### Sanwa 29E31S Neck & control board

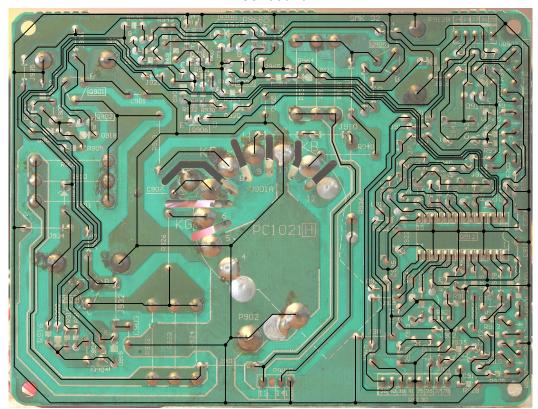
These photos were taken from the boards of 29E31SJ serial 000011.

# WARNING

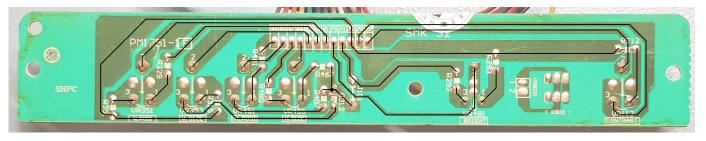
# CRT circuitry operates on potentially lethal voltages! Do NOT work on monitors if you don't know what you're doing!

Safety notes: most high voltage rails, including the picture tube anode, have bleed resistors. The 112V rail is an exception if the neckboard is not connected! It can be discharged by bridging either lead of R272 (between flyback and white jumper lead) to ground. The big heatsink in the power supply region is LIVE during operation; do not touch! All other heatsinks are grounded.

#### Neckboard



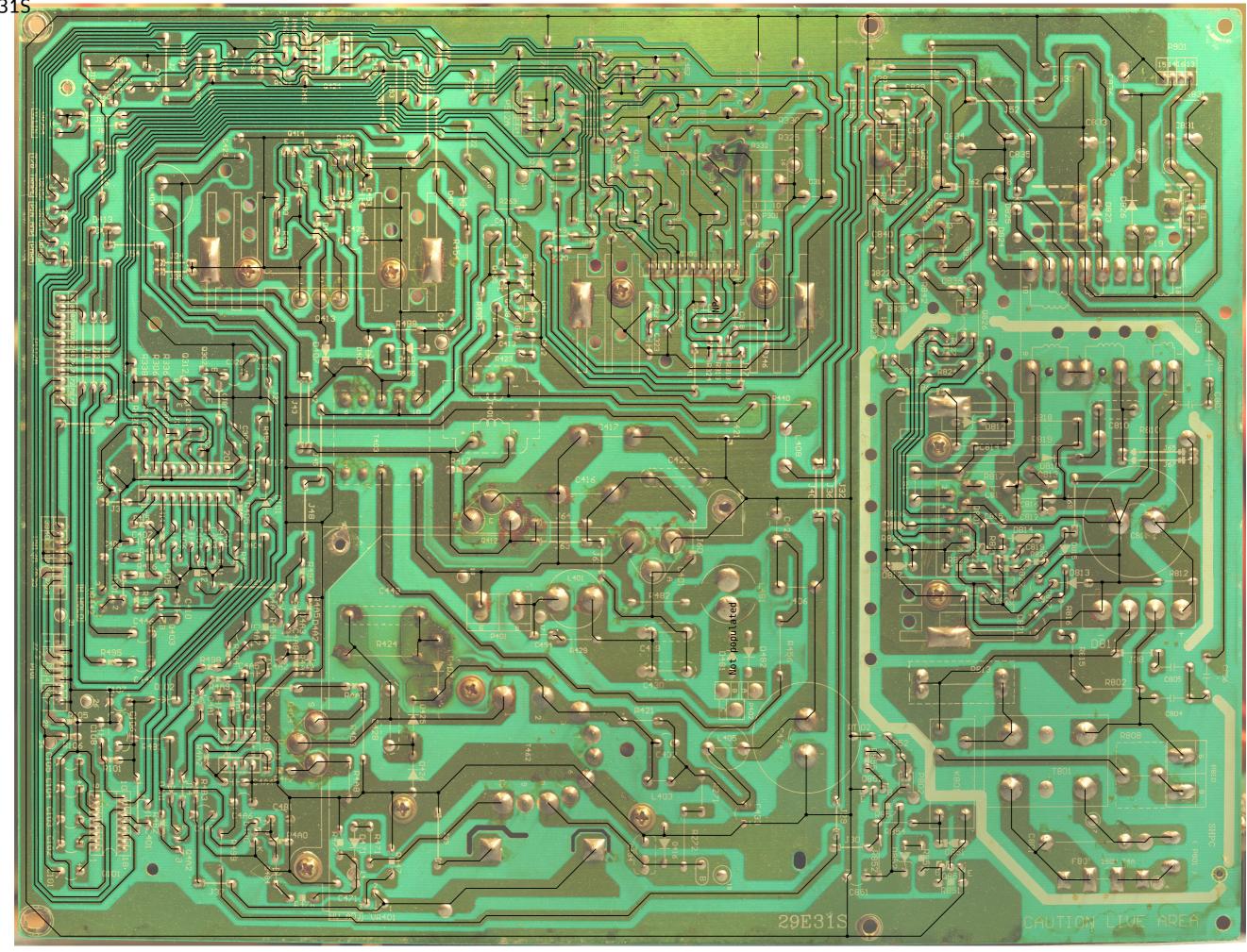
Control board



Warning: do not apply power to the chassis board without connecting the control board. The potentiometers and resistors on this board are an integral part of the chassis circuitry. Also do not apply power while testing without connecting the neck board, unless you first ground ACL (white jumper lead); D416 and C434 may be damaged otherwise.

Sanwa 29E31S Chassis board

These photos were taken from the boards of 29E31SJ serial 000011.

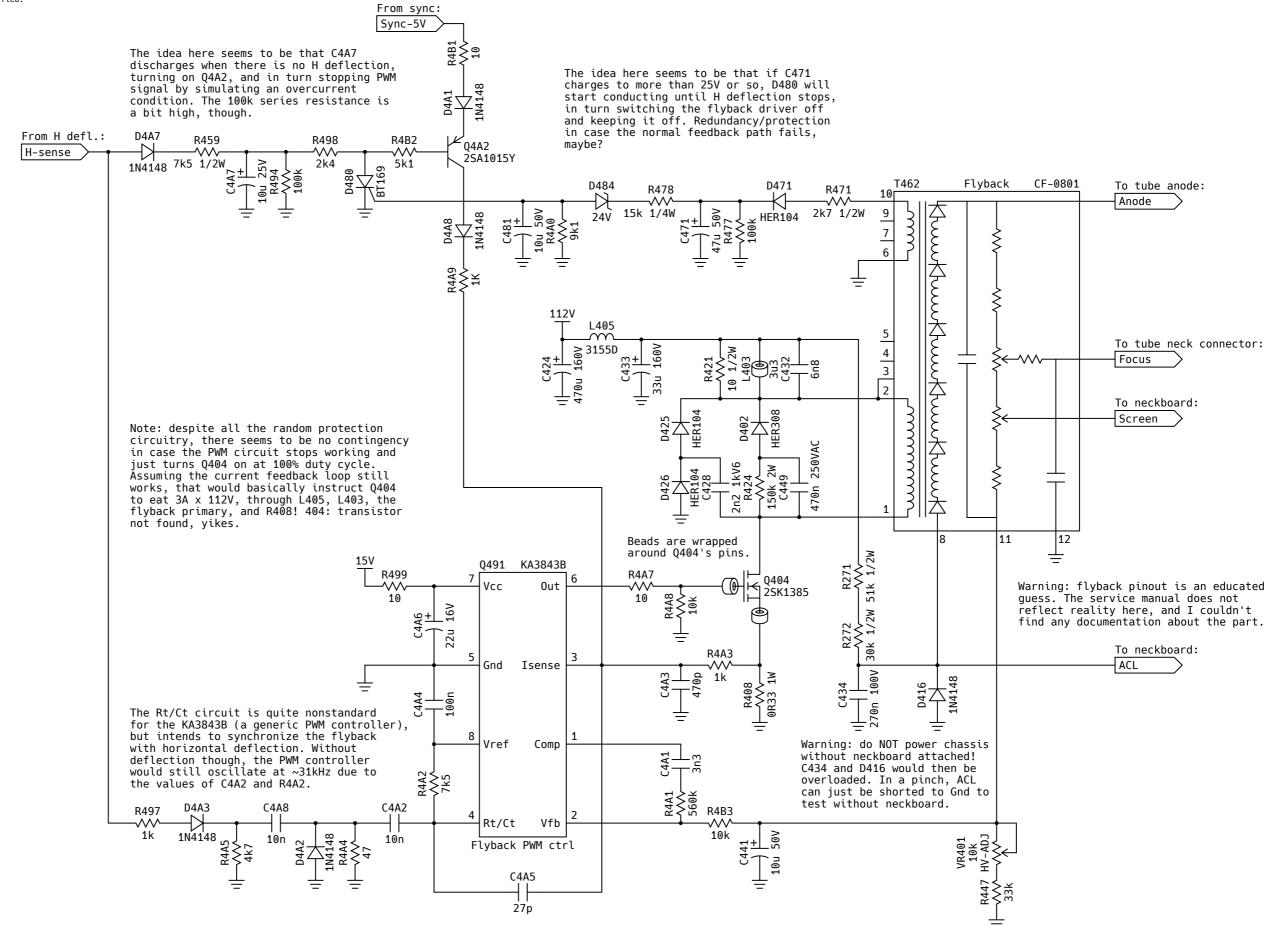


#### Sanwa 29E31S T803 D821 Rail usage Power supply 7V rail: filament heater 12V rail: sync & deflection processing, Y pre-driver, video amp 15V rail: X pre-driver, flyback control These schematics were traced from the boards of 29E31SJ serial 000011. FML-G14S Component values were taken from the 29V rail: Y deflection 112V rail: X deflection, flyback power 180V rail: cathode drivers service manual and not manually verified. AC-high -15V rail: H size amplifier -16V4 rail: H size & trapezoid opamp 112V D823 -20V rail: (intermediate rail only) FML-G14S Warning: Sanwa was too cheap for a bleed resistor across the 112V output cap! It will bleed naturally via ACL \*only\* if the neckboard is connected. AC-r<u>eg</u>-pwr C816 1n5 C812 29V 15V 12V D827 D825 AC-low FMP-G12S 1n5 AC-low 15V D826 1 2 4 Com Q801 HER302 Q821 KIA7812P STR-M6511 R825 Vin 1u 50V FLT/SS Vout 29V-raw 10k D824 L301 Gnd R347 0CP **FDBK** > 0R82 6 1/2W 56u FMP-G12S R820 DT-432-1HA R815 0R18 2k 0R18 2k 0R18 2k 470R 1/2W AC-low AC-low AC-low AC-r<u>eg</u>-pwr 1<u>12</u>V R824 R842 D836 Q826 〰∿ 470 1/2W 6k8 1W Degauss button R839 Q827 P802 7 **√**₩ 15V 2SC1815Y 4 TLP621 SE105 1N4148 JXH-2H,2.5mm 6k8 1W R827 3k9 29V-raw R828 R838 Q823 1k 1/2W 1k 1/2W Note: mystery device, datasheet is super vague. It looks like a transistor designed to break down around 105V to act as a S11ME5 reference of sorts. 2SC1815Y C840 1000u 6V3 AC-r<u>eg</u>-pwr R815 R816 Q851 2SC1815Y 6k8 1/2W 8k2 1/2W Negative voltage rails are generated as byproducts of H deflection driver AC-high Q852 2SC1815Y using the winding between T403 pin 8 and 10. This means that these voltages D811 are only present with valid VGA input, and when at least 12V, 15V, and 112V are healthy. Note: while extremely counterintuitive, above circuit is actually correct! The shunt is effectively in series with the 112V and 180V \*supplies\*, therefore the emitter of Q822 really does go negative! Trip current is ~5.8A, filtered with an RC time of about 150ms. AC-low K801 PTH451A | Mains referenced B2P-LV-TN JQX-14FC-1Z 3R0/25°C Note: 90-132VAC KBL06 4A 400V C807 3n3 250VAC 3n3 250VAC P801 B2V3-PH R813 C805 R455 LCL35-HA -20V-AC 2R7 1/2W 8R2 7W 4n7 250VAC HER104 -20V -16V4 -15V 4n7 250VAC 4n7 250VAC

#### Sanwa 29E31S Deflection drivers Note: D303 has no footprint on the PCB. It is soldered on the back, between pins of R332 (A) and C310 (K). These schematics were traced from the boards of 29E31SJ serial 000011. Component values were taken from the service manual and not manually verified. Q308 2SC4793 R330 Q303 LA7838 100 2W √√√ 56 VccCtrl VccDrive (0309 5寸 (2SA1837 8) 寸 From defl.: V-input Trigger D214 D213 -{√ 20V P301 2663131 To neckboard: 1N4148 TimeConst Blank D302 D216 R269 Stop 10 20k 4 8414NI 50/60Hz **VVV**-8k2 $\begin{array}{c} \text{C308} \\ \text{II} & \text{} \\ 1\text{u} & 35\text{V} \\ \text{tantalum} \end{array}$ ÷ R318 R319 Size T403 10k 33k Vertical deflection driver Q305 1<u>12</u>V To flyback & sync: 2SC1815Y 🔽 L406 R456 H-sense -₩ R352 100k 3155D 0R39 1/2W To power supply: From sync: To para/pin/trape adj.: C426 -20V-AC Q314 2 2SA1015Y V-low PT153KHA Sync-P0LV 늪 P401 L408 \_\_\_\_\_\_\_ 3155D R440 B2P-LV-TN 26 ZM C421 180n 400V L401 \_\_\_\_\_\_ C419 C430 220n 400V 15T31A R429 C454 0435 100n 390p 500V H47-HA 330 1/2W 2SC1959 土 From defl.: R422 Q408 2SK525 H-input -∕VV∕-1k 85 0436 F 25A562 D401 FMV-3GMR (common anode) R493 Q413 2SB688 Q414 2SA1015Y From defl.: R487 0411 2SC1815Y HSize-buf **₩** R450 **^**

# Sanwa 29E31S Flyback & high voltage

These schematics were traced from the boards of 29E31SJ serial 000011. Component values were taken from the service manual and not manually verified.



## Sanwa 29E31S Video & picture tube

R908

R902

From VGA

Red Green Blue

connector:

25V

Sub

Cont

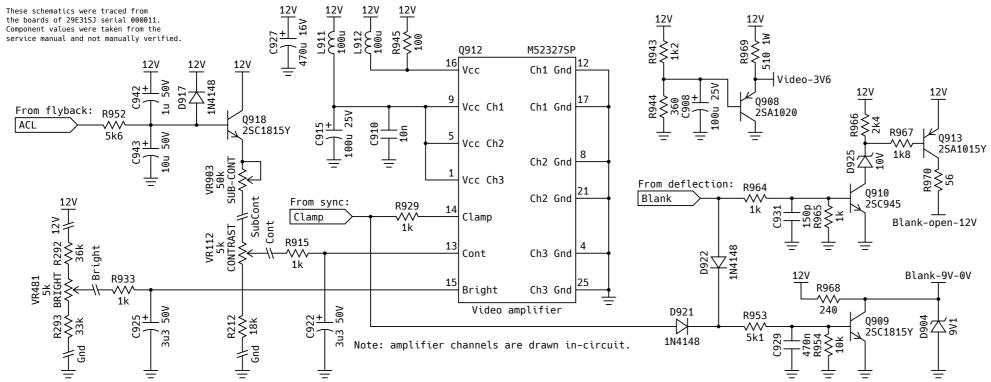
SubBr

Ch3

M52327SP

Q912 Hold

28



R920 √√∕ 1k

Sub

25V

Cont

M52327SP

Q912 Hold

SubBr

Ch2

Warning: lots of designators are printed incorrectly on the back of the neckboard. When in doubt, verify with the top side; it seems to be more accurate.

Red, green, and blue drivers are identical, except that the green channel lacks a gain potentiometer, and the blue channel has a slightly different compensation circuit (R931 is 6R8 instead of 10R).

Blank-9V-0V

Blank-open-12V Video-3V6

180V

0901

2SC5147

2SC1815Y

For whatever reason, blanking is done via three independent systems, based on two information sources. Firstly, the video amplifier clamps the signals based on the clamp signal derived by the sync processor. Secondly, the reference voltage for the power transistors (Blank-9V-0V) is pulled to ground during retrace, derived from the V driver charge pump output for vertical retrace and the T401 series transformer for horizontal retrace. Finally, the base-emitter junction of the voltage-to-current transistors is completely reversed by Blank-open-12V when either of those sources give a blanking signal.

Blank-9V-0V

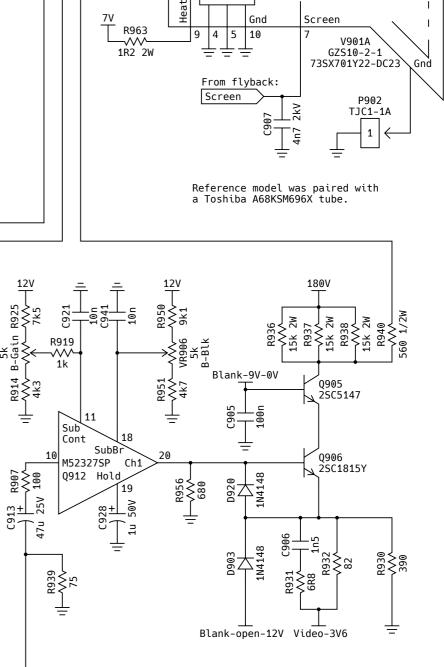
Blank-open-12V Video-3V6

180V

0903

2SC5147

2SC1815Y



From flyback:

Focus

Anode Focus

Socket Gnd

6 KG

11 KB