USING THE PARAMETERS AND VIDEO FORMATS

The PARAMETERS and VIDEO FORMAT Buttons match the input signal requirements for all monitor types. Altering the Parameter and Format settings after the monitor is producing a display provides several important performance tests.

Troubleshooting Multiscan Monitors

Multiscan monitors lock to any applied horizontal and vertical sync frequency within a set range. A common problem in multiscan monitors is they will lock to a small frequency range, either horizontal or vertical, but are unable to lock over the entire range of input sync frequencies.

You can easily test and troubleshoot this problem with the CM2125. Simply enter the lowest vertical and horizontal sync frequencies, and the highest sync frequencies that the monitor should lock to. The monitor should produce a locked-in display at both frequency extremes. If the monitor locks to one but not to the other (either vertical or horizontal), troubleshoot either the automatic synchronizing circuits or the sweep circuits of the section that will not sync.

Example: Test if a CGA-VGA multiscan computer monitor can lock to both CGA and VGA video standards. The horizontal scanning frequency is 15.7 KHz for CGA and is 31.5 KHz for VGA.

1. Hook the CM2125 to the monitor using the CGA connector (connector #1)
2. Press RECALL 0 ENTER
3. Hook the CM2125 to the monitor using the VGA connector (connector #4)
3. Press RECALL 6 ENTER

What to expect: The computer monitor should have a locked-in display for both the CGA and VGA video standards. If the computer monitor syncs to one standard and not the other, you need to troubleshoot either the automatic synchronizing circuits or the horizontal or vertical sweep circuits (depending on which circuit has lost sync).

Testing Mode Select Circuits

The mode select circuit changes the horizontal and vertical drive current to produce a full-size raster for all operating modes. It detects the operating mode by sensing the polarity of the horizontal and vertical sync pulses. A faulty mode select circuit will cause the display to be too compressed or spread out.

Use the CM2125 to quickly determine if the computer monitor you are servicing automatically switches to each mode. Simply use the Memory function to recall the number of each operating mode and confirm that the monitor produces a full-height raster for each.

Example: Testing the mode select circuit on a VGA monitor.

1. Set the CM2125 to match the monitor type being serviced (see "Connecting To A Monitor" pages 10-19).
2. Press RECALL 5 ENTER
   (this is VGA mode 1).
3. Press RECALL 6 ENTER
   (this is VGA mode 2).
4. Press RECALL 7 ENTER
   (this is VGA mode 3).

What to expect: For each mode make sure the display is not distorted. If necessary, adjust the monitor's raster size and linearity controls. The computer monitor should produce a full display in each mode. If it does not, troubleshoot the mode select circuit or the vertical or horizontal driver stages.

Note: *You can test the modes for standards that are not stored in the CM2125's memory by entering the Parameters directly.*

Troubleshooting Video Circuits

The video circuits include all the stages from the input connectors to the CRT. These stages amplify the applied signal to sufficient level to drive the CRT. All the video channels (R, G & B) of a color monitor must have the same frequency response and gain. The video stages in a monochrome monitor must be linear between black and white. Use the VIDEO PATTERNS to check for proper video circuit operation. The patterns are explained in the OPERATIONS section of this manual.

normal B&W picture. Color RGB monitors have separate video stages for each color channel. Therefore, when you inject the CM2125 "Video" DRIVE SIGNAL you will return only red, or green, or blue, depending upon which channel you inject into.

A second difference is that the RGB signals are identical on B&W patterns, but different on color patterns. The CM2125's "Video" Drive Signal matches the green video channel. If you select the "Color Bars" Video Pattern and inject the "Video" Drive Signal into the red channel, you will see red bars at the location on the screen where the green

PROBLEM	SYMPTOMS	CM2125 VIDEO PATTERN USED TO TEST THIS
PURITY	SPLOTCHES OF COLOR IN WHITE OBJECTS	WHITE RASTER R, G, B TO "ON"
CONVERGENCE	STRAIGHT LINES SHOW COLOR SHADOWS	CIRCLE OR DOTS
COLOR	WRONG COLOR(S) OR MISSING COLOR(S)	COLOR BARS
LINEARITY	INCORRECT PICTURE HEIGHT AND WIDTH	CIRCLE
GRAY SCALE TRACKING (ANALOG ONLY)	RED, GREEN OR BLUE TINT IN A GRAY SCALE DISPLAY	STAIRCASE
RESOLUTION	LOSS OF DETAIL, FUZZY GRAPHICS, LINES BLEEDING TOGETHER	MULTIBURST OR TEXT
HIGH VOLTAGE REGULATION	JUMPY DISPLAY, BLOOMING, VARIATIONS IN BRIGHTNESS	RASTER (SWITCH BETWEEN "+" & "-" VIDEO) OR WINDOWS

Table 2 The video patterns test the performance of the computer monitor.

Video circuit problems include a complete loss of video, missing colors, weak video and poor frequency response. Most video problems can be effectively isolated using signal substitution. Signal substitution lets you inject a "known good" video signal into the video circuits from the first preamplifier to the CRT drivers.

Injecting into the video stages of RGB color monitors is similar to injecting into the video luminance stages of a color television receiver. However, there are two important differences. First, the video luminance stages in a television receiver affect all three CRT guns simultaneously so signal injection restores a

bars should be (if the red channel works from your injection point forward). Likewise, injecting into the blue channel produces blue bars at the location of the green bars. Note that while the colors are displaced, injecting the Drive Signal returns the missing output to the CRT.

To simplify interpretation, use the "Raster" pattern for most video troubleshooting applications. Inject the "Video" Drive Signal. If the missing output color returns, you are injecting after the defective stage.

Example: Injecting the VIDEO drive signal into the red, green and blue video output amplifiers.

1. Set the CM2125 to match the monitor type being serviced (see "Connecting To A Monitor" pages 10-19).
2. Connect the DIRECT TEST LEAD to the DRIVE OUTPUT Jack.
3. Set the VIDEO PATTERN Switch to "Raster."

Note: *If the "R, G, & B" VIDEO OUTPUT lines are activated, substituting for the missing output will produce a white raster. You may prefer to turn off the VIDEO OUTPUT lines so that the raster is blank until you inject the missing output.*

4. Set the DIGITAL DISPLAY Switch to "Drive Signal."
5. Set the DRIVE SIGNAL Switch to "Video."
6. Select the DRIVE RANGE that is closest to the signal level in the circuit.
7. Connect the DIRECT TEST LEAD to test points (12), (22) or (32).
8. Adjust the DRIVE LEVEL Control to match the signal level found in the circuit.

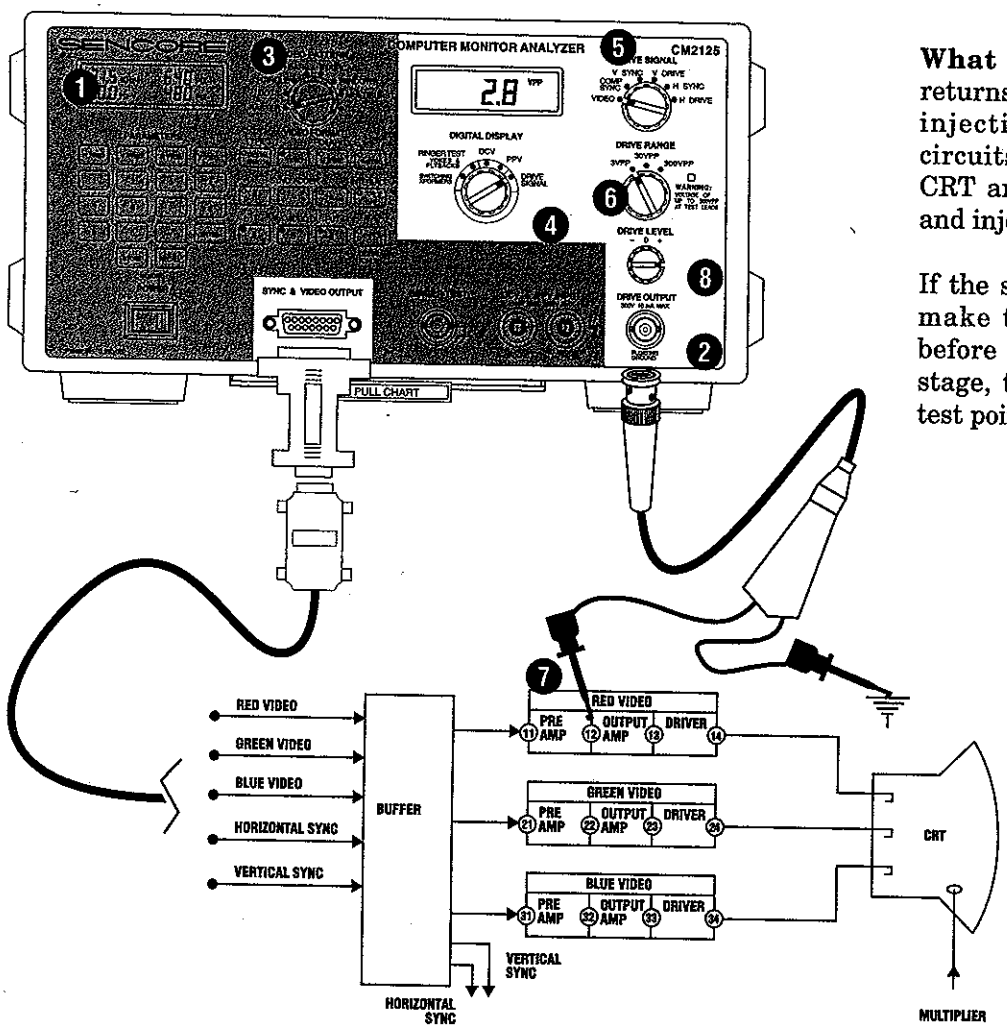

Fig. 49 - Video circuit troubleshooting.

What to expect: If the missing color returns or the output improves, you are injecting after the problem and the circuits from the injection point to the CRT are working. Move back one stage and inject at test points (11), (21) or (31).

If the same problem is created after you make the injection, you are injecting before the problem. Move forward one stage, to the driver inputs and inject at test points (13), (23) and (33).

TROUBLESHOOTING SYNC SEPARATOR PROBLEMS

Sync signals are fed to monitors by one of three methods: 1) separate V and H sync inputs; 2) V&H composite sync input; and 3) V&H composite sync on a video line (usually green). Monitors that receive a composite sync input have a Composite Sync Separator. Monitors that use "sync on video" have a Video/Sync Separator ahead of the Composite Sync Separator.

Sync separator problems cause a loss of either vertical or horizontal sync, or both. Some symptoms may lead you to suspect the problem is the horizontal or vertical circuits. Use the CM2125's "Comp Sync" Drive Signal to isolate sync problems in V&H or Video Sync Separator stages.

Example: Troubleshooting a sync separator problem on a "sync on video" computer monitor.

1. Set the CM2125 to match the monitor type being serviced (see "Connecting To A Monit pages 10-19).
2. Connect the DIRECT TEST LEAD to the DRIVE OUTPUT Jack.
3. Set the VIDEO PATTERN Switch to "Color Bars."
4. Set the DIGITAL DISPLAY Switch to "Driv Signal."
5. Set the DRIVE SIGNAL Switch to "Comp Sync."
6. Select the DRIVE RANGE that is closest to the signal level in the circuit.
7. Connect the DIRECT TEST LEAD to test point (61).
8. Adjust the DRIVE LEVEL Control to match the signal level found in the circuit.

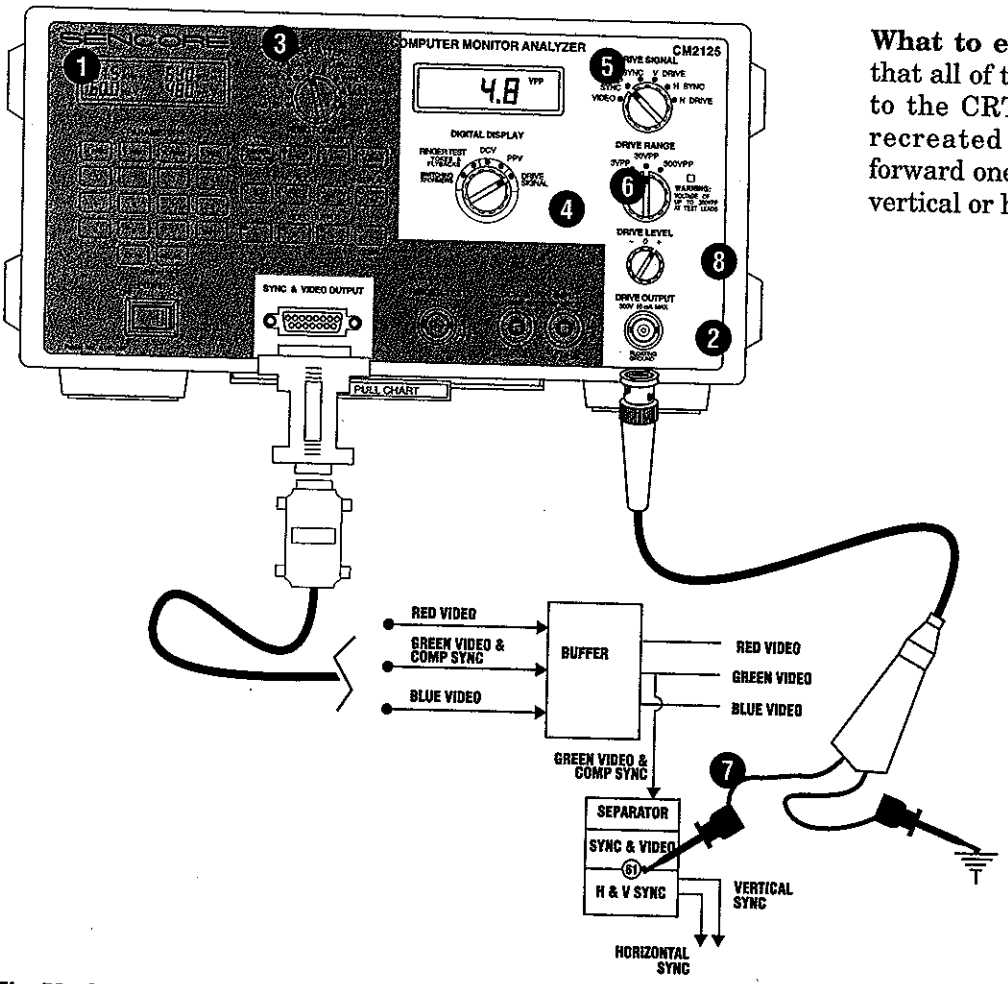

Fig. 50 - Sync separator troubleshooting.

What to expect: A locked in display prov that all of the circuits from the injection poi to the CRT are good. If the injection ha recreated the original symptom, mov forward one stage and troubleshoot either th vertical or horizontal sweep circuits.

TROUBLESHOOTING VERTICAL CIRCUITS

Troubleshooting Vertical Sync Problems

The vertical sync pulses control the timing of the vertical oscillator and sweep circuits. Sync pulses that are too low in amplitude, the wrong frequency, or are missing will cause the monitor to lose vertical hold.

Some monitors do not have a vertical oscillator. Instead, they depend entirely upon the incoming vertical sync signal to drive the deflection stages. These monitors will lose vertical deflection if the sync amplitude is too low or is missing, resulting in a single horizontal line on the screen.

Use the "V Sync" Drive Signal to inject a good signal at the input to the oscillator stage. This will determine whether the problem is in the vertical oscillator or sync line, or in the vertical sweep circuits.

Example: Troubleshooting a vertical sync problem.

Note: *If the monitor operates correctly when connected to the CM2125's SYNC & VIDEO OUTPUT Jack without injecting a Drive Signal, the signal supplied by the video adapter circuits in the computer are generating vertical sync pulses at the wrong frequency or amplitude.*

1. Set the CM2125 to match the monitor type being serviced (see "Connecting To A Monitor" page 10-19).
2. Connect the DIRECT TEST LEAD to the DRIVE OUTPUT Jack.
3. Set the VIDEO PATTERN Switch to "Color Bars"
4. Set the DIGITAL DISPLAY Switch to "Drive Signal."
5. Set the DRIVE SIGNAL control to "V Sync."
6. Select the DRIVE RANGE that is closest to the signal level in the circuit.
7. Connect the DIRECT TEST LEAD to test point (40).
8. Adjust the DRIVE LEVEL Control to match

What to expect: If the monitor regains vertical hold and gives complete vertical deflection, the oscillator and the following stages work properly. Troubleshoot the vertical sync path. If the monitor displays the same symptoms with the vertical sync signal applied, the problem is in the oscillator, driver or output stages.

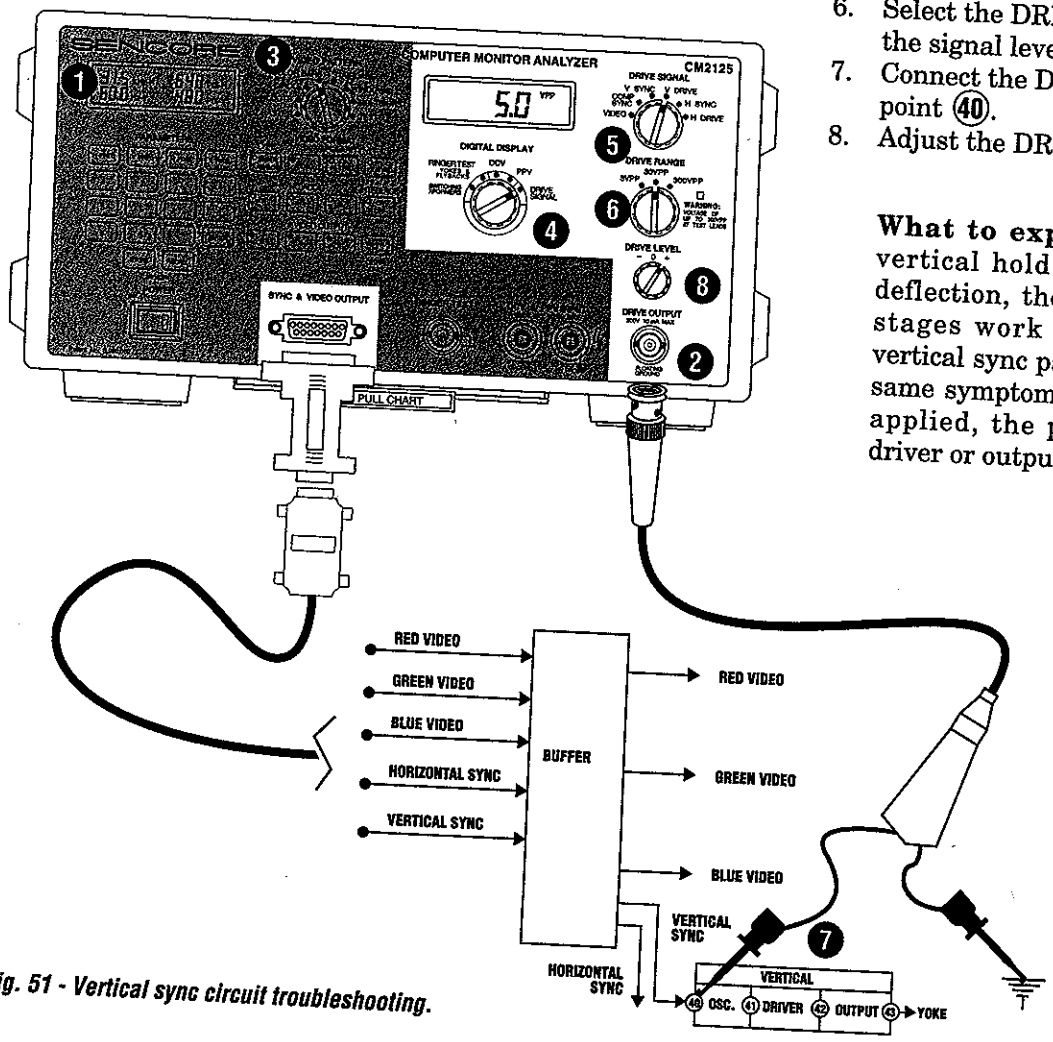

Fig. 51 - Vertical sync circuit troubleshooting.

Troubleshooting Vertical Drive Circuits

The vertical Driver and Output stages amplify the oscillator signal and provide the current drive needed for the vertical deflection yokes. A defective Driver, Output or yoke can cause loss of deflection, reduced height, or vertical non-linearity.

Use the CM2125's "V Drive" Drive Signal to isolate vertical drive circuit problems. Before you inject the Drive Signal, however, use the DVM Function to confirm the proper bias on the output components. The vertical stages are usually DC coupled to achieve good linearity. A wrong DC voltage affects all the components in the Oscillator, Driver and Output stages.

Injecting into the vertical stages won't always restore perfect vertical deflection. This is because most of the signals are uniquely shaped by feedback loops and waveshaping circuits. The Vertical Drive signal can't exactly match all the different waveshapes, but it will produce a change in deflection when injected into good stages. If driving the Driver or Output stage doesn't return sweep, either fully or partially, a component after your injection is bad.

Note: *The V DRIVE signal is not designed to drive the vertical yoke.*

Example: Troubleshooting a vertical deflection problem.

1. Set the CM2125 to match the monitor type being serviced (see "Connecting To A Monitor" page 10-19).
2. Connect the DIRECT TEST LEAD to the DRIVE OUTPUT Jack.
3. Set the VIDEO PATTERN Switch to "Color Bars."
4. Set the DIGITAL DISPLAY Switch to "Drive Signal."
5. Set the DRIVE SIGNAL Switch to "V Drive."
6. Select the DRIVE RANGE that is closest to the signal level in the circuit.
7. Connect the DIRECT TEST LEAD to test point (41).
8. Adjust the DRIVE LEVEL Control to match the signal level found in the circuit.

What to expect: Look for the sweep to expand (remember it may not be linear). If the sweep expands, either partially or fully, the circuits from the injection point to the output are good. If the sweep doesn't expand, check the output transistors or ring the deflection yoke.

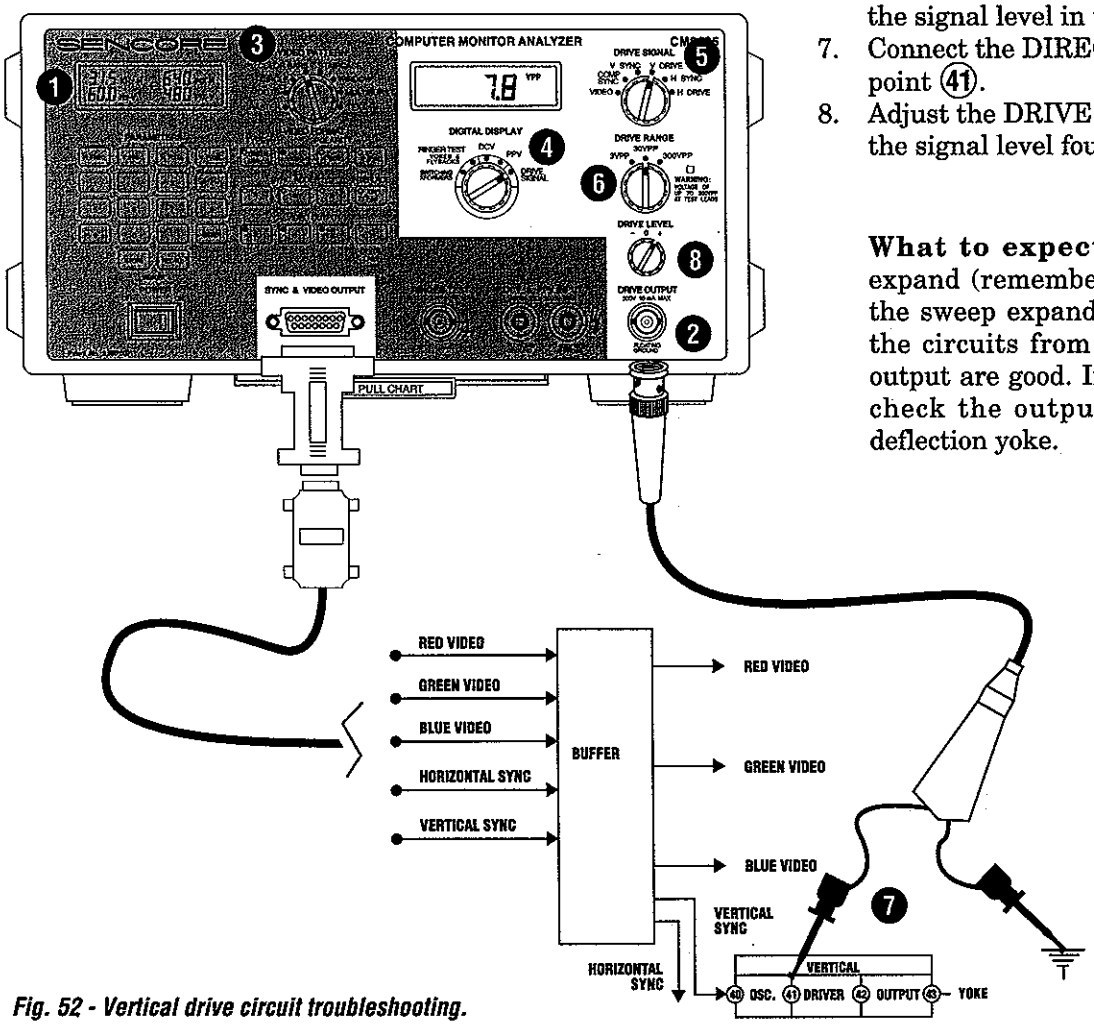

Fig. 52 - Vertical drive circuit troubleshooting.

Testing Deflection Yokes

The changing current through the windings of the deflection yoke produces a magnetic field that scans the electron beam across the face of the CRT. Yokes often develop shorted or open windings. An open or shorted winding may cause reduced vertical or horizontal raster size, or a complete loss of deflection.

The Ringer Test will find a defective yoke, even if it has a single shorted turn. A good coil will ring 10 or more times. Shorted or open coils will ring less than 10.

Follow these tips when testing yokes:

1. Deflection yokes have two sets of horizontal windings and two sets of vertical windings. Always test each winding individually because a short in one winding may not couple to the other.

2. Test the yoke while it is mounted on the CRT. Some failures are caused by the pressure of the mounting. Removing the yoke may relieve the pressure and clear the short.

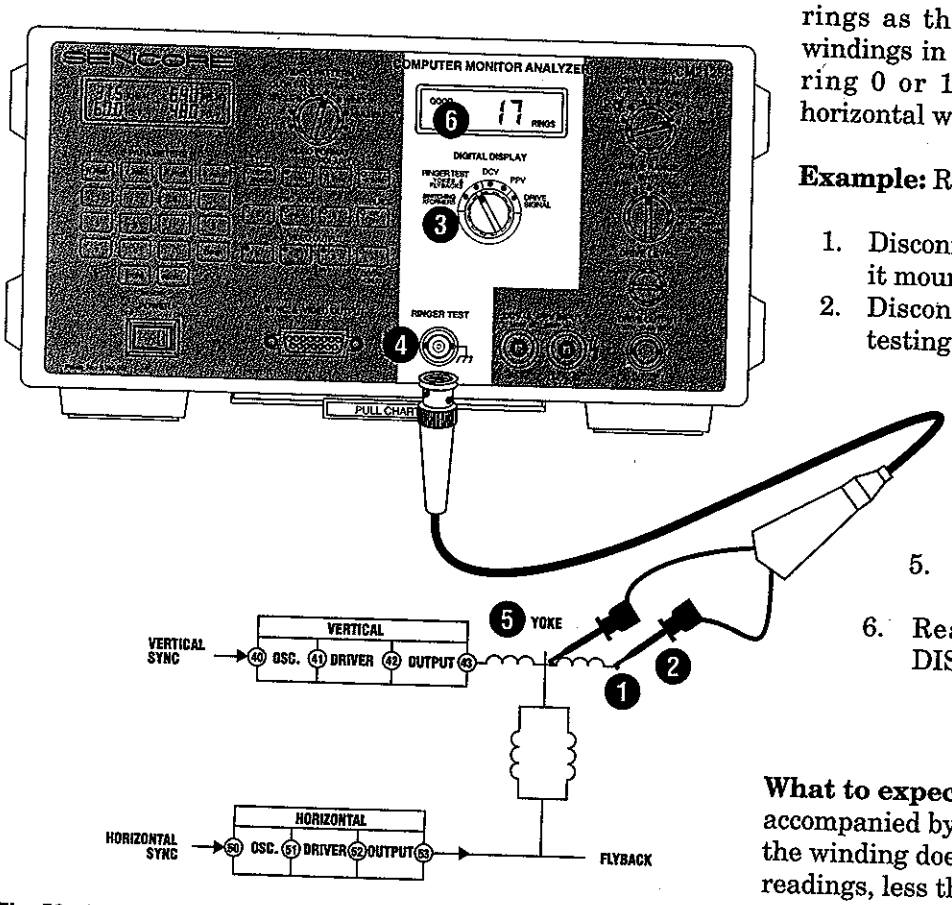

Fig. 53 - Ringing a deflection yoke.

3. Always unhook the yoke from the circuit. Often this is done by simply disconnecting the yoke plug. At other times you may need to unsolder the wires between the output stages and the yoke.

4. The vertical windings are paralleled by damping resistors. If the resistors are mounted on the yoke (they may be hidden by the plastic terminal cover), they must be removed to test. Otherwise the windings will ring bad, even if they are good. The damping resistors may also be located on the chassis. If so, they are automatically unhooked when the yoke is disconnected.

5. The vertical windings are located on the sides of the yoke. The horizontal coils are located on the top and bottom of saddle-type yokes, and are the toroidal windings of toroid-type yokes.

6. Do not test the yoke on a metal surface. The metal may act like a shorted turn and cause the tests to show bad.

7. Some toroidal yokes have a metal band around their perimeter. The band makes the yoke ring as though it had a shorted vertical winding. Use 5 rings as the GOOD/BAD cutoff for the vertical windings in these yokes. Bad vertical windings will ring 0 or 1. Continue to use 10 rings for the horizontal windings.

Example: Ringing a deflection yoke.

1. Disconnect the yoke from the circuit, leaving it mounted on the CRT.
2. Disconnect the damping resistors if you are testing the vertical windings.
3. Set the DIGITAL DISPLAY Switch to RINGER TEST "Yokes & Flybacks."
4. Connect the DIRECT TEST LEADS to the RINGER TEST Jack.
5. Connect the DIRECT TEST LEADS to the yoke winding.
6. Read the test result in the DIGITAL DISPLAY Readout.

What to expect: Readings of 10 rings or more are accompanied by a "Good" display and indicate that the winding does not have a shorted turn. "Bad" readings, less than 10 rings, indicate a shorted turn.

Testing Switching Transformers

Switching transformers are used in power supply circuits to step voltages up or down. They are much different from conventional power transformers in both appearance and operation. Power transformers usually operate at 60 Hz, and therefore contain a laminated iron core which is often visible. Because the iron core is low Q and absorbs all ringing energy, power transformers cannot be tested with the CM2125.

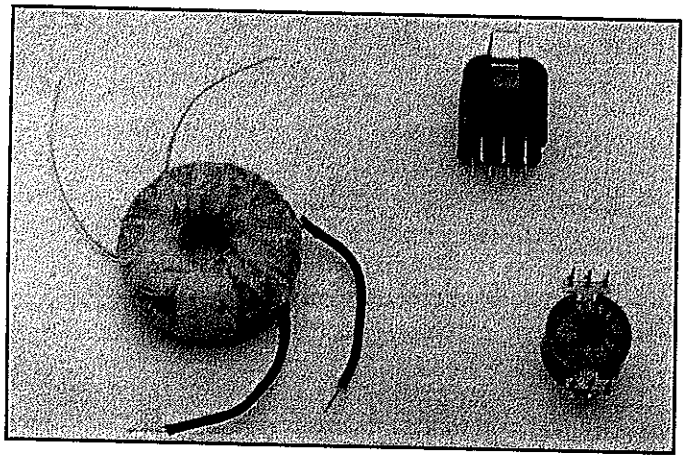

Fig. 54 - The toroid (left) and PC mount are two common types of switching transformers.

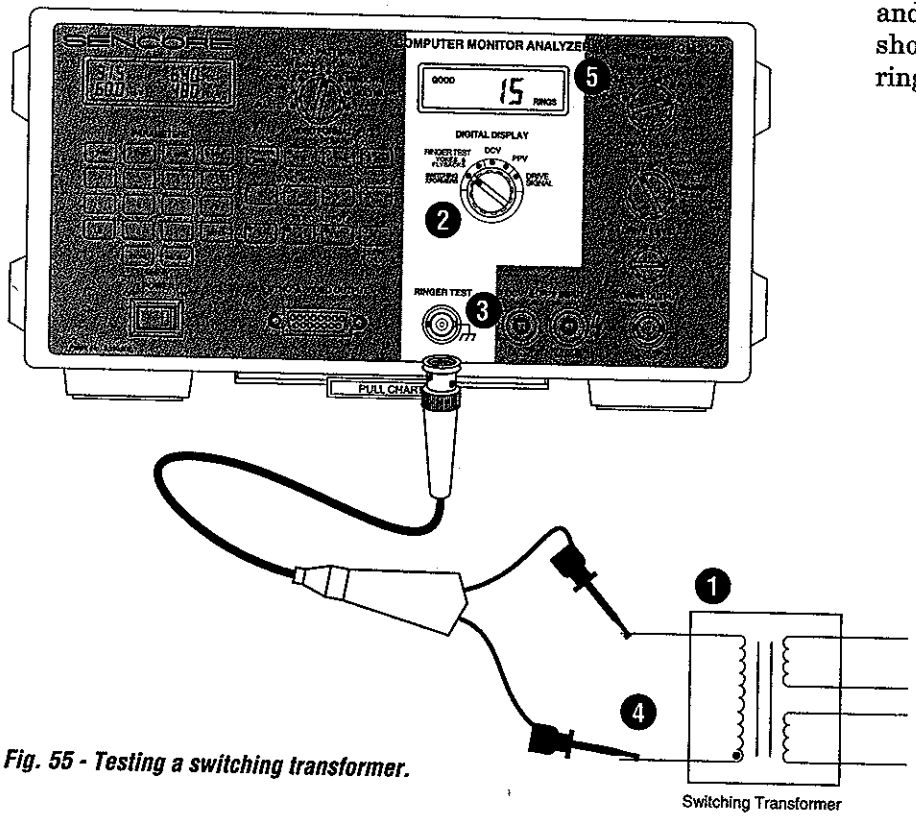

Fig. 55 - Testing a switching transformer.

Switching transformers, on the other hand, are mu smaller and lighter than power transformers. Th are wound around a ferrite core which easily rin when good. Switching transformers operate at mu lower currents and much higher frequencies th power transformers.

Example: Testing a switching transformer with t CM2125.

1. Remove the switching transformer from the circuit.
2. Set the DIGITAL DISPLAY Switch to RINGER TEST "Switching Transformers."
3. Connect the DIRECT TEST LEADS to the RINGER TEST Jack.
4. Connect the DIRECT TEST LEADS to the switching transformer.
5. Read the test result in the DIGITAL DISPLAY Readout.

What to expect: Readings of 10 rings o more are accompanied by a "Good" displa and indicate that the winding does not have shorted turn. "Bad" readings, less than 1 rings, indicate a shorted turn.

TROUBLESHOOTING HORIZONTAL CIRCUITS

Troubleshooting Horizontal Sync Problems

The horizontal sync pulses control the timing of the horizontal oscillator. Many monitors receive horizontal sync directly. Other monitors have a composite sync, or "sync on video" input and require the use of sync separators. Sync pulses that are low in amplitude, the wrong frequency, or are missing cause the monitor to lose horizontal hold.

Some monitors do not have a horizontal oscillator. Instead, they use the incoming sync signal to drive the deflection stages. These monitors will not power up if the sync signal is too low in amplitude, or is missing. This is because they use a scan derived power supply in which the horizontal output stage supplies the operating voltages.

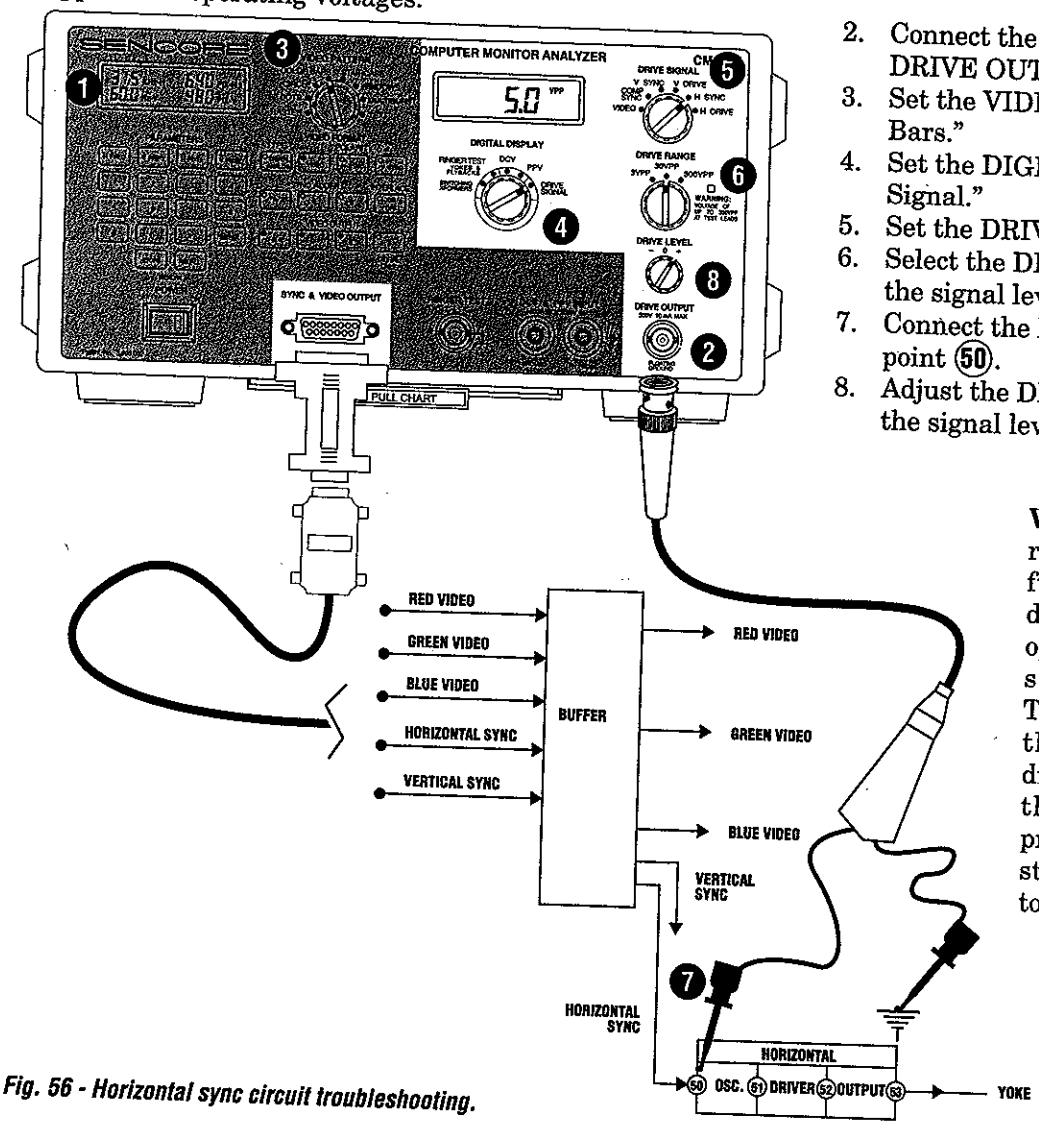

Fig. 56 - Horizontal sync circuit troubleshooting.

Use the "H Sync" Drive Signal to inject a good signal into the horizontal oscillator. This will determine whether the problem is in the stages before the oscillator, or in the sweep circuits.

Example: Troubleshooting a monitor with a horizontal hold problem.

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

Note: If the monitor operates correctly when connected to the CM2125 SYNC & VIDEO OUTPUT Jack without injecting a Drive Signal, the signal being supplied by the video adapter circuits in the computer is generating horizontal sync pulses at the wrong frequency or amplitude.

2. Connect the DIRECT TEST LEAD to the DRIVE OUTPUT Jack.
3. Set the VIDEO PATTERN Switch to "Color Bars."
4. Set the DIGITAL DISPLAY Switch to "Drive Signal."
5. Set the DRIVE SIGNAL control to "H Sync."
6. Select the DRIVE RANGE that is closest to the signal level in the circuit.
7. Connect the DIRECT TEST LEAD to test point (50).
8. Adjust the DRIVE LEVEL Control to match the signal level found in the circuit.

What to expect: If the monitor regains horizontal hold and gives full horizontal deflection, or if a dead monitor returns to operation, the Driver and Output stages work properly. Troubleshoot the oscillator and the sync path. If the monitor displays the same symptoms with the Drive Signal applied, the problem is in the Driver or output stages. Use the "H Drive" signal to inject into the output stages.

Troubleshooting Horizontal Output & High Voltage Problems

The horizontal output circuits are the heart of the monitor. The quickly-changing current in the output stages provides a practical, efficient source of operating voltages for use throughout the monitor. The horizontal output circuits are directly responsible for: 1) horizontal scanning; 2) CRT high voltage; 3) CRT focus voltage; 4) "Scan derived" low voltage supplies; and 5) feedback gating signals.

Components that make this happen are the horizontal output transistor, B+ supply, flyback transformer, high voltage multiplier and the startup and safety shutdown circuits. The horizontal yoke is not responsible for generating high voltage, but it is tied directly into the output circuits and may affect the output voltages if it is defective.

Failures in the horizontal output stages are common because the components are subjected to constant high current and high voltage stress. Without good troubleshooting procedures and test equipment, horizontal output problems can be difficult to isolate because the components interact so closely and the failure of any components often creates the same symptom: a dead monitor.

Several features of the CM2125 help simplify troubleshooting horizontal output problems. These are the Ringer Test, the Horizontal Drive Signal, and the DCV and PPV meter.

Testing Flyback Transformers

A flyback transformer can develop one of three common failures. Following is a brief explanation of each and the troubleshooting procedure to locate the failure.

First, a winding may develop an open or shorted turn. An open winding is usually easy to detect. Measure the DC or PPV output with the CM2125's DVM if the chassis is operational, or check for continuity with an ohmmeter. A shorted turn, however, can only be detected using the CM2125's Ringer Test. The change in resistance that it causes is too small to be detected with an ohmmeter.

A second failure is common only to flybacks that contain a high voltage multiplier. These flybacks are called integrated high voltage transformers, or IHVTs. If the multiplier portion of an IHVT fails, the high voltage and/or focus voltage will be low or missing. Test for this failure by driving the IHVT with the Horizontal Drive Signal and measuring the resulting output.

A third failure occurs when a flyback transformer develops a leakage path between two windings, or between a winding and the transformer's core or mounting bracket. A high resistance leakage path often pulls down the B+ supply, even if the horizontal output transistor is disconnected from the circuit. Usually the leakage path goes unnoticed until operating voltages are applied to the flyback. Use a "Hi Pot" test, such as the Sencore "Z-Meter" Leakage test, to isolate leakage between windings.

Note: *Leakage between windings is different than a shorted turn. The Hi Pot test will find leakage between windings, but not a shorted turn. The Ringer test will find the more common shorted turn, but will not find leakage or shorts between windings.*