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).

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**CHECK HERE FOR:**

- **R** = RASTER PROBLEMS
- **V** = VIDEO PROBLEMS

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**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***

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**Problems To Look For On The Screen**

![Diagram of a circuit with components labeled Q1, Q2, Q3, Q4, TP1, DC OUT, GND.]

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*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!*

- PICTURE LOCKS OUT OF PHASE (V OR H)

- NO V-SYNC

- H SYNC MISSING OR CRITICAL

- TRY SYNC AMP!

*L = Blanking (luminance)

**AFC = Automatic Frequency Control
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

V-SWEEP (FROM SYNC SECTION)

V FINAL

VERTICAL YOKE
About 50 Ohms

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

<table>
<thead>
<tr>
<th>Problem</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>VERTICAL LINE ONLY</td>
<td>Narrow, non-linear</td>
</tr>
<tr>
<td>NARROW, NON-LINEAR</td>
<td>Dark Screen—No Raster (also check flyback, HV supply, video amp settings)</td>
</tr>
<tr>
<td>PICTURE CROPS IN</td>
<td>Picture blooms</td>
</tr>
<tr>
<td>OCCASIONAL OVERSCANNING—MAY BE SEVERE</td>
<td>No detail in whites, light colors</td>
</tr>
<tr>
<td>RETRACE LINES—CHECK H. OUTPUT TRANSISTOR, RETRACE TUNING CAPS.</td>
<td>Red, blue or green ghost images</td>
</tr>
<tr>
<td>CONVERGE PICTURE</td>
<td>Oddly-shaped raster—Adjust yoke and check it with ohmmeter</td>
</tr>
</tbody>
</table>
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

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

- **DIM**

  (May need to be rejuvenated)

  Check video section controls

- **ION BURNS**