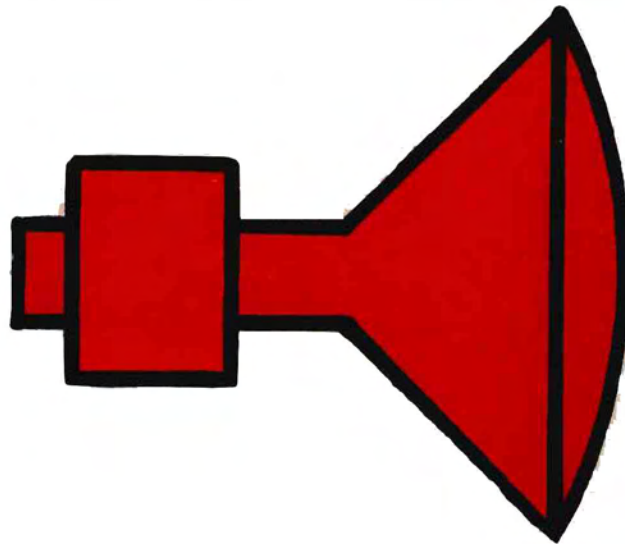


Williams[®]

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[®] 
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.

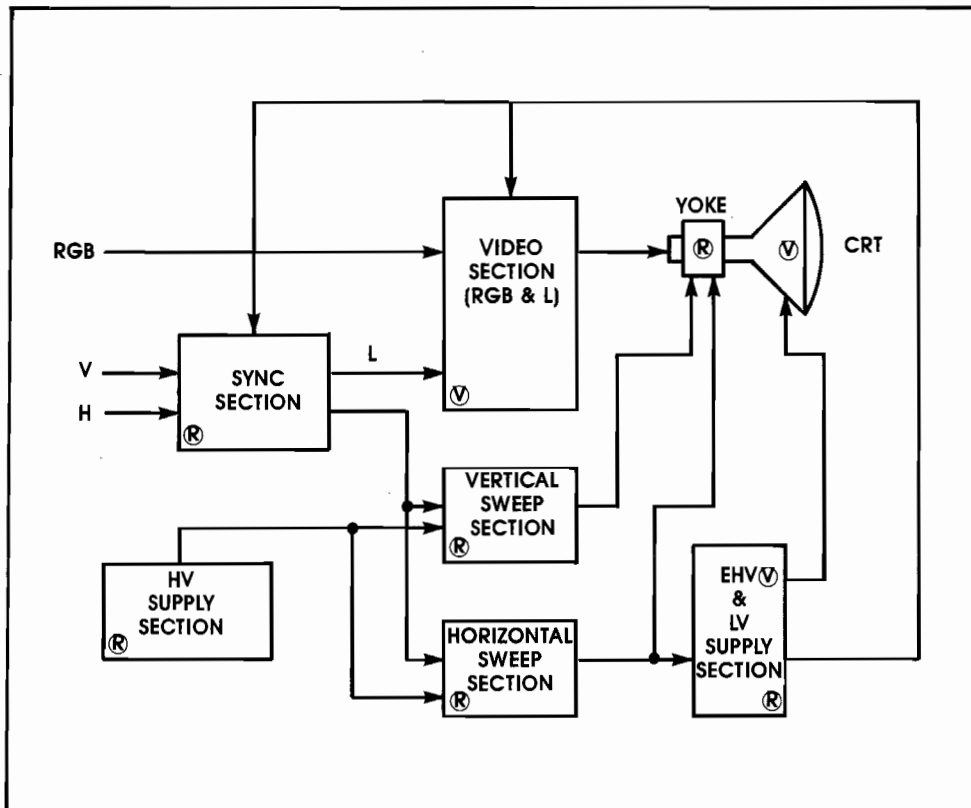
General Hints

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).



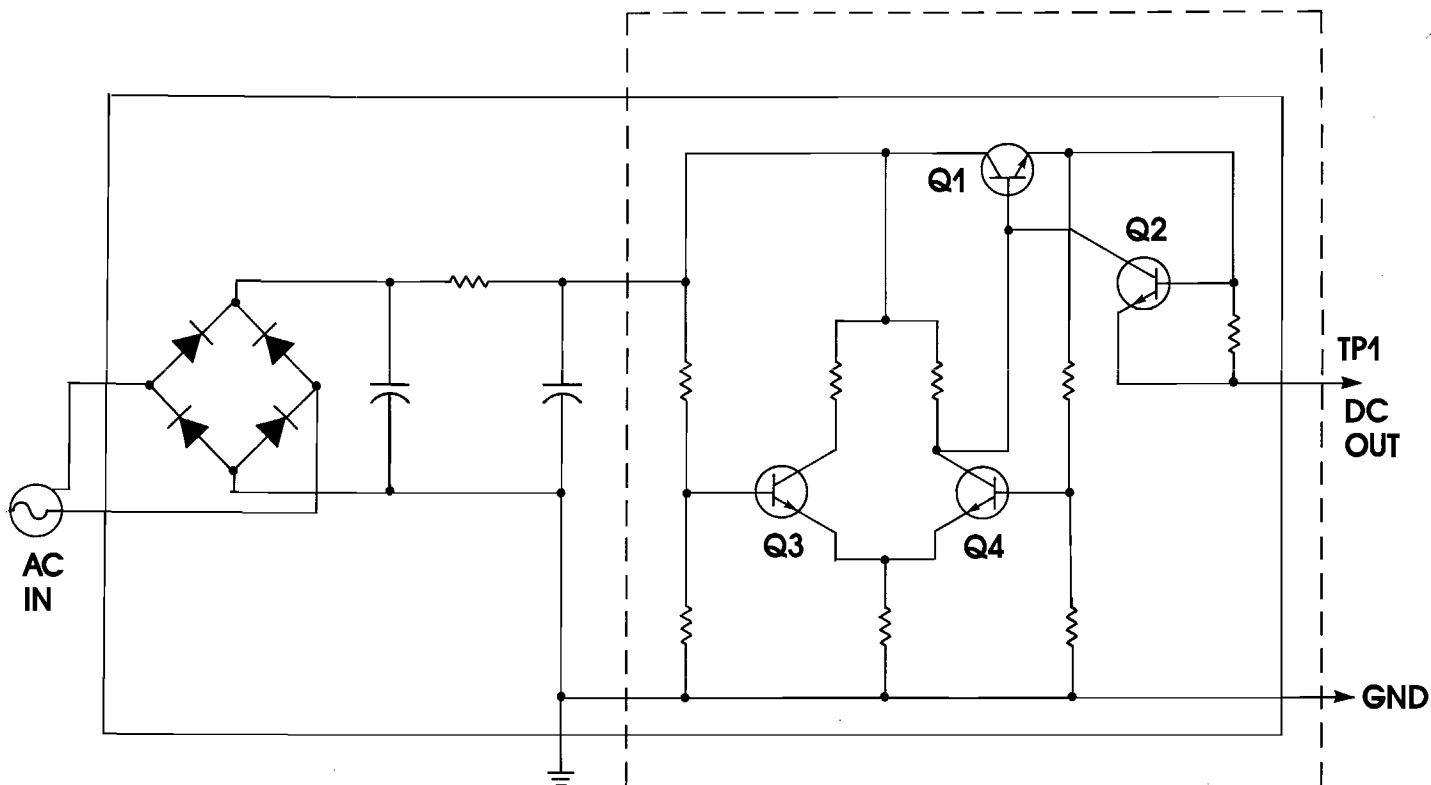
CHECK HERE FOR:

- Ⓡ = 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*



Q1—SERIES-PASS REGULATOR
 Q2—OVERCURRENT SHUTOFF SWITCH
 Q3, Q4—INPUT/OUTPUT VOLTAGE COMPARATOR

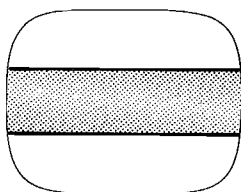
AVR/X-RAY PROTECTION (OVP)
 CIRCUIT OR IC MODULE***

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
 SPLITCHES
 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 TPI 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.

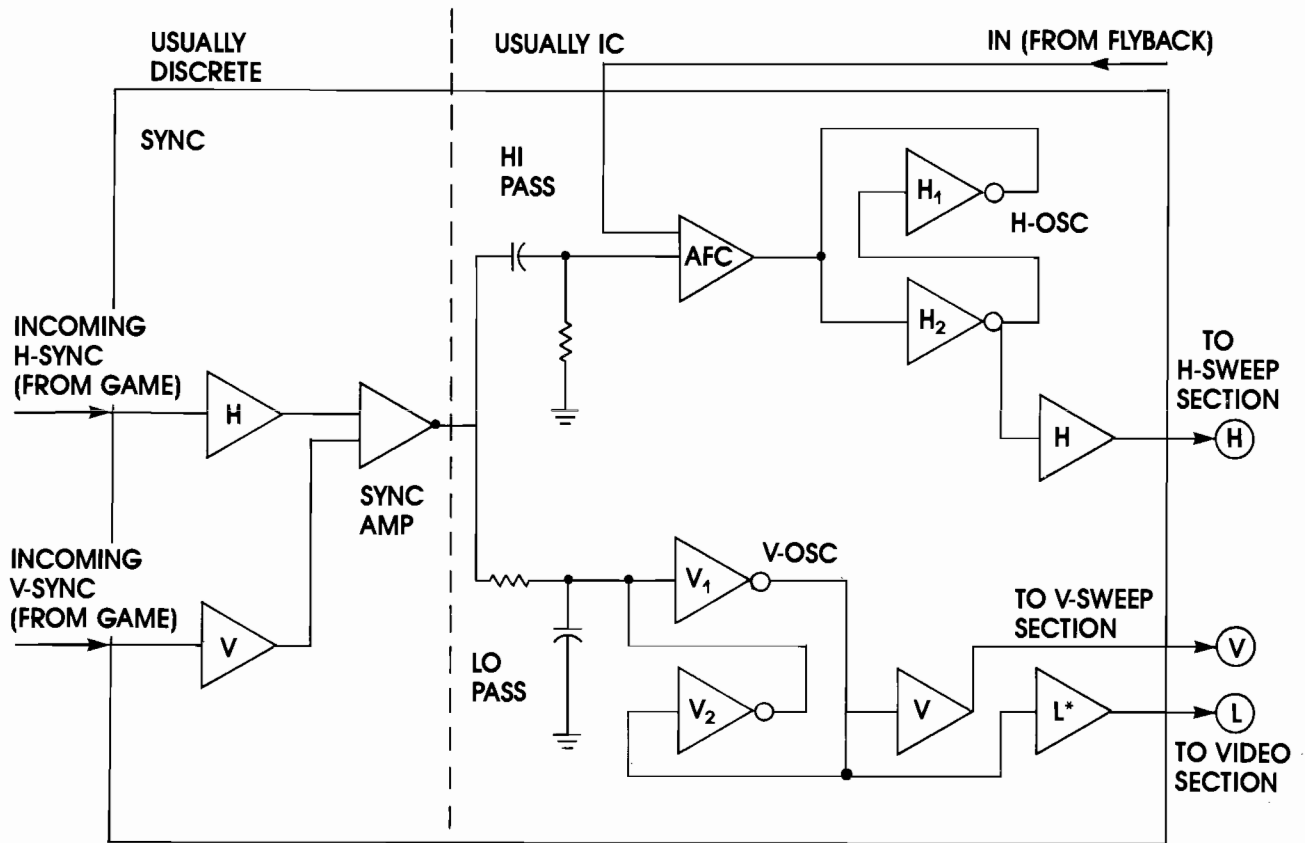
Warning: Never disable AVR (automatic voltage regulator) or X-ray protection circuits.

***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.

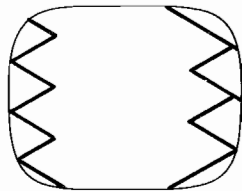
THE SYNC SECTION



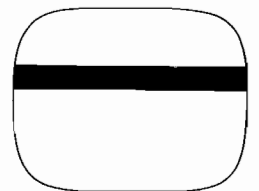
Problems To Look For On The Screen

**FULL-WIDTH
RASTER,
NARROW
VIDEO**

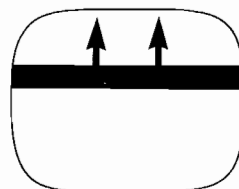
A BLANKING PROBLEM:
CHECK SYNC
CHIP. ALSO: BLANKING
AMP (SEE VIDEO
AMPLIFIER SECTION).
CHECK CAPACITOR IN
SERIES WITH WIDTH
COIL (SEE HORIZONTAL
SWEEP SECTION).



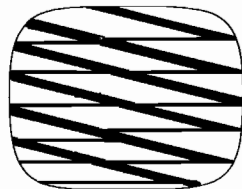
**ZIG-ZAG
OR "PIECRUST"
PICTURE:
HORIZONTAL AFC!***



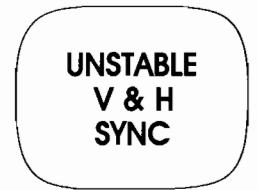
**PICTURE
LOCKS OUT
OF PHASE
(V OR H)**



NO V-SYNC



**H SYNC
MISSING
OR CRITICAL**

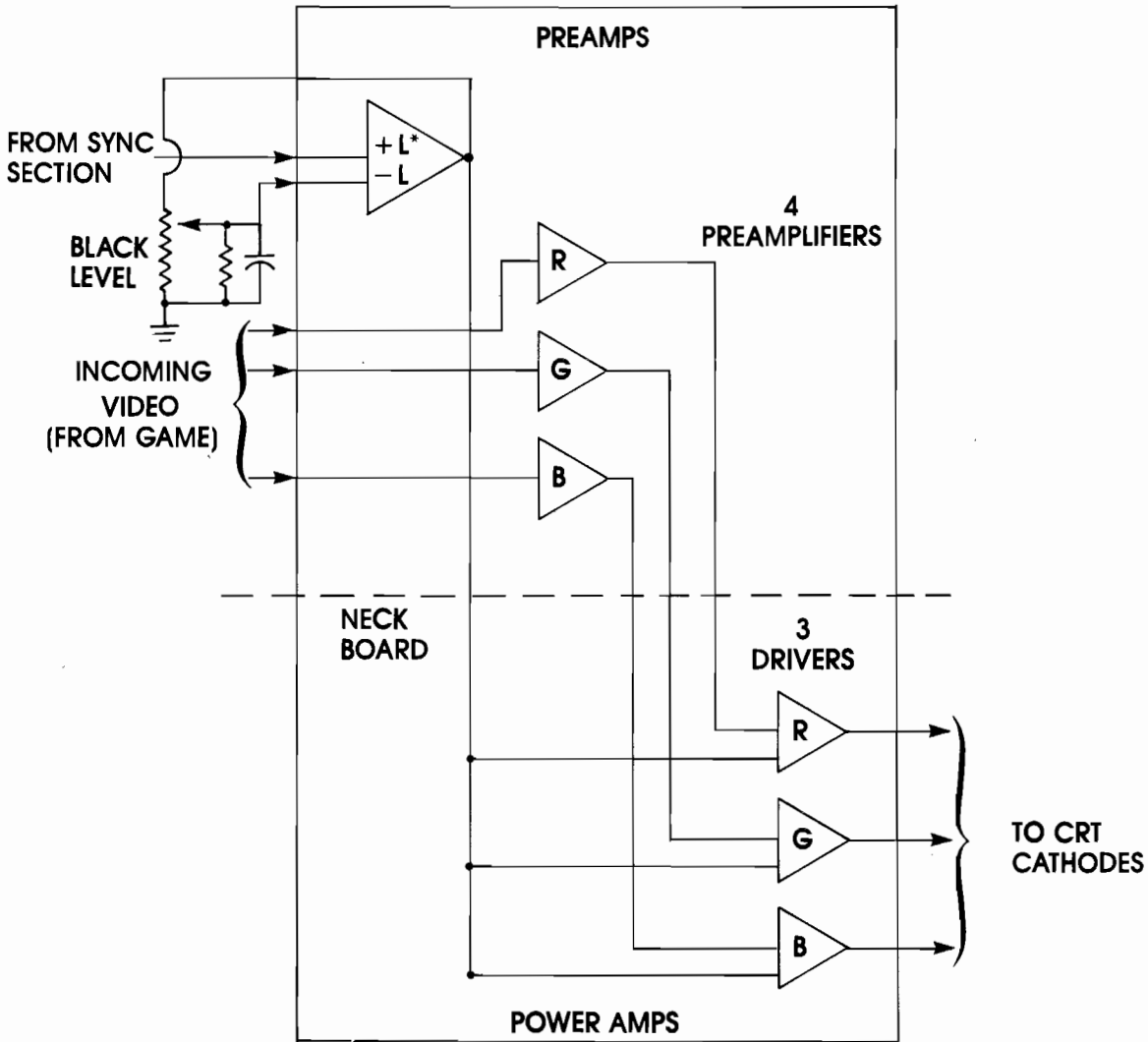


**UNSTABLE
V & H
SYNC
TRY SYNC AMP!**

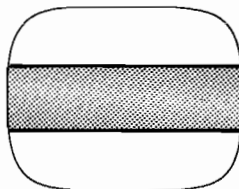
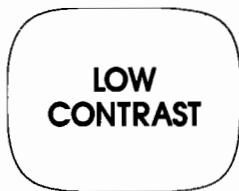
*L=Blanking (luminance)

**AFC=Automatic Frequency Control

THE VIDEO AMPLIFIER SECTION



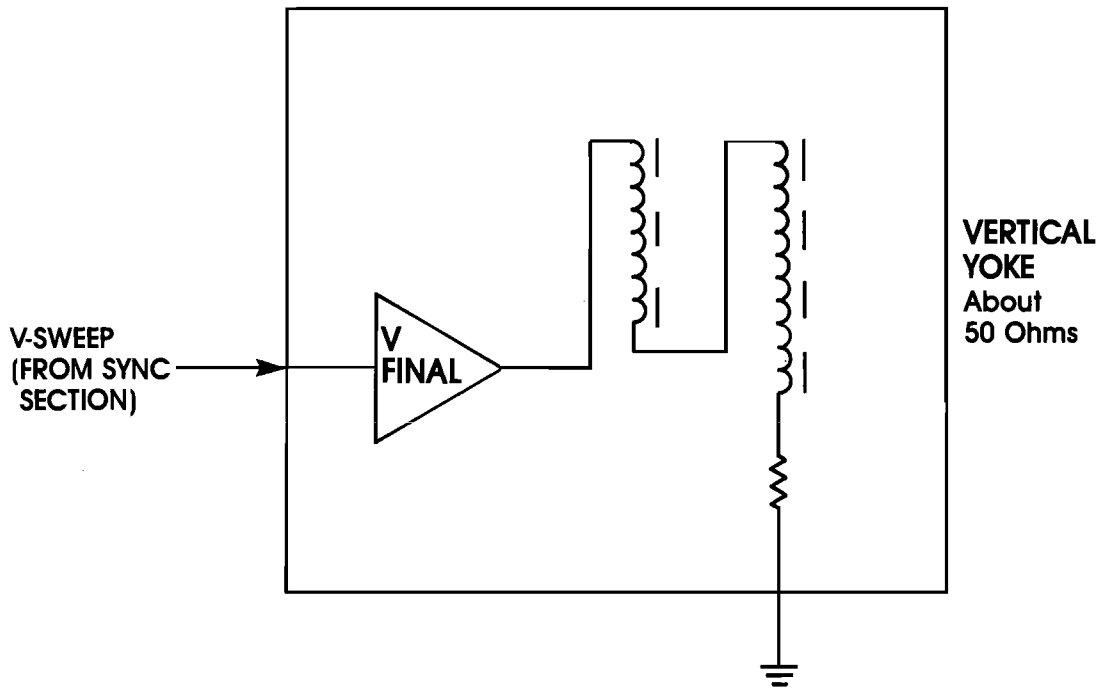
Problems To Look For On The Screen



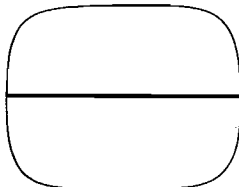
*L = Blanking (luminance)

**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).

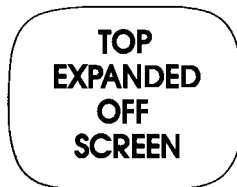
THE VERTICAL SWEEP SECTION



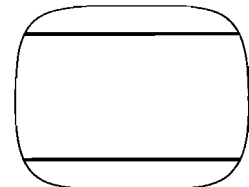
Problems To Look For On The Screen



HORIZONTAL
LINE ONLY



TOP
EXPANDED
OFF
SCREEN

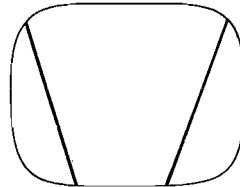


"SQUASHED"
PICTURE—
OR PICTURE
COLLAPSES

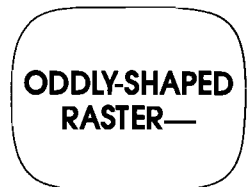


RED, BLUE OR
GREEN GHOST
IMAGES—

CONVERGE
PICTURE



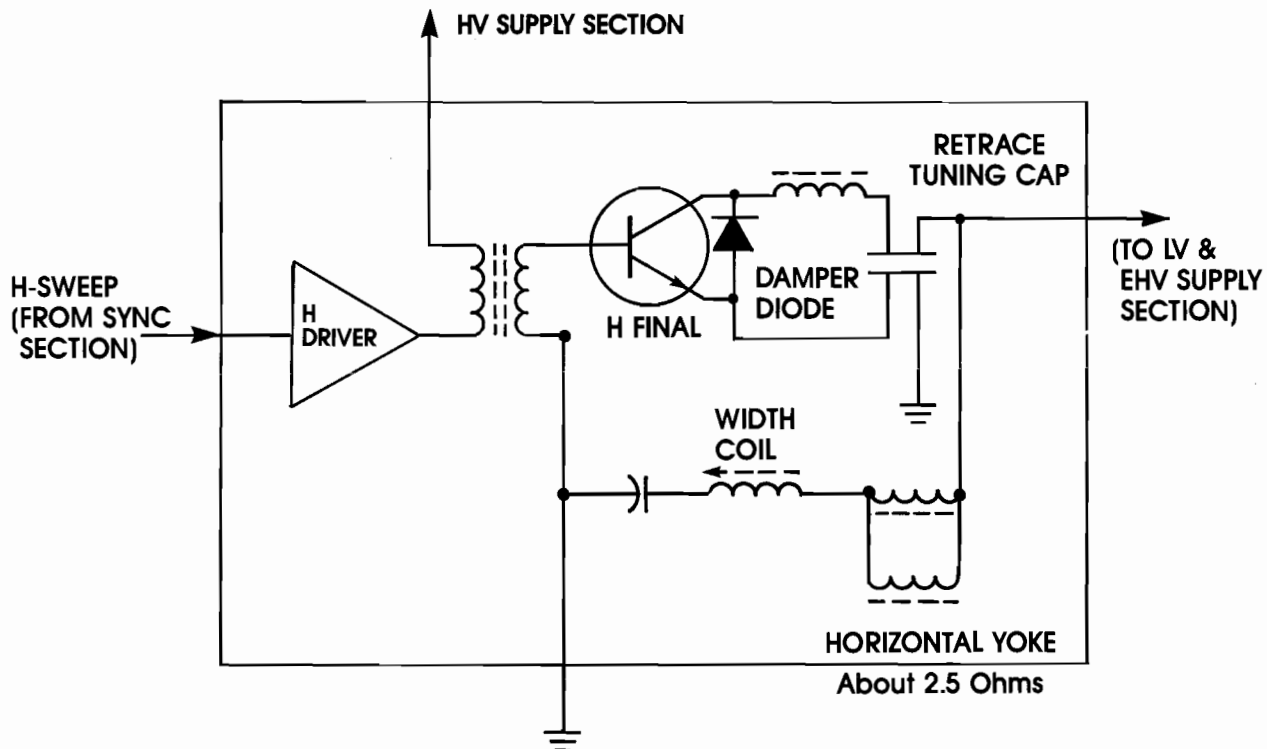
PICTURE IS
KEYSTONE-
SHAPED—
CHECK
VERTICAL
YOKE COIL
WITH OHMMETER.



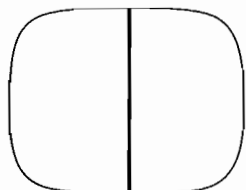
ODDLY-SHAPED
RASTER—

ADJUST YOKE
AND CHECK IT
WITH OHMMETER

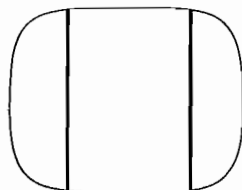
THE HORIZONTAL SWEEP SECTION



Problems To Look For On The Screen



VERTICAL
LINE ONLY

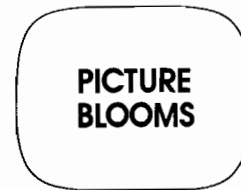


NARROW,
NON-LINEAR



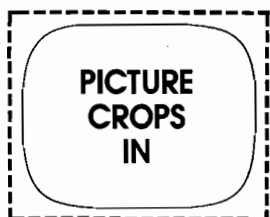
**DARK
SCREEN—
NO
RASTER**

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



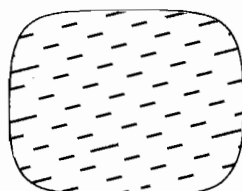
**PICTURE
BLOOMS**

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—**

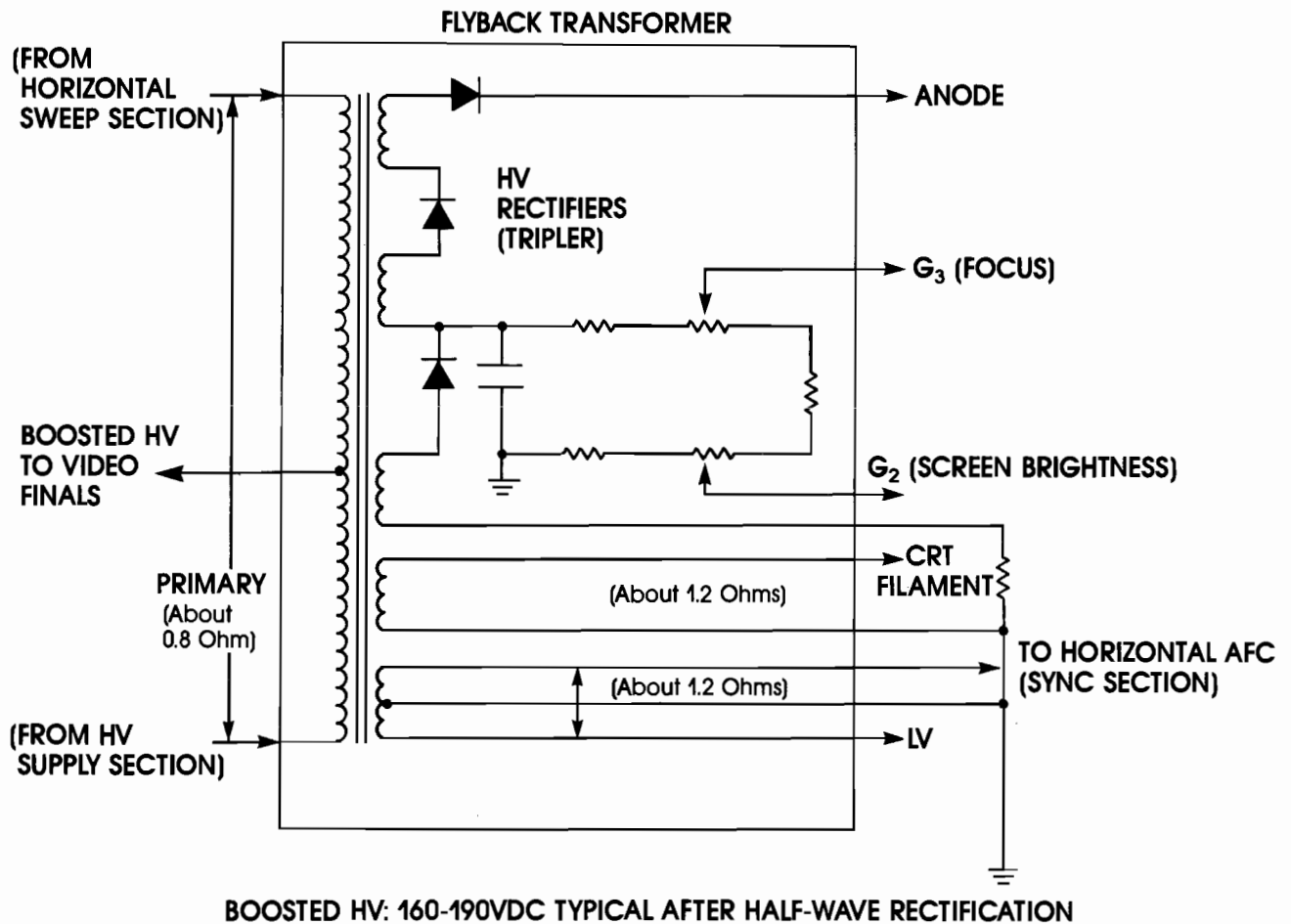
CONVERGE
PICTURE



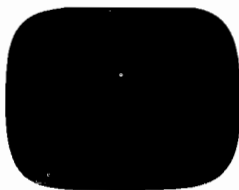
**ODDLY-SHAPED
RASTER—**

ADJUST YOKE
AND CHECK IT
WITH OHMMETER

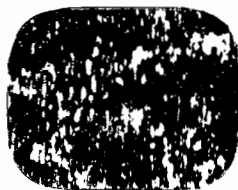
LV & EHV POWER SECTION



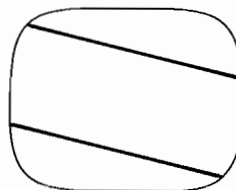
Problems To Look For On The Screen



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

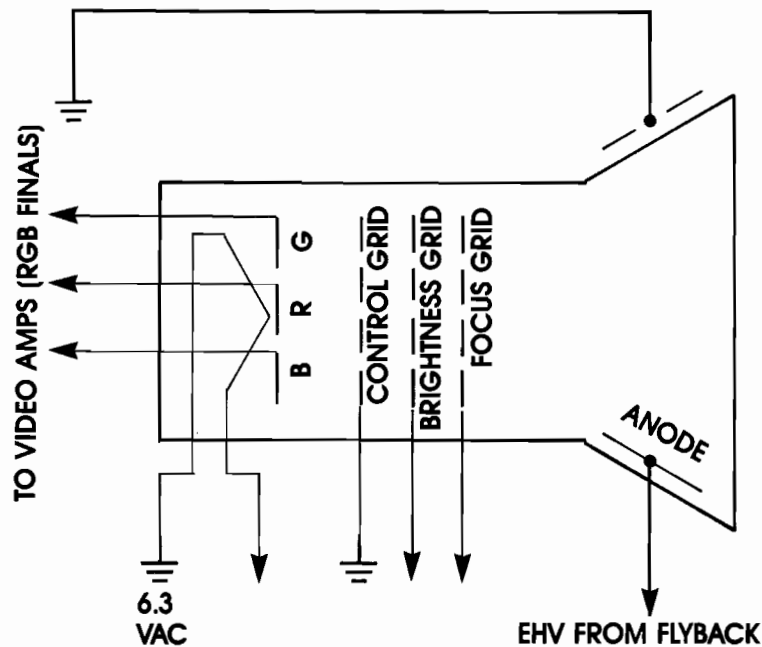
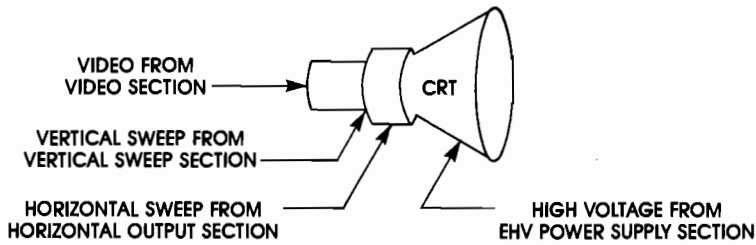
*On some monitors an SCR circuit protects against excessive EHV and X-ray hazards. The SCR shuts down the horizontal oscillator when a hazard exists, producing a black screen. **WARNING: DO NOT** defeat X-ray protection circuitry.

THE CATHODE RAY TUBE

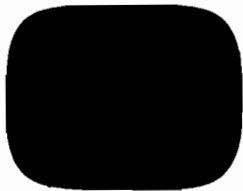
The Cathode Ray Picture Tube

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



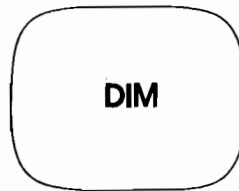
Problems To Look For On The Screen



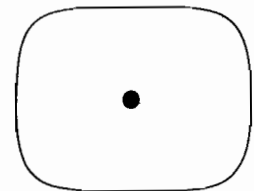
**DARK—
NO RASTER
(ALSO CHECK
HV, FLYBACK,
FUSES, THERMISTORS
AND VARISTORS,
HORIZONTAL
OUTPUT)**



**ALSO
CHECK
VIDEO
SECTION,
BLANKING**



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



ION BURNS