

Example: Ringing a flyback transformer for a shorted or opened winding.

1. Remove AC power from the monitor.
2. Set the DIGITAL DISPLAY Switch to RINGER TEST "Yoke & Flybacks."
3. Connect the DIRECT TEST LEAD to the CM2125 RINGER TEST Jack.
4. Connect the DIRECT TEST LEAD to the flyback's primary winding. (*The primary winding connects between the B+ supply and the collector of the horizontal output transistor*).
5. Read the test results in the DIGITAL DISPLAY Readout.

What to expect: A "Good" reading of "10" rings or more means that none of the windings in the flyback are shorted. You do not need to ring any other winding. A shorted turn in any other winding will cause the primary to ring bad.

A "Bad" reading, less than 10 rings, may be caused by a circuit connected to the flyback that is loading the Ringer test. Disconnect the most likely circuits in the following order: 1) Yoke; 2) CRT filament (unplug the CRT socket); 3) horizontal output transistor collector; 4) scan derived supplies. Retest the flyback after you disconnect each circuit. If the flyback now rings "good," it does not have a shorted winding.

If the flyback still tests bad after you've disconnected each of the above circuits, unsolder it and completely remove it from the circuit. If the flyback primary still rings less than 10, ring the rest of the windings. If one of the other windings rings above 10, the flyback is good. If not, the flyback is bad and must be replaced.

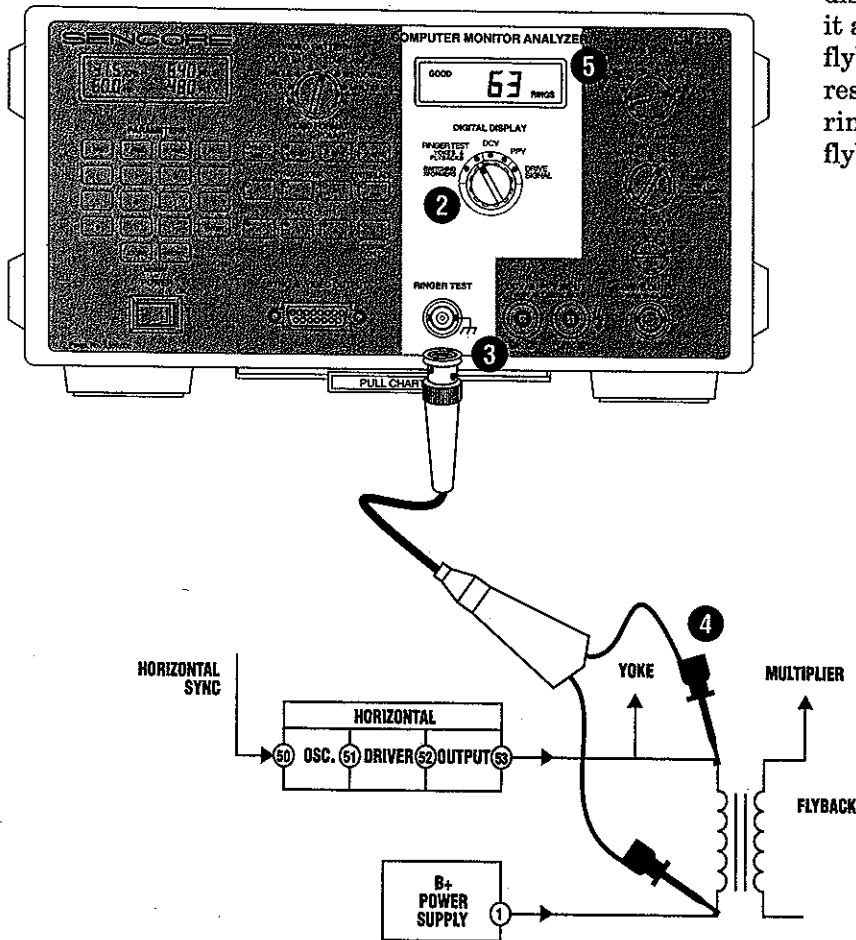


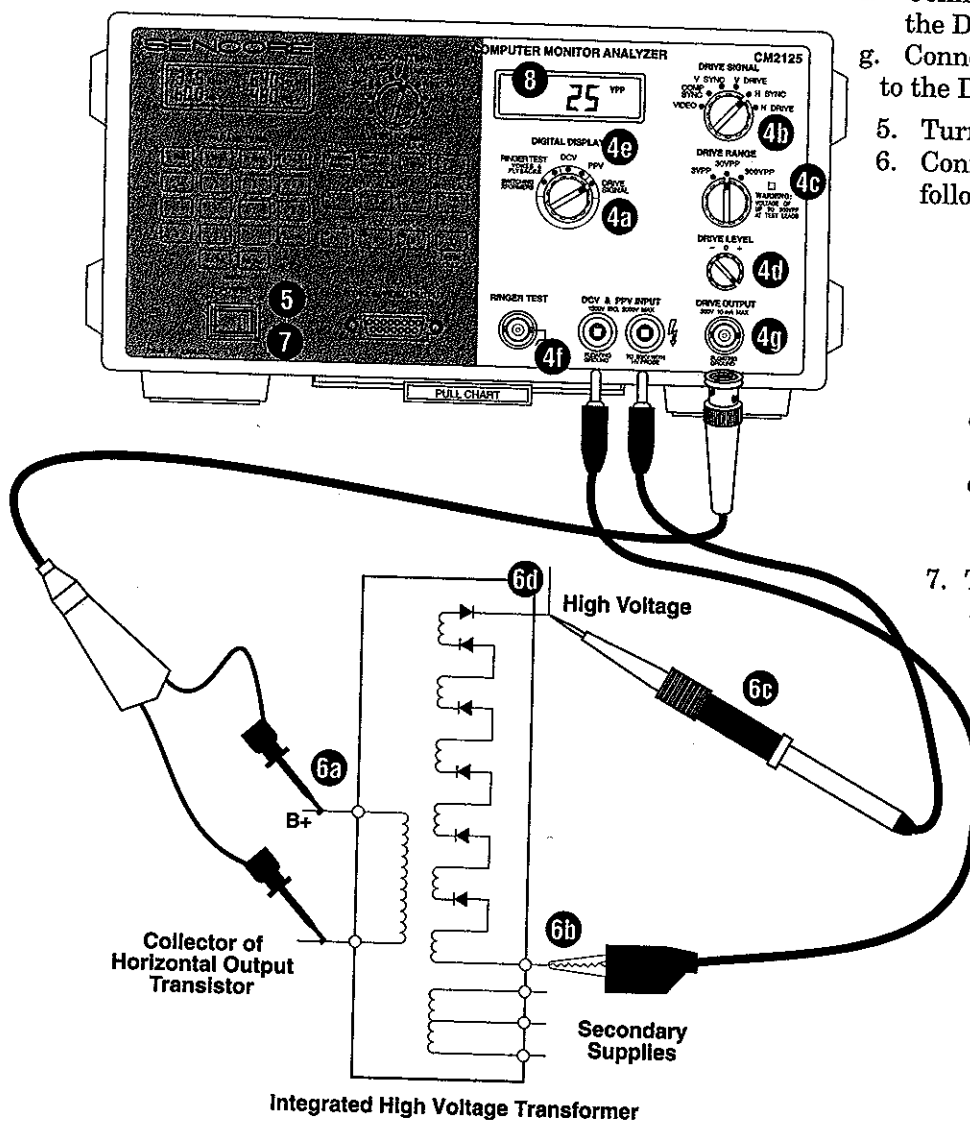
Fig. 57 - Ringing a flyback transformer.

Testing The Multiplier In An Integrated High Voltage Transformer (IHVT)

Example: Testing the multiplier section of an IHVT

Note: It is only necessary to do this test if *all* of the following conditions are met: 1) Symptom is low or missing high voltage or focus voltage, 2) The B+ and PPV voltages at the horizontal output transistor are normal and 3) The flyback passes the Ringer test.

1. Remove AC power from the monitor.
2. Discharge the CRT high voltage and remove the HV lead.



3. Remove the IHVT from the circuit or disconnect the IHVT from the circuit as needed to get a "Good" Ringer test.
4. Set the CM2125 as follows:
 - a. DIGITAL DISPLAY Switch to "Drive Signal."
 - b. DRIVE SIGNAL Switch to "H Sync."
 - c. DRIVE RANGE Control to "30 VPP."
 - d. DRIVE LEVEL Control to "+ 25 VPP."
 - e. DIGITAL DISPLAY Switch to "DCV."
 - f. Connect the DVM TEST LEAD to the DCV & PPV INPUT Jack.
 - g. Connect the DIRECT TEST LEAD to the DRIVE OUTPUT Jack.
5. Turn off the CM2125.
6. Connect the CM2125 to the IHVT as follows:
 - a. DIRECT TEST LEAD to the primary winding.
 - b. Black DVM TEST LEAD to the low side of the high voltage secondary winding ("HV resupply").
 - c. Place the TP212 on the Red DVM TEST LEAD.
 - d. Connect the Red DVM Lead & TP212 to the high voltage lead.
7. Turn on the CM2125.
8. Read the voltage in the DIGITAL DISPLAY Readout and multiply the reading by 10 to compensate for the TP212.

Fig. 58 - Testing the multiplier section of an IHVT.

What to expect: Compare the DC voltage reading to values in Table 3. If the voltage reading is below the value shown, change the DRIVE LEVEL polarity to - 25 VPP. If the reading is still low, the IHVT is bad. If the voltage reading is equal to or above the value shown in the chart, the IHVT is good.

Note: To test the focus tap, measure the DC voltage on the focus output lead or pin. A good focus supply will produce 20-35% of the voltage measured at the HV lead.

COLLECTOR PPV	CRT HIGH VOLTAGE					
	10000	15000	20000	25000	30000	35000
100	2500	3750	5000	6250	7500	8750
200	1250	1875	2500	3125	3750	4375
300	833	1250	1667	2083	2500	2917
400	625	938	1250	1563	1875	2188
500	500	750	1000	1250	1500	1750
600	417	625	833	1042	1250	1458
700	357	536	714	893	1071	1250
800	313	469	625	781	938	1094
900	278	417	556	694	833	972
1000	250	375	500	625	750	875
1100	227	341	455	568	682	795

Table 3 Use the ratio between the peak-to-peak voltage of the horizontal output transistor and the normal high voltage to determine the DC voltage for the integrated flyback test.

Testing High Voltage Multipliers

Some monitors use a high voltage multiplier that is a separate component from the flyback transformer. Typically, high voltage multipliers are doublers, triplers or quadruplers. The procedure for testing these components is similar to testing the high voltage diodes in an IHVT.

Example: Testing discrete high voltage multipliers:

1. Remove AC power from the monitor.
2. Discharge the CRT high voltage and remove the HV lead.
3. Remove the multiplier from the circuit.
4. Set the CM2125 as follows:
 - a. DIGITAL DISPLAY Switch to "Drive Signal."
 - b. DRIVE SIGNAL Switch to "H Sync."
 - c. DRIVE RANGE Control to "300 VPP."
 - d. DRIVE LEVEL Control to + 250 VPP.
5. Turn off the CM2125.
6. Connect the CM2125 to the multiplier as follows:
 - a. DIRECT TEST LEAD to the input pins.
 - b. Black DVM TEST LEAD to the ground pin.
 - c. Place the TP212 on the Red DVM TEST LEAD.
 - d. Connect the Red DVM Lead & TP212 to the high voltage lead.
7. Turn on the CM2125.
8. Read the voltage in the DIGITAL DISPLAY Readout and multiply the reading by 10 to compensate for the TP212.

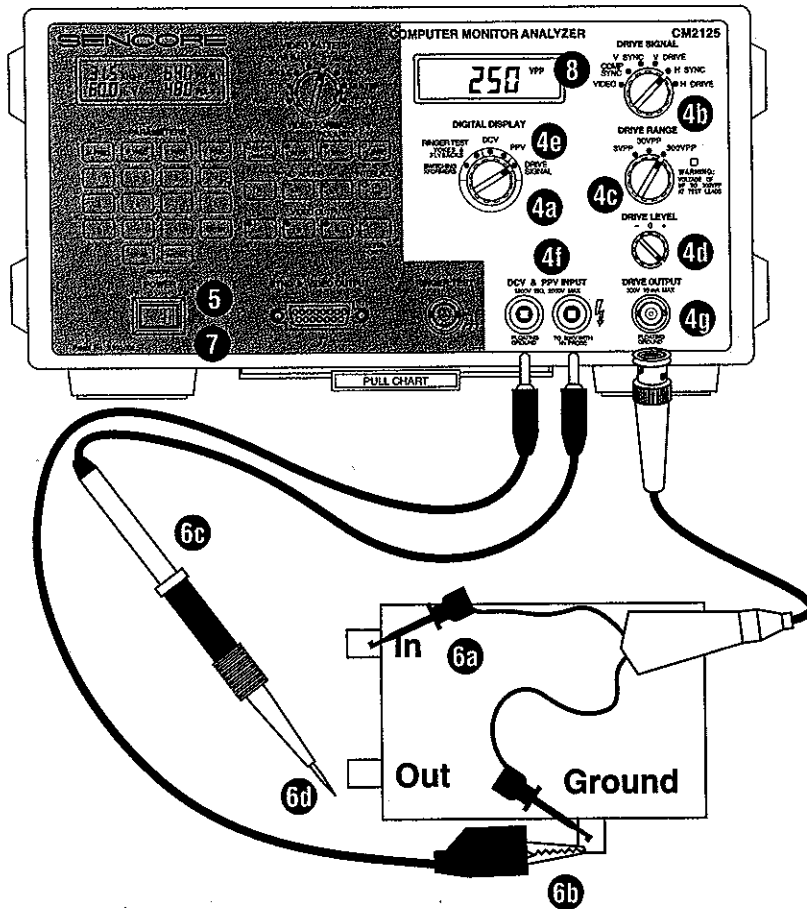


Fig. 59 - Testing a high voltage multiplier.

- e. DIGITAL DISPLAY Switch to "DCV."
- f. Connect the DVM TEST LEAD to the DCV & PPV INPUT Jack.
- g. Connect the DIRECT TEST LEAD to the DRIVE OUTPUT Jack.

What to expect: Compare the DC voltage reading to the values listed in the table below. If the DC voltage reading is below the amount listed, change the DRIVE LEVEL polarity to -250 VPP. If the reading is still low, the multiplier is bad. If the voltage reading is equal to or above the value shown in the chart, the multiplier is good.

Note: To test the focus tap, measure the DC voltage on the focus output lead or pin. A good focus supply will produce 25-50% of the voltage measured at the HV lead. If the multiplier has a CTL pin, connect the CTL pin to the ground or common pin before measuring the voltage. In this case, the voltage should be 10-20% of the voltage measured on the HV lead.

Multiplier Type	Multiply Factor	Output Voltage
Doubler	2	250
Tripler	3	500
Quadrupler	4	750

Table 4 A high voltage multiplier should produce these voltages or higher when supplying 250 VPP to the input.

Testing High Voltage Regulation

The high voltage regulator circuit is responsible for maintaining a constant high voltage at the CRT as the HV load varies. A black raster turns the guns off, so there is minimum beam current and minimum load. The heaviest load is produced by a white raster. Without regulation, the high voltage would vary with displayed image. Poor high voltage regulation creates problems such as blooming, improper brightness variations, poor focus, poor color and a jumpy display.

Use the CM2125's RASTER pattern to dynamically test a monitor's high voltage regulation circuit. Quickly switching the "Video" FORMAT Button between "+" and "-" causes the display to alternate between white (maximum load) and black (minimum load).

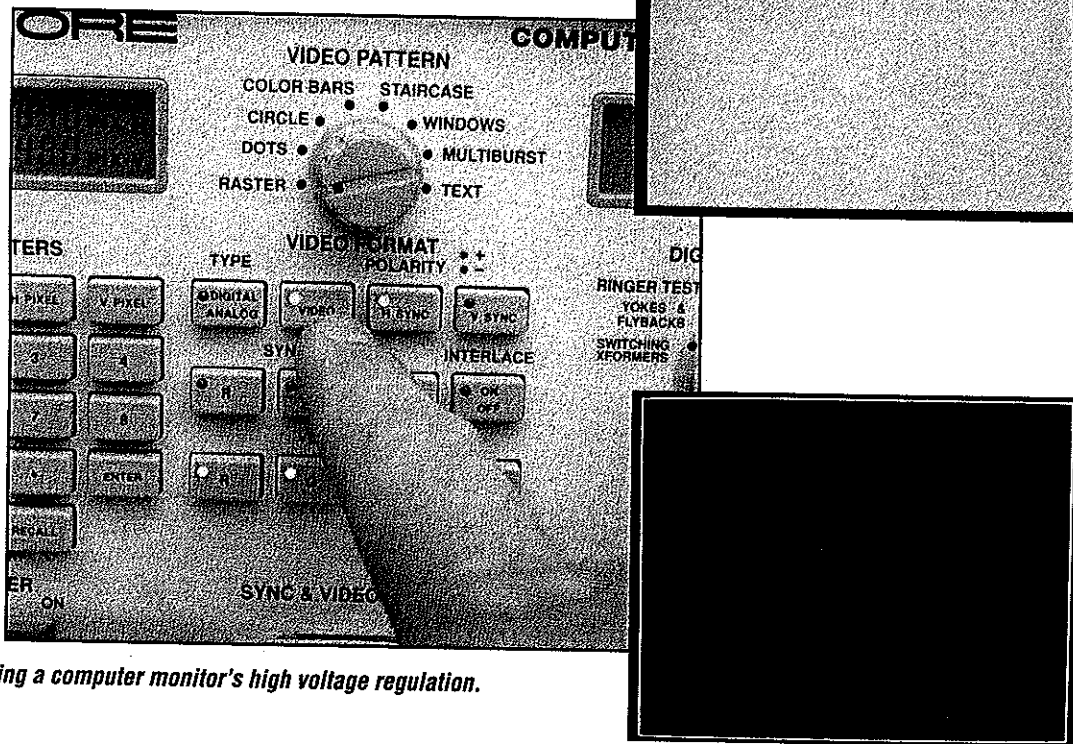


Fig. 60 - Testing a computer monitor's high voltage regulation.

Example: Testing a monitor's high voltage regulation.

1. Set the CM2125 to match the monitor type being serviced (see "Connecting To A Monitor" pages 10-19).
2. Set the VIDEO PATTERN Switch to "Raster."
3. Press R G B to "on".
4. Set the monitor's brightness to maximum.
5. Quickly press VIDEO from "+" to "-".

What to expect: The display should remain stable as it is switched between the white raster and black raster. The white border line should remain stable with no signs of bowing or blooming.

If the display shows a regulation problem, measure the peak-to-peak voltage at the collector of the horizontal output transistor while repeating step 5. If the PPV voltage changes widely with the changing video pattern, troubleshoot the B+ regulator circuit. If the PPV voltage remains stable, check the video or sync circuits for changing levels.

Troubleshooting Horizontal Drive Circuits

If the horizontal yoke, flyback, multiplier, horizontal output transistor, and B+ supply have been tested and found to be good, but the monitor still has no deflection or high voltage, the horizontal driver circuit may be defective. A missing or reduced amplitude horizontal drive signal could prevent the computer monitor from starting up and operating properly. Use the CM2125's "H Drive" to isolate problems in the horizontal drive circuit.

Example: Troubleshooting a "no high voltage" or horizontal deflection problem:

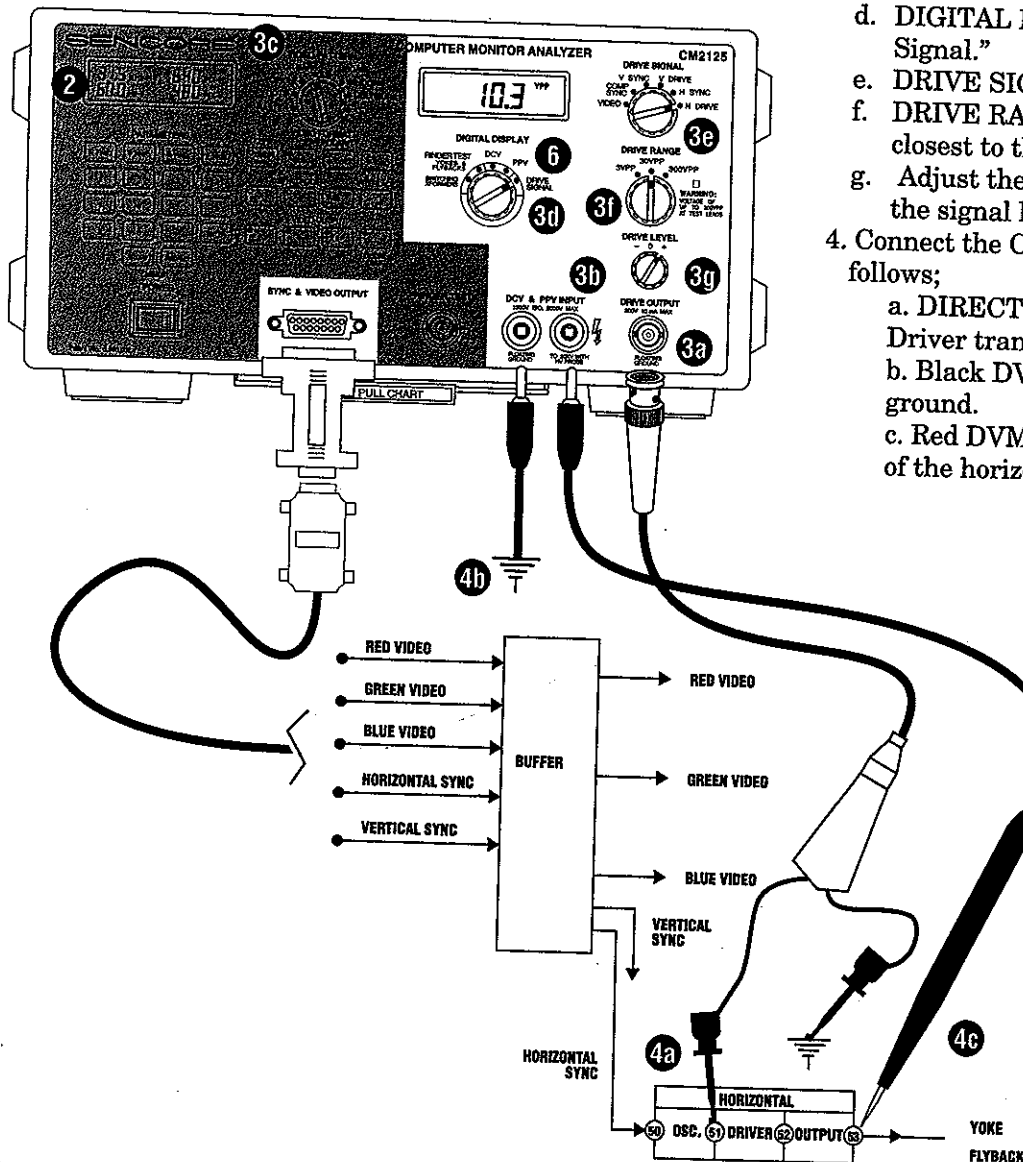


Fig. 61 - Horizontal drive circuit troubleshooting.

Notes: 1). Before injecting into the horizontal drive circuit, test the flyback and yoke, the high voltage multiplier, the horizontal output transistor, and the B+ supply and 2). When injecting the H DRIVE signal into the horizontal drive circuit always lower the line voltage to 85 volts AC.

1. Turn the monitor POWER to "Off."
2. Set the CM2125 to match the monitor type being serviced (see "Connecting To A Monitor" pages 10-19).
3. Set the CM2125 as follows:
 - a. Connect DIRECT TEST LEAD to the DRIVE OUTPUT Jack.
 - b. Connect DVM TEST LEAD to DCV & PPV INPUT Jack.
 - c. VIDEO PATTERN Switch to "Color Bars."
 - d. DIGITAL DISPLAY Switch to "Drive Signal."
 - e. DRIVE SIGNAL Switch to "H Drive."
 - f. DRIVE RANGE Control to range that is closest to the signal level in the circuit.
 - g. Adjust the DRIVE LEVEL Control to match the signal level found in the circuit.
4. Connect the CM2125 to the monitor as follows:
 - a. DIRECT TEST LEAD to base of the Driver transistor (TP 51).
 - b. Black DVM TEST LEAD to circuit ground.
 - c. Red DVM TEST LEAD to the collector of the horizontal output transistor.
5. Set the AC voltage to 85 VAC and turn "On" the monitor POWER.
6. Monitor the PPV level on the DIGITAL DISPLAY Readout as you adjust the DRIVE LEVEL Control.

What to expect: Watch for voltage on the CM2125's PPV meter and for horizontal deflection. If these return, you are injecting after the defective stage. If pulses do not occur at the collector, inject the Drive Signal at the base of the horizontal output transistor.

Note: When injecting at the output transistor, disconnect the secondary winding of the driver transformer from the base of the output transistor.

Monitoring The Horizontal Output Transistor Collector

A wealth of troubleshooting information can be gained about the monitor's operation by measuring the DC and peak-to-peak voltage at the collector of the horizontal output transistor. The DC reading tells you if the B+ supply is working correctly, while the peak-to-peak reading tells you if the output circuits are creating the needed high voltage.

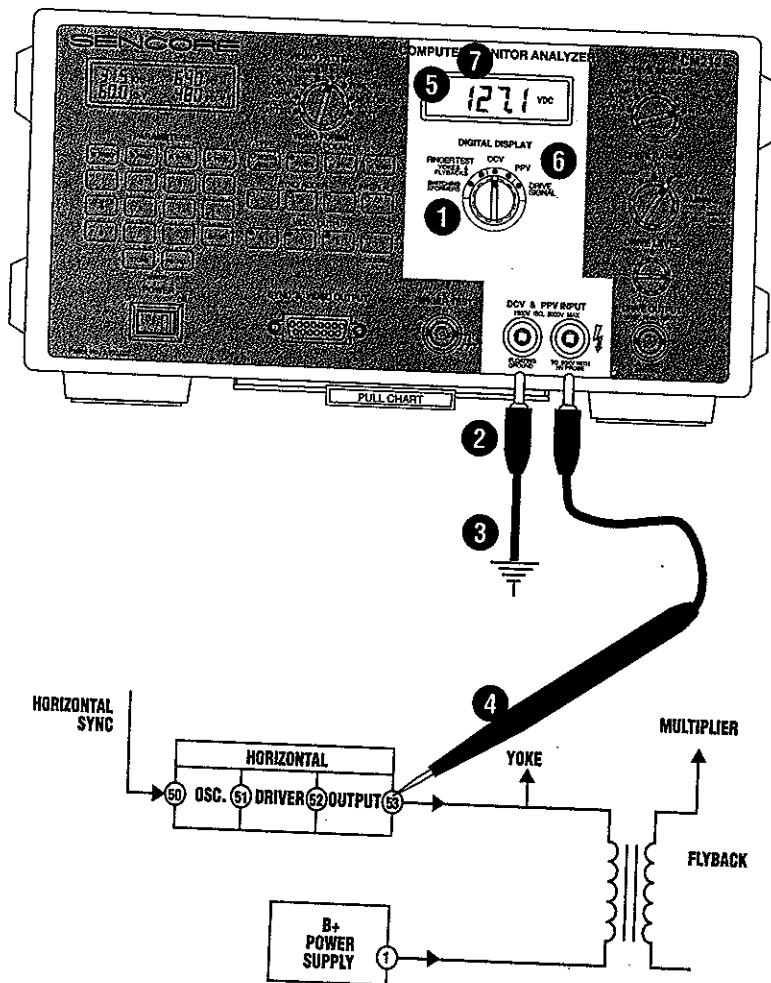


Fig. 62 - Monitoring the voltage at the collector of the horizontal output transistor.

Example: Measuring DC and peak-to-peak volts at the collector of the horizontal output transistor.

1. Set the DIGITAL DISPLAY control to "DCV".
2. Connect the DVM TEST LEADS to the DCV & PPV INPUT Jacks.
3. Connect the black DCV & PPV INPUT test lead to ground.
4. Connect the red DCV & PPV INPUT test lead to the collector of the horizontal output transistor.
5. Take the voltage reading.
6. Set the DIGITAL DISPLAY control to "PPV".
7. Take the voltage reading.

What to expect: Compare the voltage readings to those shown on the schematic. If the B+ voltage is low, unload the power supply by disconnecting the collector of the horizontal output transistor from the circuit. Measure the voltage at the output of the power supply regulator again. If the voltage is still low or missing, troubleshoot the power supply. If the voltage goes to its schematic value, something is loading down the supply. Troubleshoot the output transistor, flyback, or yoke.

If the peak-to-peak voltage reading is missing or low, troubleshoot the output transistor, flyback or yoke. If the voltage is high, check the high voltage regulation circuit, or the timing capacitors in the horizontal output circuit.

Measuring High Voltage

The CRT requires a very high DC voltage to accelerate the electrons toward the screen. This voltage is developed by the secondary winding of the flyback transformer and is rectified by the integrated diodes in the flyback, or by a separate multiplier circuit.

Measuring the high voltage at the second anode of the CRT lets you know if the output circuit, flyback, high voltage multiplier, and power supply regulation circuits are working correctly. Additionally, some monitors have adjustments to set the high voltage and focus voltage.

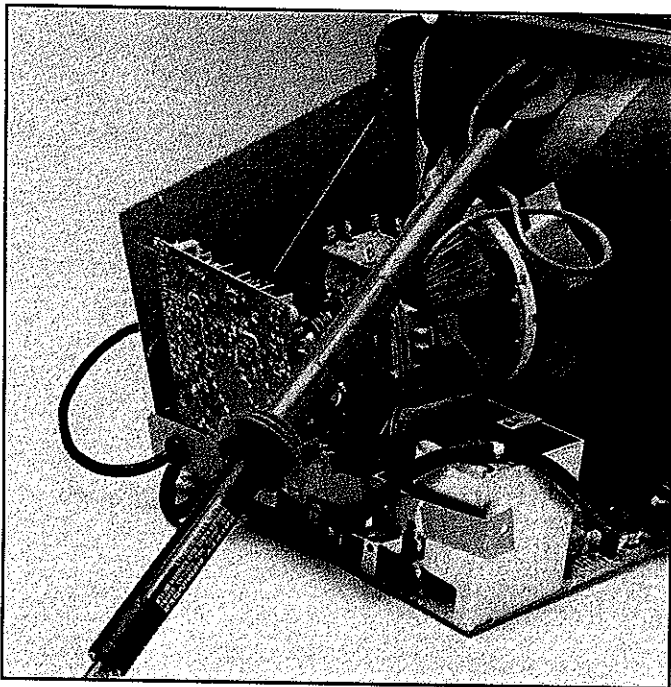


Fig. 63 - Use caution when measuring high voltage with the HP200, 50,000 volt high voltage probe.

WARNING

Measuring the high voltage exposes you to the possibility of a severe shock hazard if you do not follow careful test methods. Do not do the high voltage test until you completely read and understand the following warnings and instructions.

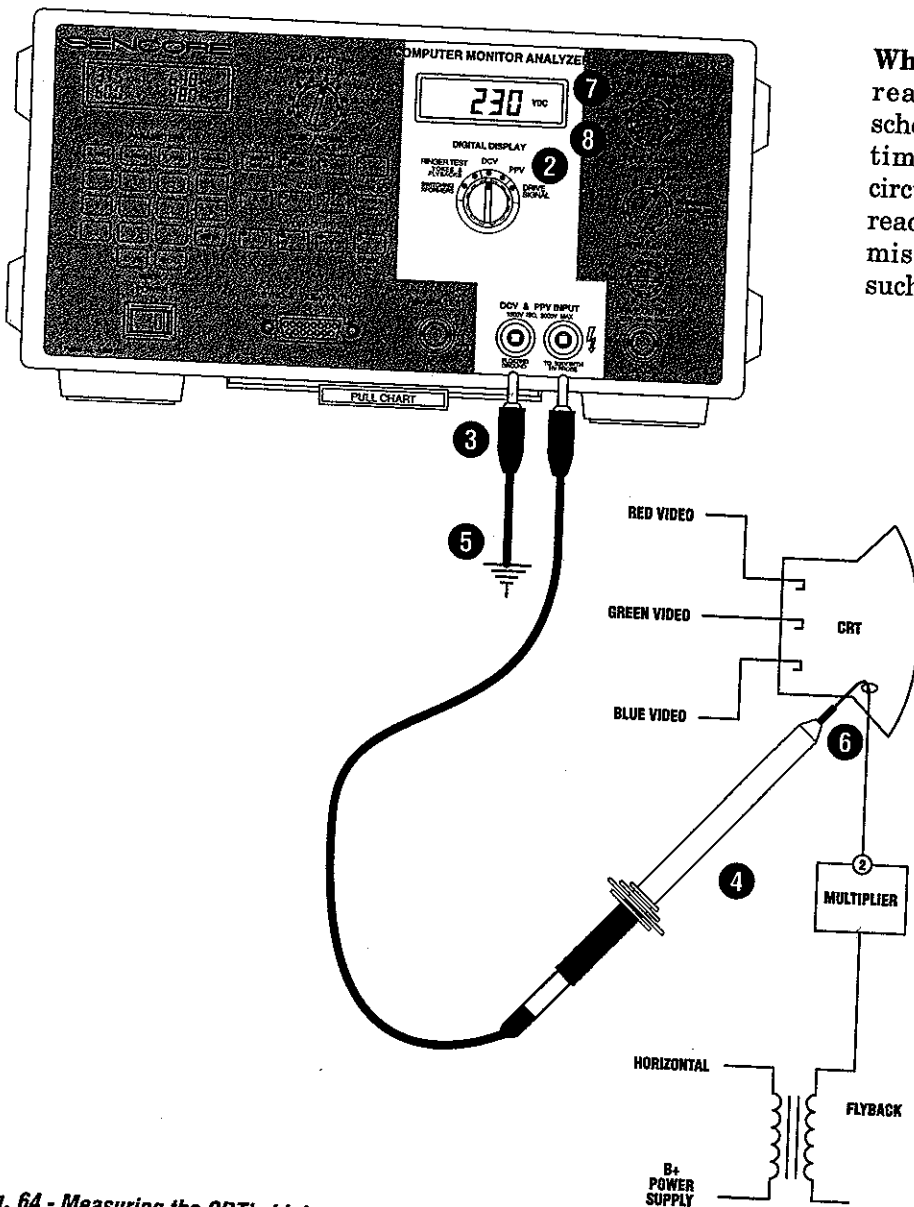
- 1. Never measure more than 2000 volts without a high voltage probe.** Use the TP212 to measure voltages in the 2,000 to 10,000 volt range. Use the HP200 for voltages near or over 10,000 volts.
 - 2. Remove power to the circuit before connecting to the test point or before disconnecting the high voltage probe.**
 - 3. Connect the ground lead so that it cannot become detached during the test.** If the ground lead becomes loose, remove the AC power to the monitor immediately.
 - 4. Connect to the correct ground point.** Some chassis use a separate ground for the high voltage.
 - 5. Immediately remove power to the circuit if the high voltage probe comes loose.** Do not touch the high voltage probe until power is removed and the high voltage discharged.
 - 6. If you must hold the high voltage probe, use extreme caution.** Be sure the connections to the probe and ground lead are firmly attached. Hold the probe behind the molded safety rings to prevent the possibility of contacting the high voltage test point or to prevent arcing across the probe to your body.
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Example: Measuring a monitor's high voltage.

1. Turn off the Power to the monitor.
2. Set the CM2125 DIGITAL DISPLAY Switch to "DCV."
3. Connect the DVM TEST LEADS to the DCV & PPV INPUT Jacks.
4. Slide the red DVM TEST LEAD into the HP200 High Voltage Probe.

Note: Be sure the tip is firmly seated in the connector inside the probe so that it will not detach during the measurement.

5. Connect black DVM TEST LEAD to the HV ground point.
6. Connect the probe to the test point so that it does not need to be held during the measurement.
7. Turn on the monitor and take the voltage reading.
8. Multiply the reading on the digital display by 100 when using the Sencore HP200.
9. Turn off the monitor before disconnecting the HP200.



What to expect: Compare the high voltage reading to the voltage shown on the schematic. If the reading is high, check for a timing problem in the horizontal output circuit, or for a B+ regulation problem. If the reading is low or missing, check for a low or missing B+ supply, or a faulty component such as the IHVT or high voltage multiplier.

Fig. 64 - Measuring the CRT's high voltage.

"Burning In" A Monitor

After you've completed a monitor repair you may want to "burn in" the unit for a number of hours to make sure no problems surface. If a monitor displays the same pattern for an extended period of time, you run the risk of burning the phosphor in the CRT. To avoid the problem, the CM2125 can be programmed to automatically sequence through each of its video patterns. Each pattern is displayed 15 seconds.

Example: Programming the CM2125 to automatically sequence through each of its patterns.

1. Set the CM2125 to match the monitor type being serviced (see "Connecting To A Monitor" pages 10-19).

2. Press

To stop the video patterns from sequencing:

3. Press

Note: The CM2125 will not be in the video pattern sequence mode if it is shut off and turned back on again.