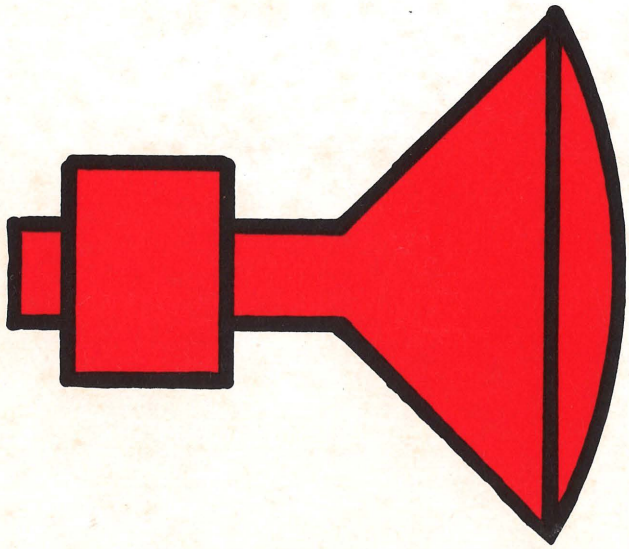
Williams®

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.

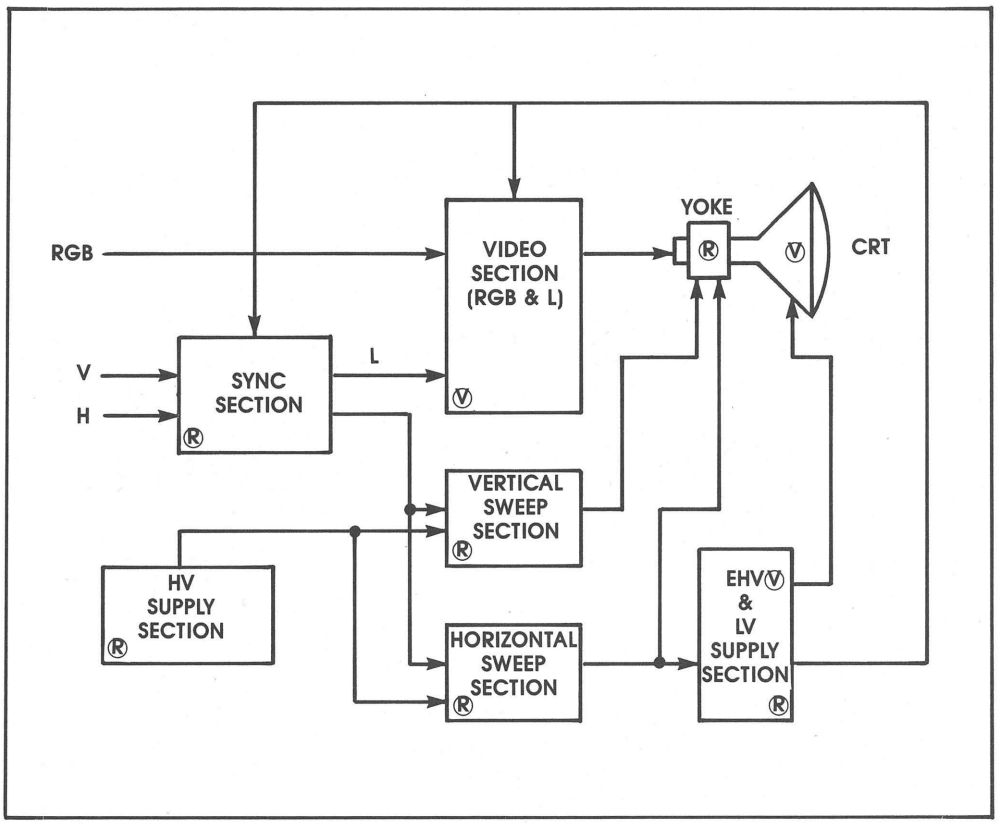
General Hints

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:

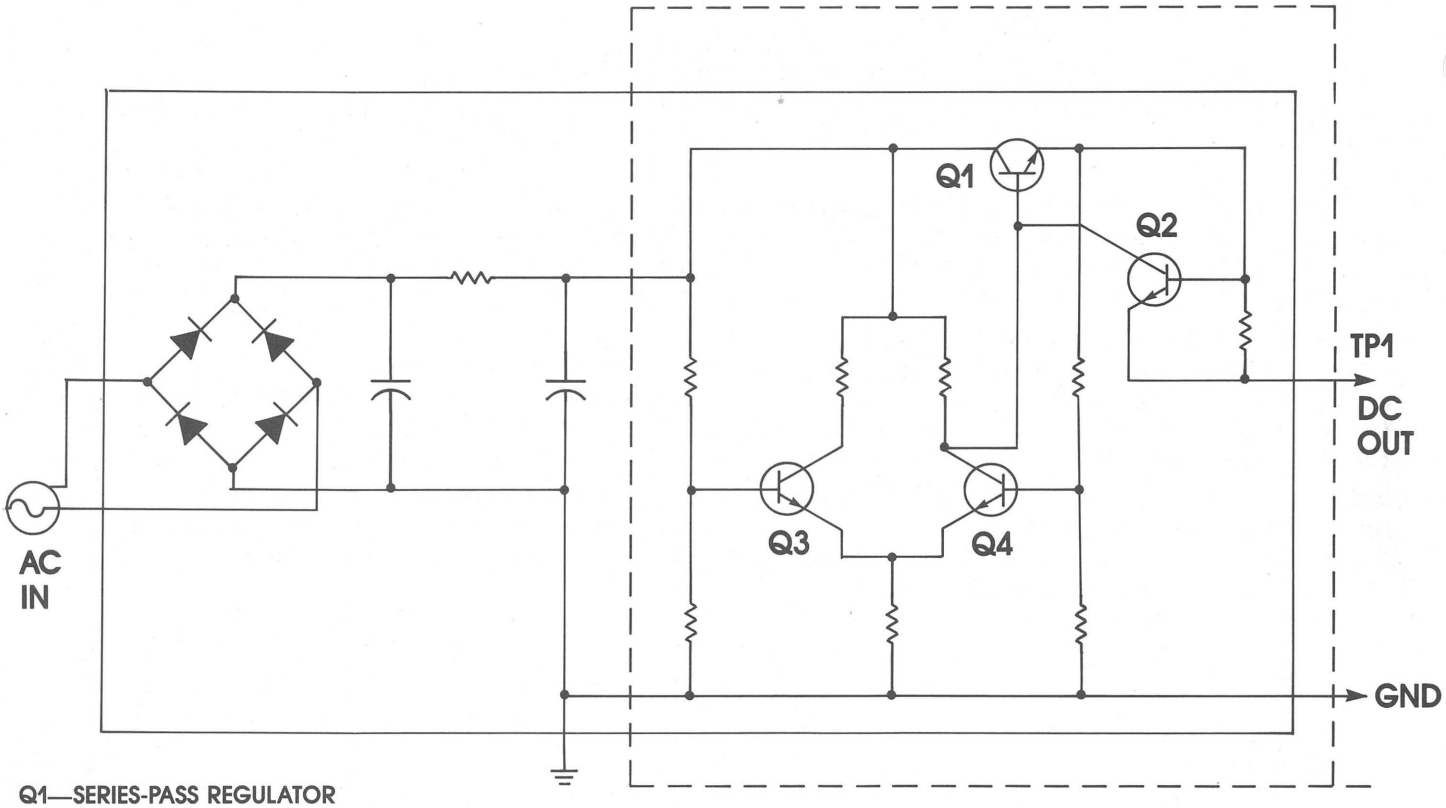
Ⓡ = **RASTER PROBLEMS**

Ⓥ = **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*



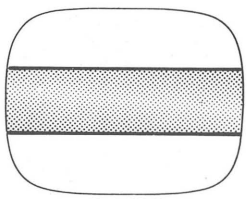
Q1—SERIES-PASS REGULATOR
Q2—OVERCURRENT SHUTOFF SWITCH
Q3, Q4—INPUT/OUTPUT VOLTAGE COMPARATOR

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

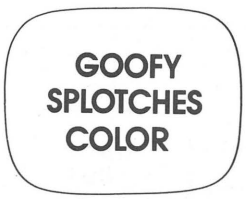
Problems To Look For On The Screen



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



HUM BAR IN PICTURE— CHECK ELECTROLYTICS



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.

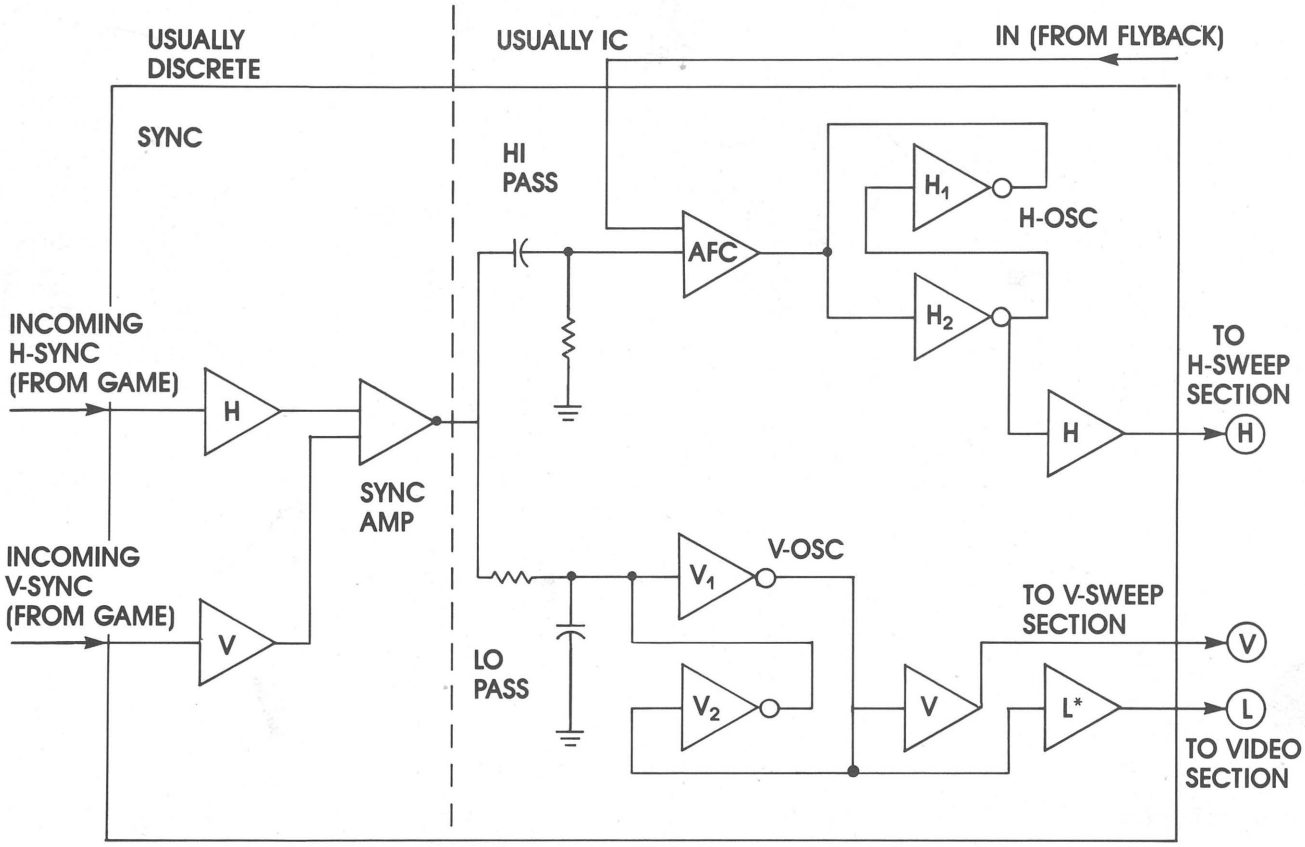
Warning: Never disable AVR (automatic voltage regulator) or X-ray protection circuits.

***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

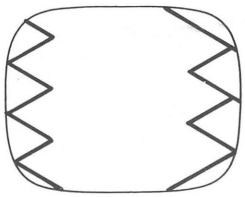


Problems To Look For On The Screen

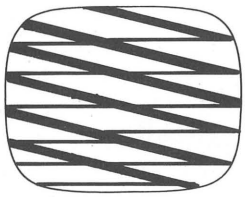


FULL-WIDTH RASTER, NARROW VIDEO

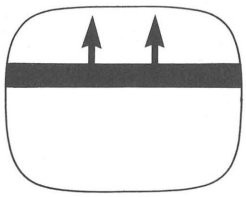
A BLANKING PROBLEM: CHECK SYNC CHIP. ALSO: BLANKING AMP (SEE VIDEO AMPLIFIER SECTION). CHECK CAPACITOR IN SERIES WITH WIDTH COIL (SEE HORIZONTAL SWEEP SECTION).



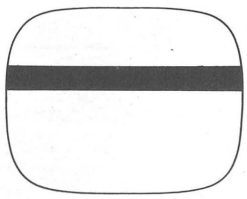
ZIG-ZAG OR "PIECRUST" PICTURE: HORIZONTAL AFC!**



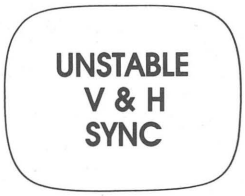
H SYNC MISSING OR CRITICAL



NO V-SYNC



PICTURE LOCKS OUT OF PHASE (V OR H)



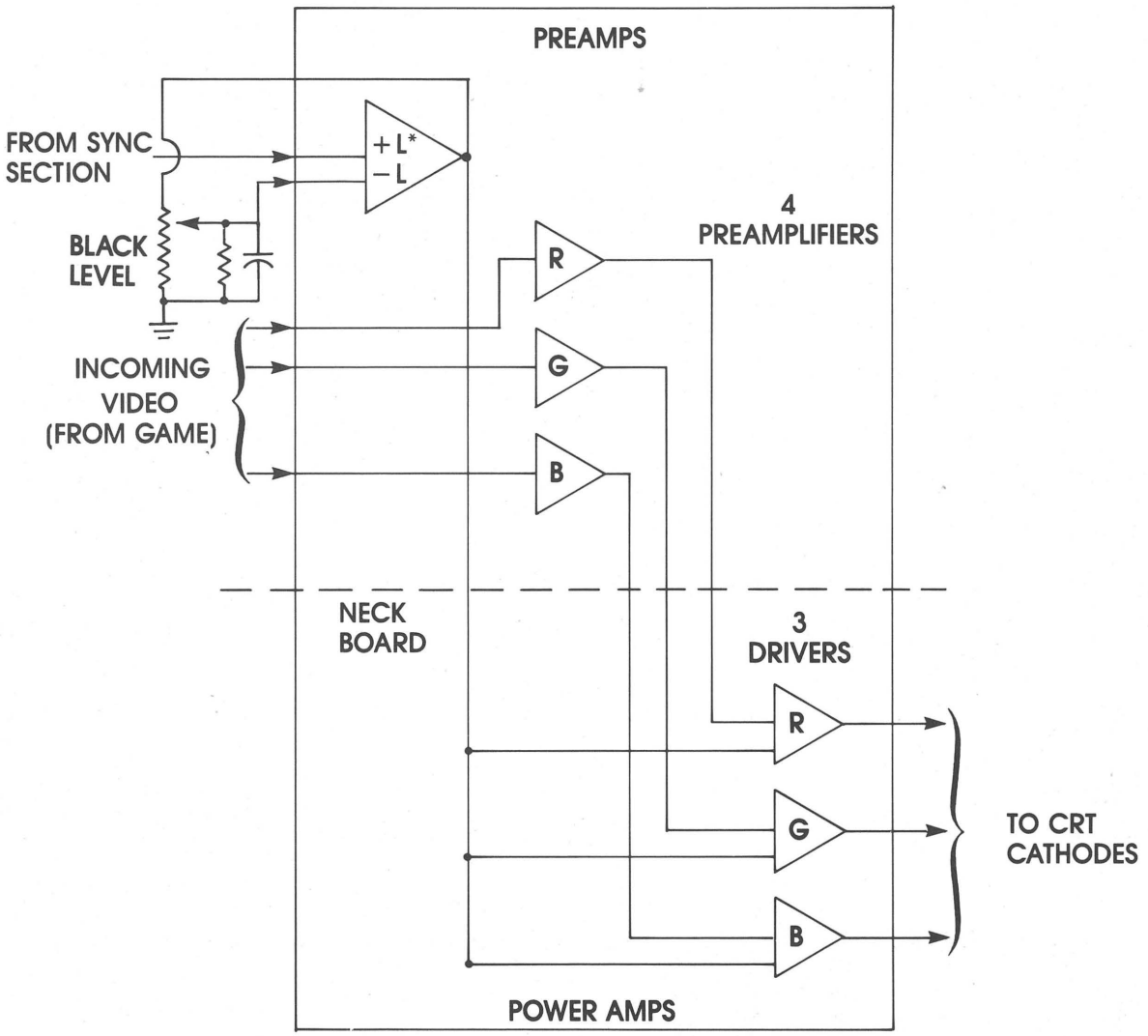
UNSTABLE V & H SYNC

TRY SYNC AMP!

*L = Blanking (luminance)

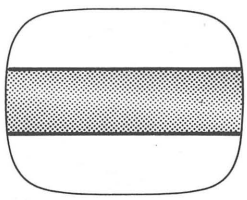
**AFC = Automatic Frequency Control

THE VIDEO AMPLIFIER SECTION



Problems To Look For On The Screen

LOW CONTRAST



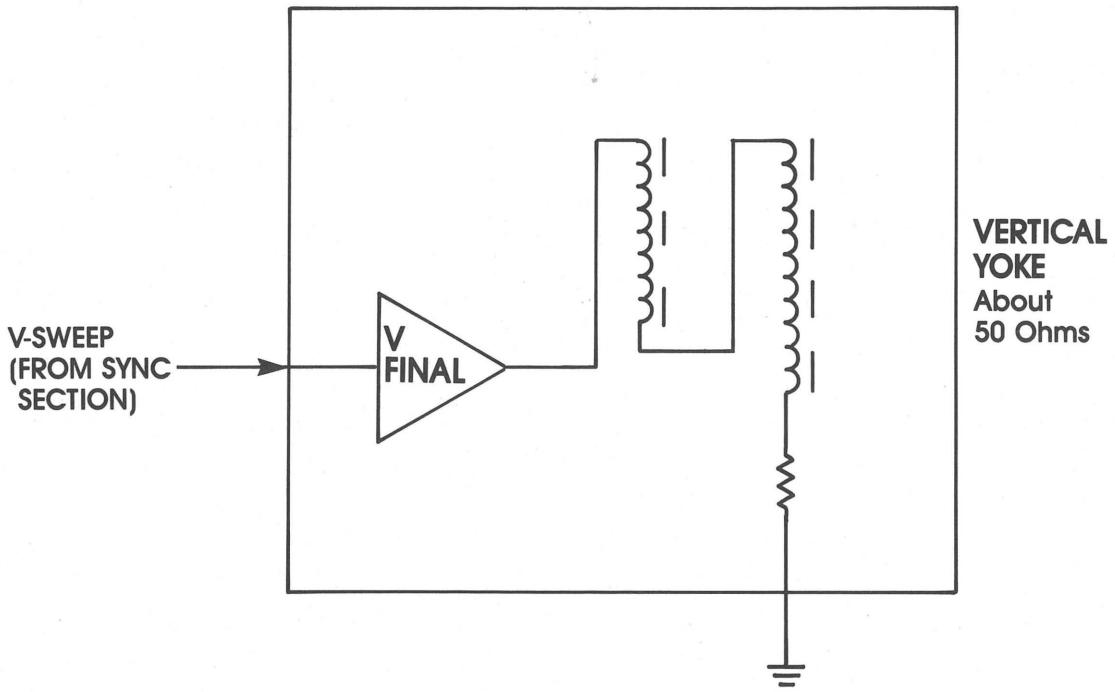
HUM BAR IN PICTURE: CHECK FILTER CAPS ALL THROUGH MONITOR.**

RASTER ONLY

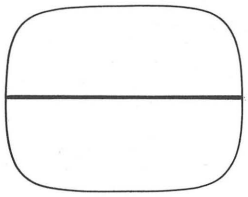
*L = Blanking (luminance)

**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).

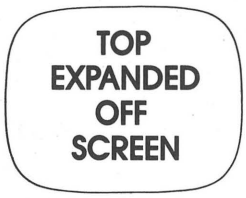
THE VERTICAL SWEEP SECTION

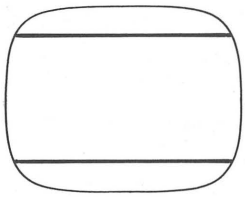


Problems To Look For On The Screen



HORIZONTAL LINE ONLY

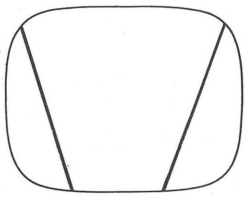




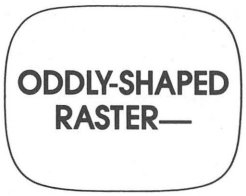
"SQUASHED" PICTURE— OR PICTURE COLLAPSES



CONVERGE PICTURE

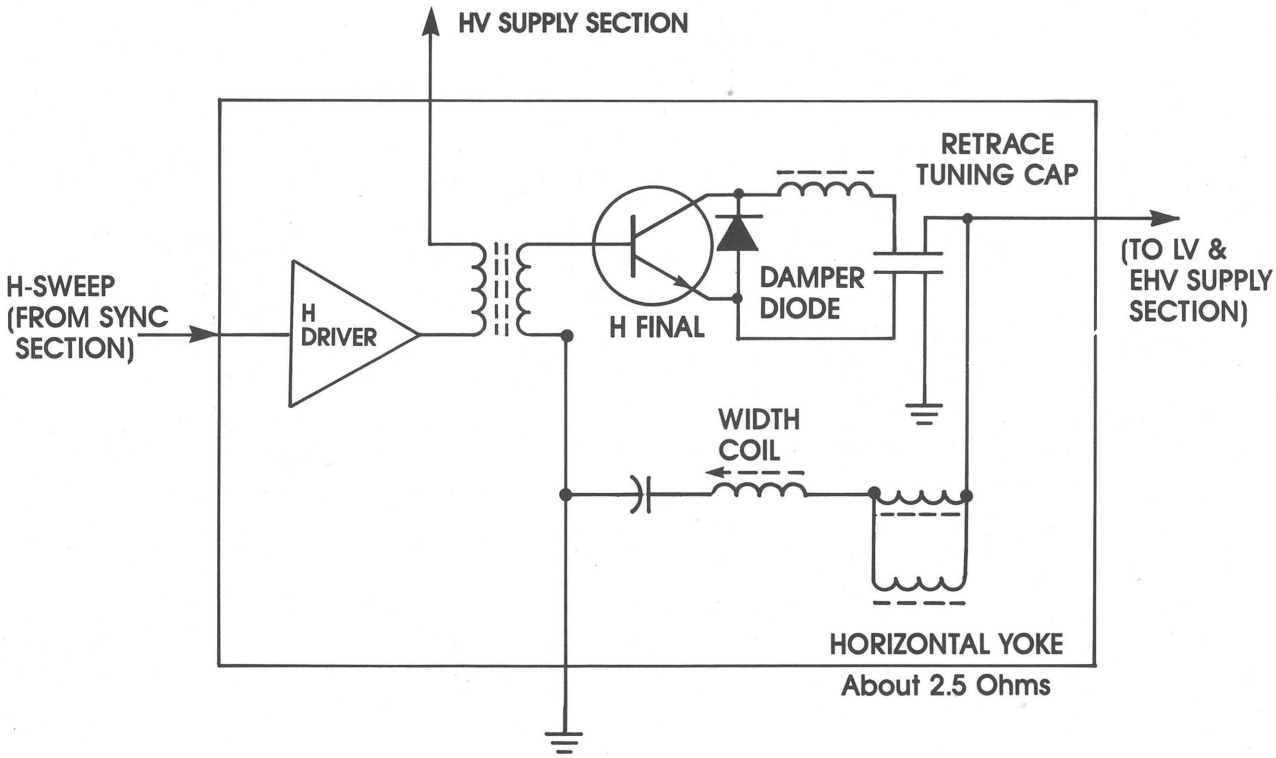


PICTURE IS KEYSTONE-SHAPED— CHECK VERTICAL YOKE COIL WITH OHMMETER.

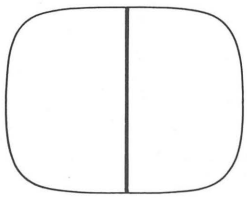


ADJUST YOKE AND CHECK IT WITH OHMMETER

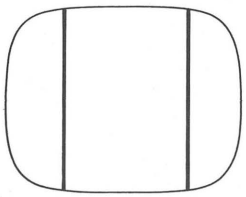
THE HORIZONTAL SWEEP SECTION



Problems To Look For On The Screen



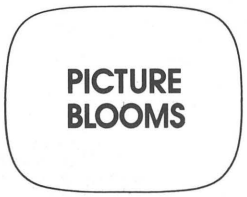
VERTICAL LINE ONLY



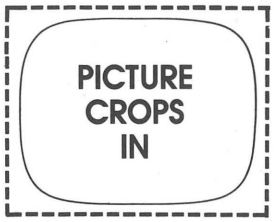
NARROW, NON-LINEAR



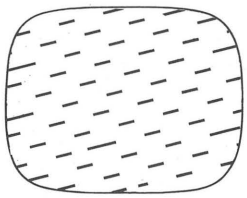
(ALSO CHECK FLYBACK, HV SUPPLY, VIDEO AMP SETTINGS)



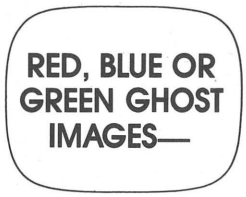
NO DETAIL IN WHITES, LIGHT COLORS



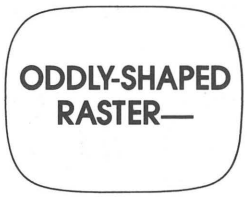
OCCASIONAL OVERSCANNING— MAY BE SEVERE



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

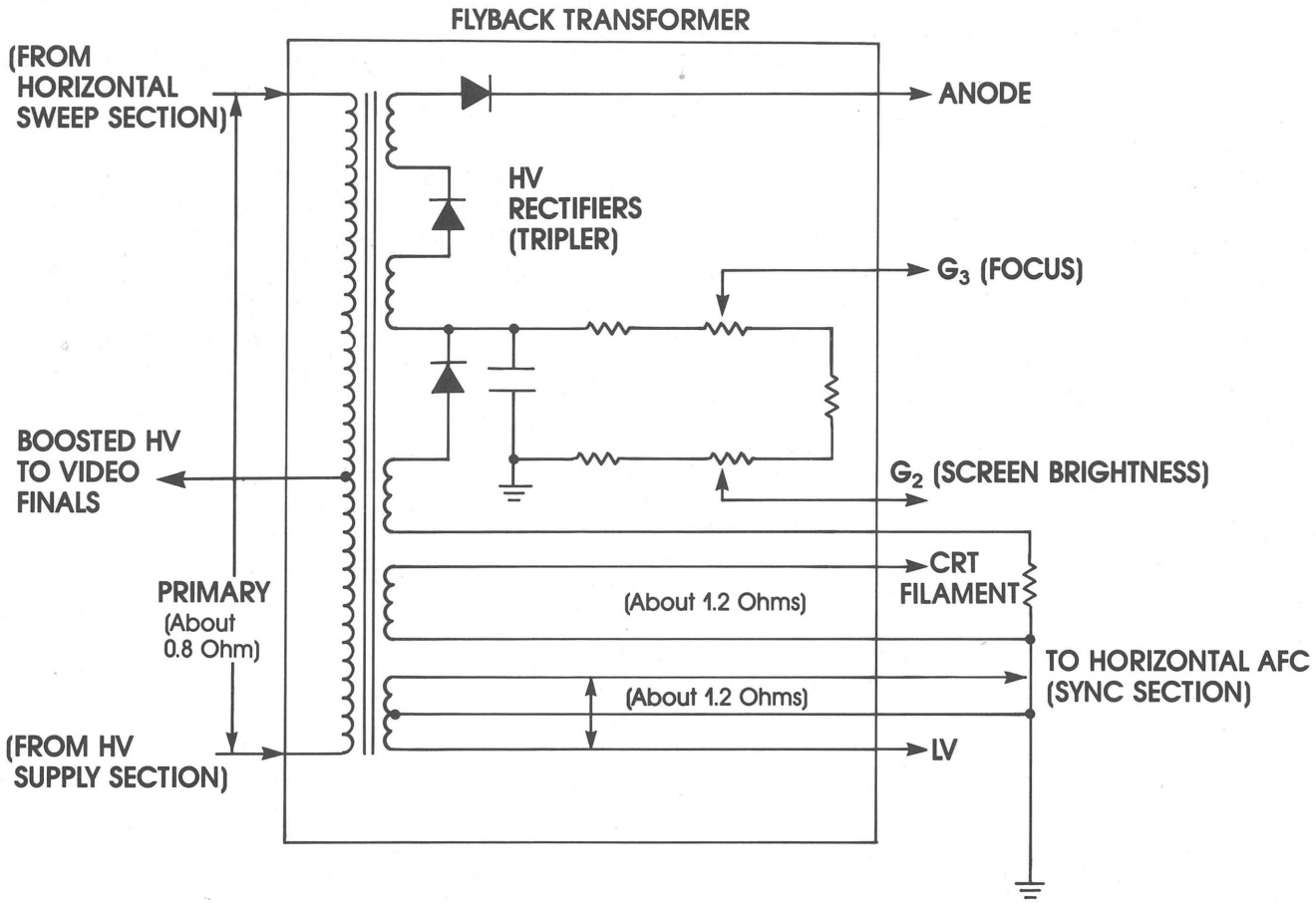


CONVERGE PICTURE



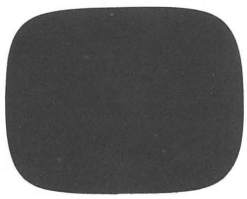
ADJUST YOKE AND CHECK IT WITH OHMMETER

LV & EHV POWER SECTION

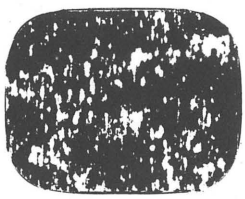


BOOSTED HV: 160-190VDC TYPICAL AFTER HALF-WAVE RECTIFICATION

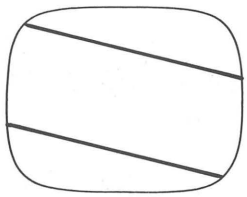
Problems To Look For On The Screen



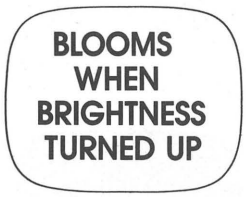
BLACK SCREEN (NO EHV OR NO 6.3V FILAMENT POWER TO CRT)* —ALSO CHECK HV, CRT, VIDEO AMP SETTINGS, HORIZONTAL OUTPUT



"SNOW"— NO LV TO SYNC, VIDEO

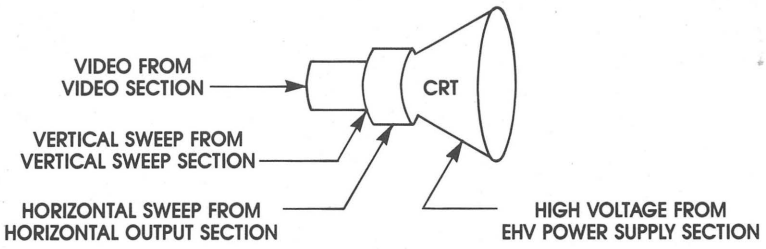


HORIZONTAL STREAKS, POPPING NOISES



*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.

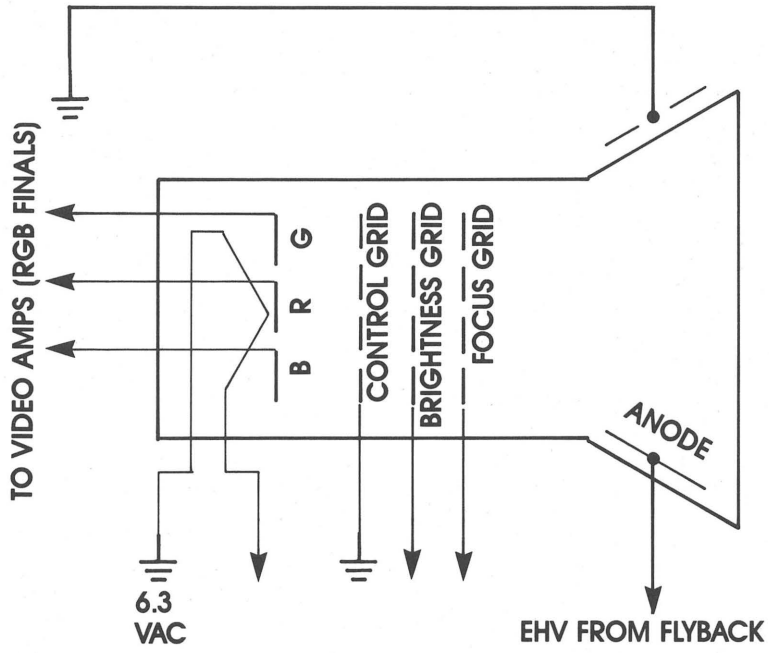
THE CATHODE RAY TUBE



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



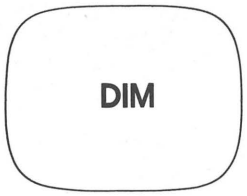
Problems To Look For On The Screen



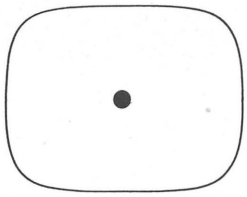
DARK—
NO RASTER
(ALSO CHECK
HV, FLYBACK,
FUSES, THERMISTORS
AND VARISTORS,
HORIZONTAL
OUTPUT)



ALSO
CHECK
VIDEO
SECTION,
BLANKING



(MAY NEED TO
BE REJUVENATED)
CHECK
VIDEO
SECTION
CONTROLS



ION BURNS