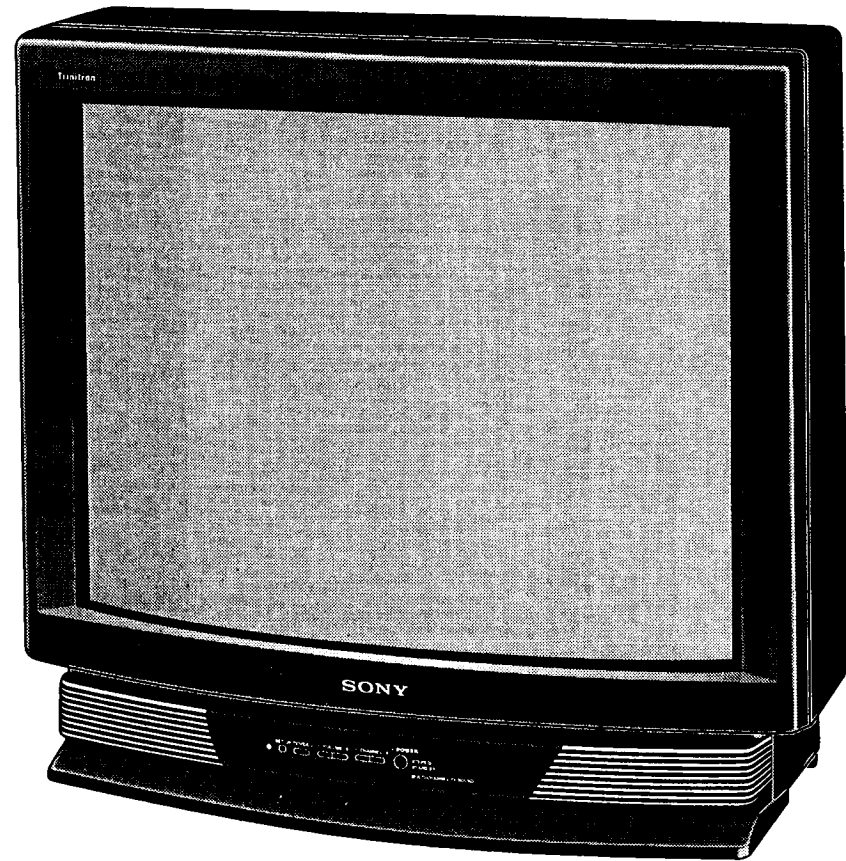


AA-1 Chassis
FN Chassis
LN-1 Chassis
ANU-2 Chassis



Troubleshooting Procedures

Course: CTV-23R1

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Introduction

In this course, troubleshooting procedures for four of Sony's television chassis presented since 1991 are outlined. They are:

1. **AA-1 Chassis.** This is a more recent chassis that is used in models such as the KV-27TS36, KV-27S10 and KV-27V15. The BA-1 and AA-2 chassis are very similar to it.
2. **FN Chassis.** Sample models are the KV-32XBR36 and KV27XBR35.
3. **LN-1 Chassis.** The KV-27TW76, KV-27TW75 and KV-32TS35 are sample models that use this chassis.
4. **ANU-2 Chassis.** This chassis is found in "EXR" models such as the KV-20EXR10, KV-20EXR20, and KV-27EXR10. The, **ANU-1** chassis is very similar to the ANU-2 chassis. Therefore, the troubleshooting techniques used for the ANU-2 chassis are applicable. Sample models that use the ANU-1 Chassis are: KV-27XBR10, KV-27XBR50, and KV-27XBR60.

A complete list of the models that use these chassis can be found in the appendix.

All the circuits in these chassis are not discussed. Only those that present the most problems, or present the most troubleshooting challenges are addressed. They are:

- The Power Supplies and Regulation circuits.
- X-Ray Protect and ABL circuits.
- AKB (IK) circuits.

Problems in these circuits are addressed in the following manner:

1. A summarized explanation of the circuit is presented.
2. Troubleshooting information in text and flowcharts.
3. Class participation in exercises called "Brains On". This is where a problem is presented and the student solves it by asking questions about circuit conditions that will help him/her identify the defective component or components.

The troubleshooting procedures suggested in this course, will definitely help a servicer successfully troubleshoot most problems in the circuits presented. However, there is always that problem that experience alone identifies and solves. It is hoped that the use of these procedures, and the knowledge acquired in the classroom, will have the servicer troubleshooting with the skill of experience within a short time.

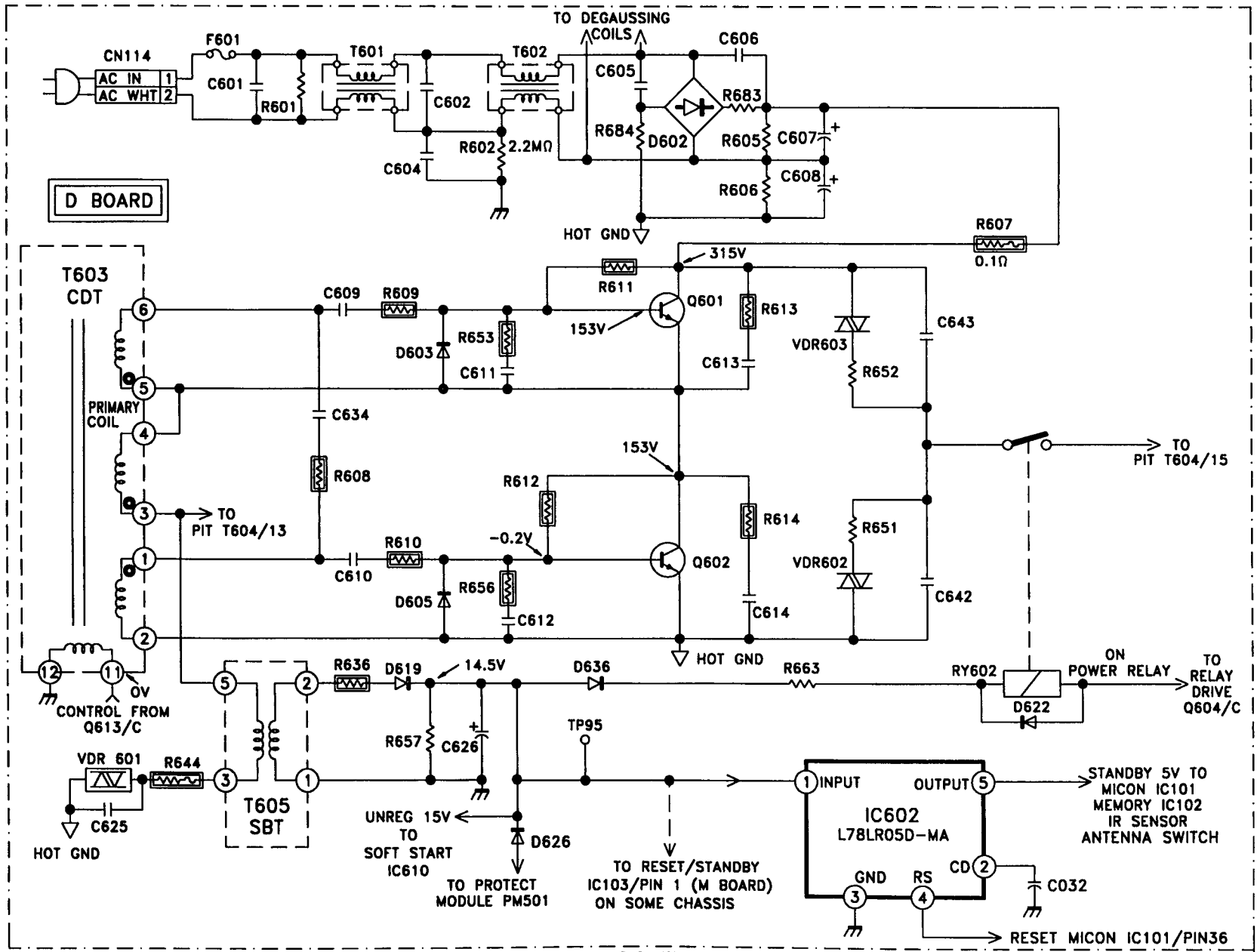
AA-1 Power Supply

Standby Power Supply.

The Standby Power circuit is activated when AC is applied to the set. (Diagram on facing page). D602, C607 and C608 produce 315VDC from the applied AC. (168V if measured from chassis ground). As this voltage increases, the power converter consisting primarily of the circuits of Q601, and Q602, Constant Drive Transformer T603, the primary of SBT T605 and C625 begins to oscillate and stabilizes at 55kHz in the Standby mode. As it oscillates, pulsating current in the primary winding of SBT T605/pins 5 and 3 are coupled to the secondary windings where they are rectified by D619 to produce the Standby 14.5V. This voltage is sent to the following circuits:

- Soft Start Circuit IC610.
- Power Relay RY602 via D636.
- Reset/Standby IC602. IC103 on the M Board in some chassis.

Reset/Standby IC602 drops the 14.5V to Standby 5V. Standby 5V is used to power the Main Micon IC101, and Memory IC102 on the M Board, the IR Sensor on the HB Board and the Antenna Switch Q415--Q418 on the U board. IC602 also provides initial reset for Main Micon IC101.

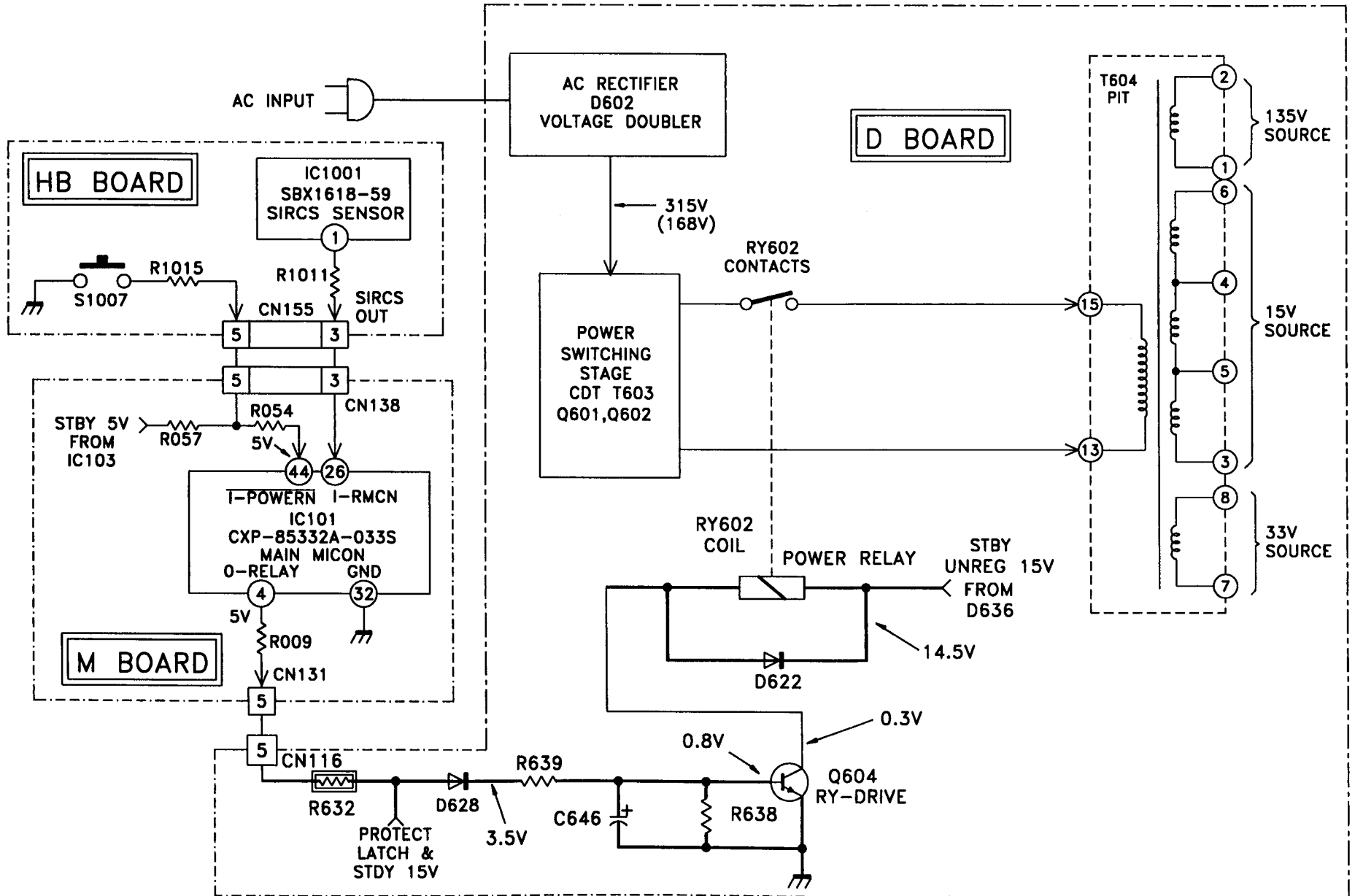


STANDBY POWER - AA-1 CHASSIS

Main Power Supply

To turn power ON, the Micon IC101, responds to a LOW from the Power ON switch S1007, or SIRCS data from the SIRCS Sensor IC1001 pin 1. IC101 pin 4 outputs a HIGH (5Vdc) to turn Relay Drive Q604 ON. With Q604 ON, RY602 closes.

When the relay contacts close, pulses from the power switching converter stage, (CDT T603, and Power Converter Transistors Q601 and Q602), are coupled to the primary winding of Power Input Transformer T604/pins 13 and 15. These pulses are inductively coupled to the secondary windings where the 135V, 15V and 33V are developed. The converter stage now oscillates at about 70Khz with a bright screen, and 73Khz with a black screen.



POWER ON - AA-1 CHASSIS

CTV23J02 386 6 12 96

Regulation and Soft Start Circuits.

Regulation

The power supply regulation circuit compensates for fluctuations in the input AC voltage, and fluctuations on the 135V supply. Regulation is accomplished in the following manner:

- 14.4V are produced at IC601/pin 3 from the 135V line input at pin 1. This voltage varies inversely with respect to the 135V line. As it varies, it controls the conduction of Q613 which is in the current path of the control winding of CDT T603/pins 11 and 12. Therefore the current in the control winding varies in step with fluctuations on the 135V supply.
- A rise in the 135V line will cause the voltage at IC601/pin 3 to decrease. This will increase the current through T603/pins 11 and 12 (control winding), effectively decreasing the transformer's inductance and increasing the oscillator's frequency. This reduces the voltages developed off the secondary of T604.
- A reduction of the 135V because of increased load has the opposite effect.

Soft Start

The soft start circuits reduce the initial current surge through the power switching converter transistors as the filter capacitors in the PIT's secondary charge up at power ON. They also prevent false triggering by the protection circuits at this time.

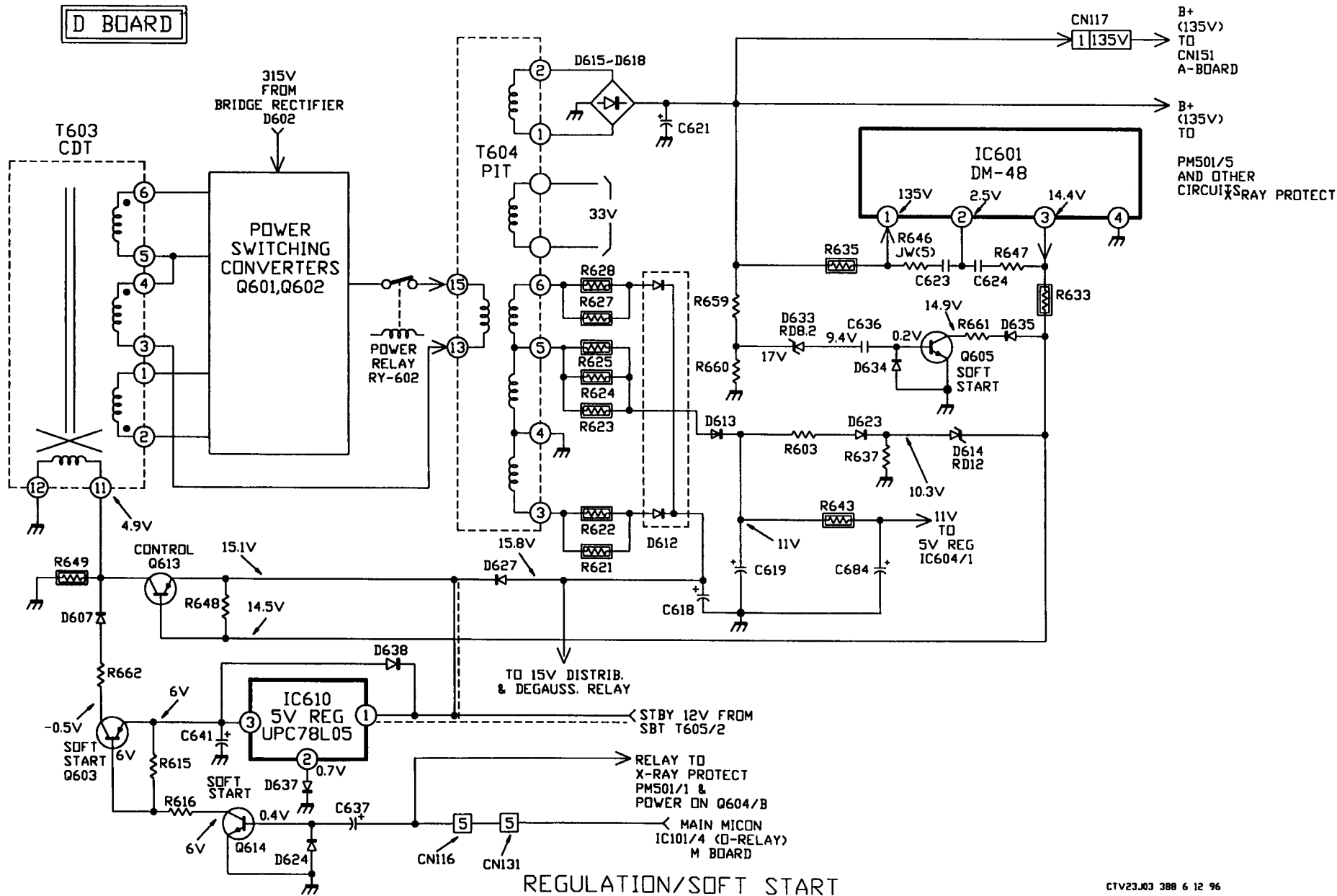
Q603, Q605, Q613, Q614, IC610, C636 and C637 comprise the main components of the soft start circuits. When power is turned ON, the Micon IC101 pin 4, outputs 5V (O- RELAY) to C637 at the base of the Soft Start Transistor Q614. Q614 turns ON for the period determined by the time constant of C637 and the Q614 base to emitter junction resistance. Q614 turns Q603 ON and allows current to flow from chassis ground through CDT T603/pins 12 and 11, to 5V Regulator IC610/pin 3.

The current flow through T603 control winding decreases its inductance. Therefore, the oscillator frequency rises and the startup secondary voltages will be reduced considerably during this time. As C637 continues to charge, Q614 and Q603 conduct less and less until shut-OFF. This causes less current to flow through the CDT control winding and decreases the oscillator's frequency, resulting in increased output voltages at PIT T604 secondary windings.

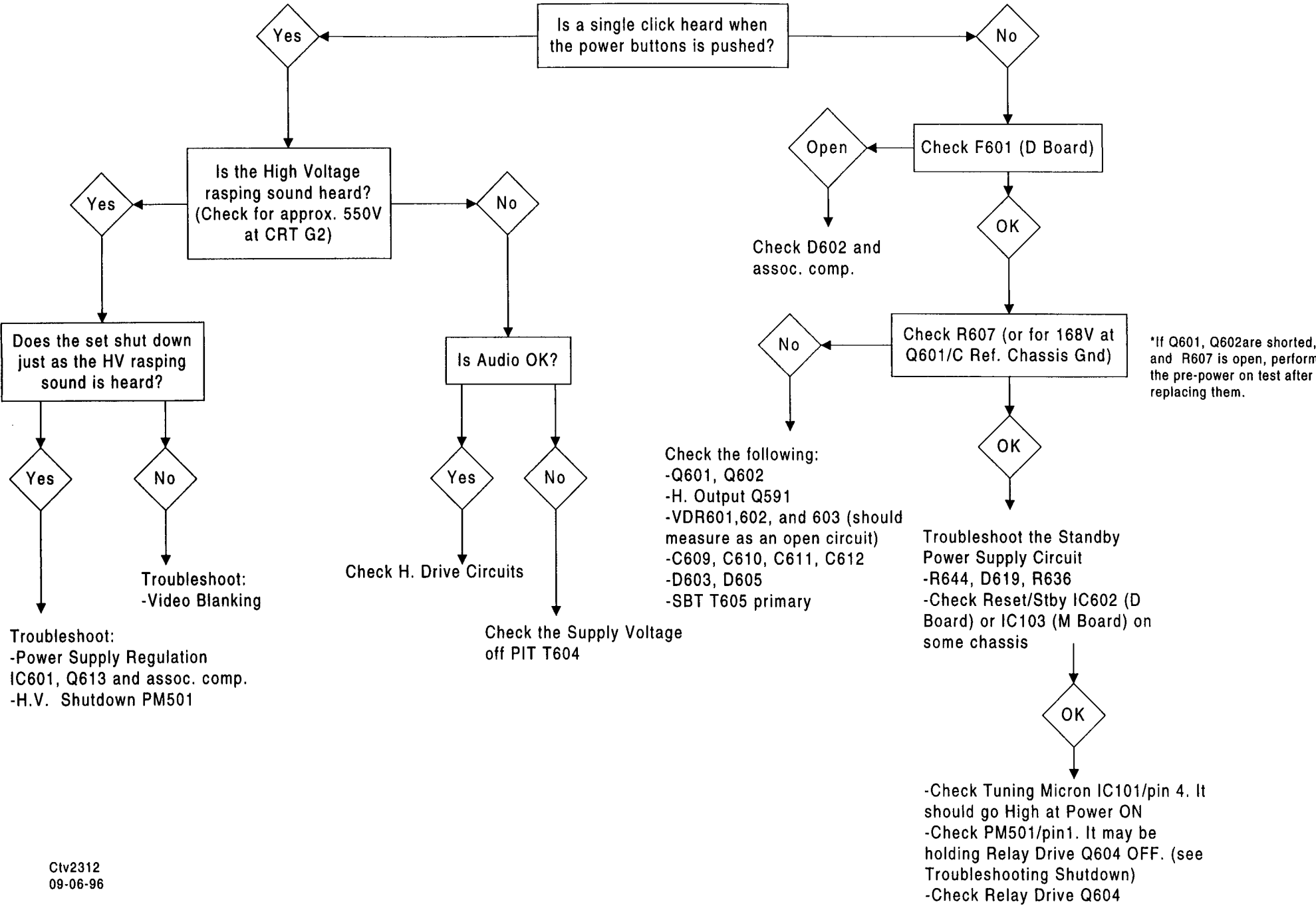
In addition to the above soft start operation, soft start is also executed by Q605 and accompanying components. Q605 is used to hold down IC601/pin 4 output which controls the conduction of Q613 until all supply voltages are up to operational levels.

As the 135V begins to rise at turn ON, it turns ON D633 which charges C636. As C636 charges, it turns Q605 ON and mutes the regulation control line via D635. During this time the voltages developed off PIT T604 are increasing to their normal levels. As C636 charges, Q605 shuts OFF and the control line rises to about 14.4V to maintain the supply voltages off T604 at their normal operational levels.

D BOARD



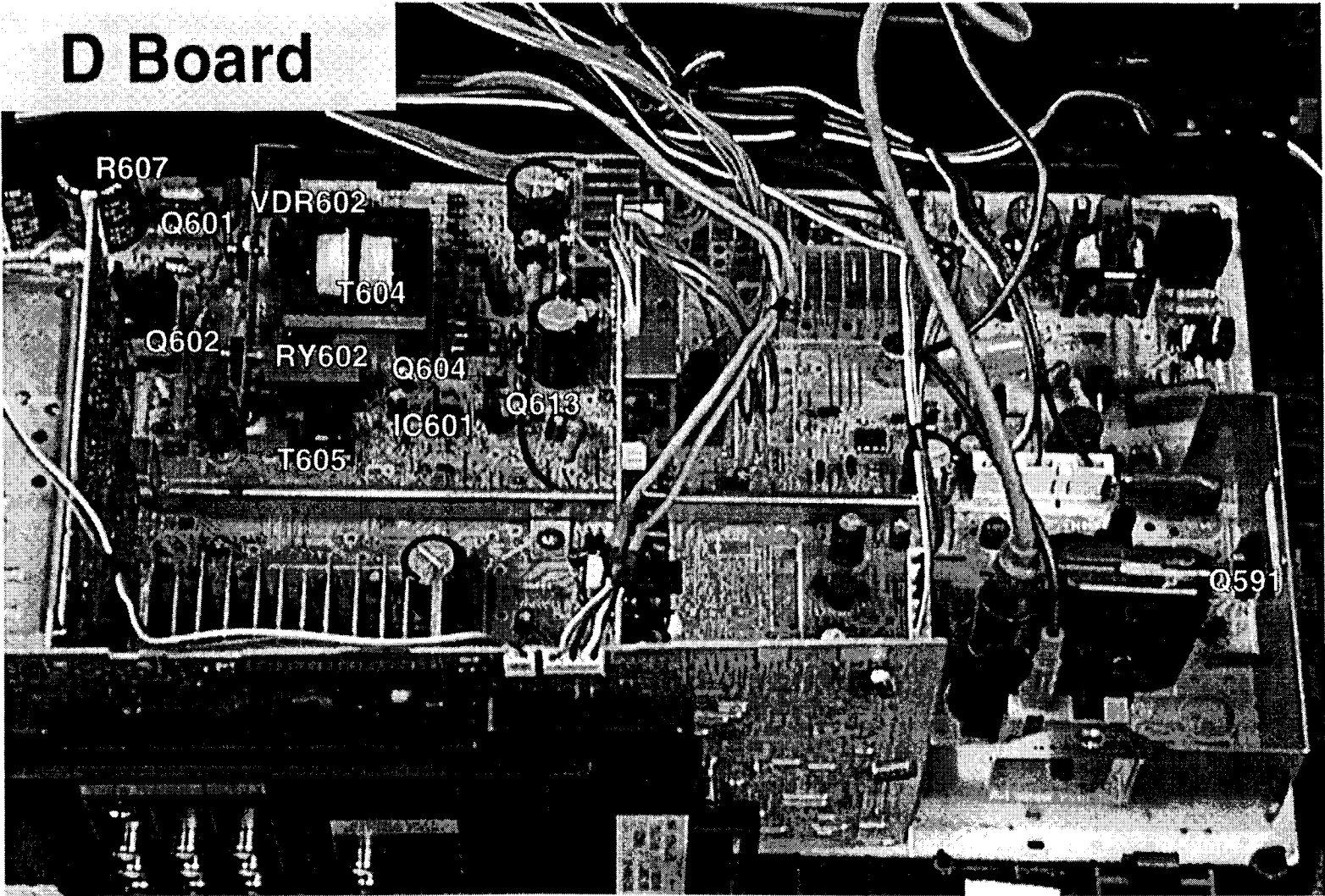
10
AA-1 Chassis
No Picture / No Power



*If Q601, Q602 are shorted, and R607 is open, perform the pre-power on test after replacing them.

Troubleshoot:
 -Power Supply Regulation
 IC601, Q613 and assoc. comp.
 -H.V. Shutdown PM501

D Board



AA-1 NO POWER

AA-1 Pre-Power ON Test

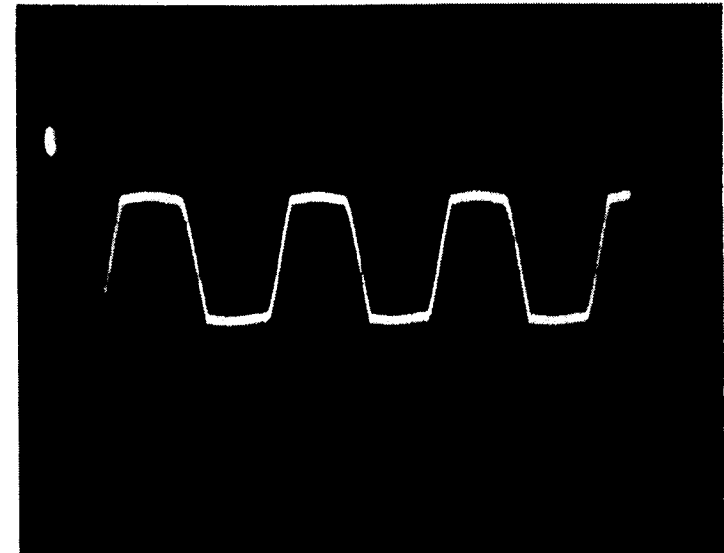
After replacing the converter transistors Q601 and Q602, and R607 in the AA-1 chassis, the following test should be performed before full AC is applied to the unit. If this is not done, the new components may be destroyed when full AC is applied to the set. This is because the cause of them being destroyed in the first place has not been corrected.

Plug the set into a variac/isolation transformer **SET TO 0V**.

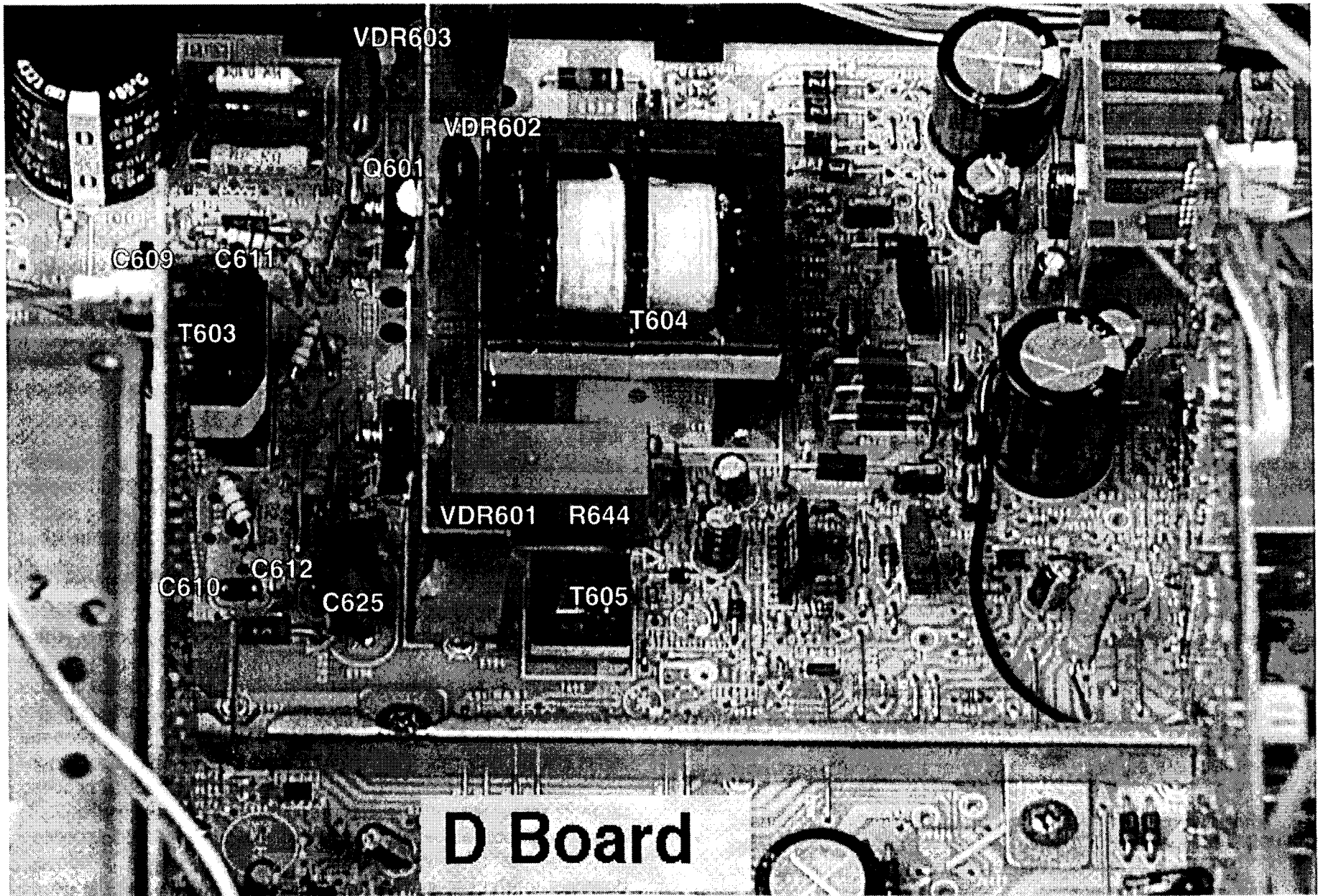
- Connect a scope set to 50V/div 5usec/div. to Q601 Emitter.
- Slowly increase the AC voltage to 40V while observing the ammeter. The current should remain at 0 Amps and a 125Vp-p signal at 63Khz should be on the scope. (See diagram). This indicates that the circuit is oscillating properly. Any variation indicates that a problem still exists. Check the following on the D Board:

1. VDR601, VDR602 and VDR603.
2. C609, C610, C611, C612 and C625.
3. D603 and D605.
4. R644

In some cases CDT T603 or SBT T605 may be damaged. This is more prevalent in areas where lightning damage is always a suspect.



Q601/Emitter (125Vp-p)



D Board

AA-1 PRE POWER ON

AA-1 Troubleshooting Shutdown

Shutdown is usually caused by a problem in one of the four following circuits:

1. **Power Supply Regulation.** (Excessive B+). The operation of this circuit is discussed under the heading "Regulation and Soft Start" in previous pages.
2. **ABL.** Increased ABL current through FBT T501/pin 10 will lower the voltage at PM501/pin 9 to less than 1.2V, at which time pin 1 goes LOW and disables RY Drive Q604. The set shuts down. The normal voltage at PM501/pin 9 varies between 1.5V (Bright picture) and 8.5V (Dark picture)
3. **High Voltage.** This is monitored at PM501/pin 14 which will increase if high voltage increases. (Normal voltage is 126V) PM501 senses this decrease and pulls pin 1 LOW to disable RY Drive Q604.
4. **High current draw on the 135V line.** Increased voltage drop across R654 lowers the voltage at PM501/pin 7 enough to cause pin 1 to go LOW and disable RY Drive Q604.

A malfunction in any one of these circuits is detected by Protect Module PM501.

The following procedure will help identify which circuit may be causing shutdown.

- If the set shuts down immediately after the high voltage rasing sound is heard, the problem is either in the regulation circuit or the high voltage circuit.
- If there is a delay before shutdown occurs, or the CRT becomes very bright before shut down, this is usually an ABL related problem.

Shutdown related to ABL problems are usually caused by a shorted CRT, defective video drive and video output circuits.

Troubleshooting procedure for immediate shutdown problem:

1. Plug the set into an isolation transformer and variac combination.
Set the variac to 0V.

2. Check Q591 for a collector to emitter short. If OK,
3. Short H. Output Q591/B to ground. H. Out circuits are disabled.
4. Connect RY602 pin 3 to pin 4 (bottom of the D Board). This activates PIT T604 and its secondary loads.
5. Slowly increase the AC voltage to 35V to 40V while monitoring the voltage on H. Output Q591/C. It should not rise above 135V.

An alternative method is to apply 117VAC to the set after step 2, and monitor the voltage on H. Output Q591/C with a "peak Hold" meter. The set will shut down, but the voltage on the meter will indicate which of the following procedures to follow to solve the problem.

1. If the voltage only rises to about 50V, check Soft Start Q605 and associated components. Q605 may be biased ON all the time.

2. If the voltage at H. Output Q591/C rises to 140V or more,

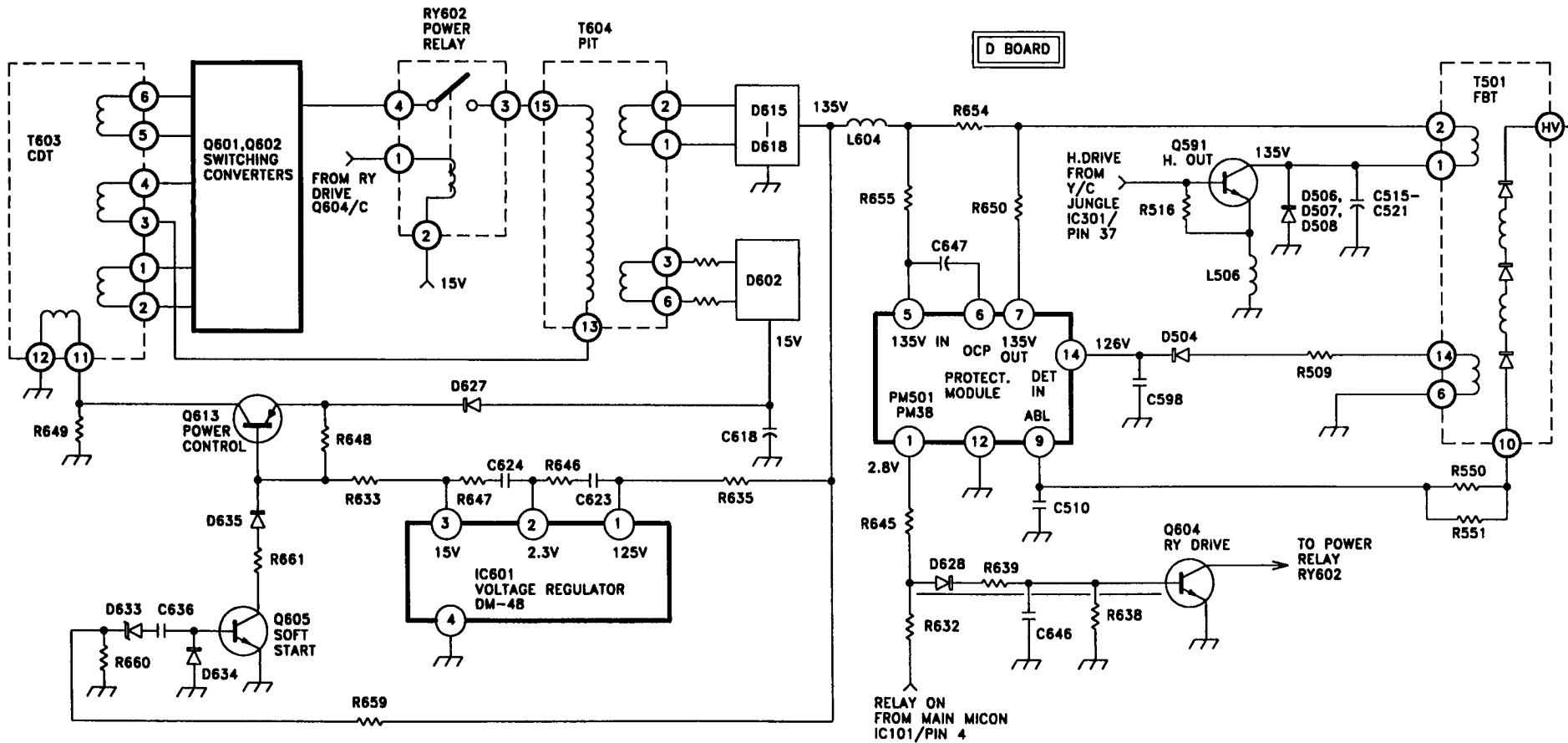
- Check IC601/pin 1 for 135V or more. If low or 0V, check R645.
- If present, vary the AC voltage between 35V and 30V while monitoring the DC voltage at Control IC601/pin 3. This voltage should vary between 2V and 14V. If this does not occur, check the components at pins 1 and 2. If they are OK replace IC601.
- Check Power Control Q613 and associated components.
- Check continuity of CDT T603/pins 11--12.

3. If the voltage at H. Output Q591/C remains at 135V

Shutdown is being triggered by a defective Protect Module PM501 or a defect in the H.Out circuit. Check PM501 in the following manner:

1. Remove the short across RY602/pins 3 and 4. Keep Q591/Base shorted to ground.
2. Turn the variac quickly up to 117VAC. You should hear Power Relay RY602 engage, followed by audio then the Degaussing Relay RY601 disengaging. This indicates that shutdown is being caused by a defective FBT T501 or capacitors on Q591/Collector.

If the action described in the above paragraph does not occur, a check at PM501/pin 1 will show that the voltage there is 0V. **REPLACE PM501.**



AA-1 REGULATION & SHUTDOWN

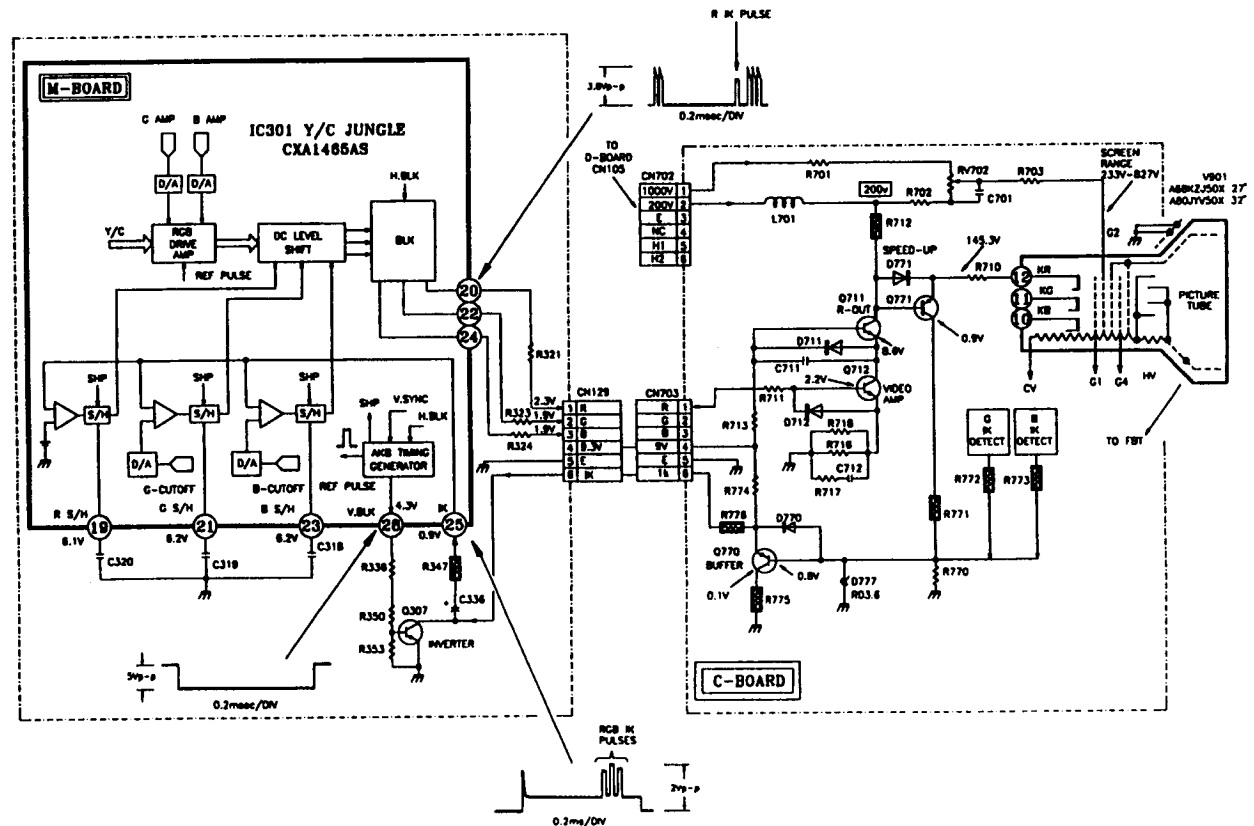
AA-1 AKB (IK Circuits)

The AA-1 chassis uses an Automatic Cathode Bias (AKB), or IK system to compensate for CRT tolerances, and improve color temperature drift problems which occur during the life of the CRT. The cathode current (IK) of each gun is monitored, and the DC bias to each gun to constantly adjusted to maintain proper grey scale.

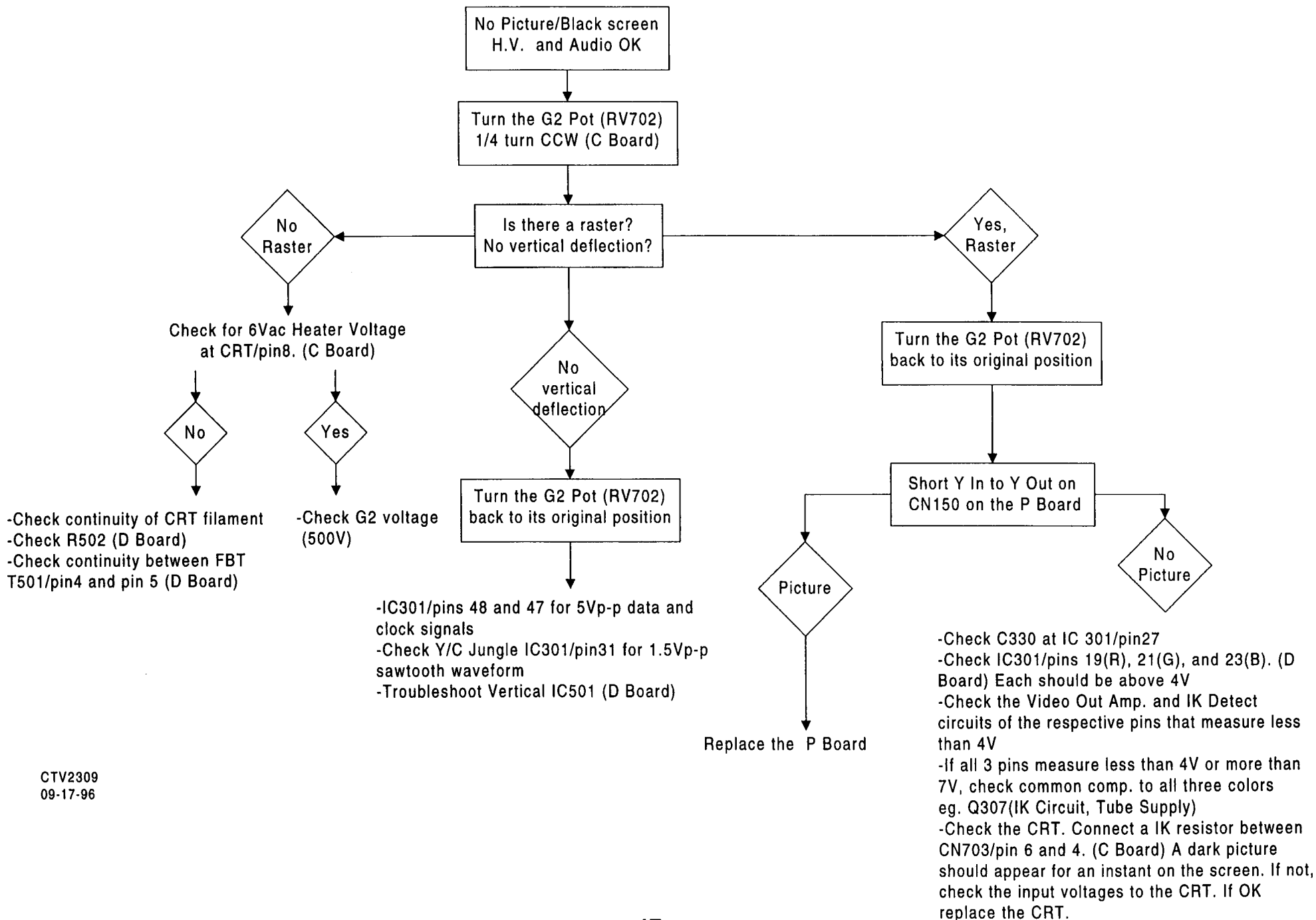
AKB operation takes place during vertical blanking. During this time, the Y/C Jungle IC301 generates a reference pulse to each CRT RGB drive via pins 20, 22 and 24. In the case of the Red drive signal, the Red video signals and IK pulses are amplified by Q712 and Q711 to drive the Red Cathode. The IK pulses set up a cathode current (IK) measurement reference signal during vertical blanking.

How much the cathode conducts at this time is reflected in the amplitude of the feedback IK pulses through IK Detect Q771. The current generated by the feedback pulses are converted to a voltage across R770, and is returned to IC301/pin 25 via IK Buffer Q770. The same operation takes place for the Green and Blue Cathodes.

The IK signal voltage is applied to sample and hold circuits within the IC that work with capacitors C318, C319 and C320 at pins 19, 21 and 23 respectively. Here the resulting voltages from the S/H circuits are compared with an internal DC reference voltage to produce the correction voltage needed to shift the cathode bias of the guns that need adjusting. If any sample and hold voltage at IC301/pins 19, 21 or 23 is less than 4.2V, or more than 7.2V, IC301 blanks the screen.



AA-1 Troubleshooting Video Blanking



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AA-1 Field Problem Reports

1. Problem: No picture. Sound OK

Solution: If the screen pot is turned up, the upper corners may illuminate. This indicates a loss of vertical deflection. Replace IC501 on the D Board.

2. Problem: No picture Sound OK

Solution: C327 at IC301/pin 34 was open. This capacitor is part of the vertical oscillator. Again there was no vertical deflection, so the CRT was blanked by Y/C Jungle IC301.

3. Problem: Vertical jitter when the set is switched ON. Operates normally after a few minutes.

Solution: C334 off IC301/pin 32 was defective. Further tests showed that it was temperature sensitive. This capacitor is also part of the vertical oscillator circuit. Its instability caused the vertical jitter.

4. Problem: Poor pincushion correction

Solution: Open L510 in the collector circuit of Pin Out Q503 on the D Board.

5. Problem: Half moon or rainbow stripes in the picture.

Solution: Replace IC501 on the D board. One can easily be led to believe that the CRT is defective.

6. Problem: No High voltage.

Solution: Defective 9V Regulator IC604 on the D board. With this voltage missing, Y/C Jungle IC301 is inoperative, therefore, there are no HD pulses.

7 Problem: Picture flickers, flips vertically and pulsating width.

Solution: Replace Flyback Transformer. T501.