TM-146

PRELIMINARY

INSTRUCTION AND SERVICE MANUAL
FOR

ATARI QUADRASCAN™ X-Y MONITOR

ELECTROHOME GO5 MONOCHROME X-Y MONITOR

ATARI®

NOTE

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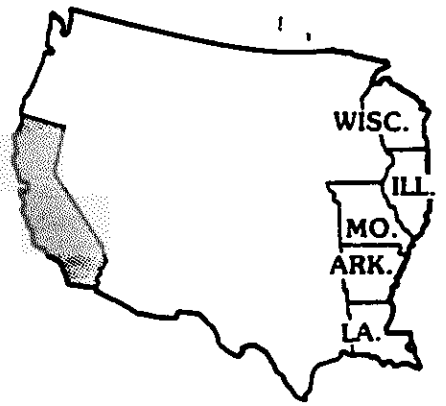

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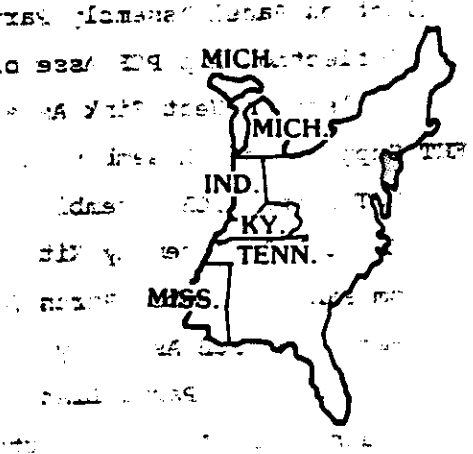

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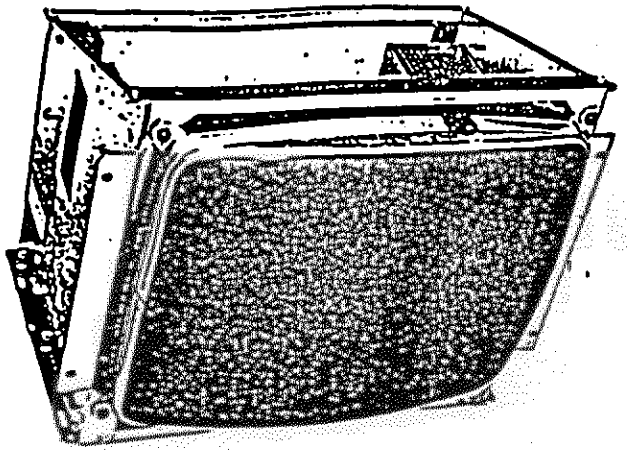
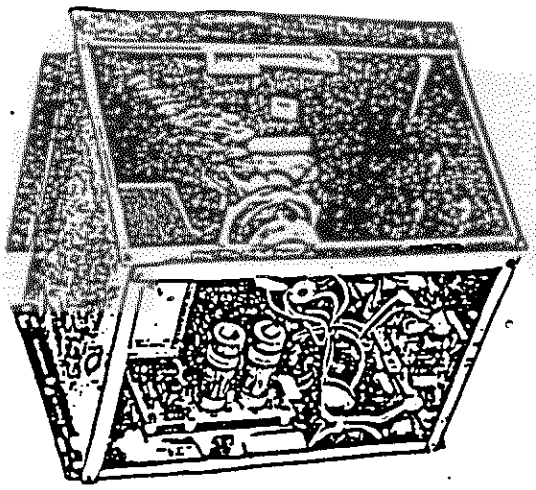




SERVICE DATA REFERENCE

28-0-28 VAC RMS, 50/60 Hz
50 Volt Amps
For 25 Volt Operation

For individual model information, see model data sheets.

When writing for Service Information, please quote chassis type number and model code. See chassis type number and model code located on the rear edge of bottom panel.

WARNINGS

1. POWER DOWN WARNING

CAUTION: REMOVE INPUT SIGNAL FROM GAME BOARD TO DEFLECTION AMPLIFIER BOARD (P-703) IN MONITOR. BEFORE REMOVING POWER TO REGULATOR BOARD (P-100) IN MONITOR.

MEASUREMENT, X-RAY, HIGH VOLTAGE AND CRT WARNINGS

2. X-Radiation

All picture tubes emit some x-rays. This chassis has been designed for minimal x-radiation. However, to avoid possible exposure to soft x-radiation, ensure that EHT value is correctly set.

3. HIGH VOLTAGE

This X-Y monitor contains HIGH VOLTAGES derived from power supplies capable of delivering LETHAL quantities of energy. To avoid DANGER TO LIFE, do not attempt to service the chassis until all precautions necessary for working on HIGH VOLTAGE equipment have been observed. In order to prevent damage to solid state devices, do not arc pix tube anode lead to chassis or earth ground.

4. CRT Handling

The picture tube encloses a high vacuum and due to the large surface area is subject to extreme force. Care must be taken not to bump or scratch the picture tube as this may cause the tube to implode resulting in personal injury and property damage. Shatter-proof goggles must always be worn by individuals while handling the CRT or installing it in the monitor. Do not handle the CRT by the neck.

5. To Prevent Fire or Shock Hazard Do Not Expose This Monitor to Rain or Moisture

6. FILE SUPPLEMENTARY MODEL DATA WITH THIS GO5 X-Y MANUAL

PRODUCT SAFETY SERVICING GUIDELINES

Caution
No modification of any circuit should be attempted. Service work should be performed only after you are thoroughly familiar with all of the following safety checks and service guidelines. To do otherwise increases the risk of potential hazards and injury to the user.

Safety Checks

Subject: Fire and Shock Hazard

1. Do not install, remove, or handle the picture tube in any manner unless shatter-proof goggles are worn. People not so equipped should be kept away while picture tubes are handled. Keep the picture tube away from the body while handling.

2. When service is required, observe the original lead dress. Extra precaution should be given to assure correct lead dress in the high voltage circuitry area. Where a short circuit has occurred, replace these components that indicate evidence of overheating. Always use the manufacturer's specified replacement component. See parts list in the back of this manual.

3. Always check high voltage for proper value and at all times use an accurate high voltage meter. The calibration of this meter should be checked periodically.

4. Check for frayed insulation on wires.

OPERATING INSTRUCTIONS

1. Apply suitable power source to monitor regulator PCB by means of P100.

2. Apply suitable signal source to monitor deflection PCB by means of P703.

3. Brightness and Contrast

   These controls are preset at the factory, but may be adjusted to suit program material. They are located on the right hand edge of the deflection amplifier PCB. R519 is the brightness control and R526 is the contrast control. Both are finger adjustment controls.

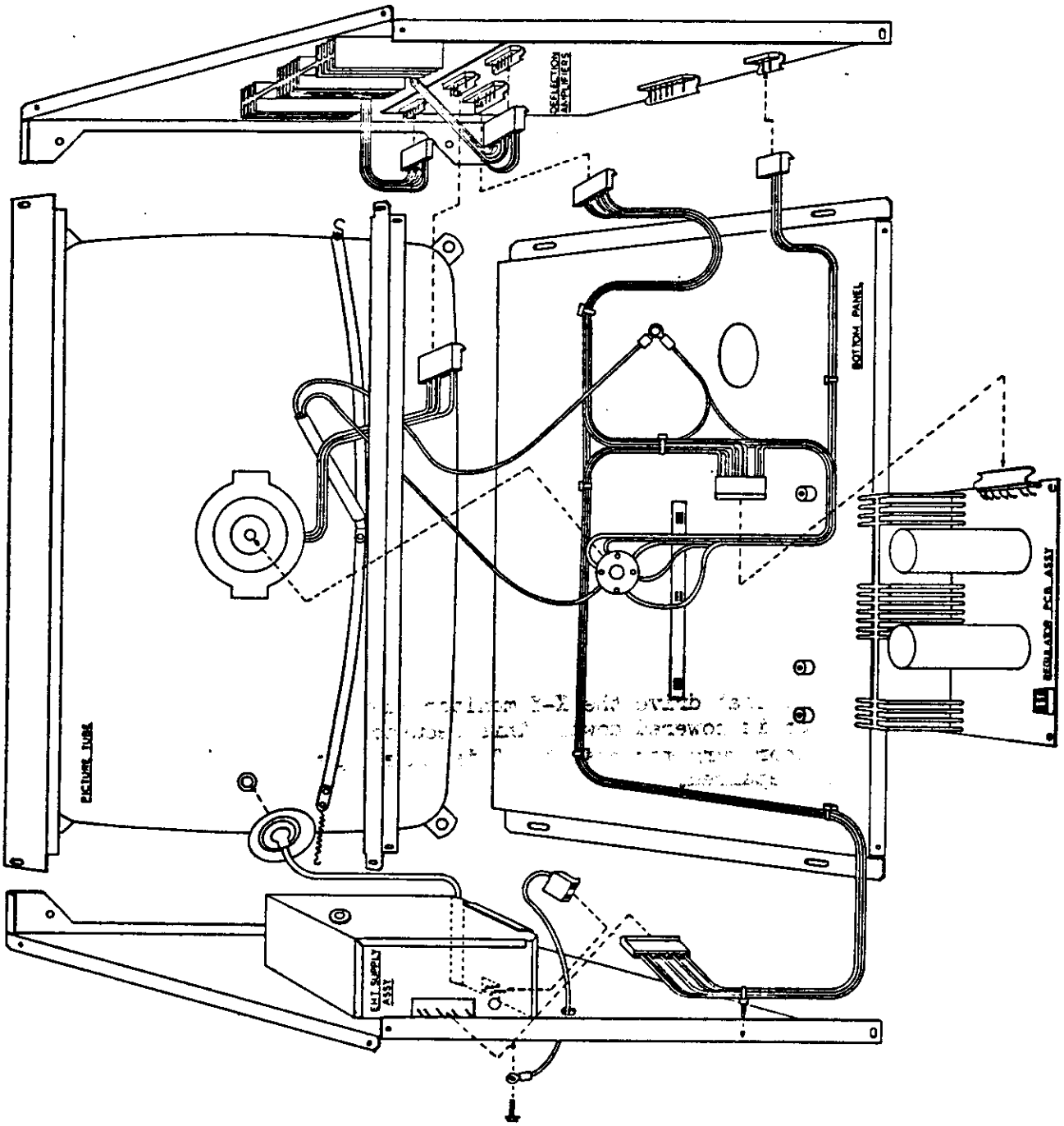
> Caution must be exercised when adjusting the brightness control. This control has more than 100% brightness range on most tubes. This control should be maintained below the point where a center spot appears on the CRT under a no input signal condition. Adjusting the control above this point may result in a phosphor burn.

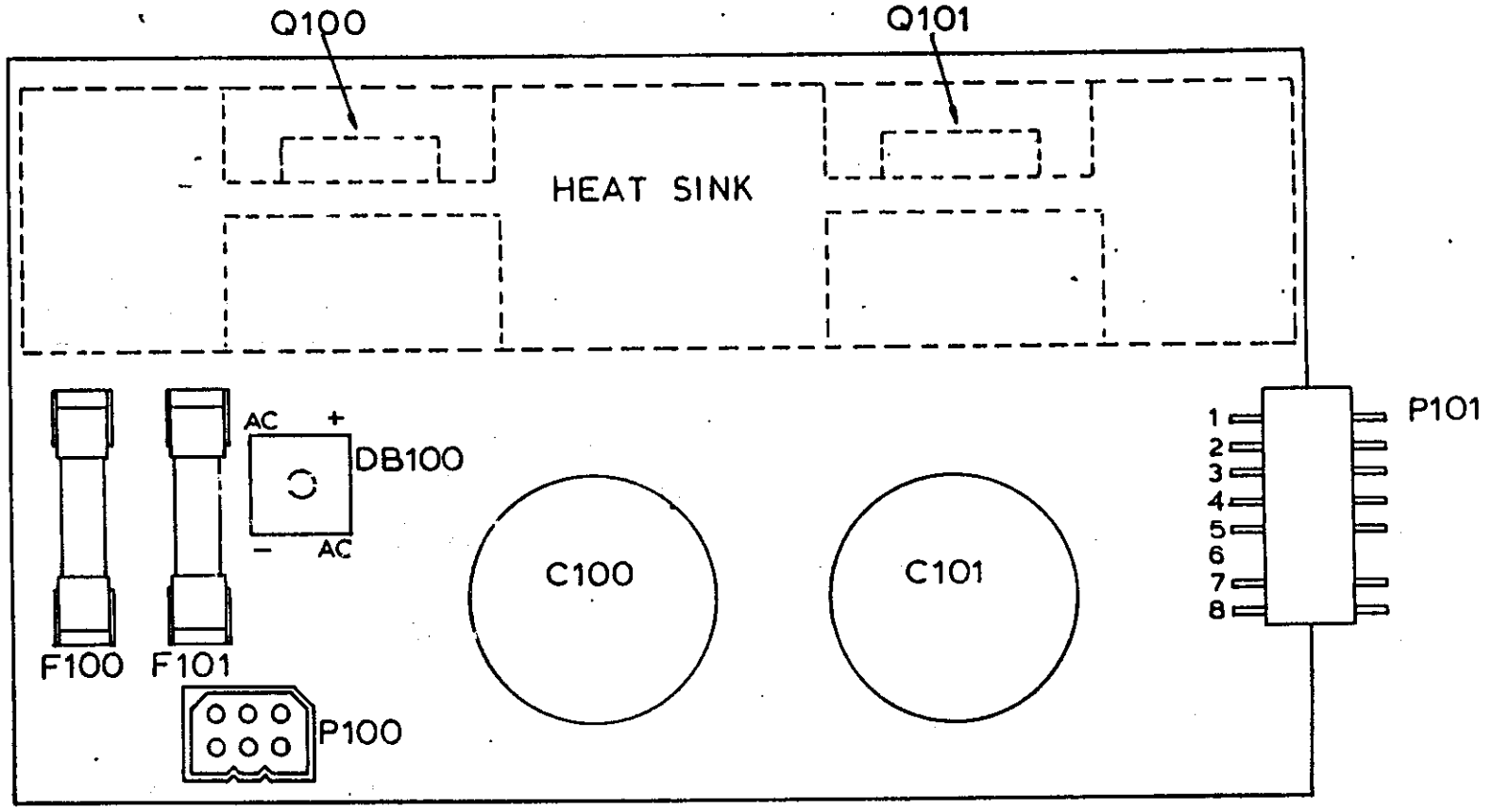
4. Spot Killer Indicator

   A spot killer circuit is used to blank the CRT under a no signal condition. When the spot killer is active, the CRT will be extinguished and LED D507 will light indicating spot killer operation.

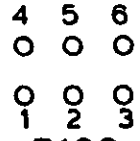
5. Power Down

   The signals that drive the X-Y monitor must be removed before the monitor is powered down. This sequence must be followed or a phosphor burn may result. This damage is permanent and cannot be repaired.


DEFLECTION ASSEMBLY
BOTTOM PANEL
REGULATOR PCB ASSY
PICTURE TUBE
UNIT SUPPLY ASSY

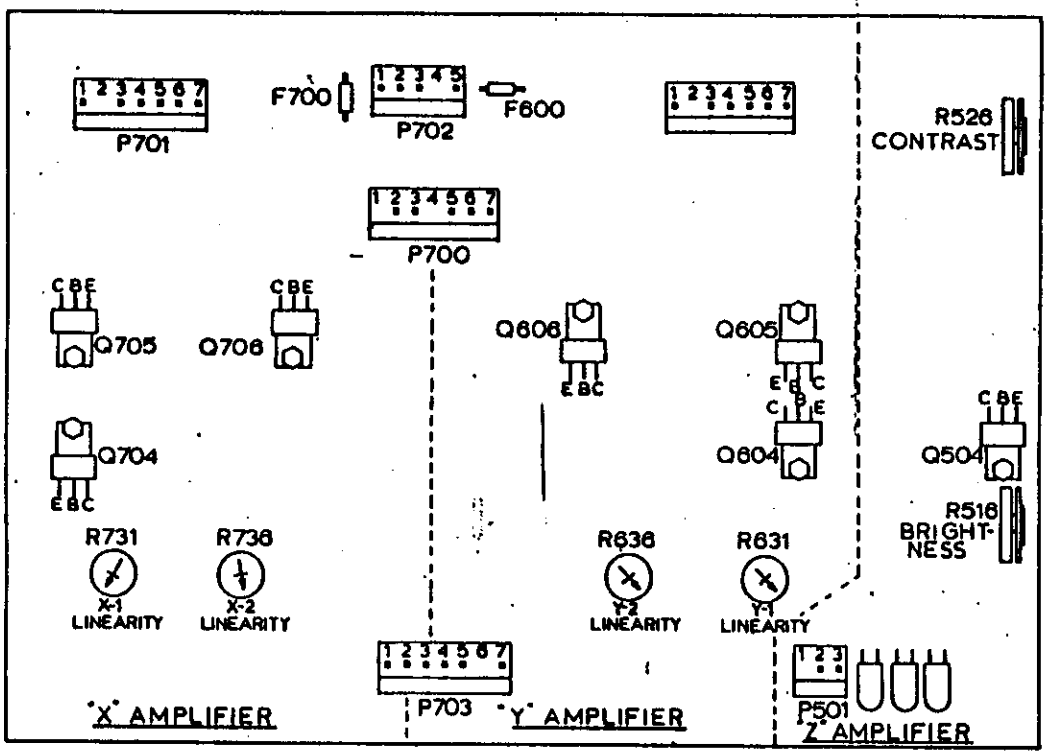


REGULATOR PCB

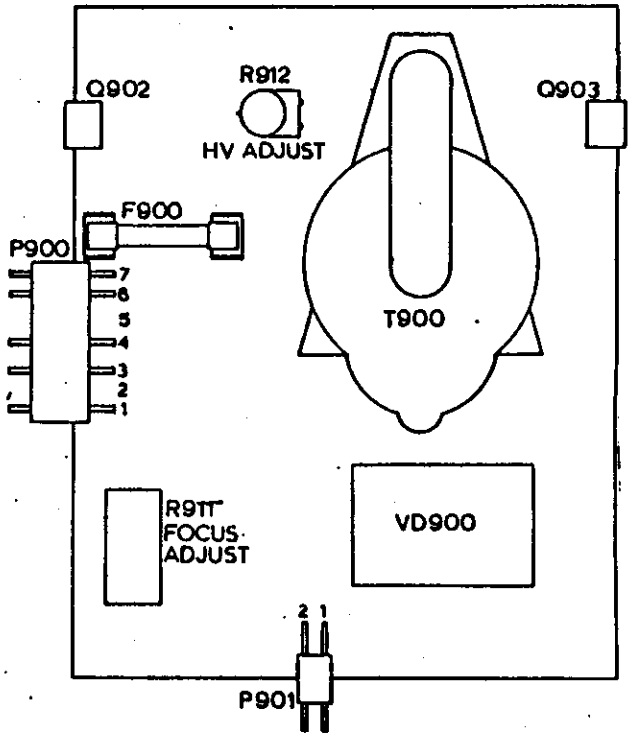


P100
PIN LAYOUT

NOTE: THERE ARE NO FIELD ADJUSTABLE CONTROLS ON THIS PCB.



DEFLECTION AMPLIFIER PCB



EHT SUPPLY PCB

NOTE: ONLY THE BRIGHTNESS CONTROL (R516) AND THE CONTRAST CONTROL (R526) ON THE DEFLECTION AMPLIFIER PCB ARE "FIELD ADJUSTABLE". ALL OTHER CONTROLS, INCLUDING X AND Y LINEARITY, FOCUS, AND HIGH-VOLTAGE, HAVE BEEN FACTORY ADJUSTED AND SHOULD NOT BE TAMPERED WITH.

1. ELECTRICAL DATA

A. Supply Voltage

For ± 25 VDC operation: 56 VAC RMS ± 15%, center tap grounded with a DC load at any current 0 to 2 amps. (28-0-28 VAC RMS)
For ± 35 VDC operation: 74 VAC RMS ± 15%, center tap grounded with a DC load at any current 0 to 2 amps. (37-0-37 VAC RMS)
Filament requirement for both ± 25 VDC and ± 35 VDC operation: .45 amps nominal at 6.3 VAC ± 10%. Line Frequency: 47 to 63 Hz

The pin assignment shall be as follows:

Pin	Description
1	56/74 VAC RMS ± 15%
2	Center Tap Ground
3	Filament Ground
4	56/74 VAC RMS ± 15%
5	Center Tap Ground
6	6.3 VAC ± 10%

B. High Voltage (EHT)

High voltage is set up for 14 KV at zero beam current.

C. Customer Controls

a) Brightness Control: Located on deflection amp printed circuit board. Control is finger adjustable.

b) Contrast Control: Located on deflection amp printed circuit board. Control is finger adjustable.

SEE CAUTION ON PAGE 4 REGARDING BRIGHTNESS CONTROL ADJUSTMENT.

D. Service Controls

CAUTION: THESE CONTROLS ARE FACTORY ADJUSTED AND SEALED. THESE CONTROLS SHOULD NOT REQUIRE FURTHER ADJUSTEMNT, AND THEREFORE SHOULD NOT BE TAMPERED WITH.

a) High Voltage Adjust: Located in EHT supply module. Hole in screen cover provides access to this control. Caution - use insulated tool to adjust.

b) Linearity Controls:
R731 & R736 are linearity controls for "X" channel.
R631 & R636 are linearity controls for "Y" channel.
These controls are located on the deflection amplifier printed circuit board.

c) Focus Control: Located in EHT supply module. Hole in supply heat sink/wrap provides access to this control.

2. MONITOR PERFORMANCE

A. High Voltage Power Supply Regulation

The high voltage power supply regulation is such that the maximum beam displacements caused by minimum versus maximum brightness settings, with the beam location 1 inch from the picture tube frame, is not more than ± 1% of horizontal width.

B. Resolution

The monitor is capable of displaying 500 parallel white lines, separated by ½ line width of black lines in either the X or Y axis and is to be performed at 75% or greater of maximum brightness. Also, the display is capable of 10 bit resolution in both the X and Y axis. Further, the noise voltage of emitter commons of each channel is less than 0.3V peak to peak with the inputs grounded.

C. Geometric Distortion

The geometric distortion shall not cause a deviation of more than .125 inch of an ideal centered rectangle of 14 inches by 10½ inches.

D. Drift (after 15 minute warmup)

Long term drift exceeding one minute duration due to dynamic effects of temperature, from 20°C to 50°C, will not be more than 0.8% of the horizontal width.

Long term drift exceeding one minute duration due to power supply and beam current variations, etc. shall be less than 0.2% of the horizontal width.

Short term drift less than one minute duration due to the dynamic effects of temperature, power supply, beam current, etc., shall be less than 0.05% of the horizontal width.

E. Vector Non-Linearity

A line drawn from any edge of the display to any other edge has a non-linearity not exceeding ± 0.2% of the horizontal width in any 3 inch span of the line.

F. Hysteresis and Closure

Any vector, or number of vectors drawn from any direction or sequence, and drawn to the same end point will terminate within ± 0.1% of the horizontal width of the actual end point.

G. Writing Speed (triangle waveform on input)

Minimum writing capability of 64 lines at 25V or 128 lines at 35V operation, full horizontal (or vertical or diagonal) lines at a repetition (refresh) rate of 40 frames per second.

The line writing capability performance for 35V operations:
256 half lines (8" hor.)
512 1/4 lines (4" hor.)
1024 1/8 lines (2" hor.)

Note: Halve the requirements for 25V operation.

X-Y deflection amplifier drawing rate:
165 µsec max. for full scale deflection at 35V and 330 µsec for 25V operation.

H. Beam Modulation

An analog signal with the following characteristics will control the brightness of the image:

0.5V or less blanking
1.0V beam off
4.0V beam full on

In between this range at least 8 levels of intensity will be discernable for any vector drawn.

I. Spot Killer Circuit

Circuitry is included such that when power is applied to the monitor, and the input causes a beam movement of less than 1 horizontal width per 20 mseconds, the circuit shall turn off the beam and turn on an L.E.D.

J. Brightness

Manual brightness adjustment by a customer control covers the full brightness range. The variation in brightness of any full scale horizontal or vertical line or a combination thereof is not greater than ± 5% of the average brightness level of all the lines displayed in one frame.

K. Display Inputs

The differential delay between the luminance (Z) and blanking channels versus the X and Y deflection channel is less than 1.0 microsecond, absolute.

L. Input Signal Pin Assignments

Pin #	Description	Impedance	Voltage
1	X	1 K ohms	± 10V (0V center)
2	GND	———	———
3	Y	1 K ohms	± 7.5V (0V center)
4	GND	———	———
5	Z	220 ohms min.	0.5V blanking 1.0V off 4.0V full on
6	Key	———	———
7	GND	———	———

M Environmental

Temperature
Operating: 0 to 55°C (32 to 131°F)
Storage: -40 to 65°C (-40 to 149°F)

Humidity
Operating: 10 to 90%
Storage: 10 to 90%, no condensation

N Safety

a) Monitor is designed to meet U.L. and C.S.A. standards.

b) The monitor is designed to meet the requirements of D.H.E.W. with regards to the amount of emitted X-ray radiation.

c) This monitor is designed to meet the requirements of F.C.C. concerning radio frequency emission.

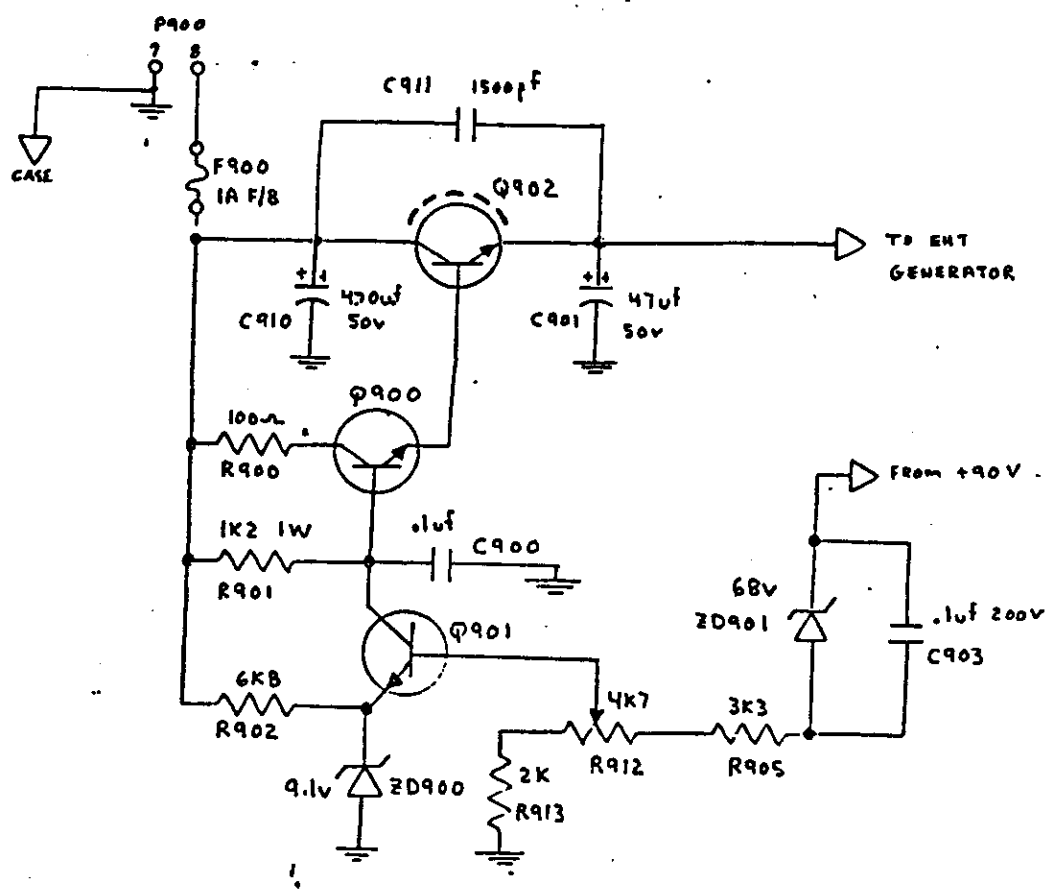
EHT SUPPLY

The EHT module has been designed to operate over an input supply voltage range of +23 to +38 volts, and an ambient temperature range of 0 to+55°C. The module produces nominal voltages of:

+ 14 kv @ 200 µa CRT annode
+ 400V G2 voltage
- 200 to +400V focus
+ 90V for Z amplifier

The circuit can be broken down into 3 basic sub-systems; regulator, high voltage generator and EHT hold down.

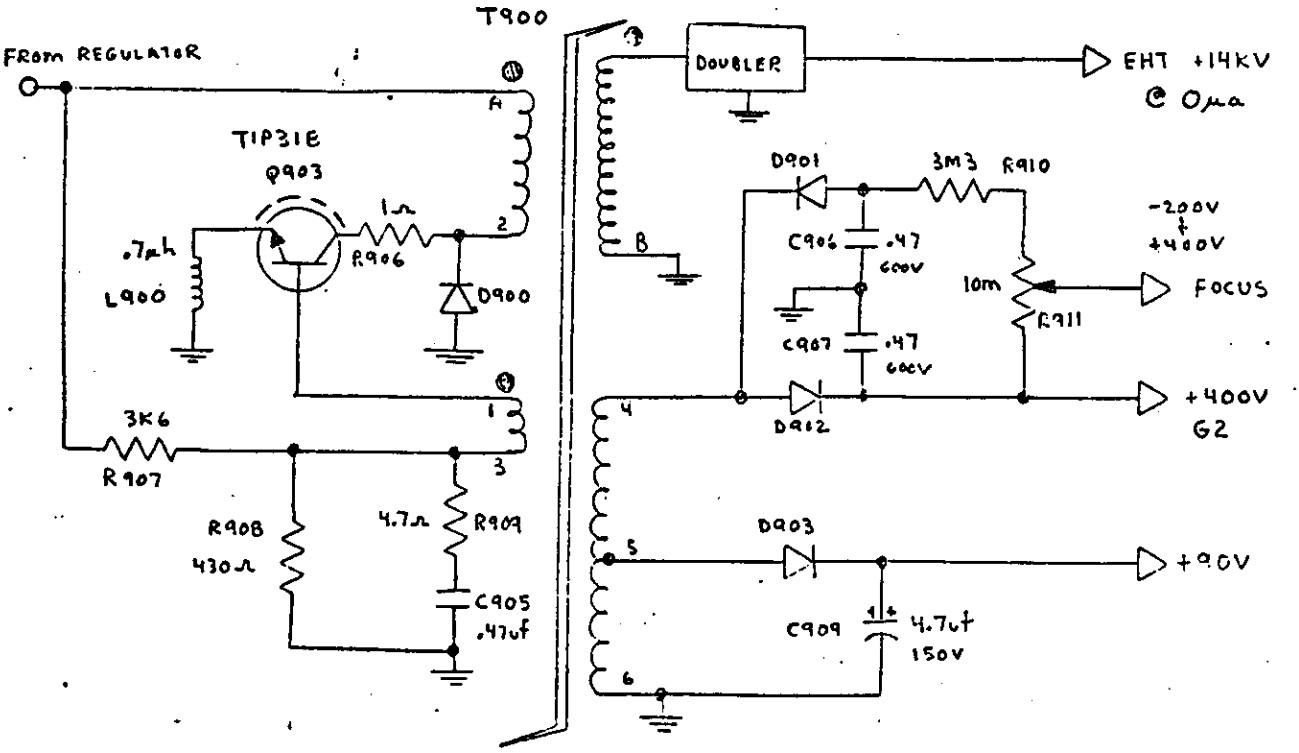
REGULATOR



This is a series regulator with Q902 being the control element, Q900 a driver, and Q901 an error amp. ZD900 forms the emitter reference voltage source. Since the generated EHT and other voltages are linked by means of the magnetic field of T900, any change in EHT will be reflected back to all of the other voltages. This EHT fluctuation is sensed on the 90V line and is used to control Q901. R905 and R913 are used to limit the range of EHT adjustment by R912, to roughly 12 to 17 KV at 0 beam current. ZD901 and C903 provide a means of dropping a large DC component without also attenuating the error voltage that is needed to stabilize the EHT line. R902 provides a means of biasing ZD900 to insure a stable reference voltage for the error amp to work against. R901 is the collector load resistor for Q901 and biases on Q900 and Q902 in the absence of an error signal. The error amp, Q901, can only divert some of the base current from Q900 and shut the regulator down. It can not increase the conduction of the regulator above a level determined primarily by R901 and the current gain of Q900 and Q902. R900 is a buffer resistor to protect Q902 by limiting the maximum current flow into its base in case of C-E short of Q900.

C900 and C911 are used to suppress any tendancy for high frequency oscillation that could generate radio frequency interference. C901 and C910 are filtering capacitors to decouple 25 KHz pulses that are impressed onto the +25V line by a normally operating EHT generator and prevent interference with other circuitry.

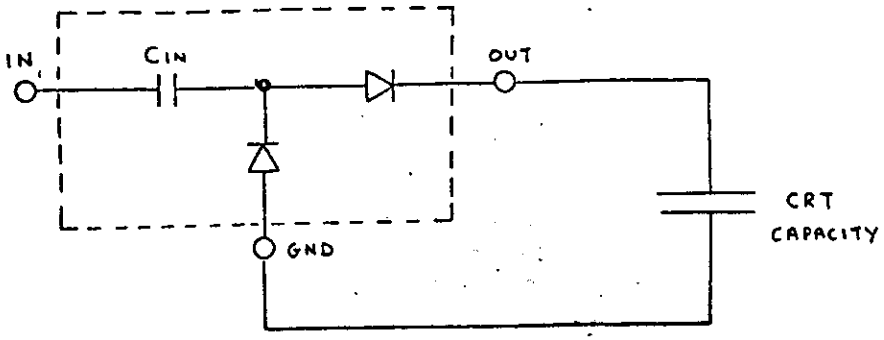
HIGH VOLTAGE GENERATOR



Q903, R907, R908, R909, C905 and T900 form a free running Hartley oscillator circuit that operates at approx. 25 KHz. The operating frequency is primarily determined by transformer and transistor characteristics. Feedback is established by the proper phasing of primary to feedback winding. AC feedback is determined by the turns ratio of primary to feedback winding as well as R909 and C905. The transistor must also be forward biased sufficiently to where oscillation can start when power is applied. This is controlled by R907 and R908. L900 is not essential to circuit operation but helps smooth out the AC waveform generated into a reasonable approximation of a sine wave. Higher operating efficiency could be obtained with square wave operation, however, there would be considerably more RFI problems. R906 is a safety resistor that will burn out, and prevent damage to Q903, should the output circuitry come under excessive current drain. D900 is a damper diode.

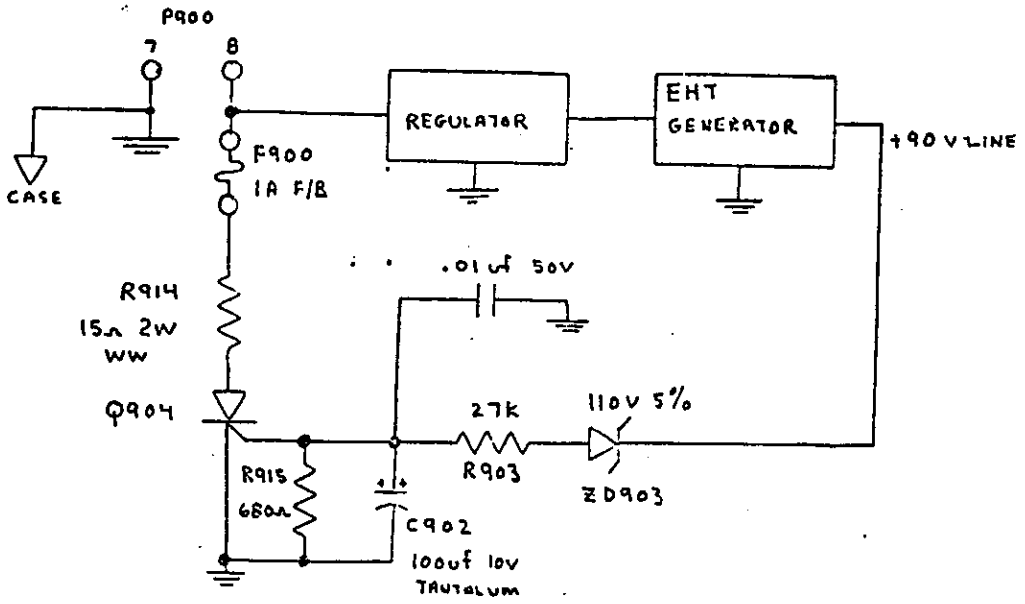
There are two secondary windings. The EHT winding delivers sufficient AC to the doubler to generate 14 KV anode voltage at a maximum current of 400 µa, and a tapped lower voltage winding that is used to generate focus voltage of +400 to -200 VDC, and G2 voltage of +400V, and +90 volts for operation of the Z amp circuitry. It is possible to obtain a negative and positive DC voltage from the same winding because of the generated sinusoidal voltage. On a conventional pulsed flyback system a separate winding would be necessary to deliver a dual polarity output voltage. R911 is a high voltage control in a conventional package that can withstand 750 VDC which is used for focus adjustment. Because the operating frequency is 25 KHz, fast recovery diodes must be used. The efficiency of a normal diode would be very low, resulting in low output voltage and excessive heating in the diode itself. Similarly C906, C907, C909 must be capacitors of low ESR so as not to overheat at this operating frequency.

The voltage doubler is of the 1/2 wave type; e.g.



The final capacitor is formed by the internal capacity of the CRT itself.

EHT HOLD DOWN

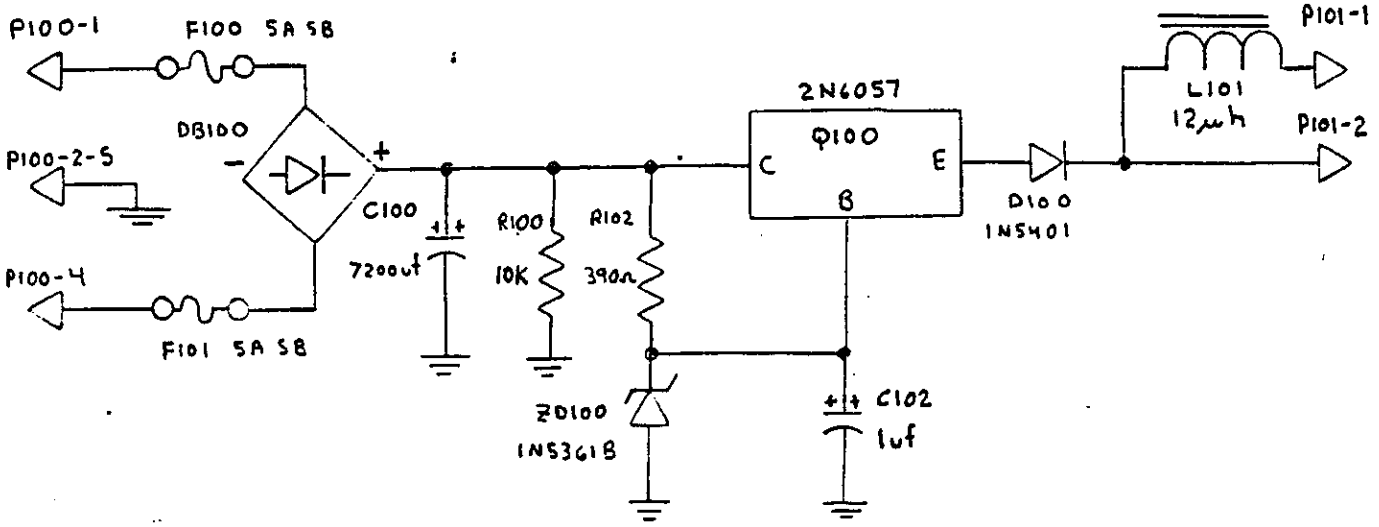


To comply with DHEW regulations it is necessary to insure that the EHT may not rise to the point where soft xrays are generated by the CRT. This would occur at 22.5 KV when sufficient beam current is present. The hold down circuitry has a max. trip range of 18 to 21 KV EHT. This circuitry is normally not active and should only function under a fault condition.

Both EHT and 90V lines are linked by the flux of the transformer. If the EHT rises so will the 90V line. When the EHT hits a nominal 19KV the 90V line will be sufficiently increased to turn on ZD903 and allow voltage divider R903 and R915 to produce 0.6 VDC to fire the SCR. Upon firing, the SCR will latch and tie the 15Ω anode resistor to ground; this in turn will cause sufficient current drain through F900 to open the fuse and disable the EHT supply. The normal operating current of the regulator and the additional current through R914 will usually open the fuse within 2 seconds. C902 and R903 form a slight RC time delay before tripping the SCR and offer a degree of immunity from false triggering due to internal arcing in the CRT. R915 also serves to improve the arc immunity of Q904. The leads of R915 and C902 must be short for good immunity from false tripping. Additionally C902 is a tantalum capacitor for low high frequency impedance and low leakage.

MEMO

DC POWER REGULATOR



For ± 25 volt operation the normal input voltage is 28-0-28 volt AC RMS. This voltage is rectified by diode bridge DB100 and the raw ± DC is filtered by C100 and C101. R100 and R101 are bleeder resistors.

Sufficient current is supplied by R102 and R103 to maintain a constant voltage of ± 27 volts (5%) across ZD100, ZD101 and supply sufficient base current to the darlington pass regulator Q100, Q101 for 2 amps peak output current There is typically 1.5 volts base emitter junction voltage on Q100, Q101, so the nominal emitter voltage will be ± 27-1.5 = ± 25.5 volts. If a current demand in excess of 2 amps is required, there will be insufficient base current and output regulation will deteriorate. If the input trough voltage on C100, C101 falls below approx. 29 volts, deterioration of output regulation will also occur.

When the supply is switched on or off, it is possible for one supply to come on first or hang on longer and drive current into the other supply. This will destroy the pass transistors. D101 and D100 are blocking diodes that carry full supply current and drop an extra .6 volts each so the nominal output is now ± 24.9 volts. They prevent the above condition from occurring. L101 is a small high frequency filter choke to decouple the EHT generator from the positive supply rail and minimize line conducted radiation.

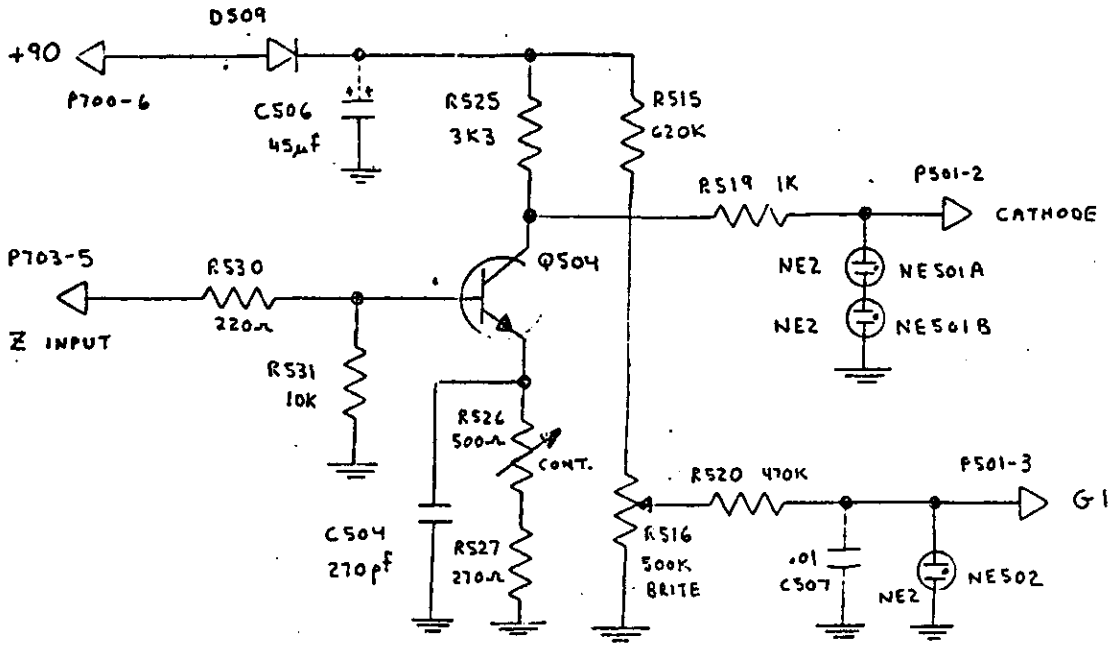
There is no short circuit protection for Q100, Q101 so even a momentary short could prove disastrous. The input legs of the bridge rectifier are fused with 5A fuses, however, these will operate only in case of catastrophic failure of bridge or filters. They are much too slow to protect Q100, Q101; they will however protect the power transformer.

Because of the high HFE of Q100 and Q101, two small capacitors C102 and C103 are tied from base to ground to eliminate any tendency toward H.F. oscillation.

The basic X-Y monitor is capable of ± 25 or ± 35 volt operation. There are two power supply assemblies available and except for component ratings the supplies operate identically.

The regulator board also loops through 6.3 volts for the CRT heater. This voltage is slightly reduced from nominal (-10%) to eliminate any possibility of secondary emission in the CRT under high line conditions. There is also a beneficial effect in expected tube life.

Z AMPLIFIER



The Z amplifier provides intensity modulation of the electron beam. A minimum of 8 steps are discernable. The driving generator must be capable of the following outputs into a 200 ohm load:

0.5 volts blanking
1.0 volts black level
4.0 volts full beam intensity

Q504 is a single stage common emitter amplifier with a 3 dB point of 1 MHz, capable of sufficient amplification to control the electron beam. Typically 30V p-p of signal may be found on the cathode of the CRT. R526 is a contrast control and varies the AC gain over a range of 3:1. R531 is a pull down resistor to insure that Q504 is cut off under a no signal input condition. C504 is a peaking capacitor - selected for good high frequency response with minimum overshoot.

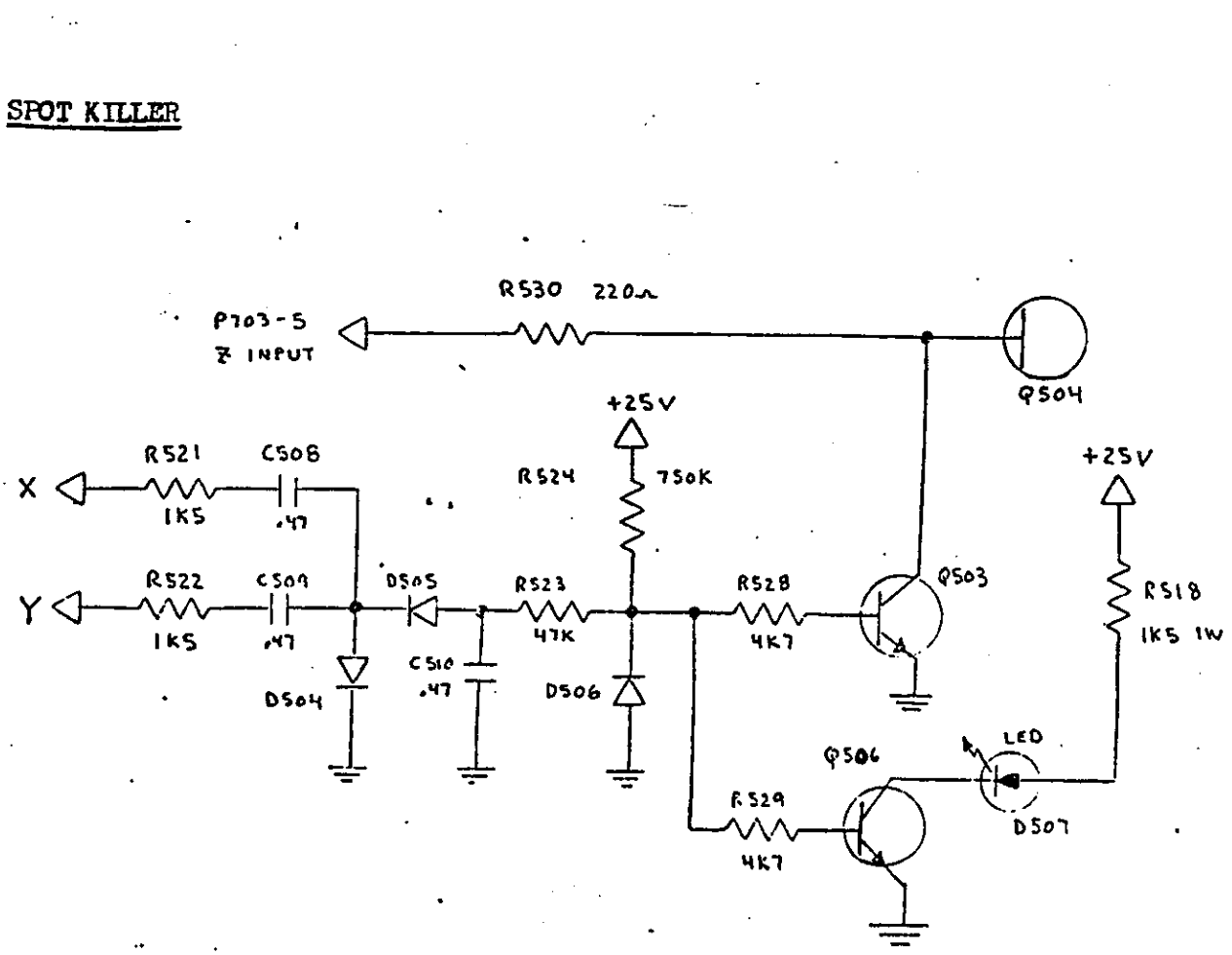
Brightness is controlled by the DC bias voltage between cathode and G1, with G1 being the most negative. It is set by a divider network comprised of R515 and the location of the wiper arm of R516. In order to accomodate the large differences in turn on characteristics of the 19VARP4 CRT, it is necessary to give this control an over range of 25%.

This means that on most tubes it is now possible to turn this control up to the point where an undeflected beam may be seen on the screen. Care must be used when adjusting this control because should this occur, the probability is high that phosphor burn and irreversable CRT damage will result in short order.

R520, C507 and NE502 are a spark supression network to keep any transient voltage spikes that may be generated inside the CRT due to internal arcing from damaging the Z amp by routing them to ground. R519 and NE501A and NE501B are also arc supression components. The two neons have a combined firing voltage of approx. 130 volts. Any voltage spike greater than 130 volts will trigger the neons and provide a very low impedance path to ground.

R515 and R516 in addition to forming the brightness divider chain are also part of a power down spot supression network comprised additionally of D509 and C506. On power down, the discharge path of C506 is through R515 and R516, and must be of sufficient time lag to allow the CRT heater to cool down before the cathode to G1 bias voltage becomes small enough to turn on the electron beam and produce an undeflected bright spot on the CRT. This spot over a period of time would burn the CRT phosphor. A typical cathode to G1 voltage for a just visable display is 60 volts. D509 is an isolation diode to prevent discharge of C506 through any resistance path in the EHT supply and to provide a repeatable time delay by steering the discharge current only through R515 and R516. The time constant of this circuit is approx. 50 seconds.

SPOT KILLER


R530 220Ω
P703-5
Z INPUT
Q504
+25V
R521
C508
X
1K5
.47
R524
750K
+25V
R522
C509
D505
R523
R528
Q503
R518
Y
1K5
.47
47K
4K7
1K5 1W
C510
.47
D504
D506
LED
Q506
R529
4K7
D507

Both X and Y channels are sampled for presence of sufficient amplitude and rate of change by means of R521, C508, R522 and C509. Any alternating voltage present is summed, rectified by D504, D505 and held as a negative voltage across C510. This negative voltage is limited in amplitude by D506 to prevent possible zenering of base emitter junction of Q503 and Q506.

A positive voltage is introduced by R524 that would be sufficient under no signal conditions to turn on Q503 and Q506. The negative sample voltage is sufficient to buck this positive voltage and under normal operation prevents Q503 and Q506 from conducting. R528 and R529 provide current limiting protection for the bases of Q503 and Q506.

When the X & Y sampled signals are of sufficient low amplitude due to:

a) lack of drive
b) removal of input signal plug
c) repetition rate too low

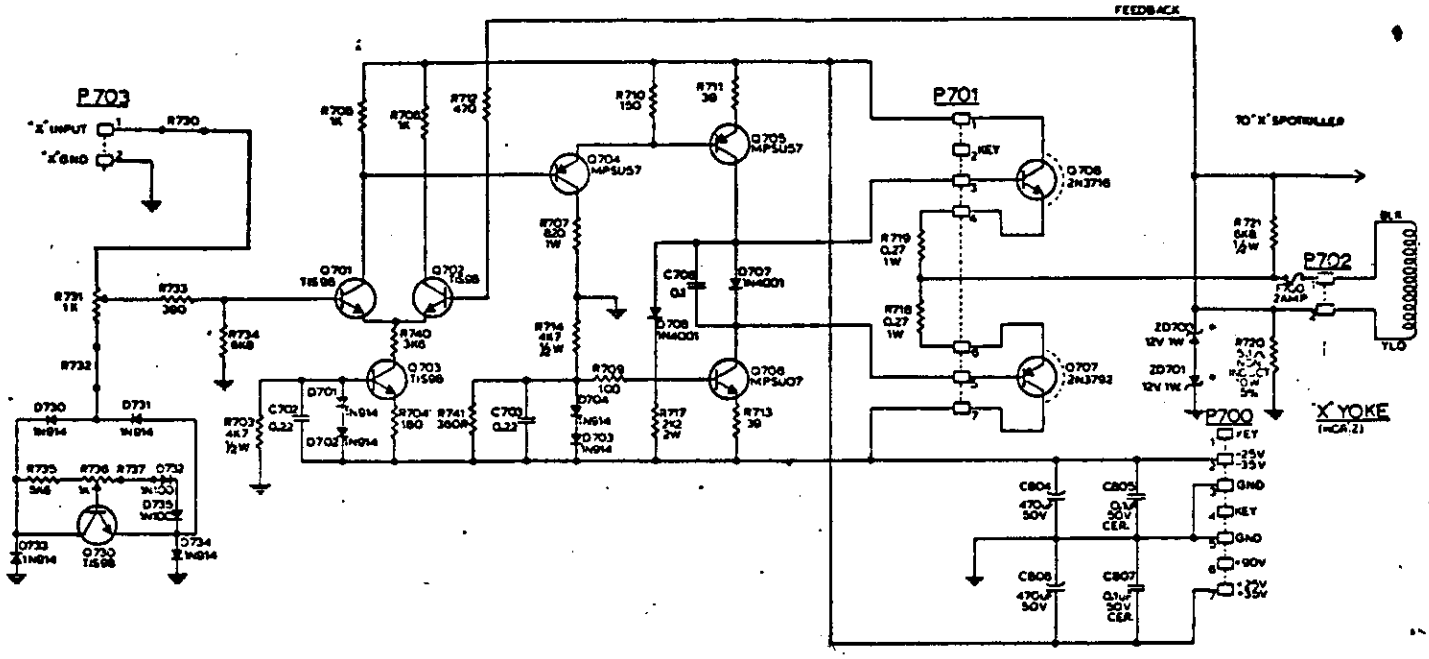
the positive voltage introduced by R524 will forward bias Q503 and Q506 causing the input Z amplifier signal to be shorted to ground via Q503 and series resistor R530. This will cause the collector voltage of Q504 to rise to full supply and the cathode to G1 voltage will be sufficient to blank the CRT. At this time, Q506 will also be turned on causing LED D507 to illuminate and indicate spot killer operation.

On power down, the transistor Q503 shorting out the Z signal, draws its operating power from a decaying +25 volt line and consequently after a short time loses its ability to short out the Z signal. If the Z signal is still present, it will turn on Q504 and greatly decrease the discharge time constant of C506, which maintains the cathode to G1 bias voltage. If this voltage falls below a critical value, the CRT will turn on and if the heater is still warm enough and EHT is present on the CRT, an undeflected spot containing very high enery per unit area of display will burn the phosphor.

It is imperative that the Z signal be removed before Q503 loses its ability to short out this signal. If the signal plug is disconnected, before the monitor is powered down, this condition will be automatically met. In a fully integrated system where generator and monitor are switched off at the same time, the power supply of the generator must decay before the power supply of the monitor.

X-Y DEFLECTION AMPLIFIER

X AMPLIFIER



Both X and Y channels are practically identical with only minor differences in some component values to accommodate the differences in input signal levels of ± 10V and ± 7.5V respectively, and to accommodate the 4:3 aspect ratio of the CRT. Because of this we will investigate only the X channel.

The amplifier is a direct coupled voltage to current converter. It is current through the yoke that will produce the magnetic field to deflect the electronic beam. The small signal response of the amplifier is DC to approx. 1 MHz with the large signal being limited mainly by yoke inductance and available supply voltage to a maximum slew rate of 2300 Hz at ± 25V supply. The voltage gain is slightly less than unity as measured across the sense resistor R620, R720.

The input signal of ± 10V is applied to P703-1 by a generator that is capable of delivering this voltage into a 1KΩ load. The signal is gain corrected to compensate for inherent CRT non-linearity in deflection by R731, R733, R734 and the components located within a bridge rectifier formed by D730, D731, D733 and D734. Q730 is the active gain correction element whose break point can be controlled by R736. Germanium diodes D732 and D735 are used to soften the turn on point and produce a closer

1st order approximate to the desired pre-distortion necessary to correct for the CRT deflection characteristics. Due to the bridge configuration, the same control element is used for positive and negative break points resulting in a very symetrical correction factor which is highly desirable without having to precisely match the gain correction components as would otherwise be necessary.

The gain corrected signal is applied to the input transistor of a differential amplifier comprised of Q701, Q702 and constant current source Q703. The current supplied by Q703 will ideally split equally between Q701 and Q702 resulting in identical no signal collector voltage. In practise it should be matched within 5% of the supply level. Very heavy negative feedback is applied to the base of Q702 from across R720, a non inductive current sensing resistor, the voltage across which supplies an accurate representation of yoke current and forces the amplifier to correct any distortion present as well as holding a 0 DC condition at the emitter commons of output transistors Q708 and Q708 under 0 input level condition.

The signal present at the collector of Q701 is current amplified by emitter follower Q704 and this in turn is used to drive Q705 which then drives the output transistors Q708 and Q707 forcing current through the X winding of the yoke and producing beam deflection.

The output transistors are current driven with the actual driver transistor being Q705 and its constant current source being Q706. D708 and R717 are a network to supress possible high frequency oscillation if the driving signal exceeds the maximum writing speed capabilities of the monitor. D708 is used to hold the bases of Q707 and Q708 separate by 0.6 of a volt. This results in output transistors that are biased Class B. Under no signal conditions no current is flowing through R719 and R718. Any small amount of crossover distortion that may result from Class B operation is removed by means of the very heavy negative feedback present. C706 is used to maintain a low impedance path across D707.

Both Q703 and Q706 are constant current sources and except for the amount of sourced current and protection in case of failure, are identical. For simplicity, we will only look at Q706 operation.

R717 allows a current to flow through D704 and D703 from the negative rail to ground. D704 and D703 drop approx. 1.4 volts in the forward biased state. This voltage remains relatively constant. A small current will flow into the base of Q706. The base emitter junction voltage is typically 0.6V. This would leave .8V across R713, a 39Ω resistor. This corresponds to an emitter current of 20 ma. This

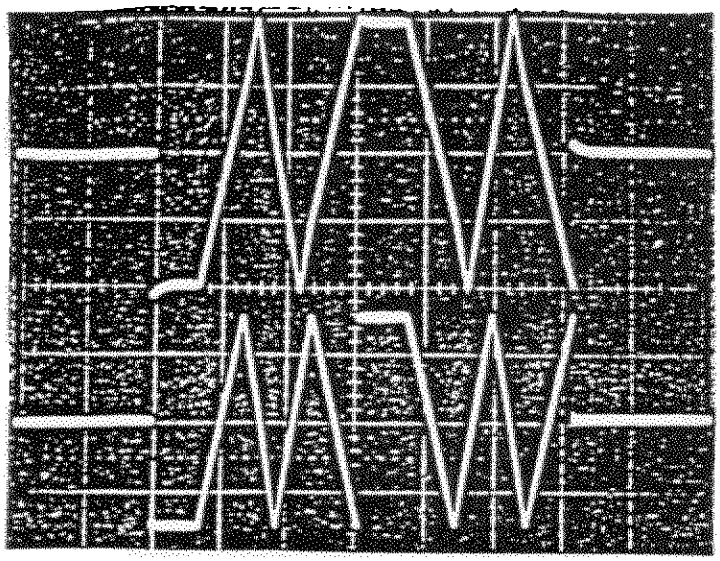
effectively represents the constant current available from Q706. R709 is a supressing resistor to prevent spontaneous oscillation of Q706. In case of a failure of D704 or D703, the 360Ω resistor across them forms a voltage divider with R717 and limits the current available to the constant current transistor Q706 and prevents its sudden destruction along with a handful of other components. C703 is an HF bypass.

A 3K6Ω safety resistor in the collector of Q703, the other constant current source prevents destruction of a large number of components should this current source fail.

R721 is a resistor critically selected to damp the yoke and minimize any tendancy for ringing. ZD700 and ZD701 are transient supressor diodes and their sole function is to clamp any voltage spike that may be induced in the yoke due to an arc in the CRT. They serve no active part in beam deflection.

In case of a failure of an output device or an extreme excursion of the electron beam, F700 will open and prevent damage to the yoke or sense resistor as well as remove all loading from Q707 and Q708, thus protecting those from potential failure also.

R719 and R718 supply a small voltage drop to help control any tendency for thermal runaway in Q708 and Q707 under heavy loading and high ambient temperature condition.



INPUT SIGNALS

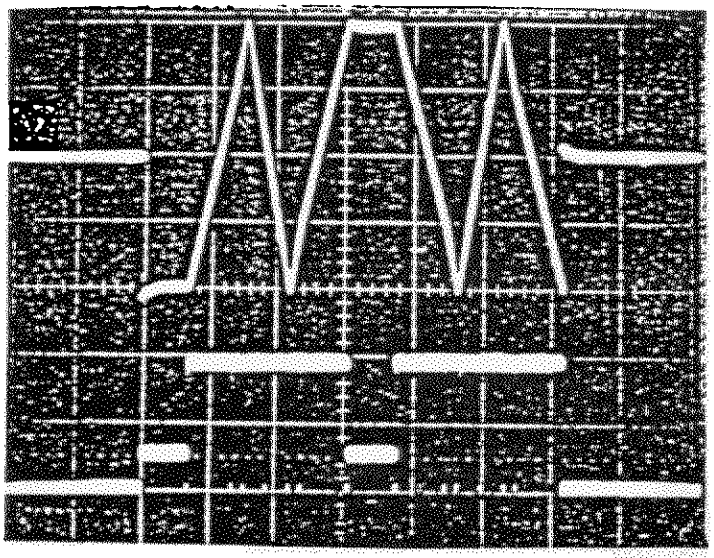
DIAGONAL CROSSHATCH PATTERN

0 DC
CENTER
X INPUT

5 ms/cm H

5 v/cm V

0 DC CENTER
Y INPUT



INPUT SIGNALS

DIAGONAL CROSSHATCH PATTERN

0 DC CENTER
X INPUT

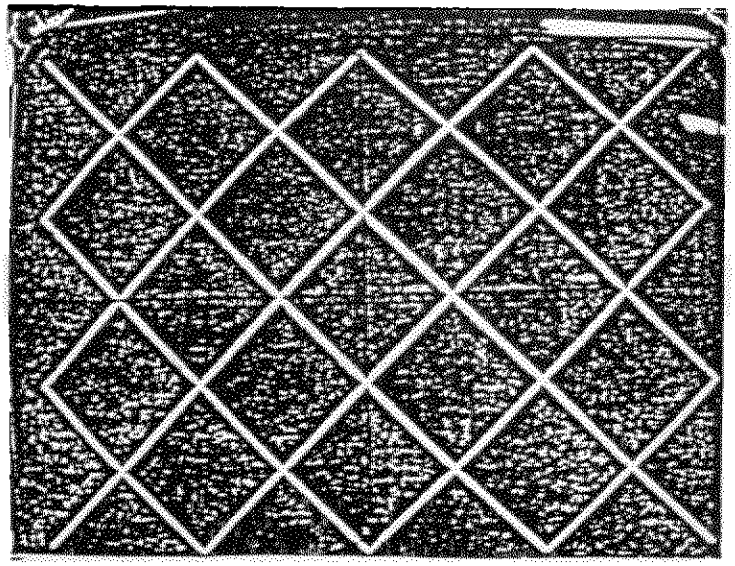
5 v/cm V

5 ms/cm H

0 DC CENTER
Z INPUT

2 v/cm V

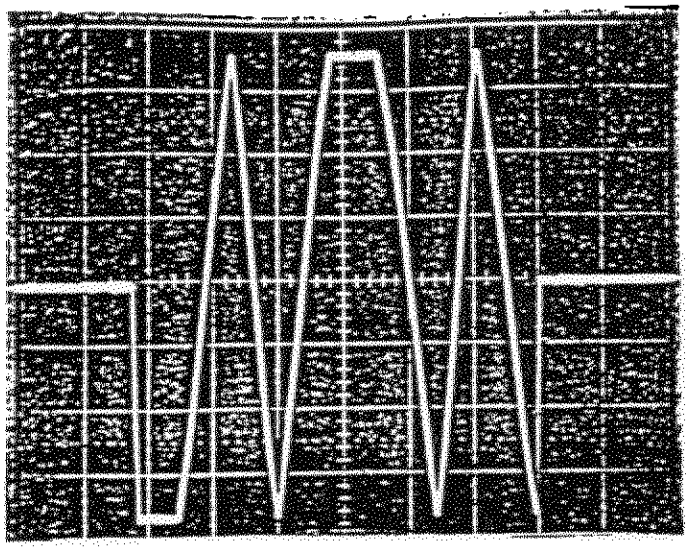
5 ms/cm H



CRT DISPLAY

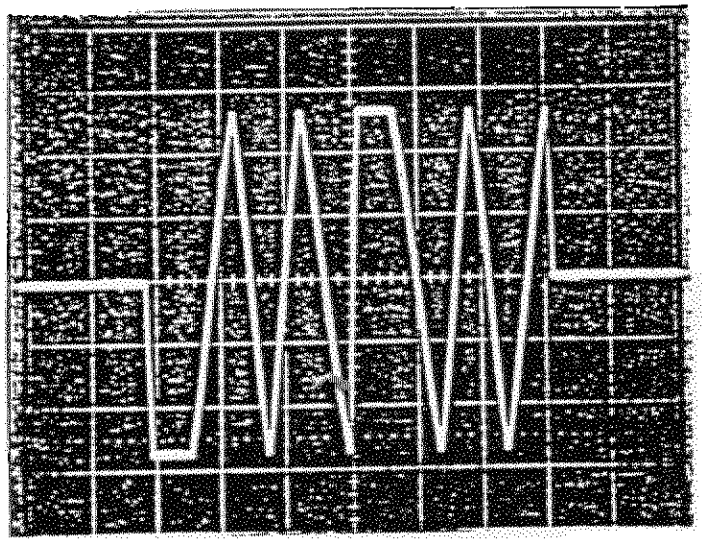
DIAGONAL CROSSHATCH PATTERN

11¼" x 15" DISPLAY



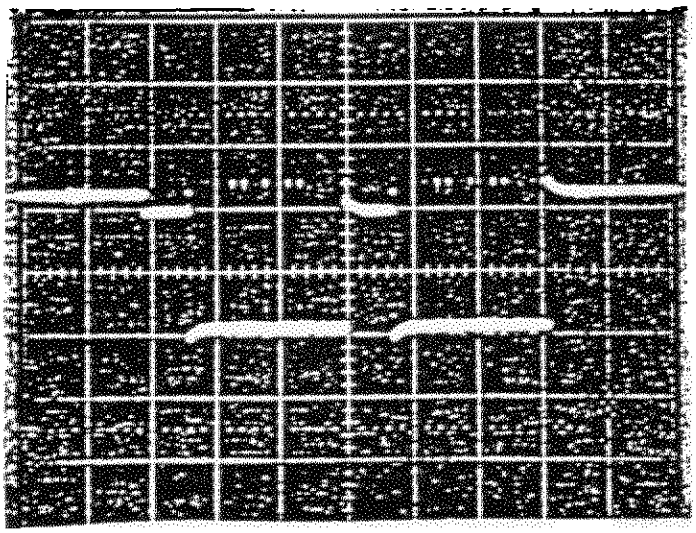
0 DC CENTER

X CHANNEL OUTPUT MEASURED
ACROSS R720
DIAGONAL CROSSHATCH PATTERN



0 DC CENTER

Y CHANNEL OUTPUT MEASURED
ACROSS R620
DIAGONAL CROSSHATCH PATTERN

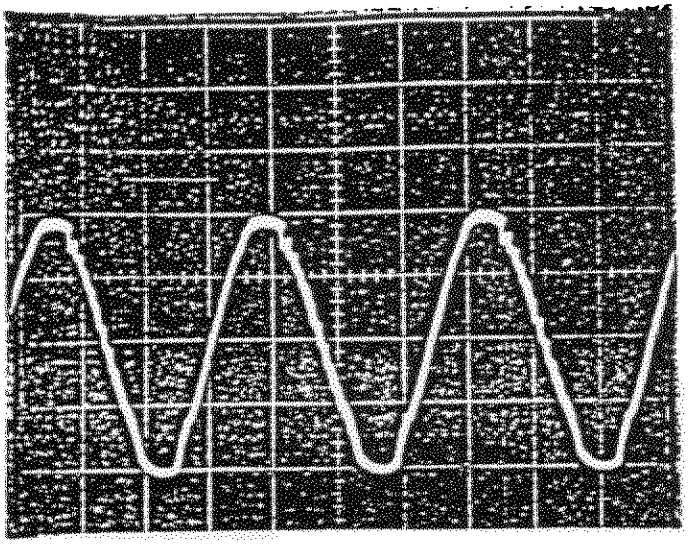


+100 VDC

Z CHANNEL OUTPUT MEASURED
AT COLLECTOR Q504
DIAGONAL CROSSHATCH PATTERN

10v/cm V

5 ms/cm H



0 DC

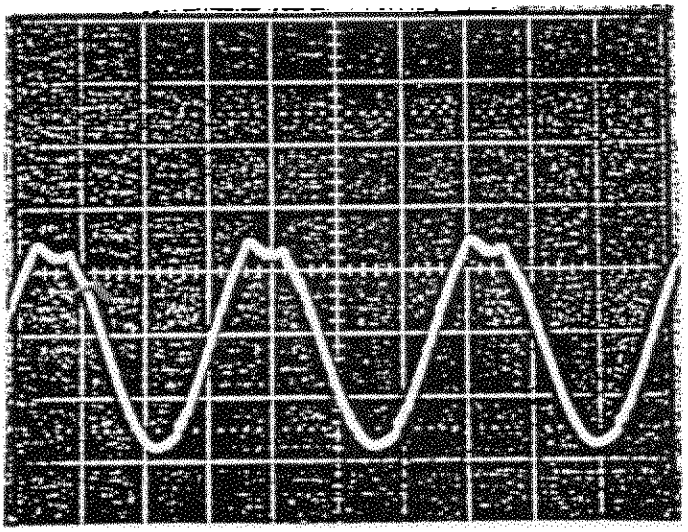
EHT SUPPLY

WAVEFORM AT COLLECTOR OF Q903

V_{OUT} = 14KV @ 0µa

10 v/cm V

10µsec/cm H



0 DC

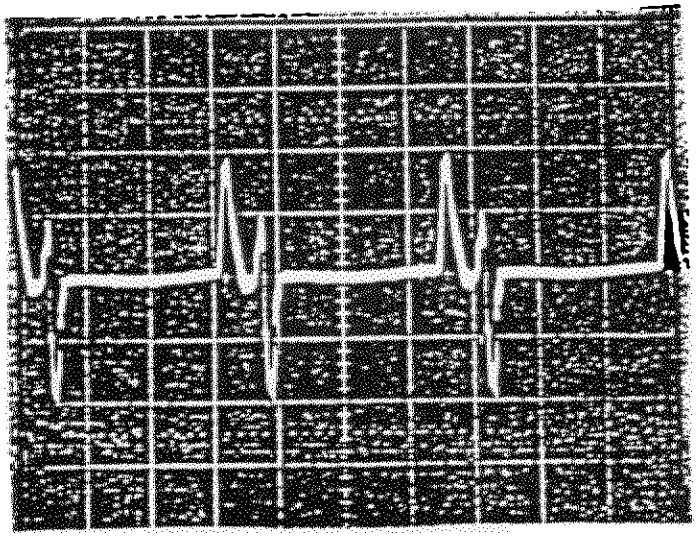
EHT SUPPLY

WAVEFORM AT BASE OF Q903

V_{OUT} = 14KV @ 0µa

5 v/cm V

10µsec/cm H



0 DC CENTER

EHT SUPPLY

WAVEFORM AT EMITTER Q903

V_{OUT} = 14KV @ 0µa

0.5 v/cm V

10µsec/cm H

REGULATOR ASSEMBLY

Caution must be exercised when servicing this module. The regulator has no current limiting and even a momentary short of output voltage could cause destruction of the pass transistors.

The two fuses on the PCB are intended to protect the power transformer only, and offer little protection to any of the components on the assembly. Replace only with identical rated devices.

The assembly may be removed from the chassis by removing the two cover mounting screws, unplugging the harnesses and sliding the board out from its mounting bracket.

When installing the board make certain it is properly seated in its mounting bracket. If the filters are replaced care must be used in their mounting so as not to deform the PC board.

The no load regulator voltage should be ±25V ±5%. The heater line is simply looped through this board with a small series dropping resistor. Under a load of 500ma this resistor will reduce the nominal 6.3 heater voltage to the CRT by approximately 10%.

The supply should be capable of delivering 2 amps output current from the positive or negative lines at nominal voltage, however not simultaneously. Ripple content should be less than .5V pk to pk under this static load.

A suitable load would be a 12.5 ohm 25W resistor momentarily held on to positive or negative rail while this measurement is taken.

Typical ripple content on C100, C101 with a diagonal cross hatch pattern display is 1.5 volt pk - pk.

EHT MODULE

The CRT anode voltage is adjustable by means of R912. This control is accessible through the top perforated shield of the module. A small flat blade screwdriver of non-metallic composition should be used for this adjustment. The EHT is adjustable from approximately 12 - 16 KV at 0 beam current. Nominal EHT is 14.0KV at 0 beam current.

Focusing may be set by means of R911. This control is accessible through the side shield of the module. It is a flat blade screwdriver adjustment. The focus voltage is adjustable over the range of -200 to +400 volts. Focus should be set for best overall definition.

Inside the module is a 1 amp fast blow fuse. This must be replaced only with a fast blow device. To replace this fuse the screened cover must be removed and the fuse holder will be clearly revealed.

When replacing the EHT module, make certain that the CRT anode is safely discharged to ground before removing the anode cap. Make certain the ground wire coming from the rear of the module is re-attached before operating EHT module in the monitor. This ground wire prevents damage to the oscillator transistor in the event of interval arcing in the CRT.

Typical input current from the 25V line for a normally operating, un-loaded EHT module, is .35 amps. Input current will increase with loading and higher than nominal 14KV EHT.

Under a load of 300 μa the EHT should not change by more than 300 volts from 14KV.

A suitable load can be made from five 10 mΩ 1W resistors in series. Caution must be used when doing this check.

The 90V line should be capable of supplying 25 ma output current with good regulation. A suitable load would be a 3.9KΩ 2W resistor momentarily held onto the 90V terminal. The output voltage should not drop significantly.

The focus and G2 voltages are capable of only very low current drain; they are potential voltage only.

Deflection Amplifier

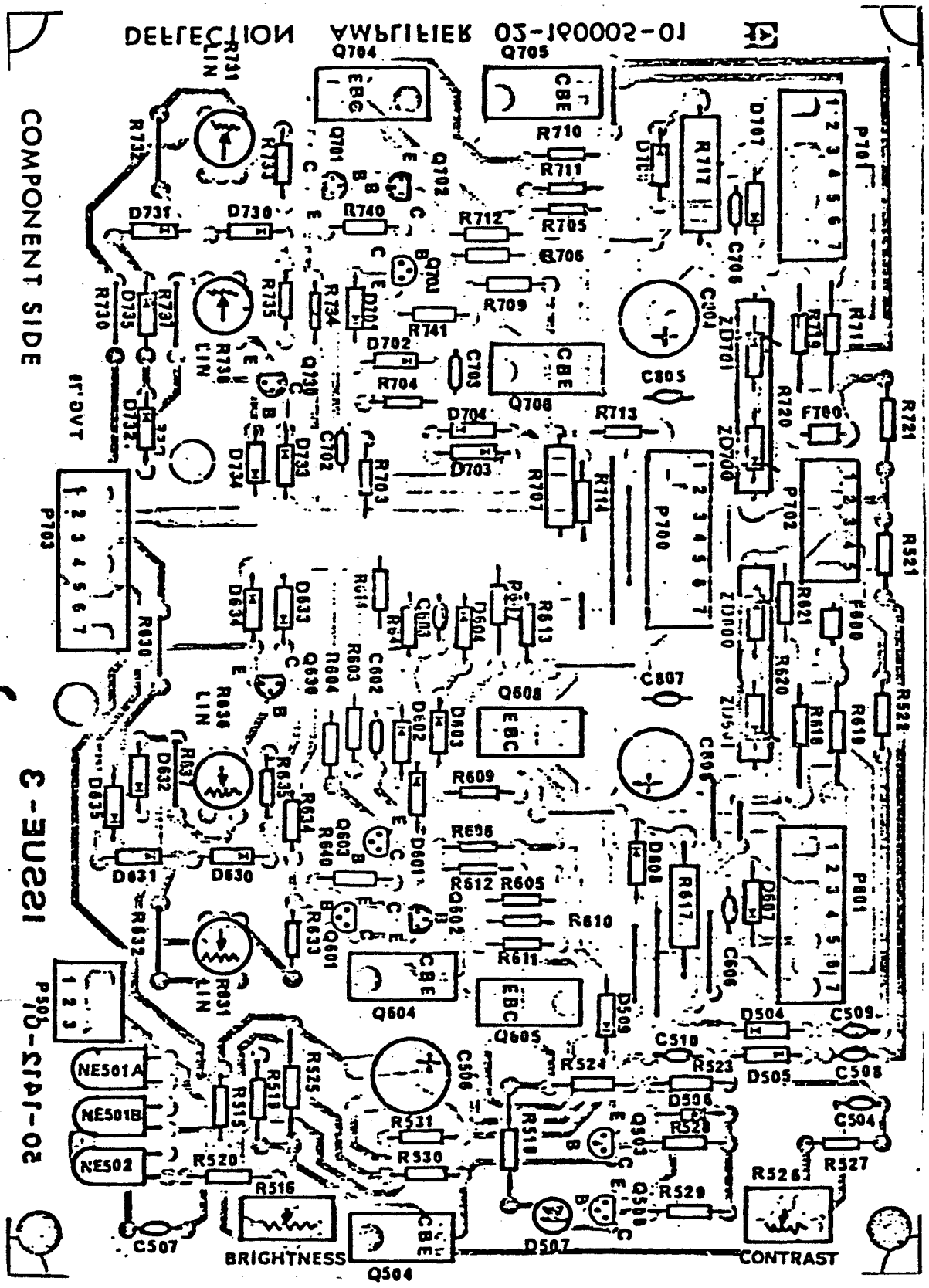
This board is held in place by 3 mounting screws and a retaining bracket. There is sufficient slack in the harness so that service may be performed with the set operating and this board removed from its mounting position. All of the plugs are keyed so improper termination would be difficult. P601 and P701 are interchangable for troubleshooting purposes.

The linearity controls R731, R736, X channel, and R636, R631, Y channel are factory sealed and do not normally require adjustment. If adjustment is necessary the seals must be broken and a generator capable of displaying a diagonal crosshatch pattern on the monitor must be used. Adjustment, while not impossible, would be difficult on a conventional crosshatch pattern. The normal imput of $\pm$ 100 and $\pm$ 75 volts must be used. Both linearity controls interact. They must be adjusted for best overall linearity with a displayed pattern size of 11¼ x 15 inches. Before adjustment is undertaken, EHT should be verified at 14KV 0 beam.

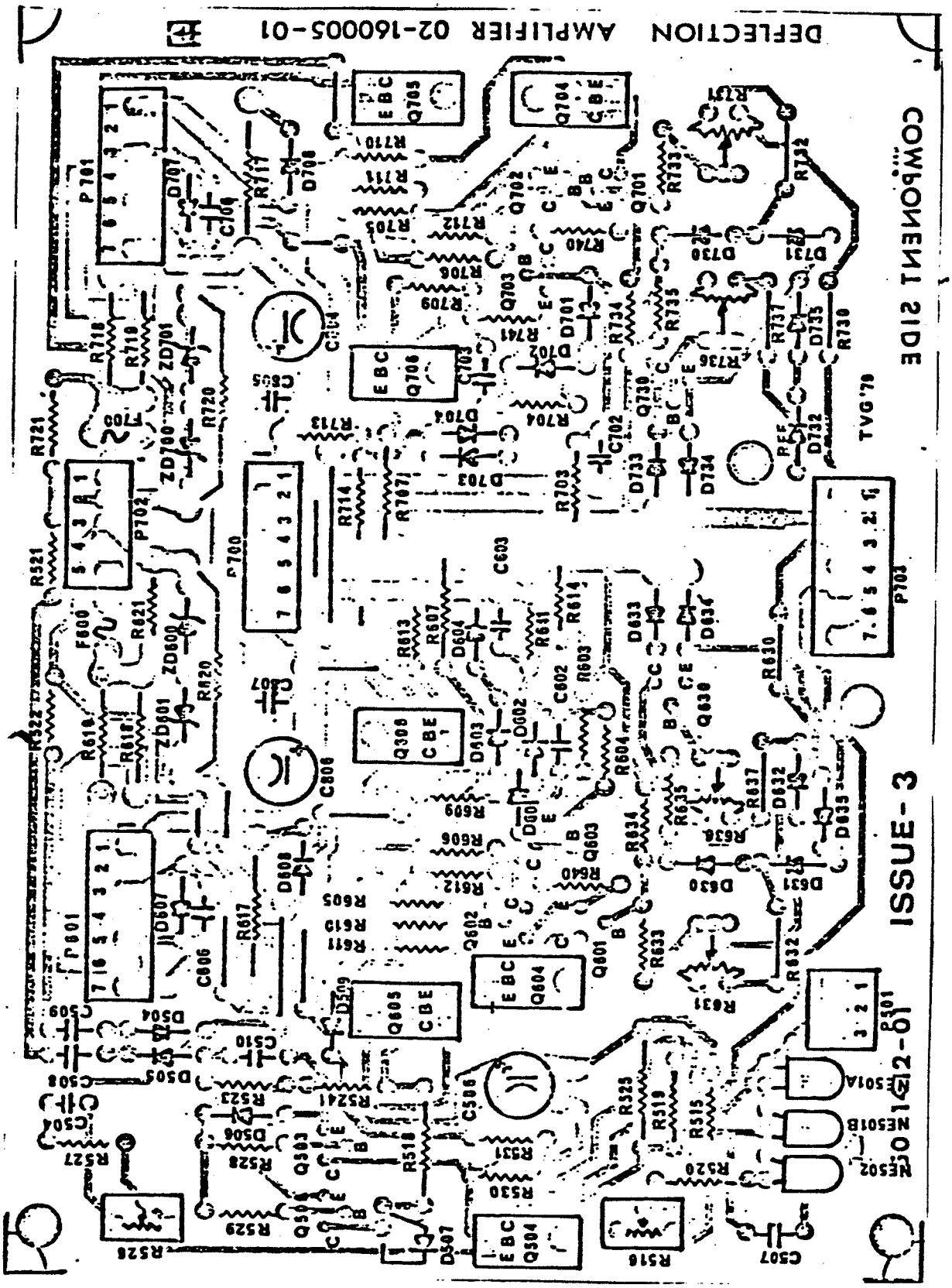
Should the sense resistors R720, R620 need replacement, they must be replaced only with non-inductive resistors of the same value or monitor performance will be degraded.

Both output channels are fused. There must be replacement with similiar fuses for continued protection. When replacing these fuses F700, F600, they should be protected from excessive heating by using needle nosed players to hold the leads and act as a heat sink.

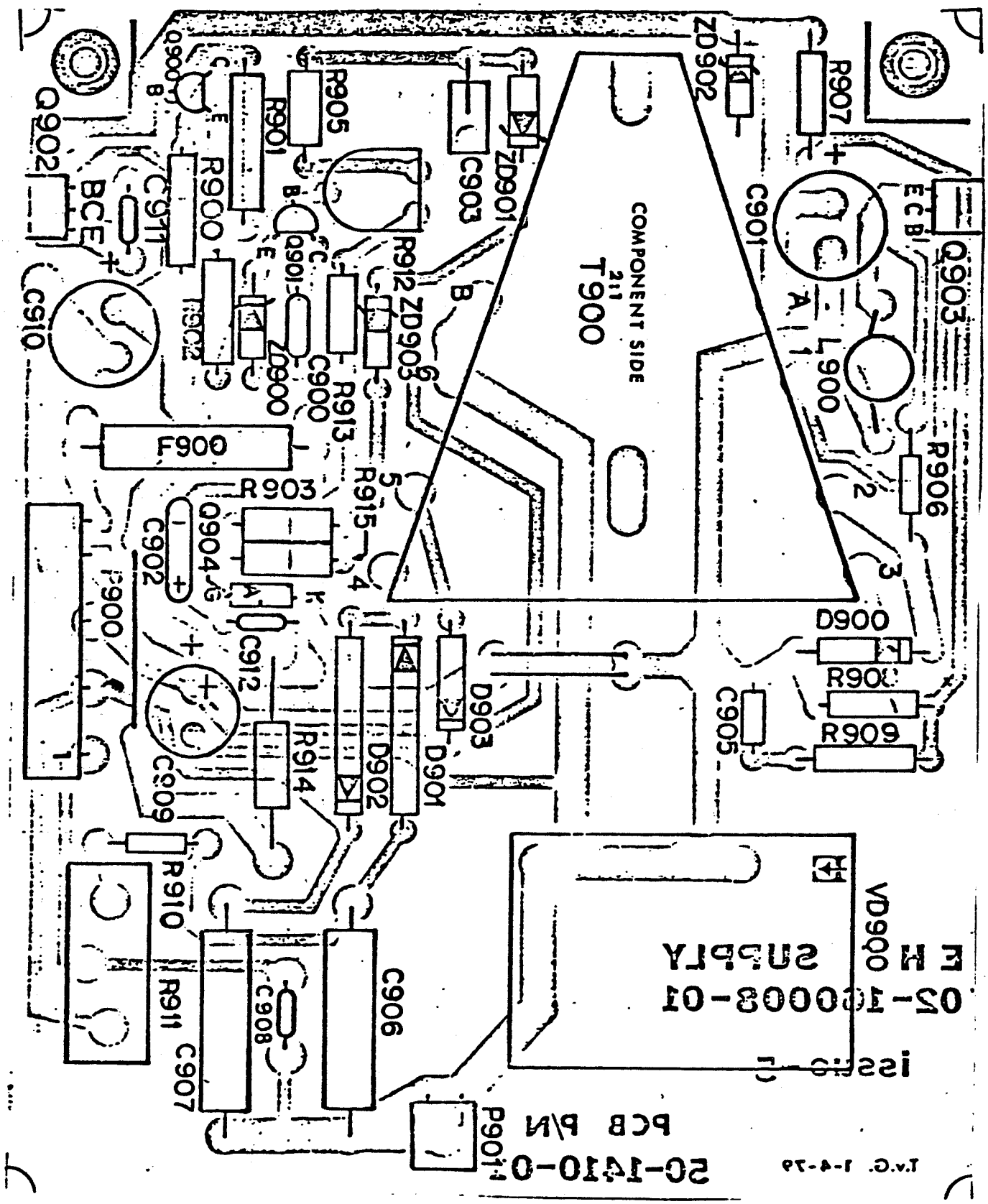
Caution: Removal of any plug on the deflection board other than input plug P703, on an operating monitor, could result in phosphor burn.



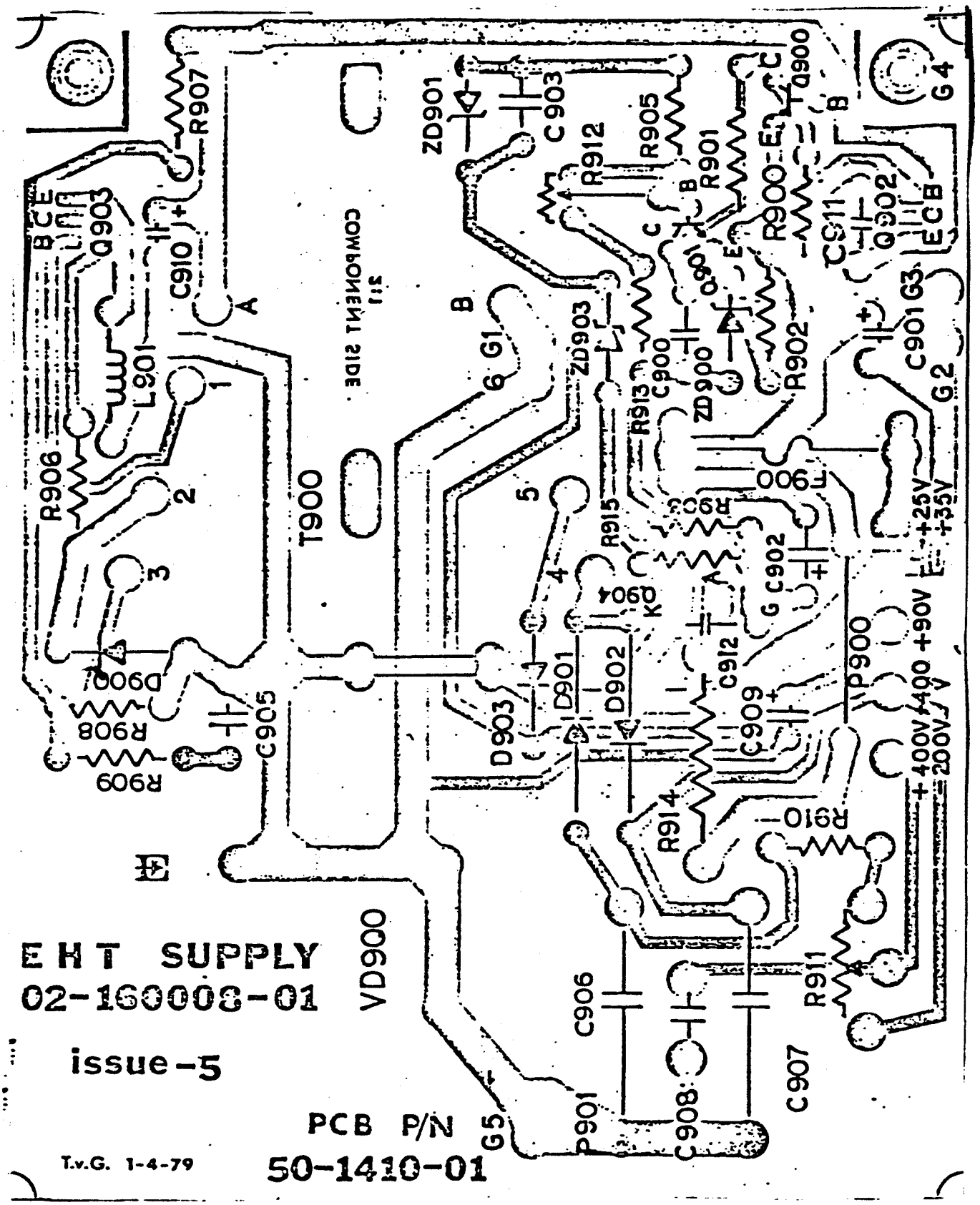
DEFLECTION AMPLIFIER PCB LAYOUT (COMPONENT SIDE)



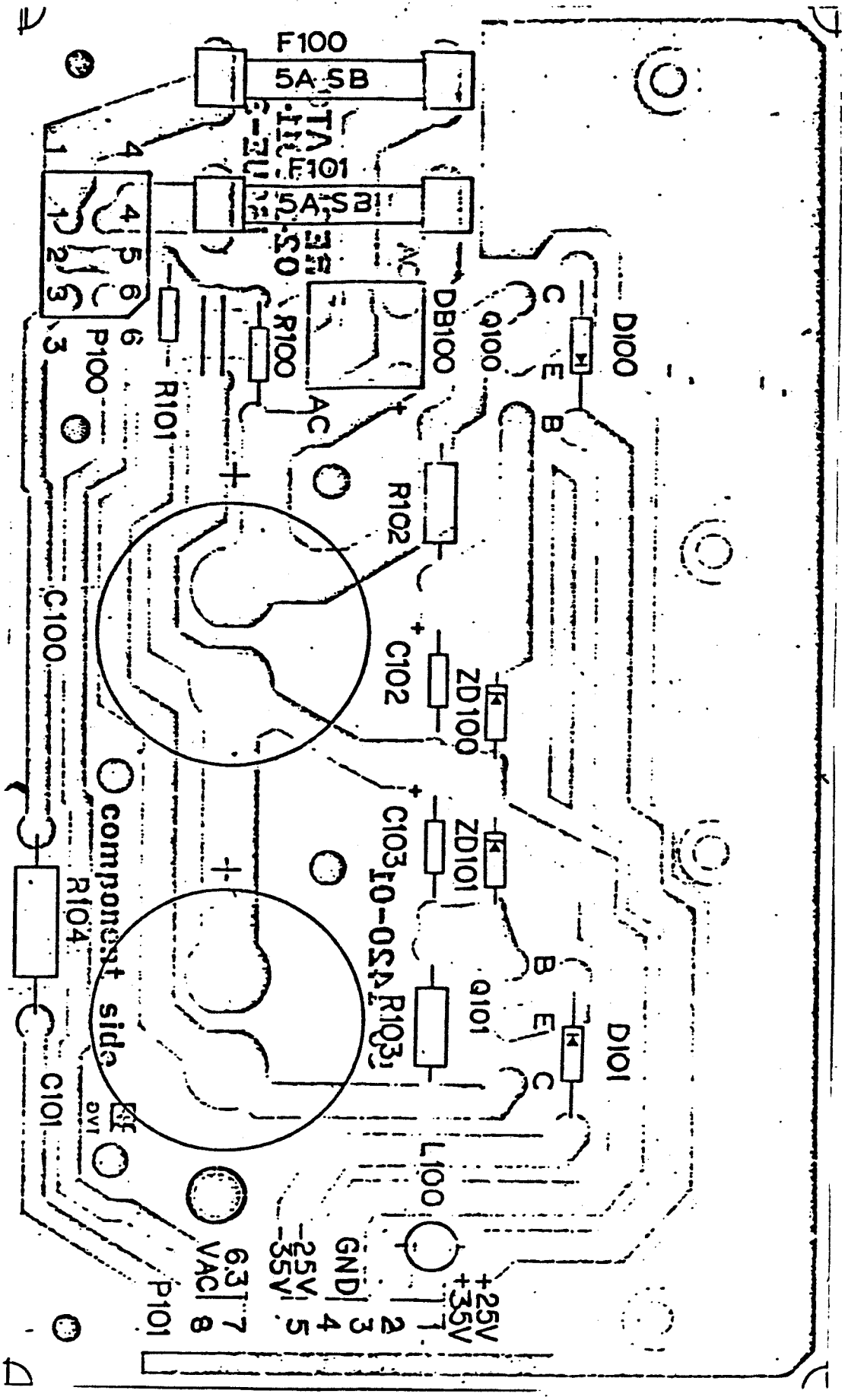
DEFLECTION AMPLIFIER PCB LAYOUT (FOIL SIDE)



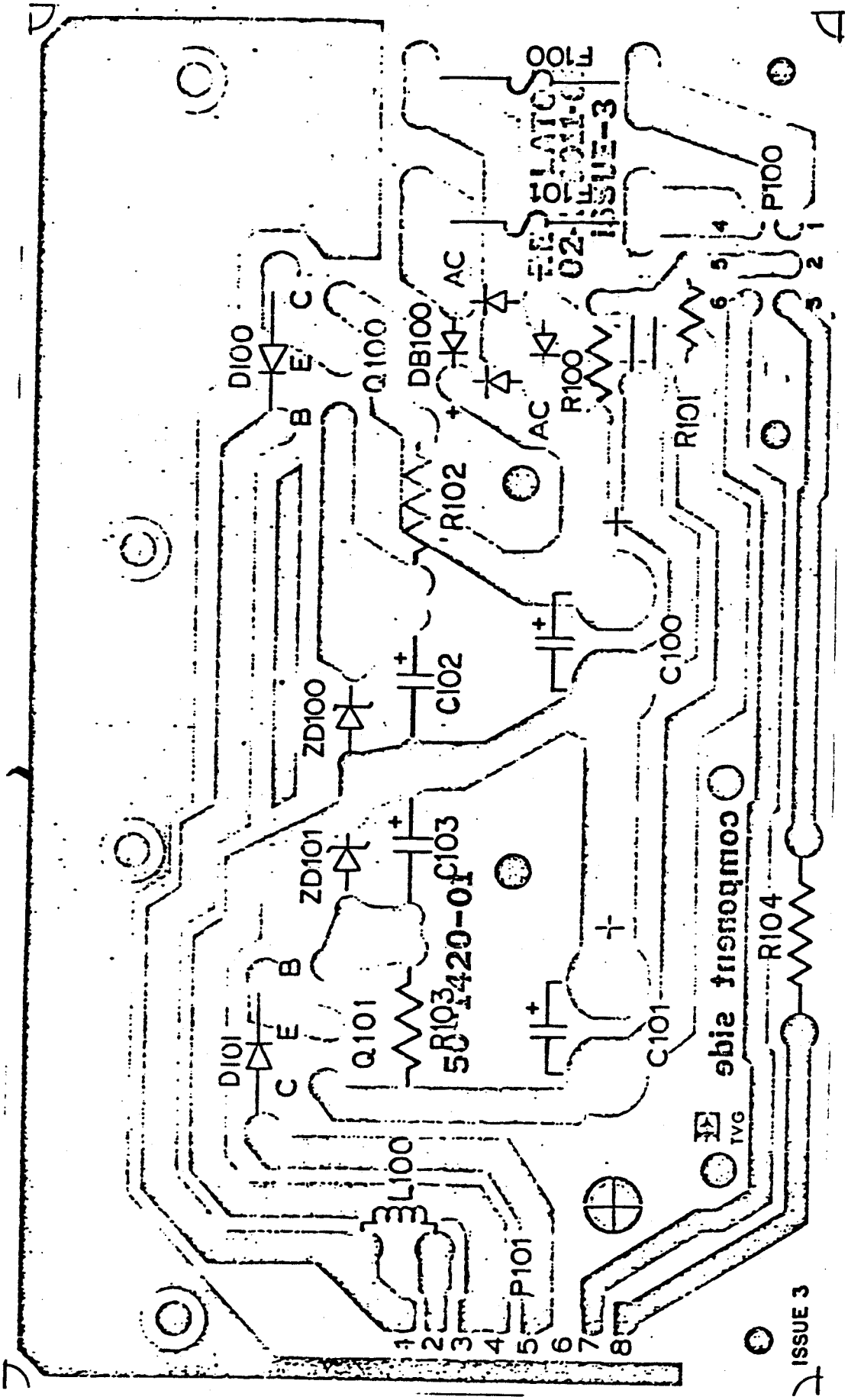
EHT PCB LAYOUT (COMPONENT SIDE)



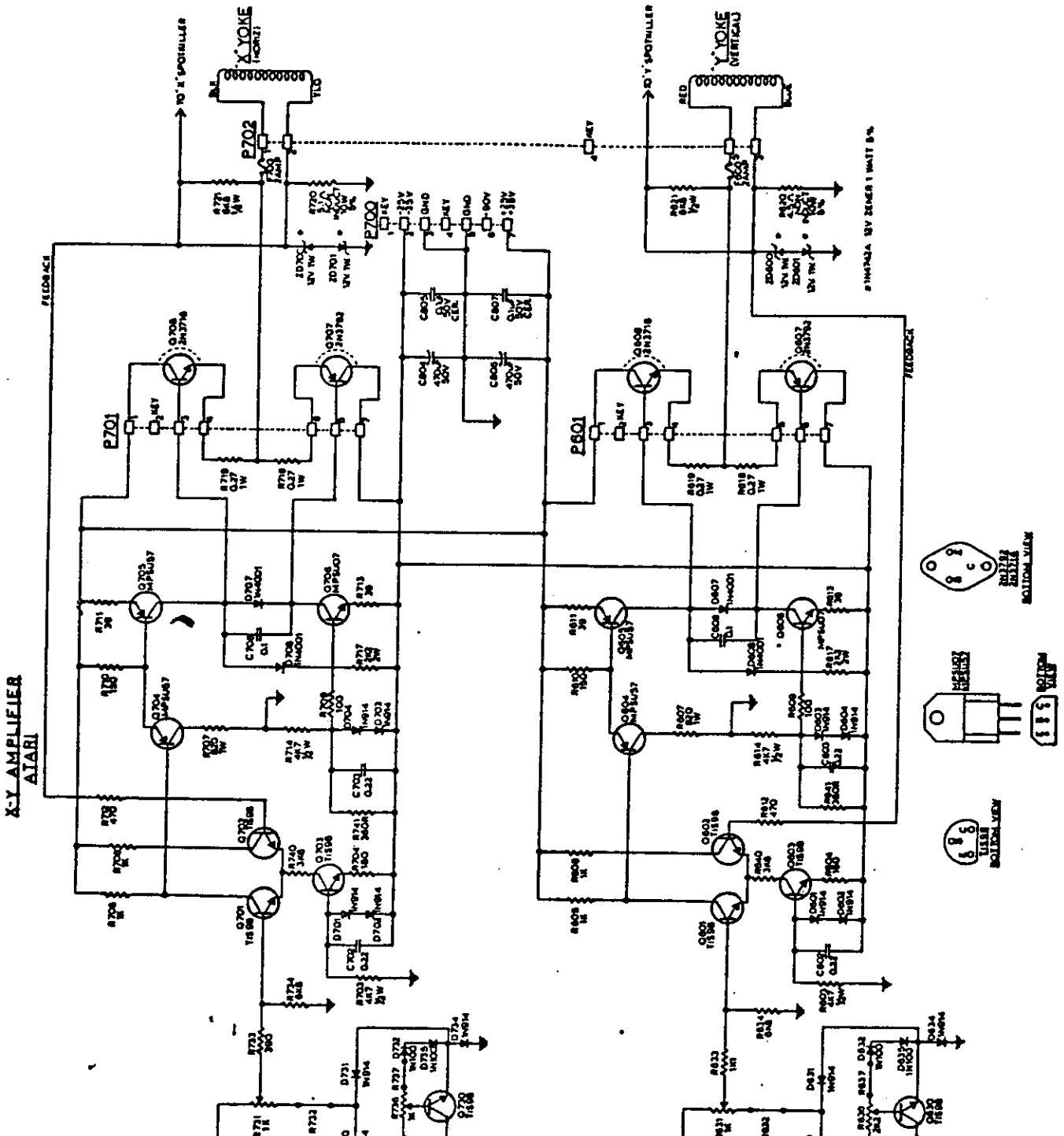
EHT PCB LAYOUT (FOIL SIDE)

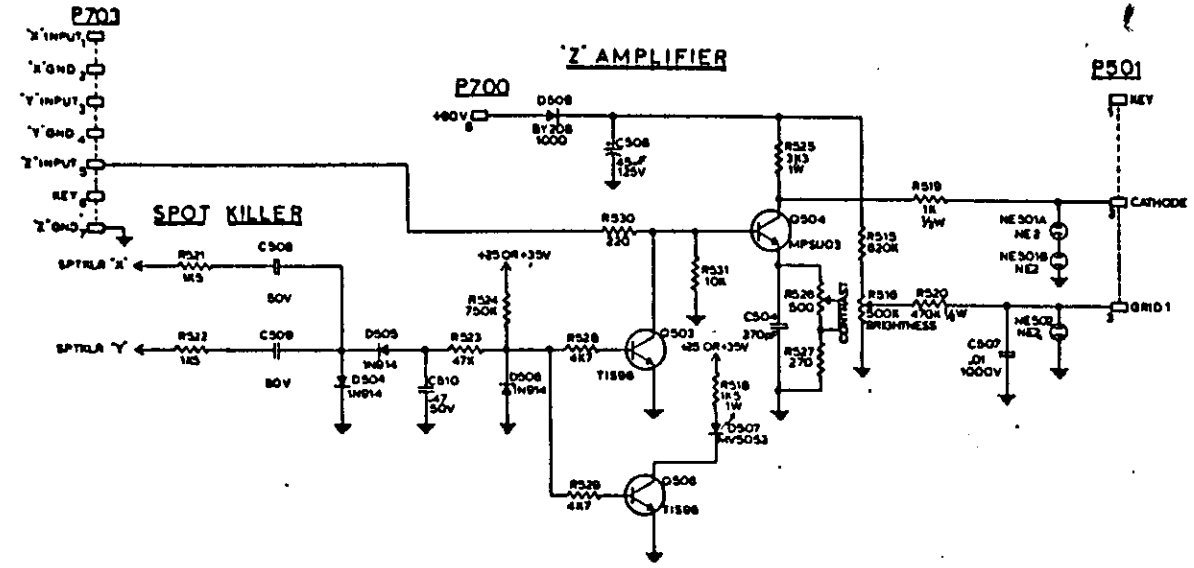


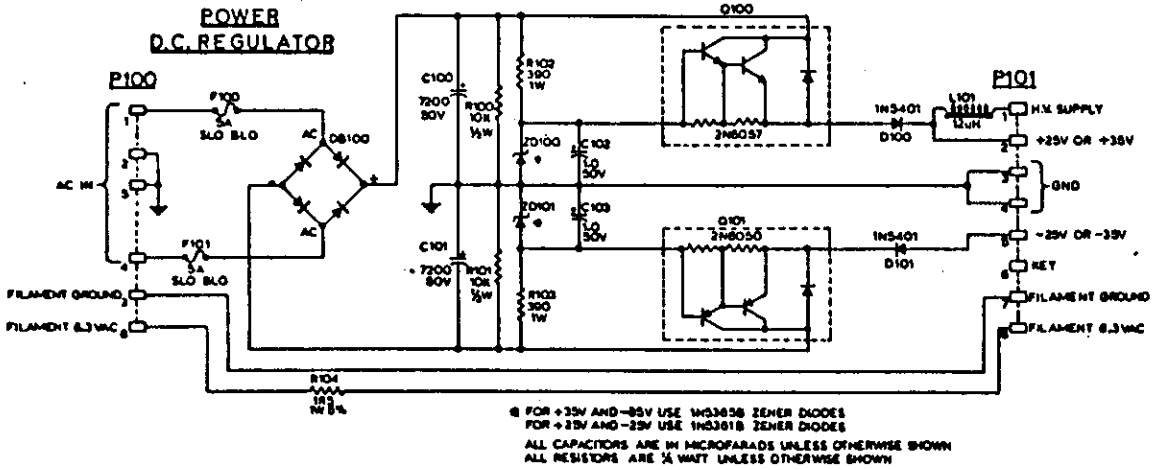
REGULATOR PCB LAYOUT (COMPONENT SIDE)



REGULATOR PCB LAYOUT (FOIL SIDE)

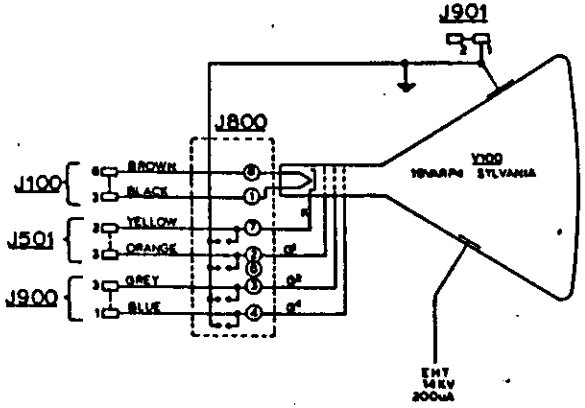

X-Y AMPLIFIER
ATARI
X YOKE
(HORIZ)
Y YOKE
(VERTICAL)
P701
P702
P703
P800
P801
P700
TO 'X' SPOTKILLER
TO 'Y' SPOTKILLER
FEEDBACK
BOTTOM VIEW

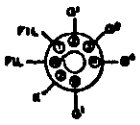


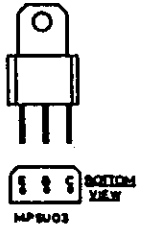


① FOR +35V AND −85V USE 1N3363B ZENER DIODES
FOR +25V AND −25V USE 1N3361B ZENER DIODES

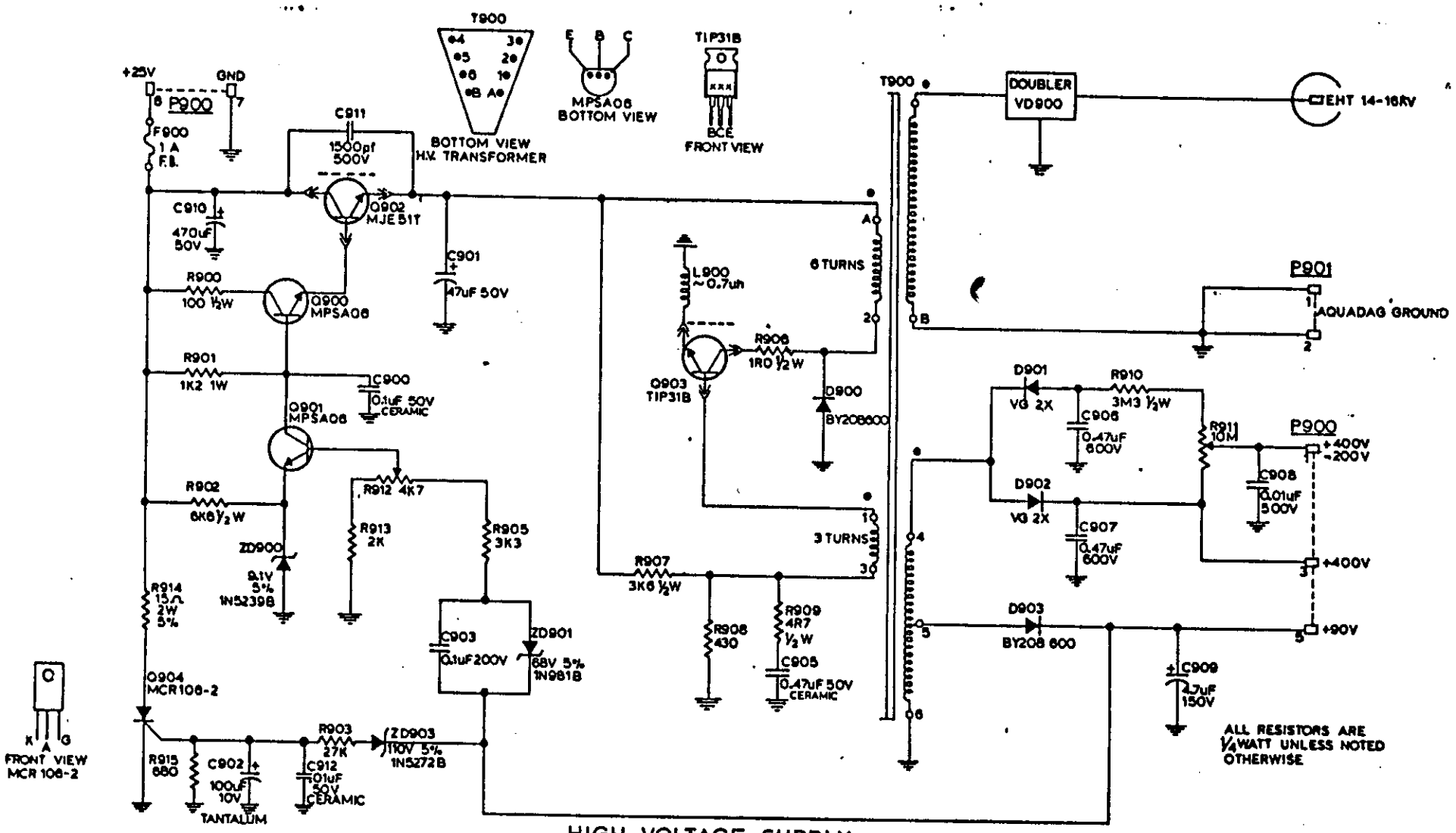
ALL CAPACITORS ARE IN MICROFARADS UNLESS OTHERWISE SHOWN
ALL RESISTORS ARE ¼ WATT UNLESS OTHERWISE SHOWN







Th



HIGH VOLTAGE SUPPLY

TITLE: DEFLECTION PANEL ASSEMBLY P/N: 02-160001-01

ITEM	SYMBOL	DESCRIPTION	ELECTROHOME P/N	COMMENT
1	X	Deflection Amp. PCB Assy	02-160005-01	SEE PAGE 44
2	X	Deflection Heat Sink Assy	02-160006-01	SEE PAGE 47
3	SC	#10-3/8" HWH SC	31-601018-06	
4	SC	#8-3/8" TFB HWH	31-610818-06	
5	SC	#8-5/8" TFB HWH	31-610818-10	
6	RV	Rivet	32-000002-06	
7	RV	Plastic Grommet	32-000061-06	
8	W	Fibre Washer	33-000041-22	
9	RV	PCB Support	33-000626-01	
10	BR	PCB Support Bracket	35-003565-02	
11	BR	Side Panel LH	35-003668-01	
12	BR	Stand-Off Bracket	35-003680-01	

TITLE: EHT SUPPLY PANEL ASSEMBLY P/N: 02-160002-01

ITEM	SYMBOL	DESCRIPTION	ELECTROHOME P/N	COMMENT
1	X	EHT Supply PCB Assy	02-160008-01	SEE PAGE 48
2	X	EHT Supply Assy Kit	05-160002-01	SEE PAGE 49
3	SC	#8-3/8" TFB HWH	31-610818-06	
4	X	Cable Tie	33-000523-04	
5	BR	Side Panel RH	35-003667-01	
6	LA	Warning Label	54-008198-02	
7	WA	Lockwasher	33-000025-01	

TITLE: BOTTOM PANEL ASSEMBLY P/N: 02-160003-01

ITEM	SYMBOL	DESCRIPTION	ELECTROHOME P/N	COMMENT
1	BR	PCB Support Bracket	35-003565-02	
2	BR	Bottom Panel	35-003666-01	
3	SC	#8-3/8" TFB HWH	31-610818-06	
4	SC	#8-5/8" TFB HWH	31-610818-10	
5	RV	Plastic Grommet	32-000061-06	
6	X	Cable Tie	33-000523-04	
7	X	Regulator PCB Assy	02-160011-01	SEE PAGE 50
8	WA	Lockwasher	33-000025-01	
9	LA	Label	54-008546-01	

PARTS LIST

TITLE: DEFLECTION AMP. P.C.B. ASSY. **P/N:** 02-160005-01

ITEM	SYMBOL	DESCRIPTION		ELECTROHOME P/N	JEDEC P/N
1	C504	270pf 25P 10% 500V.	Capacitor	46-327113-51	
2	C506	45uf 125V. High Freq.		44-000205-01	
3	C507	10uf 100V.		46-510371-75	
4	C508	.47uf 50V. Cer.		49-000032-02	
5	C509	.47uf 50V. Cer.		49-000032-02	
6	C510	.47uf 50V. Cer.		49-000032-02	
7	C602	.22uf 50V. Cer.		49-000032-01	
8	C603	.22uf 50V. Cer.		49-000032-01	
9	C606	.1uf 50V. Cer.		46-310468-65	
10	C702	.22uf 50V. Cer.		49-000032-01	
11	C703	.22uf 50V. Cer.		49-000032-01	
12	C706	.1uf 50V. Cer.		46-310468-65	
13	C804	470uf 50V. Elect.		44-347106-10	
14	C805	.1uf 50V. Cer.		46-310468-65	
15	C806	470uf 50V. Elect.		44-347106-10	
16	C807	.1uf 50V. Cer.	Capacitor	46-310468-65	
17	R515	620K ½W. 5%	Resistor	40-126245-11	
18	R516	500K Trim Pot		41-000299-22	
19	R518	1K5 1W. 5%		40-421525-11	
20	R519	1K ½W. 5%		40-121025-11	
21	R520	470K ½W. 5%		40-224745-11	
22	R521	1K5 ½W. 5%		40-121525-11	
23	R522	1K5 ½W. 5%		40-121525-11	
24	R523	47K ½W. 5%		40-124735-11	
25	R524	750K ½W. 5%		40-127545-11	
26	R525	3K3 1W. 5%		40-423325-01	
27	R526	500R Trim Pot		41-000299-17	
28	R527	270R ½W. 5%		40-122715-11	
29	R528	4K7 ½W. 5%		40-124725-11	
30	R529	4K7 ½W. 5%		40-124725-11	
31	R530	220R ½W. 5%		40-122215-11	
32	R531	10K ½W. 5%		40-121035-11	
33	R603	4K7 ½W. 5%		40-224725-11	
34	R604	180R ½W. 5%		40-121815-11	
35	R605	1K ½W. 5%		40-121025-11	
36	R606	1K ½W. 5%		40-121025-11	
37	R607	820R 1W. 10%		40-428211-01	
38	R609	100R ½W. 5%		40-121015-11	
39	R610	150R ½W. 5%		40-121515-11	
40	R611	39R ½W. 5%		40-123905-11	
41	R612	470R ½W. 5%		40-124715-11	
42	R613	39R ½W. 5%		40-123905-11	
43	R614	4K7 ½W. 5%		40-224725-11	
44	R617	2K2 2W. 5%		40-622225-07	
45	R618	0.27 1W. 5% W.W.		42-000075-01	
46	R619	0.27 1W. 5% W.W.		42-000075-01	
47	R620	4.5R 10W. 5%		42-000076-03	
48	R621	6K8 ½W. 5%		40-226825-11	
49	R631	1K Control		41-000331-02	
50	R633	1K1 ½W. 5%		40-121125-11	
51	R634	6K8 ½W. 5%		40-126825-11	
52	R635	6K8 ½W. 5%		40-126825-11	
53	R636	2K Control	Resistor	41-000331-03	

TITLE: DEFLECTION AMP. P.C.B. ASSY. P/N: 02-160005-01

ITEM	SYMBOL	DESCRIPTION	ELECTROHOME P/N	JEDEC P/N
54	R640	3K6 ½W. 5% Resistor	40-223625-11	
55	R641	360R ½W. 5%	40-123615-11	
56	R703	4K7 ½W. 5%	40-224725-11	
57	R704	180R ½W. 5%	40-121815-11	
58	R705	1K ½W. 5%	40-121025-11	
59	R706	1K ½W. 5%	40-121025-11	
60	R707	820R 1W. 10%	40-428211-01	
61	R709	100R ½W. 5%	40-121015-11	
62	R710	150R ½W. 5%	40-121515-11	
63	R711	39R ½W. 5%	40-123905-11	
64	R712	470R ½W. 5%	40-124715-11	
65	R713	39R ½W. 5%	40-123905-11	
66	R714	4K7 ½W. 5%	40-224725-11	
67	R717	2K2 2W. 5%	40-622225-07	
68	R718	0.27 1W. 5% W.W.	42-000075-01	
69	R719	0.27 1W. 5% W.W.	42-000075-01	
70	R720	5.1R 10W. 5% Resistor	42-000076-04	
71	R721	6K8 ½W. 5%	40-226825-11	
72	R731	1K Control	41-000331-02	
73	R733	390R ½W. 5%	40-123915-11	
74	R734	6K8 ½W. 5%	40-126825-11	
75	R735	5K6 ½W. 5%	40-125625-11	
76	R736	1K Control	41-000331-02	
77	R740	3K6 ½W. 5%	40-223625-11	
78	R741	360R ½W. 5%	40-123615-11	
79	D504	Diode	14-000514-36	T1 1N914
80	D505	Diode	14-000514-36	T1 1N914
81	D506	Diode	14-000514-36	T1 1N914
82	D507	Light Emitting Diode	14-000521-03	
83	D509	Fast Recovery Diode	28-000044-01	
84	D601	Diode	14-000514-36	T1 1N914
85	D602	Diode	14-000514-36	T1 1N914
86	D603	Diode	14-000514-36	T1 1N914
87	D604	Diode	14-000514-36	T1 1N914
88	D607	Diode	14-000525-01	T1 1N4001
89	D608	Diode	14-000525-01	T1 1N4001
90	D630	Diode	14-000514-36	T1 1N914
91	D631	Diode	14-000514-36	T1 1N914
92	D632	Germanium Diode	14-000514-37	1N 100
93	D633	Diode	14-000514-36	T1 1N914
94	D634	Diode	14-000514-36	T1 1N914
95	D635	Germanium Diode	14-000514-37	1N 100
96	D701	Diode	14-000514-36	T1 1N914
97	D702	Diode	14-000514-36	T1 1N914
98	D703	Diode	14-000514-36	T1 1N914
99	D704	Diode	14-000514-36	T1 1N914
100	D707	Diode	14-000525-01	T1 1N4001
101	D708	Diode	14-000525-01	T1 1N4001
102	D730	Diode	14-000514-36	T1 1N914
103	D731	Diode	14-000514-36	T1 1N914
104	D732	Germanium Diode	14-000514-37	1N 100
105	D733	Diode	14-000514-36	T1 1N914
106	D734	Diode	14-000514-36	T1 1N914
107	D735	Germanium Diode	14-000514-37	1N 100

TITLE: DEFLECTION AMP. P.C.B. ASSY. **P/N:** 02-160005-01

ITEM	SYMBOL	DESCRIPTION	ELECTROHOME P/N	JEDEC P/N
108	ZD600	12V. 1W. Zener Diode.	14-000515-75	1N 4742A
109	ZD601	12V. 1W. Zener Diode	14-000515-75	1N 4742A
110	ZD700	12V. 1W. Zener Diode	14-000515-75	1N 4742A
111	ZD701	12V. 1W. Zener Diode	14-000515-75	1N 4742A
112	Q503	Transistor	14-000943-12	T1 S98
113	Q504	Transistor	14-000944-12	MPS U03
114	Q506	Transistor	14-000943-12	T1 S98
115	Q601	Transistor	14-000943-12	T1 S98
116	Q602	Transistor	14-000943-12	T1 S98
117	Q603	Transistor	14-000943-12	T1 S98
118	Q604	Transistor	14-000934-12	MPS U57
119	Q605	Transistor	14-000934-12	MPS U57
120	Q606	Transistor	14-000935-12	MPS U07
121	Q630	Transistor	14-000943-12	T1 S98
122	Q701	Transistor	14-000943-12	T1 S98
123	Q702	Transistor	14-000943-12	T1 S98
124	Q703	Transistor	14-000943-12	T1 S98
125	Q704	Transistor	14-000934-12	MPS U57
126	Q705	Transistor	14-000934-12	MPS U57
127	Q706	Transistor	14-000935-12	MPS U07
128	Q730	Transistor	14-000943-12	T1 S98
129	F600	2 Amp Pico Fuse	27-000034-01	
130	F700	2 Amp Pico Fuse	27-000034-01	
131	NE501A	Lamp (Neon)	27-000011-05	
132	NE501B	Lamp (Neon)	27-000011-05	
133	NE502	Lamp (Neon)	27-000011-10	
134	P501	Wafer Assy.	34-000621-03	
135	P601	Wafer Assy.	34-000621-07	
136	P700	Wafer Assy.	34-000621-07	
137	P701	Wafer Assy.	34-000621-07	
138	P702	Wafer Assy.	34-000621-05	
139	P703	Wafer Assy.	34-000621-07	
140		Eyelet	32-000007-15	
141	X	Radio Pin	34-000490-01	
142	X	Cement	99-000002-28	
143	X	Silicone Compound	99-000030-05	
144	W	Wire	33-000679-01	
145	BR	Heat Sink	35-003702-01	
146	SC	PCB Studs	33-000634-01	
147	NU	Pal Nut	33-000030-07	
148	PB	X-Y-Z Amp P.C.B.	50-001412-01	
149	W	Fibre Washer	33-000041-16	
150	RU	Eyelet	32-000007-12	

PARTS LIST

TITLE: DEFLECTION HEAT SINK P/N: 02-160006-01

ITEM	SYMBOL	DESCRIPTION	ELECTROHOME P/N	JEDEC P/N
1	Q607	Transistor	14-000940-01	TI 2N 3792
2	Q707	Transistor	14-000940-01	TI 2N 3792
3	Q608	Transistor	14-000941-01	TI 2N 3716
4	Q708	Transistor	14-000941-01	TI 2N 3716
5	W	Wire #20 TR-64 White	20-311999-12	
6	EX	Heat Sink Extrusion	30-100120-03	
7	SC	#6½" TFAB HWH	31-620618-08	
8	X	Cable Tie	33-000523-01	
9	QS	Transistor Socket	34-000515-04	
10	X	Crimp Type Terminal	34-000550-01	
11	J601	Nylon Connector	34-000655-07	
12	J701	Nylon Connector	34-000655-07	
13	X	Solder	36-000001-06	
14	SH	Insulator	39-000068-13	
15	X	Silicone Compound	99-000030-05	
16	X	Polarizing Key	34-000552-01	

PARTS LIST

TITLE: EHT SUPPLY PCB ASSY. P/N: 02-160008-01

ITEM	SYMBOL	DESCRIPTION		ELECTROHOME P/N	JEDEC P/N
1	C900	.1uF 50V Cer.	Capacitor	46-310468-65	
2	C901	47uF 50V Elect.		44-347006-05	
3	C902	100uF 10V Tantalum		44-210239-03	
4	C903	Metalized Film		49-000033-01	
5	C905	Ceramic		49-000032-02	
6	C906	.47uF 600V Mylar		48-174746-62	
7	C907	.47uF 600V Mylar		48-174746-62	
8	C908	10uF 1000V		46-510371-75	
9	C909	4u7 150V Elect.		44-347509-05	
10	C910	470 uFD 50V Elect.		44-347106-10	
11	C911	1500pF Cer.		46-315217-07	
12	C912	.1uF 50V Cer.	Capacitor	46-310468-65	
13	R900	100R ½W 5%	Resistor	40-221015-11	
14	R901	1K2 1W 5%		40-421225-01	
15	R902	6K8 ½W 5%		40-226825-11	
16	R903	27K ½W 5%		40-122735-11	
17	R905	3K3 ½W 5%		40-123325-11	
18	R906	1R ½W 5%		40-221095-01	
19	R907	3K6 ½W 5%		40-223625-11	
20	R908	430R ½W 5%		40-124315-11	
21	R909	4R7 ½W 5%		40-224795-11	
22	R910	3M3 ½W 5%		40-223355-11	
23	R911	Focus Control		41-000227-72	
24	R912	Trim Pot		41-000265-12	
25	R913	2K ½W 5%		40-122025-11	
26	R914	15R 2W 5%		40-621505-04	
27	R915	680R ½W 5%	Resistor	40-126815-11	
28	D900	Fast Recovery Diode		28-000044-01	BY208-1000
29	D901	Rectifier		28-000022-29	VG2X
30	D902	Rectifier		28-000022-29	VG2X
31	D093	Fast recovery Diode		28-000044-01	BY208-1000
32	ZD900	Zener Diode		14-000515-67	1N52398
33	ZD901	Zener Diode		14-000515-73	1N981B
34	ZD903	Zener Diode		14-000515-77	1N5272B
35	Q900	Transistor		14-000936-32	MPSA06
36	Q901	Transistor		14-000936-32	MPSA06
37	Q904	SCR Transistor		14-000516-04	MCR106-2
38	VD900	HV Doubler		28-000043-01	
39	T900	HV Transformer		24-180001-01	
40	F901	Fuse (Fast Blow)		27-000014-09	
41	P900	Wafer Assy.		34-000557-08	
42	P901	Wafer Assy.		34-000557-02	
43	S0900	Trans. Socket		34-000594-02	
44	S0901	Trans. Socket		34-000594-02	
45	CL	Fuse Mtg. Clip		33-000446-03	
46	RU	Eyelet		32-000007-15	
47	WA	Lockwasher		33-000024-05	
48	NU	Hex Nut		33-000009-01	
49	PB	EHT PCB		50-001410-01	
50	X	Silicon		99-000002-28	
51	W	Wire		33-000679-01	
52	X	Ring Terminal		34-000699-01	
53	X	Sleeving		20-300013-04	
54	W	Wire (Green)		20-311999-21	
55	L900	3.58 MHz Trap Coil		21-001126-01	

PARTS LIST

TITLE: EHT SUPPLY ASSEMBLY KIT P/N: 05-160002-01

ITEM	SYMBOL	DESCRIPTION	ELECTROHOME P/N	JEDEC P/N
1	Q902	Transistor	14-000942-23	MJE 51T
2	Q903	Transistor	14-000937-23	
3	SC	#4-3/8" TFB HWH	31-610418-06	
4	SC	#8-3/8" TFB HWH	31-610818-06	
5	RV	Rubber Grommet	32-000044-04	
6	RV	Nyliner	33-000429-01	
7	H	Heat Sink	35-003678-01	
8	BR	Cover	35-003679-01	
9	SH	Insulator	39-000068-15	
10	WA	Shoulder Washer	39-001189-01	
11	LA	Fuse Caution Label	54-008399-01	
12	LA	Focus Adjust Label	54-008490-01	
13	LA	EHT Adjust Label	54-008491-01	
14	X	Silicone Compound	99-000030-05	
15	J901	2-Pin Connector	34-000655-02	
16	X	Crimp Type Terminal	34-000550-01	
17	X	Ring Type Terminal	34-000699-01	
18	W	#18 Wire Black	20-311999-21	

TITLE: REGULATOR PCB ASSY. P/N: 02-160011-01

ITEM	SYMBOL	DESCRIPTION	ELECTROHOME P/N	JEDEC P/N
1	C100	Elect. Capacitor	44-000188-04	
2	C101	Elect.	44-000188-04	
3	C102	1uF 50V Elect.	44-110509-02	
4	C103	1uF 50V Elect. Capacitor	44-110509-02	
5	R100	10K ½W 5% Resistor	40-221035-11	
6	R101	10K ½W 5%	40-221035-11	
7	R102	Fire Retardent 1W	42-000078-01	
8	R103	Fire Retardent 1W	42-000078-01	
9	R104	1.5R 1W 5% Resistor	40-521595-04	
10	D100	3 Amp. Diode	14-000514-38	MR501
11	D101	3 Amp. Diode	14-000514-38	MR501
12	D8100	Bridge Rectifier	28-000046-02	
13	ZD100	Zener Diode	14-000515-74	1N5361B
14	ZD101	Zener Diode	14-000515-74	1N5361B
15	Q100	Regulator	14-002075-01	2N6057
16	Q101	Regulator	14-002076-01	2N6050
17	F100	Fuse	27-000005-07	
18	F101	Fuse	27-000005-07	
19	L100	Horiz. Delay Choke	21-001410-02	
20	P100	Wafer Housing	34-000711-01	
21	P101	Pin Terminal	34-000557-18	
22	EX	Heat Sink Extrusion	30-100120-04	
23	QS	Trans. Socket	34-000514-04	
24	SH	Insulator	39-000068-13	
25	X	Silicone Compound	99-000030-05	
26	SC	#6-½" TFAB HWH	31-620618-08	
27	SC	#8-3/8" TFB HWH	31-610818-06	
28	BR	Cap. Mtg. Clamp	33-000479-02	
29	SC	#6-5/8" HWH SC	31-600618-01	
30	NU	Nut and Starwasher	33-000440-01	
31	SC	PCB Studs	33-000634-09	
32	CL	Fuse Mtg. Clip	33-000446-03	
33	RV	Radio Pin	34-000490-01	
34	RV	Eyelet	32-000007-15	
35	PB	Regulator PCB	50-001420-01	
36	W	Wire	20-311999-12	
37	W	Wire	33-000679-01	
38	NU	Speed Nut	33-000465-22	
39	RV	Eyelet	32-000007-12	
40	X	Cement	99-000002-28	
41	SC	Hardware for 44-188-04	33-000539-01	
42	WA	Hardware for 44-188-04	33-000539-02	

TITLE: X-Y CHASSIS KIT P/N: 05-160001-01

ITEM	SYMBOL	DESCRIPTION	ELECTROHOME P/N	JEDEC P/N
1	L101	Deflection Yoke	21-000139-02	
2	SC	#8-3/8" TFB HWH	31-610818-06	
3	RV	Rivet	32-000002-05	
4	WA	Lock Washer	33-000255-01	
5	SC	Screw, Phillips SBH	33-000485-01	
6	W	Ground Strap Assy	34-000697-01	
7	SS	Ground Strap Spring	35-003560-01	
8	BR	Rear Brace	35-003681-01	
9	BR	Front Brace	35-003682-01	
10	X	Hook Ground Strap Assy	35-003690-01	
11	SH	Isolator, Ground Strap Assy	39-001190-01	
12	TA	Masking Tape	36-000008-02	
13	LA	Label	54-008557-01	
14	V100	20" Pix Tube	17-006202-01	19VARP4
15	LA	D.P. Card Pack	54-008363-14	
16	PK	X-Y Monitor Carton	59-000147-01	

TITLE: HARNESS ASSEMBLY P/N: 02-160004-01

ITEM	SYMBOL	DESCRIPTION	ELECTROHOME P/N	JEDEC P/N
1	W	Wire #18 TR64 White	20-311999-21	
2	W	Wire #20 TR64 White	20-311999-12	
3	X	Cable Tie	33-000523-01	
4	J800	Socket	34-000213-12	
5	X	Crimp Type Terminal	34-000550-01	
6	J501	Nylon Connector	34-000655-03	
7	J900	Nylon Connector	34-000655-08	
8	J101	Nylon Connector	34-000655-08	
9	J700	Nylon Connector	34-000655-07	
10	J100	Nylon Connector	34-000655-08	
11	X	Ring Terminal	34-000699-01	
12	X	Polarizing Key	34-000552-01	

WARRANTY

Seller warrants that its television monitors (in games supplied with monitors) are free from defects in material and workmanship under normal use and service for a period of thirty (30) days from date of shipment.

If the products described in this manual fail to conform to this warranty, Sellers' sole liability shall be, at its option, to repair, replace, or credit Buyer's account for such products which are returned to Seller during said warranty period, provided:

(a) Seller is promptly notified in writing upon discovery by Buyer that said products are defective;

(b) Such products are returned prepaid to Sellers' plant; and

(c) Seller's examination of said products discloses to Seller's satisfaction that such alleged defects existed and were not caused by accident, misuse, neglect, alteration, improper repair, installation or improper testing.

In no event shall Seller be liable for loss of profits, loss of use, incidental or consequential damages.

Except for any express warranty set forth in a written contract between Seller and Buyer which contract supersedes the terms of this order, this warranty is expressed in lieu of all other warranties expressed or implied, including the implied warranties of merchantability and fitness for a particular purpose, and of all other obligations or liabilities on the Seller's part, and it neither assumes nor authorizes any other person to assume for the Seller any other liabilities in connection with the sale of products under this order.

The use of any non-Atari parts may void your warranty, according to the terms of the warranty. The use of any non-Atari parts may also adversely affect the safety of your game and cause injury to yourself and others. Be very cautious in using non-Atari-supplied components with our games, in order to insure your safety.

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