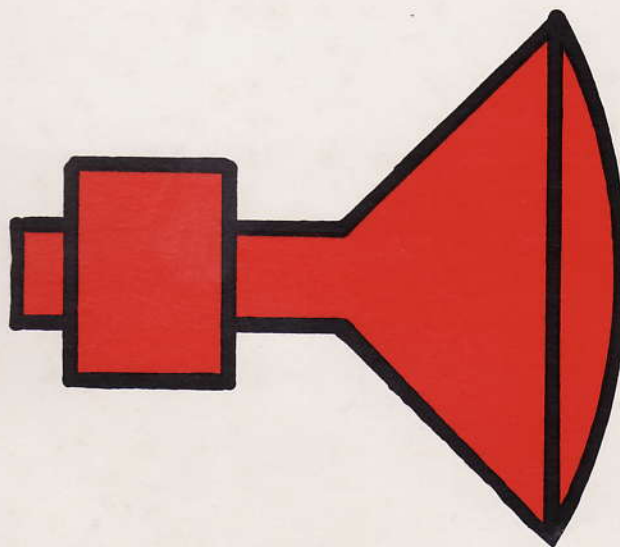


*Williams*<sup>®</sup>

16-3000-101  
November, 1982

# **RASTER MONITOR THEORY & TROUBLESHOOTING GUIDE**



Call TOLL-FREE with your  
monitor problems!  
800-621-1253  
In Illinois call 800-572-1324

*Williams*<sup>®</sup>   
**ELECTRONICS, INC.**  
3401 N. California Avenue  
Chicago, Illinois 60618



**THE RASTER MONITORS WILLIAMS ELECTRONICS USES** can be broken down into seven block-circuits or sections. These are shown in the diagram below. A more detailed breakdown of each circuit plus various symptoms that relate to problems in each section follows.

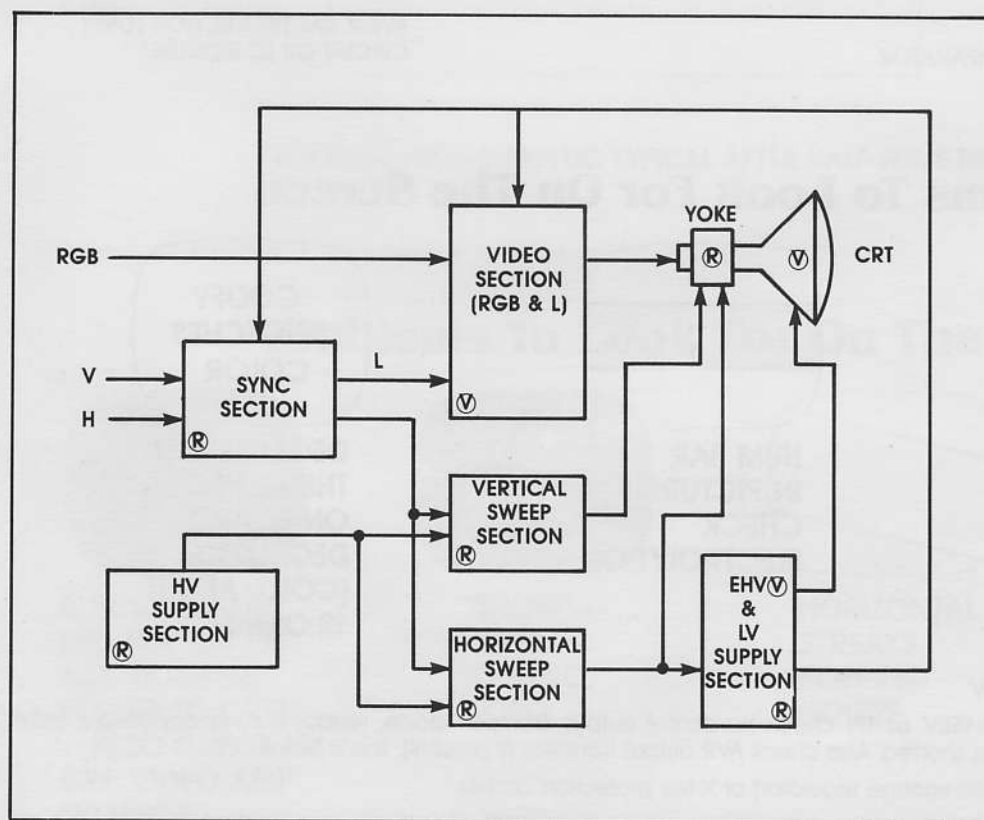
## General Hints

**FOR TROUBLESHOOTING PURPOSES** you should try to mentally localize a problem to one of these seven sections. This procedure will save you time and promote an effective step-by-step troubleshooting method.

**IF A PROBLEM DOESN'T SEEM TO SUGGEST A PARTICULAR SECTION**, try to decide what type of problem it is. The diagram below contains an R or a V in each section. These initials will help to lead you to a section or group of sections when you ask yourself a single question: *Does the problem involve picture information or video (V), or does it involve the illumination of the picture tube or raster (R)?*

**OF COURSE, A PROBLEM MAY AFFECT BOTH** the video and the raster sections of the monitor. Notice the arrows on the diagram. Only the EHV & LV Supply section\* affects both video and raster. But it in turn is driven by the Horizontal Sweep section. And the Horizontal Sweep section receives its power from the HV Supply section\*. If your monitor has a problem that affects both raster and video (a totally black screen, for example) you will have to perform voltage and continuity checks on all three sections.

**INCIDENTALLY THE MOST COMMON RASTER AND VIDEO PROBLEM** is a shorted horizontal output transistor or damper diode. The symptom is a black screen with no heater voltage on the CRT and an HV Supply voltage that's ten to twenty volts above normal (since the power supply's overcurrent protection circuit has shut off, isolating the supply from the rest of the monitor).



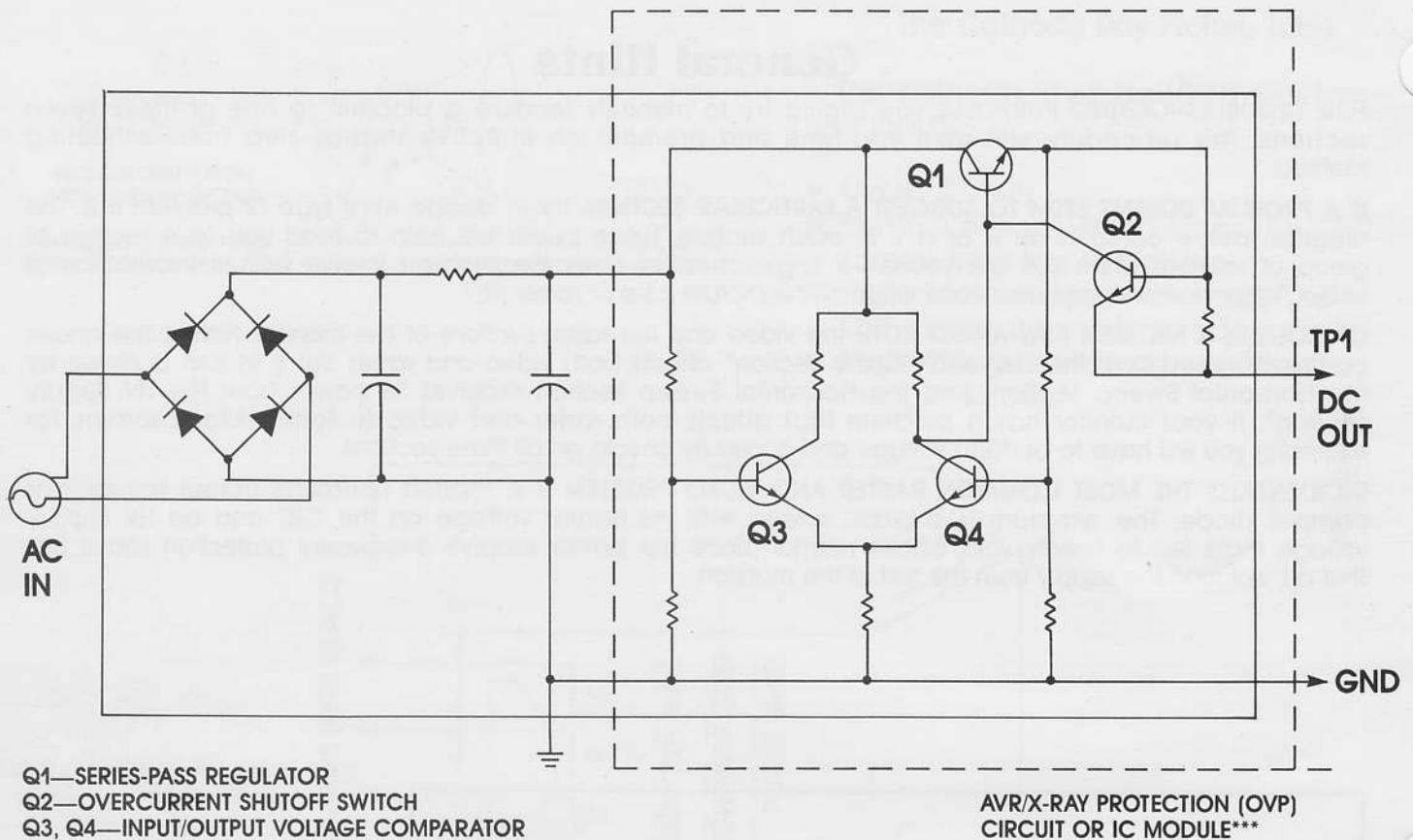
**CHECK HERE FOR:**

- Ⓡ = RASTER PROBLEMS
- Ⓥ = VIDEO PROBLEMS

HV	120-160 VDC	typical
EHV	12KV-25KVDC	typical
LV	12-30 VDC	typical

\*EHV = Extremely High Voltage; LV = Low Voltage; HV = High Voltage.

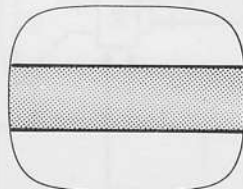
# THE HV SUPPLY SECTION\*



## Problems To Look For On The Screen

**DARK—NO  
RASTER\*\***

(ALSO CHECK  
FLYBACK,  
VIDEO AMP  
SETTINGS,  
HORIZONTAL  
OUTPUT)



**HUM BAR  
IN PICTURE—  
CHECK  
ELECTROLYTICS**

**GOOFY  
SPLOTCHES  
COLOR**

**DEGAUSS CRT!  
THEN CHECK  
ON-BOARD  
DEGAUSSER  
(COIL = ABOUT  
12 OHMS)**

\*See Flyback Transformer For LV & EHV

\*\*If HV supply voltage rises to 140-150V at TP1 check horizontal output, damper diode, retrace tuning capacitors, yoke, flyback primary. One or more may be shorted. Also check AVR output transistor (if present). This is usually OK.

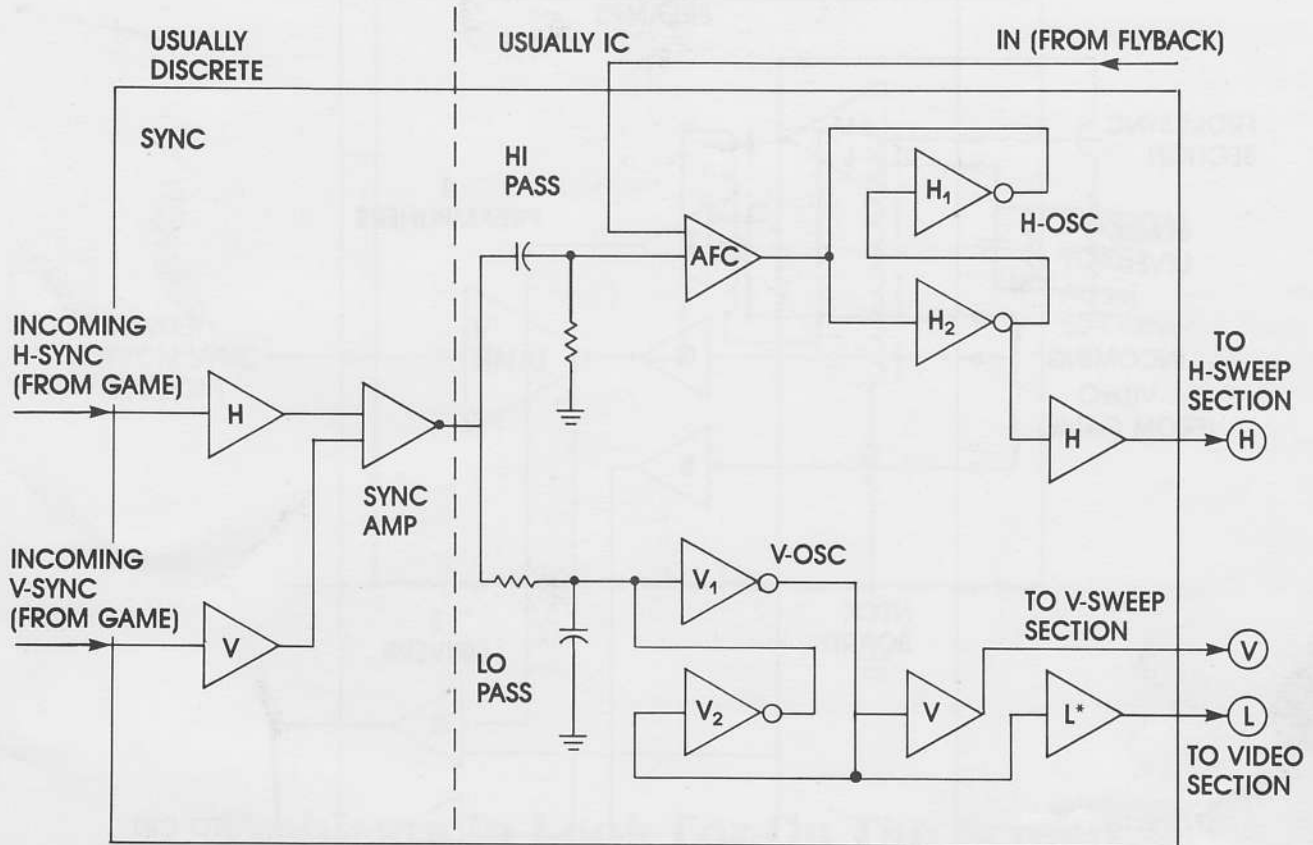
Warning: Never disable AVR (automatic voltage regulator) or X-ray protection circuits.

\*\*\*OVP = OVER-VOLTAGE PROTECTION. Some monitors have a separate OVP circuit using a single transistor and an additional fuse. At unsafe voltage levels (where the risk of X-ray emission exists) this transistor conducts and shunts the HV power supply voltage to ground through a current-limiting resistor. With the shunt in place, the AVR cuts off and a fuse in the collector circuit of series-pass regulator transistor Q1 blows.

SOMETIMES THIS FUSE may not blow soon enough to save the OVP transistor. If replacement fuses blow, test as you would for a black screen but also check the OVP or X-ray protection transistor and its circuit.

ALWAYS REPLACE DEFECTIVE X-RAY PROTECTION CIRCUITRY with exact equivalent parts as specified in the monitor manual. WARNING: Do NOT defeat X-ray protection circuitry.

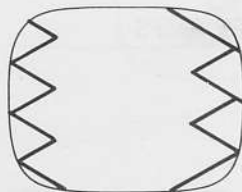
# THE SYNC SECTION



## Problems To Look For On The Screen

**FULL-WIDTH  
RASTER,  
NARROW  
VIDEO**

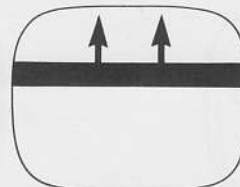
A BLANKING PROBLEM:  
CHECK SYNC  
CHIP. ALSO: BLANKING  
AMP (SEE VIDEO  
AMPLIFIER SECTION).  
CHECK CAPACITOR IN  
SERIES WITH WIDTH  
COIL (SEE HORIZONTAL  
SWEEP SECTION).



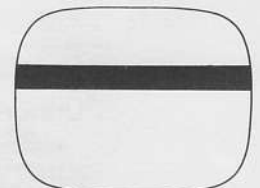
**ZIG-ZAG  
OR "PIECRUST"  
PICTURE:  
HORIZONTAL AFC!\*\***



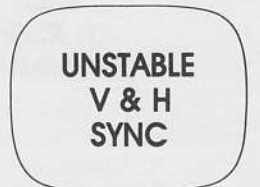
**H SYNC  
MISSING  
OR CRITICAL**



**NO V-SYNC**



**PICTURE  
LOCKS OUT  
OF PHASE  
(V OR H)**



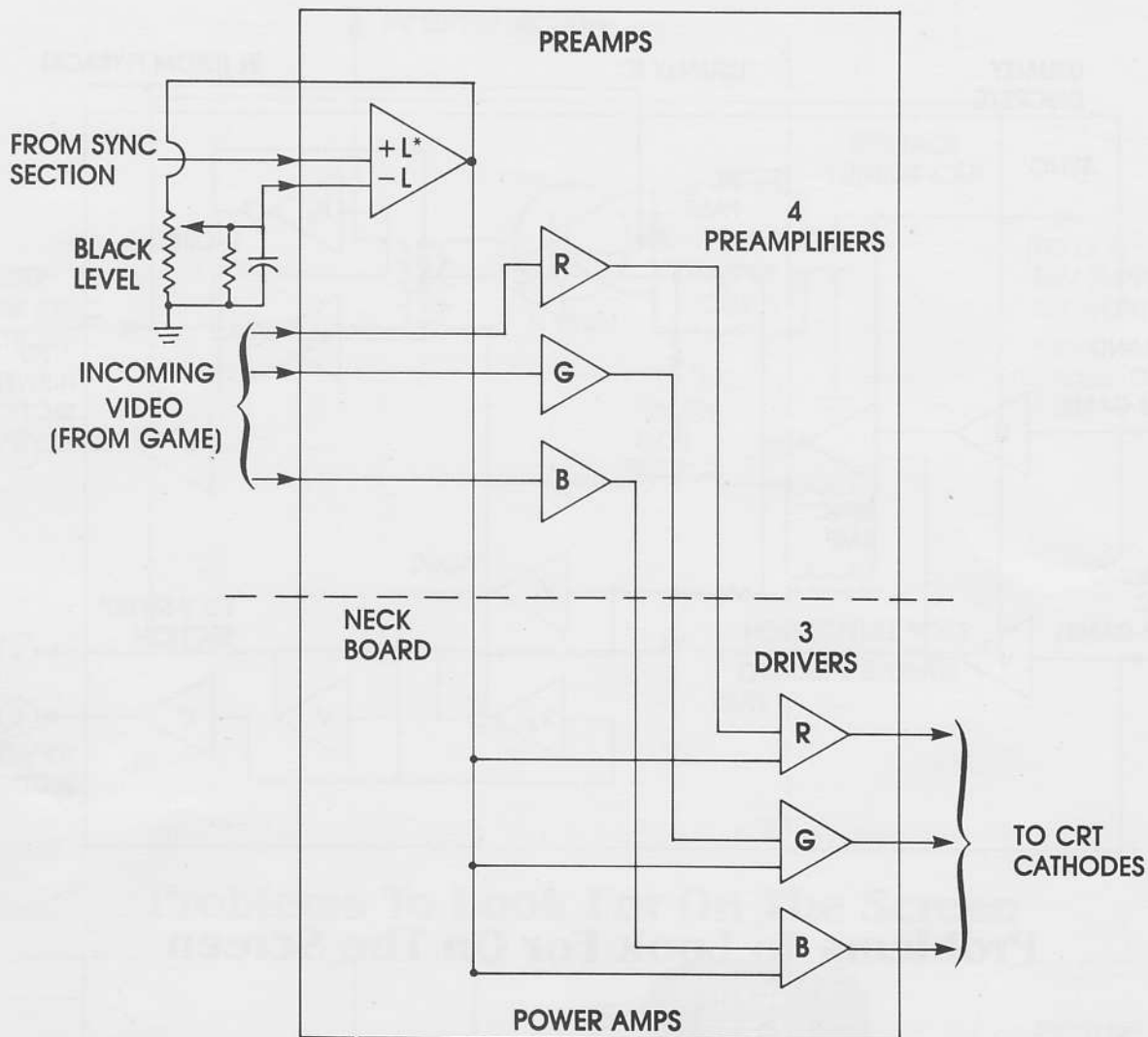
**TRY SYNC AMP!**

\*L = Blanking (luminance)

\*\*AFC = Automatic Frequency Control

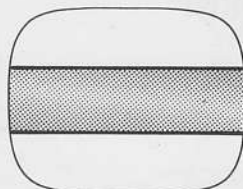


# THE VIDEO AMPLIFIER SECTION



## Problems To Look For On The Screen

LOW  
CONTRAST



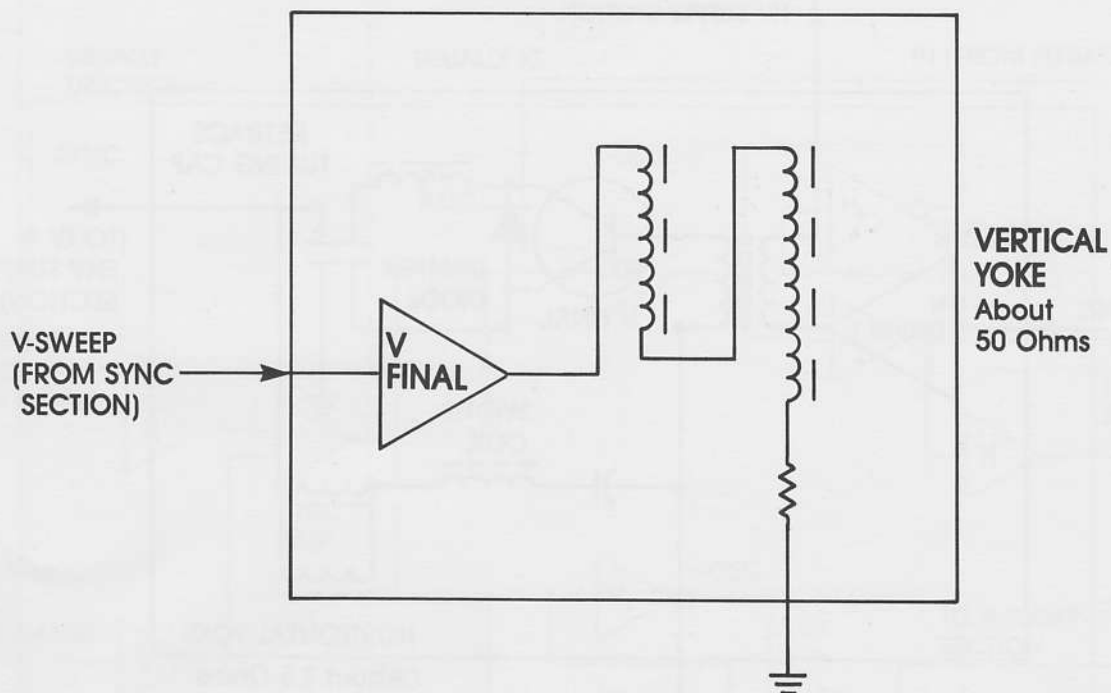
HUM BAR  
IN PICTURE:  
CHECK FILTER  
CAPS ALL  
THROUGH  
MONITOR.\*\*

RASTER  
ONLY

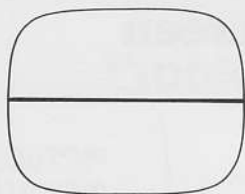
\*L = Blanking (luminance)

\*\*These will be electrolytics of 20 or more MF. Most likely the culprit is in the HV section. Could also be hiding out around the LV tap of the flyback (supplies power to video amps).

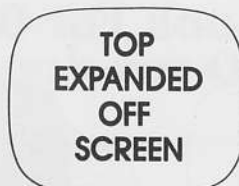
# THE VERTICAL SWEEP SECTION



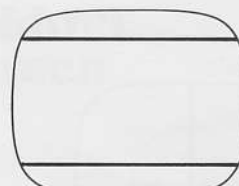
## Problems To Look For On The Screen



HORIZONTAL  
LINE ONLY



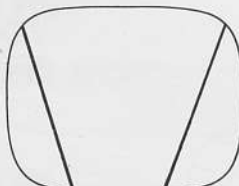
TOP  
EXPANDED  
OFF  
SCREEN



"SQUASHED"  
PICTURE—  
OR PICTURE  
COLLAPSES



RED, BLUE OR  
GREEN GHOST  
IMAGES—  
  
CONVERGE  
PICTURE

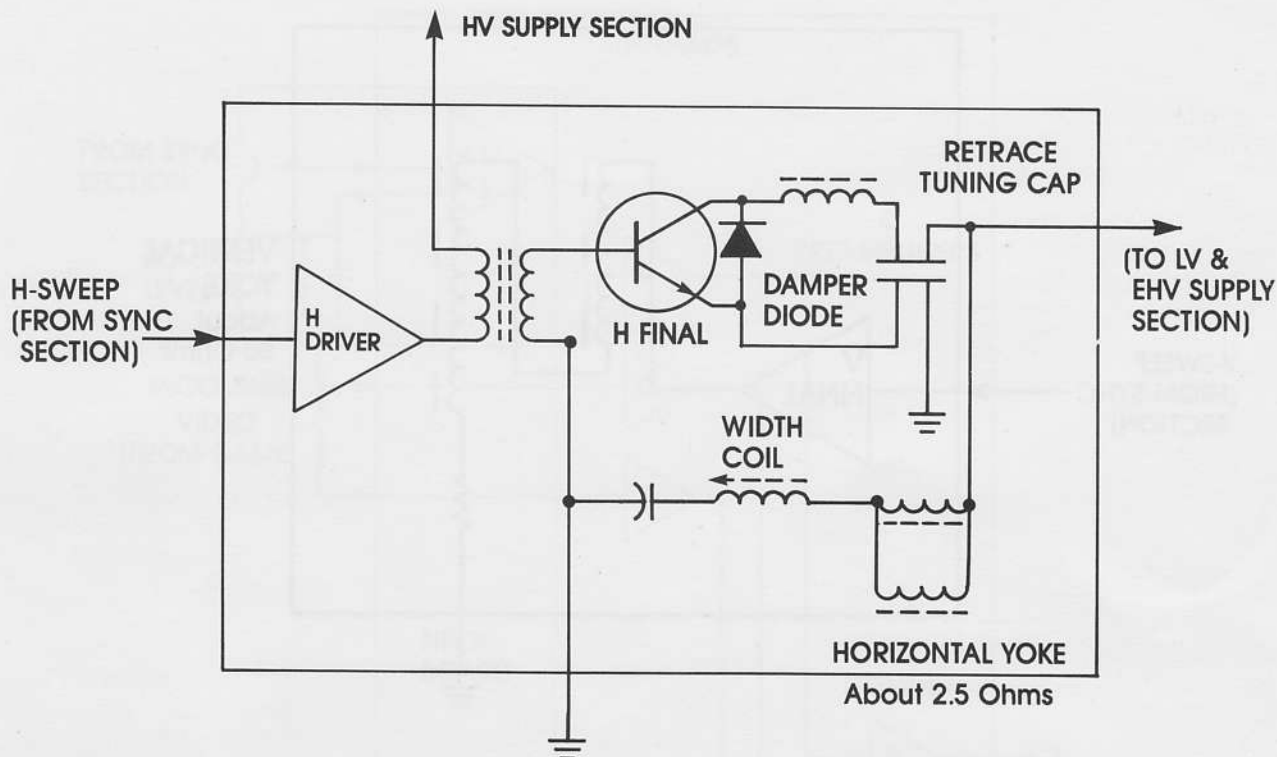


PICTURE IS  
KEYSTONE-  
SHAPED—  
CHECK  
VERTICAL  
YOKE COIL  
WITH OHMMETER.

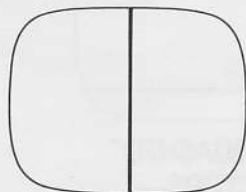


ODDLY-SHAPED  
RASTER—  
  
ADJUST YOKE  
AND CHECK IT  
WITH OHMMETER

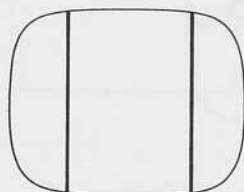
# THE HORIZONTAL SWEEP SECTION



## Problems To Look For On The Screen



VERTICAL  
LINE ONLY

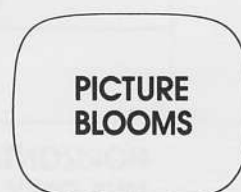


NARROW,  
NON-LINEAR



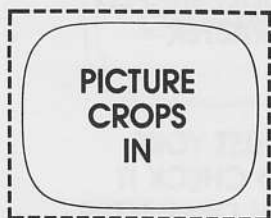
**DARK  
SCREEN—  
NO  
RASTER**

(ALSO CHECK  
FLYBACK,  
HV SUPPLY,  
VIDEO AMP  
SETTINGS)



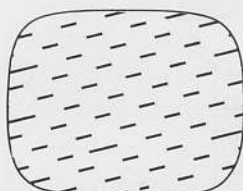
**PICTURE  
BLOOMS**

NO DETAIL  
IN WHITES,  
LIGHT COLORS



**PICTURE  
CROPS  
IN**

OCCASIONAL  
OVERSCANNING—  
MAY BE SEVERE



RETRACE  
LINES—  
CHECK  
H. OUTPUT  
TRANSISTOR,  
RETRACE  
TUNING CAPS.



**RED, BLUE OR  
GREEN GHOST  
IMAGES—**

CONVERGE  
PICTURE

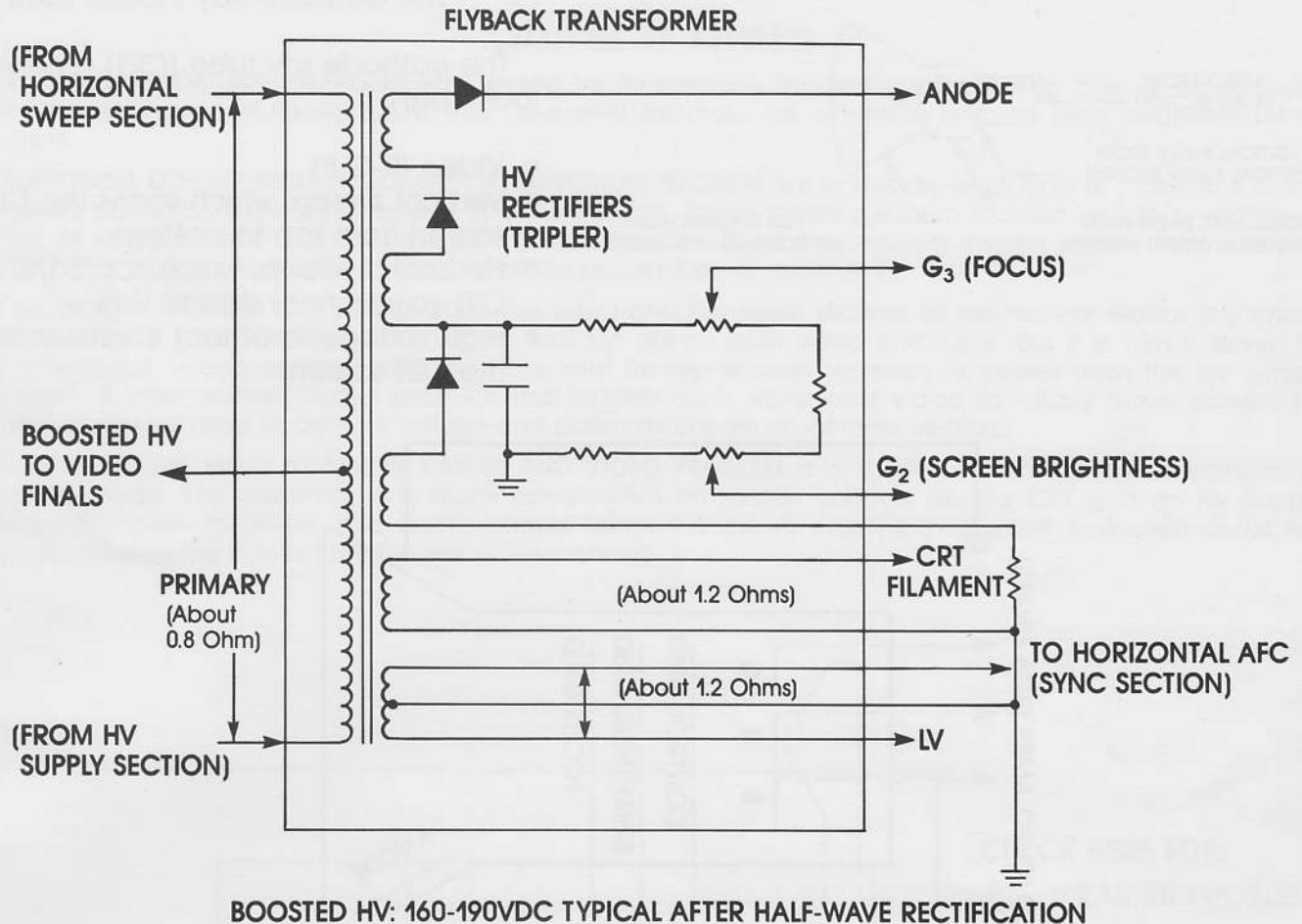


**ODDLY-SHAPED  
RASTER—**

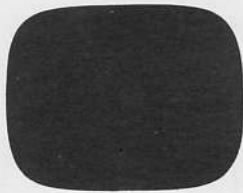
ADJUST YOKE  
AND CHECK IT  
WITH OHMMETER



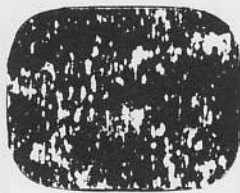
# LV & EHV POWER SECTION



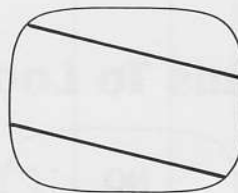
## Problems To Look For On The Screen



**BLACK SCREEN**  
(NO EHV OR NO 6.3V FILAMENT POWER TO CRT)\*  
—ALSO CHECK HV, CRT, VIDEO AMP SETTINGS, HORIZONTAL OUTPUT



**"SNOW"**—  
NO LV TO SYNC, VIDEO



**HORIZONTAL STREAKS, POPPING NOISES**

**BLOOMS WHEN BRIGHTNESS TURNED UP**

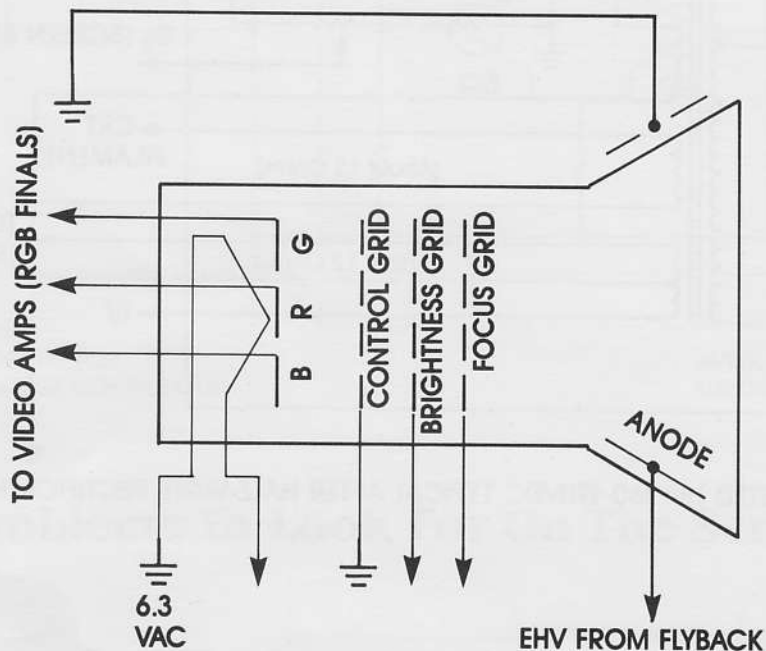
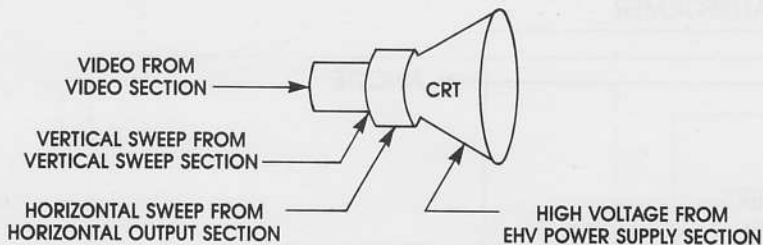
\*On some monitors an SCR circuit protects against excessive EHV and X-ray hazards. The SCR shuts down the horizontal oscillator when a hazard exists, producing a black screen. **WARNING: DO NOT** defeat X-ray protection circuitry.

# THE CATHODE RAY TUBE

## The Cathode Ray Picture Tube

The cathode ray tube (CRT) receives four inputs...

- **Video (R-G-B)**
- **Vertical sweep**, which scans the CRT screen from top to bottom
- **Horizontal sweep**, which scans the CRT screen from side to side
- **High voltage** to attract electrons to the CRT screen



## Problems To Look For On The Screen



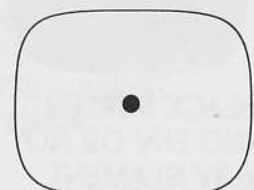
**DARK—**  
NO RASTER  
(ALSO CHECK  
HV, FLYBACK,  
FUSES, THERMISTORS  
AND VARISTORS,  
HORIZONTAL  
OUTPUT)

**NO  
CONTROL  
OF BRIGHTNESS**

**ALSO  
CHECK  
VIDEO  
SECTION,  
BLANKING**

**DIM**

**(MAY NEED TO  
BE REJUVENATED)  
CHECK  
VIDEO  
SECTION  
CONTROLS**



**ION BURNS**



