit

1 = Over modulation measure circuit ON

0 = Nomal mode

Since Pull-in time be taken if it is "1". Perform a channel search by 0

VOL.FIL	1	Disable volume DAC filter
---------	---	---------------------------

In order to get rid of the "POP" noise which is caused by the DAC of volume control, volume filter is built-in into the IC.

This filter is set 'OFF' when IC tester is used for measuring.

0 = TV operating mode

1 = Filter OFF

FM Mute	1	Disable FM output
---------	---	-------------------

0 = Enable FM output

1 = Disable FM output

RF AGC Delay	6	Align RF AGC threshold
--------------	---	------------------------

Adjust RF AGC Delay point

De-emphasis TC	1	Select De-emphasis Time Constant
----------------	---	----------------------------------

Switch of De-emphasis time constant

0 = 50uS

1 = 75uS

VIF System SW	2	Select 38.0/38.9/39.5/45.75
---------------	---	-----------------------------

IF frequency switch

00 = 38.0MHz      01 = 38.9MHz  
10 = 39.5MHz      11 = 45.75MHz

SIF System SW	2	Select 4.5/5.5/6.0/6.5 MHz
---------------	---	----------------------------

SIF frequency switch

00 = 4.5MHz      01 = 5.5MHz  
10 = 6.0MHz      11 = 6.5MHz

FM Gain	1	Select FM Output Level
---------	---	------------------------

Switch of FM detection output

0 = 500mVrms @  $\pm 50$ KHz.deviation  
1 = 900mVrms @  $\pm 25$ KHz.deviation

IF AGC Defeat	1	Disable IF and RF AGC
---------------	---	-----------------------

Usually, the IF block of the television is not in operation when the input signal is VTR signal. But, it is possible that the output of IF signal or noise signal of IF circuit may interfere the video signal in some expected conditions. In this case, we can minimize the gain of IF AGC to solve this problem.

0 = Normal mode  
1 = Minimize the gain of VIF amplifier.

Video Level	3	Align IF video level
-------------	---	----------------------

The video detection output is adjusted to 2Vpp.

The accuracy of video signal is  $2V_{pp} \pm 0.1V_{pp}$  after adjustment.

FM Level	5	Align WBA output level
----------	---	------------------------

The output of FM is adjusted to 500mVrms. The accuracy of FM output after adjustment is  $500mVrms \pm 10$  mV.

C/VCO Adjustment	3	Control free Run frequency of chroma VCO(wihout 4.43MHz mode ).
------------------	---	---

Control free run frequency of chroma VCO that use NTSC/PAL-M/PAL-N.

000 =-120kHz

001 =-90kHz

010 =60kHz

011 =-30kHz

100 = 0kHz

101 = 30kHz

110 = 60kHz

111 = 90kHz

Tint Through	1	Set tint control center value.
--------------	---	--------------------------------

Tint control set center value.

0 = Nomal mode.

1 = Tint control set center value.(Can't control tint.)

Hlock.Vdet	1	Select Vertical sync system.
------------	---	------------------------------

Select vertical sync system.

0 = Normal mode.(Vsync system always working.)

1 = LA76810 system.(If H-Lock not detect, then stop vertical sync separation.)

VIDEO.LEVEL.OFFSET	2	Control IF video output amplitude.
--------------------	---	------------------------------------

Control video output amplitude. When the video output amplitude more change, use this control. But normally set bit=01.

00 = minimum.

01 = recommend amplitude.

11 = maximum.

IF TEST1	1	IF Test mode.
----------	---	---------------

IF Test mode.

0 = Nomal mode

1 = Test mode.

OVER.MOD.LEVEL	4	Adjust over modulation operating point.
----------------	---	---

Adjust over modulation operating points.

AKB Defeat	1	Disable AKB System operation
------------	---	------------------------------

0 = Enable AKB

1 = Disable AKB

AKB Test	1	Enable IC Test Mode
----------	---	---------------------

0 = Nomal mode

1 = Test mode.

AKB Ref.Control	4	Select AKB ref. Pulse amplitude
-----------------	---	---------------------------------

SPL Test	1	Enable IC Test Mode
----------	---	---------------------

0 = Nomal mode

1 = Test mode.

Y TH	2	Select Y signal sensitivity for blue strech function
------	---	--

Y Gain	2	Select blue streching gain
--------	---	----------------------------

R Width	2	Select correction range for blue streching gain
---------	---	---

R Offset	2	Select correction range for blue streching gain
----------	---	---

B Width	2	Select correction range for blue streching gain
---------	---	---

B Offset	2	Select correction range for blue streching gain
----------	---	---

VCO Freq	6	Align ES Sample IF VCO Frequency. (MP is adjusted in the wafer line)
----------	---	---

Adjustment has done for mass production products. Although it's no need any adjustment at TV production line, set the register as "011111". (But it needs adjustment at engineering sample stage).

## Statue Register of LA76931

Register Name	Bits	General Description
H Lock	1	H LOCK Detection
Killer	1	Color Killer operation output
Color System	3	000: B/W 001: PAL 010: PAL-M 011: PAL-N 100: NTSC 101: 4.43NTSC 110: Do not care 111: Do not care

Output the color system of IC which is operating.

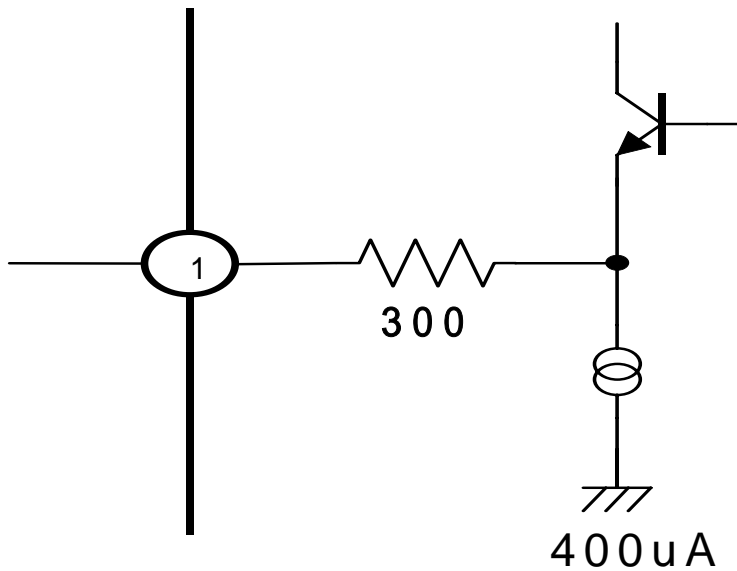
If CPU set the Color System as Auto Mode, there is an output to indicate the color system which is operating in the IC. The output will be '000' if any mistake taken.

If CPU set the Color System as Manual Mode, specified mode is output. If selection cannot be made, output '000'.

X Ray	1	X Ray Protection Detection
POR	1	Power On Reset
RF AGC	1	Detect the output voltage of RF AGC, then compare it with the reference voltage and output the information: 'High' or 'Low'
IF.LOCK	1	Output the information (locked / unlocked) of PLL
V TRI	1	Detect vertical sync signal
50/60	1	Detect 50/60Hz mode
ST/NONST	1	Discriminate Standard / Enforced Non-Standard mode

### **PIN 1 (SIF OUTPUT)**

This is a SIF output pin. The output of this pin is used when a NICAM IC is used. The output of this pin is a follow-emitter, so its output impedance is about  $350\Omega$ . And the DC output of this pin is about 2.8V. If a signal, whose P/S is 25dB, is input into IC, a 100dBu Snd will be outputted.



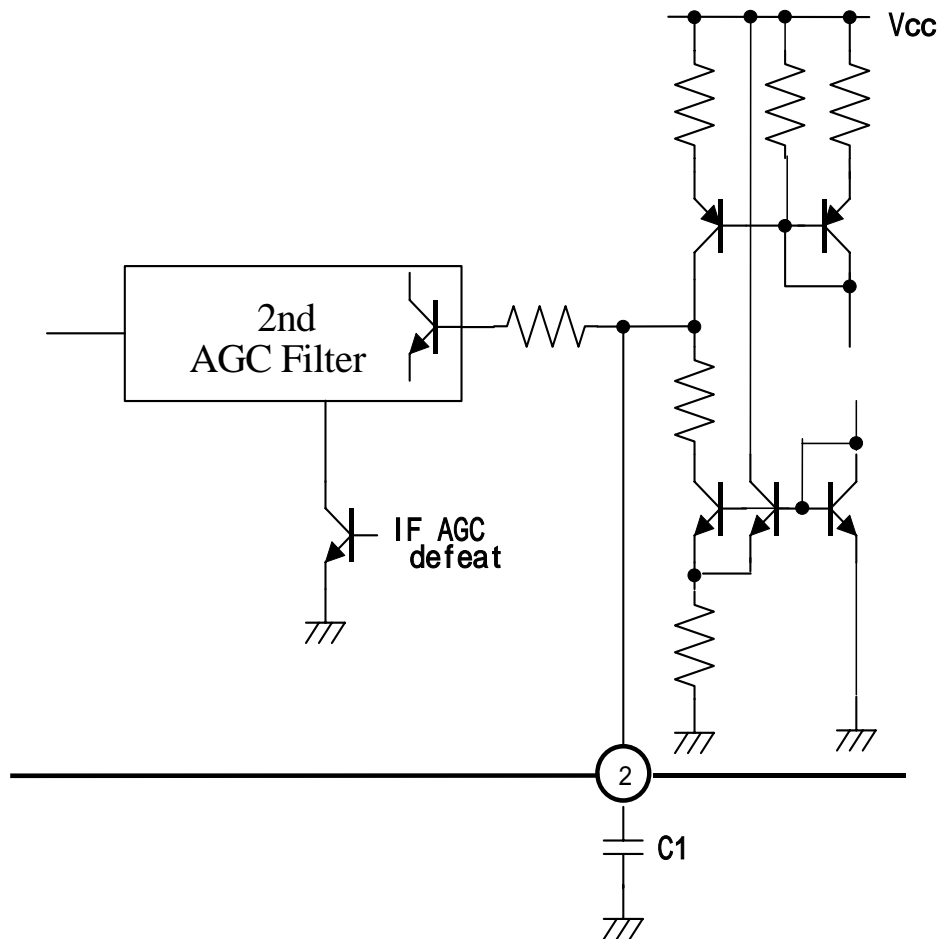
The circumference circuit of pin 1



## PIN 2 (IF AGC Filter)

This is 1<sup>st</sup> AGC filter pin. The signal, which is peak detected by the AGC detector, is smoothed by the external capacitor and become to AGC voltage. The 2<sup>nd</sup> AGC filter is also built-in into IC. The value of C1 is depending on the speed of AGC, sag etc, and the recommend value is about 0.022uF.

If the BUS of IF AGC is set as '1', the gain of PIF is set minimally.

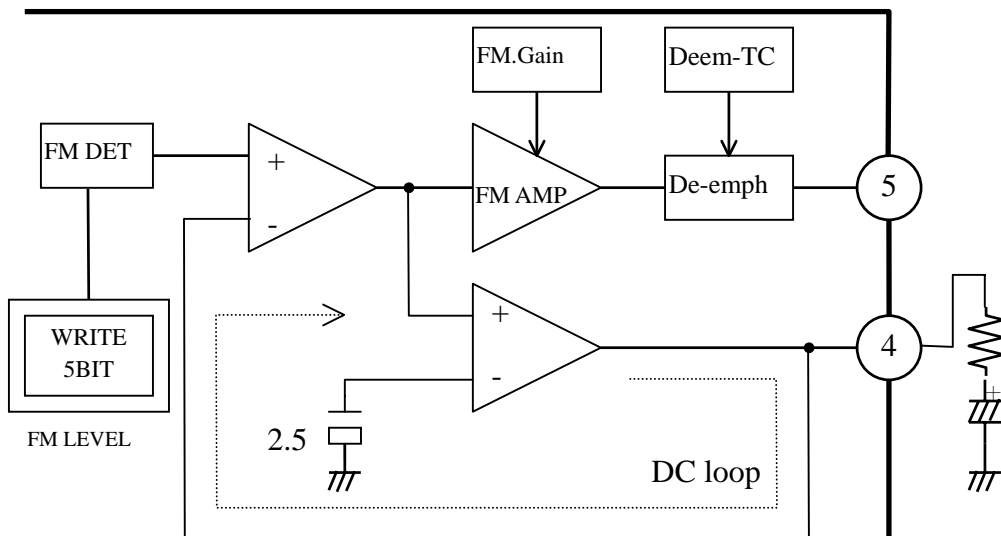


The circumference circuit of pin 2

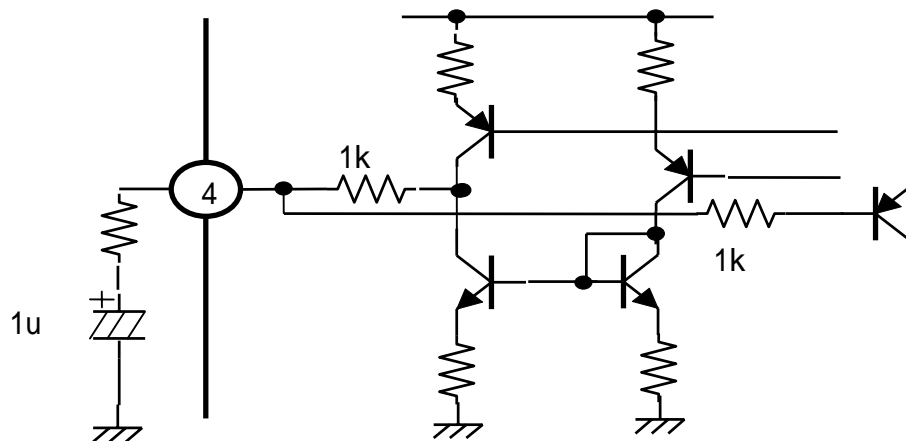


## PIN 4 (FM FILTER)

This is the filter pin for the DC loop of FM detector.



Using PLL FM detection will cause DC shift during detecting SIF from 4.5MHz to 6.5MHz. But, this IC detects SIF signal from 4.5MHz to 6.5MHz at good linearity range. Then it will pass through a amplifier after the DC output is fixed. In order to keep the DC output constantly, feedback loop of the operating amplifier is built-in into the IC. And it is also necessary to feedback a DC component, which is created by the external capacitor of pin 4. The recommend value of this capacitor is 1uF. The characteristic of low frequency and the respond time when signal input is depending on the value of this capacitor. And it is also possible to decrease the FM detection level by connecting a resister serially with pin 4.



The circumference circuit of pin 4

Pin 5 (FM Output)

This is an output pin for FM detector. The output circuit is a voltage follower. The DC voltage is about 2.5V and the dynamic range is 3.5V.

The setting of BUS is depending on the frequency of SIF:

SIF frequency	BUS setting
4.5MHz	'00'
5.5MHz	'01'
6.0MHz	'10'
6.5MHz	'11'

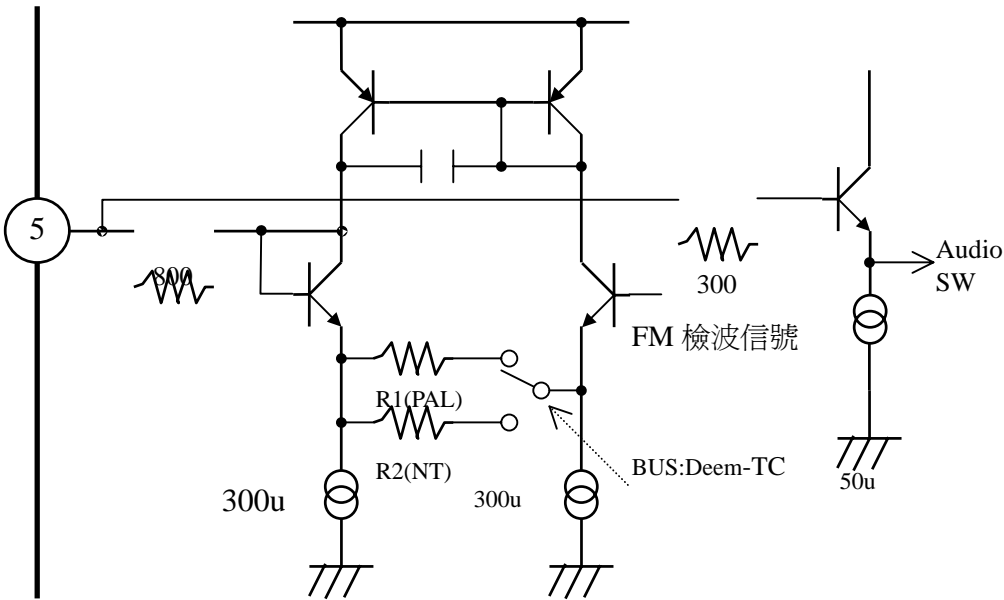
The output level is variable which is controlled by BUS:

BUS setting for FM Gain	Output level
'0'	500mVrms (±50KHz)
'1'	500mVrms (±25KHz)

The output impedance is variable which is controlled by BUS:

BUS setting for Deem-TC	Output Impedance
'0'	5.0KΩ
'1'	7.5KΩ

The time constant of the de-emphasis is determined by the value of external capacity (0.01uF). There is no necessary to connect an external capacity if a stereo IC is used. But, the output impedance is very high. This pin is also used to be an internal pin for audio SW.

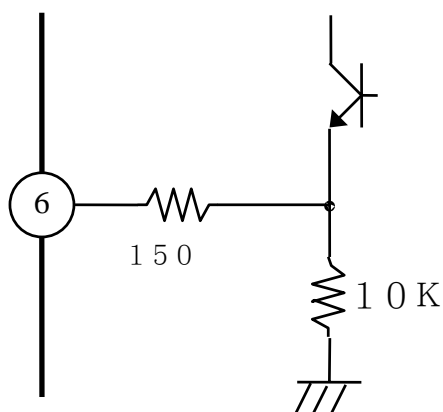


The circumference circuit of pin 5

### **PIN 6 (Audio Output)**

This is an audio output pin. The output impedance is about  $300\Omega$  and the DC output is about 2.5V. The dynamic range of it is 3.5Vpp.

There is an attenuator between input (int.: pin 5; ext.: pin 9) and output, whose maximum gain is 0dB and DAC step is 0.5dB. Also, a LPF ( $f_c = 30\text{Hz}$ ) is built-in between D/A circuit and volume circuit to solve the 'POP' noise problem which is caused by the volume control.



Circumference circuit of pin 6

### **PIN 7 (SND APC FILTER)**

This is a SND APC FILTER pin. The phase of the signals, which are divided from chroma frequency and Snd-VCO frequency, will be compared together. Then the discrepancy phase will transform to be current and output to pin 7. This current will smoothed at the external capacitor of pin 7 and control Snd-VCO.

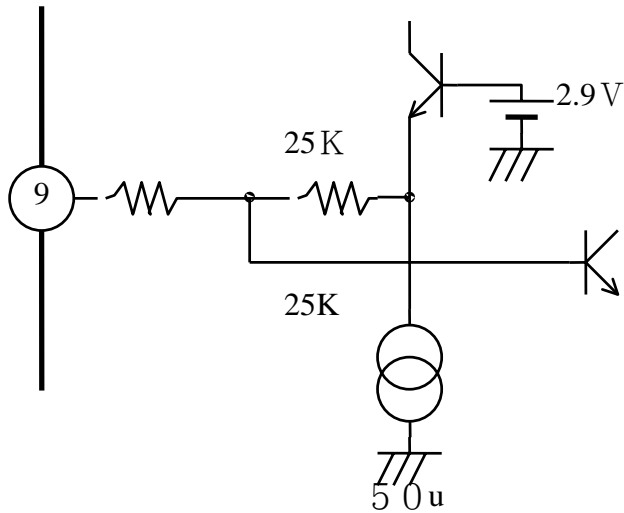
BUS: The dividing ratio of Snd-VCO, which is depending on the SIF system, is variable. The oscillator frequency of Snd-VCO is locked at the frequency which is 500k apart from SIF frequency.

### **PIN 8 (IF Vcc)**

This is DC voltage supply pin for IF circuit. Please add a 5.0Vdc to it.

## PIN 9 (EXT AUDIO INPUT)

This is an external audio signal input. The input impedance is about 50k and the DC voltage is biased at about 2.9V. There is necessary to use a coupling capacitor to combine with it.



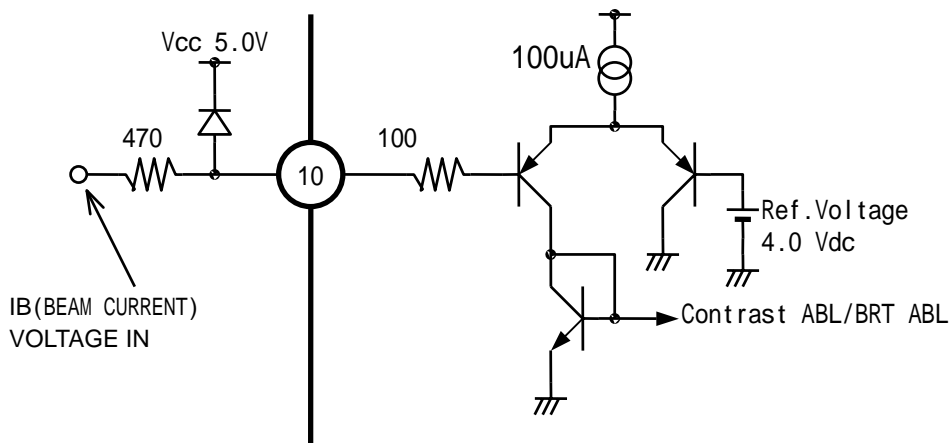
The circumference circuit of pin 9

## PIN 10(ABL)

\* ABL (Auto Beam Limiter) Function

This is a ABL / ACL input pin. Please transform beam current into voltage.

\* Please refer data-sheet about the characteristics in detail.



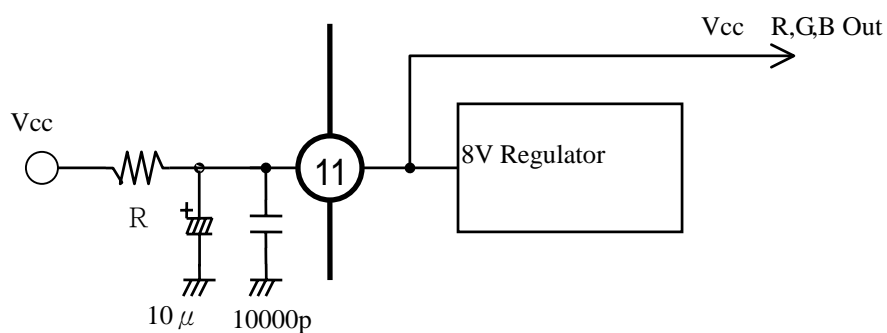
### **PIN 11(RGB Vcc)**

This is a Vcc input pin of RGB output block. A 8.0V regulator is built-in in the IC and please supply a current of 18mA to it.

A resistor is needed to connect with this pin from Vcc. The value of the resistor is decide as below:

$$R[\Omega] = (V_{cc} - 8.0)/18m$$

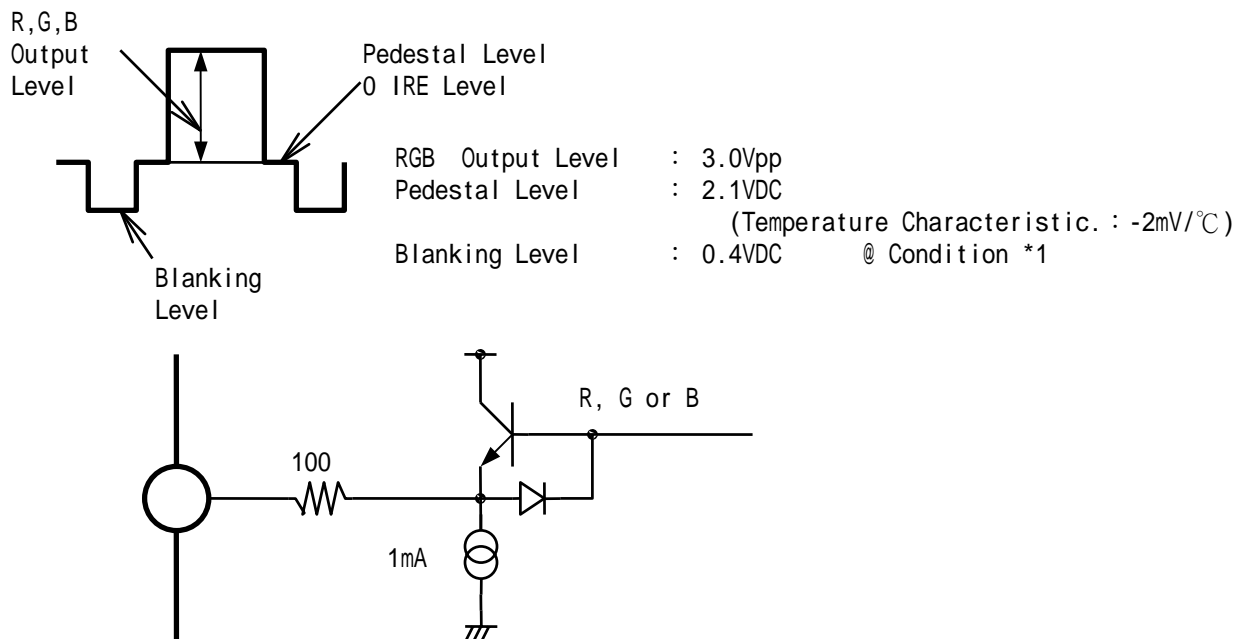
For example:  $V_{cc} = 9.0V$ , then a  $8.2\Omega$  resistor is necessary.



## PIN 12, PIN 13, PIN 14(R, G, B OUTPUT)

This is a R, G, B signal output pin. ( 12 PIN : R OUT, 13 PIN : G OUT, 14 PIN : B OUT )

Output Signal



Condition \*1 :

- Contrast Control (7 bit) : Max
- Brightness Control (7 bit) : Mid ( 100000 )
- Sub-Brightness Control (7 bit) : Mid
- R, B Drive Control (7 bit each ) : Max
- G Drive Control (4 bit ) : Min
- R, G, B Bias (Cut-Off) Control (8 bit each ) : Min

Each control variable range is show below:

Input signal : 1Vpp (Sync Tip to White) = 140 IRE

	Min	Typical	Max
Y Total Gain (Max)	12 dB	14 dB	16 dB
Contrast Control Max/Mid	5 dB	7 dB	9 dB
Contrast Control Range Min/Max (128-step)	-15 dB	-12 dB	-9 dB
Brightness Control Max/Mid (64-step)	25 IRE	30 IRE	35 IRE
Brightness Control Min/Mid (64-step)	-35 IRE	-30 IRE	-25 IRE
Sub-Bias Control Range (128-step)	700 mV	800 mV	900 mV
Bias Control Range (256-step)	700 mV	800 mV	900 mV
G Drive Reduction Control Range (16-steps)		4 dB	
R,B Drive Reduction Control Range(128-step)	9 dB	11 dB	13 dB

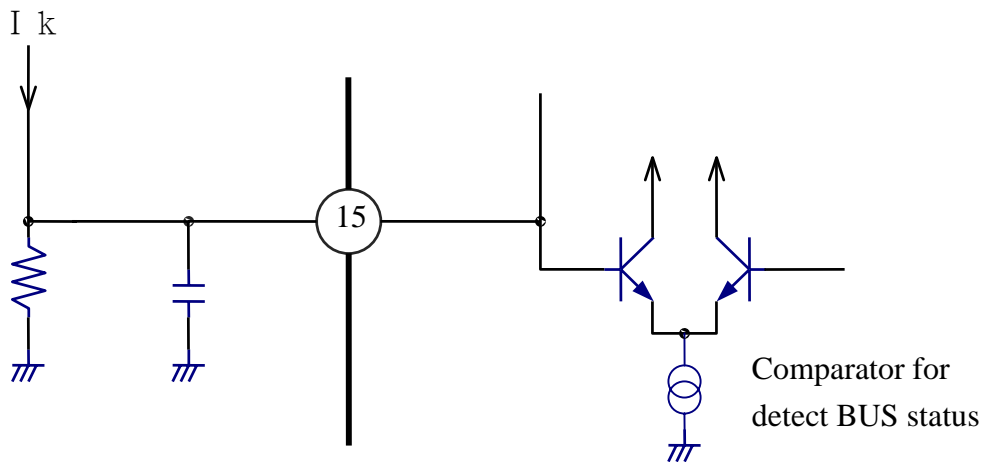


## PIN 15 (AKB(East/West:932))

### LA76830:AKB Input

Compare the AKB voltage with internal reference voltage.

The result output the read status.



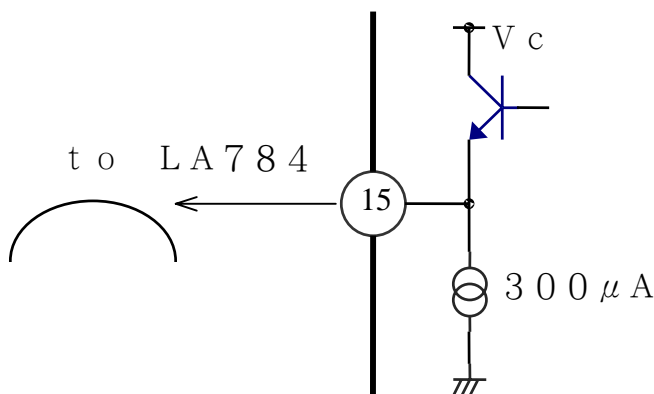
### LA76932:E/W Out

Output the ramp wave of vertical.

Basically use with LA7840 series(vertical IC)

Next things can be controlled by BUS

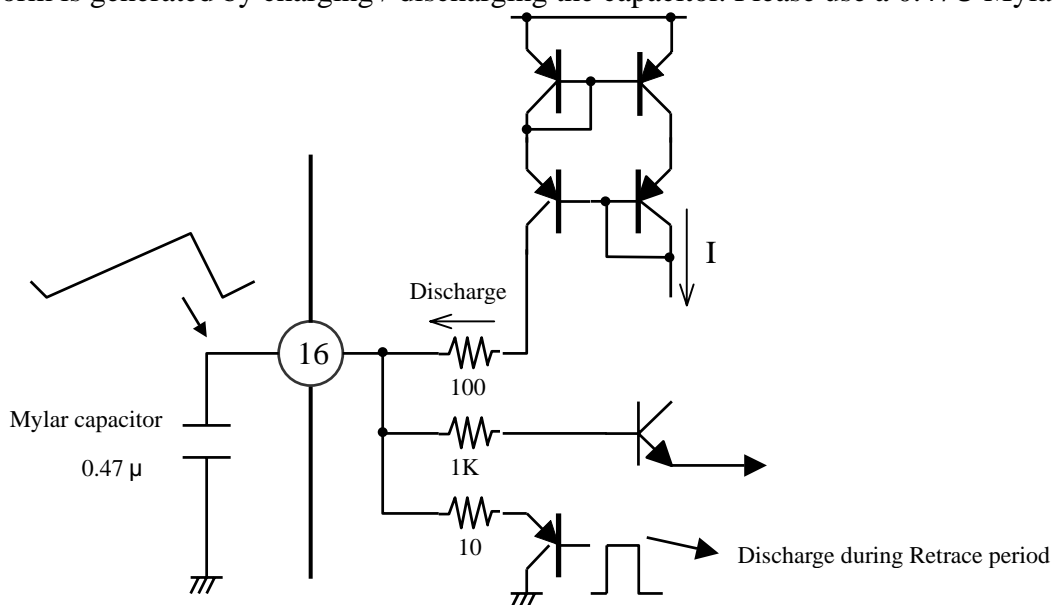
- EW DC .....Control range of EW width (6bit)
- EW AMP .....Control range of EW parabola/width ratio (6bit)
- EW TILT .....Control range of EW trapezium correction (6bit)
- EW CORNER...Control range of EW corner/parabola ratio (TOP,Bottom each 3bit)



## PIN 16 V RAMP OSC.Capacitor

This pin connect a capacitor, which is used to generate a ramp waveform for the reference of pin 17(Vertical Output).

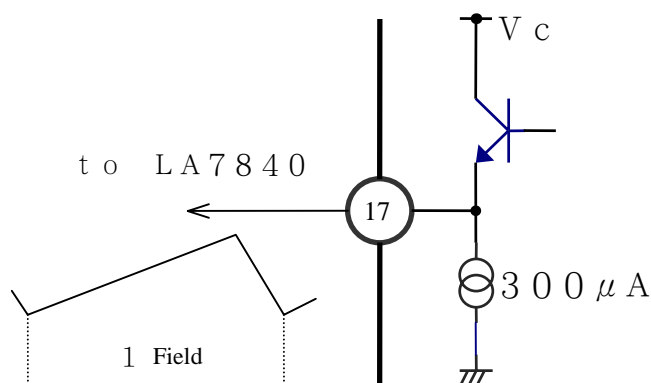
Ramp waveform is generated by charging / discharging the capacitor. Please use a 0.47U Mylar capacitor.



## PIN 17 (VERTICAL OUTPUT)

This is a output pin of vertical synchronization ramp signal. We recommend using together with LA7840 serial. Below are some functions which can be control by BUS:

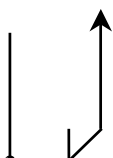
- V.DC : position of field (6 bit)
- V. size : size of field (7 bit)
- V. linearity : linearity (5 bit)
- V. SC : S compensation (5 bit)



The application of vertical position adjustment circuit is different depending on either using  $\pm$  dual voltage supply or single voltage supply. Please refer to technical note of LA7840/LA78040 (Vertical output IC).

## PIN18 (I reference)

This is a pin for producing reference current. Use a resistor of 4.7K to connect with ground from this pin.



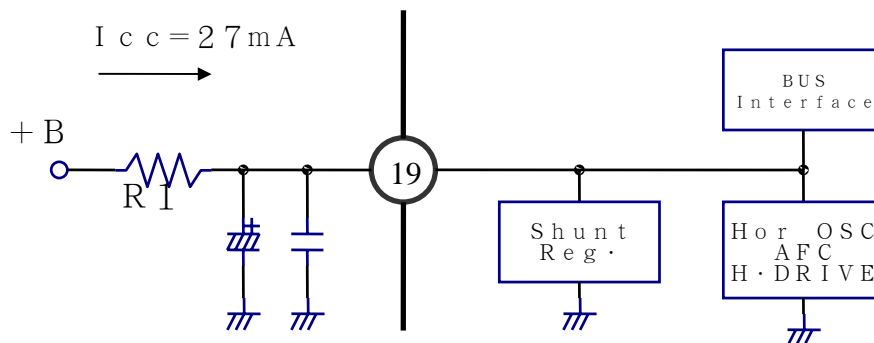


Note )

During the stage of evaluation of this IC (engineering sample), bus-control is used to adjust the horizontal frequency (H freq. = 6 bit). But no more adjustment of horizontal frequency is needed in the mass-production products. Depending on the accurate level of horizontal free-run frequency we need, a low offset external resistor is requested.

### **PIN 19 (HORIZONTAL / BUS Vcc)**

This is a Vcc pin of horizontal deflection block and BUS interface block.



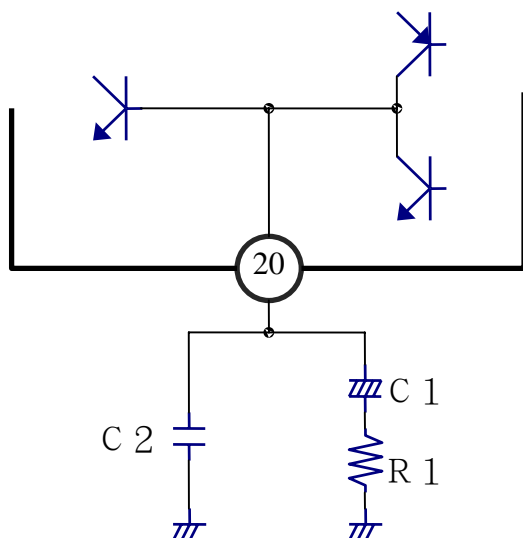
Choose the value of the resistor R1 to let the current flow into pin 19 is 26mA.

The value of the resistor is decide as below:

$$R1 = (+B-5.0V)/27mA$$

## PIN 20(AFC FILTER)

This is a AFC filter pin of horizontal VCO.



C1 is used for canceling the vertical ripple, while the resistor R1 is used for transforming the control current into voltage. C2 is a smoothing capacitor.

Reference value :

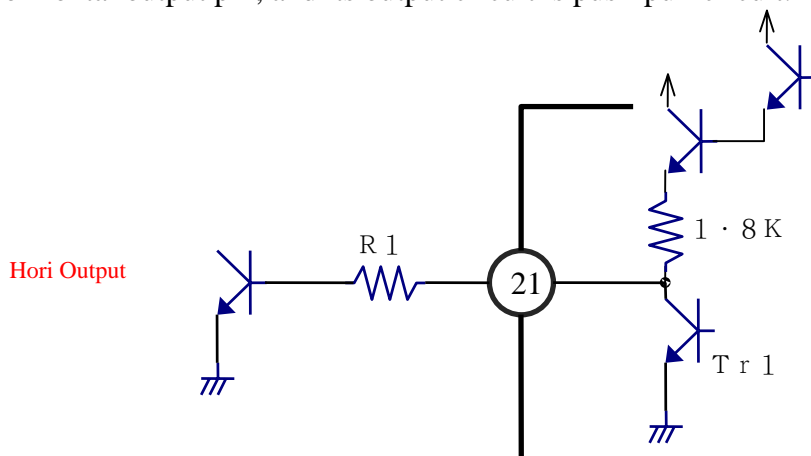
C1 = 1.0  $\mu$ F

C2 = 0.015  $\mu$ F

R1 = 3.0K $\Omega$

## PIN 21 (HORIZONTAL OUTPUT)

This is a horizontal output pin, and its output circuit is push-pull circuit.



The maximum collector current of the Tr. 1 is 3mA. Usually, R1, which is used for reducing the influence of horizontal output to IF block, is recommended to be set at 100 $\Omega$ . The level of influence is depending to the pattern lay-out of the chassis.

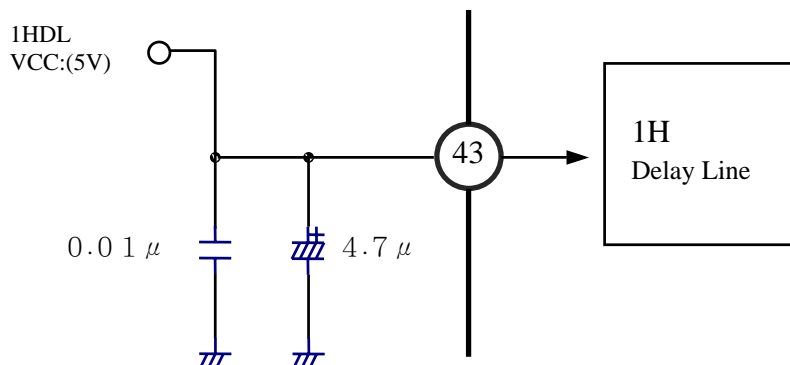
Note) The duty of the horizontal output pulse is designed at 37.6  $\mu$ s in low period.

### **PIN 22(Video Chroma Deflection GND)**

This is the ground pin of video/ chrome/ deflection block.

### **PIN 43( CCD Vcc)**

This is a Vcc (5V) pin for 1 H delay-line.

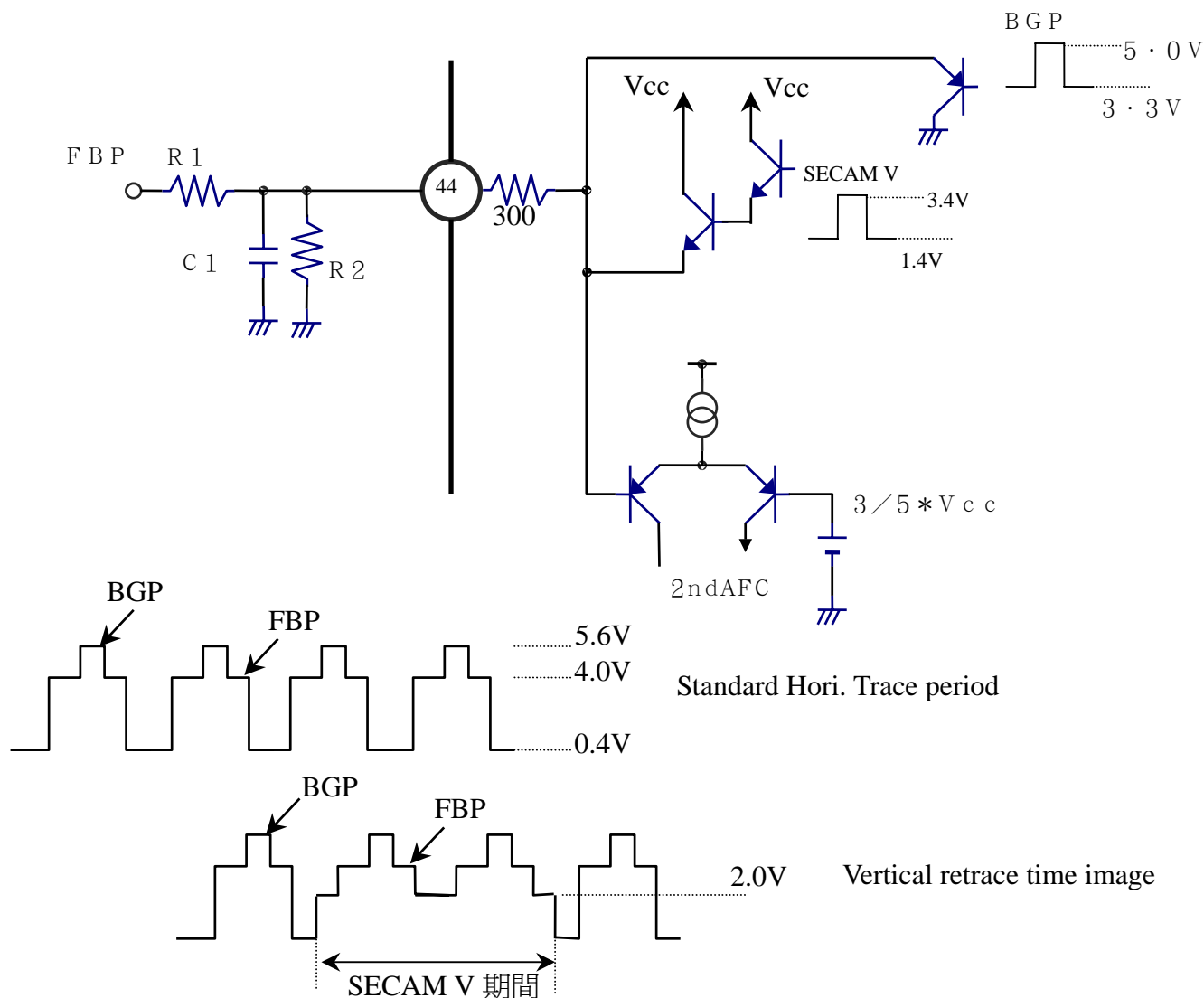


### **PIN 44 (FBP INPUT)**

This is the input pin of flyback pulse, which is used for AFC II. The threshold voltage at which the flyback pulses are acquired internally by the IC is  $3/5 \times V_{cc}$ . (For example, if the  $V_{cc}$  is 5V, it is 3V). The fly-back pulse is input via R1 and R2. Besides, although the input flyback pulses are input to the AFC II loop to take up the horizontal output storage time, since the screen center is offset in advance, the flyback pulses must be matched to the screen center by adjusting the integration provided by R1 and C1. This IC has a function which is used for horizontal position fine adjustment:

**Horizontal Phase** : the horizontal center of the screen can be adjusted by bus-controlled. (5bit)

Besides, if the peak of input FBP of pin 44 is exceeding 4V, BGP and vertical output for LA7642N (SECAM decoder) can be achieved.



#### Note 1 )

The best storage time of this IC, between the rise up of Horizontal output (pin 21) and the rise up of input FBP, is about  $9 \mu s$ . Therefore, the storage time of television chassis is better set at  $9 \mu s \pm 2s$ .

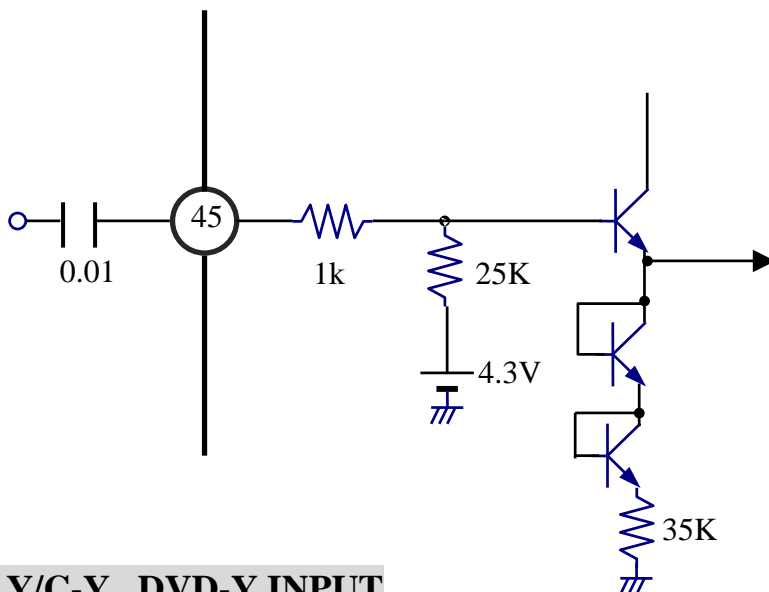
#### Note 2)

In LA76810 serial, FBP is not used in the blanking of RGB output. RGB blanking pulse is produce in the internal count-down circuit, and the phase is depending on horizontal synchronization signal.

Concerning to the phase and the width of blanking pulse, as before waveform is made up and designed suitably in FBP input circuit. But, in LA76810 serial, the phase and the width of blanking pulses (H BLK R&L) can be set by BUS control. Therefore, the design of FBP input circuit (adjustment of horizontal phase, jitter characteristic etc) become more easier. Also, in case of develop many chassis, this can contribute to speed up the development period.

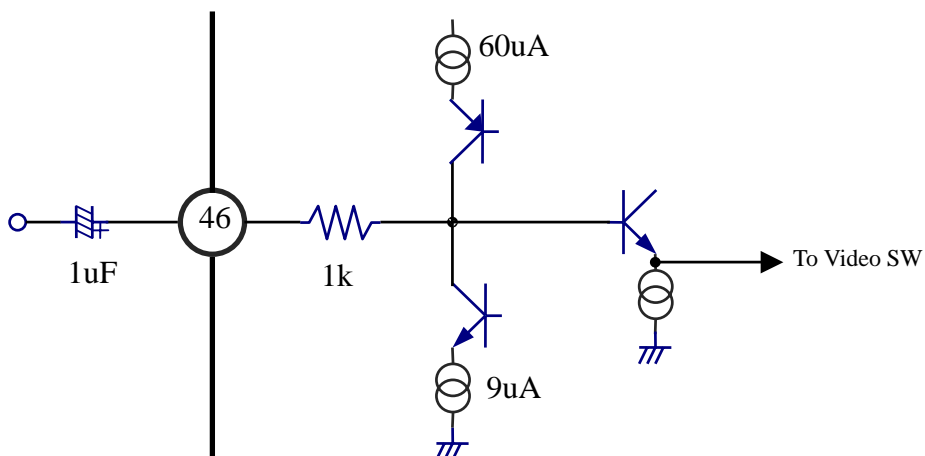
## PIN 45 : Y/C-C INPUT

This is a chroma input pin for Y/C input mode. This pin is selected at C.EXT=1.



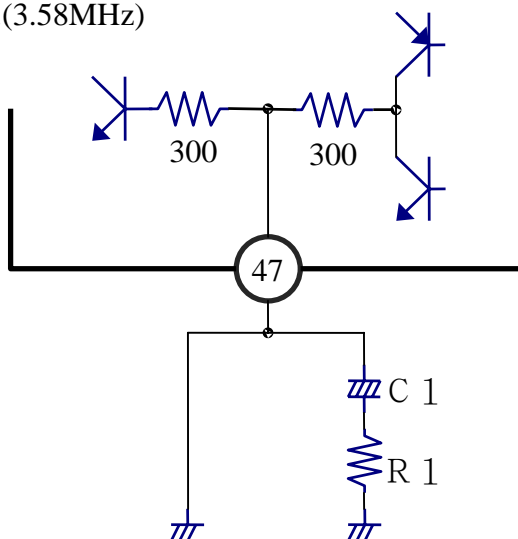
## PIN 46, 48: Y/C-Y , DVD-Y INPUT

This is a Y/C-Y , DVD input pin. The pedestrian level of input signal is clamped at  $1/2 V_{cc}$  by charging & discharging external capacitor. Besides, Y/C-Y pin and DCD-Y pin become input pin of external video signal.



## PIN 47(DDS FILTER)

This is a AFC filter pin of chroma VCO.(3.58MHz)



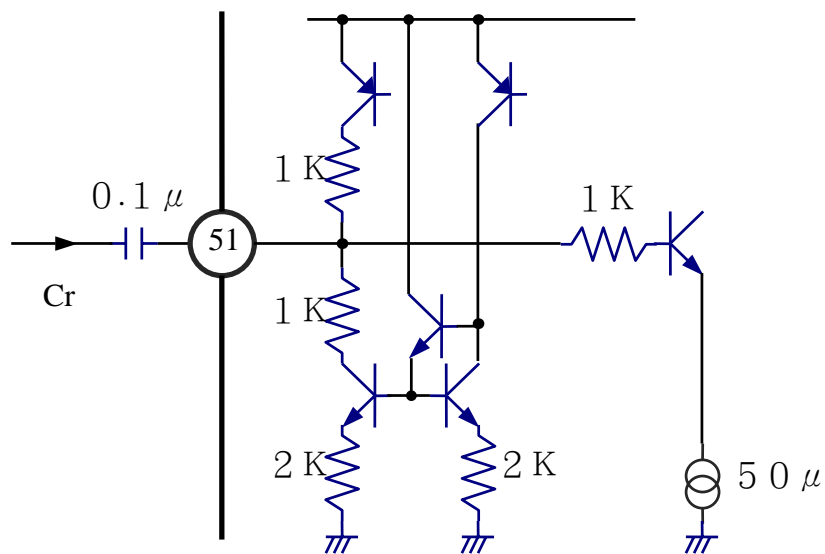
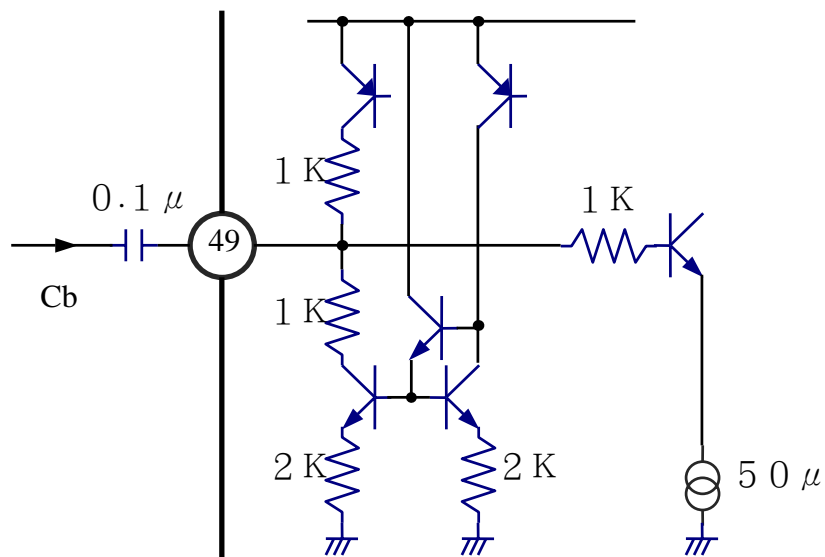
Reference value

$C1 = 1.0 \mu F$

$R1 = 750 \Omega$

### PIN 49,51(CbCr Input)

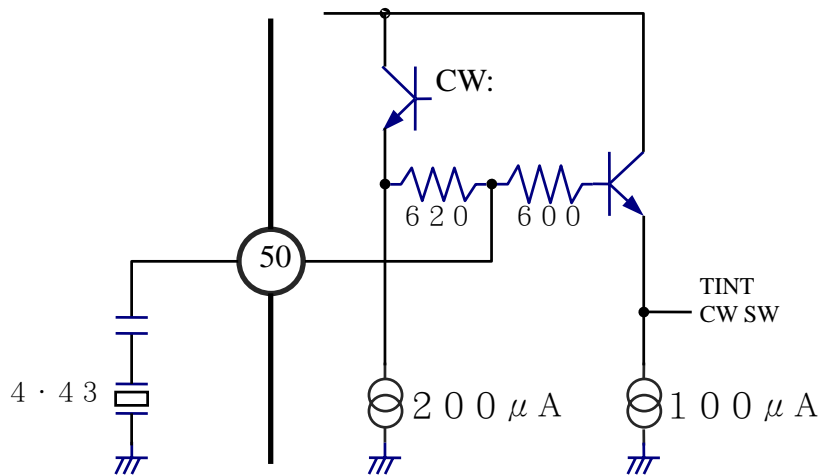
This is a CbCr input pin.





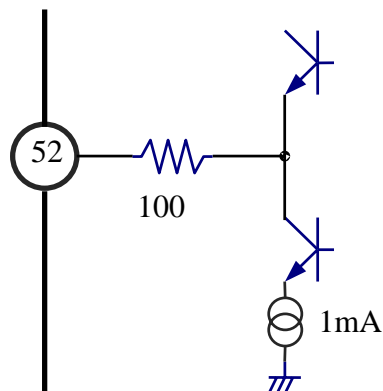
### PIN 50(4.43MHz CRYSTAL)

This is a 4.43MHz x'tal connecting pin.



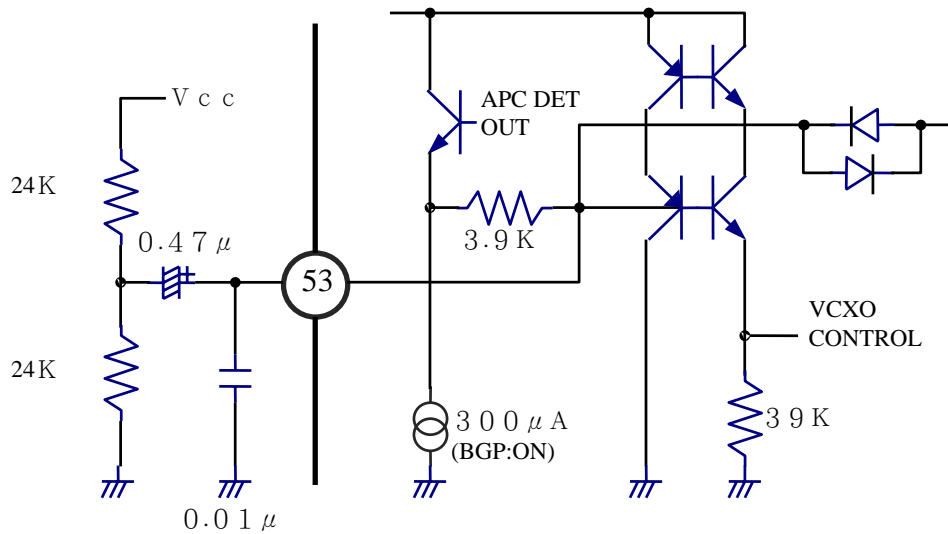
### PIN 52(Selected Video Output or fsc Output)

This is a output pin of selected video signal or fsc signal. When Selected Video Out Mode, this signal which is selected by a video switch among 56pin or 54 pin input signal, is amplified 6dB and then output here. The output amplitude is 2Vp-p. And when fsc Output Mode, fsc signal is Outputted



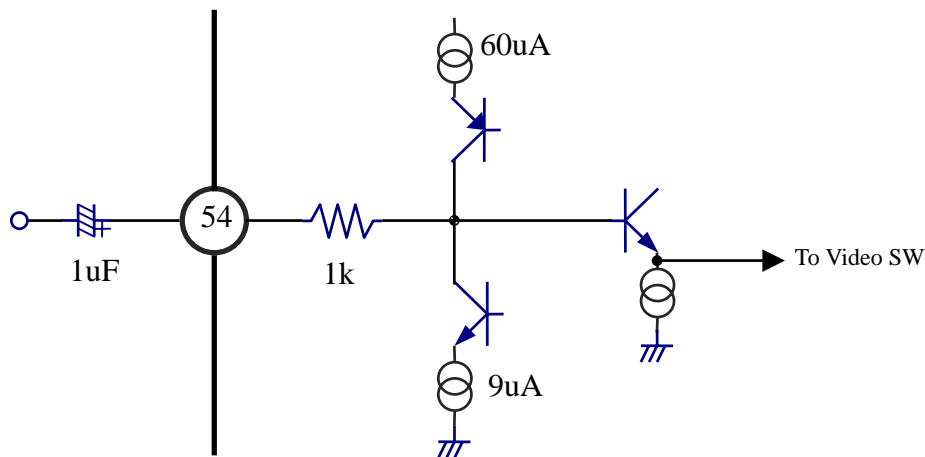
### PIN 53(CHROMA APC FILTER)

This is a filter pin for APC filter of chrome VCXO.



### PIN 54(EXT VIDEO INPUT & Y INPUT in S-VHS MODE)

This is an external video input pin. The pedestrian level of input signal is clamped at  $1/2 V_{cc}$  by charging & discharging external capacitor. Besides, this pin becomes input pin of Y signal in S-VHS mode.

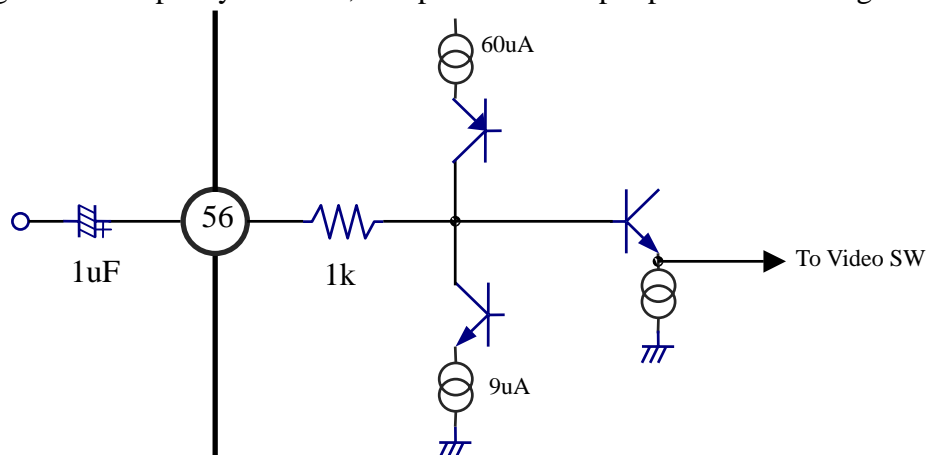


### PIN 55(VIDEO CHROMA DEFLECTION VCC)

This is a Vcc pin of video/ chrome/ deflection block.

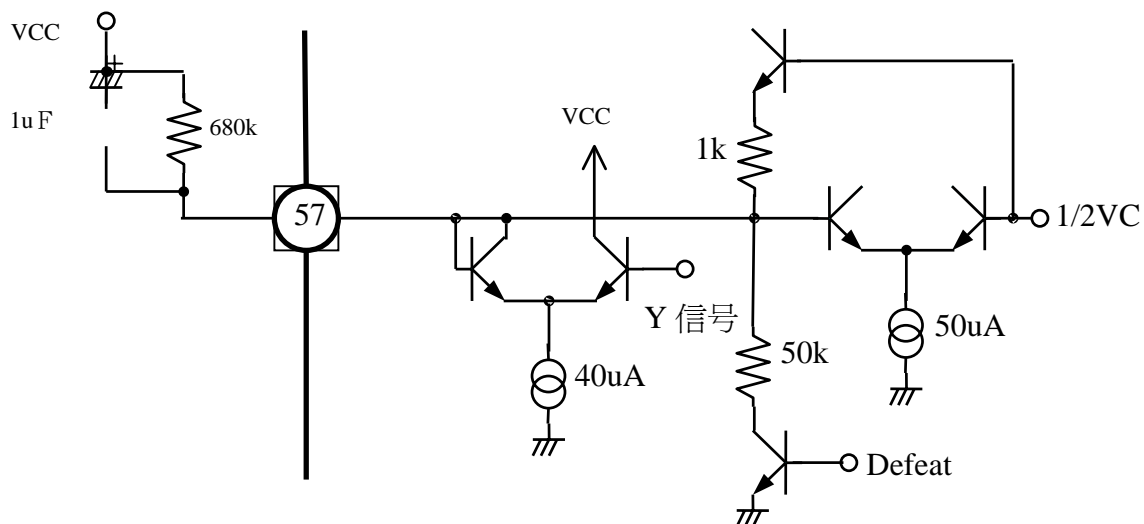
### PIN 56(INT. VIDEO INPUT & CHROMA SIGNAL INPUT IN S-VHS MODE)

This is an internal video input pin. The pedestal level of input signal is clamped at  $1/2 V_{CC}$  by charging & discharging external capacity. Besides, this pin become input pin of chrome signal in S-VHS mode.



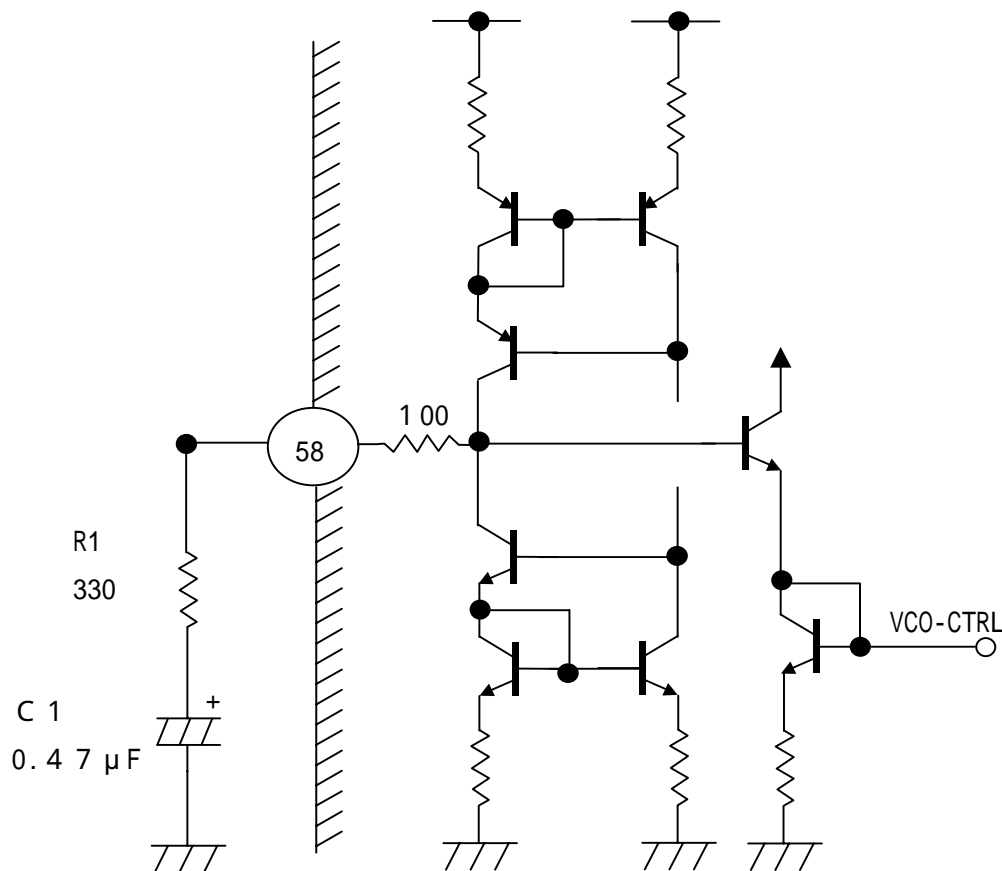
### PIN 57(BLACK STRETCH FILTER)

This is a filter pin for black peak level detection in black stretch circuit. The capacitor is charging during black peak period, and discharging via external CR exclude black peak period. The DC level of the output and the gain of black stretch will be reduced if the value of time constant is large.



## PIN 58 (PIF APC FILTER)

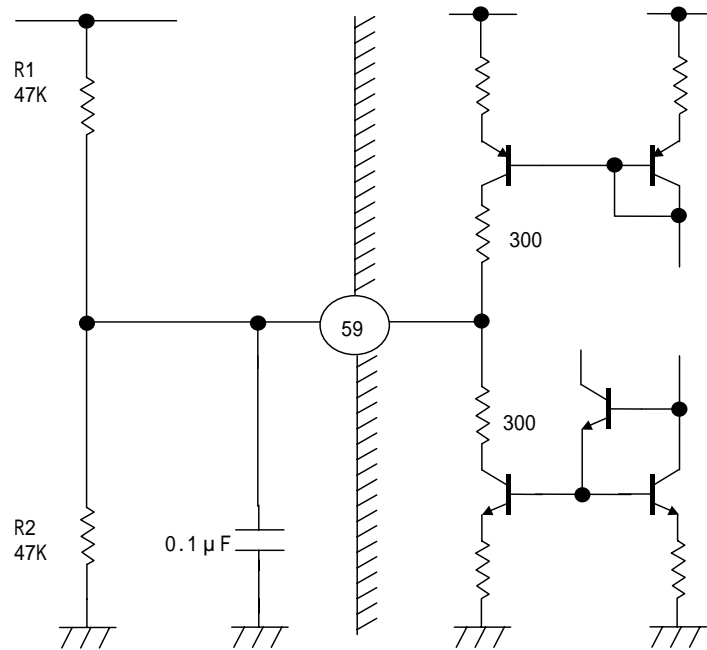
This is a APC filter pin for PLL circuit. The output is achieved from the collector of the current mirror circuit. First, the APC loop gain is determined by the time constant ( $R1$  &  $C1$ ). If  $R1$  is increased, the loop gain will increase and the pull-in range will increase as well. But, the characteristic of the noise sensitivity will degrade at the same time, therefore our recommended value for  $R1$  is  $330\Omega$ . In the other hand, the time constant of APC loop is determined by the capacitor  $C1$  and the internal resistor inside IC. Therefore, if the capacitor  $C1$  is variable, the time constant of loop will change largely by every step. We recommended the value of  $C1$  is  $0.47\mu F$ .



## PIN 59 (AFT OUTPUT)

This is an AFT output pin. The output is achieved from the collector of the current mirror circuit. The control sensitivity of AFT can be adjusted by the external resistor (R1, R2). The current mirror circuit doesn't operate at around center frequency ( $f_0 \pm 35\text{kHz}$ ), and the voltage of pin 59 is determined by the external resistor (R1, R2). The control sensitivity of AFT is about  $20\text{mV/kHz}$  when  $R1 = R2 = 100\text{k}\Omega$ .

The BUS control is fixed at "L" when IF PLL is unlocked.



The circumference circuit of pin 59

## PIN 60 (VIDEO OUTPUT)

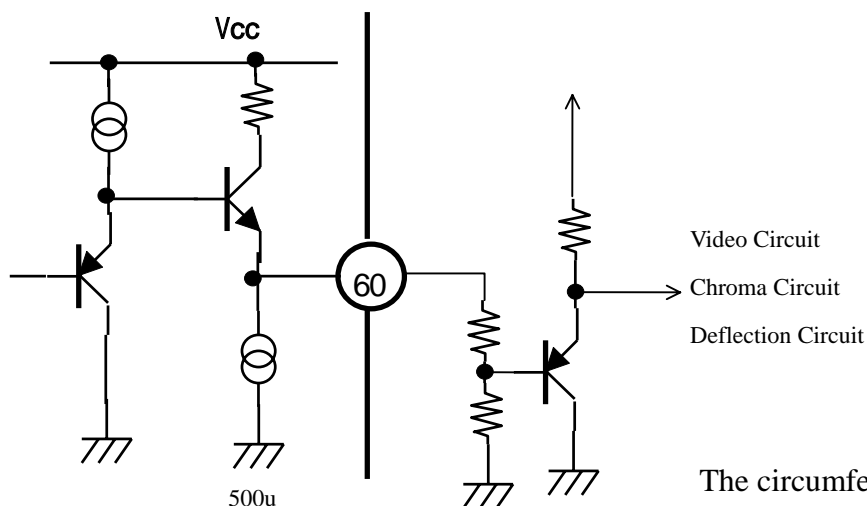
This is a video output pin. The output is a low impedance circuit.

- The video DC output is 3.7V when there is no signal.
- Sync Tip Voltage is 1.4V
- The video amplitude is 2.0Vpp

In addition, there is a Black Noise Inverter Circuit built-in in this IC.

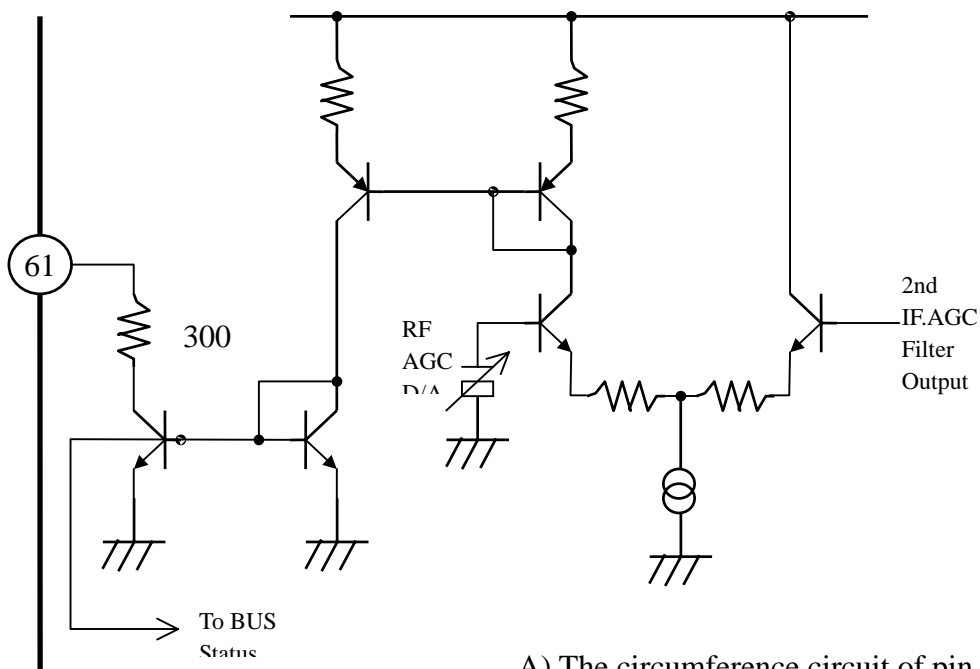
- The threshold voltage of Black Noise Inverter is 0.8 V
- The replacement voltage of Black Noise Inverter is 1.8 V

The built-in sound trap is linked with the BUS (SIF SYSTEM) that the trap frequency is set automatically depending on the SIF frequency. In order to prevent the unsatisfied drive capacity of amplitude matching (1Vpp) and load (video circuit, chroma circuit, deflection circuit), we recommend application circuit below:



## PIN 61 (RF AGC OUTPUT)

This is a RF AGC output pin. The reference voltage, which is controlled by RF AGC D/A, and the IF AGC voltage is input into differential amplifier, then the output can be achieved at the open collector. The time constant is determined by the value of the external R & C. The maximum drive current of Q1 is 1mA. The maximum DC voltage of pin 4 is 9V. Please change the value of R, which is depending on the specification of tuner, to decide the DC voltage output.

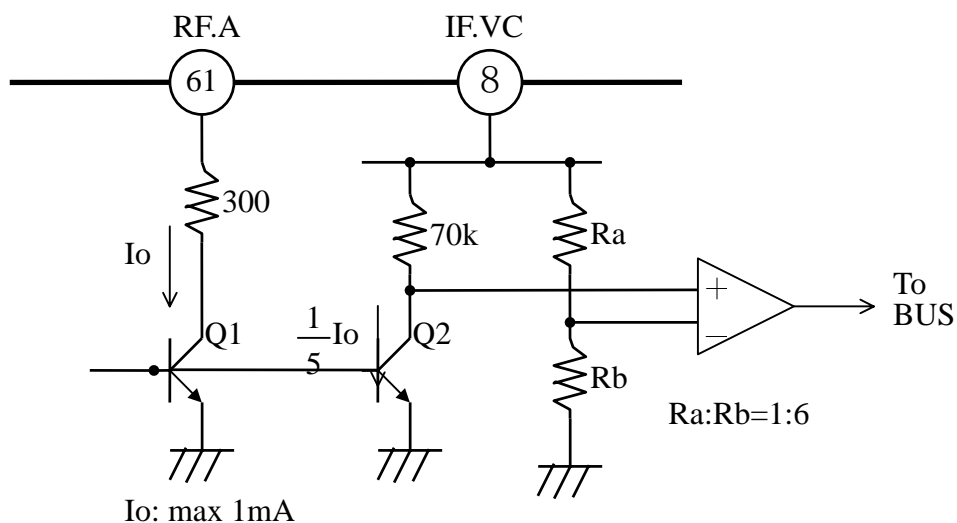


A) The circumference circuit of pin 61

A comparator, which is used for BUS statue, is built-in this IC. The reference voltage of this comparator is set as  $V_{cc} \cdot (6/7)$  and compare with voltage below:

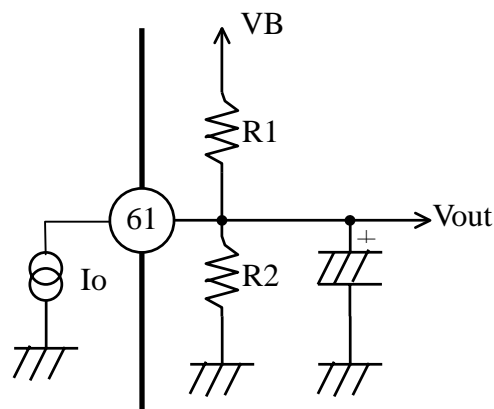
$$V_{cc} - \{I_o \cdot (1/5) \cdot 70k\Omega\}$$

\*  $I_o$  is the output current of pin 61.



B) The circumference circuit of pin 61

[ The example application circuit ]



$$V_{out} = \frac{R_2}{R_1 + R_2} (V_b - I_o \cdot R_1)$$

The BUS statue is '1' if Vb, R1, R2 is set as below and the Vout is 6V:

Vb = 9V, R1 = 30KΩ, R2 = 120KΩ

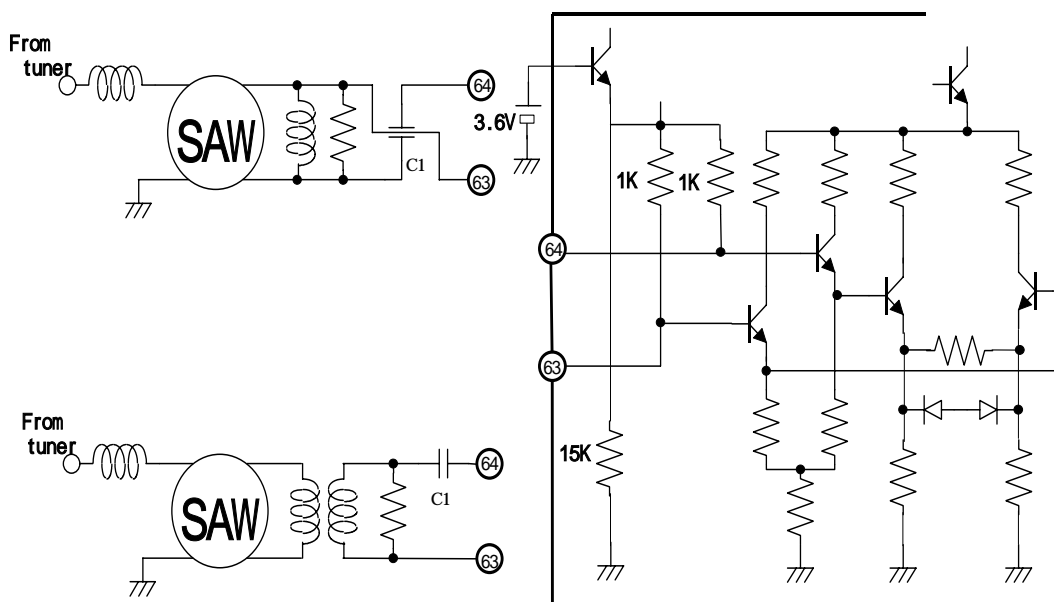
### PIN 62 (IF GROUND)

This is the ground of IF circuit.

### PIN 63,64 (PIF AMP INPUT)

This is a PIF input pin. The input impedance Ri is about 1.5kΩ and the input capacity is about 5pF.

This is a balanced input and it needs a 0.01uF capacitor for coupling. The balanced error generated in the SAW filter and the printed plate can be canceled and the weak field characteristic may be improved by using C1 to cross the IC input pin layout on the printed plate.



The circumference circuit of pin 63 & 64



## < < $\mu$ -COM Block > >

### Internal communication

Bus control of LA76931 is controlled by the internal communication ( $I^2C$ ) of  $\mu$  COM. The internal communications ports of  $\mu$  COM are assigned special functions such as DATA for P31, CLOCK for P32.

The internal communications ports (P31, P32) of  $\mu$  COM are internally connected to general-purpose ports (P12 : DATA, P13 : CLOCK) through register control, so that the Bus Control can be controlled by an external device.

The terminal AN3 of  $\mu$  COM is internally connected to the terminal AFT (PInt18) of BIP.

The terminal P33 of  $\mu$  COM is internally connected to the terminal C\_SYNC (PInt01) of BIP.

### Recommended Oscillation Circuit and Sample Characteristics. (XT1,XT2)

The sample oscillation circuit characteristics in the table below is based on the following conditions:

- Recommended circuit parameters are verified by an oscillator manufacturer using a Sanyo provided oscillation evaluation board.
- Sample characteristics are the result of the evaluation with the recommended circuit parameters connected externally.

Recommended oscillation circuit and sample characteristics ( $T_a = -10$  to  $+65^\circ\text{C}$ )

Frequency	Manufacturer	Oscillator	Recommended circuit parameters				Operating supply voltage range	Oscillation stabilizing time		Notes
			C1	C2	Rf	Rd		typ.	max	
32.768kHz	Seiko Epson	C-002RX	T.B.D	T.B.D	T.B.D	T.B.D	4.5 – 5.5V	T.B.D	T.B.D	

Notes The oscillation stabilizing time period is the time until the VCO oscillation for the internal system becomes stable after the following conditions. (Refer to Figure 2.)

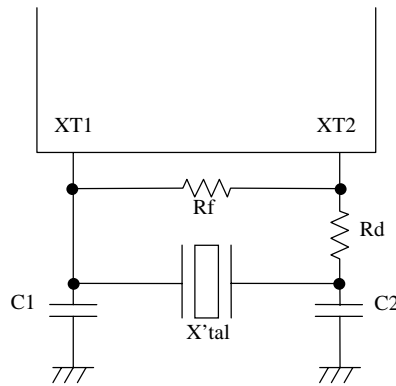
- 1 · The VDD becomes higher than the minimum operating voltage after the power is supplied.
- 2 · The HOLD mode is released.

The sample oscillation circuit characteristics may differ applications. For further assistance, please contact with oscillator manufacturer with the following notes in your mind.

- Since the oscillation frequency precision is affected by wiring capacity of the application board, etc., adjust the oscillation frequency on the production board.
- The above oscillation frequency and the operating supply voltage range are based on the operating temperature of  $-10^\circ\text{C}$  to  $+65^\circ\text{C}$ . For the use with the temperature outside of the range herein, or in the applications requiring high reliability such as car products, please consult with oscillator manufacturer.
- When using the oscillator which is not shown in the sample oscillation circuit characteristics, please consult with Sanyo sales personnel.

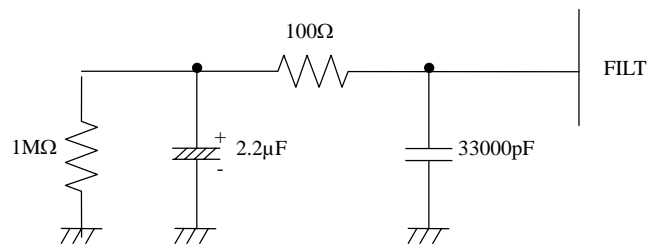
Since the oscillation circuit characteristics are affected by the noise or wiring capacity because the circuit is designed with low gain in order to reduce the power dissipation, refer to the following notices.

- The distance between the clock I/O terminal (XT1 terminal XT2 terminal) and external parts should be as short as possible.
- The capacitors' VSS should be allocated close to the microcontroller's GND terminal and be away from other GND.
- The signal lines with rapid state changes or with large current should be allocated away from the oscillation circuit.



Recommended oscillation circuit.

### FILT recommended circuit



FILT recommended circuit

(Note) Place FILT parts on board as close to the microcontroller as possible.

## CHAPTER FOUR I2C BUS CONTROL INSTRUCTION(USE HYDFSR-N-GEO RC)

### 4-1、Picture adjust(brightness, position ,WB)

#### 1)、Operation method:

- Press “M” key enter into factory mode, “M” will show on the top left corner of screen.
- Press CH+/CH- to select the item.
- Press VOL+/VOL- to adjust the desired item.
- Press “M” key exit.

#### 2)、Items maybe need adjusting :

NO.	OSD	ITEMS	DEFAULT
0	S-BRI	Sub-brightness(range : 0~127)	80
1	R-CUT	Red cut-off(range : 0~255)	120
2	G-CUT	Green cut-off(range : 0~255)	120
3	B-CUT	Blue cut-off(range : 0~255)	120
4	R-DRV	Red driver(range : 0~127)	70
5	G-DRV	Green driver(range : 0~15)	7
6	B-DRV	Blue driver(range : 0~127)	70
7	C.B/W	Inside signal (range : 0~3)	0
8	HPS	PAL horizontal center adjust(range : 0~31)	5
9	N.HPS	NTSC horizontal center adjust(range : -7~+8)	+08
10	VPS	PAL vertical center adjust (range : 0~63)	7
11	N.VPS	NTSC vertical center adjust(range : -31~+32)	-05
12	HIT	PAL vertical range adjust(range : 0~127)	41
13	N.HIT	NTSC vertical range adjust(range : -31~+32)	-03
14	VLIN	PAL vertical linearity adjust(range : 0~31)	14
15	N.VLIN	NTSC vertical linearity adjust (range : -7~+8)	00
16	VSC	PAL vertical SC adjust (range:0~31)	5
17	N.VSC	NTSC vertical SC adjust (range : -7~+8)	+05
18	AGC	RF.AGC adjust(range : 0~63)	16
19	OSDV	OSD position on vertical (range : 0~31)	8
20	OSDH	OSD position on horizontal (range : 0~63)	27

### 4-2、Other items set:

#### 1)、Operation method:

- Press “M” key to enter into factory mode, “M” will show on the top left corner of screen.
- Press CH+/CH- to select the item.
- Press VOL+/VOL- to adjust the desired item.
- Press “M” key to exit, press MENU key to page up and down.

#### 2)MENU0-MENU17 data set. (MENU0)

NO.	ITEM	DEFAULT	Maybe different in different model		
0	S-BRI	80	NO.	ITEM	DEFAULT
1	R-CUT	120	4	R-DRV	70
2	G-CUT	120	5	G-DRV	7
3	B-CUT	120	6	B-DRV	70

## (MENU1)

NO.	ITEM	REMARK
0	SCR. H. POSI	Not use, DEFAULT:0
1	H. BLK. LEFT	Horizontal blanking at the CRT left, DEFAULT:4
2	H. BLK. RIGHT	Horizontal blanking at the CRT right, DEFAULT:2
3	POWER LOGO	Not use, DEFAULT:0
4	SCREEN TYPE	DEFAULT :1
5	SCREEN OPT.	DEFAULT :1
6	SCREEN TIME	DEFAULT :0
7	TOFAC	DEFAULT :M

## (MENU2)

NO.	ITEM	REMARK
0	ENGLISH OSD	Only use in factory, DEFAULT:1
1	CHINESE OSD	Only use in factory, DEFAULT:0
2	BACK COLOR	Only use in factory, DEFAULT:0
3	BLK PROCESS	Only use in factory, DEFAULT:1
4	V. MUTE P. OFF	Only use in factory, DEFAULT:1
5	MUTE REM.	Not use, DEFAULT:1
6	HI SENSE LOGO	Not use, DEFAULT:0
7	LOGO H. POSI.	Not use, DEFAULT:68
8	LOGO V. POSI.	Not use, DEFAULT:30
9	FACTORY TUNE	Only use in factory, DEFAULT:0

## (MENU3)

NO.	ITEM	REMARK
0	POWER OPTION	Only use in factory, DEFAULT:1
1	AV OPTION	Only use in factory, DEFAULT:2
2	S-VIDEO OPT.	Only use in factory, DEFAULT:1
3	YUV OPTION	Only use in factory, DEFAULT:1
4	DVD OPTION	Not use, DEFAULT:0
5	DVD CHANNEL	Not use, DEFAULT:3
6	VOLUME OPT.	Only use in factory, DEFAULT:0
7	VOLUME 25	Not use, DEFAULT:100
8	VOLUME 50	Not use, DEFAULT:110
9	VOLUME 75	Not use, DEFAULT:120

## (MENU4)

NO.	ITEM	REMARK
0	GAME OPTION	Only use in factory, DEFAULT:3
1	ON COLOR	Only use in factory, DEFAULT: BLACK
2	OFF COLOR	Only use in factory, DEFAULT: BLACK

3	CHR. COLOR	Only use in factory, DEFAULT:1
4	CALENDAR	Only use in factory, DEFAULT:1
5	LIM.SET OPT.	Only use in factory, DEFAULT:1
6	BIOLOGY OPT.	Not use, DEFAULT:0
7	CHILD LOCK	Only use in factory, DEFAULT:1
8	SENSITIVITY	Not use, DEFAULT:0

(MENU5)

NO.	ITEM	REMARK
0	AUTO OPTION	Only use in factory, DEFAULT:1
1	AUTO1/2 OPT.	Only use in factory, DEFAULT:0
2	PAL OPTION	Only use in factory, DEFAULT:1
3	PAL-M OPTION	Only use in factory, DEFAULT:0
4	PAL-N OPTION	Only use in factory, DEFAULT:0
5	N3.58 OPTION	Only use in factory, DEFAULT:1
6	N4.43 OPTION	Only use in factory, DEFAULT:1
7	HALF TONE	Only use in factory, DEFAULT:2
8	DIGITAL OSD	Only use in factory, DEFAULT:1

(MENU6)

NO.	ITEM	REMARK
0	4.5M OPTION	4.5M sound option, DEFAULT:0
1	5.5M OPTION	5.5M sound option, DEFAULT:1
2	6.0M OPTION	6.0M sound option, DEFAULT:0
3	6.5M OPTION	6.5M sound option, DEFAULT:1
4	BLANK DEF	Only use in factory, DEFAULT:0
5	MENU BACK	Only use in factory, DEFAULT:0
6	MENU ICON	Only use in factory, DEFAULT:0
7	ICON COLOR	Only use in factory, DEFAULT:3
8	POSITION L/R	Only use in factory, DEFAULT:1
9	OSD CONTRAST	Only use in factory, DEFAULT:2

(MENU7)

NO.	ITEM	REMARK
0	SUB. CONT.	Only use in factory, DEFAULT:10
1	SUB. COLOR	Only use in factory, DEFAULT:15
2	SUB. SHARP	Only use in factory, DEFAULT:15
3	SUB. TINT	Only use in factory, DEFAULT:32
4	BRT.ABL.DEF.	Only use in factory, DEFAULT:0
5	MID.STP.DEF	Only use in factory, DEFAULT:1
6	BRT.ABL.TH	Only use in factory, DEFAULT:3
7	RGB TEMP SW.	Only use in factory, DEFAULT:1
8	CORING W/DEF	Only use in factory, DEFAULT:3

## (MENU8)

NO.	ITEM	REMARK
0	R-Y/B-Y G.BL	Only use in factory, DEFAULT:8
1	R-Y/B-Y ANG.	Only use in factory, DEFAULT:10
2	B-Y DC LEVEL	Only use in factory, DEFAULT:8
3	R-Y DC LEVEL	Only use in factory, DEFAULT:8
4	SECAM B-Y DC	Not use, DEFAULT:8
5	SECAM R-Y DC	Not use, DEFAULT:8
6	YUV B-Y DC	Only use in factory, DEFAULT:7
7	YUV R-Y DC	Only use in factory, DEFAULT:8
8	3 HOUR A-OFF	Only use in factory, DEFAULT:0
9	EVERY DAY	Only use in factory, DEFAULT:0

## (MENU9)

NO.	ITEM	REMARK
0	ZOOM OPTION	Not use, DEFAULT:0
1	ZOOM1 V.SIZE	Not use, DEFAULT:31
2	ZOOM2 V.SIZE	Not use, DEFAULT:30
3	HOTEL MODE	Not use, DEFAULT:0
4	HOTEL VOLUME	Not use, DEFAULT:50
5	ON POSITION	Not use, DEFAULT:1
6	ON TV/AV	Not use, DEFAULT:0

## (MENU10)

NO.	ITEM	REMARK
0	TUNER OPTION	TUNER OPTION (0:VS ;1:FS) , DEFAULT:1
1	VL/VH FREQ.	Only use in factory, DEFAULT:64
2	VH/UHF FREQ.	Only use in factory, DEFAULT:167
3	BAND OPTION	Only use in factory, DEFAULT:2
4	SEARCH CHECK	Only use in factory, DEFAULT:0
5	UHF/DEGAUSS	Only use in factory, DEFAULT:0
6	P-MUTE H./L.	Only use in factory, DEFAULT:0

## (MENU11)

NO.	ITEM	REMARK
0	VOLUME OUT	Not use, DEFAULT:110
1	STEREO OPT.	Only use in factory, DEFAULT:0
2	LV1116 IC	Not use, DEFAULT:0
3	LV1116 GAIN	Not use, DEFAULT:4
4	SUR. MODE	Not use, DEFAULT:7
5	WOOFER GAIN	Not use, DEFAULT:7
6	2/3 CHANNELS	Not use, DEFAULT:0
7	BALANCE OPT.	Not use, DEFAULT:0

8	S . TRAP TEST	Only use in factory, DEFAULT:4
9	S.TRAP.SW	Only use in factory, DEFAULT:1

(MENU12)

NO.	ITEM	REMARK
0	VOL. FILTER	Volume filter, DEFAULT:0
1	FM LEVEL	audio Warning frequency level ( range : 0~31 ) , DEFAULT:16
2	A.MONI.SW	Only use in factory, DEFAULT:1
3	A2 SW	Not use, DEFAULT:0
4	SCREEN SAVER	Not use, DEFAULT:0
5	SAVER TOP	Only use in factory, DEFAULT:0
6	SAVER BOTTOM	Only use in factory, DEFAULT:255
7	SAVER LEFT	Only use in factory, DEFAULT:0
8	SAVER RIGHT	Only use in factory, DEFAULT:255

(MENU13)

NO.	ITEM	REMARK
0	V.SHIFT	Not use, DEFAULT:8
1	AFC GAIN	AFC plus (0 : AUTO / 1 : HIGH), DEFAULT:0
2	V TRANS	Only use in factory, DEFAULT:1
3	V.SEPUP	Only use in factory, DEFAULT:1
4	V RESET TIMING	Only use in factory, DEFAULT:0
5	C . D. MODE	Only use in factory, DEFAULT:0
6	V BLK SW	Only use in factory, DEFAULT:0
7	FBPBLK. SW	Only use in factory, DEFAULT:1
8	SVO OR FSC	Only use in factory, DEFAULT:0
9	C.BYPASS	Only use in factory, DEFAULT:1

(MENU14)

NO.	ITEM	REMARK
0	PAL APC SW	Only use in factory, DEFAULT:0
1	C.KILLER OPE	Only use in factory, DEFAULT:7
2	G-Y AMP	Only use in factory, DEFAULT:8
3	G-Y ANGLE	Only use in factory, DEFAULT:1
4	VIDEO. LEVEL	video output level(range : 0~7), DEFAULT:6
5	V.LEV.OFFSET	Only use in factory, DEFAULT:1
6	C.VCO.ADJ.	Not use, DEFAULT:4
7	GRAY MODE	Only use in factory, DEFAULT:0
8	VCO FREQ.	Not use, DEFAULT:31
9	VIF.SYS.SW	image intermediate frequency, DEFAULT:0 (0: 38.0M)

## (MENU15)

NO.	ITEM	REMARK
0	OVER. MOD. SW.	Over modulation adjust switch(0: turn off 1: turn on), DEFAULT: 1
1	OV. MOD. LEVEL	Over modulation adjust (range : 0~15), DEFAULT: 7
2	Y TH	Only use in factory, DEFAULT: 0
3	Y GAIN	Only use in factory, DEFAULT: 0
4	R WIDTH	Only use in factory, DEFAULT: 0
5	R OFFSET	Only use in factory, DEFAULT: 0
6	B WIDTH	Only use in factory, DEFAULT: 0
7	B OFFSET	Only use in factory, DEFAULT: 0

## (MENU16)

NO.	ITEM	REMARK
0	PRE SHOOT	Only use in factory, DEFAULT: 0
1	OVER SHOOT	Only use in factory, DEFAULT: 0
2	WPL OPE.	Only use in factory, DEFAULT: 1
3	Y GAMMA STA.	Only use in factory, DEFAULT: 0
4	DC. REST	Only use in factory, DEFAULT: 3
5	BLK. STR. STA.	Only use in factory, DEFAULT: 1
6	BLK. STR. GAIN	Only use in factory, DEFAULT: 1
7	C . TRAP TEST	Only use in factory, DEFAULT: 4
8	C . BPF TEST	Only use in factory, DEFAULT: 0

## (MENU17)

NO.	ITEM	REMARK
0	W/B BRIGHT	Only use in factory, DEFAULT: 70
1	W/B CONTRAST	Only use in factory, DEFAULT: 75
2	W/B COLOR	Only use in factory, DEFAULT: 75
3	LINE BRIGHT	Only use in factory, DEFAULT: 65
4	LINE CONTR.	Only use in factory, DEFAULT: 65
5	LINE COLOR	Only use in factory, DEFAULT: 50

## 4-3、notes:

- 1) The data in MENU1-MENU17 please set to default for work normally.
- 2) Please adjust TV according to the fact.
- 3) You need a repair RC(model: HYDFSR-N-GEO).

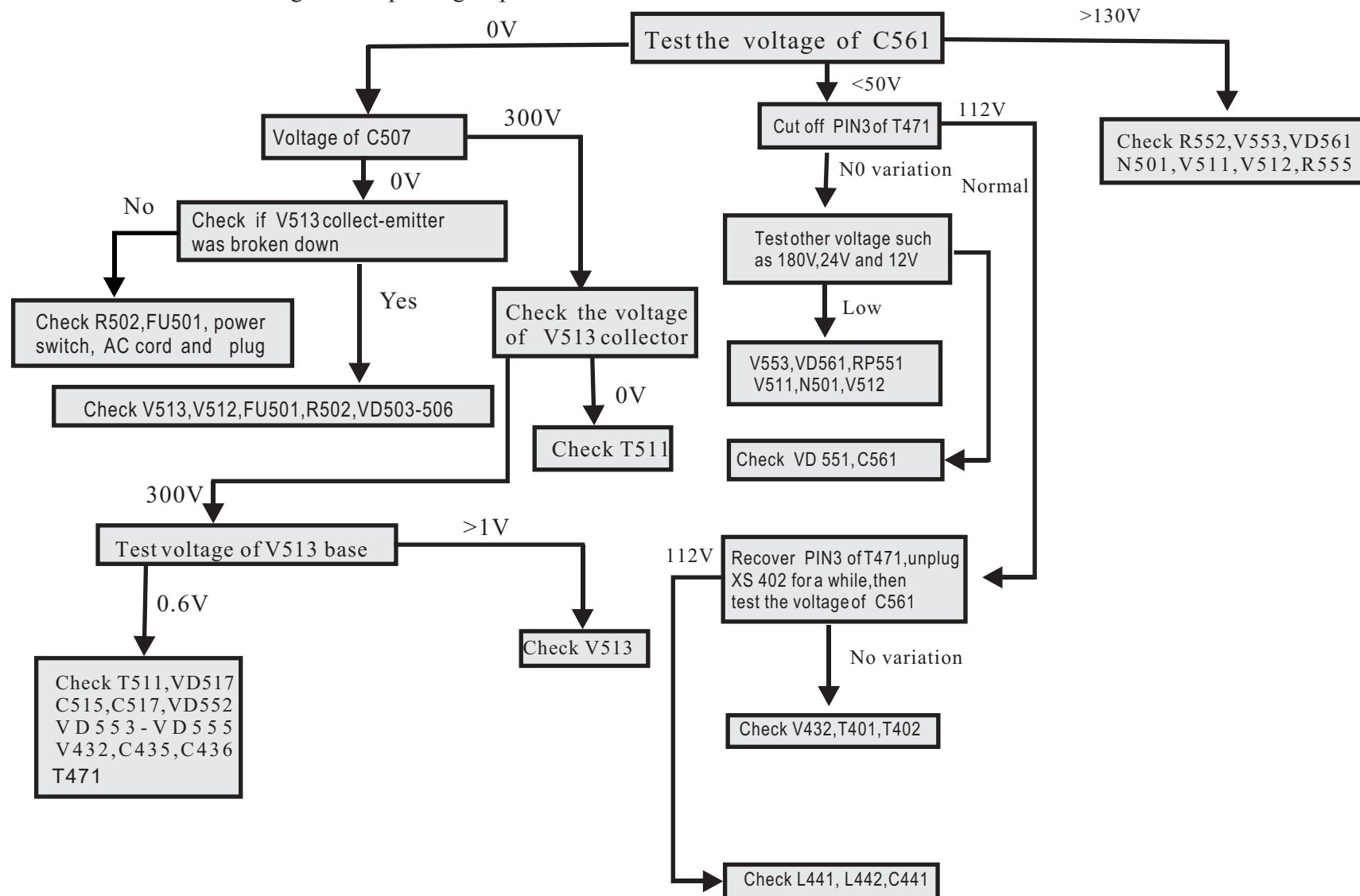


## CHAPTER FIVE Typical Failure Analyse

### A Three-None (no raster, no picture, no sound)

This failure is mainly caused by big-power circuit such as power supply, horizontal scanning, vertical scanning.

The detail checking and repairing steps are as follow.



## B Two-None (no picture, no sound)

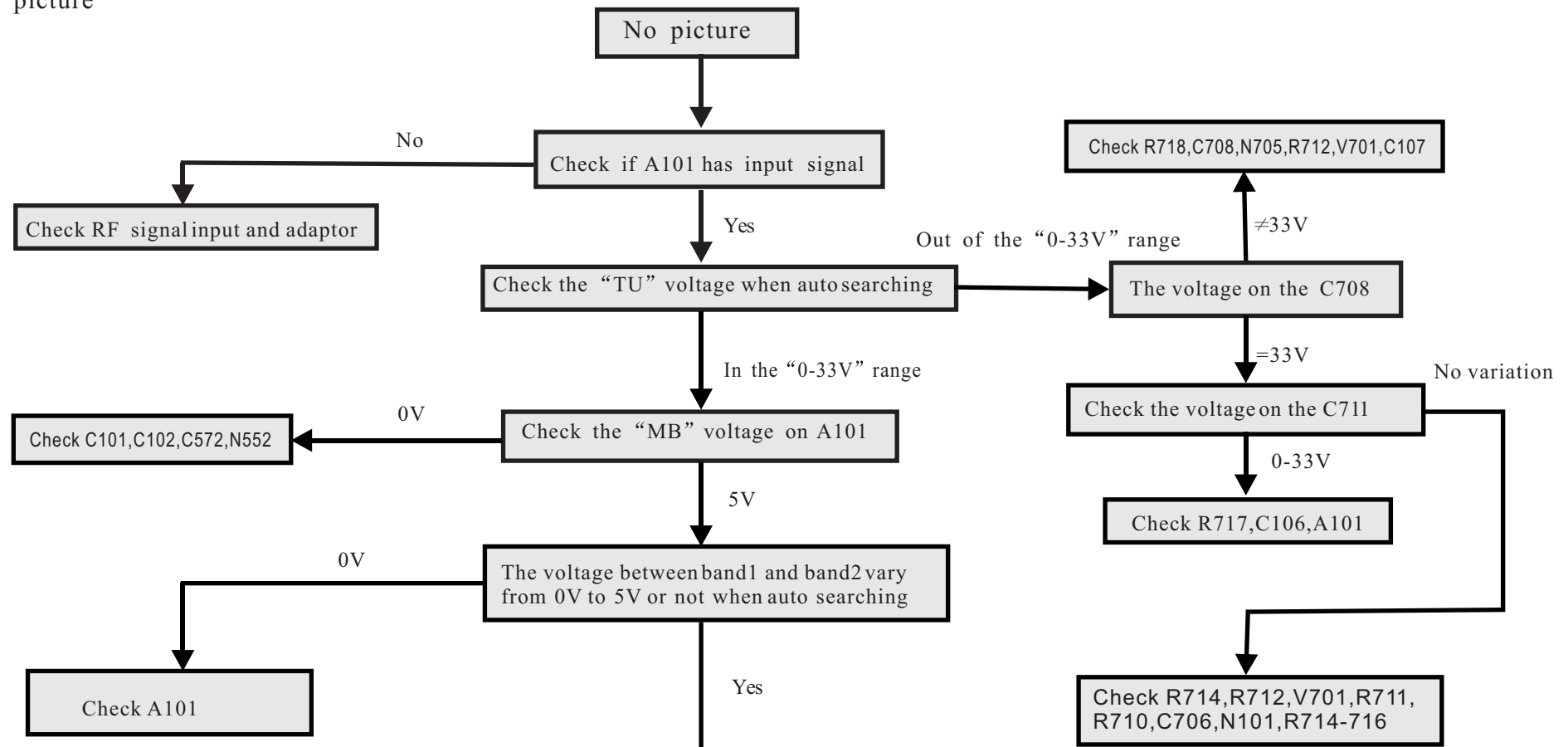
The failure shows that the set does not display the picture but it has noise wave or blue background or OSD on the screen. This means that the circuits of power supply, horizontal scanning, vertical scanning and video amplification are normal and they are not considered in the repairing. The failures are mainly in the small signal processing circuits.

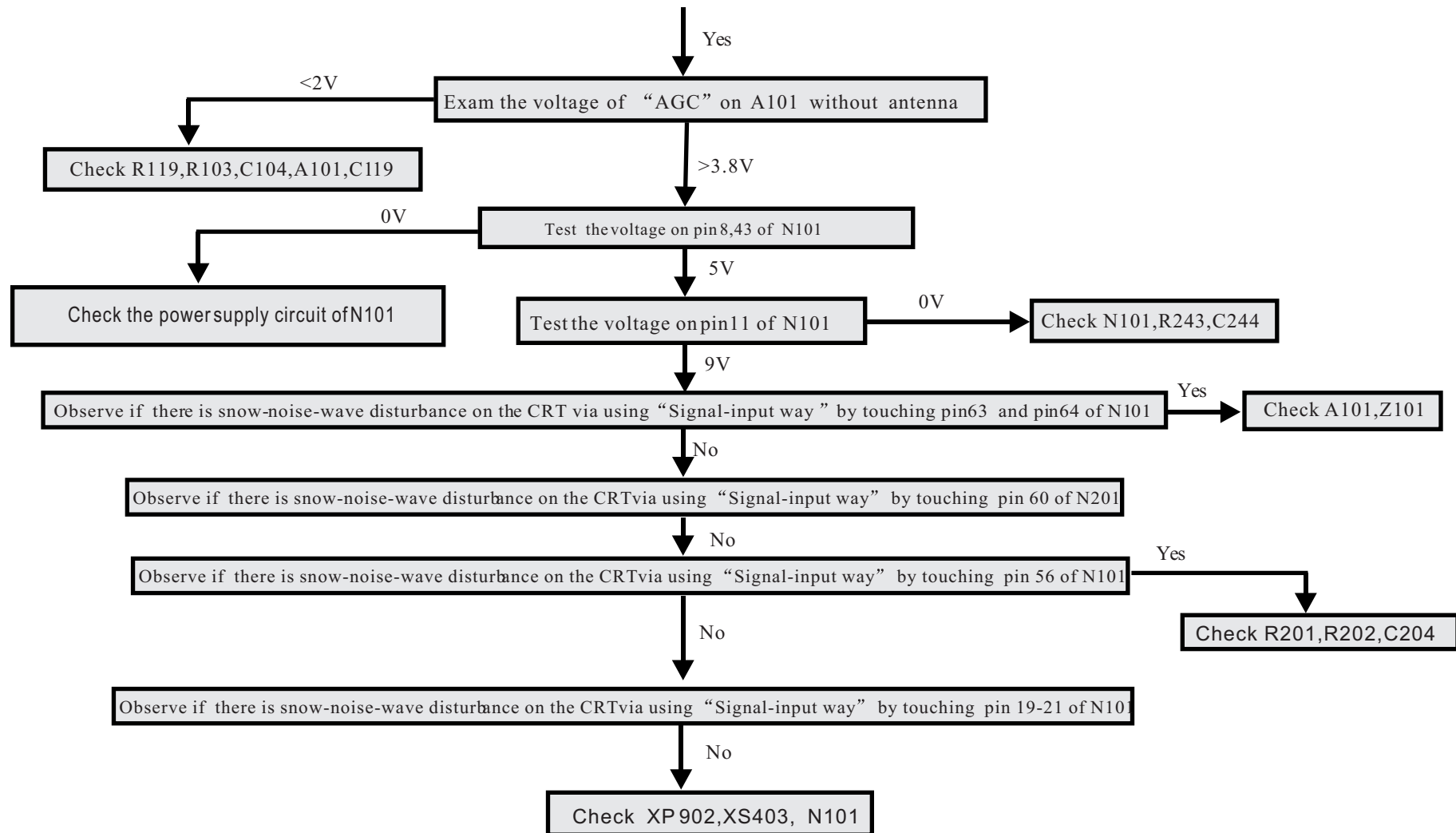
Before checking these circuits, a kind of practical test method is introduced. It is called "Signal-input way". The detail is described as follow:

We can use the resistance function of an analog multimeter, connect the red pole (negative in ohm scope) on the circuit board ground, then touch softly the test point with another pole (black pole) in ohm scope meanwhile observe the reactivity on the output device.

Note: In the TV test, we mainly observe the noise wave on the CRT and listen to the noise voice liking as "Ka....Ka" from the loudspeakers.

### 1.No picture



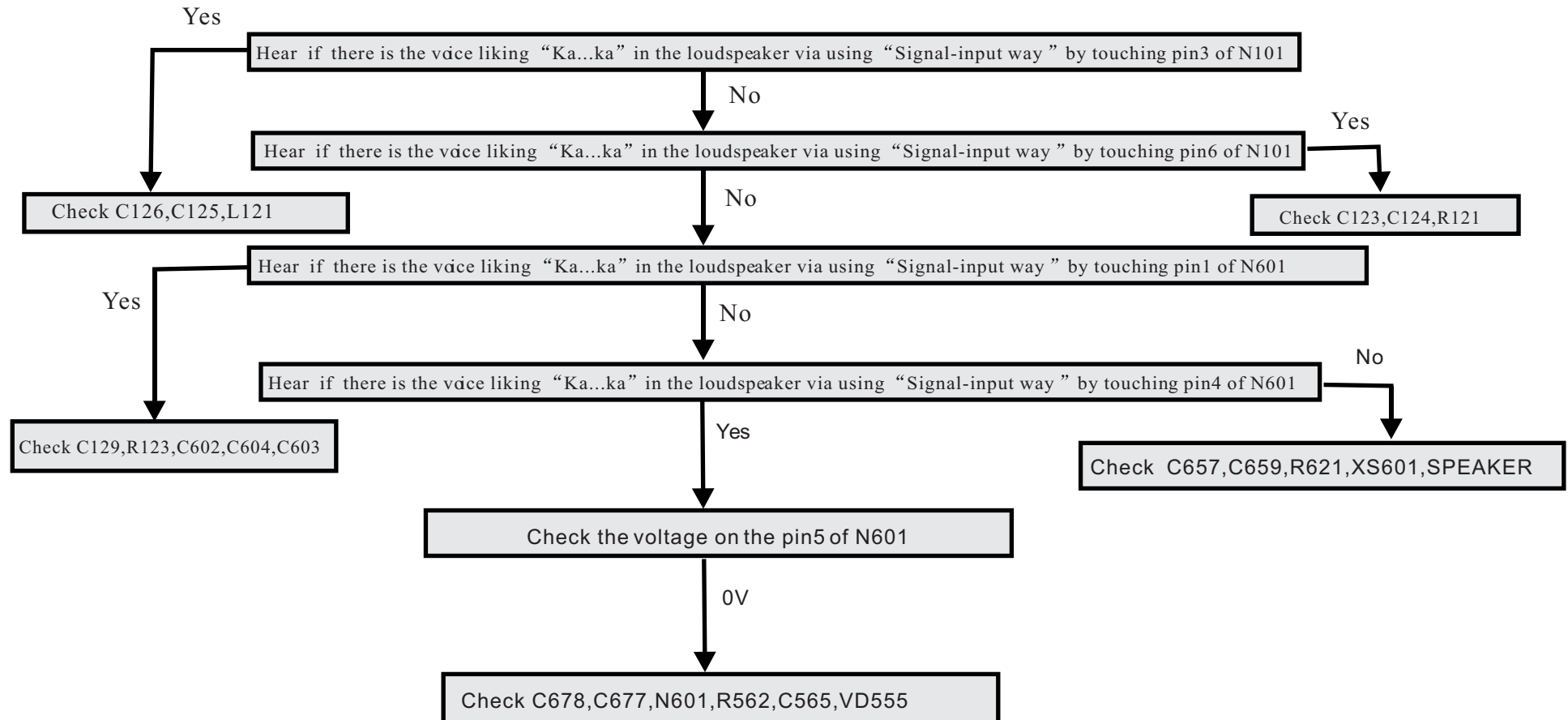


## 2. No sound

In this kind of failure ,first of all we should observe if there is the picture on the CRT .It proves the small signal circuit to work correctly with the picture on the CRT and we only check the sound signal processing and sound amplification circuit.The repairing method (B1)may be refered without picture.The detail checking and repairing steps are as follow.

Note:

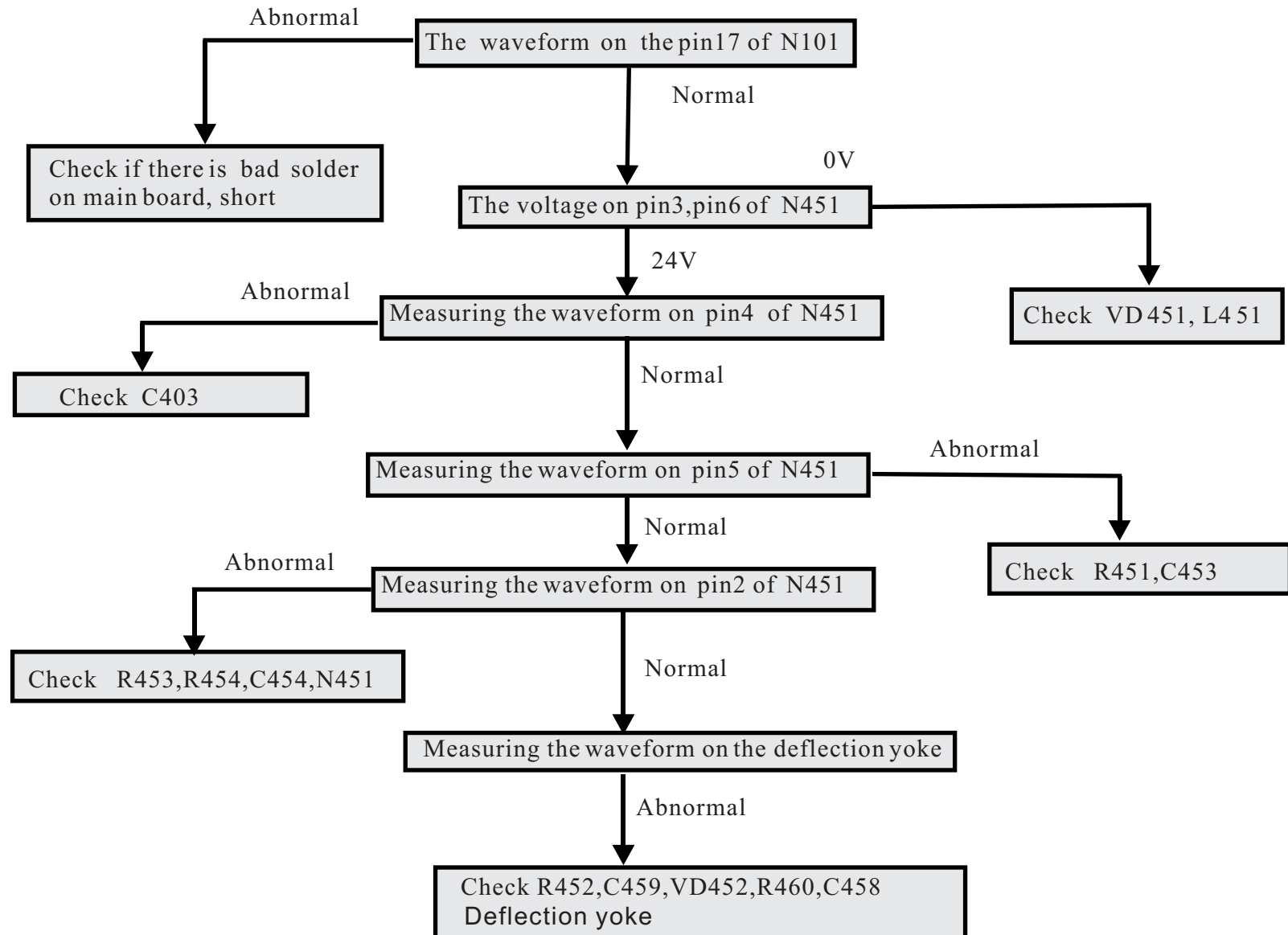
Before repairing, assure that the volume is on and the state of set is in “TV” .



C Only horizontal line in the middle of the screen:

If vertical deflection circuit does not work, this kind of failure will happen. In deflection yoke, there only has horizontal scanning beam, the electron beam in the CRT only moves in the horizontal orientation, so form this failure.

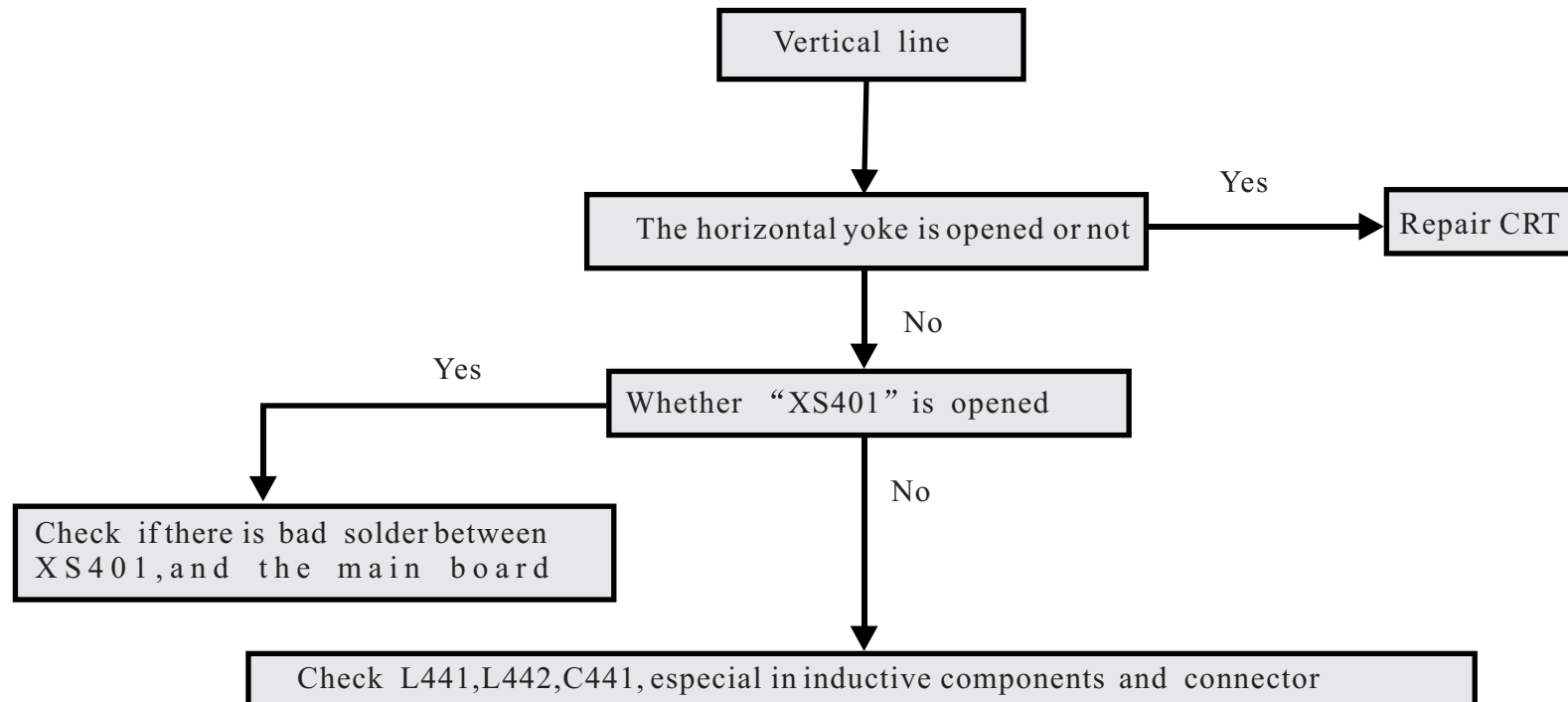
(While checking horizontal and vertical deflection circuit's failure, we have better to use an oscilloscope.)



D Only vertical line in the middle of the screen

This is a dangerous failure. It probable causes flashover and smoking inside the set. Don' t let your TV work for a long time as this failure appears.

Because the electron beam can not move in the horizontal orientation, the failure should be in the horizontal deflection circuit. We mainly check the open-circuit fault in horizontal deflection circuit. The detail checking and repairing steps are as follow:



## E Other failures analyzing:

### 1. Decaying or erratic focus or screen (G2) voltages

The fellow applies to both CRT focus voltage (which should be a few KV) and screen or G2 voltage (which should be several hundred V)

“The screen voltage will come to normal after sitting over night. 400V or so. After approximately 5 minutes or slightly longer, the screen voltage will wander anywhere from 75V up to maybe 150V, Adjustment of the screen control on the flyback has only a small effect and is not permanent. Removing the CRT pcb results in the screen voltage returning the normal”

This is very likely a short between electrodes inside the CRT unless there is something on the neck board that is breaking down as a result of some connection to the CRT. The flyback should largely not know the difference with the socket plugged into the CRT.

One possibility is that glue used to hold components down on some circuit boards has deteriorated and turned conductive. Check for tan to brown stuff shorting traces on the CRT neck board. If this is present on the focus or screen traces or wires, it may just be your problem. Scrape off all of the old glue and then clean thoroughly. Repair any damaged traces.

What happens to the HV? A HV breakdown possibly inside the CRT would result in all the voltages being dragged down.

What happens to picture?

If you connect a charged HV capacitor (guessing a couple hundred volts, a couple microfarads) between G2 and G1 or focus, you will know if tapping the neck results in a momentary short!

Here is another thing to try : put a 100M ohm or so resistor between SCREEN and the CRT socket. This should not affect the behaviour much until the failure occurs. Then , check the voltage on both sides with a high impedance voltmeter. If the CRT is arcing, it will be much lower on the CRT side and will probably fluctuate. You can play similar games with focus voltage.

### 2 Disconnecting focus wire from CRT driver board

In some cases, the focus wire-the not-so-fat wire from the flyback- may terminate directly in the CRT socket with no obvious means of freeing it should flyback replacement be needed.

One alternative is simply to cut the wire in a location that is well away from any place to short out, solder, and then do a most excellent job of insulating the splice.

However, you may find that the cap on the CRT socket snaps off using a thin knife blade or screwdriver. The wire may be soldered or just pressed in place in such a way that pulling it out is difficult or impossible without removing the cover.

### 3. No color - black and white picture

This means absolutely no color - equivalent to a black and white picture. Not even a hint of color.

First, confirm that the source is actually in color - try another channel or input device.

Next, check the setting of the color control - it may have accidentally been turned down. If your TV has some kind of automatic picture mode, try turning it off and adjusting the color control. Try adjusting fine tuning if you have such a control and the problem is with a broadcast or cable transmission.

At this point with a confirmed color signal source, there is a problem with the chroma circuitry.

Note that to the average person, the obvious question becomes: is my color picture tube bad? The answer is a definitive NO. It is virtually impossible for a defective CRT to cause a total loss of color. A defective CRT can cause a lack of a primary color - R, G, or, B or a short between two colors which will mess up the color but is not likely to result in a black and white picture.

Some possibilities in no particular order:

1. Weak signal or defect in tuner/IF causing loss of signal strength.
2. Color killer set too high (internal control) if it has one.
3. Defective part around the chroma chip/circuit. Faulty color oscillator.
4. Bad connection in area of chroma chip/circuit.
5. Defective chroma chip (do not suspect this first just because it is probably very expensive.)

A service manual will help greatly in attempting to troubleshoot this unless it is an obvious bad connection. Try prodding the main board around the chroma chip with an insulated tool to see if you can make the color come and go.

#### 4. Brightness control has no effect

The following assume that the picture is fine but the brightness is fixed-probably at too high a level. However, there could be several interrelated problems if a common supply voltage were missing, for example, if it is a knob, then it should be varying the control grid voltage relative to the cathodes of the CRT, this is not likely to be a very complex circuit. If you do not have a schematic, I would start by tracing from the control, check continuity and solder connections. Check the control itself for proper operation with an ohmmeter. A power supply going to one side of the control (negative probably) may be missing. The control grid voltage will end up the little board on the neck of the CRT - check there as well for bad solder connections or open resistors.

If brightness is a digital control, then you will need a schematic unless there is an obvious bad connection.



## MAIN BOARD

