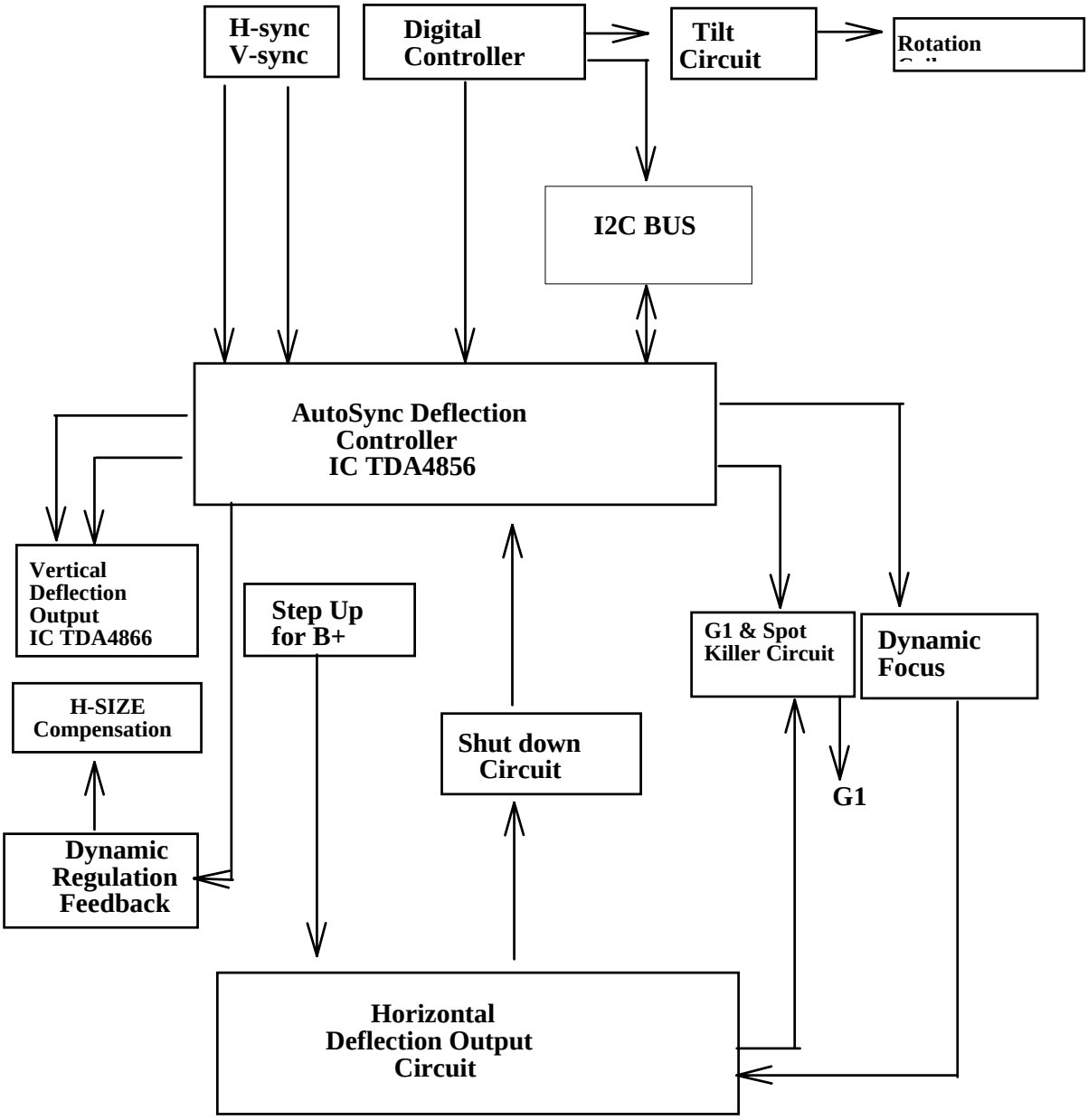
ACER V772 DEFLECTION CIRCUIT OPERATION THEORY

1. The Block Diagram of Deflection:



2. Autosync Deflection Controller (TDA4856)

2.1 pin 1 is AFC feedback.
2.2 pin XRAY: if V XRAY > threshold (6.25V typical) switches the whole IC into protection mode.
2.3 pin 3,4,5,6,8 for B+ control function block.
2.4 pin 11(EWDRV) is a parabolic waveform used for pincushion correction
2.5 pin 16 generates video claming & blanking pulse.
2.6 pin 18,19 is I2C data.
2.7 pin 21 V-regulation.
2.8 the resistor from pin 28 (HREF) to ground determines the maximum oscillator frequency.
2.9 the resistor from pin 27 (HBUF) to pin 28 defines the frequency range.
2.10 pin 31 H-regulation.
2.11 pin 32 focus.

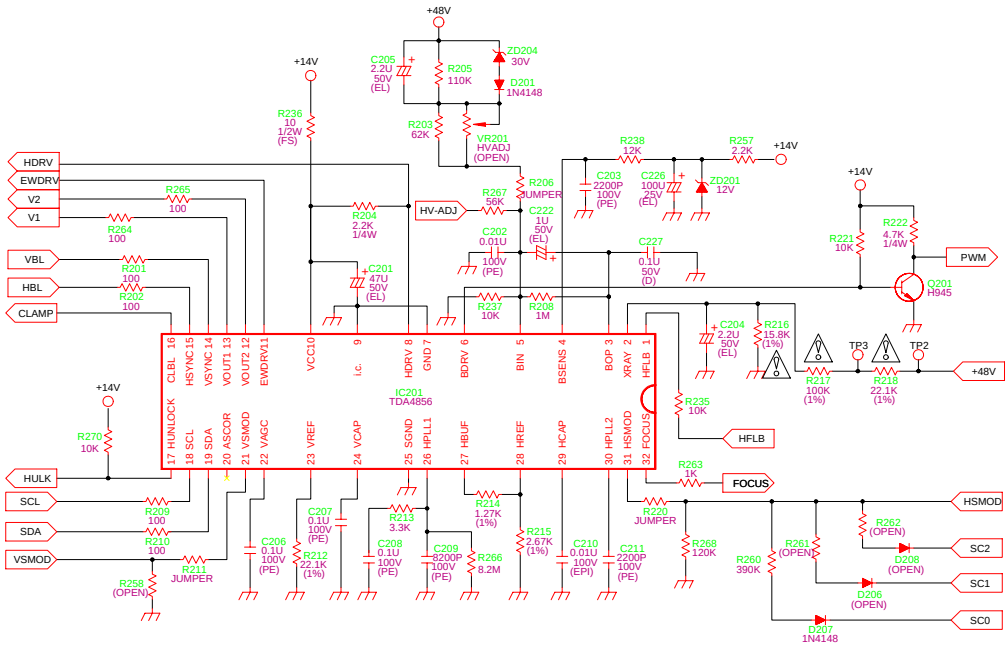


Fig 2 Autosync Deflection Controller circuit

3. H-Driver & Output CKT:

3.1 HDRV signal comes from IC201 pin8, then goes into Q301, Q301 constitutes an inverting stage and combines with T302 to drive Q302.
3.2 Q302, C306, C309, D305 constitute the H-output CKT with diode modulator mode.
3.3 Q324 & Q325 constitute a switch for lower frequency driver switching to cover the low h_{fe} HOT running under low frequency will occur poor-drive condition.

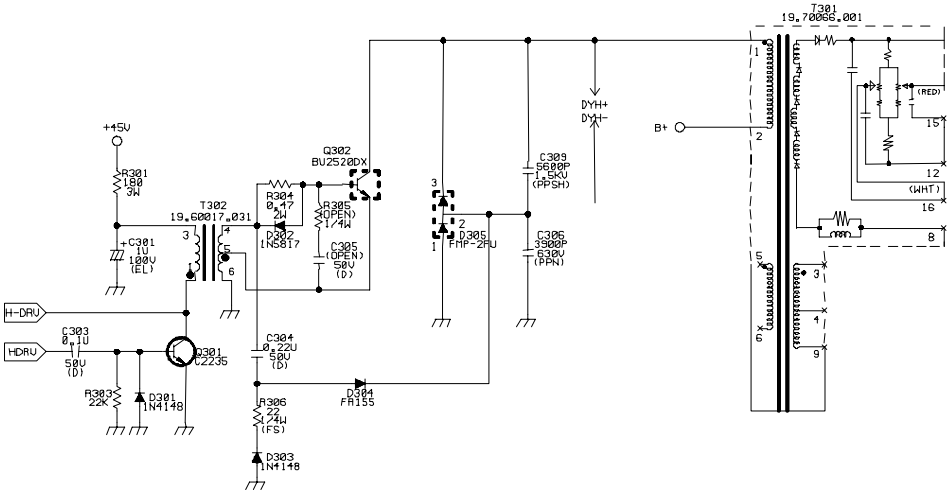


Fig 3 HDRV & output circuit

4. Dynamic focus CKT

According to the CRT spec

H dynamic focus Vpp = 300 V

V dynamic focus Vpp = 130 V

4-1 Vertical dynamic focus

The signal from IC201 (pin 32) is a vertical frequency parabolic waveform.

Q321: an inverting amplifier stage.

4-2 Horizontal dynamic focus:

The waveform of C313 (CS-2, CS-1) is a horizontal frequency parabolic waveform, and is amplified by T304.

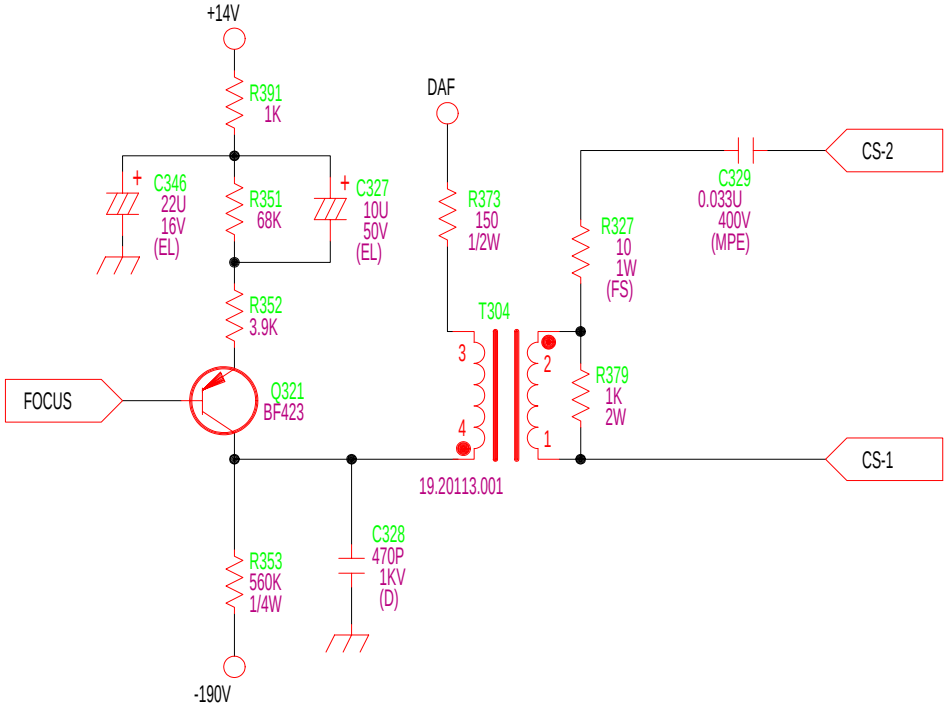


Fig 4 Dynamic Focus circuit

5. Brightness & spot killer CKT.

5.1 G1 CKT

The bright control signal from UC controller is about 0 ~ 5V, when the voltage of bright control signal decreases, the current flow through R241 increases and the voltage of G1 increases.

5.2 Blanking CKT

To avoid the disturbed picture display on the screen, we have to blank the monitor in the following situations.

(1) when display mode is changed.

(2) when the monitor enter the power saving mode.

(3) blank the vertical retrace line

when the " blank" signal becomes "high" Q208 "ON" , Q203 "OFF".G1 voltage is about (-190 * R271/(R271+R241)) -184V. The signal which is IC201 (pin 16) is inverted and amplified by Q202, and coupling to G1.During the vertical retrace interval , the G1 voltage will be drop down about 48V.

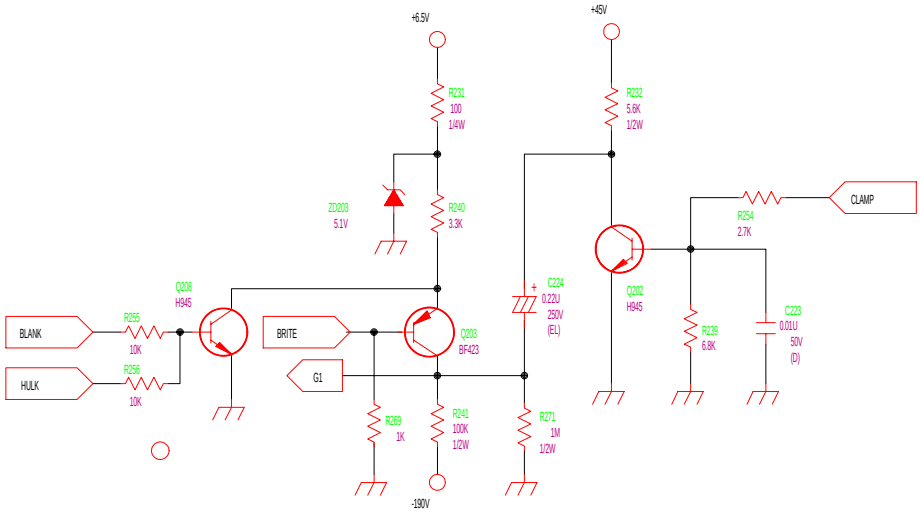


Fig5 Brightness & Spot killer circuit

6. BDRV and step-up CKT

6.1 The "BDRV" signal from TDA4856 pin6 is a square waveform. It is inverted and amplified by Q201, Q311 and Q312 constitute a buffer stage.

6.2 Q325, L301, D318, C323 is step-up circuit B+ = 45 * (T_{on} + T_{off}) / T_{off}.

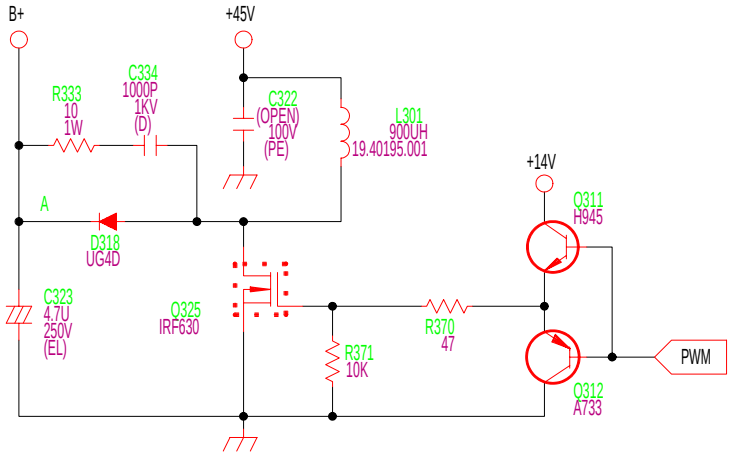


Fig 6 BDRV & Step-up circuit

7. HV Shutdown Circuit

The IC201 pin2 (XRAY) provides a voltage detector with a threshold. If the voltage at pin XRAY exceeds this threshold (6.25v typical) the pins HDRV, BDRV, VOUT1 and VOUT2 are floating. When anode voltage increases, the voltage at FBT (pin3) increases, the voltage at IC201 pin2 increases. The shutdown voltage is about 28KV.

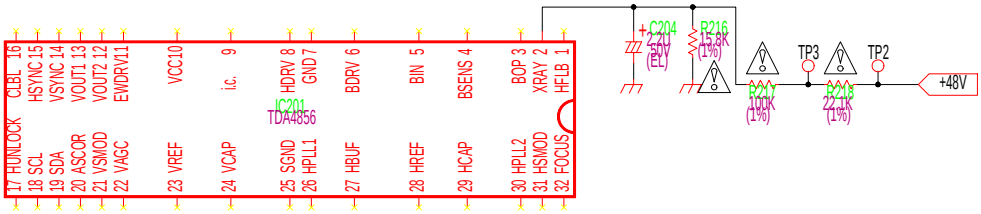


Fig 7 HV- shutdown CKT

8.Horizontal linearity CKT

V772 Cs control truth table

Frequency range	SC0	SC1	SC2	Cs Capacitor
Fh＜ 36K	0	0	0	C310+C311+C312+C313
36K＜Fh＜40K	0	0	1	C310+C311+C312
40K＜Fh＜51K	1	0	1	C310+C312
51K＜Fh＜62K	1	0	1	C310+C312
62K＜Fh＜72K	1	1	1	C310

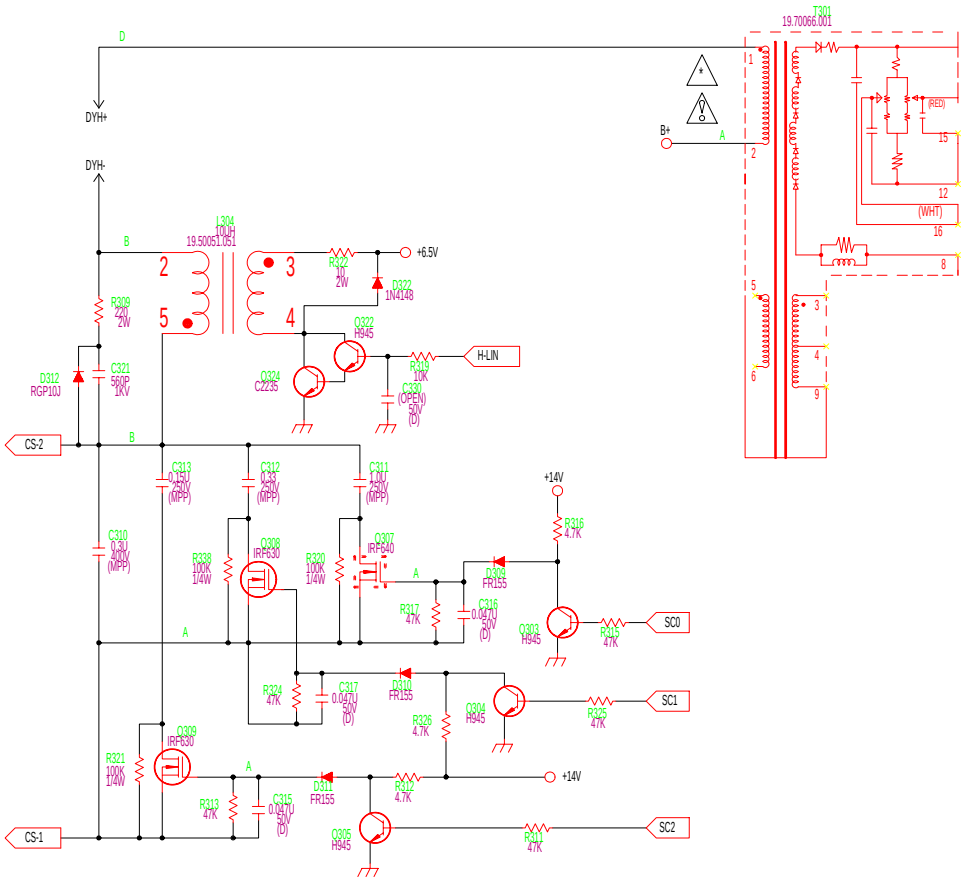


Fig 8 Linear circuit

9. ABL CIRCUIT

When the beam current is over the limited current, the ABL circuit will pull down the voltage of the video preamp (pin 10) to reduce the gain of video amplifier.

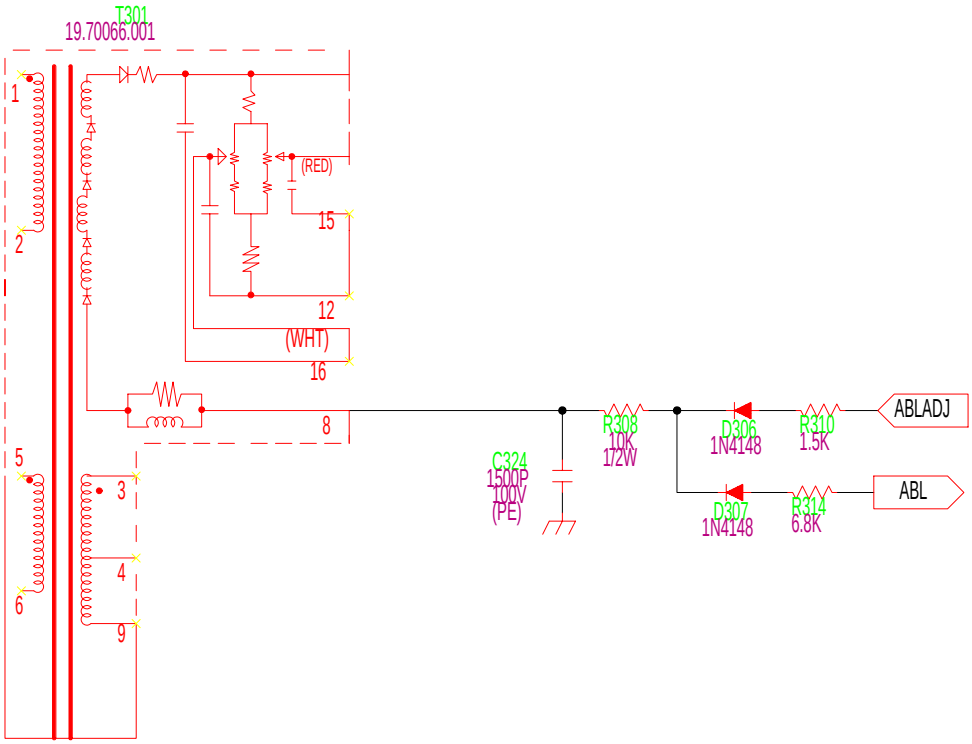


Fig 9 ABL circuit

10. TILT CKT

We can rotate raster clockwise or counterclockwise by changing the direction of the current flow through the tilt coil.

When the voltage of MP202 (pin3) is larger than 8V, the current flows from Q205 to Tilt coil, other wise, the current flows from tilt coil to Q206

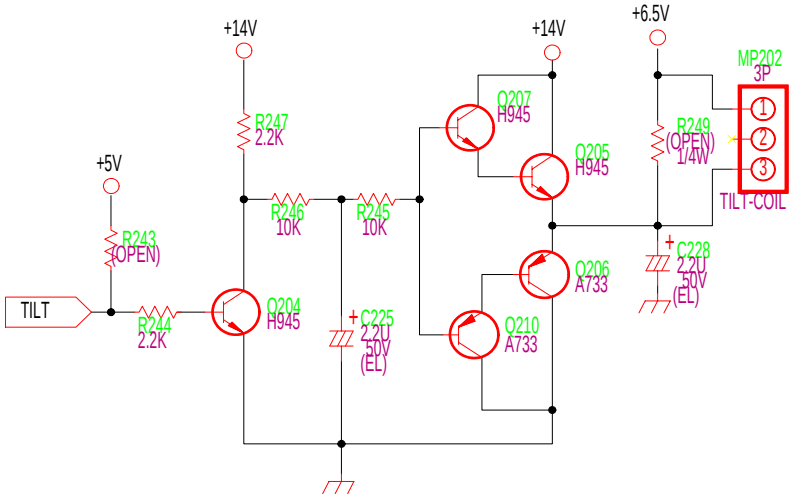


Fig 10 TILT circuit

11. Vertical Output Circuit

This vertical driver IC circuit is a half bridge configuration
The signals from TDA4856 OSC IC to TDA4863AJ

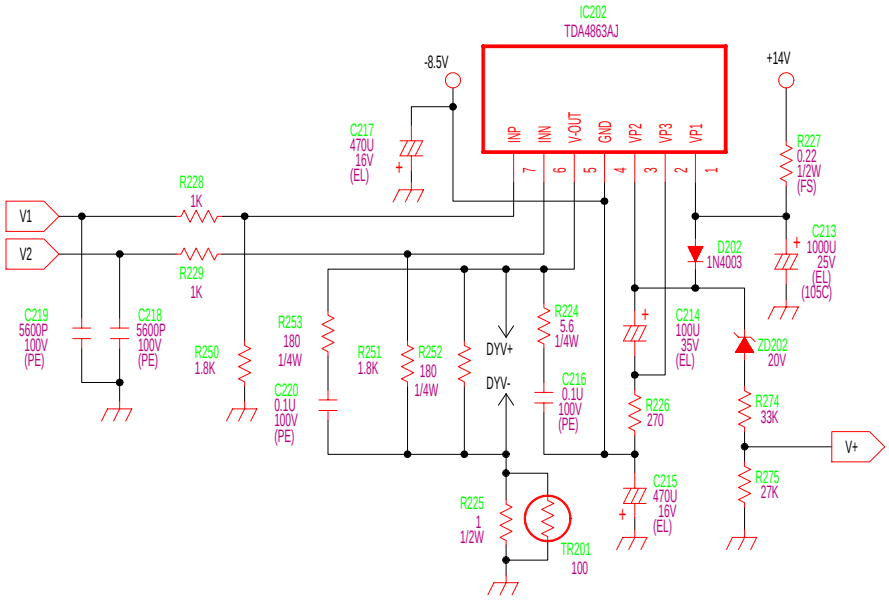


Fig11 Vertical output circuit

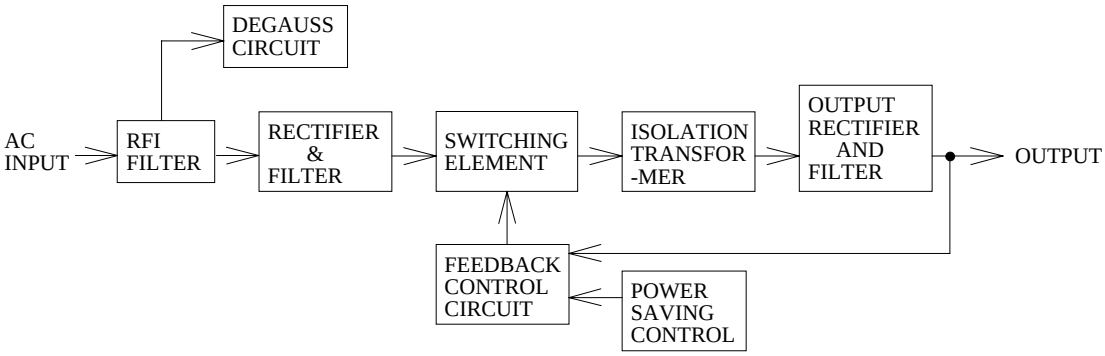
Switching Power Supply Operation Theory

1. General Specification

Input Voltage: 90~264VAC (FULL RANGE)
Input Frequency: 47~63Hz
Output Requirement: Dc Output

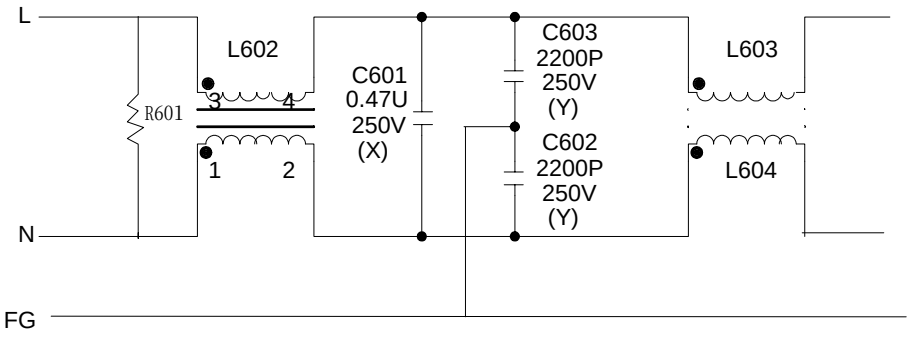
+6V
+13V
+78V
+45V
-10V

2. Block Diagram



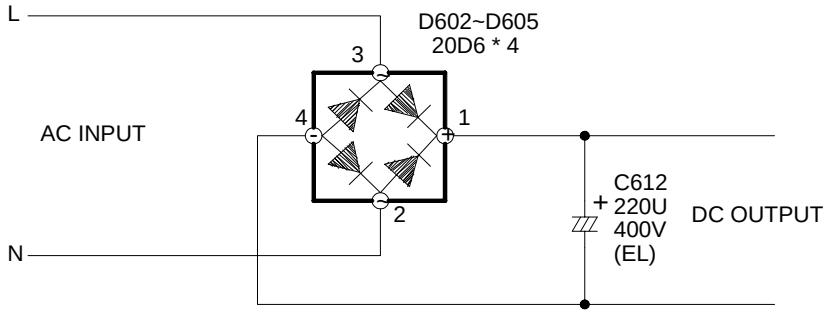
3. Circuit Operation Theorem

3.1 RFI FILTER



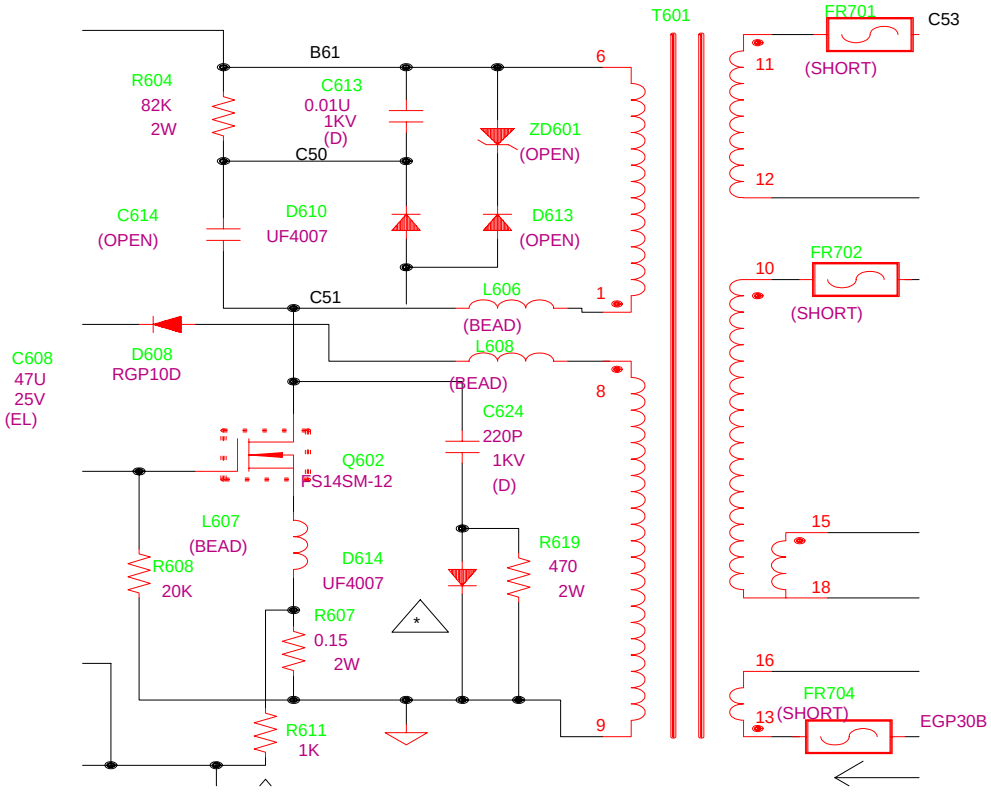
This circuit designed to inhibit electric and magnetic interference for meet FCC, VDE, VCCI standard requirements.

3.2 Rectifier and filter



When power switch is turn on, the AC voltage is Rectifier and filter by D603~D606, C612. The DC output voltage will be 1.4*(ac input)

3.3 switching Element and isolation transformer

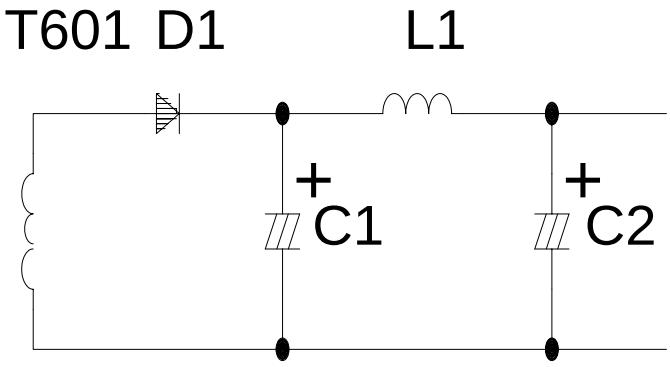


In a flyback converter operated in the discontinuous mode, the energy stored in the flyback transformer(actually an inductor) must be zero at the beginning and end of each switching period.
During the "ON" time, energy taken from the input is stored in the transformer when

the switching transistor turn-off, this stored energy is all delivered to the output.

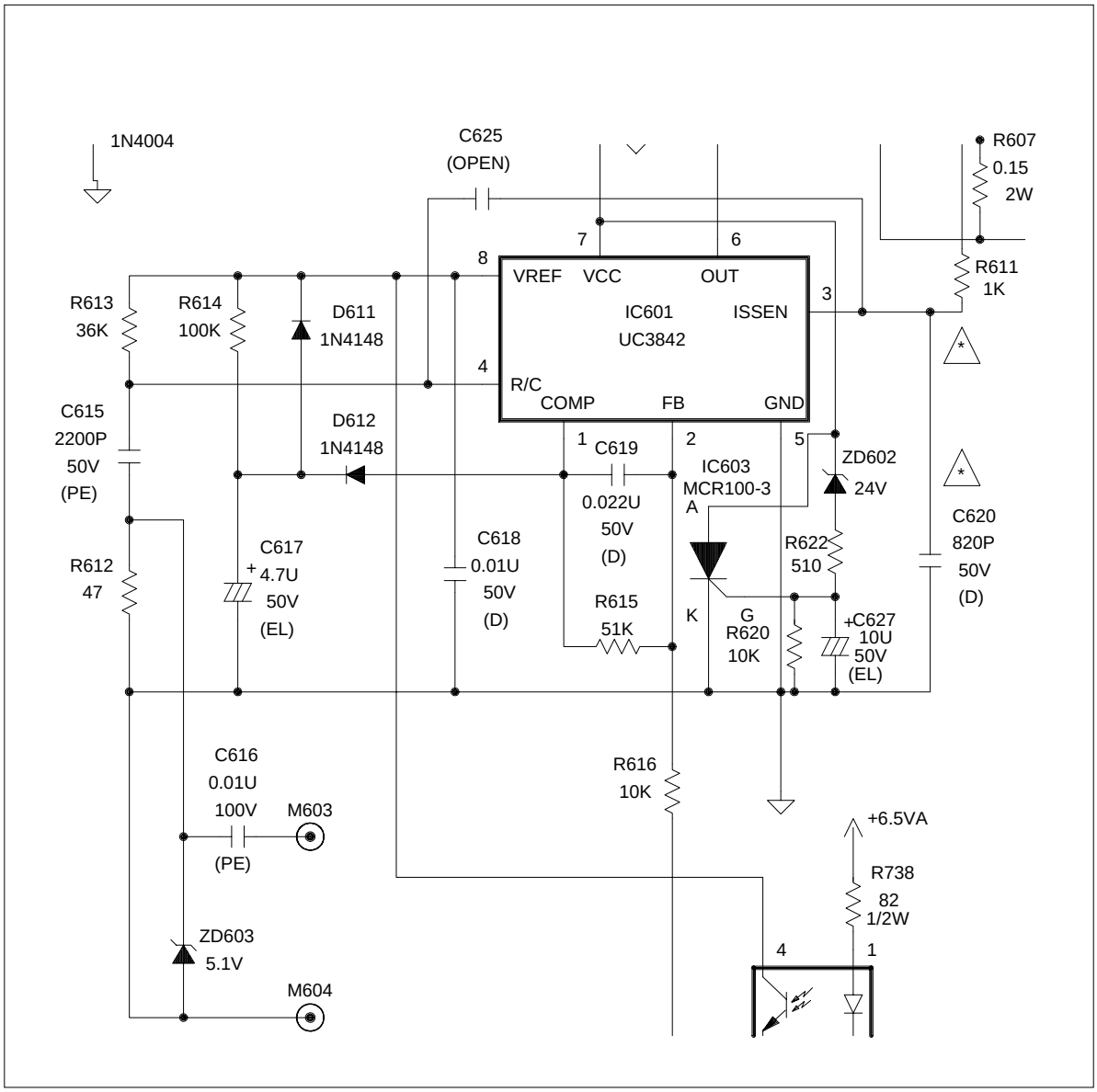
3.4 Output Rectifier and filter

The structure of each output is illustrated as below



since the transformer T601 acts as a storing energy inductance, diode D1 and capacitor C1 are to produce a dc output and additional L1, C2 to suppress high-frequency switching spikes.

3.5 Control circuit



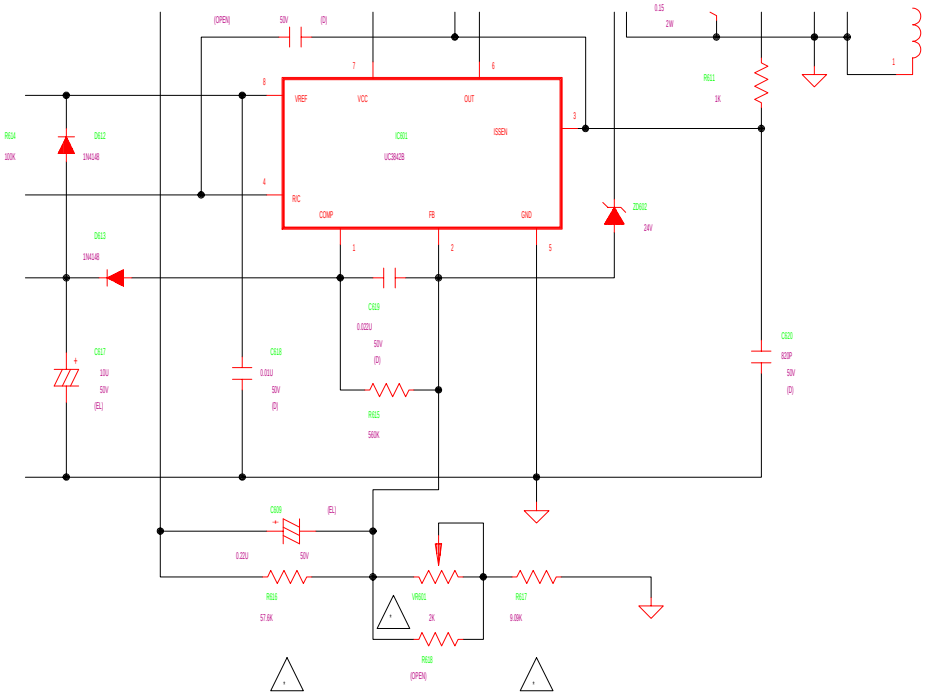
The current mode control IC UC3842 is used in the switching power supply which function of each pin
described as follows.

pin 1 : Error amplifier output
pin 2 : Error amplifier reverse input
pin 3 : Current sense
pin 4 : OSC sawtooth
pin 5 : Ground
pin 6 : Output
pin 7 : VCC
pin 8 : Reference Voltage:5V

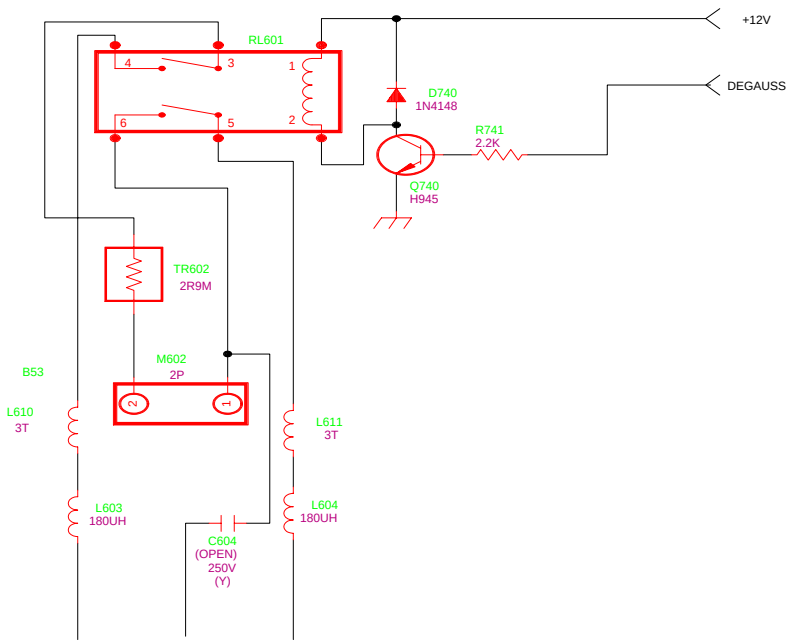
When power is initially applied to the circuit, capacitor C626 charges through R624, R623, ZD601. When the voltage across C607 reaches a level of 16V, IC601 is turn-on the +5Vdc will be set up at pin8 then R613, C615 generate a fixed frequency sawtooth wave to pin4, at this time MOSFET will be driver by pin6 with square wave the pulse width of square wave is decided by pin2, pin3 is current feedback control, It will to sense MOSFET current. The D613, D612, R614, C617 are soft start components to avoid the duty too large when power starts up.

3.6 Feedback circuit

This power supply is a primary feedback circuit. It used IC601 for voltage regulation , The output voltage differential signal will be detected and sensed to the pin2 of UC3842 for comparison then the duty cycle of MOSFET will be decided to control the output voltage.



3.7 DEGAUSS CIRCUIT



This circuit has the function of auto degaussing and manual degaussing. When power supply is switched ON it is auto degaussing stage. When user make the selection of the manual degaussing function in OSD, the degaussing current will flow through coil to degauss the screen of monitor. TR602 is a PTCR to control degaussing coil current

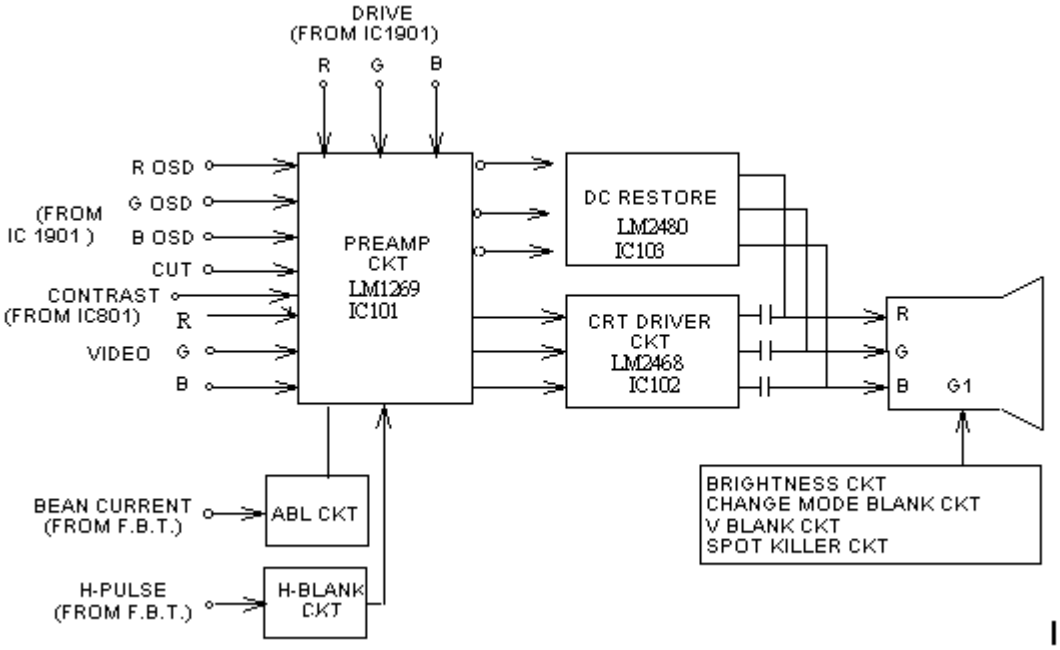
3.8 power saving control

Mode	H-sync	V-sync	LED	Power Rating
Normal	Normal	Normal	Green	100％
Stand-by	None	Normal	Amber	≦ 5W
Suspend	Normal	None	Amber	≦ 5W
Off	None	None	Amber	≦ 5W

When both of the H-sync and V-sync are none, the power supply +14v output will be cut-off. The power input will be under 5W.
When the H-sync or V-sync is none, the power supply +14v output will be cut-off. The power input will be under 5W.

30. Video CKT

V772 VIDEO C.K.T. BLOCK DIAGRAM：



31. OSD Preamp CKT:

(a) AS shown in the block diagram:
The R/G/B signals will generate an enough amplitude of Vpp to show up on the CRT screen after the amplification of two amplifiers. The first one, preamp CKT, process the signal and mix up the OSD, and the second one does the power amplification.

(b) OSD preamp IC101, LM1269, will output the R.G.B signals separated. The R.G, B driver will control the gain of these three guns individually to approach the white balance of CRT.

(c) The signal H-Blank is to let the output of LM1269 down to 0.2V while non-display duration. Then the CRT driver CKT will generate a level higher than Black Level. (i.e. SYNC TIP), therefore the video signal will be blanked in order to prevent the fold over to occure while adjusting H-phase. Besides, the SYNC TIP is used for the DC Restoration of cascode CKT.

(d) LM1269 is equipped with OSD mixer, when signal CUT is Low, the output of LM1269 is video signal when signal CUT goes high, the output will be OSD signal.

32. CRT DRIVER CKT:

Output stage adopts CRT driver LM2468 to amplify the signal which has been recessed by LM1269 to a enough amplitude of Vpp, then display on the CRT. The IC contains three high input impedance, wide band amplifiers which directly drive the RGB cathodes of a CRT. The gain of each channel is internally set at -15 and can drive CRT capacitive loads as well as resistive loads presented by other application limited only by the package's power dissipation.

33. DC Restore CKT:

(a) The video signal amplified by the output stage is coupled to CRT by way of AC coupling. So DC restoration CKT is needed to do the white balance adjustment.

(b) This DC restoration circuit adopts SYNC TIP CLAMP, in the duration of SYNC TIP the capacitor charges, and the capacitor discharge in the other time. The Black Level is kept to the level of DC restoration set by UC.

34. ABL CKT: (Auto Brightness Limit)

ABL is a protection circuit. When the anode current goes higher than the setting value of ABL circuit. ABL will pull down the voltage of contrast to limit the anode current. This is helpful to protect CRT.

35. H-BLANK CKT:

Affair the collect pulse comes from FBT being shaped and inverted, it will be sent to preamp CKT and used as the H-Blank.

36. Brightness, V-blank, change mode blank, spot killer CKT:

(a) About the cut off voltage , while the voltage, cathode to G1 , over the cut off , voltage, the picture will disappear, If cut off voltage of the CRT is set at 110V and the black level of cathode is 60v, the picture won't show, the signals higher the black level once the G1 voltage is lower than-50v.

(b) As described above, we may using the voltage control G1 as the brightness control. Generally the G1 control range is about 10~15V if the raster brightness is form 0 to 0.8 ft-L.

(c) Similarly, we may overlap a negative pulse of vertical duration on the G1 voltage to prevent the vertical retrace line from showing on the picture , This is to keep the voltage cathode to G1 over the cut off voltage during the period of vertical retrace.

(d) In order to avoid the picture occur transiently while change mode, pull down the G1 voltage and let the voltage cathode to G1 over CUT OFF voltage. This will make the picture blanking.

(e) While monitor turned off , the discharge speed of high voltage circuit is slow since there is no deflection scan act on the electronic beam, a spot which will destroy the phosphor of CRT. So the SPOT KILLER circuit will generate a negative voltage higher than CUT OFF to the G1 to beam this is to protect the CRT.

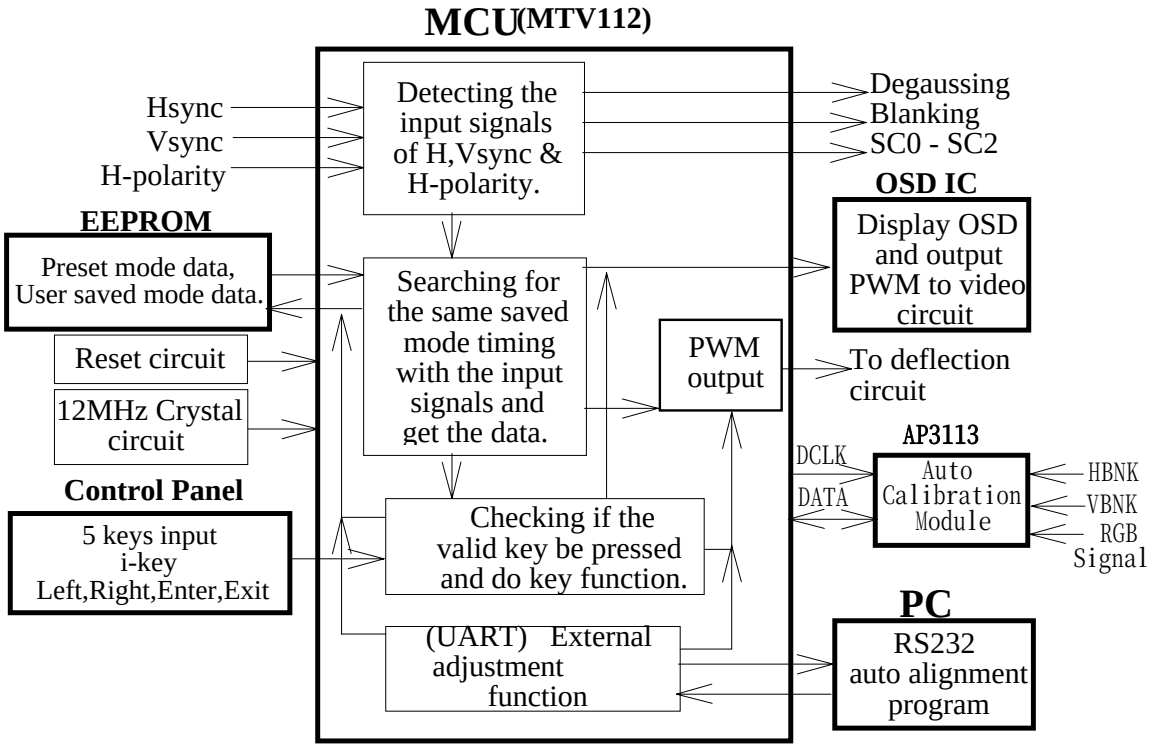
ACER V772 MICROCONTROLLER CIRCUIT OPERATION THEORY

1. **Introduction:**

This model, V772, will support powerful OSD function to help end user fine adjustment. The Microcontroller circuit of the V772 can determine what mode it is by detecting the frequency of horizontal and vertical synchronous and the polarity of horizontal synchronous, and provide DC voltages to control the picture and save the adjusted value into the EEPROM by using the OSD, "On Screen Display control", that means the user can get any information of the picture display or adjust it and save the status values into the EEPROM by choosing and pressing the proper key according to the indication of the OSD. In addition, user can press i-key to do auto-calibration.

2. **Block diagram :**

The major parts of V772 Microcontroller circuit are MCU, EEPROM, OSD IC, and Auto Calibration Module. The circuit block diagram is shown as below.



3.MCU and the peripheral circuit operation theory:

3-1.MCU function:

The MCU is MTV112, it is an 87C51 with PWM output controlled microcontroller, after power on, the reset circuit output a "High" to "Low" signal (>40mS) and the 12MHz crystal oscillated circuit working, the MCU begin to manages the following functions,

(1) To detect mode and output proper SC0, SC1 and SC2 to deflection circuit.

(2) To check if there is the same saved mode in the EEPROM and get the data to transfer into DC voltages by PWM output and RC filter circuits to control the picture, color, contrast and brightness.

(3) To check if there is the valid key be pressed and do the key function.

(4) To memorize mode timings and any adjustable parameters of the picture into EEPROM.

(5) To output data to OSD IC for making an "on screen display control" menu.

(6) The inner registers and PWM output of MCU can be controlled by the external PC alignment program.

(7) To calibrate the size, position, and geometry of the picture by pressing i-key. It will be placed right size and position.

3-2.How to detect mode timing:

Only when the mode timing input is stable, we can adjust the picture and check the horizontal and vertical sync frequency by the OSD menu, and the mode timing input mean the horizontal sync signal and the vertical sync signal.

(1) The vertical sync frequency measurement:

We use the base timer, it can generate a count during a fixed time, this fixed time is 12/12MHz and we call it "Time base", so when the first vertical sync generated, we enable the base timer, and the next vertical sync generated, we disable the base timer, and we only need to calculate how many counts are during a vertical sync period. The formula is

Vertical sync frequency
= FV
= 1 / Vertical sync period
= 1 / [Counts * (Time base)]
==> **Vertical sync frequency = 1000000 / Counts**

(2) The horizontal sync frequency measurement:

We use the event counter for calculating how many counts are during a long fixed time, because the vertical sync period is longer than the horizontal sync period, we can enable the event counter when the first vertical sync generated and disable the event counter when the next vertical sync generated, this time, we can get the horizontal sync counts during a vertical sync period.

The formula is Horizontal sync frequency
= FH
= Horizontal sync counts / Vertical sync period
==> **Horizontal sync frequency**
= Horizontal sync Counts / Vertical sync period

3-3.What are the valid key functions for user:

There are four keys on V772 control panel. They are "Left," "Right," "Enter," and "Exit." There are used for OSD controlling. "Enter" for entering sub-menu of main menu, "Exit" for escaping to main menu from sub-menu or leaving OSD menu, and "Left," "Right" for adjusting the bar value.

Except the OSD basic key functions, the user can only press "Right" for brightness adjustment, or "Left" for contrast adjustment.

3-4.How to memorize the timing and adjusted data:

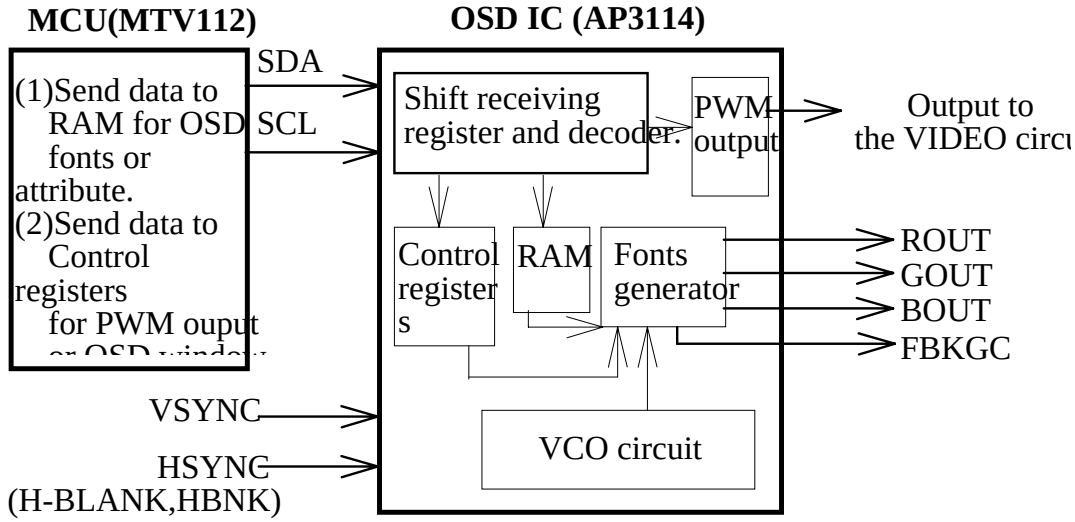
The EEPROM of V772 is 24C08, it has 1024 bytes memory size and communicates with MCU by two wires of I^2C bus, one wire is "SCL," the other is "SDA".

The MCU send clock and data to EEPROM to do "Write" function and send clock and receive data from EEPROM to do "Read" function by these two wires.

We define three parts of storage area. One is for the storage of the factory preset data, another is for saving user adjusted data, the other is for common settings area where stored the data of the OSD color temperature settings, contrast and brightness value.

3-5.How to display the OSD menu:

The OSD IC of V772 is AP3122 which is developed by vender, it receives the data of the OSD fonts and attribute what we want to display on the screen from the MCU by 2 wires of communication, and exports OSD window data and PWM volume to the VIDEO circuit, the block diagram is shown as below,



3-6.How to execute the auto alignment function:

The MCU MTV112 supports the UART function, it has 2 I/O serious ports, one is the receiver, the other is the transmitter, they are connected with an interface to PC and PC can execute alignment program by RS232 communication to send the formatted data to the MCU for adjusting any adjustable parameters of the picture and saving the adjusted values into

EEPROM. By this way, we can get the products with the same quality and reduce the manufacturing time.