D98 CHASSIS

OPERATION MANUAL
TROUBLESHOOTING MANUAL

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TRINITRON® COLOR COMPUTER DISPLAY

MICROFILM

SONY®

CIRCUIT DESCRIPTION

D BOARD POWER SUPPLY SECTION

Power Supply Electrical Circuit

The power supply is located on the D Board. It has three modes of operation that are controlled by a microprocessor. The architecture is similar to discontinuous mode flyback converters and has photocoupler feedback for regulating the secondary voltages. Circuit operation and troubleshooting are explained in the following sections:

Operation Modes
AC Input
Degauss Circuit
Primary Circuitry
Secondary Circuitry
Protection Circuits
Troubleshooting

Operation Modes

The power supply has four modes of operation, ‘off’, ‘active off’, ‘suspend’ and ‘active on’. These modes are related to power savings and are indicated by the front panel LED. Additional indications are failure diagnostics and aging mode. The table below lists operation mode, condition and LED status.

Mode	Syncs	Condition	LED
Off	NA	AC Switch Off	Off
Active Off	No H and V	Low Power, Heater Off	Amber
Suspend/ Standby	No H or V	Low Power, Heater On	Amber 0.5s<- ->Green 0.5s
Active On	H and V Present	Phase Locked, Normal Operation	Green
Failure	1NA	HV or +B Failure	Amber 0.5s<- -> Off 0.5s
Failure 2	NA	H Stop, V Stop, Thermal Failure	Amber 1.5s<- -> Off 0.5s
Failure 3	NA	ABL Failure	Amber 0.5s<- -> Off 1.5s
Aging/Self Test	No H and V	Aging Raster or Test Pattern	Green 0.5s<- -> Off 0.5s

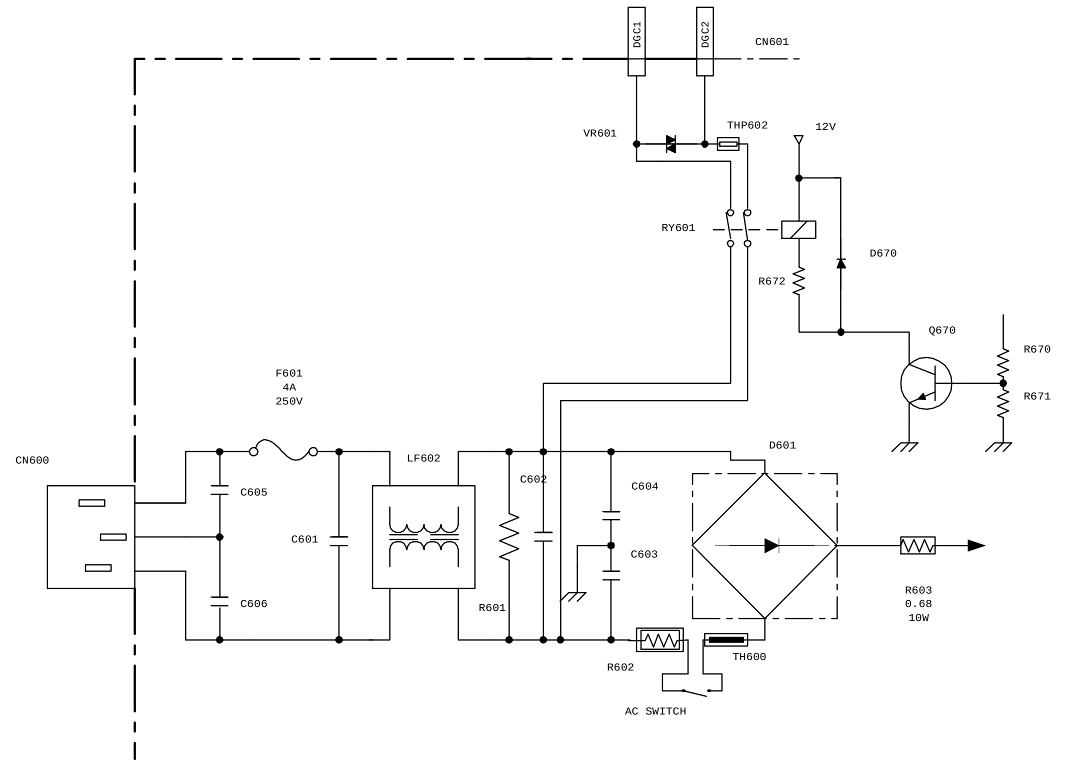
Except for AC switch off, all modes of operation are controlled by the microprocessor located on the N Board. The failure modes are detected by the microprocessor and the power supply is forced into active off mode. These functions are discussed later (Deflection).

With the AC cord attached to the monitor and connected to an AC source, the monitor will be off until the AC switch is turned on. When the AC switch is turned on, the power supply starts and is in active off mode. The next step is active on mode. The power saving modes are activated by the microprocessor based upon the presence of either H or V sync. If no sync signals are present, the power supply is set to active off mode. If only horizontal sync is present the power supply moves to suspend mode. If only vertical sync is present the power supply enters standby mode.

Power supply operation control signals are “Remote On/Off” and “Heater On/Off”. Remote On/Off is digital low for active off and suspend modes. Heater On/Off is digital low for suspend mode. Suspend mode is similar to active off mode, but with heater voltage on. To enter active on mode, the microprocessor must set remote on/off to digital high. Heater on/off is also made digital high and the heater is turned on.

Output	Off	Active Off	Suspend	Standby Active On
B+	0	120V	120V	180V
80V	0	55V	55V	78V
±16.5V	0	8.7V	8.7V	+16.5V
-16.5V	0	-12V	-12V	-16.5V
+12V	0	0	0	+12V
5V	0	+5V	+5V	+5V
Heater	0	0	3.2V	6.3V
H. Centering	0	±5V	±5V	± 8V

AC input and Degauss



1. AC Input Section

The AC input section provides EMI filtering, input protection, surge limiting and CRT degauss operation. An AC switch is also present for complete power off condition.

EMI Filter

The EMI filter comprises X-capacitors C601 and C602, Y-capacitors C603, C604, C605 and C606 and the line filter transformer, LF602. Input protection is provided by F601 and surge current limiting by thermistor TH600 and resistors R602 and R603. Degauss is explained in the next section.

The front panel AC switch is wired electrically between R602 and TH600 and when closed, completes the circuit. This allows the bridge diode, D601, to full wave rectify the AC input voltage.

Degauss Circuit

The degauss circuit is used to demagnetize the CRT. After power on, the microprocessor located on the N Board sets the degauss signal to digital high and through Q607 turns on relay RY601. This allows AC current into the degaussing coil through posistor THP602. The current heats up the posistor and its affective resistance increases, this dampens the current in the degauss coil to nearly zero. Duration time is approximately 5-6 seconds and the microprocessor then shuts off RY601, which disconnects the degauss coil from the AC line. This operation should sufficiently demagnetize the CRT.

2. Primary Circuitry Section

IC601

The heart of the primary section is the AN8037 power supply controller, IC601. The following describes the functions of each pin.

Pin 1 – TR - This is TR or transformer reset. Similar to a demagnetization function, this pin detects the falling edge of the primary waveform during relaxation period. It allows the next conduction pulse only after reaching the bottom of the ringing waveform. It contributes to the maximum on time setting.

Pin 2 – OCP - Over current protection. Used to determine the overload level at which the timer latch is activated.

Pin 3 – CF – Oscillator. With a capacitor, determines the switching frequencies. (On/Off times.)

Pin 4 - CLM - Over current protection. If the voltage on this pin (primary current feedback) exceeds -0.18V, the power supply will enter cycle-by-cycle current limit mode.

Pin 5 – GND- IC ground terminal.

Pin 6 – OUT- Output driver for switching transistor Q602.

Pin 7- VCC- IC supply voltage terminal. This voltage is nominally 17.5 volts during active on mode and 12 volts during suspend or active off mode. The IC receives starting current via startup resistor (R613) until the auxiliary supply is available from T601 VCC winding. If the voltage on this pin exceeds 19.4 volts (OVP), the power supply shuts off and can only be restarted by disconnecting and reconnecting the AC line. Under voltage lock out (ULVO) occurs when the voltage is less than 9.5 volts.

Pin 8 – SD- Used for OVP and timer latch functions. A capacitor determines the timing for OVP function.

Pin 9 - FB – Feedback terminal.

Operation

The power supply is a flyback type converter. It has both PWM and RCC characteristics. The PWM controls the pulse width of the gate drive. The RCC portion insures that the next conduction cycle starts at zero volts. Therefore, the gate pulse width varies and the switching frequency also varies. The on and off timing is determined by pins 3 and 1. Pin 1 detects the zero voltage point or the valley on the relaxation ringing waveform.

When AC is applied to the power supply, start up current is supplied though R613 to pin 7 of IC601. Startup voltage is approximately 15V. After start up, the voltage to pin 7 of IC601 is supplied through D605 connected to T601 pin 8. The first mode of operation is active off mode and the VCC will be approximately 12 volts. The output drive pulse frequency will be near 40kHz. or a type of frequency burst mode.

When the power supply enters active on mode, the switching frequency will vary between 65 and 120kHz., depending upon input voltage and power level. The VCC level will be approximately 17.5 volts. OVP threshold is 19.4 volts and UVLO is 9.5 volts. Therefore, if the VCC voltage is not correct, the power supply will not operate properly.

Feedback from the secondary side comes through IC603 and is connected to IC601 pin 9. (See diagram on page 5.)

3. Secondary Circuitry Section

The secondary section consists of the following circuits. Rectifier diodes and filters for all output voltages, horizontal centering, +5/12 volt regulator, +5 volt back up circuit, heater voltage regulator, voltage feed back circuit, standby mode feedback, B+ detection and protection circuits. This section will describe each circuit and its function.

Secondary Rectifiers

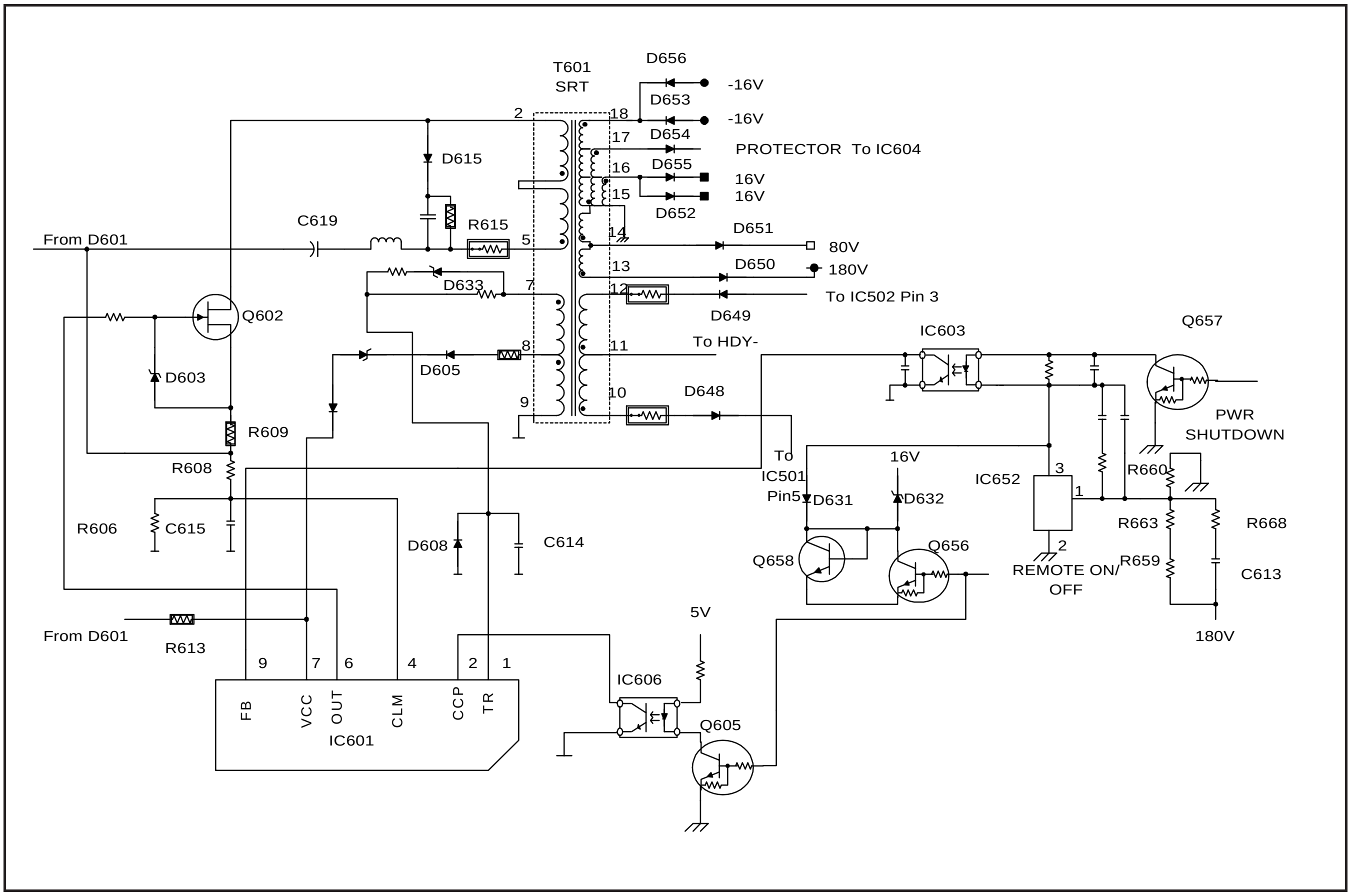
The secondary rectifiers supply the following voltages, 180V (B+) deflection and video, 80V video, ±16V deflection and regulators and 8 volt heater regulator.

Horizontal Centering

This circuit supplies IC502, which is used to adjust horizontal raster position on the CRT. The horizontal centering circuit consists of fusible resistors R621 and R622, diodes D648 and D649 and filter capacitors C656 and C657. In respect to the secondary ground, the horizontal centering ground is floating and connected to –H DY line. The voltages in reference to this floating ground are ±8 volts. Care should be taken to not short the floating ground to the secondary ground.

+5/12 Volt Regulator

IC605 is the voltage regulator for +5 and +12 volt lines. The output voltages are supplied to the microprocessor, deflection



and video circuits. The +16.5 volt and the 8-volt lines supply the input voltages for +12V and +5V regulator sections, respect-fully. During active off or suspend mode a standby back up circuit supplies the 16.5-volt line to the +5 volt section.

+5V Standby Circuit

Normally, the +8V line supplies the +5V regulator. During active off or suspend modes, the voltage supplying the +5 regulator, IC605, will become very low. In order to prevent loss of the +5V, it is necessary to supply a back up voltage. Supplying +16.5V line to the regulator through Q601 does this. Note: at this time the +16.5V has been reduced to 8.7 volts.

In Active off mode, Q607 is off, Q606 is on and Q601 is on. Through Q601, IC605 receives its input voltage for +5V. In Active On mode, Q607 is on, Q606 is off and Q601 is off. Since Q601 is off, IC605 must receive the +8 volt line through D610. There is a time delay in this circuit, which is used to insure that during any transitions, the +5V line does not drop out. These components are C636, R638 and D619.

Heater Voltage Regulator

Heater filament voltage is supplied by the 8-volt line and is regulated by IC604. Heater on/off is used to turn the output on or off. This is found at pin 4, VC. The output is off during active off and suspend modes.

Feedback Circuit

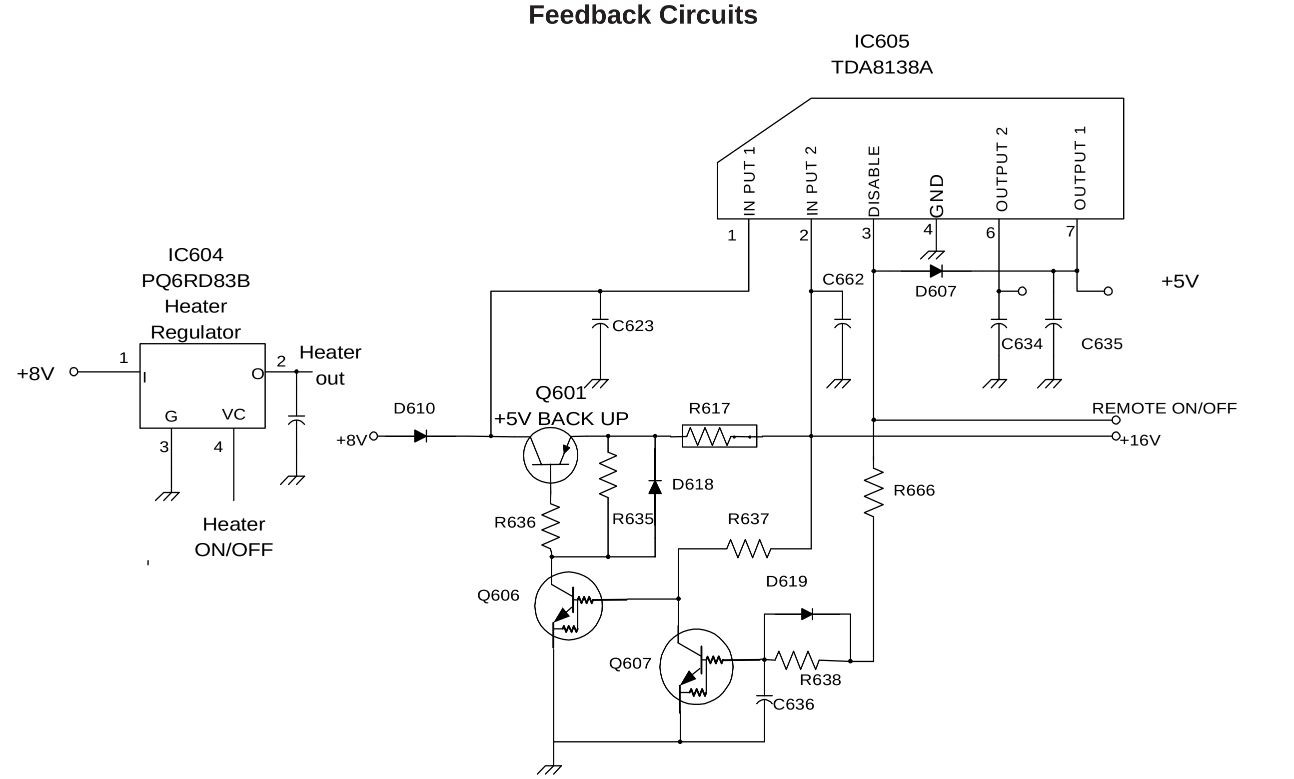
The feed back circuit is divided into two sections. One is for active off and suspend modes, the other for active on mode. The following two sections explains the theory and operation.

Active Off and Suspend Mode Feedback

Feedback is provided by circuit elements IC603, D632, Q658 and Q656. The 16.5V line is regulated and the actual voltage is 8.7. Due to this condition, B+ is no longer regulated and is reduced approximately 67%.

During active off and suspend modes, remote on/off is low and Q656 is off. Current flows through D632 when the 16.5 V line is greater than 8.2 volts. This current biases Q658 and current from IC603 is allowed to sink to ground. The 16.5-volt line supplies this current to IC603. The current through IC603 biases its transistor and sinks current from IC601 pin 9. IC601 then responds accordingly and adjusts its duty cycle in order to make the output voltage reach 8.7 volts. This completes the feedback loop.

Feedback Circuits



When remote on/off is set high, Q656 is turned on and Q658 is turned off; this disables active off and suspend modes regulation loop.

Active On Mode Feedback

As stated earlier, when Q656 is on, the active off and suspend mode regulation is disabled. At this time, IC652 takes over and the B+ line is regulated. IC652 is a shunt regulator and regulates the B+ voltage by sinking current from IC603 to ground. The reference voltage at pin 2 determines the sink current into pin 3. The reference voltage is set to 2.495 volts by resistor divider R659 and R660. Since the B+ is connected to the resistor divider, any changes in voltage is detected at the reference terminal; the shunt regulator then tries to force the reference voltage to 2.495 volts by sinking more or less current into pin 3. As mentioned before, IC603 biases its transistor accordingly and IC601 responds by changing the switching duty cycle in order to keep the output voltage at 183 volts. The other components connected to pins 2 and 3 are for compensating frequency response. This completes the feed back loop for active on mode.

4. Protection Circuits

There three protection circuits: OCP, OVP and secondary short circuits. OCP is pulse by pulse and is performed on the primary side. OVP detects excessive output voltages. To detect secondary side short circuits, there is a circuit called B+ detect and it is monitored by the microprocessor. The following will explain the operation of these functions.

OCP

OCP is activated if there is too much current passing through the power MOSFET, Q602. This condition will occur if either the B+ line or 80 volt line is shorted.

R609 is the current sense resistor. Current through this resistor will cause a negative voltage drop in reference to ground. R608, R606 and C615 couples this voltage drop to IC601 pin 4. If the voltage level exceeds –0.18 volts, the IC sets pulse by pulse current limit and the output voltages are in affect very low. This condition is often audible and characterized by a ‘chirping’ sound.

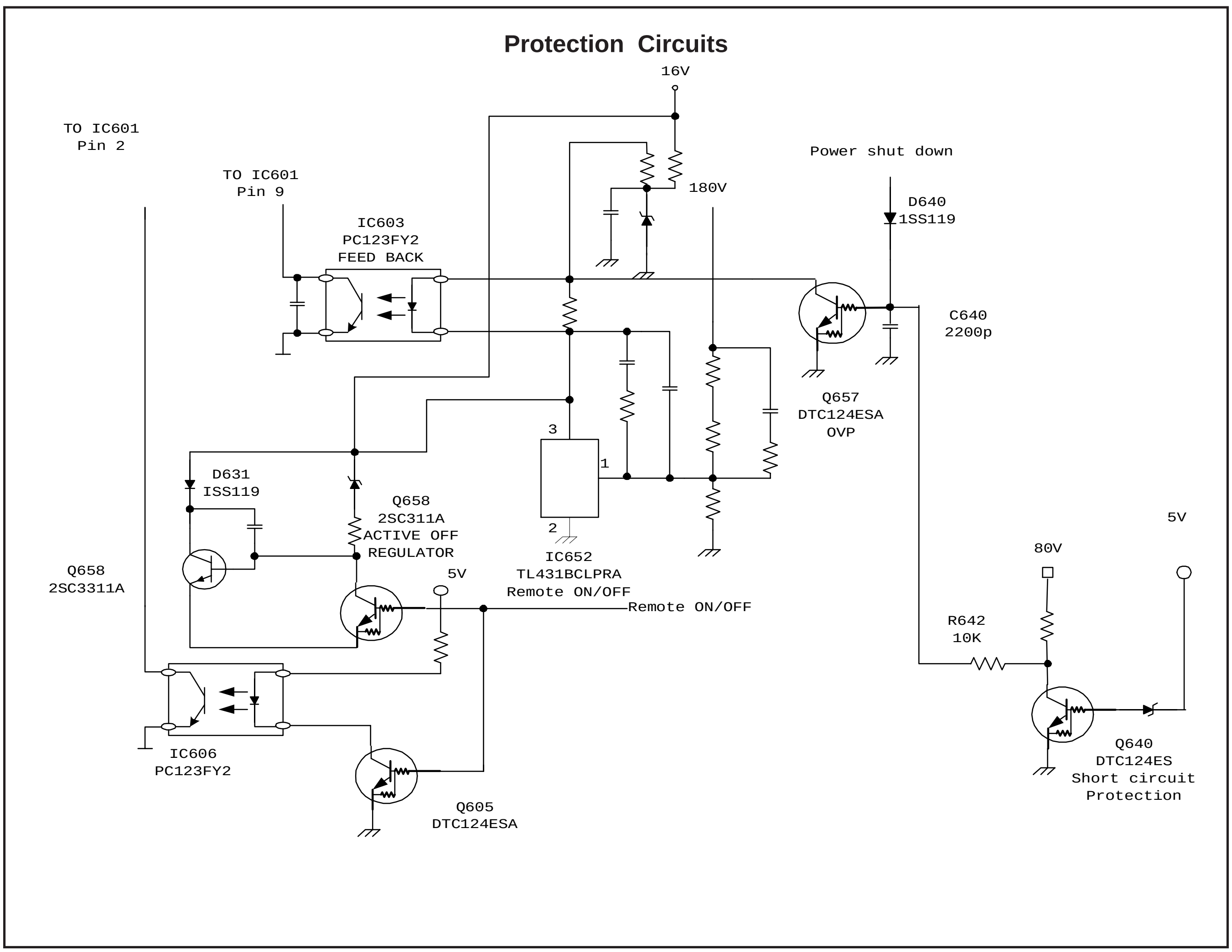
OVP

The function of OVP is related to IC601 and the threshold is approximately 19.4 volts. This is sensed at pin 7 of IC601. Under normal operation, the VCC voltage is 17.5 volts. In the event the regulation loop was open or the control loop fails, the output voltages would rise rapidly. Likewise VCC will rise and when the threshold voltage is reached, IC601 would latch up. This condition disables the output circuit at pin 6 and the power supply will not operate. Since the IC is now latched, only turning the AC switch off and then on again can restart the power supply.

5. Secondary Short Circuit

B+ detect purpose is for determining secondary side short circuits. Sensing the node voltage of resistor divider R611 and R612 does this. R611 is connected to +5V and –16.5 is connected to R612. If the node voltage exceeds 2.0 volts, the microprocessor sets PWR Shut Down to digital high. In this event, Q657 is turned on and feedback current is bypassed to ground from IC603. This causes unregulation and the output voltages become high. The VCC winding on the primary side reflects this condition and exceeds 19.4 volts, which will cause IC601 to latch and disable the power supply. Turning the AC switch off and then on again can only restart the power supply.

An additional short circuit protect is provided if the +12V, +5 or 3.3V lines are shorted. This is through circuit elements D641, Q640 and Q657. During normal operation, through D641, the +5 volt line biases Q640 on. The 80 volt line is connected to the collector of this transistor through R641. When the transistor is on, the collector voltage is nearly zero. This point is connected to Q657 through R642 and Q657 is still off. If there is a short on any of the lower voltage lines, the +5 volt line will become lower than 3 volts and Q640 will turn off. In this case the collector voltage rises and Q657 will turn on. Then through Q657 the feedback loop current is shorted to ground and causes OVP, which is sensed by IC601.



6. Troubleshooting

Warning
Before attempting to fix the power supply, safety should be consider first. Never connect test probes to the primary side circuits, unless proper isolation has been installed. If isolation for the AC mains is not present, serious harm can occur. Never assume you are safe.

No Power
In the event that the monitor does not turn on, first check F601 and R615. If these parts are blown, the primary side circuitry should be checked. If the fuses are not blown, then check the secondary side circuitry, especially the protection circuits. If these circuits are causing a no power symptom, the problem can be more readily found.

AC Input and Degauss Circuit Trouble Shooting
For no power or nonoperating power supply, the AC input circuitry should be checked. Open or short circuit elements will cause non-operation. F601, CN600, CN603 and CN2003 On the H Board should be checked first. The wiring between the AC switch on the H Board and D Board should be checked. Check the front panel AC switch for continuity.

If all elements are correct, check whether F601 breaks when power is applied and the AC switch is closed. If the fuse does blow, there may be problems with the primary circuitry or a component short.

The degauss will malfunction if CN601 is not connected. One problem could be loss of degauss signal from N Board. This can be verified by using the manual degauss command found in the OSD menu. If the signal does not appear at R670, then check the signal on the N Board and all connections. It is possible that the microprocessor does not function correctly.

The second step is to place a short across the AC terminals of RY601 for less than two seconds. If degauss operates then check Q670 and RY601. If degauss does not work, check THP602 for an open condition and VA601 for a short condition.

Primary Section
Three main areas can diagnose primary circuit failures. These are IC601, Q602 and Feedback system.
Visible checks of these areas will aid in finding problems. The following will discuss each section.

IC601
First apply AC to the monitor and check IC601 pin 6 output. If the output on pin 6 is not present or briefly appears, there could be problems with Q602 and related parts. Further, check VCC level at pin 7. If it less than 9 volts, the IC could be in latch mode. If the voltage is very low, there could be a short on any of the IC pins. In reference to ground check the impedance of pin 1, 6, 7 and 9. If any of these pins are shorted, replace the IC and check components connected to the related pins. Pin 1 is especially vulnerable to damage. Take care that C619 and C616 are fully discharged before replacing the IC.

Q602
The switching transistor can be damaged in various ways. These are related to voltage, current and temperature.

Check whether the transistor is shorted across drain and source terminals. If there is a short, R609, R615 and FS601 should be checked. R609 is usually broken when Q602 fails. Additional components to check are D603, D604 and IC601. If Q602 is shorted, all these parts should be replaced.

Failure of a secondary rectifier diode can also cause Q602 to fail. Check B+ and 80V diodes for open or short conditions. There is also a clamp circuit, which is used to clip the turn off spike found on Q602 drain. If the clamp circuit is broken, it can cause Q602 failures. Check D615, C622 and R619.

Secondary Circuit
Failure in the secondary circuits can be categorized by rectifier diodes, fusible resistors, regulators, +5 volt back up circuit, feedback loops and protection circuits. These sections are interrelated and failure in one can affect another. Consequently, some failures will also affect the primary circuitry.

Rectifier Section
Rectifier diode failures are not common, but do occur. Deflection, video and N Board failures contribute to diode damage. In the event a voltage is not present, check for shorts to ground, open or short diodes. Also check fusible resistors or any zener diodes found on the voltage lines.

Horizontal Centering

Loss of horizontal center adjustment can be affected by the rectifier diodes, fusible resistors, IC502 and related circuitry. Measure the voltages in reference to the horizontal centering ground. Typically, the voltages are ±8 volts. However, the adjustment setting can reduce the voltages by 1 volt. If there are no problems found with the diodes or fusible resistors, the next step is to check the adjustment signal at Q517. If the adjustment signal is not present check the N Board and connections. Otherwise, check IC502 and related components.

+5/12 Volt Regulator

Loss of voltage due to shorts or device failures on either +5 or +12 volt output lines can occur. Consequently, IC605 can be damaged and need replacing. Before replacing IC605 check for shorts or damaged parts along the output lines. If +12 volt does not appear, check the remote on/off signal. The N Board supplies this signal and it may be necessary to check it and all connections.

+5 Volt Standby Circuit

Failure of this circuit can be affected by IC605. The remote on/off signal controls circuit operation and it may need checking. In case the circuit does not work properly, check D619, R617 and Q601. If these components are good, check the remaining circuit parts.

Heater Voltage Regulator

This circuit may be affected directly by fusible resistor R654 or D654. If these parts are good, check the regulator output for a short to ground. Shorts can occur on the video board. In the case of an output short, IC604 may have been damaged. If the IC appears to have no damage, check the connections and N Board for any problems with the heater on/off signal.

Feedback Circuit

Problems with feed back can cause power supply shut down or low voltages. First determine whether the power supply is operating in active off, active on modes or not at all.

The power supply can be stuck in active off mode. The remote on/off signal, Q656 and IC603 can affect this condition. Likewise, if the power supply is always in active on mode, the same items should be checked.

Checking for voltages at IC603 pins 1 and 2, IC652 pins 2 and 3 can solve more difficult problems. Additionally, IC603 pin 4 and IC601 pin 9 should be checked. If there are problems with these devices, B+ or 16.5 volt line, the feedback systems will not work correctly. Also check the protection circuits.

Protection Circuits

OCP occurs when there is excessive current through Q602. Failures with Q504, Q505 or the video section commonly cause this condition. These areas should be checked. OCP condition can also occur if R609 is open or if there are problems with IC606 or Q605.

OVP usually occurs when the feedback loop is open, secondary voltage shorts or loss of +5 volts. Isolate the OVP trigger condition, by first checking the operation of the feedback loop and Q657. Either PWR shutdown or Q640 can turn on Q657. The feedback loop can be verified by removing Q657 and measuring the B+ voltage level.

D BOARD DEFLECTION SECTION

1. Horizontal Deflection Circuit

Overview
These circuit drive the DY(Deflection Yoke) for Horizontal Deflection. The H size and H shape control (IC805 and around) is included in this page as well.

H Drive, H Out, Feedback
HD pulse supplied from N board is inverted by Q501 and switch Q504 through Q502,503. The drive current which introduced in HDT by this switching will drive Q505(H OUT) and 1000v pulse appears on collector. D504 is the “Damper Diode” which avoid the negative pulse and discharge the energy for next Horizontal Drive. Q514 is the buffer for the “H FBP” feed back to N board and it will be the reference of phase/jitter control of DSP. T504(HST) is to sense the deflection current going to DY. The voltage appeared on secondary side will be the feed back for H Size/Shape control.

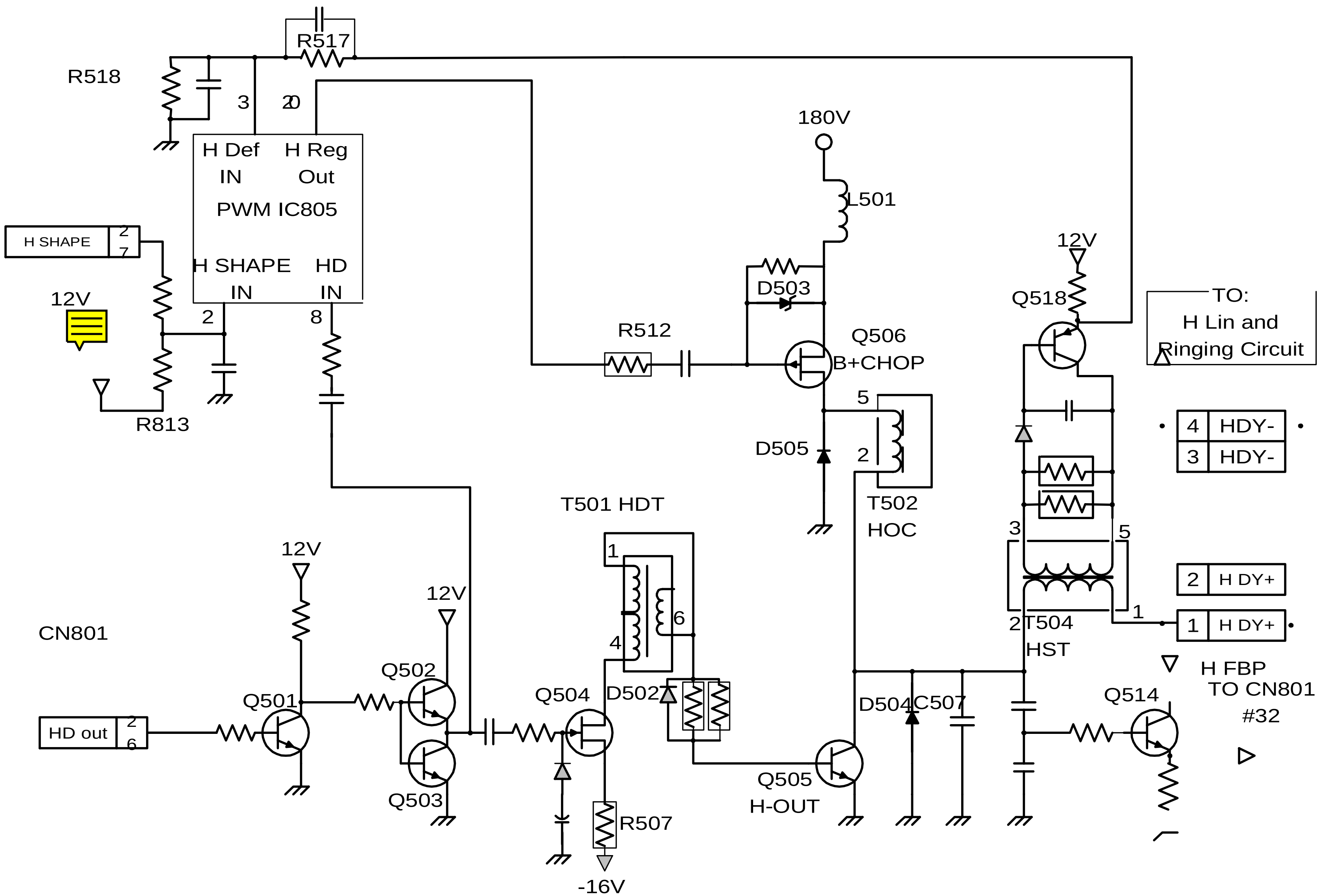
H Size/Shape control
HD pulse also triggering the H Size/Shape control IC805 (pin#8). IC805 is “PWM IC” and it controls H and HV B+ chopper duty. H Shape coming from N board is already including the Size Information(DC Level). It will be supplied to IC805 (pin#2) after pulled up to 12V through R813. H Reg Output(pin#20) is switching pulse of Q506(B+ chopper). The energy supplement from 180v to H Def circuit (through T502) is controlled by the duty of this pulse. The H Shape input and feedback voltage(pin#20) from T504 are compared by error amp (in IC805) and H Reg out pulse duty is controlled to keep the level of these two the same.

Troubleshooting
See attached “FLOW CHART” and confirm if it’s really H Deflection issue.

No H Deflection / No Power
Check Q505, Q506 and D504 first. In case any of these shorted, check T501, Q504, R507 and D502.
Those parts might have been damaged.
If both of Q505, 506 were not broken, check the HD pulse at the gate of Q504.
If no pulse, check Q502, Q503, Q504.
Otherwise, check R512, D503 or try changing IC801.

Bad Distortion
Check pin#2 of IC805 and confirm that proper DC level and AC waveform.
If the distortion is on only right side, check all above (“No H Deflection”).
Otherwise, refer to the Troubleshooting of next section (“H Lin and Ringing Correction”).

H Deflection Circuit



2. H Linearity and Raster/Distortion Ringing Correction Circuit

This section includes HLC Control circuit which is new in D98, S cap switching and HLC/S-Cap Damping circuits. These circuits are placed directly on the “cool side” of DY which is in series with deflection current line.
H Centering circuit will be explained in next section.

HLC Balance Control and HLC damping

There is no HLC switch for this chassis. Instead of that, HLC(L502) effectiveness is changed by LCT(503) for each Fh since T503 and L502 is in parallel. LCT is Cross Transformer which can change its inductance accordingly to the DC current of secondly side. The current of secondly side controlled by DAC output of MICRO through Q507. *It can be changed by register “HLC BAL”. R520 and C528 is damping circuit to avoid the Raster Ringing (mainly on left side of picture) caused by HLC, DY and S-caps.

S-Cap switching and S-cap Damping

H Def current is distorted by resonance between S-Cap and DY to correct the linearity. Since the resonance frequency has to be changed for each fH, S-Cap switching is controlled by MICRO
Switches are "On" when its gate is Hi(5V) and that moment, drain voltage should be grounded (0V).

L505, R522 and C513 is damping circuit to avoid Distortion Ringing (mainly on top of the picture) caused by S-caps and H Control loop gain. L504, R523 and C527 is also the same purpose as above but only works when Q508 (Switch **for th**e Biggest S-Cap) is “On”.

Troubleshooting

See attached “FLOW CHART” and confirm if it’s really H lin issue.

Bad Linearity

Confirm that Raster is approximately in the center of the Bezel. If not, refer to next section (Raster Centering Circuit).
Check S-cap switches (Q508, 509, 510, 511, 512, 513) and confirm that H Linearity changes proportional to the value of “S-Cap Direct”. Confirm that H LIN BAL changes by the register value of ”HLC Balance(Max/Min)”.
If it’s not working, check Q507 and the connection between N bd and D bd or, Check L502, T503.

Bad Top Distortion/ Left side Raster Ringing

Check damping circuits explained above or check the connection between N & D(HLC control line).

3. H. Raster Centering Circuit

Overview

H Centering is changed by supplying DC current to DY. D98 is taking the common level on DY cool(-) side and +/- 8V from power supply transformer(T601 PIN#10, 11, 12. #11 is the common).

H Center Circuit

The DC current is outputted by powered OP-amp(IC502). This circuit is making “invert amp” with the gain of R549/R548 and input 1S Q515 collector. The level is controlled by MICRO”H CENT’ through Q517(buffer). Q516 is Stand by-MUTE switch which activates when “Remote On/Off’ is Off(Lo).

Trouble Shooting

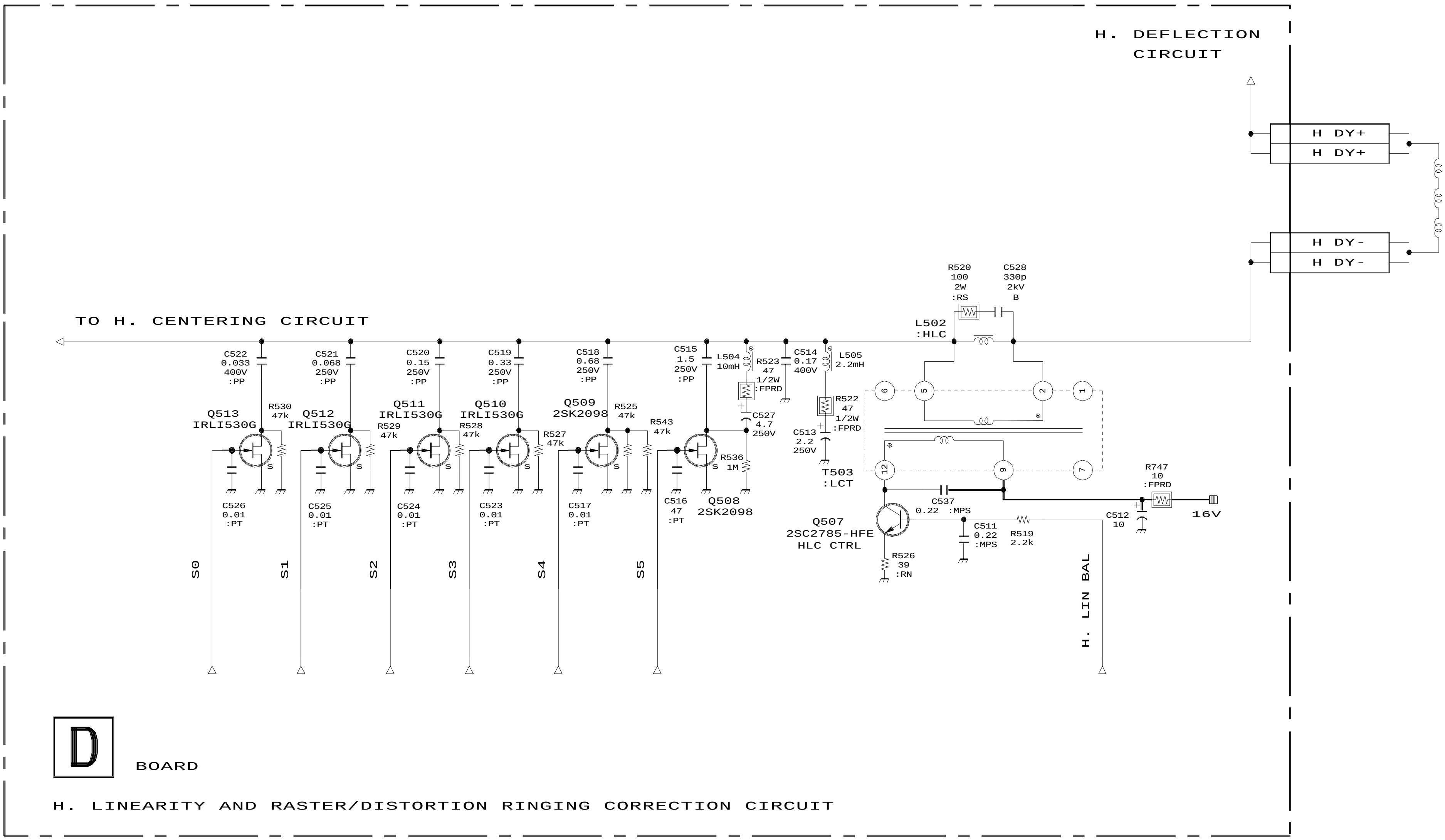
See attached “FLOW CHART” and confirm if it’s really H Center Circuit issue.

No Raster Centering Control

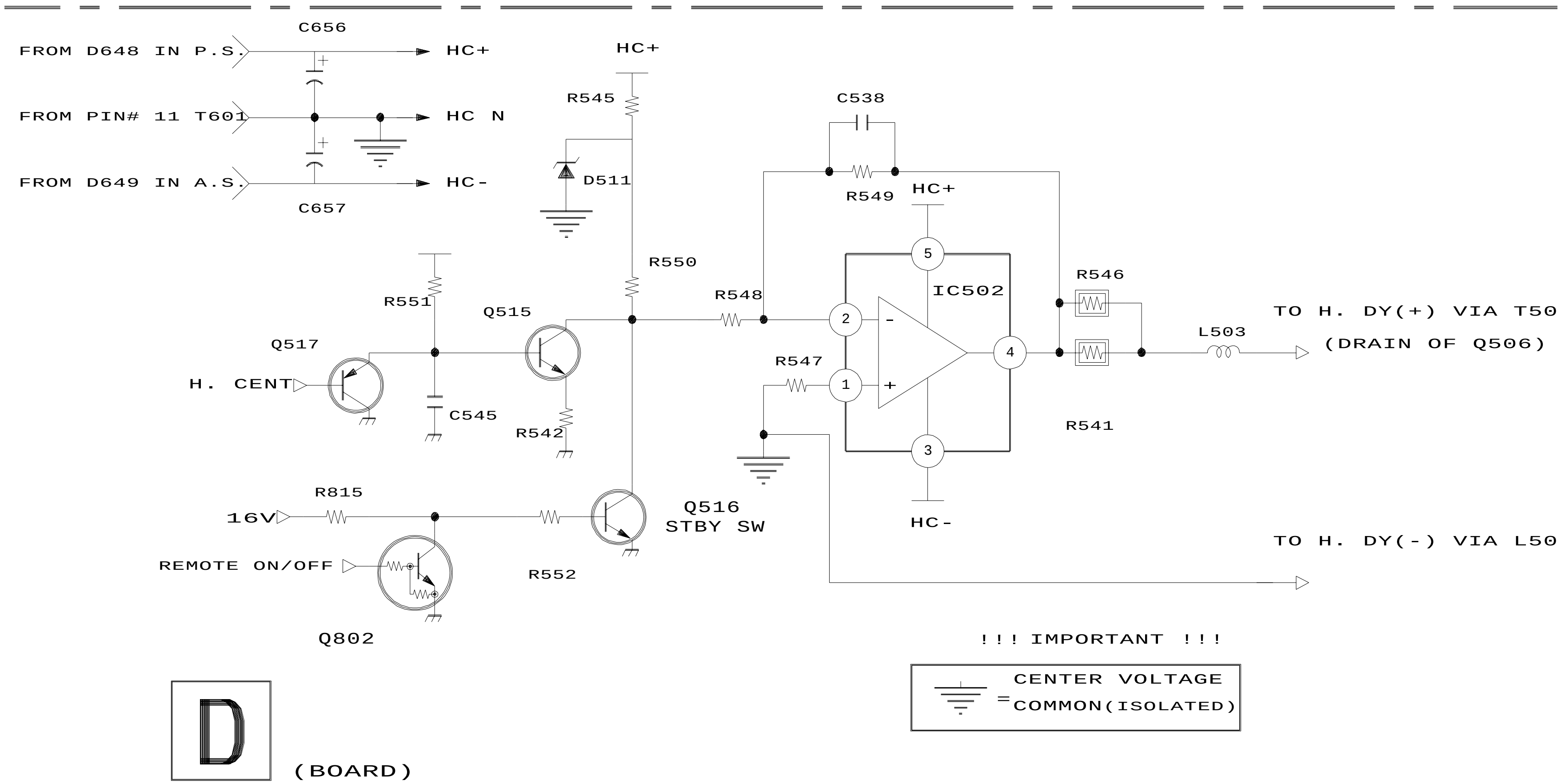
Check R621, 622(Right next the SRT) first. If it’s open, change IC502.
Confirm that voltage of Q5 l 5 base is changing accordingly to “H CENT MAX or MIN” register.
If not, change Q517 or check the connection between N and D.
Confirm that Q516 is Off. This circuit should not work when the Monitor is in Main mode.
Check IC502.

CAUTION!!

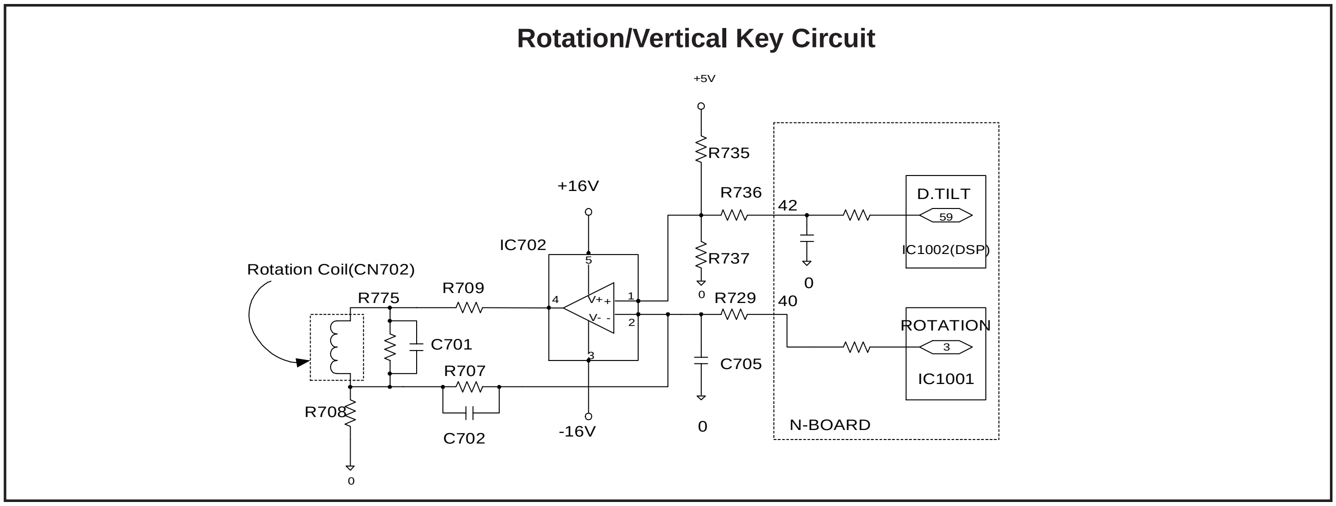
The heatsink of IC502 is connected to the H center(-) level, not GND! It could have up to 150V and should not be touched to any other metals.



H. LINEARITY AND RASTER/DISTORTION RINGING CORRECTION CIRCUIT



(19D98 H. CENTERING CIRCUIT)



4. Rotation/Vertical Key Circuitry Mounted on the D/N Boards) Circuit

Theory of Operation

The Rotation/Vertical Key circuitry takes its input from the N-board via pins 40 (Rotation) and 42 (D.Tilt). D. (Dynamic) TILT is generated by the DSP (IC1002) while Rotation is generated by the microprocessor (IC1001). Rotation is a PWM waveform at approximately 40kHZ measuring 5V pk-pk at pin #3 of the microprocessor. While D.TILT is a triangular waveform at the vertical scan rate, 1.0Vpk-pk in amplitude centered at 1.5V. Typical waveform patterns are provided as figures #1 and #2 below. Rotation is filtered by the R729 and C705 combination and a DC offset is added to D.TILT from the +5V line via R735. These two waveforms are added together and amplified by IC702. This amplifier is a transconductance amplifier (it amplifies a low-level voltage into a high level current). The output current from pin 4 of IC702 flows through R709 and the rotation coil and returns to ground through R708. The feedback is sensed at R708 and sent back to the amplifier through R707. The DC level of the current through R708 is controlled by the Rotation signal while the triangular currant amplitude is controlled by the D.TILT waveform.

FIGURE 1

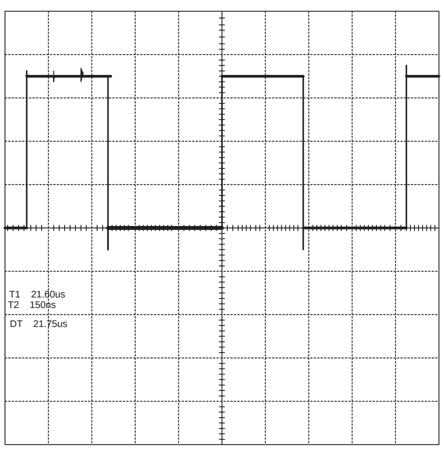
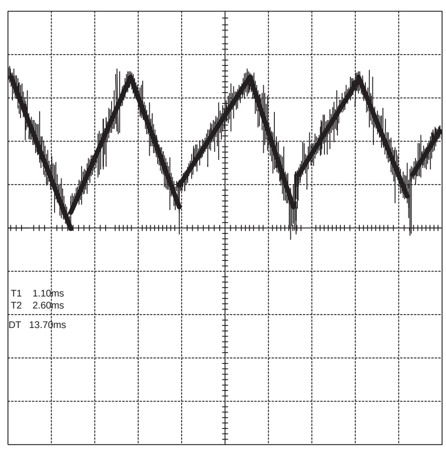


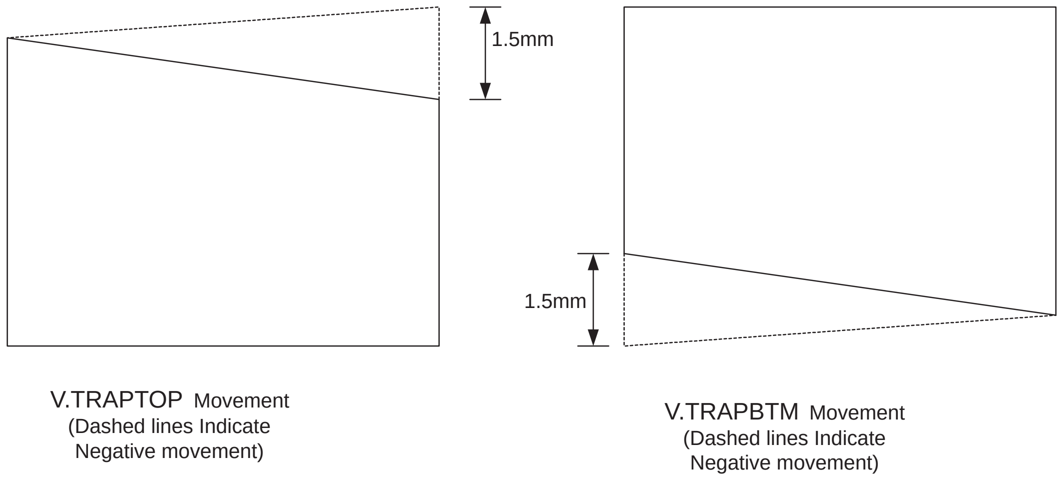
FIGURE 2



Vertical Key Circuit Troubleshooting Hints

It is possible to have a malfunction of only the Vertical Key portion of the circuit. This can occur by a loss of signal from D.TILT. First check if the Rotation function is working properly. There should be no more them a +/-15 degree picture rotation by operating the rotation function through min-max extremes. When the Rotation function is at its full position (SV at R729) the voltage at R708 should be a positive 2.25 vdc, approximately. And at its full negative position this voltage should be a negative (-) 2.5 vdc approximately (NOTE: if D.TILT is open or shorted to ground these voltages will not be well centered around 0V).

Signal tracing should begin at pin 59 of IC1002 on the N board. The triangular output waveform at this point should change +/-1 vdc by operating V.TrapSawBtm and V.TrapSawTop registers through function through min-max extremes. This same signal should appear at pin 42 of CN801 and at the input side of R736. Screen movement for this function is as shown below:



Rotation Circuit Troubleshooting Hints
If Rotation does not work Vertical Key will not work. Signal tracing for a rotation problem can start at pin 3 of IC1001. The Rotation signal will be a square waveform at 40kHz. This signal is filtered at the R729, C705 combination. If this waveform is reaching R705 the problem is in the IC702 area.

5. Dynamic Focus Circuit

Overview
Both H and V Dynamic Focus Waveform originally formed by DSP.
H DF is amplified by Hi-speed OP Amp and also Transformer.
V DF is amplified by Transistor inverter.

H DF
IC703 is amplifying the H DF waveform formed by DSP. The voltage is re-amplified by T701 to about 600Vp-p and supplied to FBT.

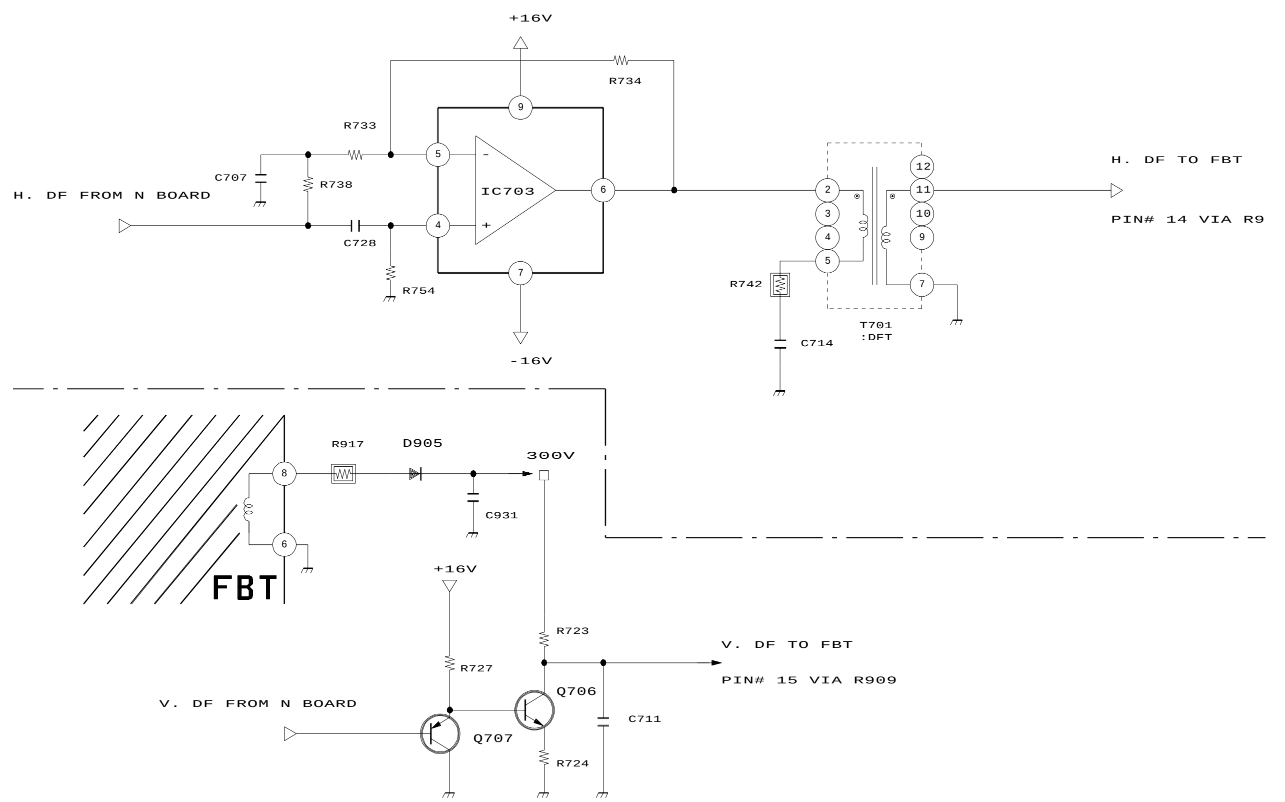
V DF
V DF waveform is buffered by Q707 and amplified by Q706 to about 200vp-p.
300v Vcc is made by FBT through D906. This voltage is also used for HV Protector.

Troubleshooting
See attached “FLOW CHART” and confirm if it is really a DF issue.

Bad H DF
Confirm that waveform from N board is correctly there(1Vp-p).
Check the voltage of pin#6 of IC703. If no output, change IC703. If there is wave form, change T701.

Bad V DF
Confirm that waveform from N board is around 3Vp-p. If it’s more than 3.3Vp-p, change the N board.
Check 300v from FBT.

Dynamic Focus Circuit



6. High Voltage Protect Circuit

This circuit generates the High Voltage supply for the anode and G2 (1000V) of the CRT. It consists of a high voltage driver and regulator similar to a switching power supply function. In addition, there are High Voltage and Beam Current protection circuits. All those circuits are similar to N3 or D1 chassis circuits.

High Voltage Regulation and Output Circuit

The HV Drive pulse is generated by IC805 and synchronized with Horizontal drive pulse. It is supplied to the Gate of Q902 the HV Out FET.

The HV Out Pulse approximately 700V, is generated by Q902 switching with the peak voltage being controlled by the switching duty of Q901 (B+ chopper). Internal resistors and R903 and RV904 divide HV generated in the FBT. Since this voltage is the feedback for HV Regulation control. Adjusting RV904 will result in changing the HV Regulation level(= HV level). HV Feedback voltage is returned to IC805 at pin#12 to be compared with an internal reference voltage of IC805 at pin#13. According to this feedback level, IC805 changes the pulse duty cycle. This pulse is felt at pin #18 of IC805 thereby controlling the output of B+ chopper drive Q901.

G2 Voltage

G2 voltage at approximately 1000vdc is produced by the FBT rectifying the output voltage of T901 pin#2 through D906 and C933. This voltage will be supplied to A board via CN 510, which contains the G2 control circuit.

HV Protect Circuit

HV Protect circuit will be activated by the Microprocessor when the signal at HV DET, CN801 pins#24 reaches a +5vdc level. HV DET indicates the level of the primary current developed by the 300V winding of the FBT through R921, D908.

Beam Current Protect

Beam Current Protect will be activated when ABL DET at CN801 pin#1 reaches a level of 0V when operating in main mode. ABL DET level is corresponding to the Beam Current which is supplied to FBT through R914 and D909. The voltage current relationship is inversely proportional Voltage (down) Current (up).

Troubleshooting Hints
See attached FLOW CHART to confirm if is really an HV/Protect Circuit issue.

No HV / No Power
Perform basic checks of Q901 and Q902 first. If both Q901 and Q902 were not broken, check the HV Drive pulse at the gate of Q901. If no pulse, check R911 and D903. Otherwise, check R910, D901 or try changing IC805.

No G2 Voltage
Check R918 and D906.

Protect Malfunction
To see if HV Prot or ABL Prot are suspect check the Shutdown Log data at the Shutdown Log register. Refer to Shutdown Log Table below.
When an HV Shutdown is indicated, check all N board connections, R917, R921 and D905 or, replace T901 (FBT).
Where ABL Shutdown is indicated, check the voltage T901 pin#11.
If it is higher than 0.5v immediately prior to shutdown, check connections all the way to N board. Should the voltage reach and remain at the 0 volt level, even after the first 2.0 seconds of Power On, check D909 and 904 or check White Balance.

SHUTDOWN LOG TABLE

Bit	Register value	Shutdown Mode	Comment
bit7	128	N/A	N/A
bit6	64	B+ Shutdown	Explained later
bit5	32	S cap Shutdown	Explained later
bit4	16	ABL Shutdown	Hardware Controlled
bit3	8	HV Shutdown	Hardware Controlled
bit2	4	HV U Shutdown	Not Used
bit1	2	No Vertical	Explained later
bit0	1	No H Pulse	Explained later

7. Protection Circuitry Overview

Overview
The 19D98 chassis was developed with protection circuits other than HV/ABL.These protection circuits are controlled by the N board mounted Microprocessor(IC1001);

- B+ Shutdown: Activates when the secondary of the power supply is overloaded.
- S Cap Switch Shutdown: Activates when any of S-Cap Switching FETs are broken.
- V Scan Shutdown: Activates when Vertical Deflection signal is absent or of insufficient level or of a distorted nature.
- H Scan Shutdown: Activates when Horizontal Deflection signal is absent or of insufficient level or of a distorted nature.

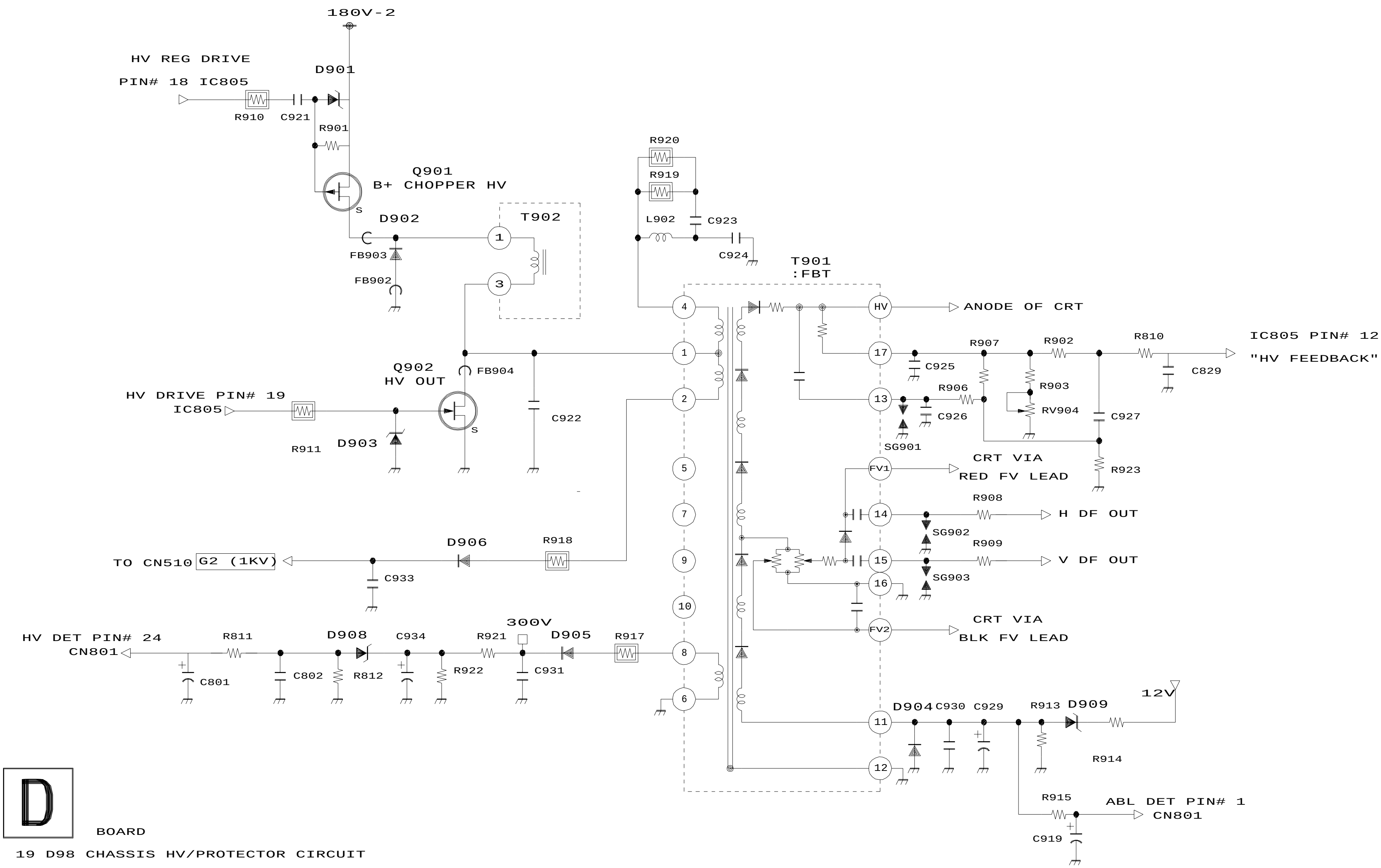
Troubleshooting Hints

B+ Shutdown
Refer to POWER SUPPLY section.

S Cap Switch Shutdown
In the event of failure of any S-Cap Switching FETs, and Remote or AC Power switch was turned Off/On, the Microprocessor detects FET gate damage and goes into shutdown mode. For these conditions, refer to the section of H Linearity Circuit.

Vertical Scan Shutdown
If the V FBP feedback at pin #42 the Microprocessor becomes less than +2.5V, a Shutdown will be initiated. Power Supply problems may also produce a similar type failure. For these conditions, refer to the V Deflection Circuit or the Power Supply section.

Horizontal Scan Shutdown
If the H FBP feedback at pin #32 of the Microprocessor becomes lower than +2.5V, Shutdown will be initiated. Some power Supply problems may also produce a similar type failure. For these conditions, refer to the H Deflection Circuit or Power Supply sections.



D

BOARD

19 D98 CHASSIS HV/PROTECTOR CIRCUIT

8. Vertical Deflection (D/N Boards) Circuit

Theory of Operation

The Vertical Deflection block takes its input from the N-board via pins 13 (VSAWN) and 15 (DCC2). These two signals are generated by the DSP (IC1002) and are both centered on 1.5V. VSAWN is a sawtooth waveform that controls VSIZE. DCC2 is a DC reference that is compared to VSAWN at IC401. VCENTER is controlled by the shift of VSAWN relative to DCC2. VSAWN and DCC2 are filtered heavily on the N-board by R1035, R1036, C1009 and C1010 and therefore require the use of IC1007 as a buffer. Along with a buffer a retrace switch is also necessary to short R1036 and remove the filtering during the retrace. The retrace switch is internal to the DSP and is found between pins 63 and 64 (see schematic on the following page).

IC401 serves as a transconductance amplifier (it amplifies a low level voltage into a high level current) for VSAWN and the DC difference between VSAWN and DCC2. The current generated by IC401 is fed to the Vertical Deflection Coil. At the return point of the Vertical Deflection Coil the current flows through R405 and R403 which generates a voltage across them which is fed back to the amplifier via R404.

The Vertical Deflection Coil has a large inductance (3mH) and therefore it is very difficult to make large quick changes in the current without high voltage. This situation occurs during the retrace time (+/-15V is not enough). A circuit internal to IC401 is used to raise the voltage at its output. This circuit works as a charge pump that generates about 40V at pin 6 during retrace and this is added to +/-15V to generate a total of 55Vpk-pk at the output of IC401. Two external components are used for the flyback generator. C403 is used as part of the charge pump, while D401 is used to block the high voltage of the flyback pulse during retrace.

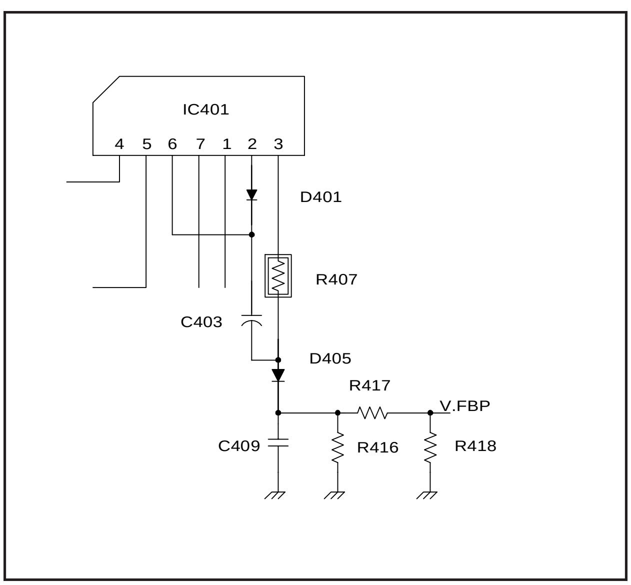
VFB Signal Generation

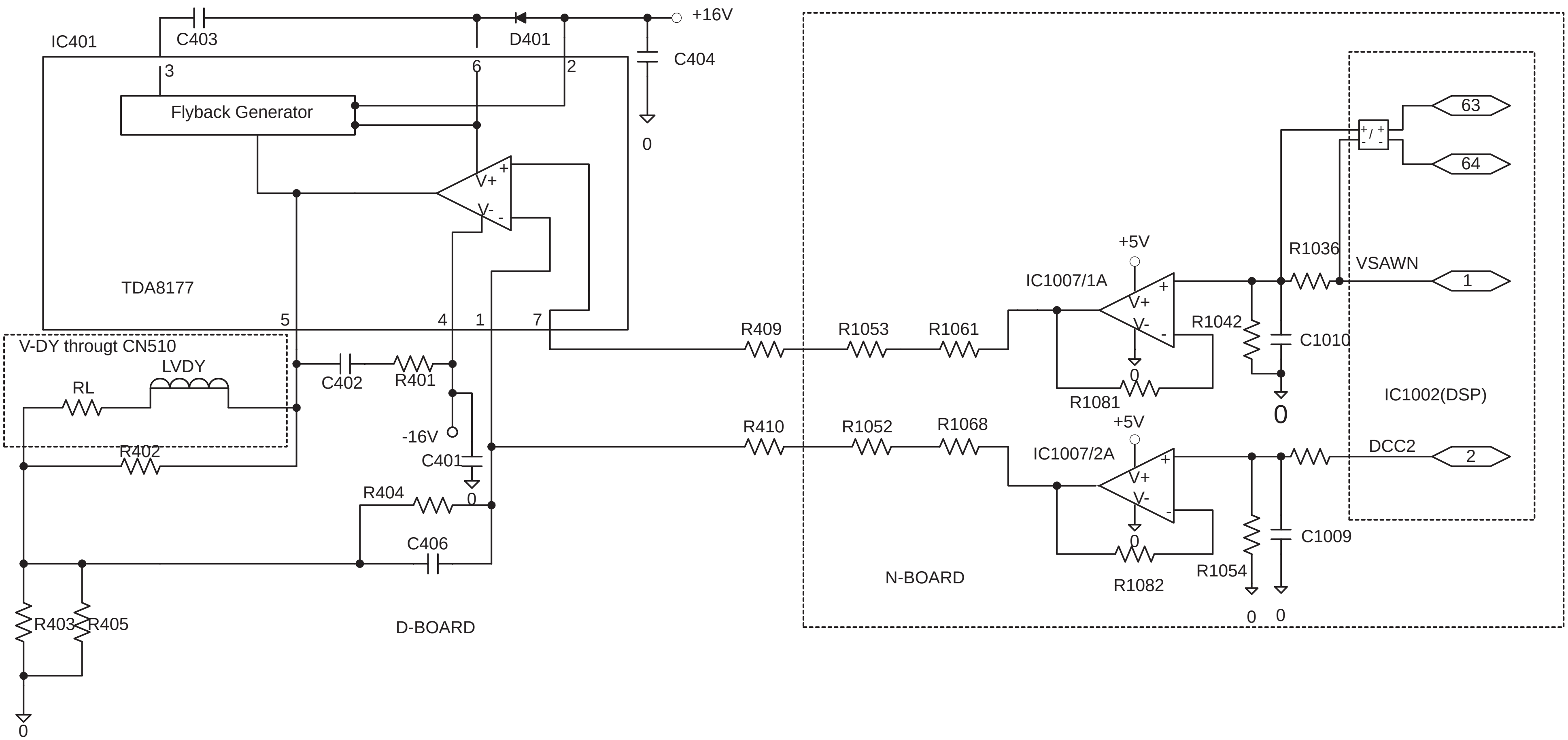
For D98 VFB is a DC signal. It is generated by rectifying the flyback pulse generated at pin 3. D405 and C409 do the rectification while R417 and R418 the DC level appropriately. If the flyback generation at IC401 does not work (ie. IC401 malfunctions) then the DC level at this point will be reduced and trigger the Vertical Shutdown Protection Mode after one second the set’s LED will blink amber for 1.5 sec. and then off for 0.5 sec. This is the indication of a scan failure.

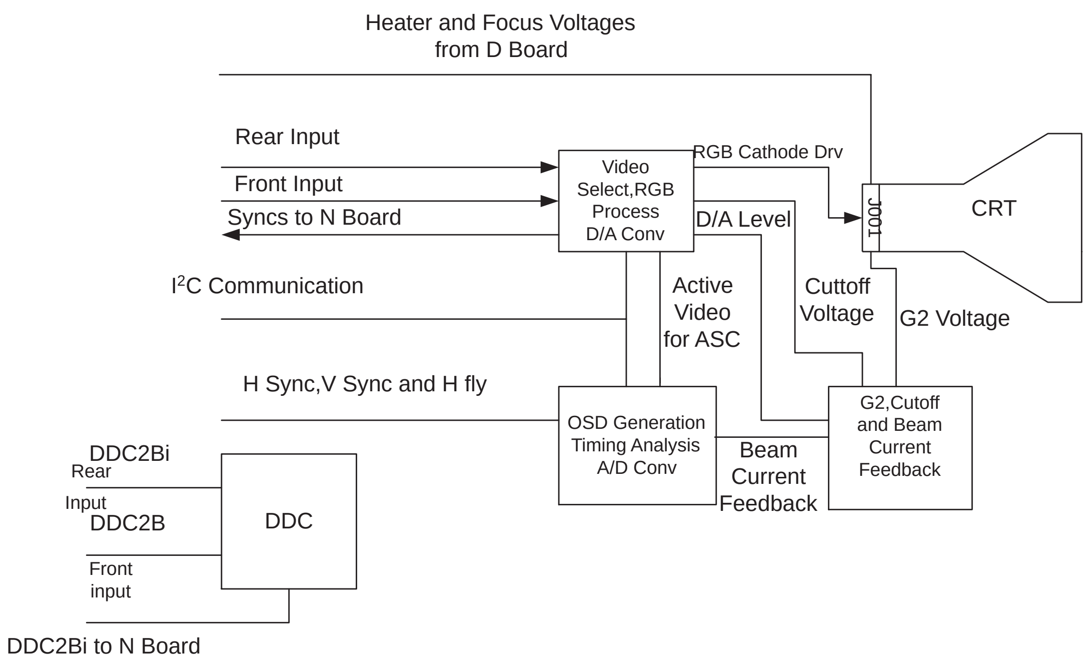
Troubleshooting Hints

Vertical Scan Failure

The first step is to check the shutdown log of the monitor and make sure the microprocessor has detected a loss of VFB. Once this has been verified the output of IC401 should be checked. If a normal output exists after the remote on/off bit is turned on but the monitor still shuts down then the VFB detection circuit (see VFB signal generation section) is malfunctioning. If no output exists signal tracing should begin at IC1002 pin 1 for VSAWN and pin 2 for DCC2. In shutdown mode both of these levels should be 1.5V DC. If the remote on/off bit is turned on a sawtooth waveform of about 1Vpk-pk should appear on VSAWN while DCC2 stays at 1.5V this should last about 2 seconds until a loss of VFB is detected and the monitor shuts down again. If these signals are good check for the same signals at the output of the N-Board pins 13 (VSAWN) and 15 (DCC2) by repeating the remote on/off step. If no signal is present the problem is with IC1007, if present continue tracing to R410 and R406. If the signals make it this far the problem is likely in the IC401 area.




+16V
C403
D401
IC401
C404
3
6
2
Flyback Generator
0
V+
+
V-
-
TDA8177
5
4
1
7
V-DY througt CN510
LVDY
RL
C402
R401
-16V
C401
0
R402
R404
C406
R403
R405
D-BOARD
0
R409
R1053
R1061
R410
R1052
R1068
IC1007/1A
IC1007/2A
+5V
R1081
R1082
R1042
C1010
R1036
VSAWN
R1054
C1009
DCC2
IC1002(DSP)
63
64
1
2
N-BOARD



19 D98 Chassis A board Block Diagram

VIDEO "A" BOARD ELECTRICAL CIRCUIT

The main function of the A Board is to receive incoming video signals and process them into the RGB video drives necessary for the CRT cathodes. Video signals can be received from two sources: One is the conventional 15 D-sub connector and the second is an additional input located at the front of the monitor consis ing of the female portion of the 15 D-sub. The purpose of this second input is to allow easy hookup to a laptop computer with the aid of an additional video cable (provided).

The A board circuitry also buffers the Sync timing signals, and provides On Screen Display (OSD) video. The timing analysis for the Auto Size Center function as well as the Analog to Digital conversion for the Color Restoration functions are processed on the A-board also.   Additional functionality's include: the Display Data Channel information functions to the DDC equipped host computer and all the CRT cathodes operating voltages such as the heater, G2 and focus are either processed or passed to the CRT socket (J001).

A Board Functions

The A Board functions are divided into four operational sections which are described as follows.

1) Video Select and RGB Process Functions

- Video input selecting is controlled by Microprocessor.
- Sync Timing Buffering.
- RGB video signal amplification and adjustment according to white balance requirements, contrast and brightness settings.
- On Screen Display mixing.
- D/A conversion for RGB CRT cathode cutoff G2 levels control.

2) On Screen Display Generator, Timing Analysis and A/D Conversion

- OSD RGB video pattern generation.
- Timing analysis for Auto Size Center function.
- Analog to Digital Conversion for Color Restoration function.

3) G2 and Beam Current Sensing Functions

- Amplifies setup levels provided by Preamplifier A/D outputs for G2 control.
- Beam Current Feedback (BCF) sensing for Color Restoration function.

4) Display Data Channel Interface

- DDC2Bi
- DDC2B

1. RGB Signal Processing (A Board)

RGB Signal Select

The Video and Sync inputs from the rear D sub and front input connectors are applied to the inputs of IC008. Each input is terminated by an 82 Ohm resistor which is seen as 75 Ohm termination due to effect of the input impedance of IC008. IC008 switches between inputs, at the user’s discretion, when the input select button on the front panel is accessed. A low on IC008 Pin (9) selects the rear D sub input. Sync timing signals are buffered by IC008 before being sent to the N board. Sync on Green timings are passed to IC001 where the sync signal is isolated and then sent to the N Board.

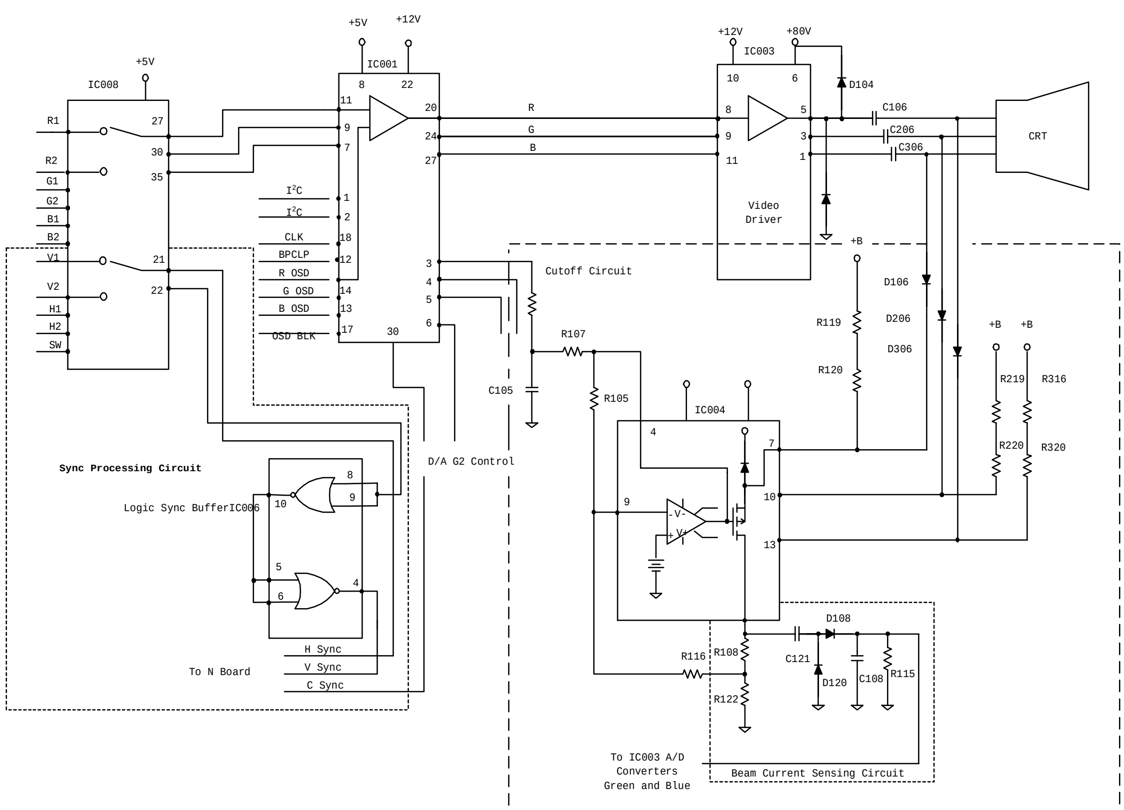
RGB Signal Amplifiers

Selected and buffered RGB video signals are amplified by IC001. Here the individual Sub Contrasts, Brightness offsets, and Contrast gain levels are set by the Microprocessor via I2 C control. The OSD RGB video signals from IC003 are mixed into the main video channels inside IC001. IC002 provides a final amplifier stage for the RGB video signals. This video driver is internally set to a gain of –14. Therefore at the output pins of IC002 (Pin1, 3 & 5) the waveform is inverted with typical drives levels on the order of 45Vpp. The Video Driver IC002 drives the CRT cathodes via AC coupling.

RGB Cathode Cutoff Amplifiers

The Red cathode DC cutoff level is amplified by IC004. It is controlled by the D/A output of IC001. The Red cutoff level is

Video Select and RGB Process Functions



clamped by discharging C106 via D106. The Green and Blue cathode Cutoff levels are clamped in a similar fashion. The individual cathode cutoff levels are set for white balance by the Microprocessor via I2C communication with IC001.

Troubleshooting Hints

1) If the screen is blank with no output check:

- Video signals with proper cutoff levels are provided to the CRT cathodes.
- Supply voltages are at the appropriate levels and locations starting at CN305.
- Heater voltage is correct and present at the heater cathode.
- Diode shorts at the cathodes.
- Sync timing signals are present at the output of IC008.
- That there is I2C communication to IC001.

2) If the screen is lighted with no video check:

- Control, blanking and clamp signals to IC001, IC002, and IC008.
- +5V, +12V, and +80V to these circuits.
- For shorted diodes on the IC002 outputs.

3) If colors are wrong or missing and white balance cannot be adjusted check:

- Each individual color signal path comparing DC offset and peak to peak signal levels to each other to determine if there is any single amplifier at fault.
- For shorted diodes on the IC002 outputs.

2. On Screen Display Functions

On Screen Display(OSD)

IC003 is the On Screen Display character and graphic generator. It provides RGB and Fast Blanking data to IC001 for mixing with the main video channels when required. Outputs voltages are two dimensional, either 0V or 3.6V. IC003 is controlled by the Microprocessor via the I2C bus. The sync timings necessary are V sync and H Fly. The reference oscillator is set by an 8MHz crystal X001.

Timing Analysis

Timing Analysis for the Auto Size Center function is provided by IC003. Time measurements are taken with V sync (pin6), H sync (pin5) and Active Video (pin7). These measurements are then sent to the Microprocessor via I2C communication for size and centering calculations.

A/D Conversion for Color Restoration

Coloration can be achieved by measuring the CRT beam current during the blanking time. This current is converted to a voltage via a sensing circuit. This voltage is converted to a digital format by the Analog to Digital converters contained in IC003. There are three A/D converters for the RGB beam current feedback (BCF) circuits. These digital representations of the RGB beam currents are stored in the BCF Red, BCF Green, and BCF Blue registers at the time white balance is finished on the production line. In the field the Color Restoration can be achieved by sampling the RGB beam currents again and comparing these new values to the ones stored in the BCF registers. The Microprocessor then adjusts the cutoff voltages until the measured beam current is equal with the values stored in the BCF registers. This function is not done automatically. It is necessary for the end user to activate this function through the OSD menu from the front panel controls.

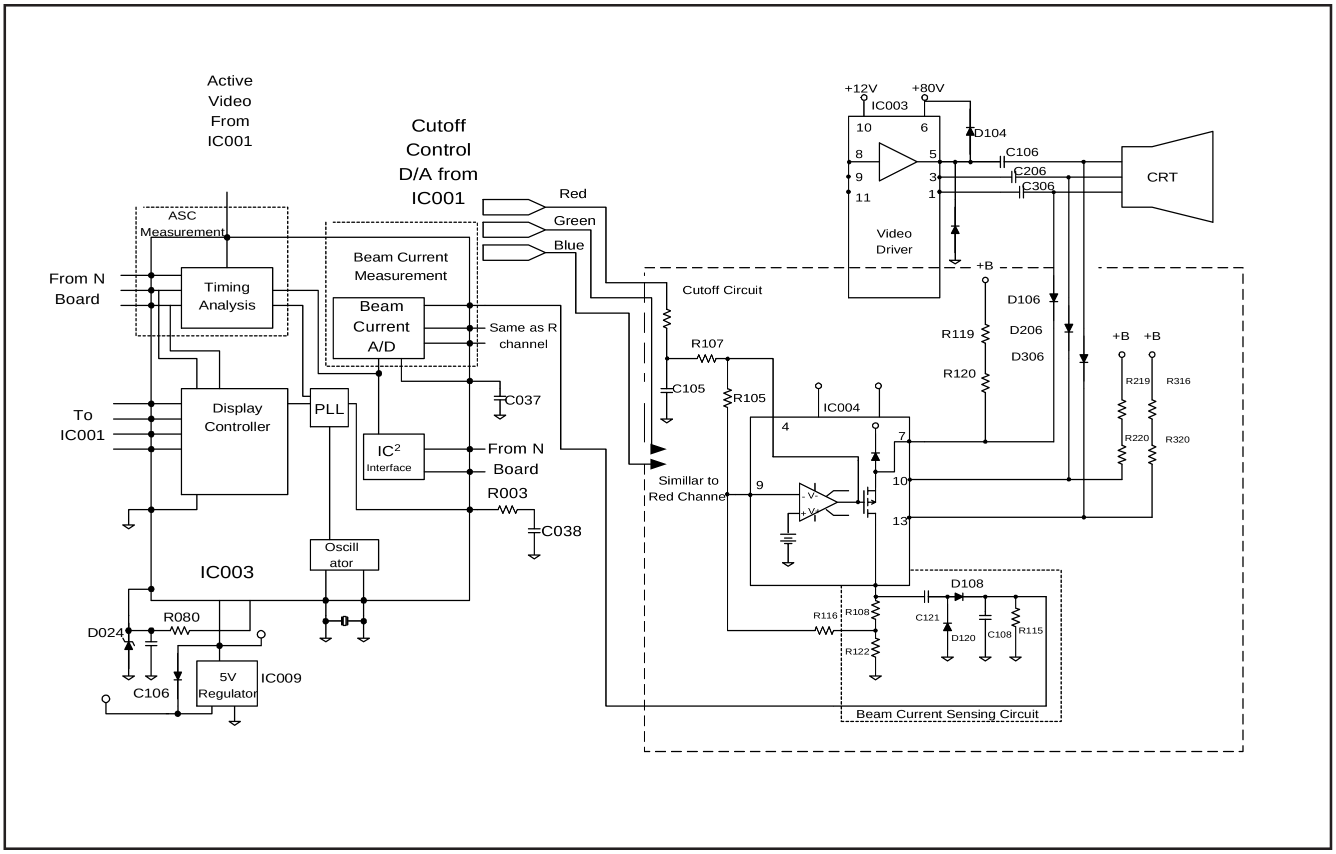
Troubleshooting Hints

1) No OSD is displayed, check:

- RGB and Fast Blanking inputs to IC001. If there are no signals then IC003 may be at fault.
- That +5V is supplied to IC003(Note: Pin 18 will read 3.6V)
- V Sync and H fly signals are at pins 4 and 7 of IC003 respectfully.
- That Crystal X001 is oscillating (8MHz).
- That there is I2C communication to IC003.

2) Auto Size Center Does is not working, check:

- That +5V is supplied to IC003.
- V Sync, H Sync, H fly, and Active Video signals are at pins 6, 5, 7 & 8 of IC003 respectively.
- That Crystal X001 is oscillating (8MHz).
- That there is I2C communication to IC003.



3) Color Restoration doesn't work. Bad color after restoration, check:

- That the OSD is working. If not follow steps of 1).
- BCF registers on the Color Table. Look to see if any registers are abnormally low or high.

The following are typical ranges:

	Mode 1	Mode 2	Mode 3
R BCF	110~140	130~160	105~135
G BCF	115~145	90~120	130~160
B BCF	125~155	45~80	180~230

If values seem strange, check voltages at the BCF pins (20,21,22) of IC003. With a full white image the voltage should be around 2.5~4.5V. If levels seem strange check beam current sensing circuit (next section).

3. G2 and Beam Current Sensing

G2 Amplifier

The G2 reference is provided to IC005 Pin 5 by the IC001 D/A converter. The G2 voltage at the cathode is typically 500v ~ 750V.

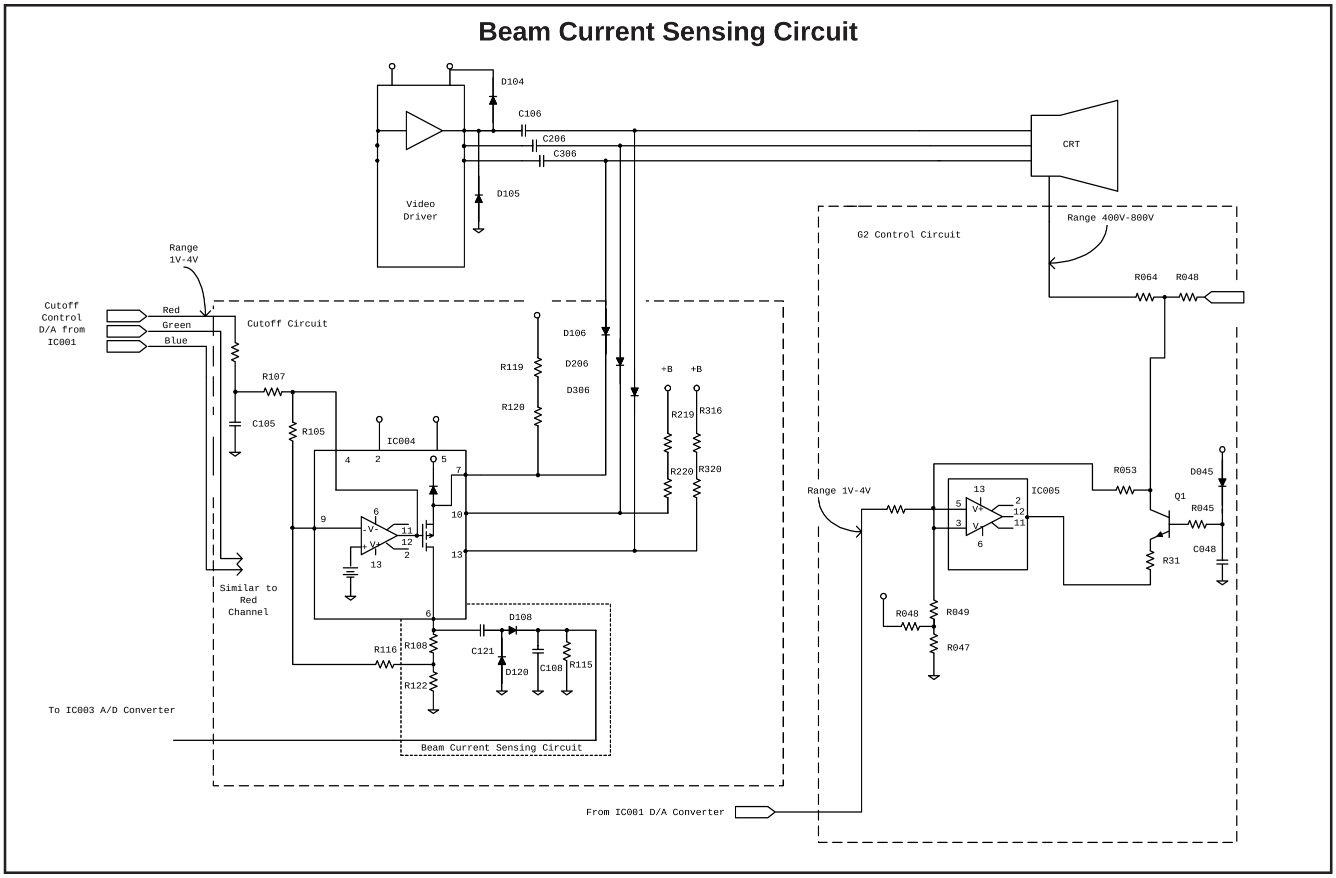
Beam Current Sensing Circuit

Sensing resistors R108, R208, and R308 convert the beam current flowing through the cutoff amplifier during the blanking time into a voltage. This voltage is then AC coupled and clamped to ground. It is then rectified to a DC voltage and sent to the A/D converters of IC003. Here it is converted to digital format and stored in the RGB BCF registers.

Troubleshooting Hints

1) If picture is black, check:

- G2 level at the cathode using HV probe.
- Input to G2 amp, Pin 5 of IC005.



- Heater voltage at the cathode.
-+12V, +5V, and G2 voltage coming from D board.

2) Color Restoration doesn't work. Bad color after restoration, check:
- Check waveforms at pins 6, 11 and 14 of IC004.
- Trace these signals through the rectifier back to IC003.
- If there are no waveforms at pins 6,11, and 14 then IC004 may be suspect.

4. Display Data Channel Circuits (DDC)

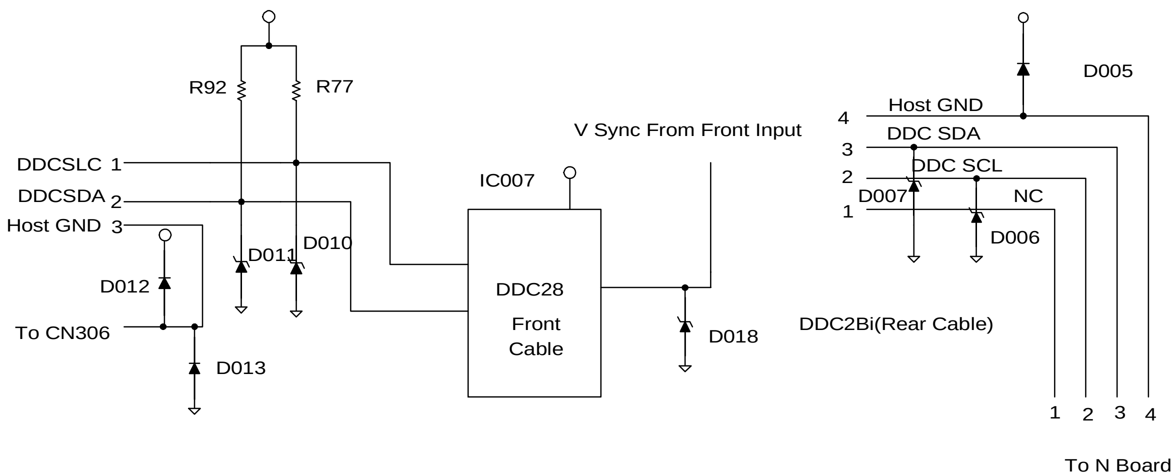
This display can support two video sources. The front input supports DDC2B. While the rear input supports DDC2Bi. For DDC2B (Front Cable) IC007 is a serial memory device providing Extended Display Identification or EDID data that is read by the compatible Host Computer on Pin 5. The basic EDID format consist of 128 bytes which are described in the table below. The 15 Pin VGA connector allocation is also described. The compatible Host Computer provides a V CLK on Pin 7 that is derived from the V Sync input and is used to set the timing of each data reading cycle. The data is clocked by the input of IC007 Pin 6. The rear input supports DDC2Bi. The data is passed through the A Board to the Microprocessor on the N Board via CN311.

Troubleshooting Hints

1. The DDCB circuit should be checked if error DDC messages or erroneous monitor identification data is indicated by DDC2B the compliant Host Computer. Check that the V CLK and S CLK signals are input to IC007 on Pins 7 and 6. The Data transition should be visible at Pin 5.

DDC Data format and VGA Connector Allocations					
Basic EDID consist of 128 bytes		15 pin VGA type connector			
Number	**Description**	**Pin No**	**Assignment**	**Pin No**	**Assignment**
8 Bytes	Header	1	RED Video	11	Option
10 Bytes	Vender/Product Identification	2	GREEN Video	12	Data(SDA)
2 Bytes	EDID Version/Revision	3	BLUE Video	13	H SYNC
5 Bytes	Basic Display Parameters/Features	4	Option	14	V SYNC
10 Bytes	Color Characteristics	5	Return	15	Clock(SCL)
3 Bytes	Established Timings	6	Red Return		
16 Bytes	Standard Timings	7	Green Return		
72 Bytes	Detailed Timing Description	8	Blue Return		
1 Bytes	Extension Flag	9	Option +5V		
1 Bytes	Checksum	10	Sync Return		

Display Data Channel Circuits (DDC)



N BOARD SYNC AND CONTROL CIRCUITS

Overview

The N board performs H and V Sync processing within the Microprocessor (IC1001)and DSP (IC1002 Digital Signal Processor) which generates shaping, centering, deflection drive pulse and other corrections. The DSP is controlled by the Microprocessor using I2C BUS with the Microprocessor having an external EEP ROM. Other Video functions are controlled by Microprocessor through the I2C bus.

MICROPROCESSOR

H Sync (sync out from Microprocessor) and V sync (sync out from Microprocessor) is buffered by internal sync processors and will be sent to DSP and OSD (on A board). In the absence of Video Input, this output will be the Microprocessor’s free running output. The Microprocessor directly outputs the control of H center, H Lin Balance, and Rotation by DAC outputs. In Accordance with the monitor’s operating condition, it switches the Remote On/Off, Heater On/Off, Input select, S Caps, and Degauss.

DSP (Digital Signal Processor)

This IC requires 3.3v VDD. The 3.3vdc is supplied from IC1006 (Regulator). The DSP outputs waveforms for the deflection circuit with most of these going to D Board. Pin #1 is V SAW output and will go to D board through IC1007 acting as a buffer. Pins#6 and #7 are for Dynamic Convergence. Pins #60, 61 are for Static Convergence. Pin #10 is H DF output and #58 is V DF. Pin #59 is V Key output and #64 is H Shape. Pin #57 is PIN/KEY Bal out, this is supplied to the Phase Lock Loop(PLL) Circuit of the DSP which is on pin#12 – 22. H Drive Pulse will be outputted from pin#25 after being modulated by Bal correction and Moire correction(#22). This IC works with 3.3v VDD. The 3.3v is supplied from the IC1006 (Regulator)

Trouble Shooting Hints

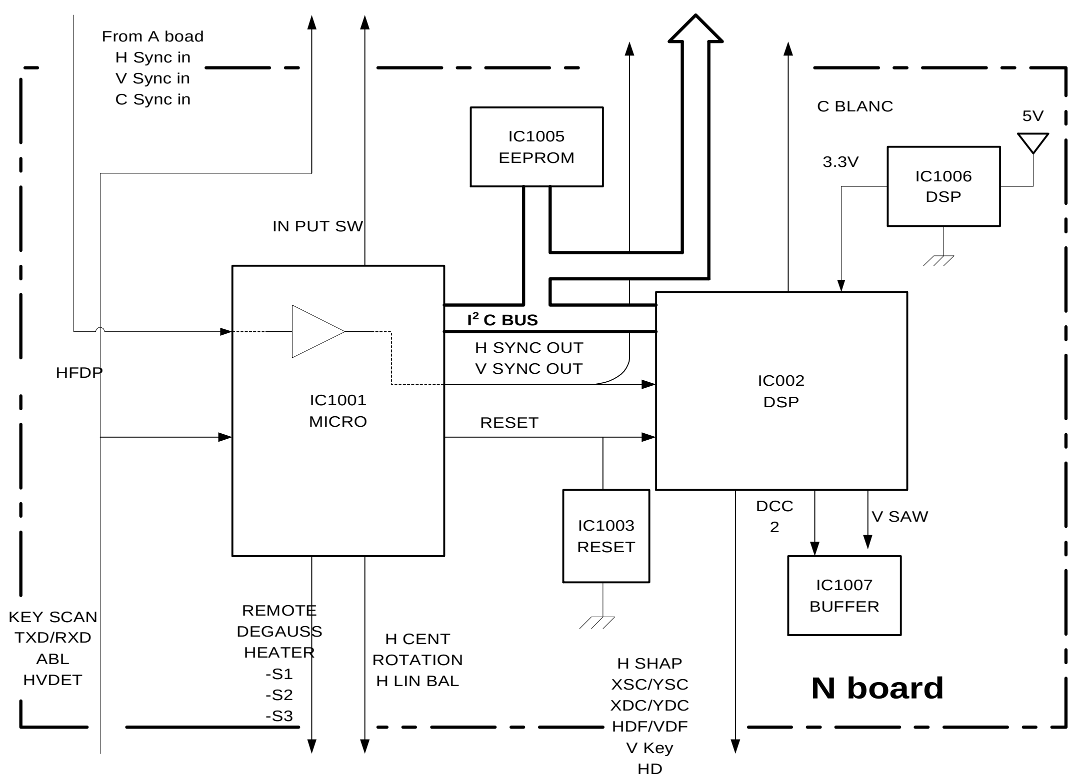
See attached “FLOW CHART” to confirm N Board issues.

Incorrect/No Wave form from DSP

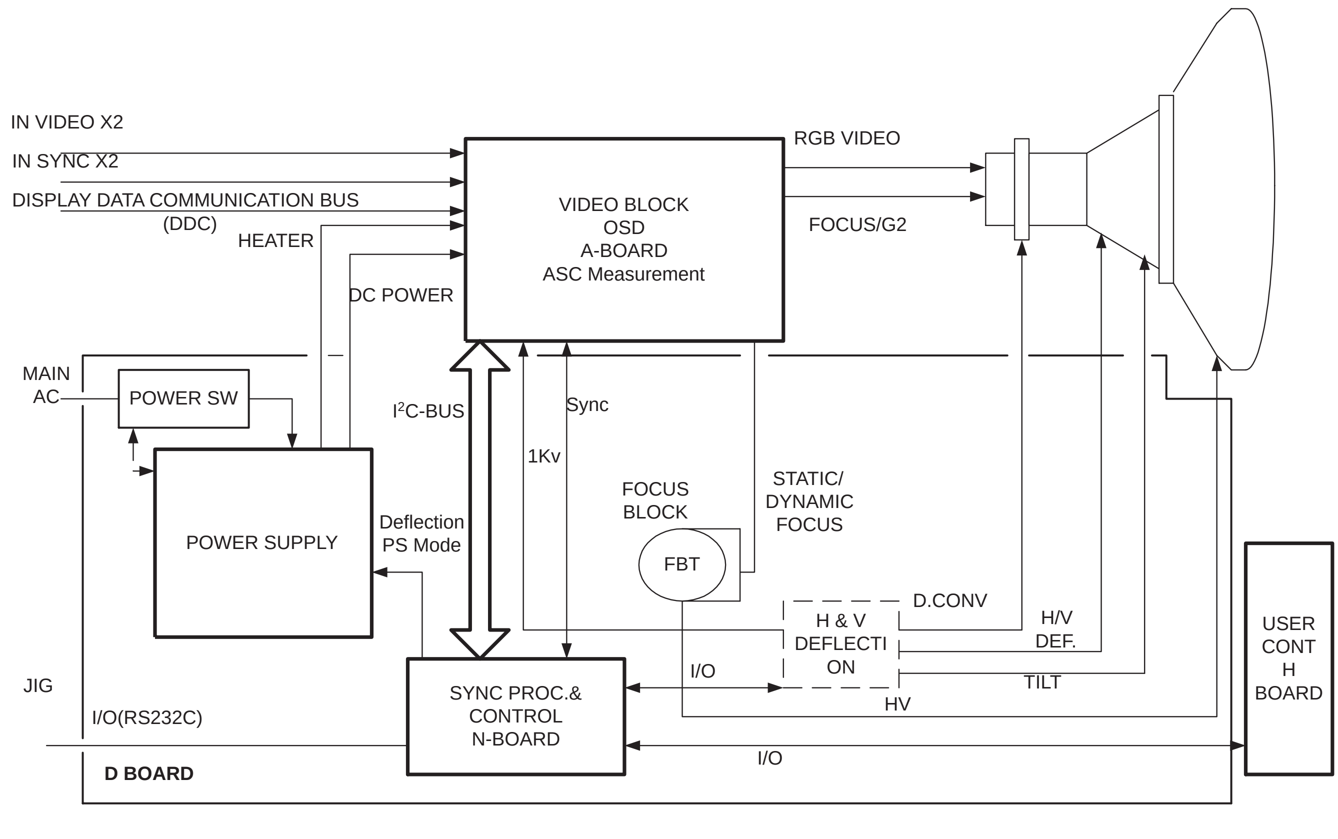
Check the 3.3vdc from IC1006, if O.K, confirm that I2C BUS is sending a pulse(0v-5v) to the DSP. Confirm that Reset (pin#49) is HI and POC-IN(pin#30) is almost 1v.

No Communication or Microprocessor related failure

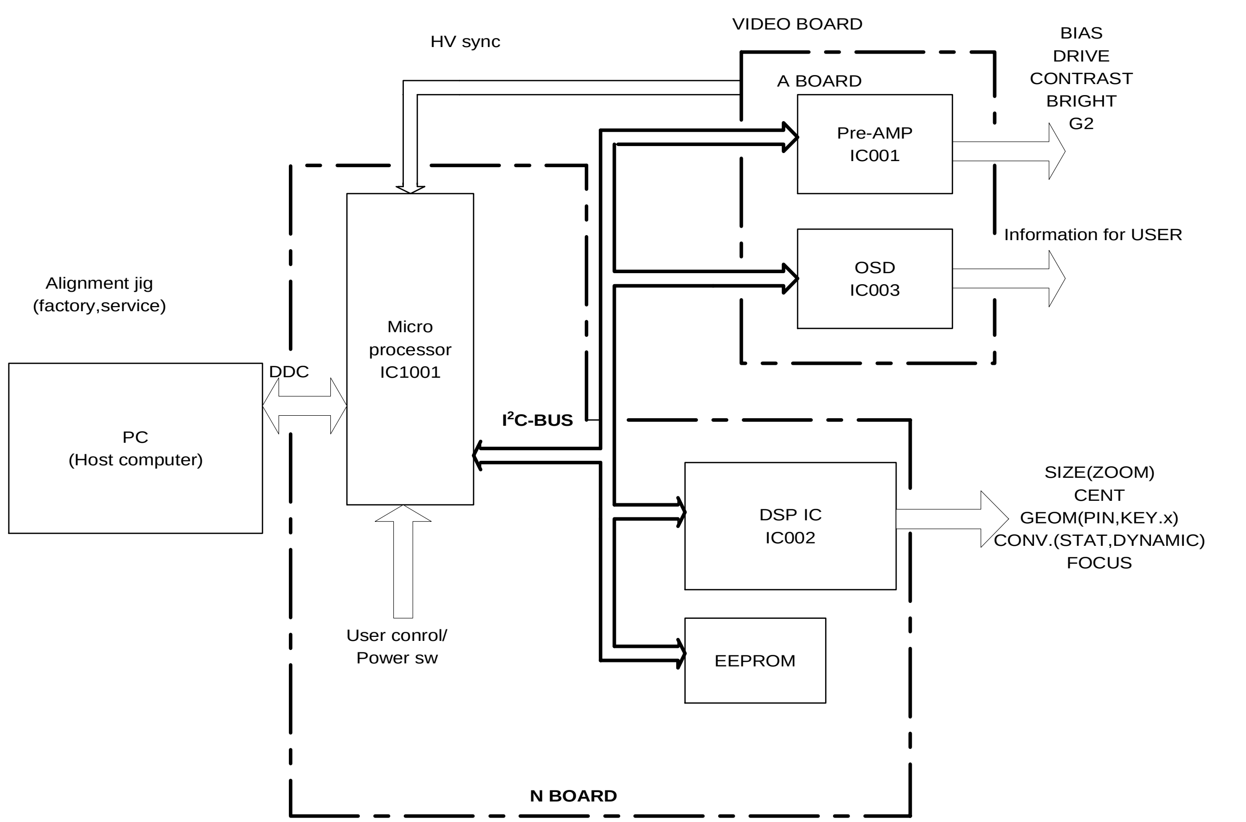
Check CN1003, CN1004 connections first. If OK, then check 5v supply and to see if X1001 is oscillating, also RESET(pin#54) is HI. In case of No Communication, confirm pin #38(RXD) is receiving pulse signal (0v-5v).



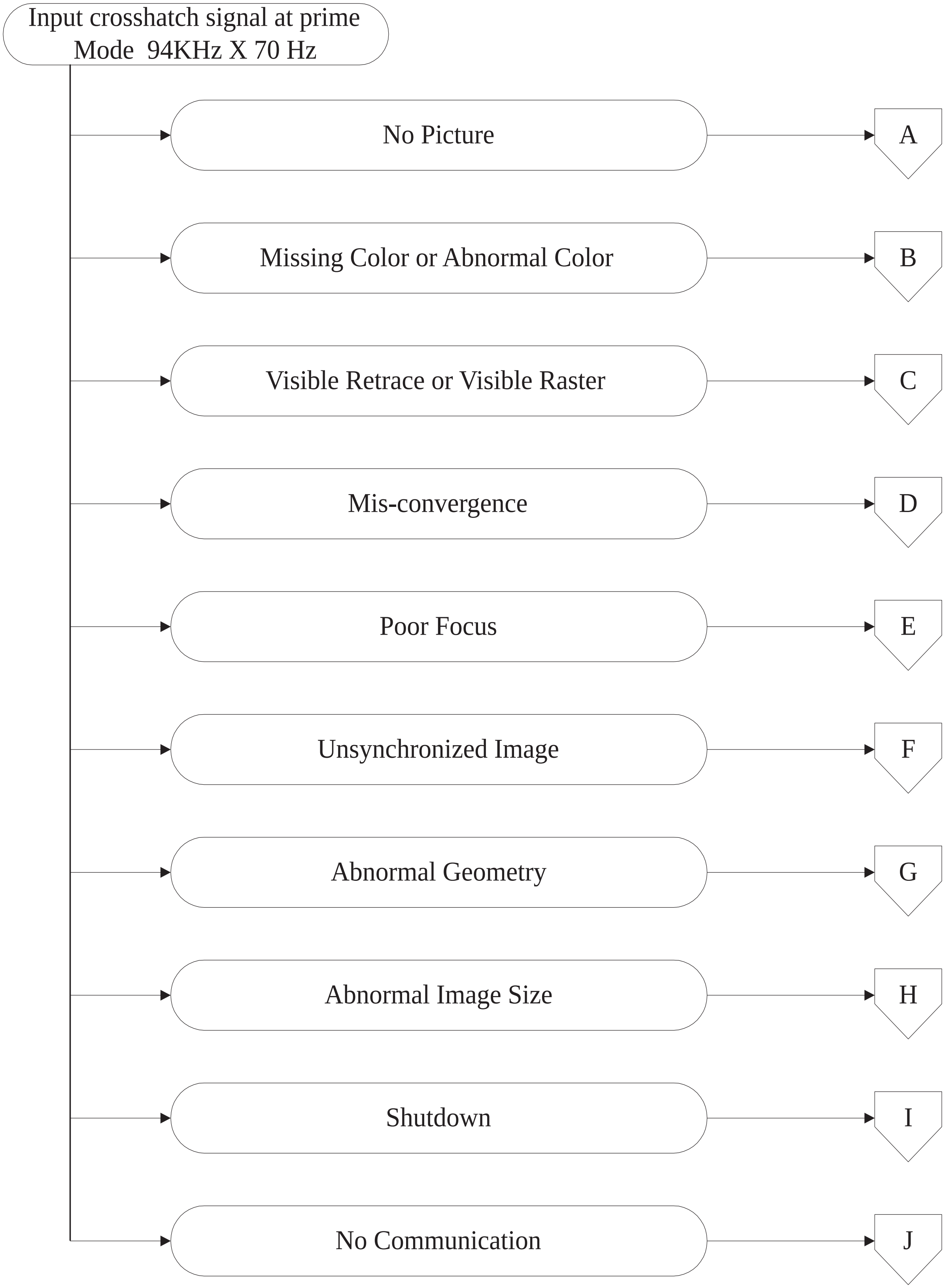
System Block Diagram



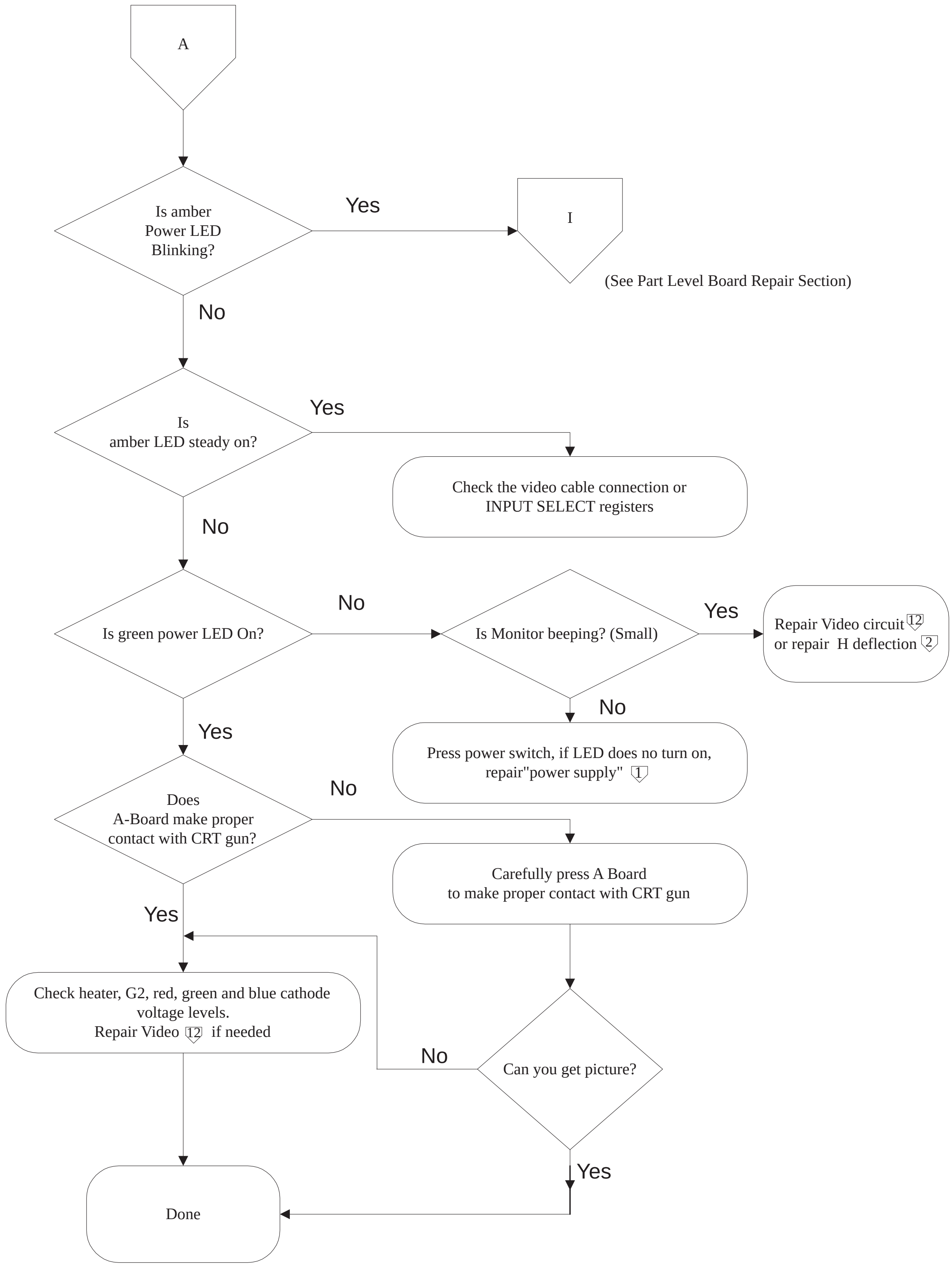
DIGITAL CONTROL COMMUNICATION DIAGRAM



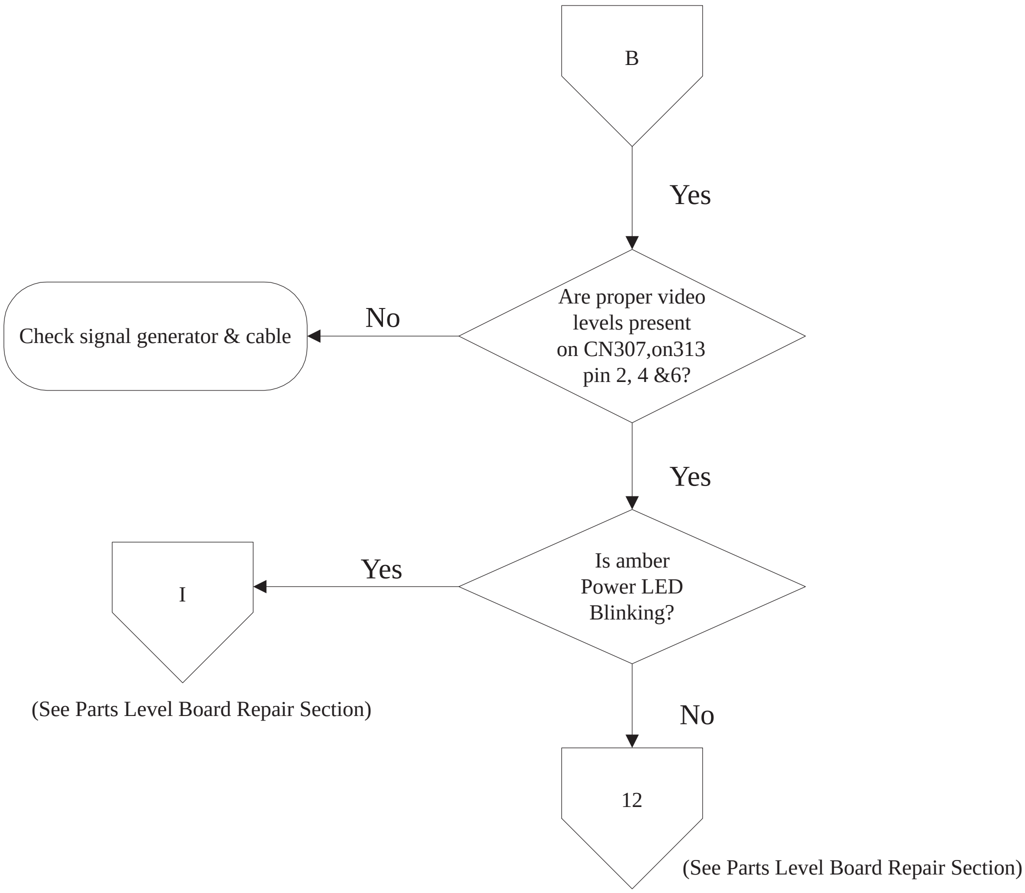
GENERAL TROUBLESHOOTING



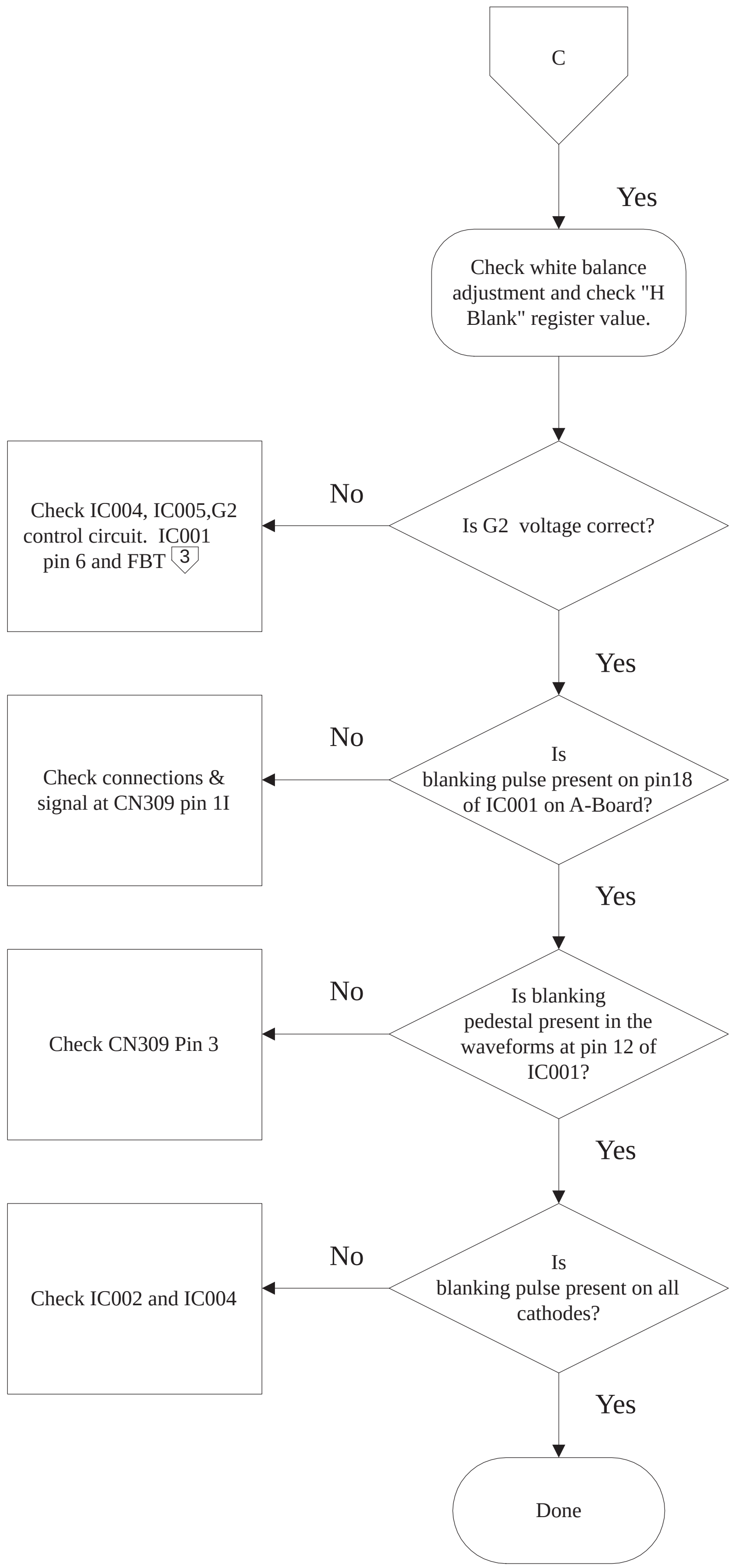
NO PICTURE


A
Is amber Power LED Blinking?
Yes
I
(See Part Level Board Repair Section)
No
Is amber LED steady on?
Yes
Check the video cable connection or INPUT SELECT registers
No
Is green power LED On?
No
Is Monitor beeping? (Small)
Yes
Repair Video circuit 12 or repair H deflection 2
No
Press power switch, if LED does no turn on, repair"power supply" 1
Yes
Does A-Board make proper contact with CRT gun?
No
Carefully press A Board to make proper contact with CRT gun
Yes
Check heater, G2, red, green and blue cathode voltage levels. Repair Video 12 if needed
No
Can you get picture?
Yes
Done

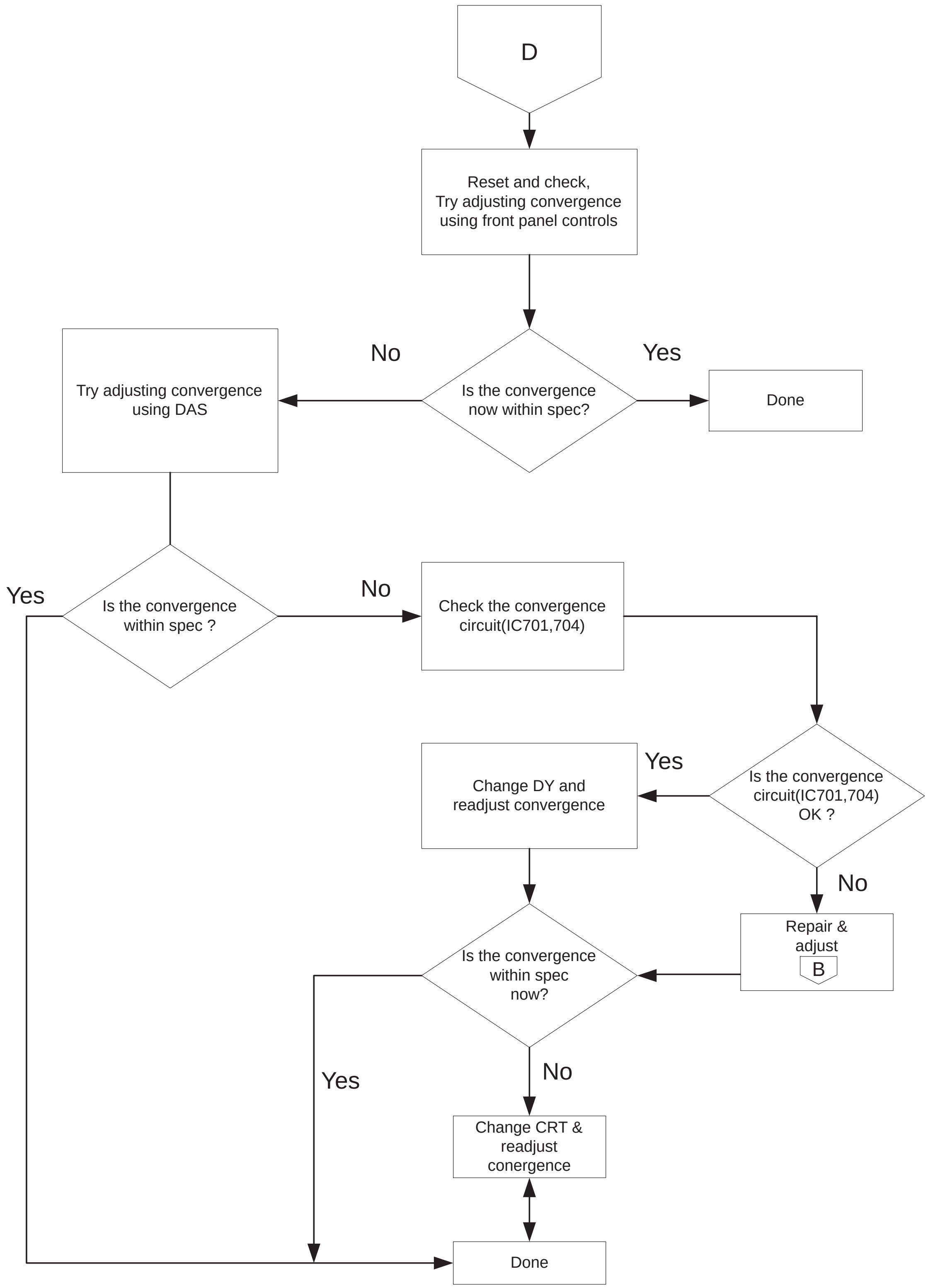
MISSING COLOR



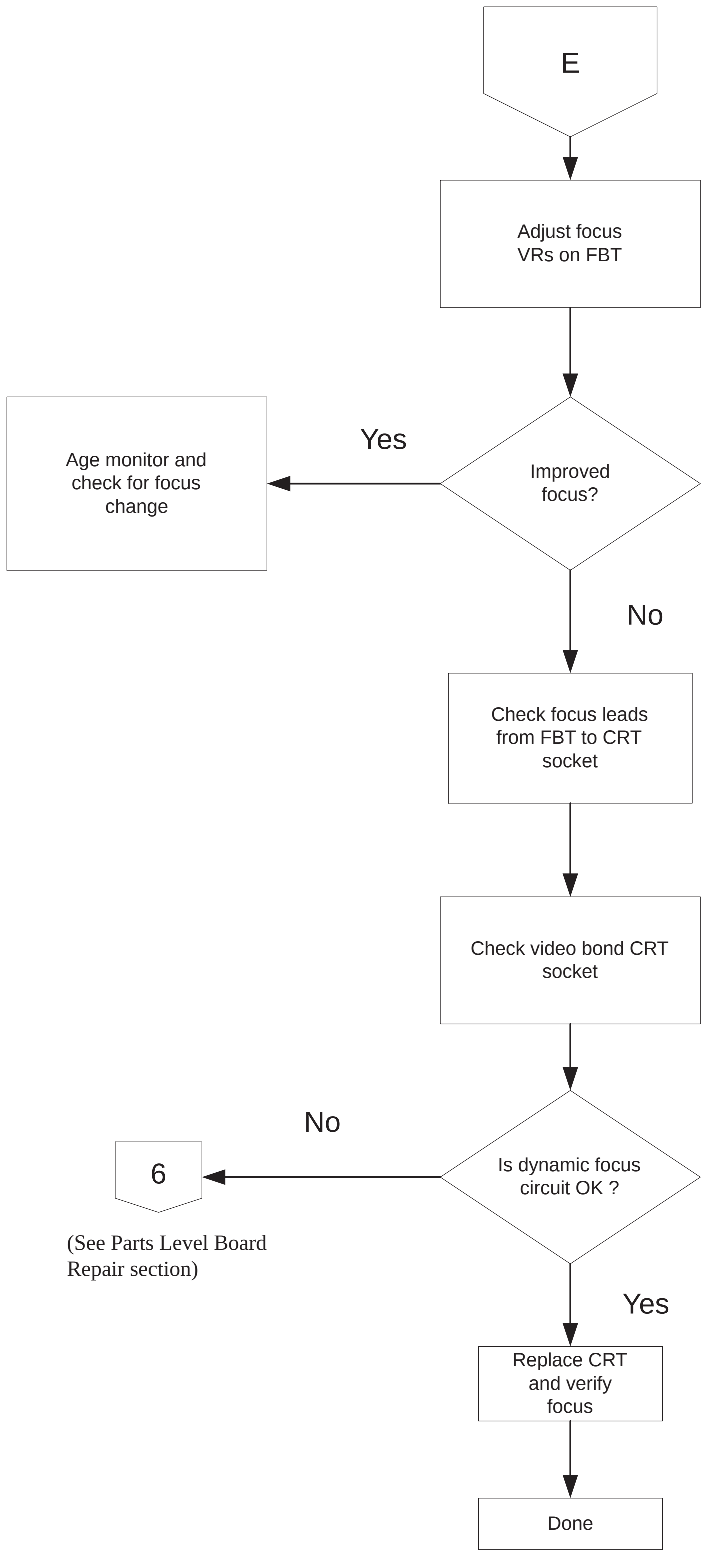
VISIBLE RETRACE



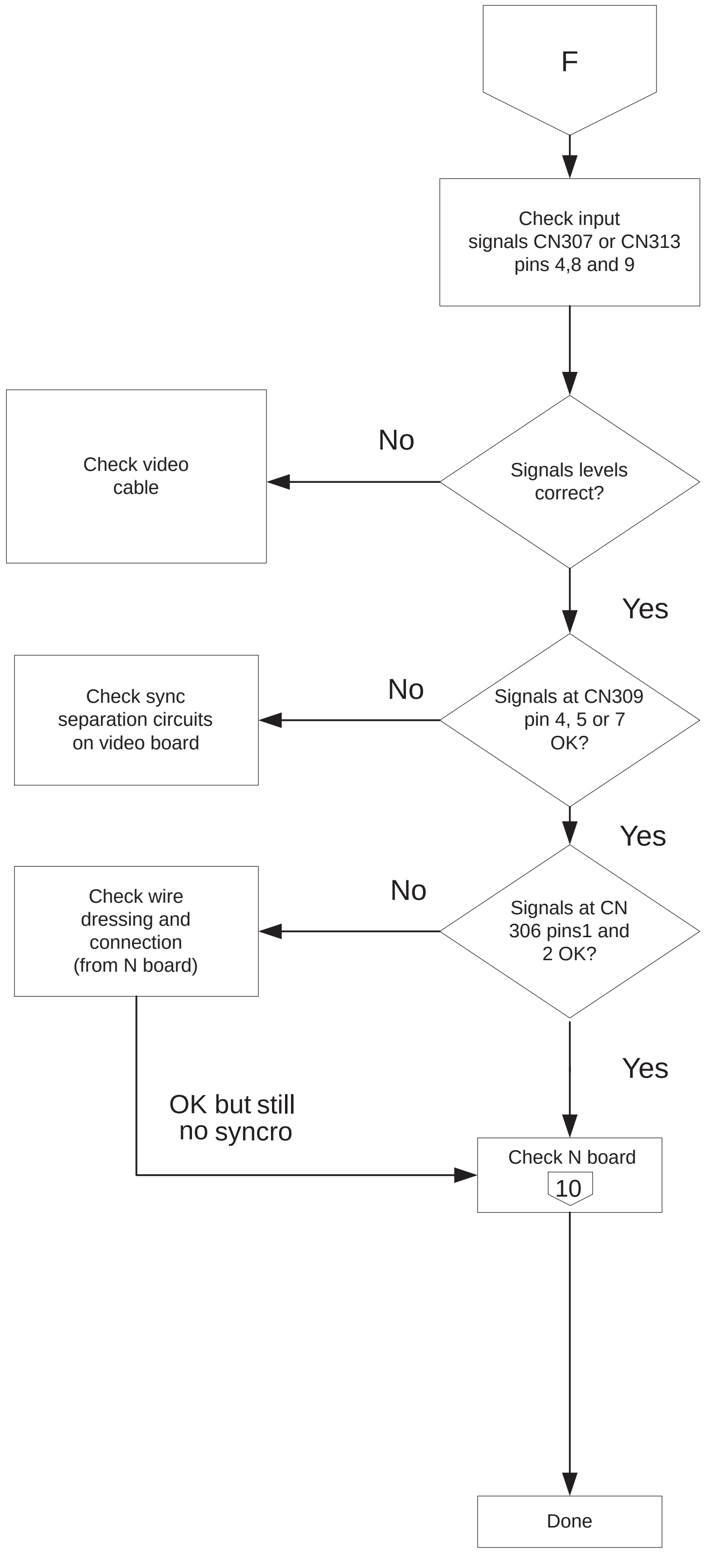
MISCONVERGENCE



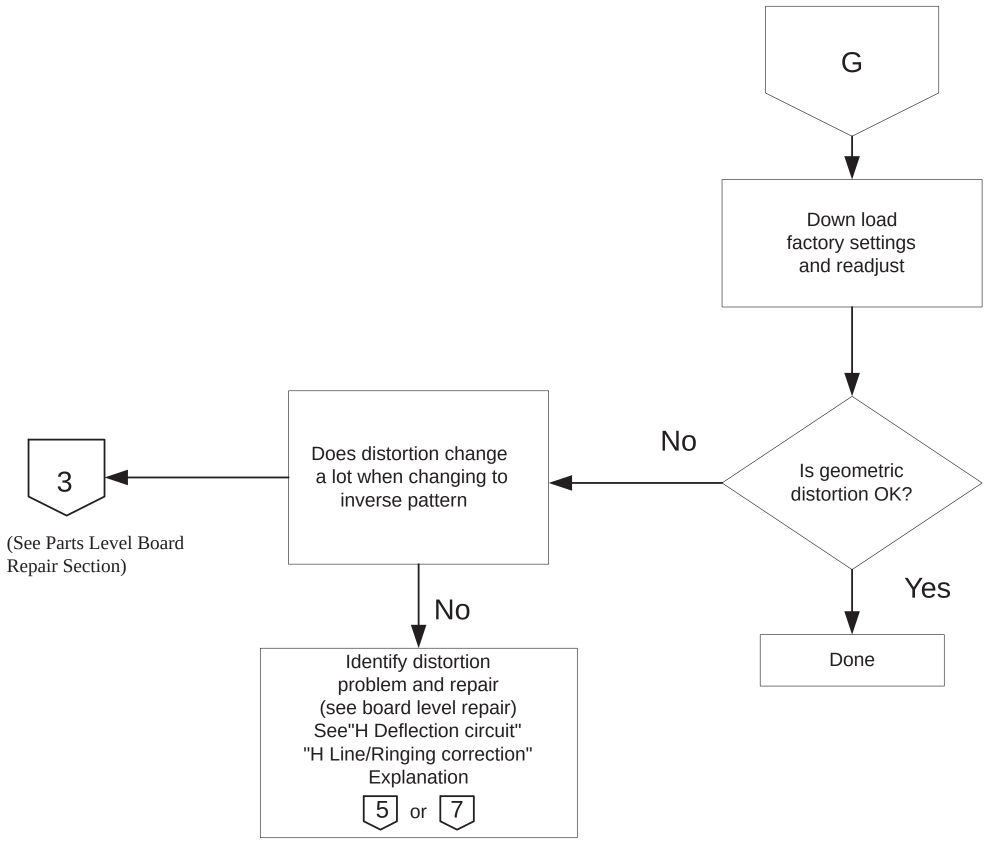
POOR FOCUS


E
Adjust focus VRs on FBT
Improved focus?
Yes
Age monitor and check for focus change
No
Check focus leads from FBT to CRT socket
Check video bond CRT socket
Is dynamic focus circuit OK ?
No
6
(See Parts Level Board Repair section)
Yes
Replace CRT and verify focus
Done

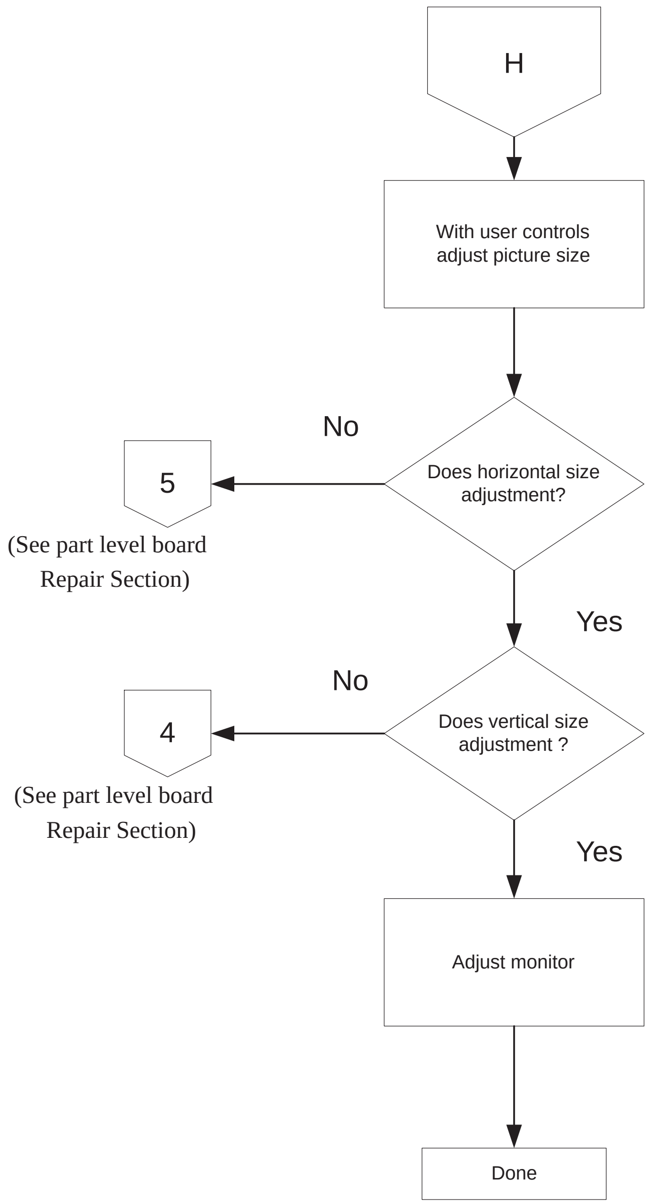
UNSYNCHRONIZED IMAGE



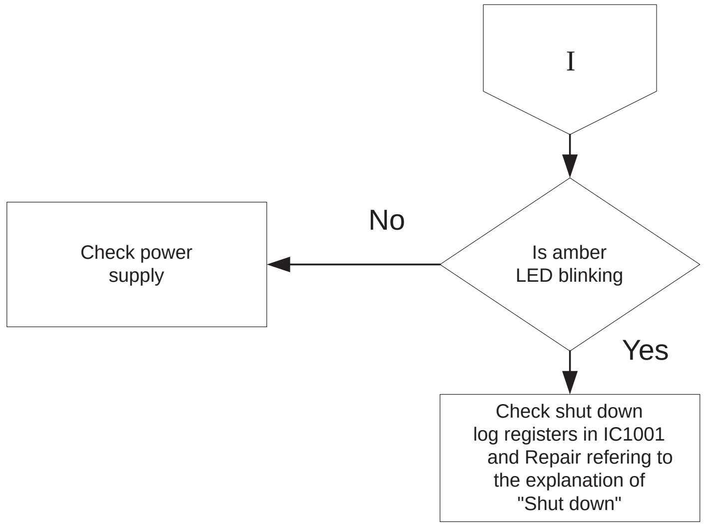
ABNORMAL GEOMETRIC DISTORTION



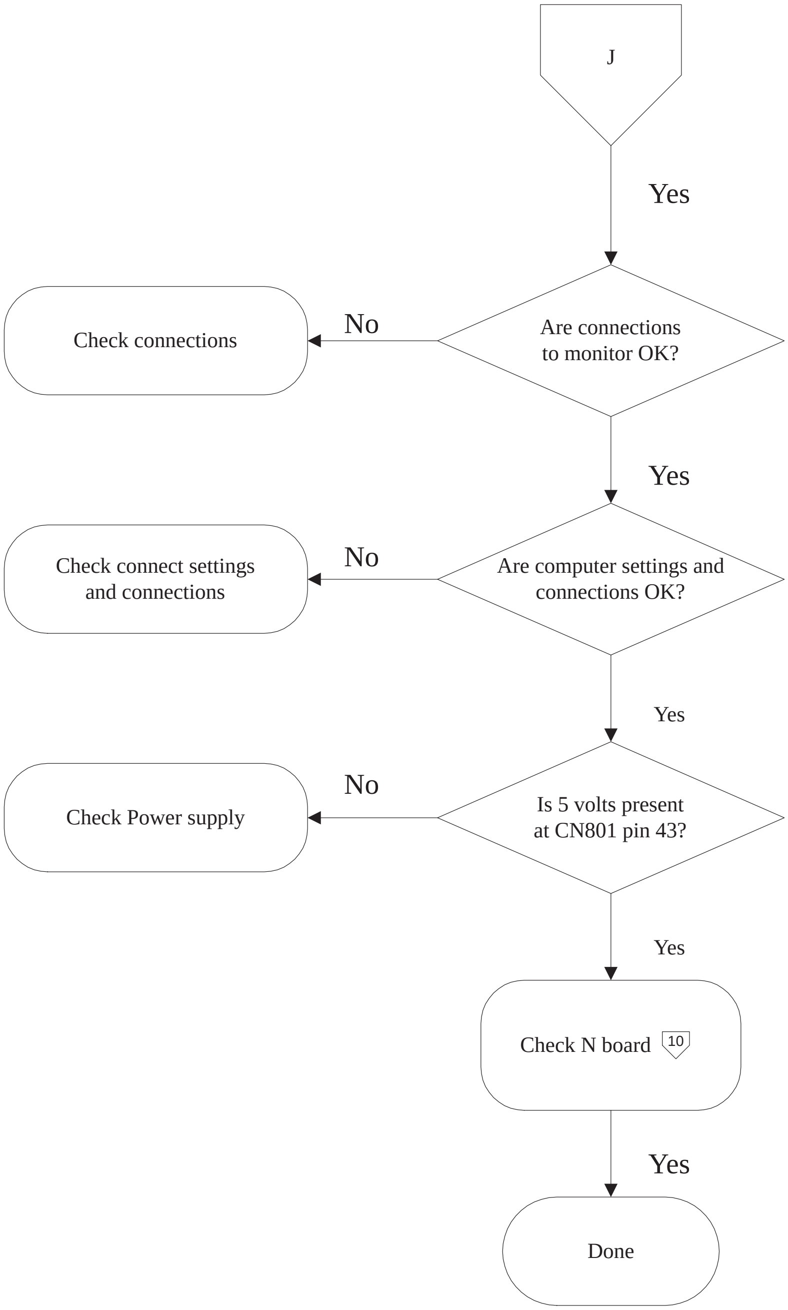
ABNORMAL IMAGE SIZE



SHUT DOWN


I
No
Check power supply
Is amber LED blinking
Yes
Check shut down log registers in IC1001 and Repair refering to the explanation of "Shut down"

NO COMMUNICATION

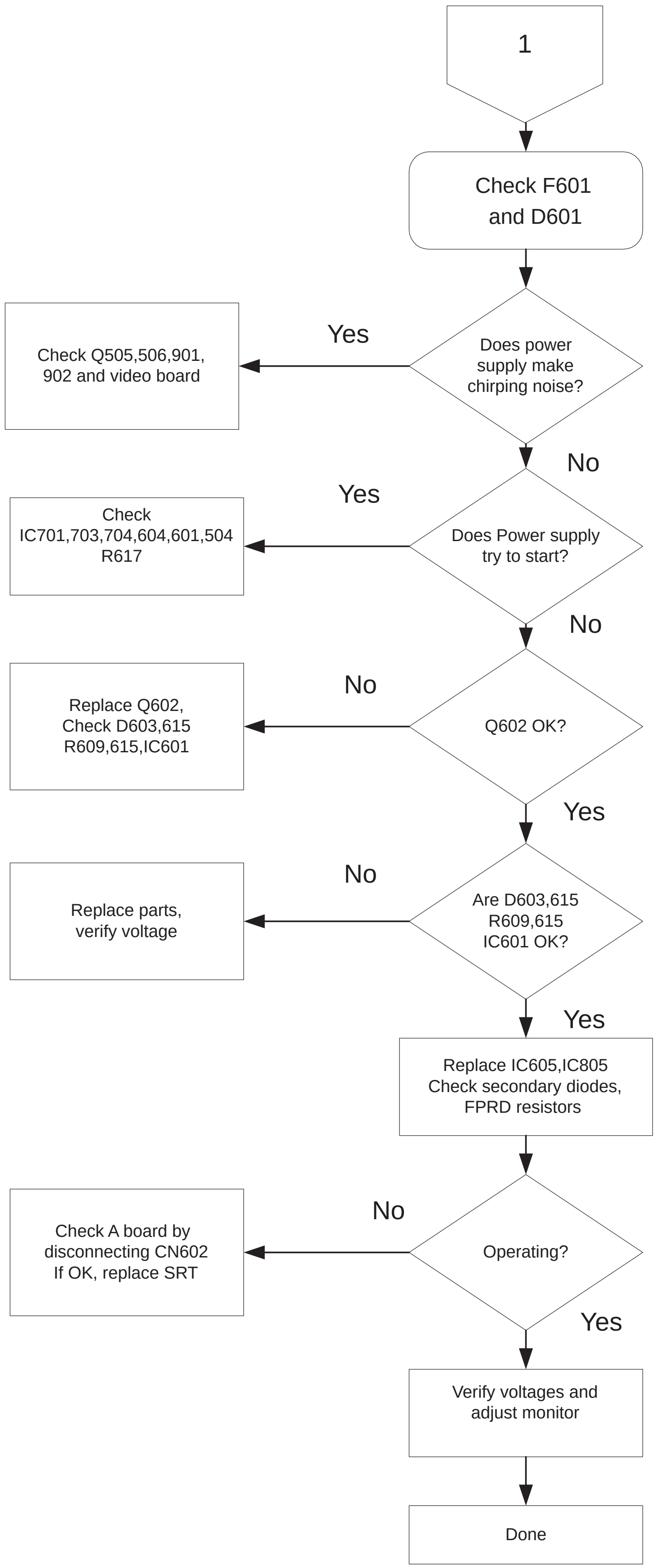


PARTS LEVEL BOARD REPAIR

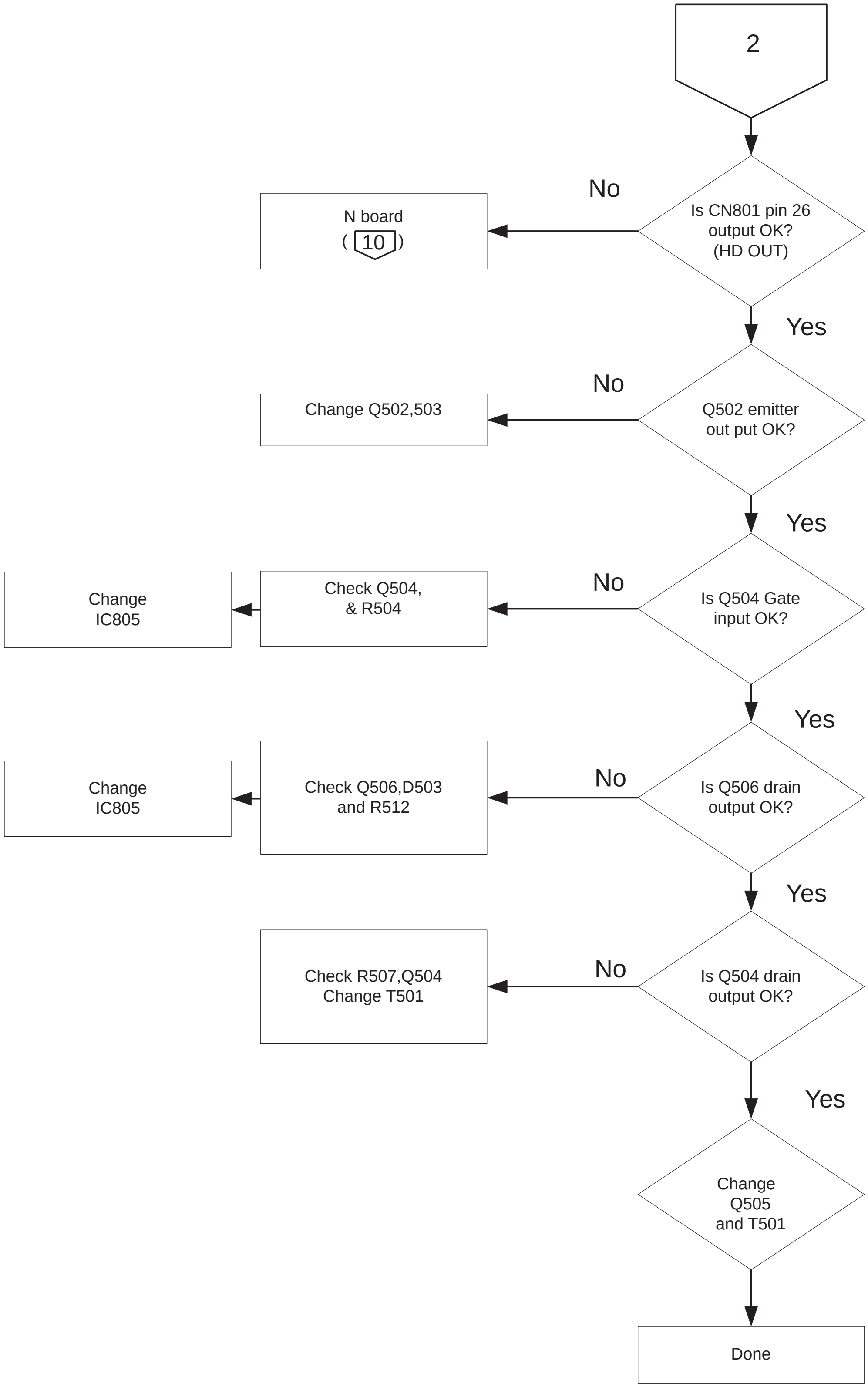
Parts Level Board Repair

- (1) Power Supply
- (2) Horizontal Delection
- (3) High Voltage
- (4) Vertical Deflection
- (5) Horizontal Size
- (6) Horizontal Center
- (7) Key and Pin
- (8) Key and Pin Balance
- (9) Rotation
- (10) N board
- (11) Dynamic Focus
- (12) Video
- (13) Convergence

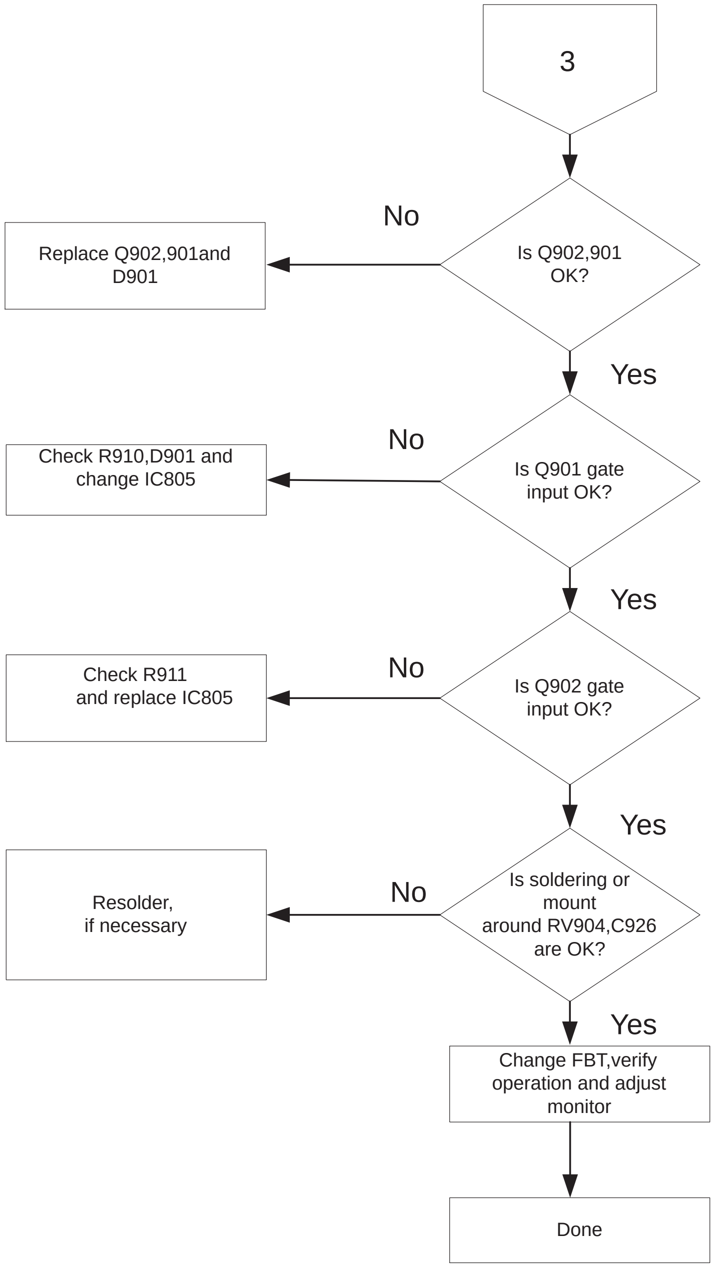
POWER SUPPLY



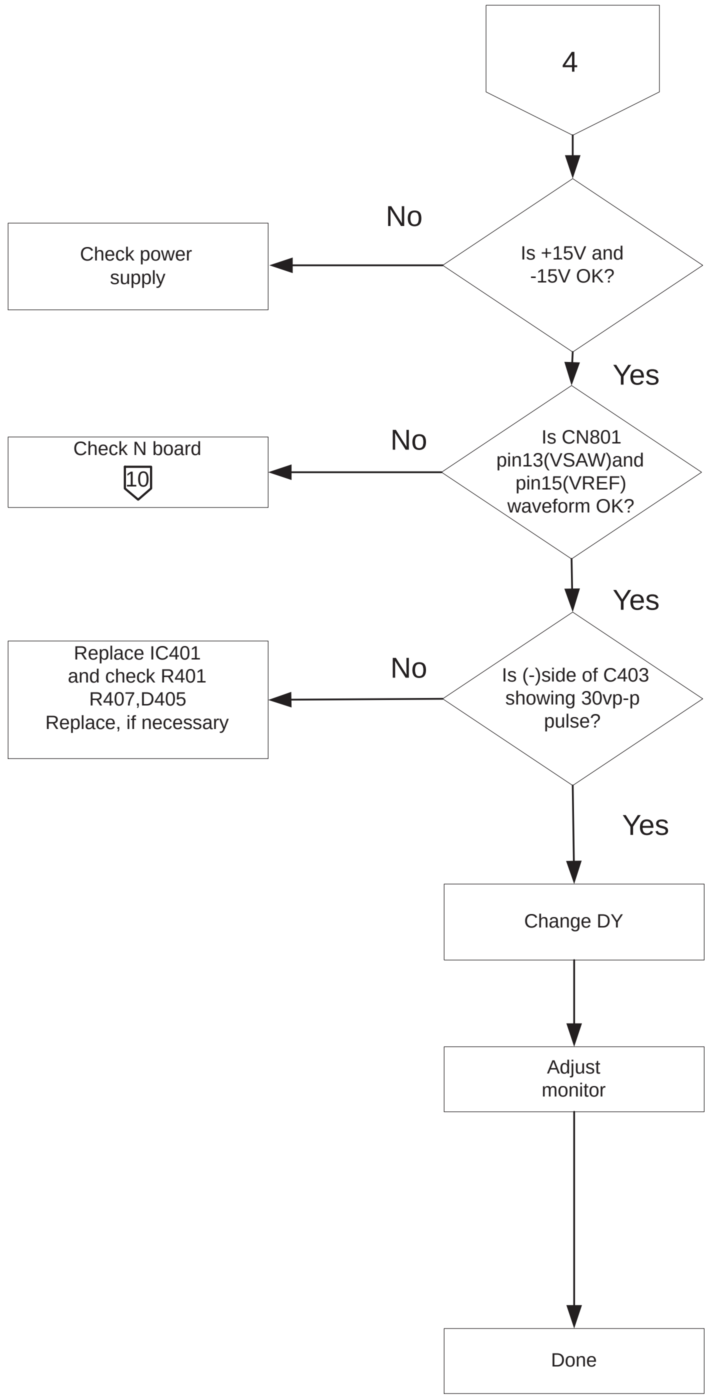
HORIZONTAL DEFLECTION



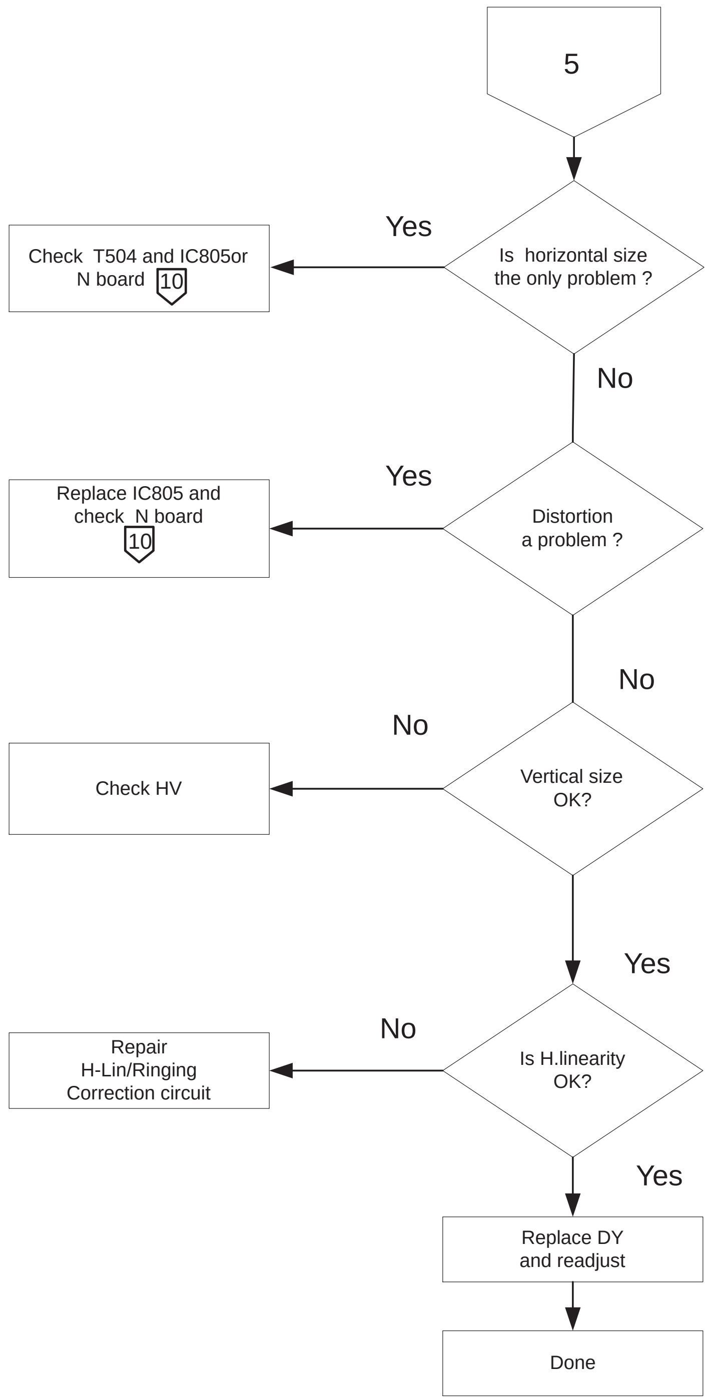
HIGH VOLTAGE



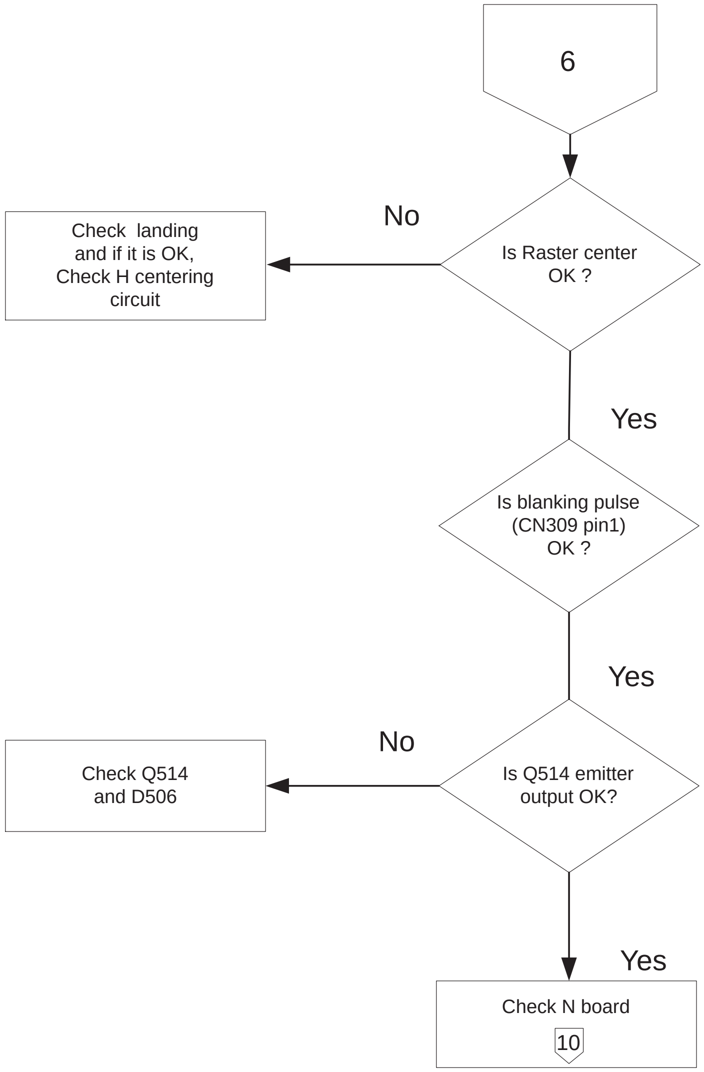
VERTICAL DEFLECTION



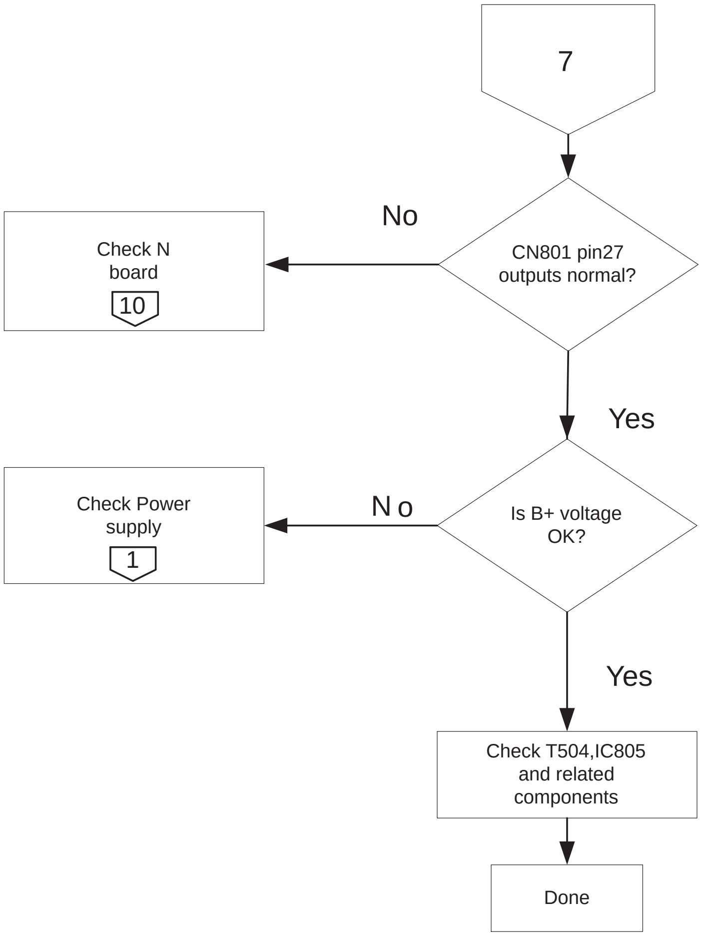
HORIZONTAL SIZE



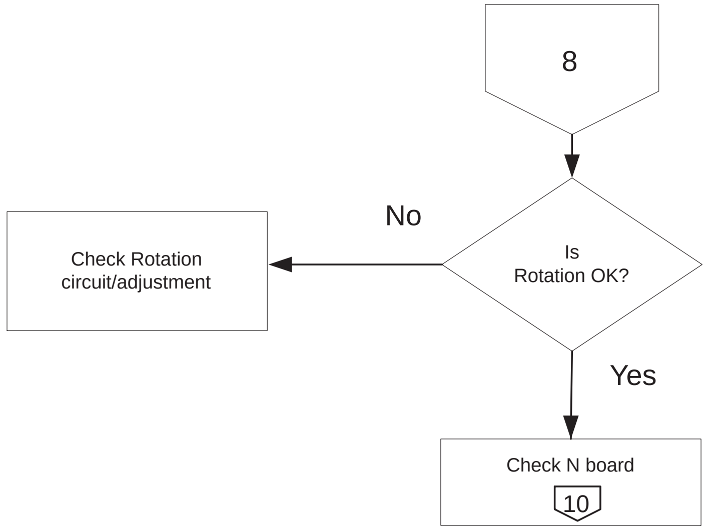
HORIZONTAL CENTER



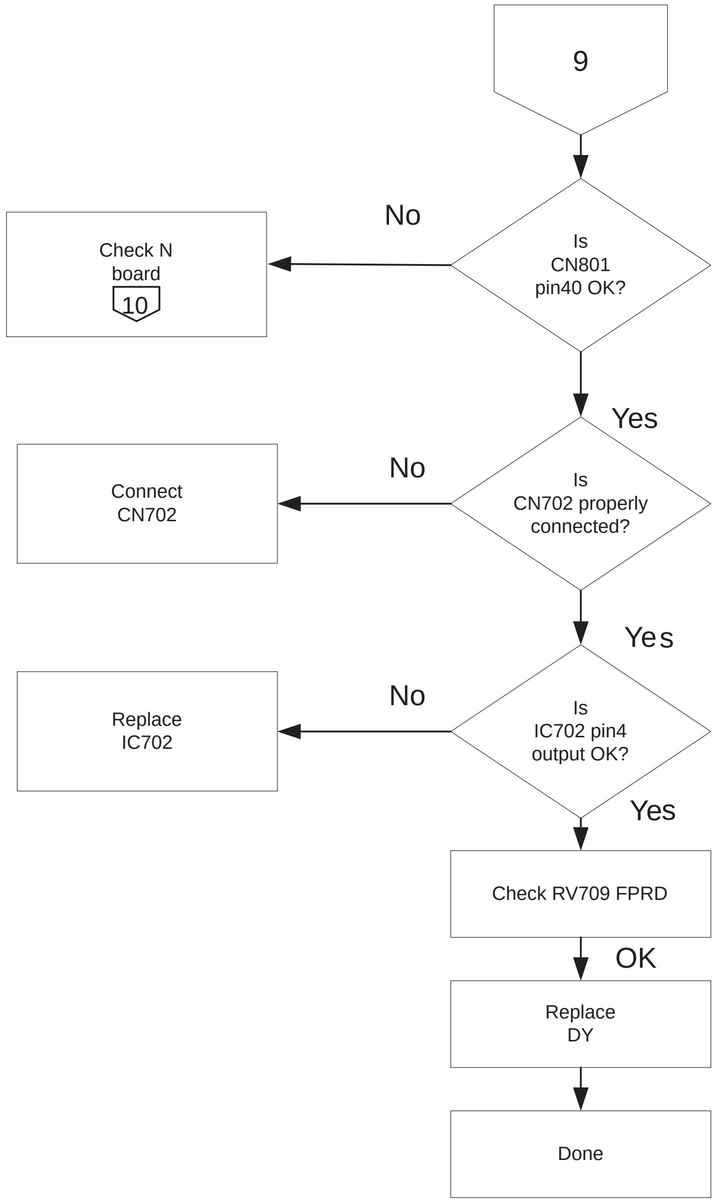
KEY AND PIN


7
CN801 pin27 outputs normal?
No
Check N board
10
Yes
Is B+ voltage OK?
N o
Check Power supply
1
Yes
Check T504,IC805 and related components
Done

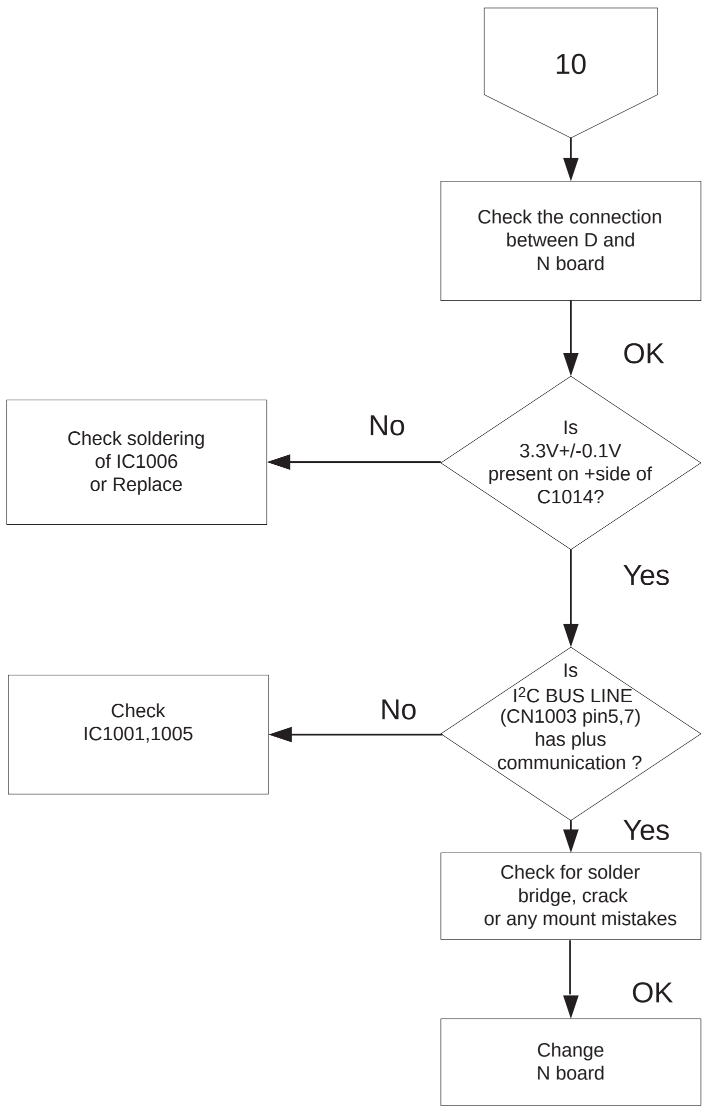
KEY AND PIN BALANCE



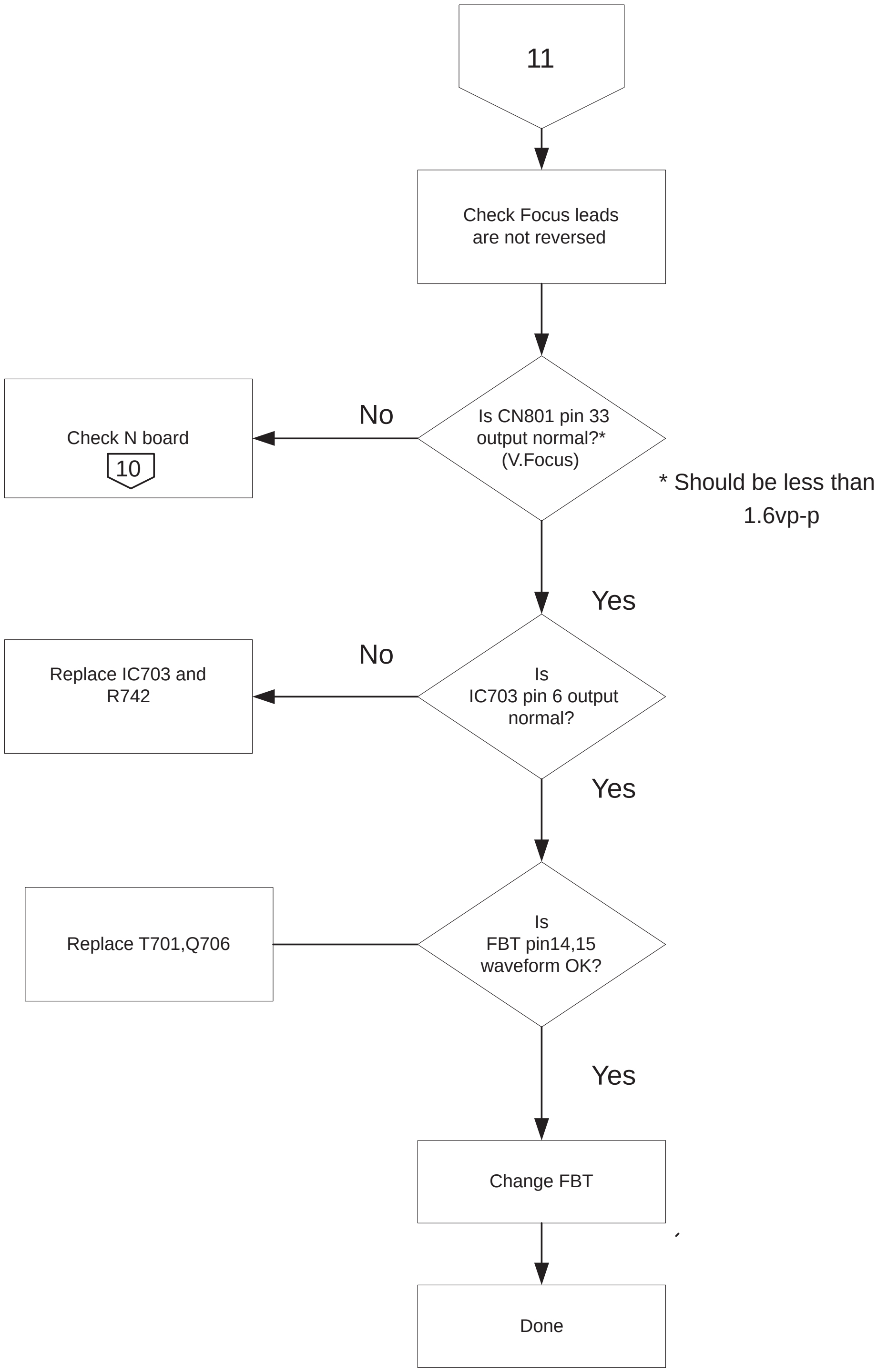
ROTATION


9
No
Is CN801 pin40 OK?
Check N board
10
Yes
No
Is CN702 properly connected?
Connect CN702
Yes
No
Is IC702 pin4 output OK?
Replace IC702
Yes
Check RV709 FPRD
OK
Replace DY
Done

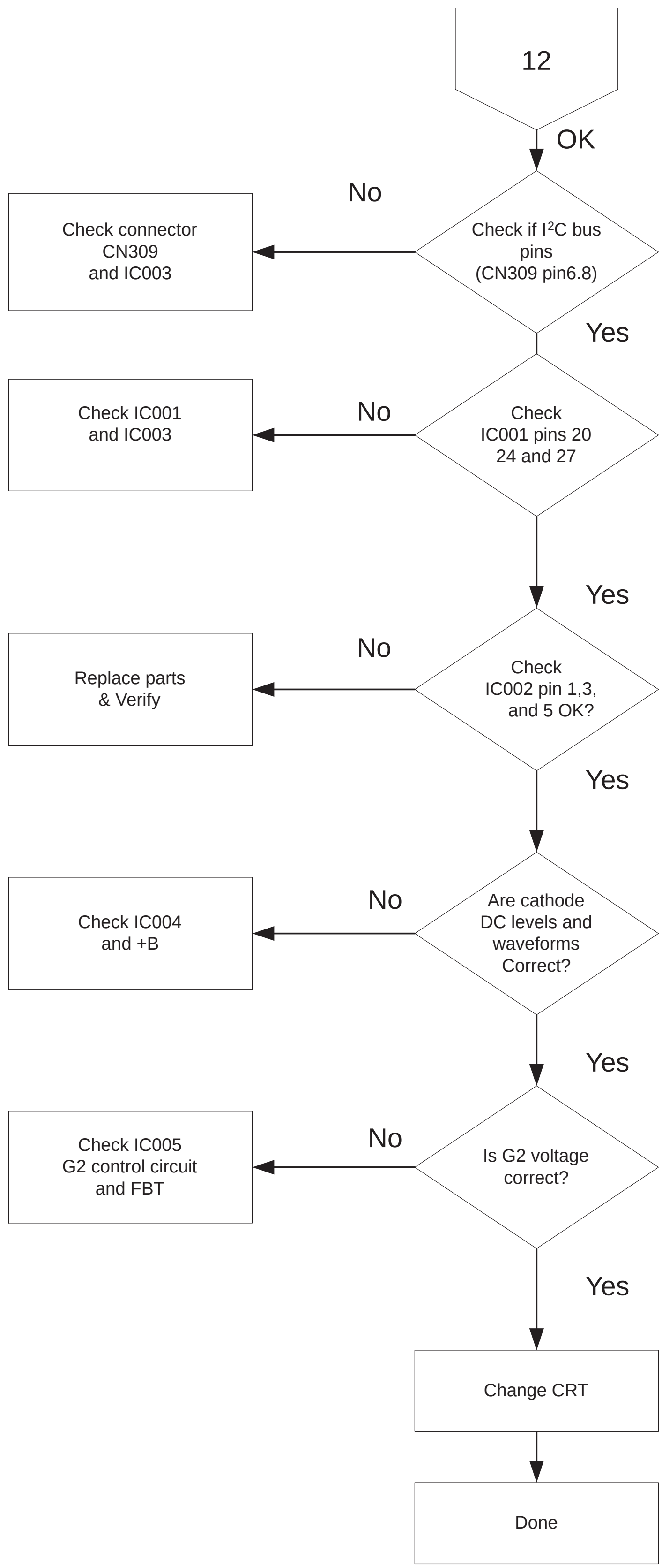
N BOARD


10
Check the connection between D and N board
OK
Is 3.3V+/-0.1V present on +side of C1014?
No
Check soldering of IC1006 or Replace
Yes
Is I2C BUS LINE (CN1003 pin5,7) has plus communication ?
No
Check IC1001,1005
Yes
Check for solder bridge, crack or any mount mistakes
OK
Change N board

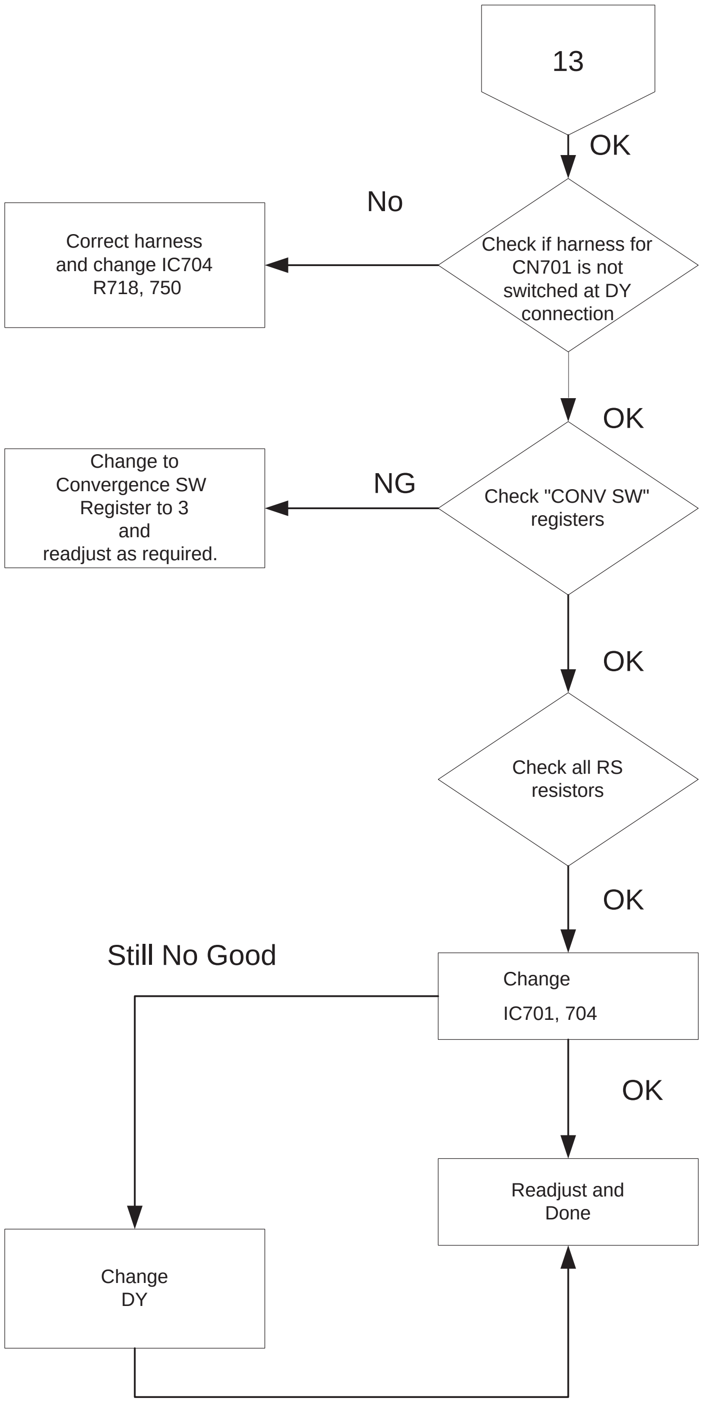
DYNAMIC FOCUS



VIDEO - A BOARD



CONVERGENCE



NOTES:

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